Before the
New York State Public Service Commission

In the Matter of

Consolidated Edison Company of New York, Inc.

Case 16-G-0061

May 2016

Prepared Exhibit of:

New York City Gas Infrastructure Panel:

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On Behalf of:

The City of New York

Company Name: Con Edison
Case Description: 2016 - Con Edison Electric and Gas Rate Filings
Case: 16-E-0060; 16-G-0061

Response to City of New York Interrogatories – Set City-1
Date of Response: 03/09/2016
Responding Witness: Gas Infrastructure & Operations Panel

Question No. : 20

With respect to the Company's proposal to replace 12-inch cast iron and unprotected steel pipe, provide the following:

a. Identify and provide underlying analyses for the specific relative risk reduction to be gained from replacing 12" diameter cast iron and unprotected steel pipe.

i. In response to (a), provide an explanation for how such risk reduction is measured.

ii. In response to (a), if no such analyses have been performed, explain why not.

b. With respect to the Company's efforts to reduce system risk by replacing 12-inch cast iron and unprotected steel pipe, provide Con Edison's underlying analyses and calculations that demonstrate the specific risk reduction achieved per dollar spent for replacing 12-inch pipe.

i. If no such analyses and/or calculations have been performed, explain why not.

c. With respect to the Company's efforts to improve system resiliency by replacing 12-inch cast iron and unprotected steel pipe, provide the analyses and calculations that Con Edison uses to identify the improvement in system resiliency per dollar spent for replacing 12-inch pipe.

i. If no such analyses and/or calculations have been performed, explain why not.

d. With respect to the Company's efforts to improve system safety by replacing 12-inch cast iron and unprotected steel pipe, provide the analyses and calculations that Con Edison uses to identify the improvement in system safety per dollar spent for replacing 12-inch pipe.

i. If no such analyses and/or calculations have been performed, explain why not.21

Response

(a). Recent industry events have demonstrated that 12 inch cast iron pipe poses a significant risk. In order to evaluate the risk of 12 inch cast iron and unprotected steel pipe, a subset of PHMSA Natural Gas Distribution Incident Data from 2010 to February 2015 was analyzed. The subset included non-company natural gas distribution main incidents during this time period which were associated with the following DOT cause categories: corrosion failure, material failure of pipe weld, and natural force damage. Of the PHMSA data subset examined, it was found that 100 percent of incidents involving fatalities and injuries were associated with gas mains of 12 inch diameter or less.

Con Edison gas leak repair trends also provide evidence of the risk reduction gained from replacing 12 inch diameter cast iron, as well as for 12 inch unprotected steel. The average leak repair rate per mile of inventory for 12 inch unprotected steel gas mains was higher than that of 8 inch unprotected steel gas main, for the years 2009 – 2015. This comparison was also true for non-breakage leak repairs on 12 inch versus 8 inch cast iron mains. This suggests that there is significant risk reduction to be gained by expanding the main replacement program to target 12 inch and under diameter mains.

The specific relative risk reduction resulting from the Company's proposed main replacement program was not measured, due to the significant number of variables that can influence the assessment of risk. We continuously monitor emerging Company and industry leak/incident trends. Based on these trends, we incorporate new or update existing factors in our main prioritization model, to guide how our main replacement program targets risk.

(b). See response to subpart (a).

The Company's main replacement program is designed to target mains which pose the biggest threat of loss of life, injury, and property damage.

(c). The main replacement program increases reliability in our distribution system, by eliminating smaller diameter mains that are prone to leaks and water infiltration. During main replacements, we also have the opportunity to install larger diameter mains where beneficial, which can increase our system capacity. In recent years, we have seen an increase in the number of leak repairs on 12-inch and under cast iron and unprotected steel. Adding this inventory to our main replacement program will eliminate the chance that an outage will occur from an uncontrollable leak that occurs on a 12-inch and under cast iron or unprotected steel main.

Additionally, larger diameter mains in the distribution system often act as supply mains, which feed the remainder of the system. If an outage were to occur on one of these mains, due to a leak or water infiltration, it could result in disruption of service to a large number of customers.

Despite the added reliability benefit of replacing 12-inch and under cast iron and unprotected steel main, the primary justification to adding 12-inch cast iron and unprotected steel mains to the main replacement program is to reduce system risk.

(d). See response to subpart (a).

Company Name: Con Edison
Case Description: 2016 - Con Edison Electric and Gas Rate Filings
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Response to City of New York Interrogatories – Set City-1
Date of Response: 03/08/2016
Responding Witness: Gas Infrastructure & Operations Panel

Question No. : 22

On page 13 of the GIOP's pre-filed direct testimony, the Panel proposes to accelerate the replacement of cast iron and unprotected steel pipe with the goal of replacing all 12-inch-and-under diameter cast iron and unprotected steel pipe in 20 years. With respect to the Company's proposal to accelerate main replacement, provide the following information:

a. All underlying analyses used by Con Edison to determine a 20 year replacement period.
b. All consultant reports considered in determining the Company's optimum replacement period for its accelerated main replacement program.
c. Alternative main replacement programs considered (*i.e.,* 25 years, 30 years, 40 years)?
i. With respect to (c), provide an explanation as to why a 20 year replacement program was chosen versus an alternative program.
ii. With respect to (c), provide all underlying analyses that were used to assess alternative main replacement programs.
iii. If no such analyses were performed, explain why not.

Response

(a). Con Edison is accelerating the main replacement program in order to increase emphasis on reducing the risk posed by our cast iron and unprotected steel distribution mains. Industry and stakeholder focus on this risk has helped guide the decision to accelerate the program. For example, in March 2012, PHMSA released a bulletin urging natural gas system owners to accelerate pipeline repair, rehabilitation, and replacement of high-risk cast iron pipelines. In addition to enhancing safety, the acceleration of the main replacement program will also allow us to accomplish significant reductions in greenhouse gas emissions associated with methane leaks.

A replacement period of twenty years will allow us to accomplish the desired risk reduction at a pace which can be realistically accomplished, taking into account resource constraints and municipal impacts.

(b). The ZEI Cast Iron and Bare Steel Gas Main Study for Consolidated Edison Company of New York, Inc. was performed in 2008. Please see attachment City-1-22-Att 1.

(c). A description of alternative main replacement programs considered can be found in Section 5.4.2 of our 2010 Gas Long Range Plan. See Attachment DPS-1, Q9 Attachment 2 Gas Long Range Plan. Also see attachment City-1-22-Att 1.

As a part of the 2014-2016 rate case, Con Edison increased its main replacement levels from the 50 mile annual target suggested by the ZEI Cast Iron and Bare Steel Gas Main Study. We now propose to increase our replacement levels further, to allow for the replacement of all 12-inch-and-under cast iron and unprotected steel in a 20 year period. This increase was made to support the Company's increased focus on risk management and public safety.

The alternative main replacement program proposed by the ZEI Gas Main Study was re-assessed after we experienced a dramatic rise in incoming gas leaks in 2014. This rise was due to increased leak survey levels, and to an increased public awareness of gas safety. The sustained change in leak levels has resulted in a "new normal," which is significantly higher than the historical leak levels that were used as the baseline for the ZEI Cast Iron and Bare Steel Gas Main Study in 2008.

Company Name: Con Edison
Case Description: 2016 - Con Edison Electric and Gas Rate Filings
Case: 16-E-0060; 16-G-0061

Response to City of New York Interrogatories – Set City-1
Date of Response: 3/7/2016
Responding Witness: Gas Infrastructure &Operations Panel

Question No. : 25

Provide the quantity of incremental main to be replaced as a result of replacing 12- inch cast iron and unprotected steel pipe.

Response:

As explained in the testimony of the Gas Infrastructure and Operations Panel, the Company's current main replacement program focuses on 8-inch and under cast iron and unprotected steel pipe. The Company is proposing to expand its program to include up to 12-inch and under cast iron and unprotected steel pipe. This proposed expansion will result in the following incremental pipe replacements:

- An additional 40.4 miles of 10 – inch cast iron / wrought iron and unprotected steel pipe will be replaced; and
- An additional 207.23 miles of 12 – inch cast iron / wrought iron and unprotected steel pipe will be replaced.

The values below represent the main inventory as of December 31st, 2015.

Pipe Diameter	CI / WI (miles)	Unprotected Steel (miles)	Total
10”	21.08	18.96	40.04
12”	135.13	72.10	207.23
Total	156.21	91.06	247.27

Company Name: Con Edison
Case Description: 2016 - Con Edison Electric and Gas Rate Filings
Case: 16-E-0060; 16-G-0061

Response to City of New York Interrogatories – Set City-1
Date of Response: 3/7/2016
Responding Witness: Gas Infrastructure & Operations Panel

Question No. : 26

Provide the quantity of 12-inch cast iron and unprotected steel pipe that is located in flood-prone areas.

Response:

The table below provides the quantity of 10-inch and 12-inch cast iron / wrought iron and unprotected steel pipe located in flood-prone areas.

Pipe Diameter	Cast Iron / Wrought Iron (miles)	Unprotected Steel (miles)	Total
10”	1.17	0.19	1.36
12”	5.89	1.92	7.81

The values above represent the main inventory as of December 31st, 2015.

Company Name: Con Edison
Case Description: 2016 - Con Edison Electric and Gas Rate Filings
Case: 16-E-0060; 16-G-0061

Response to City of New York Interrogatories – Set City-1
Date of Response: 03/07/2016
Responding Witness: Gas Infrastructure & Operations Panel

Question No. : 27

Identify how many miles of flood prone cast iron main were replaced during each of the five (5) years prior to 2016.

Response

3.80 miles of flood prone cast iron / wrought iron was replaced in 2015.
1.47 miles of flood prone cast iron / wrought iron was replaced in 2014.

Please note: The storm hardening initiative for replacing leak prone pipe in flood prone areas was created in 2014 and only focuses on 8-inch and smaller diameter pipe. The specific cast iron / wrought iron replacement data for flood prone areas was not tracked prior to 2014.

Company Name: Con Edison
Case Description: 2016 - Con Edison Electric and Gas Rate Filings
Case: 16-E-0060; 16-G-0061

Response to City of New York Interrogatories – Set City-1
Date of Response: 03/07/2016
Responding Witness: Gas Infrastructure & Operations Panel

Question No. : 28

With respect to the Company's new geographic area approach for main replacement:

a. Identify the weighting factors used by this model
b. Identify how often the model's weighting factors will be calibrated/evaluated or changed.

Response

28 (a).

- MRP Condition Score
  - Previous Failure History
  - Background Failure Zones
  - Age
  - Diameter
- MRP Risk Score
  - Previous Failure History
  - Background Failure Zones
  - Age
  - Proximity
  - Open Ground
  - Cellars
  - Diameter
- Electric Structures
- BOPA
- Unstable Soil
- Critical Main
- ZEI Soil Data
- Active Main and Service Leaks
- Population Density
- Leak Prone Service Count

28 (b). The models weighting will be recalibrated whenever new weighting factors are added to the model or every three years, whichever is less.

Company Name: Con Edison
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Response to City of New York Interrogatories – Set City-1
Date of Response: 03/10/2016
Responding Witness: Gas Infrastructure & Operations Panel

Question No. : 32

Provide the average costs to replace services for each of the following main replacement programs:

a. Pre 1972 services with main replacement.
b. Service replacement due to missing curb valve.
c. Leaking services.

Response

Program	3 Year Average
Pre 1972 services with main replacement	$8,700*
Service replacement due to missing curb valve	$10,100
Leaking Services	$19,800

*Please note the Company forecast for the average cost of services related to MRP for the Rate Years is approximately $15,900 due to significantly more MRP work planned for Manhattan.

Company Name: Con Edison
Case Description: 2016 - Con Edison Electric and Gas Rate Filings
Case: 16-E-0060; 16-G-0061

Response to City of New York Interrogatories – Set City-1
Date of Response: 03/03/2016
Responding Witness: Gas Infrastructure & Operations Panel

Question No. : 33

On page 52, line 10 of the GIOP's pre-filed direct testimony, the Panel discusses the Company's expenditures related to transmission programs and projects. Identify whether these transmission costs reflect the total transmission project costs, or only the Con Edison allocation of the New York Facilities budget?

Response

These transmission costs reflected on page 52, line 10 of the GIOP direct testimony are the Company's total transmission project costs.

Company Name: Con Edison
Case Description: 2016 - Con Edison Electric and Gas Rate Filings
Case: 16-E-0060; 16-G-0061

Response to City of New York Interrogatories – Set City-4
Date of Response: 04/07/2016
Responding Witness: Gas Infrastructure & Operations Panel

Question No. : 176

Provide the 100-year flood maps of the Company's service territory in New York City.

a. Provide the number of customers in each of these areas.

b. For each of these areas, provide the length of:

i. leak-prone pipe main.

ii. non-leak-prone pipe main.

Response

The Company uses the FEMA Preliminary Firm Maps to determine the flood zones in New York City. They can be found at FEMA's website at https://msc.fema.gov/

a. Approximate number of customers in each area:

Borough	Customers
Manhattan	5,800
Bronx	3,200
Queens	3,000

b. i & ii.

As of June 2015 the Company's inventory of distribution main in the 100 Year flood maps (FEMA Preliminary FIRM maps) was:

Borough	All Mains (feet)	Flood Prone Pipe* (feet)	Non-Flood Prone Pipe (feet)
Manhattan	294,140	85,607	208,533
Bronx	136,299	29,510	106,789
Queens	171,818	40,286	131,531

*Low pressure cast iron and unprotected steel of 12” diameter or less.

Company Name: Con Edison
Case Description: 2016 - Con Edison Electric and Gas Rate Filings
Case: 16-E-0060; 16-G-0061

Response to City of New York Interrogatories – Set City-4
Date of Response: 04/11/2016
Responding Witness: Gas Infrastructure & Operations Panel

Question No. : 182

With respect to the Company's general proposed reinforcement of transmission mains in New York City, provide a detailed analysis on the impacts to customers and system reliability if some or all of the reinforcement work was deferred. Include any work papers, data, and Excel spreadsheets with formulas and inputs intact.

a. If no such analysis has been performed, explain why not.

Response

If some or all of the reinforcement work was deferred, gas transmission pressure in the 3rd Ward of Queens will be below our design criteria of 150 psig. Low pressure on the transmission system can cause regulator stations to not adequately supply gas to the distribution system, which can cause low-pressure conditions, or gas outages to firm gas customers. All system analysis is performed using DNV-GL Synergi Network analysis.

Company Name: Con Edison
Case Description: 2016 - Con Edison Electric and Gas Rate Filings
Case: 16-E-XXXX; 16-G-XXXX

Response to DPS Interrogatories – Set DPS-1
Date of Response: 01/29/2016
Responding Witness:

Question No. : 9

Provide a copy of all strategic operating plans that describe the company's current or prospective corporate goals and objectives.

Response

CECONY's strategic operating plans, corporate goals and objectives are updated as part of the Company's Long-Range Planning (LRP) Process and address the Company as a whole across all its services. The Company is in the process of updating its electric and gas long range plans.

Annual Long-Range Planning Process Overview

Our integrated long-range plan is guided by our corporate vision: *Con Edison is a premier provider of safe, reliable, clean, innovative, cost-effective energy services and solutions that enhance the lives of our customers***.** Our long-range plan serves as a roadmap for how we will accomplish our vision. Our planning is, and must be, a continuous effort, which means we will annually revisit this process. Our ongoing planning process anticipates the need to make adjustments that incorporate new insights we develop as we execute the plan—all with our ultimate goal of delivering the level of safe and reliable service our customers have come to expect. This process is highlighted below:

1. **Customer and industry trends.**

Annually, we develop a 20-year outlook on customer and industry trends that serves as the basis for our long-range plans. Our forecast for energy use reflects our views on the local economy, employment, demographics, and also considers preferred energy solutions. We also consider the regulatory landscape, technology improvements, and energy markets to forecast what it will cost to deliver this energy.

2. **Determine customer energy needs, the existing system capability and infrastructure investment requirements.**

Once we have developed our long-range demand forecasts, we identify areas in our system that will need reinforcement to meet projected demand growth, and determine when that reinforcement will be needed.

3. **Apply an integrated infrastructure planning framework to optimize our investment requirements.**

   We then look further into what causes demand to grow and consider a broader set of solutions. First, we look for opportunities to shape, or shift, demand. We may look to shape the demand by implementing demand-side management programs (e.g., efficient lighting and demand-response programs). We look for opportunities to shift demand across commodities with solutions such as using gas or steam instead of oil, self-generation of electricity and using combined heat and power systems.

   We then determine the infrastructure investments we must make. We review options available to us and identify the lowest cost solution that is consistent with maintaining safe and reliable service. Where possible, we use existing assets with spare capacity rather than make large infrastructure investments. To this end, we perform cost-benefit analyses on all of our projects before choosing the most cost-effective solution.

4. **Focus on the total customer bill, targeting common cost drivers such as supply, taxes, and fees.**

   Although we only have direct control over the delivery portion of our customers' bills (approximately one-third of the total bill), our goal is to minimize the total customer bill. To that end, our expanded focus includes strategies for limiting the supply (or commodity) portion of the bill as well as taxes and fees.

5. **Enhancing customer insights, interactions and engagement.**

   Our goal is to improve customer experience and deliver a consistent, high quality customer experience as "one Con Edison" across electric, gas, and steam, while maintaining high levels of reliability and safety. Customer insights developed through identification of evolving customer energy uses and emerging industry trends enable us to better serve our customers.

   We strive to improve our interactions with our customers. An essential element of achieving our goal is that we continue to demonstrate to customers, through our interactions, that we are responsive and customer-focused, and an organization that provides high quality customer experiences in response to customer concerns and requests.

   We also seek to proactively engage our customers to help them make more informed energy decisions and direct them to the least cost energy solution.

Overview of CECONY Corporate strategy and objectives for all services and the Company as a whole.

To achieve CECONY's corporate vision and enhance the value our Company delivers to customers and society, we focus on seven objectives:

- **Reduce risk** to deliver energy safely, with high reliability and resilience
- **Enhance our customers' experience**
- **Mitigate bill impact** by advancing system design and reducing both delivery and non-delivery costs
- **Pursue operations excellence and public/employee safety**
- **Advance employee engagement, diversity, and inclusion initiatives**
- **Respond to regulatory environment to advance the value our utilities offer customers and society (e.g., Reforming the Energy Vision proceeding - "REV")**
- **Advance corporate sustainability efforts**

We provide additional detail on the first three of these objectives below because they are specific to the rate filings.

CECONY LRP approach and key focus areas for 2015

In the 2015 LRP planning cycle, there were key updates in the areas of customer experience, managing risk and system design.

<u>Customer Experience</u>

As part of the long range planning process, we have identified six objectives for our service commitment to our customers:

- Delivering customer value
- Providing convenience
- Offering choice of services
- Tailoring customization products and services
- Giving customers control and information to manage their energy use
- Enhancing our employee culture by fostering a positive customer focus across the Company

Our plan works towards these objectives through five imperatives:

- We improve our processes to deliver responsive and customized customer services.

- We educate our employees, training them to provide service for today and tomorrow's energy customer.
- We engage with our customers to learn about their needs and provide outreach to the communities we serve
- We leverage technology and systems to optimize existing and create new channels of communication.
- We facilitate and offer new products and services consistent with the REV vision to help customers manage their energy use.

Each of our five imperatives is supported by initiatives designed to achieve the core objectives of our plan to enhance the customer experience. A list of selected initiatives is provided in the table below:

Customer Experience Imperatives

Imperative	Initiative
Improve our processes	Improve storm communication Service automation
Educate our employees	First call resolution "+1 experience" initiative "Enhancing the customer relationship" training
Engage with our customers	Customer outreach Online interactions Corporate branding
Leverage technology and systems	Targeted distributed resource pilots Advanced Metering Infrastructure (AMI) Improve outage management
Offer new products and services	Energy Efficiency programs Distributed System Platform (DSP) New tariffs and rates

We also envision a future where we interact in real-time with our customers to meet their needs for the electric and gas commodities we deliver. We are already engaged in working with our customers to increase the efficiency of their energy consumption, to help prepare for new and innovative technologies that are on the horizon, and to achieve state and local goals for environmental sustainability. Currently, our delivery of energy operates largely in one direction, from us to our customers. In the future we will continue to work to empower our customers by making them a joint source of energy supply.

We have made progress in engaging with our customers through the development of an online advisory community and utilizing various types of surveys.

Our Con Edison Advisory Community is an online portal that has over 10,000 customers that engage the Company through moderated forum discussions, surveys, photo/video galleries, ideation sessions and quick polls. The portal helps us gain valuable insight about our customers to better understand their needs. We have thus far conducted over 40 customer surveys targeted to specific customer needs.

In addition to our Advisory Community, we conduct research to better gauge the voice of the customer through JD Power surveys, targeted phone surveys of our customers, focus groups and monitoring social media.

We have also established a team dedicated to enhancing the customer experience. This team seeks to examine our business through the eyes of the customer and identify gaps between our customers' expectations and the service that we provide. The team seeks to close such gaps wherever possible by revising policies, procedures and practices. The team has several subgroups focused on specific outcomes:

- Best practices – focused on identifying and sharing best practices across the enterprise
- Customer experience metrics – develops customer experience metrics for adoption across the enterprise
- Customer satisfaction - address aspects of our business that score low in surveys and cross functional issues and drive improvements
- Communications standards - engage and educate employees in the importance of the customer communication standards and reinforce how good communications creates +1 experiences
- Recovery – challenge business paradigms so that in an event caused by the Company, everything possible is done to make the situation as painless as possible for the customer
- Training – continue to develop training that helps employees better understand customer expectations, improve their communications with customers, represent Con Edison well and become service champions.

Managing Risk

The Company has an active enterprise risk management process ("ERM") in which we identify and prioritize our top corporate risks. We use a multi-tier framework and process which includes:

- Risk management culture and governance
- Risk control through policies, infrastructure, and methodologies
- Risk reduction of large scale events through multi-prong strategy:
    - Invest to prevent the cause of event
    - Improve real time detection of potential events
    - Respond to and contain scale of events

  - Improve resiliency and recovery efforts
- Consideration of risk mitigation in the capital optimization process

The Company's risk management process has identified 11 top corporate risks related to the electric and gas systems as follows:

- NY regulation
- Major storm
- Gas distribution event
- Low voltage cable failure
- Underground distribution failure
- Safety
- Network shutdown
- Cyber security
- Loss of area or transmission substation
- Gas transmission event
- Rogue employee

The ERM process develops and improves the structure, process, tools, and communication channels to support the following critical elements of ERM: identification, analysis, integration, assessment, management, monitoring, and risk mitigation. The ERM process vision is to protect the value of the enterprise and realize opportunities for all our stakeholders by promoting the efficient and effective management of risk across the Company and reduce the probability of significant risk events through the focus of and monitoring of key risk indicators.

The organization has several objectives that drive us towards our vision:

- Identify, assess, mitigate, monitor and report risks that have the potential to significantly impact the Company or our stakeholders
- Align business risk exposures with strategic objectives
- Allocate resources accordingly
- Identify, assess and mitigate significant risks at a department level
- Identify, assess and mitigate compliance risks across the Company
- Continue to progress towards ERM best practices through benchmarking

<u>Gas</u>:

During 2015, the Company made significant progress in managing the risk related to gas events in the areas of improving risk culture, prevention, detection and response:

- **Risk Culture**
  - Implementing a multi-layer quality control inspection program

- **Prevention**
    - Accelerated main replacement from 34 years to 20 years
    - Performed risk analytics to identify internal (e.g., infrastructure condition) and external factors (e.g., soil type, traffic load) that contribute to main failures
    - Developed geographic replacement program to manage risk, achieve economies of scale, and minimize community impacts
- **Detection**
    - Enhanced leak survey process by increasing full system leak surveys to 13 times annually
    - Launched pilot program to improve effectiveness of leak surveys via more sensitive equipment
    - Pursued R&D to advance next generation customer methane detection
- **Response**
    - Improving organizational performance through benchmarking and self-assessment
    - Deploying additional isolation valves

The Company also placed significant focus on addressing physical and cybersecurity risks:

Physical Security

- Established physical controls and electronic perimeter security measures
- Implementing an advanced internal security awareness and training program
- Deploying an integrated security system platform
- Continuing to collaborate with industry and law enforcement
- Complying with NERC regulations

Cyber Security

- Established functional group of cybersecurity analysts for policy interpretation and implementation, security risk management and incident response
- Developed cyber attack response plans
- Blocked all unauthorized cloud-based file sharing websites
- Responding to new standards and government actions

Electric Distribution

As an example of risk reduction, in addition to maintaining levels of day-to-day electric reliability, CECONY seeks to reduce the risk of a prolonged, large-scale network outage, and the resulting adverse impacts experienced by our electric customers. Con Edison has developed and utilizes analytical models to understand the performance of each of the Company's electric networks based on their unique characteristics. The key output from these models, the Network Reliability Index (NRI), is a probabilistic measure of risk levels of each network. NRI is defined as the state where four or more electric feeders supplying power to one local portion of a network experience failure at the same time during periods of high electricity demand. NRI has become an important electric planning measure that the Company uses in a variety of design and investment decision-making processes. The Company has made significant progress in addressing reliability of its distribution networks and expects all networks to meet the NRI standard of 1.0 by the end of 2016.

System Design

In 2015, the Company continued updating its system design process to reduce the delivery component of our customer bills by reducing the amount of capital invested to meet growing energy demand. We seek to reduce capital requirements by deferring or minimizing investment requirements for traditional utility solutions such as new substations. We plan achieve this by better incorporating non-traditional solutions such as distributed energy resources into our grid as well as utilizing innovative 3G (third generation) designs which increase asset utilization, improve operational flexibility while maintaining reliability, all at lower cost.

Incorporating Distributed Resources

In 2015 we made progress in incorporating distributed resources into our planning and system design processes as follows:

- Developed a framework for integrating DER into the system planning process
  - Outlined criteria to consider DG and PV capacity in the system and network forecasts including reliability, coincidence with network and system peak demands and duration of output
- Improved the method used to forecast energy efficiency and demand response resources
  - Utilized a more accurate and granular analysis
  - Increased future energy efficiency program volumes
  - Included NYSERDA Clean Energy Fund resources

As a result of these process improvements, the 2015 ten year independent network forecast takes credit for the following resources, reducing the need for capital investment:

- 80 MW of demand response105 MW of energy efficiency
- 130 MW of distributed generation
- 80 MW of solar photovoltaic generation

Innovative System Designs

In 2015, the Company made progress on a number of system design projects as follows:

- Prevention of Cascading Events: utilizing an innovative low voltage switch developed by the Company to relieve overloaded transformers and feeders along the edges of networks during summer peak periods or when we experience feeder contingencies
- Distributed Generation Quick Connect Plug: Developed a patent pending, DG quick connector to more quickly connect generators to the secondary grid to reduce customer restoration time and avoid cascading failures and the potential for larger outages.
- Three-Position Medium Voltage Switch: Utilizing three-position primary switches to isolate customers and expedite feeder processing, improving network reliability.

- Transferable Feeder Group at Avenue A: Applying the transferable feeder group concept which uses primary switches to transfer load between two networks to de-load Avenue A substation and defer costly load transfers from Cherry Street to Seaport No. 2
- Gateway Estates New Business Design: Developed a design to use primary switches and an underground auto-loop to supply new customer, Gateway Estates, with fewer secondary cables thus reducing capital installation costs

conEdison

Gas Long Range Plan

2010-2030

December 2010

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1.0 EXECUTIVE SUMMARY

1.1 BACKGROUND

For over 180 years, Consolidated Edison, Inc. (Con Edison or the Company) has had the privilege of providing power, light, and heat to the people of New York City (NYC) and Westchester County through our natural gas delivery system. This Gas Long Range Plan (GLRP) provides our plan for the gas delivery system for the next two decades.

Con Edison's vision is to be a trusted industry leader who takes pride in providing safe, innovative and competitive gas energy solutions today and for future generations. Our mission is to deliver gas to our customers safely and reliably, to demonstrate respect for the environment, and to create a culture that encourages safety and develops our employees. This mission entails building and maintaining the gas infrastructure necessary for the transmission and distribution of gas, and providing meter reading, billing and other services to our customers. We also procure gas supply for our full service customers. Other customers purchase their gas supply directly from energy services companies or directly from pipelines, but we continue to deliver the gas they purchase through our transmission and distribution systems.

The GLRP's strategy to meet our mission focuses on improving cost-effectiveness while meeting safety and reliability objectives. We will minimize rate increases for our customers by efficiently managing our assets and investments and by pursuing cost-effective growth. Our long-term strategic objectives are to:

1. Meet our customers' expectations for safe and reliable gas service
2. Manage cost to keep rates affordable
3. Pursue incremental growth opportunities that are economically beneficial to our gas customers
4. Provide competitively-priced gas supply to our city-gates from diversified sources
5. Be stewards of investors' economic interests through responsible financial management
6. Provide a safe and professionally satisfying environment for our workforce
7. Support the environmental and economic development policy goals and betterment of New York and the communities we serve

During the period of the 2010-2030 plan, we expect to invest $6.5 billion in capital infrastructure in real 2010 dollars, or an average of $309 million a year, including investments to support gas customer demand growth. This level of investment reflects reductions in our ongoing capital investments for maintenance offset by investments for growth, resulting in a flat capital budget during the plan horizon. By serving more customers while holding overall capital expenditures flat, we plan to reduce the unit cost per customer. As a result, we expect to see a decrease in delivery rate increases from 1.6% annually to 1.1% annually for our total customer base during 2014-2030.

The Company is encouraged that there are opportunities to reduce pressure on customers' bills. The projected bill reflects a lower rate of increase than our recent historical trajectory due to better project design approaches, more efficient management of assets, increased system usage, and lower gas commodity costs. The cost to replace existing vintage facilities is much higher than the current average system cost due to more stringent construction standards and higher material, equipment, and labor costs. We are sensitive to these cost impacts on our customers and will work to keep costs down. Beyond the cost projections set forth in this study, there are additional opportunities to moderate customer bills, we will continue to leverage technological advances as new technology becomes available and to improve efficiency and also to support efforts to lower the tax component of customer bills and to achieve additional regulatory reforms. As such we will address safety, system integrity, service reliability, regulatory requirements and cost impact to maintain the critical gas infrastructure that supports the economic viability and security of NYC and Westchester County.

1.2 PLAN DEVELOPMENT PROCESS

Historically, Con Edison developed 10-year infrastructure plans for its gas distribution and transmission systems. The purpose of these infrastructure plans was to determine the work needed to build sufficient system capacity to meet customer energy requirements. The plans were based on stringent design criteria aimed to produce a very safe and reliable system. This 20-year GLRP extends the transmission and distribution system infrastructure plans by adding other elements of our business, such as demand and supply drivers, customer, and workforce implications to present a single comprehensive plan for the business unit. We also initiated a comprehensive and quantitative approach to capital investment optimization for this plan. This enhanced process considers the impact of investments on the cost, performance, and risk profile of the gas system.

The first step in this expanded planning process is to develop forecasts for gas demand. We made assumptions about economic trends, environmental and regulatory requirements, the competitiveness of natural gas prices, and technological advances to develop three forecasts of customer demand: a High Case, Plan Case, and Low Case. To develop the infrastructure projects and programs in this plan we used the Plan Case demand forecast and identified signposts that we will monitor to update our plan in the future as appropriate.

Over the next twenty years, natural gas will remain an integral part of our community's energy mix. We expect demand for natural gas to grow because it is a cost-effective, environmentally-responsible fuel for particular energy applications, such as heating, power generation, and transportation. Motivated by economic and environmental considerations, we anticipate that consumers will consider natural gas as a heating fuel and power generation source, evaluate the economics of gas-fired distributed generation, incorporate energy efficiency improvements, and integrate natural gas vehicles into their fleets. Con Edison will facilitate and support the increasingly complex energy choices faced by our customers.

Demand for natural gas applications is highly dependent on the commodity's availability and its price relative to competing fuels and price volatility. Recent North American unconventional gas discoveries, including the potential for Marcellus shale production in the northeast United States, suggest that natural gas prices will likely remain competitive during the planning period. Through our supply diversification, gas procurement, and hedging, we obtain adequate supplies of natural gas, while reducing the near-term commodity price volatility our full-service customers experience. We also offer multiple payment options to help customers manage their energy bills. Reliable gas supply and service also depends on adequate pipeline capacity and storage contracts to deliver gas to our city-gates. Con Edison expects to continue to manage this important business requirement during the planning period.

Our infrastructure plan seeks to balance the safety, reliability, and affordability concerns of our customers. We will reduce our ongoing capital investments through improved asset management, incorporating innovative approaches as well as deferring investments that do not compromise system integrity. We are engaged in natural gas research and development activities and have pioneered several cost-effective technologies such as system integrity-related trenchless and pipe rehabilitation technologies. We will continue to invest in research and to adopt proven technologies that reduce costs. Incremental capital investments for new demand sources will be carefully managed through smart design approaches and improved coordination with interested new customers. We will invest in growth wherever increased usage of the system will help to reduce costs for our customers or to meet our service obligations.

Enhancing customer experience is one of the strategic objectives outlined in our plan. The rapidly changing environment increases the importance of putting systems in place to meet the challenges ahead. In terms of delivering value, the entire plan is focused on that goal. We know customers do not desire rate increases and also have expectations of service commensurate with what they pay. This is a difficult balance to achieve, particularly given the diversity of the Con Edison customer base. Nevertheless, it is one that the Company must successfully accomplish.

Success in defining and executing this plan depends on a strong partnership with our customers. Gathering feedback on key issues directly from our customers allowed us to build on our daily interactions with them and better understand customers' energy needs and priorities. We conducted a number of outreach sessions with our residential and commercial customers. The feedback helped refine the objectives of this plan and confirmed our belief that customers value reliability, prefer that we are proactive with our investment programs rather than reactive, and understand that there are costs associated with maintaining a complex system that meets their expectations. The general view, however, was that customers were willing to tolerate a small increase in rates as long as they were educated on what the maintenance and improvements expenditures were for.

Just as our business drivers are changing, so are our workforce demographics and skill requirements for planning, engineering, and customer support. We will support our workforce by introducing new training that increases our capability to meet the needs of a rapidly changing energy economy.

1.3 KEY ELEMENTS OF THE PLAN

1.3.1 Demand and Supply

We ensure that our transmission and distribution systems must have sufficient capacity to meet our firm[1] customers' peak gas demand and that we can procure adequate natural gas for our customers. Peak demand, or the maximum quantity of natural gas that our firm customers require at a single point in time, drives infrastructure investment because our system must be able to meet that demand even if it is a relatively infrequent occurrence. In our service territory, these peak demand periods occur only during the coldest winter days, often for only several hours over the span of a few days.

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[1] A firm gas customer is one whose equipment is entirely dependent on natural gas and cannot be interrupted. Interruptible customers are generally dual fuel and gas service to them maybe curtailed by the company based on an agreed set of conditions such as adequate notification, outside temperature, and/or certain allowable timeframes during winter months. Different tariffs apply to different types of firm and interruptible gas customers.

We have planned for demand in two categories:

- **Traditional Demand**: Historically, demand for gas service has increased in our service territory because of economic development, which increased residential and commercial developments requiring gas service. Historically, peak day demand has grown at 1-2% Compound Annual Growth Rate (CAGR). We anticipate that this growth will continue at nearly 1% CAGR during the plan period.
- **Incremental Demand**: Beyond the traditional determinants of growth, we expect environmental and air quality concerns to drive firm gas demand growth in four main areas:
    1. **#4/#6 Heating Fuel Oil Conversions**: Driven by air quality and public health concerns, NYC has proposed a regulation to phase out the use of heavy fuel oils for space heating. The regulation recommends a conversion to #2 oil or natural gas. With the expected competitiveness of natural gas prices compared to oil, we expect a good proportion of customers to convert to natural gas, largely depending on their initial costs of conversion such as equipment and building retrofits. We expect heating oil conversions to be our largest source of incremental demand/growth during the plan period.

    2. **Distributed Generation:** Distributed Generation (DG), in various applications, could be a way for Con Edison and its customers to reduce their dependence on the existing electric grid by offsetting power consumption from traditional centralized power plants. We understand the value of DG to certain types of customers and expect continued, moderate growth of DG across our service area, particularly in Manhattan.

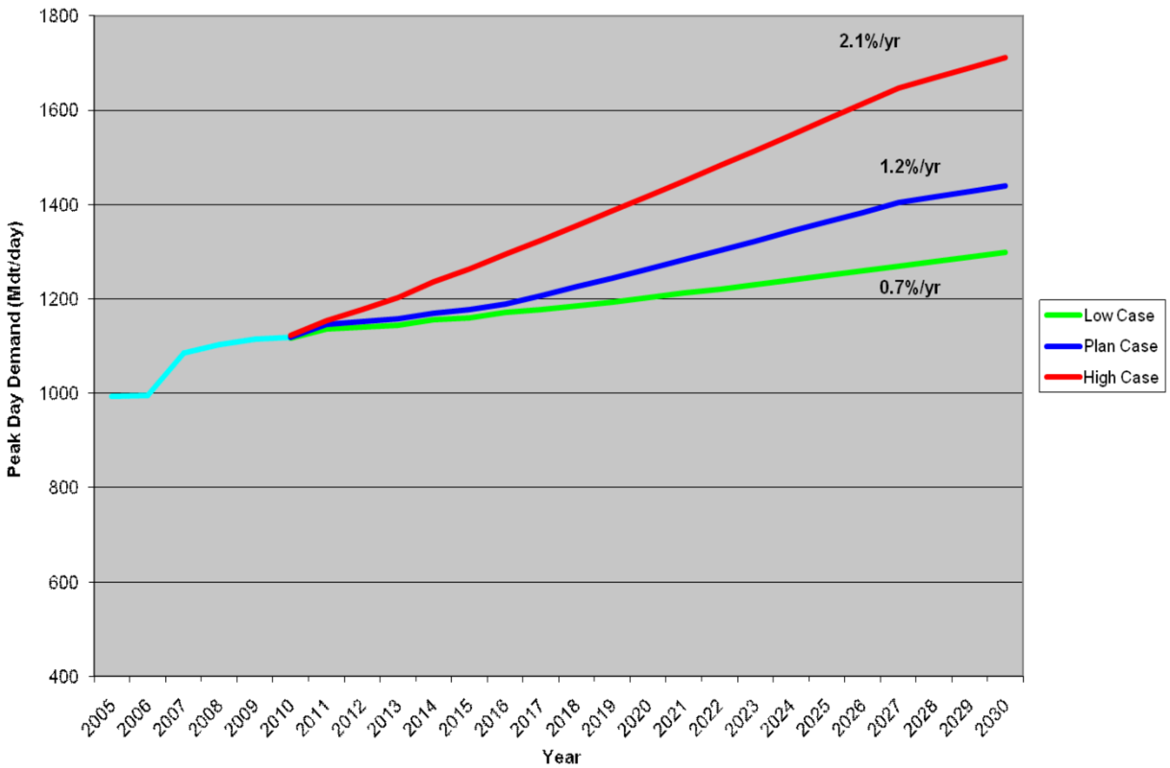
    3. **Natural Gas Vehicles:** There is a burgeoning interest in alternate fuel vehicles, especially electric vehicles, driven by the interest in managing our carbon emissions. Compressed Natural Gas (CNG) vehicles are a mature technology, already prevalent in many parts of the world. Natural gas's many benefits, such as a domestically-available, clean fossil fuel, combined with the maturity of the technology, make CNG a good solution for several vehicle types and the policy goals of the region.

    4. **Steam to Natural Gas Conversions:** We also expect to see some steam customers to switch to natural gas during the plan period. Customers could either switch to natural gas to simply fulfill heating needs in lieu of steam, or install a combined heat and power system using natural gas as the fuel.

In both traditional and incremental demand categories, growth is offset by energy efficiency programs which reduce the overall consumption of energy.

We developed three forecasts to assess the potential impact of various economic, legislative, regulatory, and technological drivers on customer demand for gas. The projected daily peak demand by year in the Company's service territory is shown in Figure 1-1 for the three cases.

Figure 1-1. Daily Peak Demand Forecasts (Weather-Adjusted)



The Plan Case forecast, which will determine our primary course of action under the GLRP, is based on gradual economic recovery out of the current recession, and modest economic growth over the planning period. This case incorporates modest energy efficiency gains, conservative assumptions for oil-to-gas conversions, and historical rates of growth for gas-fired distributed generation and natural gas vehicles. At a compound annual growth rate (CAGR) of 1.2% per year for peak-day demand, the Plan Case represents a cumulative 30% increase in peak day demand over the planning horizon.

The High Case assumes a more rapid economic recovery, leading to rising gas prices due to increased gas demand and input prices. Similar to the Plan Case, this case has modest energy efficiency gains, but more oil-to-gas conversions, distributed generation, and natural gas vehicle usage. At a CAGR of 2.1% per year in peak-day demand, the High Case represents a cumulative 54% increase in peak day demand over the planning horizon.

The Low Case reflects moderate economic growth (consistent with the Plan case) but has reduced demand due to successful demand-side management and improved energy-efficiency codes and standards. Improved codes and standards should reduce load as older gas units are replaced with newer ones**.** This case incorporates low gas prices driven by a reduction of electric generation demand and stringent energy efficiency measures. This case contemplates only minimal incremental demand from oil to gas conversions, distributed generation, and natural gas vehicles. At a CAGR of

0.7% per year in peak-day demand, the Low Case represents a 15% increase in peak day demand over the planning horizon.

Due to economic, energy security, and environmental concerns, our demand cases expect growth in peak-day gas demand, even in the Low Case. Programs to upgrade gas equipment and stricter building codes will help to reduce the system peak, thus deferring infrastructure investments and lowering customer bills.

Natural gas commodity costs are a major component of our customers' bills. Con Edison is a local gas distributor whose customers must pay the cost of natural gas, inclusive of pipeline charges to the citygate. Con Edison's plan case analysis suggests that the citygate average cost of gas for firm customers[2] will remain on average within $7-9 per dt (in 2009 dollars), increasing at an compounded annual growth rate of 1.2% over the planning period.

Over the next twenty years we expect to deploy a full portfolio of programs to help customers actively manage demand, diversify supply sources, and improve our overall environmental profile. The major initiatives we will offer in this portfolio are to:

- Continue to serve existing customers safely and reliably and connect new customers within close proximity of our infrastructure
- Plan for and ensure adequate pipeline capacity and storage contracts to deliver gas to our city-gates
- Diversify our gas supply portfolio to increase energy security, competitive prices, and renewable components. Towards this end, Con Edison will work to incorporate multiple gas sources (conventional, unconventional, and LNG resources) from various regions, increase the use of Marcellus shale gas as it becomes available, and explore biogas opportunities in our territory
- Continue to develop, support, and promote gas efficiency programs, working closely with NYSERDA and city, and state authorities
- Expand our role as an energy advisor to customers to aid them with increasingly complex energy choices, including energy efficiency improvements, heating fuel choices and conversions, and gas-fired distributed generation initiatives
- Monitor and evaluate the impact of meeting the current and future requirements of power and steam generation and potential conversions from steam to natural gas
- Support infrastructure needs of expanding natural gas vehicles, working closely with industry associations, manufacturers and customers
- Explore the benefits for our gas infrastructure and customers of Con Edison's investments in the cost-effective deployment of an electric advanced metering infrastructure (AMI)
- Continue to improve Con Edison's environmental impact in all aspects of our business

[2] Citygate cost of gas for firm customers represents the total cost of gas supply delivered to our system including the cost of pipeline and storage capacity. See Chapter 4 for a detailed discussion of gas supply and price projections.

1.3.2 Transmission & Distribution Infrastructure

Our gas system consists of more than 4,320 miles of pipe transporting approximately 300 million dekatherms (MMDt) of natural gas annually. Gas is transported from interstate pipelines into the Con Edison system to supply our customers. Since the early 1800s, we have installed gas pipes under almost every street and/or sidewalk in our service territory (aside from Northern Westchester). Today, these pipes are alongside other underground facilities (such as electric, telephone, and cable television ducts and water, steam, and sewer pipes) and their location makes infrastructure repair and replacement projects logistically challenging and expensive.

Con Edison's Gas Operations has historically developed detailed 10-year infrastructure plans. For the Gas Long Range Plan, these infrastructure plans were modified to account for new sources of demand and were extended out to twenty years. For each of the demand forecasts discussed in the previous section, we projected the work required to maintain the safety, integrity, and reliability of our gas system. For all three cases, there is a significant ongoing investment in infrastructure replacement. Mindful of rate impacts, we are exploring new project approaches, technologies, and performance levels for the work required. The major difference in work plans and capital expenditures across the three cases is in the expansion needed to meet new customer demand. .

The customer is our source for expected load needs as well as reliability and safety standards. Our System Design Criteria are developed to manage the infrastructure to the expected performance levels. The combination of the expected customer demand and the system design criteria drives our infrastructure requirements. These infrastructure requirements are put through rigorous iteration of tailored system design, asset management practices, capital estimations, and ultimately a project prioritization to produce an Infrastructure Plan.

Infrastructure Plan Overview

The programs outlined in our infrastructure plan help Con Edison manage a large, complex, logistically challenging, underground gas transmission and distribution infrastructure designed to the rigorous reliability and safety standards that our customers have come to expect from us. Our current infrastructure initiatives represent three broad activities as shown in Figure 1-2:

1. **Maintaining and reinforcing our infrastructure**. Infrastructure investments in this category are designed to maintain pressures for system reliability, to reduce leaks to maintain system integrity and safety, and to accommodate new load on the system. The programs in this category represent two types of investments:

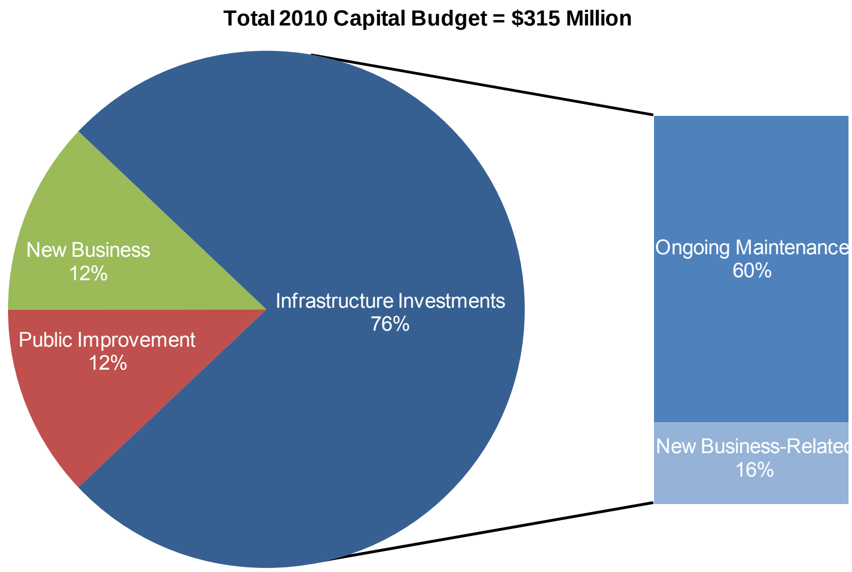
   - Ongoing maintenance required to replace or repair system components
   - New business-related investments designed to reinforce or upgrade the system to accommodate new load

   Assets managed under this category include pipes, regulator stations, valves, couplings, etc. In 2010, this activity represents 76% of our investments.

2. **Connecting new customers to our system**. Expenditures in this category represent the cost of installing new services or pipes to connecting new customers to our system. In 2010, this activity is expected to represent 12% of our investments.
3. **Undertaking Public Improvement projects**. When a municipality decides to perform work under its streets, that work is often complicated by the presence of our facilities. Under those

circumstances, the Company has the legal obligation to remove or otherwise protect its facilities to accommodate the municipal activity at our—and therefore our customers'—own cost. In 2010, this activity is expected to represent 12% of our investments.

Figure 1-2: Gas Infrastructure Plan (2010 Budget)



The rest of this section describes some of the key infrastructure programs in our plan and some initiatives to optimize these investments.

Key Gas Infrastructure Plan Initiatives

Our Main Replacement Program (MRP) represents approximately one-third of our 2010 capital budget and is our largest infrastructure maintenance initiative. Our gas distribution system was primarily installed between the 1890's and 1960's, and the original installations were primarily cast iron, unprotected bare steel or coated steel. Over time, our cast iron and unprotected steel pipes become vulnerable to leaks because of corrosion and some breaks for small diameter cast iron which adversely affects our system's integrity. Since 1971, pipe additions or replacements are composed of plastic or cathodically-protected steel which increase the pipe's life by reducing the incidence of corrosion and leaks. Today, approximately 30% of the pipes are cast iron, 30% are unprotected steel, 30% are plastic, and 10% are protected steel. The MRP's objective is to replace our remaining 60% of cast iron and unprotected steel pipes with plastic pipes. Replacement is prioritized using a statistical computer program that considers main conditions (material, age, and size), risk, and economic factors.

Currently, we replace approximately 40 miles of pipe per year under this program[3], a pace that was recently validated by an external review of our system and program[4].

In addition to the MRP, which targets our distribution pipes, a portion of our Supply Main program also involves replacement of cast iron and unprotected steel pipes in our backbone system. For both of these programs, we expect productivity and technology-related improvements to realize cumulative reductions of $8 million in capital expenditures over the plan period. Where possible, we intend to use trenchless technologies (for example, increased instances in which we insert liners to rehabilitate pipes instead of replacing them) to reduce the costs of pipe replacement and to minimize digging and disruption. The major projects in the pipe replacement portion of our Supply Main program will also be completed by 2030, reducing our investments in this area.

We have also reviewed our proposed ongoing transmission investments. As a result of the approval of a new gate station in Lower Manhattan to connect new supply from Spectra Energy (expected to be placed in service in 2014), we have deferred $75 million of capital investment associated with a new transmission pipe from Astoria to Ravenswood.

We have also agreed to a lower rate of meter replacements with the PSC which will realize some savings. We would like to extend these meter-related savings by giving residential cooking gas customers a “flat-billing” option. Flat-billing allows us to charge cooking gas customers a flat rate for gas usage, eliminating the need to read, maintain, and replace meters in individual units in multi-family dwellings. We will work with the regulatory agencies as these meter-related initiatives would entail changes to our tariffs.

The above initiatives, affecting both infrastructure maintenance (repairs, replacement) and new business (reinforcement, upgrades to accommodate increased load) affect approximately $240 million or 76% of our 2010 capital budget. We expect to realize a 20% reduction in these investment categories from $240 million in 2010 to $192 million in 2030 as shown in Figure 1-3 below.

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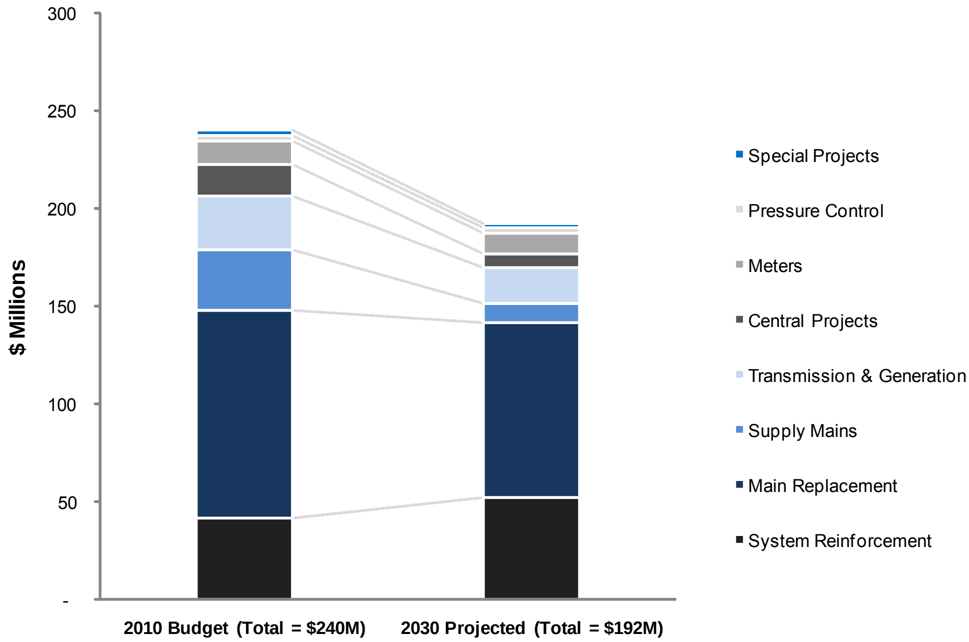
[3] Con Edison also replaces, on average, an additional 10 miles of pipe as part of Public Improvement projects.

[4] Please refer to Appendix A: Gas Main Replacement Study for additional details. The study’s objective was to determine optimal levels of annual distribution pipe replacement to maintain system integrity. The study concluded that the most cost-effective rate was 50 miles of annual pipe replacement. A minimum of 35 miles maintains our system integrity at current levels. Between 35-50 miles we see increasing rates of leak reduction. More than 50 miles of annual pipe replacement produces diminishing leak reduction rates.

Figure 1-3: Optimization of Ongoing Maintenance and New Business-Related Infrastructure Investments (Plan Case)



We also expect to realize significant savings from another project to reinforce a transmission pipeline running from the Bronx border to White Plains. We are exploring other approaches to this project, including using the adjacent high pressure system to transport some volume of gas. Using the adjacent high-pressure system would enable us to avoid having to reinforce the existing ten (10) miles of main. Further, we are exploring ways to reduce the cost of replacing the 24-inch pipe using a high-pressure liner currently only employed in Europe. Our goal is to further reduce the project cost from the original replacement estimate of $350 million to below the $200 million currently forecasted for this project.

To support peak-volume traditional growth in the Plan Case, we will need to construct an average of two new distribution regulator stations per year to accommodate demand across the distribution system. In addition to these regulator stations, we will need to construct associated pipes and services to serve new customers. In addition to traditional new business investments, we have also projected expected investments required to support incremental growth beyond traditional new business. For this additional growth, we would need to install new regulator stations when and where load concentrations arise, and would also incur the cost of connecting incremental new customers as necessary.

We intend to bring customers on to the system as efficiently as possible. Toward this end, we plan to lower the cost to reinforce the system by installing regulators where possible instead of installing additional pipe in the ground. We further plan to actively pursue the “clustering” of conversion candidates whereby we encourage customers in close geographic proximity to convert to natural gas at the same time to minimize excavation and paving, reinforcement, conversion, and connection costs and to reduce customer disruptions. Such new customers will increase the usage of our system, resulting in overall lower rate increases for all of our firm customers.

In a city as congested as New York, Con Edison's gas infrastructure must share the space under the city's streets with not just with other utility facilities, such as telephone and cable TV owned by private companies but also with sewer and water systems owned by municipalities. When a municipality decides to perform work under its streets, that work is often complicated by the presence of our facilities. In those circumstances the Company has the legal obligation to remove or otherwise protect its facilities to accommodate the municipal activity but the Company is not entitled to be reimbursed for the costs it incurs to do so. Often the facilities replaced have many years of useful life left. Due to the cause of the work, we have little control over the amount or timing of public improvement investments required.

As with all of our work, we will endeavor to realize productivity and technology-related gains wherever we can, including public improvement projects. We often combine main replacement efforts during a public improvement project. Our plan accounts for an additional 10 miles of distribution main replacement during public improvement projects, in addition to the 40 miles accounted for in our main replacement program. We also collaborate with the other entities involved to benefit from common project elements (for example, a common trench) to reduce costs and disruption.

Capital Investment Projections (Plan Case)

Each of the initiatives discussed above, other than public improvement expenditures, was designed to help us achieve our goals to provide our customers with safe and reliable gas service at a reasonable cost.

The Company's overall capital investment profile is presented in Figure 1-4. At our current investment trajectory, we would be investing approximately $313 million (in 2010 dollars) annually for public improvements, infrastructure maintenance, and traditional new business. This would equate to a cumulative investment of $6.5 billion during the plan period.

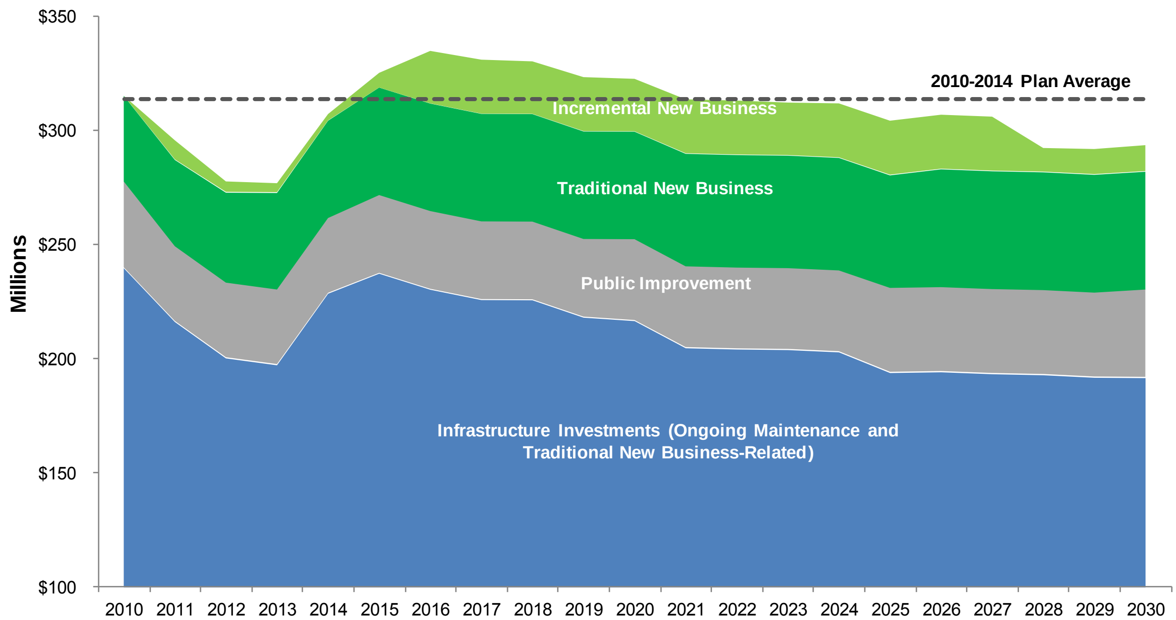
Offsetting our significant reductions in infrastructure investments for ongoing maintenance and to support new business (shown in Figure 1-3 above), we expect to experience about 38% growth in capital investments for connecting traditional new business to the system. We expect our cumulative 2010-2030 investments to connect traditional new business for the Plan Case to be $987 million.

Public improvement investments are expected to remain approximately flat (in 2010 dollars) during the plan period. Overall, we expect to save $428 million cumulatively (excluding incremental new business growth) from our current budget levels.

Beyond our traditional growth, we expect incremental demand during the plan period from heating oil and steam conversions to gas, distributed generation, and natural gas vehicles. For this incremental demand, we expect to incur additional cumulative capital investments related to connecting customers and reinforcing the system of $342 million in the Plan Case.

Despite increases in traditional and incremental demand, we still expect our total capital investments to average $309 million annually in 2010 dollars, which would still result in total cumulative savings of 1-2%, approximately $86 million, over current budget levels during the plan period.

Figure 1-4. Gas Capital Investment Expenditures, 2010-2030[5] (2010 Real Dollars)



1.3.3 Customer Experience

We will continue to do everything we can to help customers control their gas costs while maintaining our system's safety, integrity, and reliability. Our planned capital optimization efforts along with increased usage of the system from both traditional and incremental growth will help reduce the rate of growth in delivery charges during our plan period as illustrated in Figure 1-5. This figure shows three delivery rate curves with the following capital and growth assumptions:

- **Pre-GLRP --** is our baseline curve which assumes traditional growth and our pre-GLRP capital budget (with none of the capital optimization efforts described in this plan)
- **GLRP Plan Case: Traditional Growth Only** –continues to assume only traditional growth, but builds in the capital optimization efforts described in this plan
- **GLRP Plan Case** – reflects the full impact of our plan case with both traditional and incremental growth assumptions, as well as our capital optimization efforts.

Under the pre-GLRP assumptions, using our current capital investment trajectory ($313 million annually) and traditional sources of business growth, we would expect rates to grow at 1.6% CAGR for our total customer base during 2014-2030[6]. With the addition of our capital optimization efforts and still

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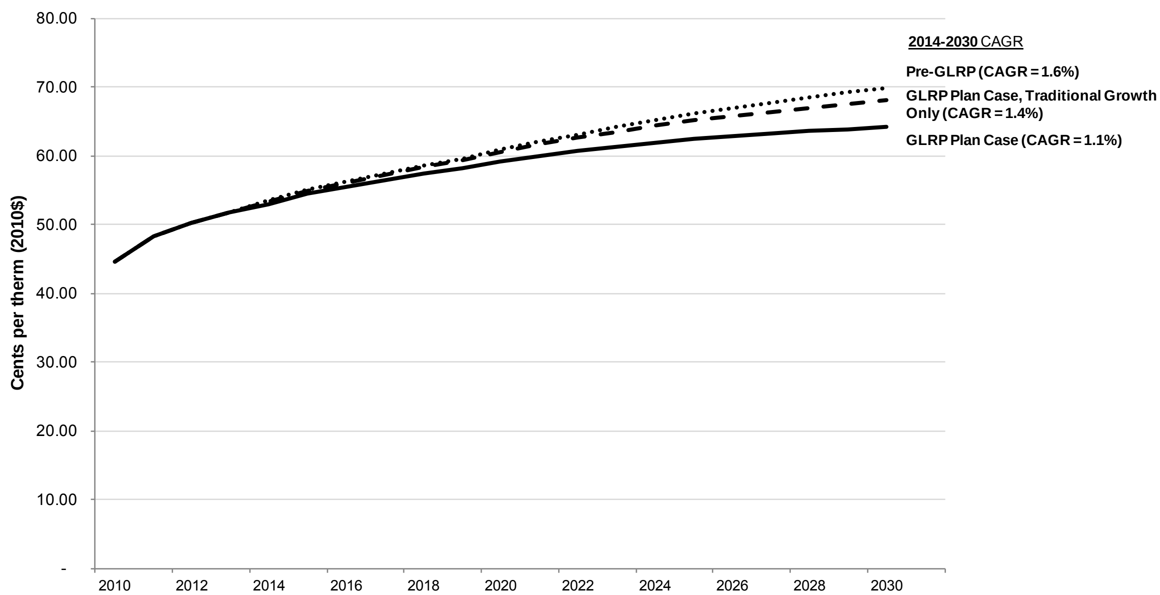
[5] Con Edison is in the midst of getting the 2011-2013 rate case approved while this GLRP is being written. At the time of this version, a Joint Proposal was agreed to in principle with the regulators, but not finalized. Under this Joint Proposal, Con Edison has agreed to austerity measures of approximately $12 million reduction in revenue requirements during 2011-2013. The impact of these measures on gas capital expenditures are reflected in the figures and charts shown here.

[6] Con Edison's rate case for 2011-2013 had been filed prior to launching the Gas Long Range Planning effort. Consequently, CAGRs were calculated starting in 2014 as an acknowledgment that the GLRP had minimal influence on the proposed rates for 2011-2013.

with only traditional growth sources, we estimate that the rates would grow at a slower pace of 1.4% CAGR. Layering on incremental sources of growth (and associated incremental capital investments) has a further beneficial impact on rate trajectory, slowing it down to 1.1% during the same period.

Figure 1-5. Delivery Rates for Total Firm Customer Base[7]



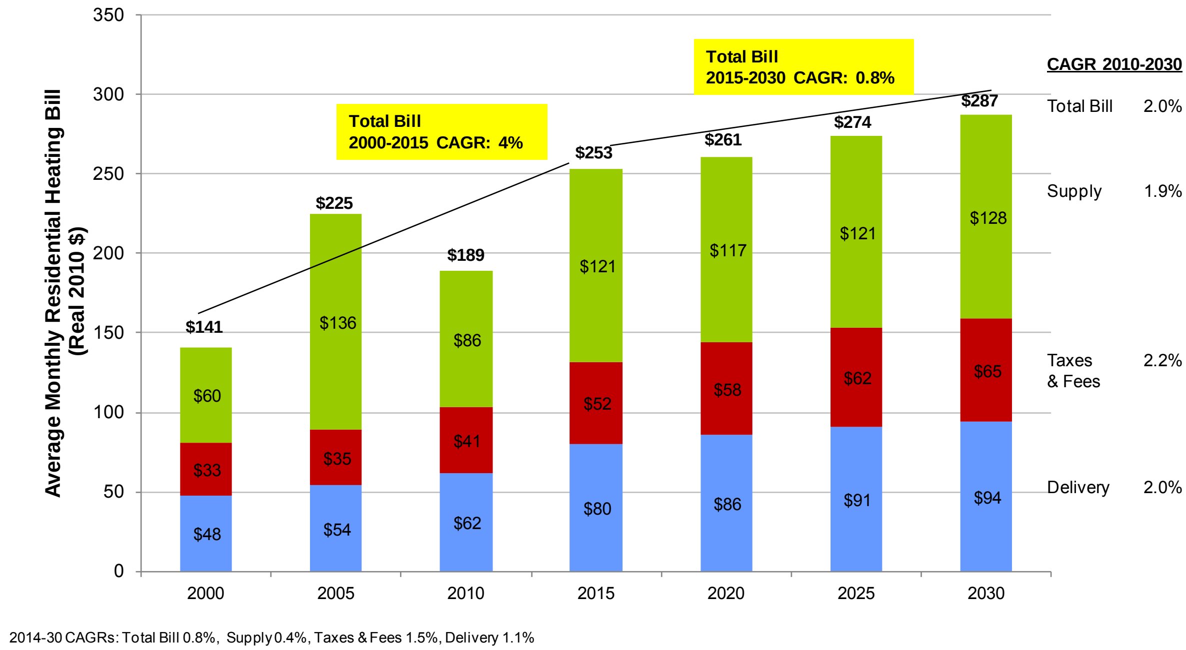
Source: Customer Impact Summary 07.10.2010, Scenarios 5A, 6A, 7A

Commercial heating customers would see the slowest rate increases at approximately 0.9% CAGR under the Plan Case as most of the incremental growth is in the commercial segment. Residential customers, however, also benefit with a slowing of their rate trajectory to 1.1% CAGR during the plan horizon.

At these levels of delivery rate increases, along with projected increases in the cost of supply and taxes, we expect that a typical residential heating customer's monthly bill for gas would increase from approximately $189 in 2010 to $287 in 2030, representing an annual growth rate of 2.0%. The total increase broken out by component of the bill is illustrated in Figure 1-6. Bill increases after 2015 at 0.8% CAGR are significant improvements over historical bill increases of 4% CAGR during 2000-2015.

[7] As explained in the previous footnote, CAGRs shown here are 2014-2030. Corresponding CAGRS for 2010-30 are as follows: Baseline (pre-GLRP) = 2.2%, GLRP Plan Case: Traditional Growth Only = 2.0%, GLRP Plan Case = 1.7%.

Figure 1-6. Total Bill Impact for Residential Heating Customer[8]



The delivery portion of the bill, excluding taxes and fees, represents approximately one-third of the total bill in 2010 and 2030.

During the plan period, we expect that technology and industry innovation will lead to a significant change in our relationship with customers. We will collaborate with customers more closely to aid them in the decisions that they make about their energy choice and use. Con Edison will also support the development of incentives to help customers with initial investments and costs of fuel conversion which benefit both the community and the individual customer. We are also committed to offering customers flexible billing options to manage their energy costs and volatility. Examples include our “flat-billing” proposal to reduce costs of metering individual cooking gas customers and our existing “level-billing” option which allows customers to spread their gas costs during the course of the year and avoid a winter spike in gas bills.

The widespread adoption of new technologies may prompt investments in our transmission, distribution, and billing infrastructure to support energy efficiency and distributed generation activities. We are committed to having the right systems and skills in place to enhance the customer experience and address key issues including cost, quality of service, and the ease of doing business with us. We will employ new media to offer customers an increased level of control of their gas use through energy management tools. Customer service initiatives included in the plan are grouped into five categories:

- Provide a more efficient and effective customer service experience by introducing new and enhanced contact center technology

[8] Average residential customer was assumed to consume 137 therms of gas monthly.

- Expand the ability for customers to access information on their own terms by implementing enhanced mobile and web interfaces and expanding mobile tools and notification options
- Empower customers with information and tools to manage their energy bills by expanding energy efficiency programs
- Promote customers' choice of energy suppliers by enhancing systems and tools that facilitate customer enrollment with Energy Services Companies (ESCOs)
- Support the integration of information and communication systems by streamlining customer access to information about any of our services

1.3.4 Our People and Processes

To carry out our 20-year plan, we will need to develop new skill sets, processes, and systems to support the growth of our people. We will concentrate on five areas: (i) identifying and addressing gaps in our desired corporate culture, (ii) enhancing our skills, (iii) standardizing our integrated long range planning process, (iv) leveraging and expanding our capital optimization model, and (v) improving cost management.

Every organization has its own culture, and critical cultural assessment is essential for continuing organizational effectiveness. Our desired culture will focus on five attributes:

- More customer focus and outreach
- Vigilant cost management
- Increased trust among employees
- Continuous performance improvement by sharing best practice within the company and benchmarking with other gas distributors to learn from industry best practices
- Enhanced external relations

Through our workforce strategy, we will adapt and enhance the skills we need for business continuity through effective succession planning and training, satisfy the needs of our customers, and support the successful implementation of this plan. We will enhance these skills by training our people in areas such as decision-support for customers, advanced analytics, understanding new technologies, and integration of customer, regulatory, and governmental requirements into operations planning.

Improving performance, cost-effectiveness, and risk mitigation are the main drivers behind our current planning process. Our goal is to have a planning process that is more integrated, interactive, and is clearly linked to the corporate strategy. The GLRP will be established and regularly reviewed under different forecasts for demand, commodity prices, and other aspects of the business environment.

To meet our financial, operations, regulatory, and strategic objectives, we will support planning with a comprehensive process and tool for capital optimization. The process and tools will allow us to evaluate projects across the system and make trade-offs across operating units through standardized analytical methods and guidelines. We will also build on the capabilities we have developed over time to monitor expenditures effectively. A number of cost and work management initiatives have been identified to promote further integration and collaboration between financial and field operations. Through enhancements to our technology, organizational structure, and processes, we will improve our cost and performance management.

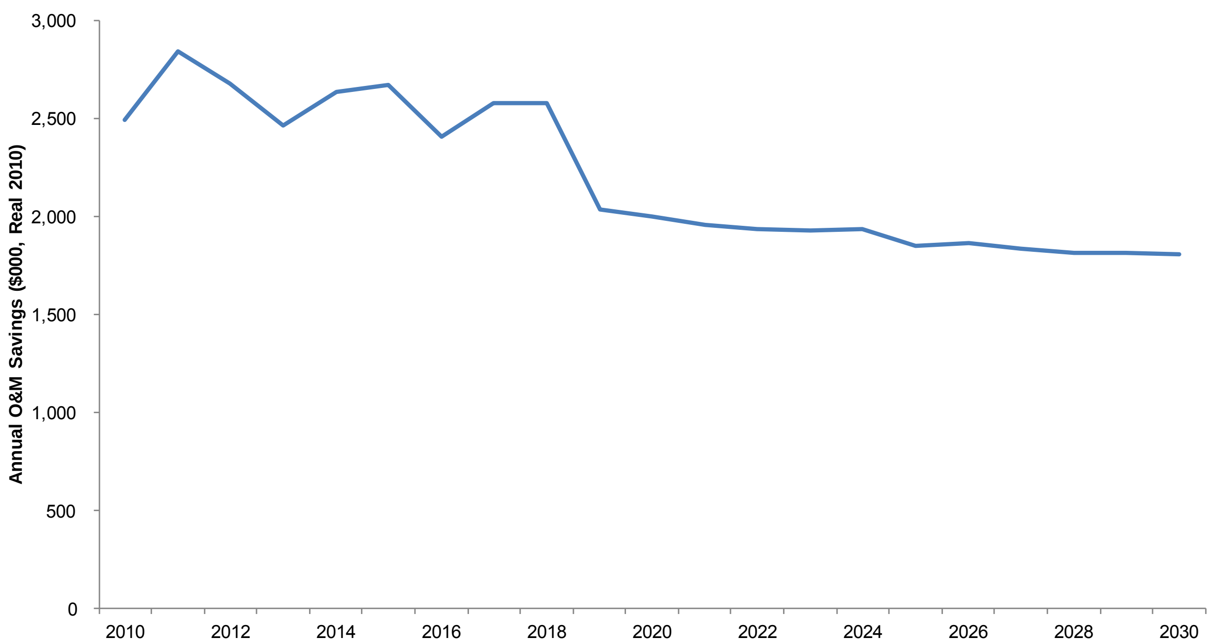
1.4 PLAN PERFORMANCE

The GLRP, while considering cost impact, includes specific ongoing investments to maintain the safety, integrity, and reliability of the gas system as well as incremental investments to support anticipated growth in demand. To support the development of the plan we created a capital investment database and analytical model to evaluate the impact of our planned programs and initiatives. Capital investment projects were evaluated for impacts on cost, performance, and risk characteristics of the gas system. This analysis is consistent with the Company's asset management practices, annual capital expenditure prioritization process, and our focus on enterprise risk management.

Cost Savings

Investments to upgrade and enhance the system will reduce future operations and maintenance expenditures. For example, replacing small diameter, cast iron pipes will reduce the operations and maintenance costs required to repair leaks in those parts of the system by about $17 million cumulatively during the plan period. From 2010 to 2030, Con Edison expects to realize a total of roughly $46 million in operations and maintenance savings or approximately 2.5% of gas transmission and distribution operation and maintenance costs. Figure 1-7 shows the expected cost savings from the avoidance of operational and maintenance costs associated with system leaks and equipment failures. We expect that our planned level of capital investments will result in average savings of $2.2 million per year.

Figure 1-7. Gas O&M Savings, 2010-2030 (Plan Case)



Leak Management and System Integrity

Our main replacement and supply main programs target the condition-based replacement of our cast iron and unprotected steel pipes with plastic and protected steel pipes to maintain system integrity, reduce the rate of incoming leaks, and maintain our leak backlogs. As shown in Table 1-1, the annual replacement of 40 miles of pipes provides a measureable reduction in the most hazardous types of leaks.

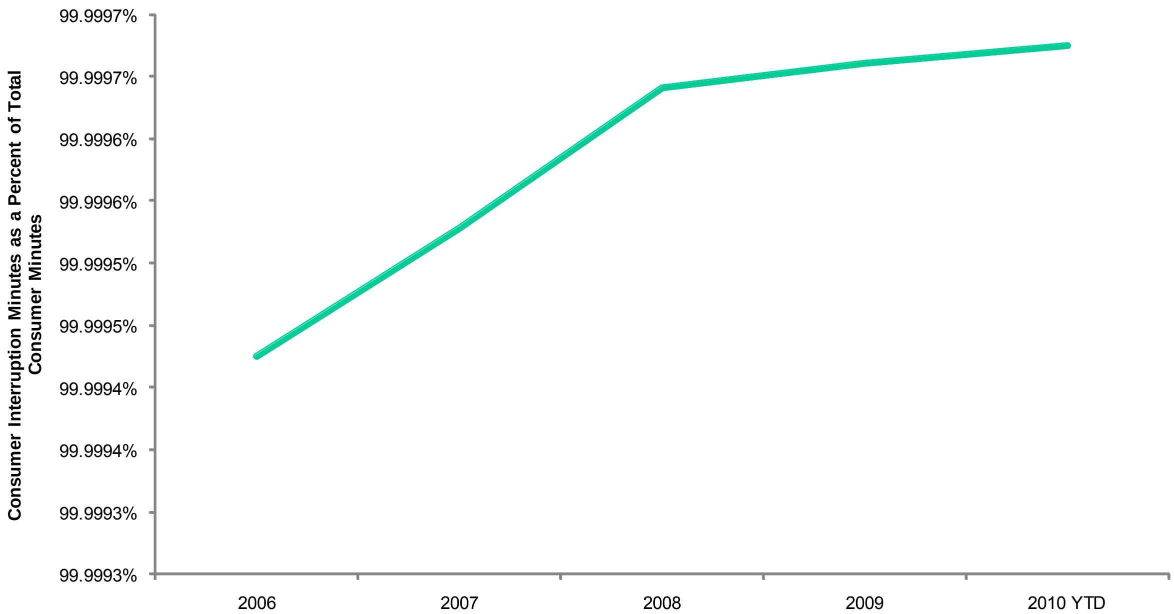
Table 1-1: Leak Reduction Impacts of Main Replacement Program (MRP)

Hazard	MRP Initiative	Impact
Cast Iron Breaks	Replace 20 miles of cast iron mains per year with plastic or coated steel pipe	By 2035, breaks would be reduced by 30%
High Pressure Corrosion Leaks	Replace 15 miles of steel mains with plastic or coated steel pipe per year	By 2035, incoming leak repairs will be reduced by 31.7%
High Pressure Coupling Leaks	Replace 5 miles of small diameter (2”) high pressure steel mains per year with plastic pipe	Eliminate small diameter high pressure steel mains joined by couplings in areas experiencing increased failures
Total	**40 miles**	

System Reliability

Con Edison maintains a high level of gas system availability as shown in Figure 1-8 below. Our investments in system reinforcements and pressure control initiatives are designed to maintain our reliability to these standards. Currently, our system has nearly 100% availability and customers have rarely experienced a gas interruption particularly on a cold winter day.

Figure 1-8. Gas System Availability (2006-2010 YTD)



Environmental Performance

Con Edison is committed to environmental responsibility. The Company has been a member of the Environmental Protection Agency's (EPA) Natural Gas STAR Program since its inception in 1993 and has achieved estimated cumulative reductions in released methane of nearly 4.4 million Mcf[9] primarily through the repair or replacement of leaking pipe and the use of automated systems to reduce pressure. In 2008 alone, the Company reduced its methane releases by an estimated 158,795 Mcf, largely through the identification and rehabilitation of leaking pipe. Nearly all methane emissions caused by the gas distribution industry are due to unintended fugitive leaks.

We measure the environmental impact of our plan by the extent to which we reduce our emissions of greenhouse gases. Figure 1-9 summarizes the environmental improvements that result from the investments and sustainability initiatives contemplated by the GLRP.

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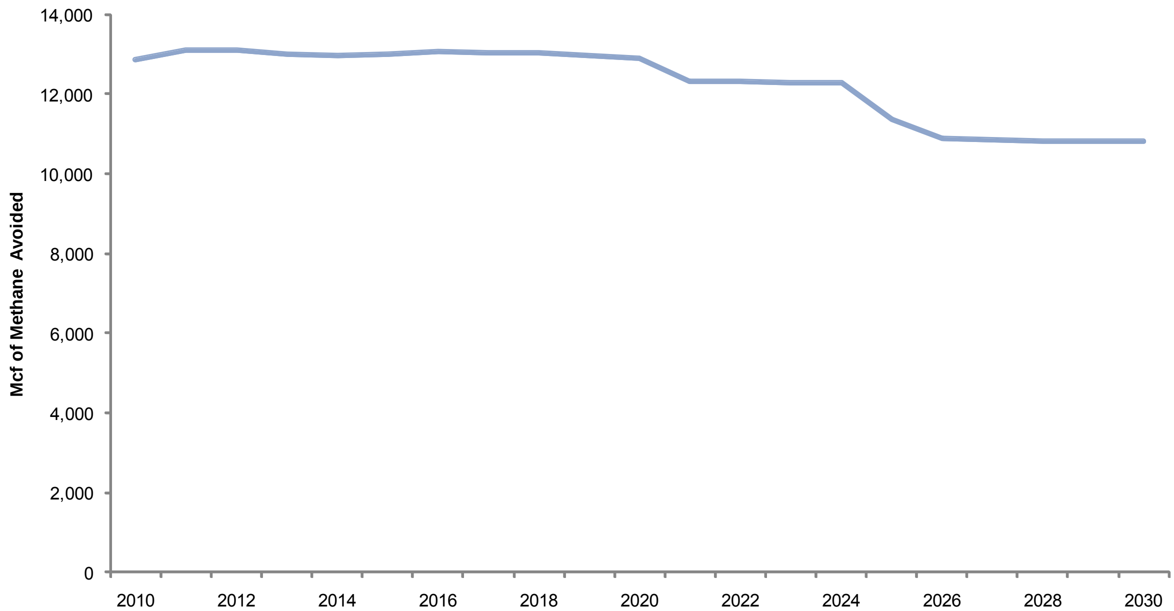
[9] Methane emissions are measured in thousand cubic feet (Mcf).

Figure 1-9. Target Methane Emissions Reductions (Mcf) by 2030



In addition to the environmental gains forecast in Figure 1-9, Con Edison will also support initiatives for customers to convert their heating and power generation fuels to reduce carbon emissions and improve air pollution for our community. Con Edison will work closely with local and state authorities to plan and prepare to support any extra demand resulting from the community's environmental objectives.

Public and Employee Safety

A factor of pivotal importance to us is the safety of the public we serve and of our employees who make these services possible. Over the past several years we have made improvements in our ability to provide a safe environment for both the public and our employees. Our goal is to continue to improve in these critical areas.

Our commitment to public safety is evidenced by the investments the Company has made and continues to make in risk mitigation, environmental performance, reliability, pressure control, and, most importantly, leak management programs. Despite these measures, incidents ranging in severity from gas leaks to rare explosions have occurred within our system. We have an emergency response system designed to act quickly and efficiently during serious leak conditions to minimize the severity of the consequences of these leaks. In 2009, we responded to 81% of emergency calls within 30 minutes. Despite the challenges of timely responses in NYC's highly congested and densely populated urban area, we continue to improve our response times to safeguard the public. Further, through our risk mitigation programs, we developed new methods and procedures used during an emergency to protect life and property, such as Code MuRRE (Multiple Resource Response Event), which is an alert to field personnel and fire departments for situations that require an escalated response to gas events.

We aim for an accident-free workplace. To reduce employee injuries, we analyze those incidents that do occur and develop new programs to address root causes of incidents in an effort to improve continuously. In addition, we have increased safety awareness by implementing several new initiatives. Our Company-wide goal for employee safety is to reduce our OSHA (Occupational Safety and Health Administration) Incidence Rate to 1.5, or approximately 1.5 injuries and illnesses per 100 workers per year by 2015, from 3.24 in 2009. If achieved, an incidence rate of 1.5 would be in the current top quartile among industry peers. As we continuously improve our culture to embrace learning from our experiences and achieving personal and organizational bests, we will seek to maintain or improve that performance over the planning horizon.

1.5 UNCERTAINTIES AND SIGNPOSTS

By definition uncertainties are difficult to predict. This plan assumes growing demand for natural gas based on abundant, affordable gas supplies and key economic, regulatory, and technology drivers. Our plan was developed under considerable uncertainty including emerging technologies, energy and environmental regulations, customer demand, availability and cost of fuel supplies, economic conditions, availability of financing and utility regulation and ratemaking approaches. We realize that over time, the nature of these uncertainties will change and new uncertainties will emerge. As such, the plan is intended to be a flexible, living document that will be monitored and reshaped as circumstances change.

- **Economic Uncertainties**

1. **Price of natural gas and affordability relative to oil**: The competitiveness of natural gas compared to oil will strongly influence the rate of conversion of heating oil customers to natural gas and the adoption of natural gas as a vehicle fuel. Natural gas prices are also a major input to the cost-competitiveness of distributed generation. As prices decline, adoption of distributed generation should increase, specifically relative to internal combustion engines, microturbines, gas turbines, and fuel cells.

2. **Input Prices**: The current plan does not account for any unusual spikes in the costs of our labor or commodity inputs. High oil prices, for example, could affect the costs of manufacturing our materials and components, while healthcare reform could adversely impact our payroll costs.

- **Regulatory and Legislative Uncertainties**

3. **NYC regulation of heavy fuel oil**: During preparation of this plan, the regulation was not yet published. NYC expects to publish the proposed regulation for comment shortly. No City Council or legislative action is required to issue the regulation.

4. **Environmental and/or Energy Efficiency Mandates**: Enactment of stringent air, carbon-related laws or Federal renewable portfolio standards could promote CNG as a viable option for reaching transportation policy goals or change the economics of certain distributed generation technologies—particularly those powered by natural gas—and thus alter adoption patterns. Adoption of more stringent building codes and standards, and application to new builds or retrofits, could have a significant impact on space heating demand.

5. **Government Incentives**: Incentives would facilitate fuel oil conversions and infrastructure investments to support distributed generation or CNG fueling.

- **Technological Uncertainties**

6. **Increased efficiency of natural gas end-use technologies or advancement in substitute technologies**: Further improvements in the efficiency of space and water heating technologies would increase energy efficiency gains and reduce

gas consumption per customer. Further, advancement or promotion of substitute heating technologies (e.g., the electric heat pump) would reduce current end-use space heating demand. Advancement in distributed generation and storage technologies would increase the economic viability and therefore adoption of distributed generation.

7. **Evolution of technologies related to natural gas vehicles**: Development of additional Original Equipment Manufacturer (OEM) natural gas vehicles, home refueling technology, etc. would increase appeal and adoption.

- **Change in Customer Mix:** Natural gas infrastructure planning and enhancements are based on firm gas demand. Factors like the anticipated competitiveness of natural gas compared to oil or increased air pollution regulation may encourage interruptible customers to become increasingly firm demand (for example, steam or electric generators). Such changes in customer mix could drive significant changes in investments and tariffs.

1.6 SUMMARY

Our GLRP describes our intent to serve our customers cost-effectively with safe and reliable natural gas. It provides a strategic framework for implementing our plans to manage demand and supply, invest in our infrastructure, provide environmental stewardship, and to serve our customers at a reasonable cost. Over the planning horizon, some uncertainties will be resolved, and other uncertainties will surface. It is because of this uncertainty that we must plan ahead.

In the process of developing a plan, we express desired outcomes, identify unknowns, and enhance our corporate ability to address contingencies and to adjust to new and unforeseen developments when they inevitably arise.

We developed this long range plan to reflect our latest thinking, approach and road map of what we are trying to achieve over the next 20 years. We have described the various uncertainties, identified key signposts and we expect to update the plan as material changes occur in our operating environment. During the planning period, we will measure our performance, manage our costs, and reduce the risks on our system. To accomplish our goals, we will collaborate with our customers, legislators, regulators, community leaders and others in order to implement our plan successfully.

This plan is consistent with our mission to provide safe, reliable energy to our customers, demonstrate respect for the environment, and create an atmosphere that encourages safety and development of our employees. “Safe” and “Reliable” energy service are words that are embraced by all of us at Con Edison. We will do so by managing demand and supply and protecting our environment. We will integrate our system design to meet the needs of customers in specific areas and improve our asset management through increased use and optimal replacement and maintenance of our assets. We will extend the life of our system if feasible and minimize capital investments. We will provide our customers with cost-effective, safe, and reliable service, and train our workforce to be positioned to serve today and in the future.

It is in these ways that we expect to successfully carry out our objectives and implement our long range gas plan.

2.0 INTRODUCTION

This chapter provides an overview of the vision, mission, and plan objectives for Con Edison's Gas Operations. It further reviews the unique requirements of our service territory, describes the salient technical points of our transmission and distribution system, and provides historical performance statistics relative to industry averages.

2.1 VISION AND MISSION

A clear vision for our future and well-defined mission for our operations are necessary to guide our decisions for investments and programs in the 20-year planning period. The Con Edison Gas Operations vision statement is as follows:

"We will be a trusted industry leader who takes pride in providing safe, innovative and competitive gas energy solutions today and for future generations."

The Company's New York City (NYC) and Westchester County service territory is a densely populated urban environment that is also a critical commercial center and national infrastructure hub. Con Edison Gas Operations serves a wide range of residential, small business, large commercial, and energy generation customers in this territory who use natural gas for a variety of applications.

Individual homes and multifamily dwellings depend on natural gas provided by Con Edison for their space heating, water heating, and cooking needs. Con Edison has approximately 670,000 cooking gas customers and 270,000 heating customers. Our customers include the largest cooperative housing development in the world and the largest public housing authority in North America.

Commercial enterprises, including forty-seven Fortune 500 companies, and commercial buildings require natural gas for heating, combined heat and power generation (distributed generation), and as a fuel for transportation. Con Edison serves approximately 60,000 commercial heating customers and an additional 60,000 commercial non-heating customers.

Our approximately 1,100 large volume, dual fuel, interruptible customers include in-city electric and steam generation units. Nearly 75% of NYC's in-city electric power generation and 57% of steam capacity is dependent on natural gas as a primary or backup fuel. Reliability of gas service is critical to these generation customers and to our service area's electric and steam customers.

Con Edison counts among its gas customers:

- One-hundred and eleven colleges and universities
- Forty public and private hospitals and medical centers
- A comprehensive public transportation system that is distinguished from other major metropolitan systems by its 24-hour convenience and widespread use including some compressed natural gas (CNG)-based public buses
- Three regional railways by which residents of Long Island, New Jersey, and Connecticut connect to the larger NYC metropolitan region

Given the frequent harshness of winters in the northeastern United States, and the criticality of the area as a commercial hub, reliable gas delivery ranks high among customer expectations in our densely populated service territory. A gas outage has the potential to affect multiple, possibly thousands of customers at any given time, and restoration of service has a significant time lag for safety reasons – ensuring premises are adequately inspected and pipes are free of leaks (integrity tested) prior to restoring gas service.

Public and employee safety is another key priority of Con Edison's Gas Operations given the combustible nature of gas. Due to the dense population of our urban service territory, any such incident on our gas system could entail significant risk to life and/or property. The Company is committed to the safe operation of its gas system.

Con Edison Gas Operations is also committed to being a responsible steward of the environment. We support the reduction of energy consumption with energy efficiency programs and are committed to helping our community achieve a cleaner energy mix. Natural gas is the most efficient energy source for heating purposes, as well as the cleanest fossil fuel available to fulfill our area's power needs. Con Edison is committed to meeting the natural gas demand generated from the environmental goals of New York State (NYS) and NYC.

We also believe that the needs of NYC and Westchester County will continue to grow and change. Con Edison will continue to fuel existing customer needs while watching for what is to come for future generations. While appliance and building codes and standards will continuously improve the efficiency of gas-fired applications and reduce per-capita gas consumption, we believe overall gas demand will increase from the need to reduce environmental impacts and use optimal fuels.

We envision a future that will contain at least the following three critical elements:

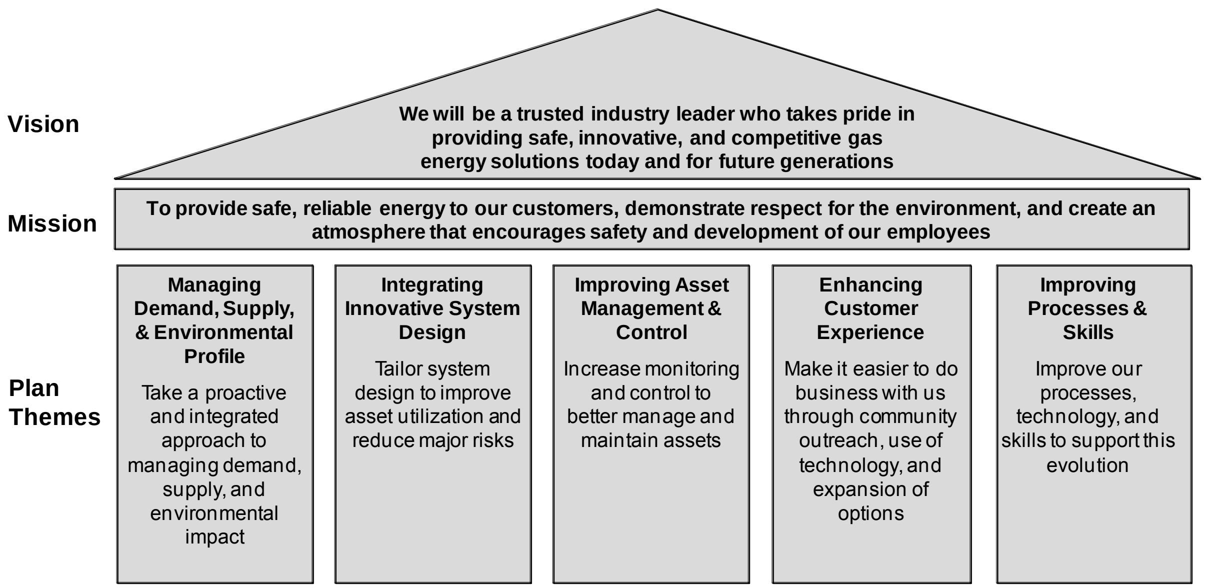
- **Natural gas will remain an integral part of our community's energy mix**. Natural gas is a cost-effective, environmentally responsible fuel for particular energy applications such as heating, power generation, and transportation.
- **Increased need for integrated planning at the utility, local, state, and federal levels**. As a citizen of this community, Con Edison is committed to supporting the goals of the New York State Energy Plan (NYSEP), PlaNYC, and local, state or federal regulations designed to promote the public good.
- **An even greater dependence on the sound engineering competencies that brought us to this time in our evolution**. Our jobs in the future will entail a more integrated systems approach where more and more information will need to be collected, analyzed, and acted upon to keep the system operating at optimal levels.

To get us from here to there, Con Edison has further defined its strategic mission to align near-term objectives with our longer term vision. Our mission to *provide* ***safe, reliable energy to our customers, demonstrate respect for the environment, and create an atmosphere that encourages safety and development of our employees***, serves as a touchstone for our planning and decision-making processes. The Company's core commitment is to deliver safe, reliable, and cost-effective gas service to NYC and Westchester County and this is the foundation for all of our actions. Con Edison's goal is to provide a positive contribution to the economic and environmental well-being of the entire community it serves. Despite our forecast of increased sales and associated capital investments, our long term capital plan is to remain flat (level) for the next 20 years.

2.2 PLAN THEMES AND PLANNING PROCESS

We have developed five themes to guide the development of the Gas Long Range Plan. The plan themes carry out our mission and individually describe areas of Con Edison strategy by which individual programs and investments are developed. Figure 2-1 illustrates how the objectives support the Con Edison vision and mission.

Figure 2-1. Con Edison Gas Vision, Mission, and Plan Themes



Managing Demand, Supply, and Environmental Profile

Con Edison takes a proactive and integrated approach to managing demand, supply, and environmental impacts. Con Edison's first priority is to maintain safe, reliable, and reasonably-priced gas service for our customers. We will continue to encourage demand side management to reduce peak demand and overall energy use and will support the development of highly efficient codes and standards. The Company will also carefully plan for area-specific loads to meet the environmental goals of the community arising from conversions from heating oil, gas-fired distributed generation, and natural gas vehicles.

The Company is committed to helping customers manage the price and volatility of gas through our contracting strategies and billing options. Aligned with the state and city's energy security goals, our plan diversifies our gas supply sources to include Marcellus shale gas and renewable gas. We are also carefully planning to ensure enough pipeline capacity to meet the future gas needs of our customers in NYC and Westchester County.

Integrating Innovative System Design

The deployment of a targeted approach to increasing gas system integrity, capacity, and reliability will improve asset utilization; reduce major risks, and lower costs. We will incorporate new designs and advanced technologies into our traditional system integrity and reliability solutions for transmission, supply, and distribution mains. Examples include installing more regulating stations to add capacity to our distribution system to avoid costly main reinforcement and integrating our Bronx/Westchester high pressure system to help reduce the need to upsize the Bronx to White Plains transmission system.

Improving Asset Management and Control

Con Edison will focus on efficient management of transmission and distribution assets. We will use innovative maintenance practices, monitoring tools, and control technologies. We will manage the costs of infrastructure construction and leverage new communications technologies arising from the Company's SmartGrid efforts into future asset management protocols as they evolve. Wherever possible, the Company will utilize trenchless technologies, including liners, to repair or rehabilitate gas pipes. Trenchless technologies help to reduce costs and minimize customer disruption because of digging and interruptions.

Enhancing Customer Experience

Con Edison will focus on customer needs and strive to make it easier for customers to interact with us through the use of new technology. We will incorporate feedback from customer outreach as we introduce new customer service options, communication channels, and information systems. Our plan is to broaden the ways in which we service and communicate with customers.

Improving Processes and Skills

Our people are our key strength. We will continue improving our internal processes and educating our employees to make sure our people have the skills needed to work safely and efficiently while providing excellent customer service. We intend to develop our organizational structure, with increased focus on planning tools, such as cost and work management (following the Electric work management process), to successfully meet future challenges. We intend to provide a supervisor/crew productivity system.

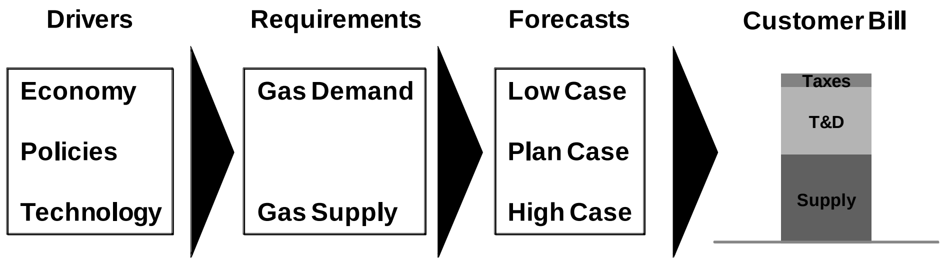
2.3 PROCESS OF DEVELOPING THE GAS LONG RANGE PLAN

Our process for developing this integrated Gas Long Range Plan includes careful considerations of the questions listed below:

- What do our customers want?
- What are the key policy, technology, and economic drivers impacting the gas marketplace?
- How will various types of gas consumption (i.e., residential, commercial, industrial, power and steam generation, distributed generation, and transportation) be impacted by the key drivers?
- What are the resultant gas growth cases for our service territory?
- How do we design our systems, build new infrastructure, and maintain existing assets to meet evolving customer needs?
- What are the implications of the various gas forecasts on our customers' bills?

As depicted in Figure 2-2 we have developed hypotheses regarding the key drivers, projected the implications of various uncertainties on gas demand and gas supply, and developed three gas growth cases. From here, we conducted a thorough review of our methods of system design and our plans to maintain and build assets. Plans were shared with stakeholders and tested for total customer bill impact.

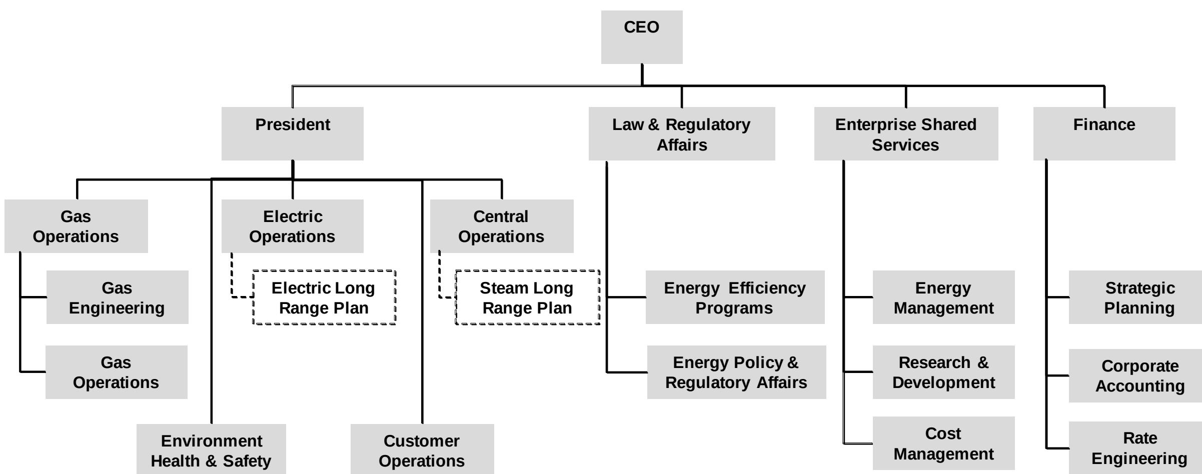
Figure 2-2. Process for Developing the Gas Long Range Plan



To identify, assess, and prioritize business unit activity, we conducted a comprehensive review of business unit plans and evaluated the merit of incorporating emerging ideas into the integrated plan. Throughout this planning process, plans were adjusted to ensure that collective organizational activities will fulfill our mission and optimize our performance described later in this chapter.

In order to ensure the plan was truly integrated across all business units, the planning process required collaboration across the entire organization. Each of the organizations depicted in Figure 2-3 was integral to the process. In addition to these groups, the development of this plan included collaboration with the Electric and Steam long range plans, in order to ensure common assumptions, forecasts, and the impact of emerging technologies on our systems.

Figure 2-3. Con Edison Organization Chart



2.3.1 Gas Usage Forecasts

The gas forecast drives the timing and magnitude of the required investment in transmission and distribution infrastructure. Con Edison currently develops 10-year load forecasts to ensure that transmission and distribution infrastructure is adequate to support the economic growth of NYC and Westchester County. To develop the 20-year forecast for the Gas Long Range Plan, we extended the existing forecast based on a number of key driver sensitivities.

A standard forecast consists of two components: a volumetric forecast and a peak demand forecast. The volumetric forecast is a projection of annual gas consumption by firm and interruptible[10] customers, measured in millions of dekatherms (MMdt). The peak demand forecast is a projection of the maximum gas requirements that Con Edison's firm gas customers demand at a single point in time, measured in thousands of dekatherms per day (Mdt/day) or thousands of dekatherms per hour (Mdt/hr). Peak demand, or the maximum gas that our customers require at a single point in time, drives infrastructure investment because we must build to that demand even if it is a relatively infrequent occurrence to ensure reliable gas service when it is most needed. For the Con Edison gas system, firm gas peak demand occurs in winter when customers have a high demand for reliable gas service for heating purposes.

Historically, the primary driver of gas demand is economic growth, which affects employment, construction and population growth in our service territory. Another important driver today is environmental and energy policy and regulation, which influences customer fuel choices. Con Ed's gas system will experience growth due to conversion of fuels from liquid fuel to natural gas. Innovations and price changes in end-use technology (e.g., higher efficiency boilers, natural gas vehicles) also affect customer energy use.

To facilitate the development of the plan, we developed a base Plan Case and two alternate bounding cases. These three forecasts for energy and demand are described in brief below and depicted graphically in Figures 2-4 and 2-5.

- **Plan Case**—Based on gradual economic recovery out of recession, and modest economic growth over the planning period. The plan case is the basis for all initiatives and assumptions discussed in the plan. This case incorporates modest energy efficiency gains, conservative assumptions for oil to gas conversions and historical rates of growth for gas-fired distributed generation and natural gas vehicles.
- **High Case**—Assumes rapid economic recovery, leading to higher gas prices from high gas demand and higher input prices. This case also has modest energy efficiency gains, but higher oil to gas conversions, distributed generation, and natural gas vehicle usage.
- **Low Case**—Reflects moderate economic recovery (like the Plan case) but has reduced demand due to successful demand side management and improved codes and standards. This case incorporates low gas prices driven by a reduction of electric generation demand and energy efficiency measures. This case only accounts for minimal incremental demand from oil to gas conversions, distributed generation, and natural gas vehicles.

[10] Interruptible customers are generally dual fuel and gas service to them maybe curtailed by the company based on an agreed set of conditions such as adequate notification, outside temperature, and/or certain allowable timeframes during winter months. A firm gas customer is one whose equipment is entirely dependent on natural gas and cannot be interrupted. Different tariffs apply to different types of firm and interruptible gas customers.

Figure 2-4. Annual Gas Demand (MMdt)

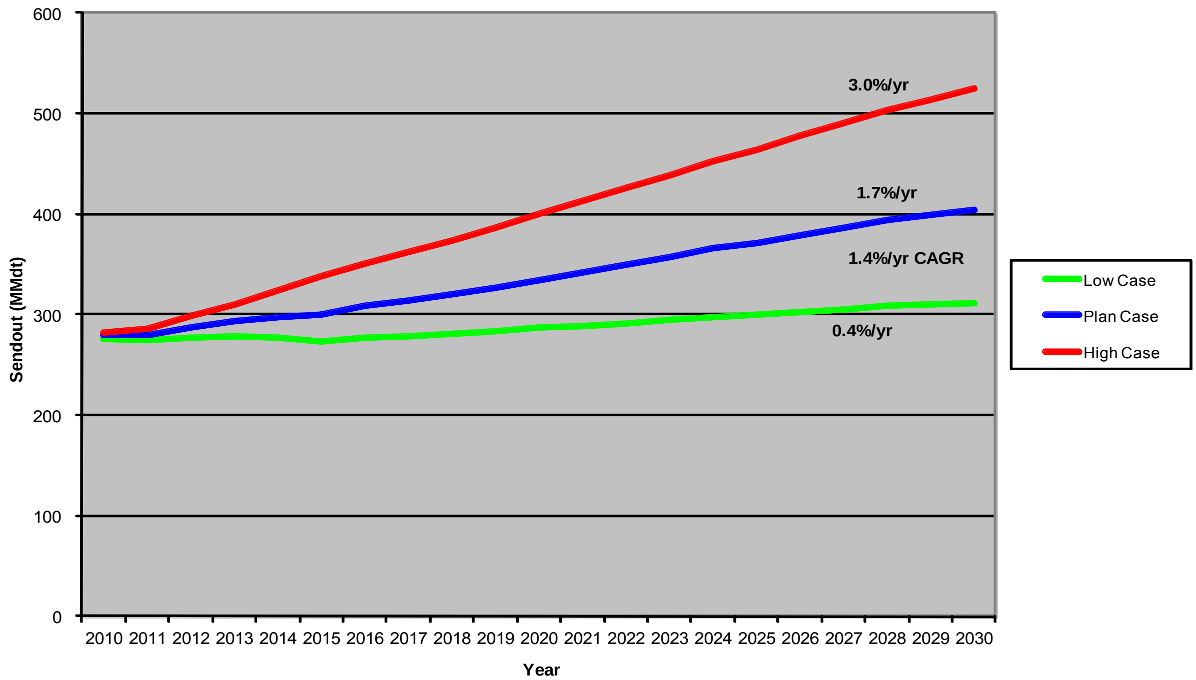
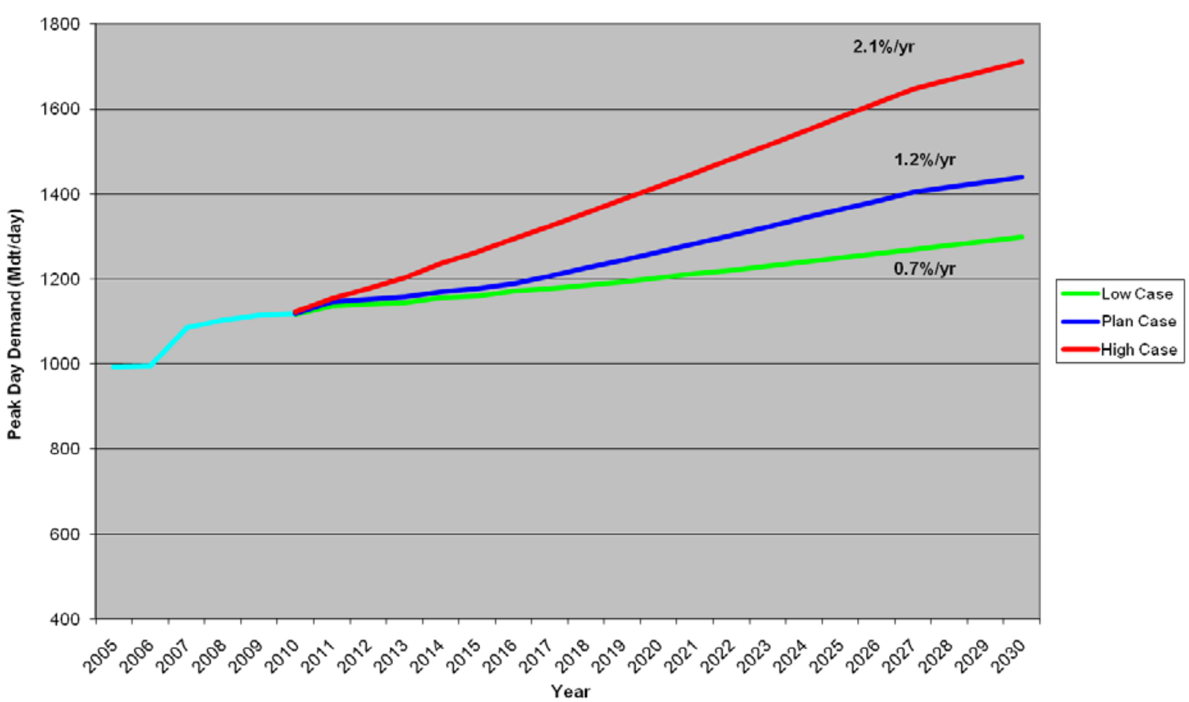


Figure 2-5. Daily Peak Demand Forecasts (Mdt/day)



Detailed descriptions of anticipated gas demand and current planning assumptions that contribute to the above demand cases can be found in Chapter 3: Customer Needs.

2.3.2 Stakeholder Input

During the development of the Gas Long Range Plan, Con Edison met with a representative group of stakeholders, including various NYC agencies involved in economic development, environmental and energy policy. We also have ongoing discussions with the Public Service Commission Staff. We expect to continue to have discussions with key stakeholders about our plans.

We also engaged in a targeted customer outreach effort. We organized focus groups of residential and small commercial customers in NYC and Westchester County and conducted one-on-one interviews with large commercial customers. Outreach topics covered affordability, reliability, energy efficiency, infrastructure upgrades, and oil to gas conversions. Customer feedback was incorporated in the plan. Additional information about our customer outreach efforts and the related findings can be found in Chapter 6: Enhancing Customer Experience.

2.3.3 Evaluation of Investments Based on Performance, Cost, and Risk

The overall management challenge of effective planning is to balance the often competing priorities of cost, performance, and risk. The Company's strategic priorities and specific initiatives are designed to improve one or more of these attributes, and make informed trade-offs. For example, increasing reliability or reducing risk is desirable but could increase new capital expenditures or investment in additional operating programs. Consequently, the themes of performance, cost, and risk must be balanced in a systematic and appropriate manner.

As part of our effort to prepare this plan, we developed a capital investment database and custom analytic model to systematically evaluate the impact of specific programs and initiatives over the 20-year planning horizon. The forecasted capital investments were each evaluated in terms of their incremental impact on the performance, cost, and risk characteristics of the Con Edison gas system.

- Performance measures include system reliability (measured by system availability) and environmental impact (measured by methane emissions)
- Cost measures include savings of capital and operations and maintenance expenditures when compared to traditional solutions as well as the rate and bill impact of those investments
- Risk reduction is measured within the analytical model based on system integrity (incoming leak rates and leak backlogs) and outside the model with various public and employee safety initiatives

These measures are consistent with the Company's asset management practices, annual asset prioritization process, and Con Edison's enterprise risk management (ERM) process. The Company develops strategies to mitigate the cost increases indicated by the plan. Each of these facets of the Company's planning and prioritization methods will be described in more detail in subsequent chapters.

2.4 BACKGROUND ON THE CON EDISON GAS SYSTEM

2.4.1 Service Territory

As depicted in Figure 2-6, Con Edison's gas service territory is composed of 471 square miles with approximately 4.8 million residents. The territory includes Manhattan, Bronx, northern Queens, and almost all of Westchester County. Con Edison serves approximately 1.1 million firm customers and 1,100 large volume interruptible customers, seven of which are in-city gas fired power generation plants.

Figure 2-6. Con Edison Gas Service Territory

Table 2-1 details the geographic breakdown of our approximately 1.1 million metered customers in NYC and Westchester County.

Table 2-1: Service Area Statistics

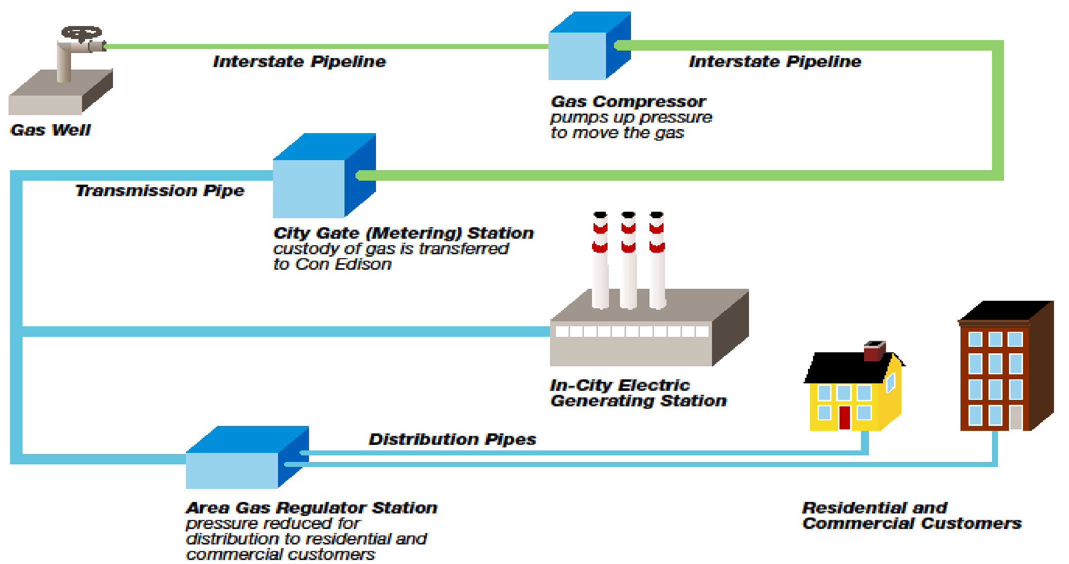
	Square Miles of Gas Service Area	Customers[11]
Bronx	41	296,000
Manhattan	23	336,000
Queens	40	200,000
Westchester County	367	223,000
Total	**471**	**1,055,000**

2.4.2 Con Edison Gas System

Con Edison manages a large, complex, logistically challenging, underground gas transmission and distribution infrastructure designed to rigorous reliability and safety standards.

Our gas system consists of more than 4,320 miles of main transporting approximately 300 million MMDt of natural gas annually. Gas is transported from interstate transmission pipelines through gate stations into Con Edison-owned transmission pipelines and then through key regulator stations into backbone systems and finally into our distribution network to supply our customers.

Figure 2-7. Illustration of Con Edison Gas System



[11] Number of customers or Gas Accounts is determined based on number of gas meters.

Figure 2-8. Underground Gas Manifold[12]

2.4.2.1 Gas Transmission

Con Edison's gas transmission system is comprised of 86 miles of 6" to 36" diameter mains, operating at pressures ranging from 125 psig to 350 psig, in Manhattan, Queens, the Bronx and Westchester County. The majority of these mains were installed from 1947 to 1973 and consists of cathodically-protected coated steel.

Of these 86 miles of transmission main, 41 miles operate at a Maximum Allowable Operating Pressure (MAOP) of 350 psig[13] in Manhattan, Queens, and the Bronx. The remaining 45 miles operate at a MAOP of 245 psig in the Bronx and Westchester. Con Edison's transmission system is currently supplied by six gate stations and the distribution system is directly supplied by four additional gate stations.

The six gate stations supplying the gas transmission system are from three pipeline companies - two Transco stations in NYC, three Tennessee stations in Westchester, and one Iroquois station in the Bronx. An additional Spectra Energy gate station will be added in NYC, estimated to be completed in 2013. The station in the Bronx is the demarcation point between the 245 and 350 psig transmission systems – gas flows seasonally through the two pressure systems by way of a regulator station during the heating season and a compressor station during the summer.

In addition, Con Edison's transmission system is part of a larger regional network called the New York Facilities (NYF) System. The NYF System is jointly operated and maintained by National Grid and Con

[12] Required due to shallow cover over city subways.

[13] Pound-force per square inch gauge

Edison. Con Edison is connected to National Grid at two bi-directional metering stations – one in the Brooklyn/Queens border and one at Long Island/Queens border. However, NYF pipe configuration (smaller pipe in National Grid territory compared to Con Edison) and firm pipeline gate station contracts that National Grid has with Transco and Tennessee dictates that normal flow at the two bi-directional metering facilities is from Con Edison to National Grid.

2.4.2.2 Gas Distribution

Con Edison's gas distribution system consists of 4,237 miles of main, operating at pressures less than 99 psig in Manhattan, the Bronx, Queens and Westchester.

Key regulator stations and backbone systems, called supply mains, are critical facilities which transport gas from transmission to distribution systems. Most of these supply mains are large diameter and are located under major roadways.

The remaining 3,616 miles of the distribution system consist of smaller diameter mains, operating at a variety of pressures:

- 32% of the system is high pressure (HP) operating between 15-99 psig
- 9% of the system is medium pressure (MP) operating between 2-15 psig
- Less than 1% of the system is intermediate pressure (IP) operating between 1-2 psig
- 59% of the system is low pressure (LP) operating between 4-12" water column (wc)

As noted above, a large portion of the distribution system consists of low pressure mains which support smaller residential heating and non-heating loads. This configuration of the distribution system limits the type of growth the system can accommodate without significant enhancement or reinforcement.

Emanating from the distribution mains, 383,900 steel, plastic, and copper services connect the distribution system to customer premises.

The distribution system was primarily installed using cast iron, unprotected steel or coated steel mains. Since 1971, as mains and services are replaced or added, pipe installed is composed of plastic or cathodically-protected steel pipes to increase their longevity by reducing corrosion and leaks. Today, approximately 30% of the mains are cast iron, 30% are unprotected steel, 30% are plastic, and 10% are protected steel. Approximately 57% of the services are plastic.

2.4.2.3 Design Specifications

Con Edison's gas transmission and distribution systems are designed to meet the requirements of the gas safety code: NYS Codes, Rules and regulations Part 255[14]. In addition to Part 255, Con Edison's gas transmission and distribution systems are subject to a variety of federal, state, and city regulations along with standards published by professional organizations listed in Chapter 5: Infrastructure Plan.

The Con Edison system is designed to a rigorous "*zero-degree day" standard*: to meet the load requirements of all firm customers[15] 365 days per year, 24 hours per day, provided that the average of 24 hourly temperatures in a calendar day does not fall below 0°F, and the temperature does not fall below –10°F (design hour).

The purpose of these design criteria is to govern key reliability, safety, and system integrity conditions:

- Maintain the reliability of supply mains in the event of an outage to a gate station or critical regulating station
- Maintain the reliability of the transmission system
- Reduce the potential of incoming gas leaks each year
- Maintain the system at optimal operating pressures while satisfying detailed design basis conditions described in Appendix G: Overview of Gas System Design Criteria.

2.5 THE CUSTOMER BILL

As explained in the previous section, gas is transported from wellhead to the city-gate via interstate pipelines. As a Local Distribution Company (LDC), Con Edison's role is to transport the gas within the citygates and deliver it to the customer. Con Edison charges the consumer a fee for that service typically referred to as the delivery charge.

A typical consumer bill also reflects the cost of the natural gas commodity, typically referred to as Supply charges. Although the commodity cost is shown on Con Edison's bill, Con Edison is neither a gas producer nor an interstate pipeline and, therefore, does not set natural gas prices nor control market volatility. Con Edison also does not earn a return on the commodity. For 85% of total residential and commercial customers, Con Edison does purchase the gas from various suppliers[16]. Through its gas procurement and contract hedging strategies, Con Edison moderates the commodity's price volatility.

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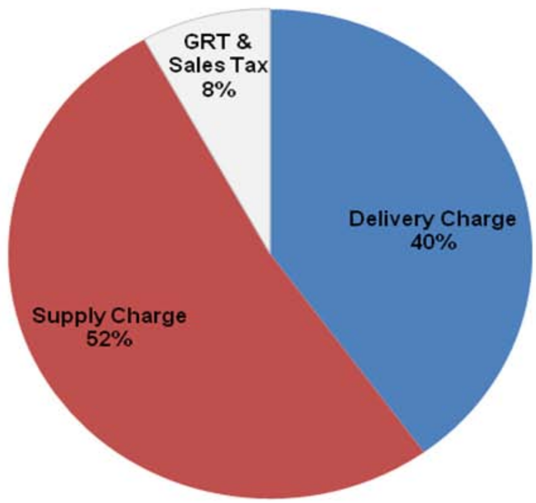
[14] NYS PSC Code Part 255 prescribes minimum safety requirements for the design, fabrication, installation, inspection, testing and operation and maintenance of gas transmission and distribution systems, including gas gathering lines, gas pipelines, gas compressor stations, gas metering and regulating stations, gas mains, service lines, gas storage equipment of the closed pipe type fabricated or forged from pipe or fabricated from pipe and fittings, and gas storage lines not covered by 49 CFR 192.

[15] For Off-Peak Firm and other non-firm customers, Con Edison's obligations are less stringent, allowing interruptions at higher temperatures or for other reasons.

[16] 15% of customers purchase the commodity from sources other than the Con Edison Company of New York (CECONY).

Figure 2-9 reflects the three categories of charges on a typical residential natural gas bill: supply charges, delivery charges, and taxes/fees.

Figure 2-9: Components of the Residential Space Heating Customer Bill (January 2010)[17]



Source: ConEdison Rate Engineering
Note: Analysis based on Residential Service for Residential Heating (1-4 Family)-SC3 block using 300 Therms

2.5.1 Supply Charges

Supply charges include the actual cost of the commodity (i.e., the cost of the natural gas itself) and related charges for the cost of storage and delivering the gas to Con Edison for redelivery to customers. The supply charge is generally the largest portion of the customer's gas bill. In January 2010, it represented 52% of the average residential heating bill.

As mentioned above, Con Edison procures gas for some residential and commercial customers from various gas suppliers. Con Edison passes on the actual cost of the gas to the customer without any additional markup. The Company charges a nominal fee, known as the Merchant Function Charge (MFC), its charge for competitive functions that have been unbundled from base rates and may be avoided by any customer taking gas transportation service only[18]. The MFC currently is comprised of:

Supply related charges – primarily procurement

Credit and collections related charges

Gas in storage working capital

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[17] Customer bills vary during the course of the year. We have used the January bill for a heating customer (who purchases gas from CECONY) as an illustration in this section because it represents the peak usage month in the year for one of the most critical residential uses of natural gas.

[18] Full-service customers acquire their gas from Con Edison. Transportation customers acquire their gas from third party marketers.

Gas Cost Factor (GCF)-related uncollectibles

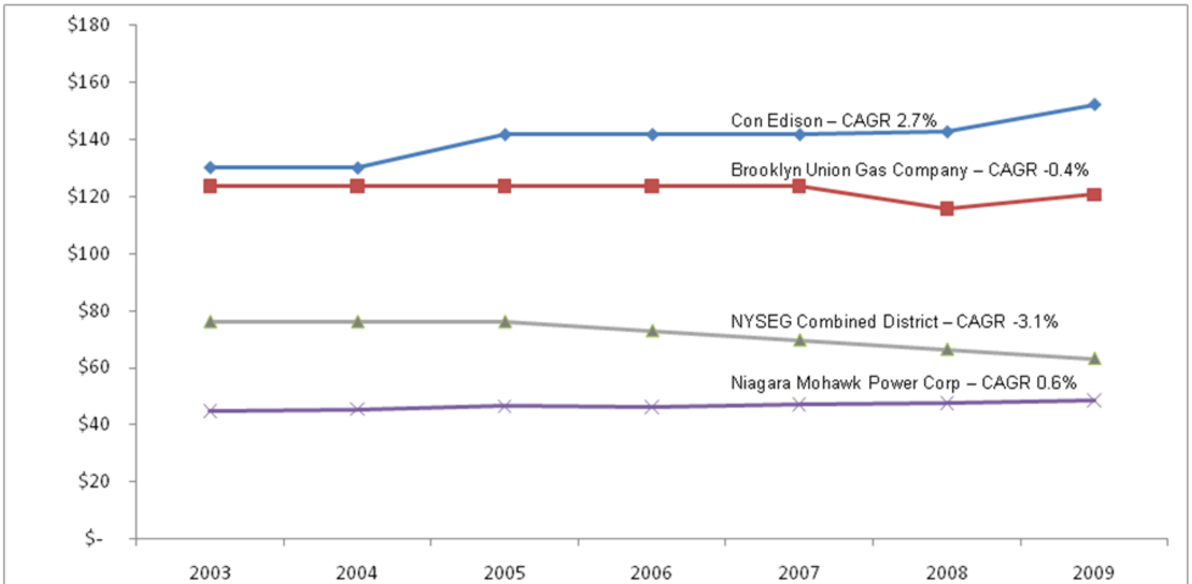
2.5.2 Delivery Charges

Delivery charges represent what Con Edison charges the customer to transport the gas across its transmission and distribution system to the customer premises. In January 2010, delivery charges represented approximately 40% of the heating customer's residential gas bill. The delivery rate represents Con Edison's "cost of service", including

- Capital expenditures to provide service, upgrade the infrastructure, and to ensure safety and reliability
- Operating and maintenance expenditures to maintain the infrastructure and to respond to emergencies
- General and administrative expenses required to run Con Edison's business
- Taxes paid by Con Edison, such as income and property taxes, which represent almost 32% of the delivery charges or nearly 12-13% of the customer's total January 2010 residential heating bill

During 2003-2009, Con Edison's delivery charges have risen at approximately 2.7% per year for residential heating customers, based on January bills. A select set of NYS utility benchmarks (in nominal dollars) are provided in Figure 2-10 below.[19]

Figure 2-10: Trends in Delivery Charges (nominal $) for NYS Gas Utilities (2003-2009)



Source: NYS Public Service Commission
Note: Analysis based on Residential Heating customers using 300 Therms, based on January 2003-09 bills

[19] These are the only NYS utilities that report residential heating and non-heating customers separately. All other NYS utilities provide combined reporting on their heating and non-heating customers and were, therefore, excluded from the analysis.

2.5.3 Taxes

Customers typically pay a Supply Gross Receipts Tax (GRT), a Delivery GRT, and a Sales Tax on their bill. In January 2010, these taxes represented approximately 8% of the residential customer's gas bill. Combined with the taxes paid by Con Edison (discussed in Delivery Charges above), taxes make up approximately 20% of the customer's total gas bill.

2.6 PERFORMANCE, COST, AND RISK TRENDS

The Company will make business decisions related to operation, maintenance, and investment in the gas system in the context of their impact on the system's performance, cost, and risk metrics. In this section we describe our historical performance on these expenditures and our goals for the future.

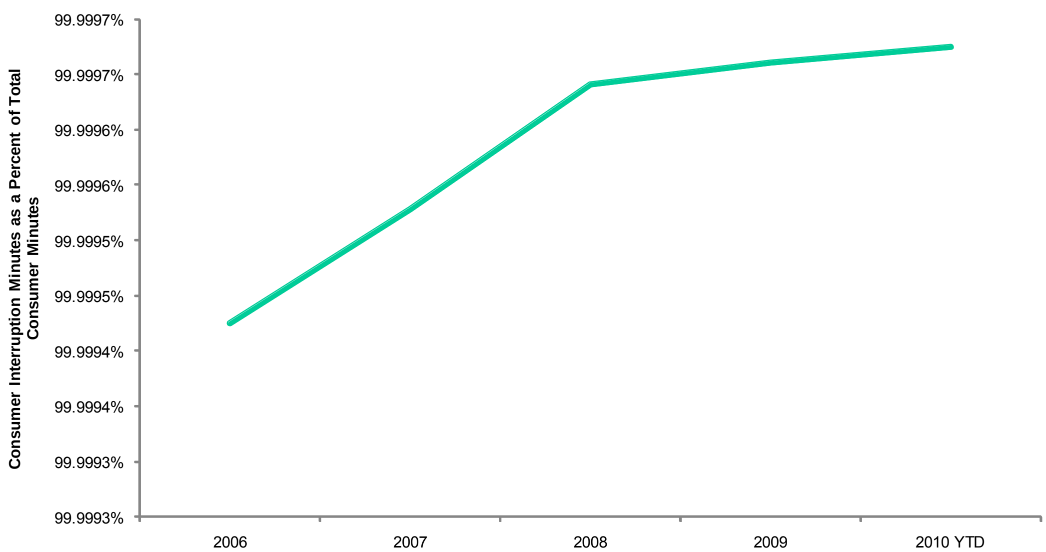
2.6.1 Performance

2.6.1.1 Reliability

Con Edison's gas customers have come to expect a high level of gas system availability, and our goal is to consistently meet that expectation. We have lowered pressure in the high pressure systems in Queens and Westchester. The reduced pressure allows for increased reliability to increasing capacity and adds to public and employee safety. The Westchester HP system originally operated at 99 psig during peak winter mornings and now operates at 70-75 psig.

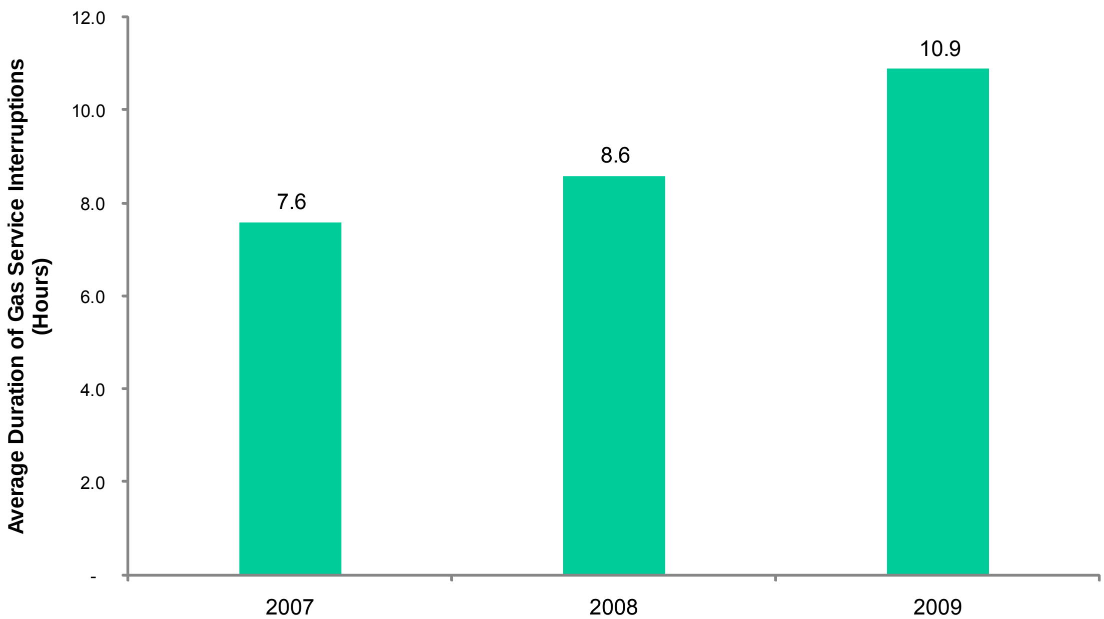
Figure 2-11 shows Con Edison's gas system availability from 2006 to the time of writing this plan. System availability is measured as the percent of time gas service is interrupted out of total system time.

Figure 2-11: System Availability (2006-2010 YTD)



Another common measure of reliability is interruption duration. Figure 2-12 shows the average number of hours gas service was interrupted during 2007-2009 for those customers who experienced an outage caused by company/company supervised forces. Con Edison's outage duration has increased over the last 3 years due to a handful of outages with lengthy durations (up to over 72 hours) that brought up the averages. The Company's increasing outage duration reflects the greater amount of time needed to identify and repair assets in our extensive and highly complex underground network system. Further, the outage duration is a function of the older legacy systems, for example, cast iron joints, breaks, and corroded steel replacements. The Company places a high priority on minimizing overall outage times.

Figure 2-12: Average Duration of Gas Service Interruptions Caused by Company/Company Supervised Forces (2007-2009)



To continue high reliability performance, we set the following performance objectives for the Gas Long Range Plan: to maintain system reliability at our current levels and to improve our customer restoration performance, as measured by outage duration.

2.6.1.2 Environmental Performance

Con Edison is committed to environmental responsibility. The Company has been a member of the EPA's Natural Gas STAR Program since its inception in 1993. The Natural Gas STAR Program is a flexible, voluntary partnership that encourages natural gas companies to adopt proven, cost-effective technologies and practices to improve operational efficiency and reduce methane emissions. Nearly all distribution sector methane emissions are due to unintended fugitive leaks.

Since 1993, Con Edison has achieved cumulative methane reductions of 4,393,613 thousand cubic feet (Mcf) primarily through the rehabilitation of leaking pipe and the use of automated systems to reduce pressure[20]. In 2008 alone, the Company achieved 158,795 Mcf of methane reductions, largely through the identification and rehabilitation of leaking pipe.

[20] Peak demand pressures are often set for extended periods, but are necessary only a small fraction of the time. Higher-than-necessary system pressure intensifies leakage. Distribution companies use one of two approaches to match pressure with

Methane is considered a potent greenhouse gas – 23 times more powerful than carbon dioxide in trapping heat in the atmosphere over a 100-year period. Table 2-2 below illustrates the magnitude of Con Edison's methane reductions in some commonly used carbon dioxide and greenhouse gas equivalents.

Table 2-2: Con Edison's Methane Emissions Reductions

	Con Edison's Methane Emissions Reductions (Mcf)	Metric Ton CO_2 Equivalent	Equivalent CO_2 Emissions from Electricity Use In Homes	Greenhouse Gas Emissions From Passenger Cars
2008	158,795	64,225	8,507	11,763
Cumulative Since 1993	4,393,613	1,776,997	235,366	325,457

Source: EPA Natural Gas STAR Program

Another indicator of our environmental performance is the number of reportable spills within Gas Operations. In 2009, we had nine such spills (one gas condensate spill and eight petroleum/oil spills) which was an improvement over the ten spills we experienced in 2008. Although we exceeded our 2009 target of eight spills, the Company remains committed to improvement in this area with a 2010 target of eight spills. The majority of spills is vehicle-based and averages approximately half a gallon quantity each.

2.6.2 Cost

The Company's overall "cost of service" is primarily for construction, operation, and maintenance costs for our transmission and distribution infrastructure. Cost of service is a primary input into determining the Company's gas delivery charges.

2.6.2.1 Asset Intensity and Capital Expenditure Patterns

The NYS median net distribution plant per customer is in line with the national 3rd quartile. Con Edison's asset intensity is well below the NYS median and in line with the national median from 1994-2003. Since 2002-03, net distribution plant[21] per customer has risen at a more rapid rate (but still approximately parallel to NYS utilities) to almost the 3rd quartile levels nationally.

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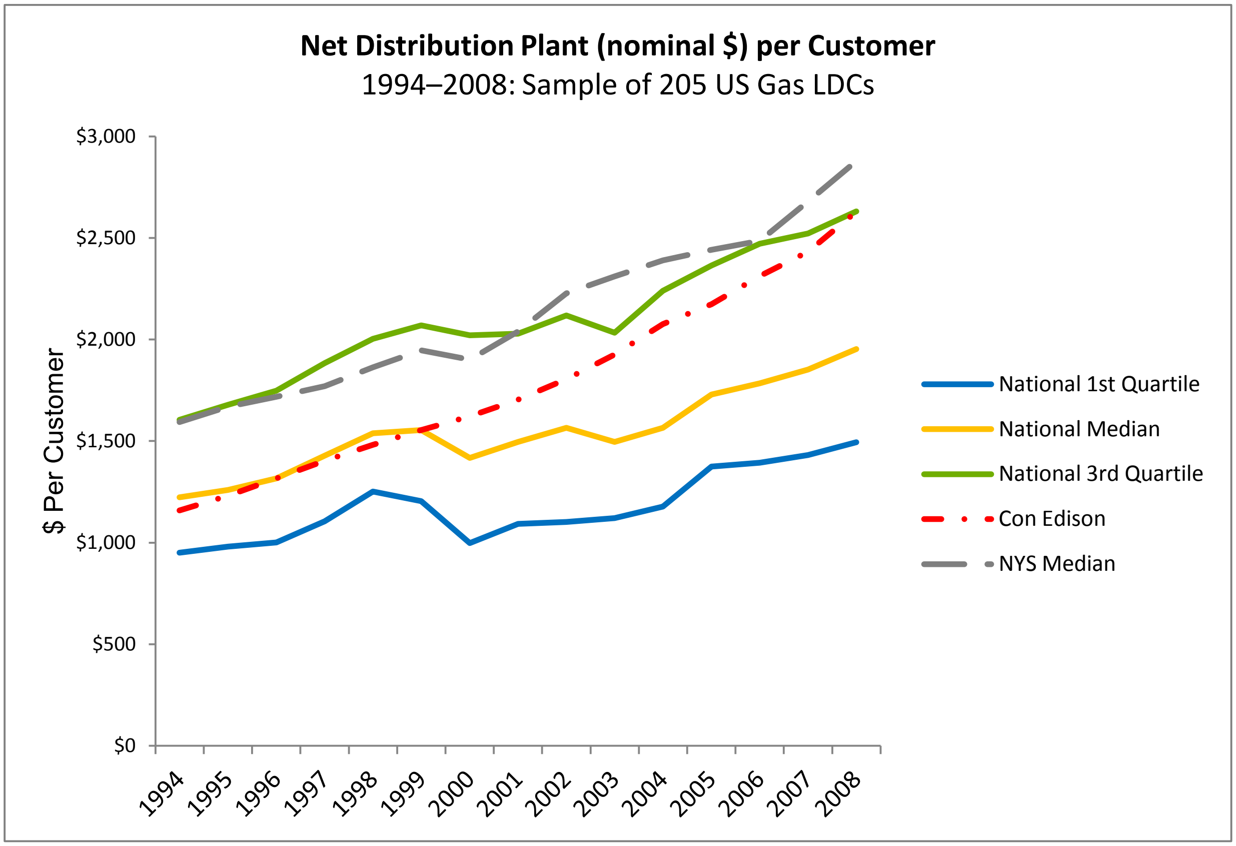
demand: Manual, periodic pressure regulation (which involves visiting regulator stations to adjust District Regulator set points) or Automatic, near real-time pressure regulation (which entails the installation of control systems to adjust District Regulator set points). Con Edison invented automatic pressure control (Grid Boss) and algorithmic control (smart regulators) via R&D projects.

[21] Net plant is defined as the historic gross additions to plant accounts, net of accumulated depreciation.

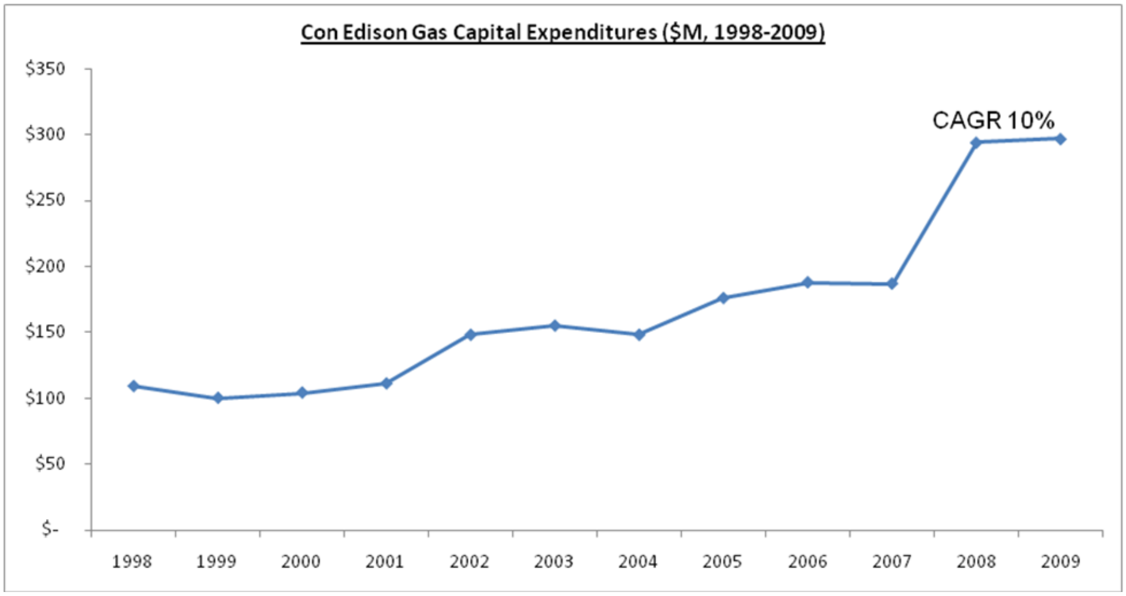
Figure 2-13: Asset Intensity Summary



As seen below in Figure 2-14, capital expenditure has risen at a CAGR of 10% during 1998-2009. Various programs directed at continued safety and reliability drove the recent increases in capital expenditure growth. A key example of such expenditures is the Main Replacement Program, in which Con Edison has undertaken higher rates of replacement of smaller diameter cast iron and unprotected steel pipe to reduce leaks, which improves the safety and reliability of the system. From 2005-2007, less than 15 miles of planned main replacement was completed per year at an average annual cost of approximately $23 million. In the 2008-2010 Rate Case, the Company agreed to accelerate the main replacement programs by removing from service 120 miles of leak-prone gas main during the three calendar-year period of 2008 to 2010. An additional $50 million per year of capital funding was provided to support the updated main replacement performance targets. While the level of main replacement programs significantly increased, Con Edison has kept unit costs of main replacement lower by pioneering and adopting trenchless technologies. Another reason for the increase in capital expenditures has been the expansion of our transmission system. In this past decade, we have added pipe capacity to eliminate bottlenecks on the gas transmission system between the Bronx and Queens.

In the figure below, the capital expenditure spike in 2008 corresponds to the start of Con Edison's present 2008-2010 rate case. One key driver behind the 2008 increase is the Public Service Commission (PSC) mandate to replace 120 miles of pipe in a three year period with a minimum of 30 miles per year.

Figure 2-14: Capital Expenditure Patterns (nominal $M)

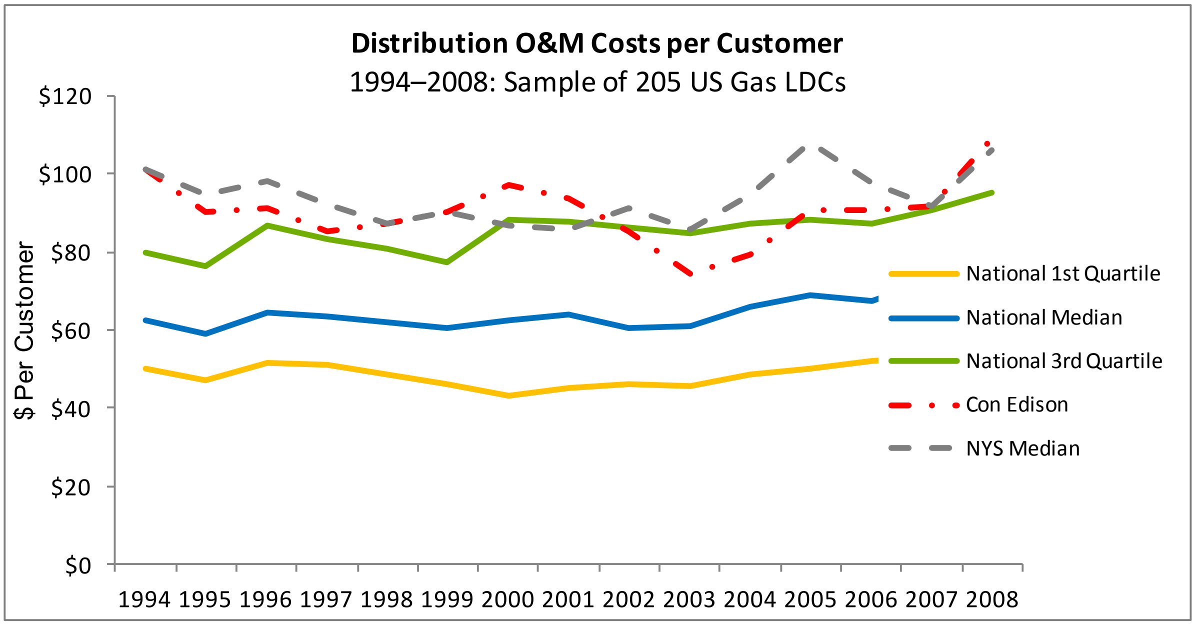


2.6.2.2 Operations and Maintenance Cost Patterns

The Company's Operations and Maintenance (O&M) costs are also a critical component of our cost of service. Distribution and maintenance costs include our regular infrastructure maintenance programs, leak repairs, system monitoring operations, and emergency response. From 1998 to 2009 our distribution operations and maintenance cost per customer was in the top quartile nationally but in line with NYS utilities, reflecting the higher costs of doing business in New York and the density of underground facilities. Some unique drivers of our high O&M costs include

- The dense underground system with multiple facilities in close proximity
- Significant public improvement projects requiring us to move our facilities at our cost
- Nearly wall-to-wall pavement and a concrete base below most of the pavement, and in some cases, paving of multiple levels of streets.

Figure 2-15: Distribution Operations & Maintenance (O&M) Costs



Although our distribution O&M costs per customer are high, Con Edison has successfully limited growth in gas O&M expenditures to 1% annually by increasing productivity and using technologies such as keyhole for leak repair[22].

Figure 2-16 shows a jump in O&M expenditures from 2004 to 2005. In the 2005-2007 rate case, Con Edison received $24M for specific O&M programs ($8M per year). That additional funding extended to the present rate case (2008-2010), with various other programs replacing the 2005-2007 programs (i.e. coating of the Astoria main, several LNG O&M projects, pressure control projects, etc). The 2008-2010 rate case also has higher O&M expenditures related to increased main work.

[22] Keyhole technology is a method of performing some types of gas main work through a small, usually 12" x12" excavation using long handled tools. The Keyhole excavation is performed using a vacuum truck to remove the spoils, which are then used as backfill. When Core boring is teamed with Keyhole, a repair can be made with no need for permanent restoration. The following types of repairs can be done using Keyhole; joint or coupling encapsulation, service cut off / reconnect, installation of anodes, test pits.

Figure 2-16: O&M Expense Patterns

2.6.2.3 Other Expenses

The Company's customer service and administrative and general costs on a per customer basis have historically been low (1st quartile) relative to the national industry median.

Taxes and other fees have historically been high in the Con Edison territory – in the top quartile of the industry. As mentioned above in the discussion on the customer bill, the combined tax burden for the average residential heating customer is approximately 20% of the total gas bill, when taking into consideration federal, state, and local taxes paid by Con Edison combined with the sales/GRT levied on the energy bill.

Our cost objectives are to minimize expenses through a combined strategy of improved processes, operations, and human resource management (improved productivity); use of advanced technology; and encouraging effective energy efficiency and regulatory and tax reform, offsetting projected cost increases without sacrificing safety and reliability.

2.6.3 Risk

Given the complexity of our gas system, there are numerous inherent operational, financial, and safety risks that could potentially impact our customers, the communities we serve, our employees, and the public at large. The Company evaluates its risks and seeks to mitigate them to improve its performance. As a result, these risks drive many O&M programs and capital investments, and are considered within the project prioritization process when planning the budget.

We have developed an enterprise risk management (ERM) process by which the Company identifies, monitors, and mitigates risks. Below we highlight our ERM process and, as examples of some of the risks we manage, we describe our ongoing efforts to mitigate risks associated with wide-scale system reliability and employee and public safety.

2.6.3.1 Enterprise Risk Management

The Company has always placed a high priority on identifying and mitigating risk and, like many other companies, has implemented a formal ERM process. Con Edison's ERM program, initiated in 2005, is the subject of ongoing refinement to improve its usefulness. Through a collaborative process of risk assessment, ERM has become embedded into the planning and budgeting functions of all operating groups. As part of the annual ERM cycle, groups identify operational and administrative risks, and assess their severity, likelihood, and controllability. These assessments are reviewed and adjusted through the active participation of senior management.

ERM is a process to identify, analyze, integrate, evaluate, manage, monitor, and communicate risks across the Company. Our risk management program has three primary objectives:

- **Systematic risk mitigation**—Continually evaluate the likelihood, severity, and control mechanisms of risk categories and ensure proper risk mitigation and preparedness. Promote a culture of comprehensive risk assessment and prevention throughout Con Edison.
- **Proper allocation of resources**—Integrate ERM into the development and evaluation of business cases. Ensure that annual budgeting and longer-term program development allocate funds for risk mitigation.
- **Enhanced communication and transparency**—Ensure greater transparency and collaboration by actively involving all levels and functions of the organization, up to and including the CEO and Board. Establish clear accountability by assigning specific officers to each risk.

As shown in Figure 2-17 below, ERM allows Con Edison to translate a broad concept such as "risk" into quantifiable measures of severity, likelihood, and controllability.

- **Severity**—Estimate of the event's potential impact on public perception, safety, finances
- **Likelihood**—Estimate of the likelihood that an event will occur within a set timeframe based on past experience and current probability
- **Controllability**—Estimate the likelihood that existing detection or control mechanisms could predict or prevent the event

For each identified risk, these three components are assigned a value from 2 to 10. These component factors are then multiplied to produce a Risk Priority Number (RPN). The RPN quantifies the relative priority of risks across the Company. This value is a key input into the Capital Optimization process described in Chapter 5: Infrastructure Plan.

Figure 2-17. Risk Assessment Factors

ERM - RISK ASSESSMENT FACTORS
YEAR 2009

The following table should be used as a guide for assessing risk within the context of an enterprise risk management system. Consider the most probable realistic worst-case scenario.

Severity Factor

Estimate the severity of the event using the five-point scale and use the highest score of the three perspectives:

	Factor	Impact Category A	Impact Category B	Impact Category C
Insignificant	**2**			
Moderate	**4**			
Significant	**6**			
Severe	**8**			
Catastrophic	**10**			

Likelihood Factor

Estimate the frequency of occurrence of the triggering event based on past experience as well as considering the current probablity of the event occuring:

	Factor	Description
Rarely	**2**	One incident in 10 years
Unlikely	**4**	One incident in 5 years
Likely	**6**	One incident in 3 years
Frequent	**8**	One incident in 1 years
Certain	**10**	Greater than one incident per year

Controllability Factor

Determine the likelihood that existing detection or control mechanisms would predict or prevent the triggering event:

	Factor	Description
Almost Certain	**2**	Excellent detection and control over the triggering event
High Probability	**4**	Highly predictable detection and control over the triggering event
Moderate	**6**	Detection and control are reasonably achievable
Low	**8**	Detection and control are very limited
Impossible	**10**	No ability to detect or control the triggering event

The output of the ERM process is detailed mitigation plans for each key risk. Illustrative examples of risks are set forth in Table 2-3 below.

Table 2-3. Illustrative Gas Operations Risks

Event	Illustrative Mitigation Programs
Gas distribution system events (e.g., explosion/fire caused by damages, inside/outside leaks, etc.)	• Perform annual leak surveys of the entire main system • Perform safety inspections of key assets • Maintain low inventory of leaks pending repair • Install corrosion resistant plastic mains and services • Operate at lower pressures than historical past practices • Timely response to gas odor complaints
Gas from our transmission system explodes or burns out of control.	• Operate the gas transmission system at optimal pressures • Heat the gas at inlet stations before it enters our system • Install high strength, ductile steel piping • Use scientific methods to detect, repair, and prevent corrosion and leaks • Inspect for existing external and internal corrosion or damage • Patrol the entire system weekly to detect unreported contractor activity (daily patrols in Manhattan)
A water main break impacts our low pressure gas system and causes an extensive customer outage.	• Coordinate with DEP for more advance notification from the DEP about service area infrastructure related events, including 311 water leak related calls from the public and Fire Department notification • Receive direct notification of major water main breaks from NYC OEM and by the Breaking News Network pager system • Install new valves as low pressure mains are installed or replaced. • Replace 20 miles per year of cast iron pipe with more ductile steel or plastic mains • Install new regulator stations to provide new sources of supply

Other Gas Operations risks tracked in the ERM include

- We lose our gas supply into NYC or the O&R service territory for an extended period of time (e.g., Transco supply at Meadowlands heater site).
- Inadvertent shutdown of a remotely operated gas valve causing widespread customer outages

2.6.3.2 System Integrity and Leak Management

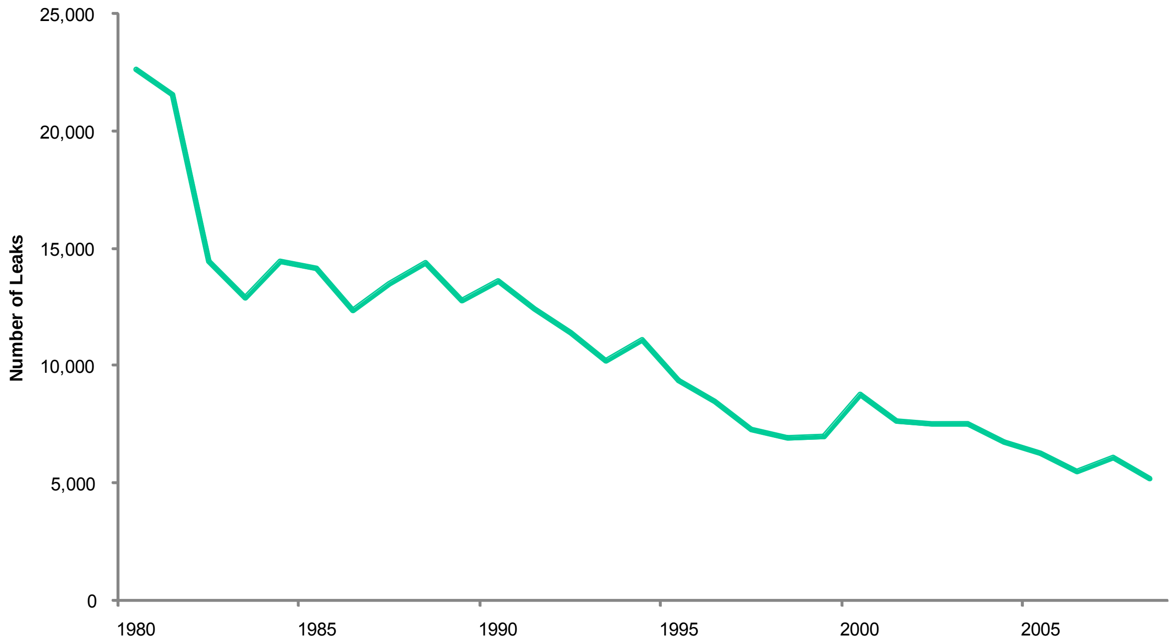
As explained in Section 2.4.2, nearly 60% of the distribution mains are composed of either cast iron or unprotected steel. These pipes are vulnerable to corrosion or leakage due to a variety of factors including age, soil condition, weather, etc. Corrosion adversely affects the integrity of the system by causing leaks. Leaks give rise to a host of safety and reliability issues including reduced energy efficiency through gas losses along the system, possible pressure drops causing outages, and flammable gas in the atmosphere. To manage the safety and reliability risks posed by a loss of system integrity, Con Edison has an extensive leak management program to detect, monitor, prevent, and prioritize leaks for repair.

Con Edison performs leak surveys to ensure public safety and pipeline integrity by proactive identification of gas leaks and timely corrective action. Con Edison performs annual leak surveys on all 4,300 miles of gas mains and periodic surveys of our 380,000 services. The Company also performs special cast iron surveys during extreme weather conditions, special surveys as needed such as pre-paving and pre-parade routes, and conducts visual inspections of above ground gas service piping for atmospheric corrosion. The frequencies of leak surveys performed are as follows:

- Business District (BD) Survey: 100% of BD services must be surveyed every year. 41,987 services will be surveyed in 2010.
- Non Business District (NBD) Survey: All NBD services are surveyed over 3 years (one-third annually equating to 108,621 services to be surveyed for 2010).
- Tri-annual Mains Survey: 86 miles of transmission main are surveyed three times each year, Jan – March, July and October.
- Special Surveys: surveys completed as required for pre-paves, parades, public buildings, and large public events, e.g. Veterans Day Parade, Thanksgiving Day Parade, New Years Eve and 2” Westchester and Queens Coupling survey.
- Type 3 Surveillance Survey: a leak not immediately hazardous at time of detection but surveillance required annually to confirm they remain non-hazardous.

Con Edison also maintains a proactive program of replacing cast iron and unprotected steel prone pipe to reduce leaks in the system. During 2008 and 2009, the Company has replaced over 50 miles per year. As seen in Figure 2-18 below, Con Edison has reduced the incidence of leaks on the system from over 22,000 in 1980 to approximately 5,700 leaks in 2009. As part of our long term main replacement initiative, we have retained an outside consultant to establish optimal long term replacement levels. While the consultant’s report is still under review, this plan assumes that the Company will continue to replace approximately 50 miles of main annually. Additional detail regarding Con Edison’s main replacement program can be found in Chapter 5: Infrastructure Plan.

Figure 2-18: Incoming Leaks (1985-2009)



Con Edison also performs extensive leak repairs annually and has managed to reduce the backlog of leaks as shown in Figure 2-19 below. In 1988, the gas leak backlog was just over 15,000 leaks and year-end 2009 leaks were under 1,400. Most of the leaks in the leak backlog are Type 3[23] leaks which are not hazardous. We enter each winter with less than 100 hazardous leaks. Gas leak repairs are a major commitment of our O&M expenses. Con Edison has the highest amount of leak reports issued annually of all NYS utilities. Con Edison has committed to the NYS Public Service Commission that it will maintain a leak backlog of less than 1,600[24] leaks at the end of the year.

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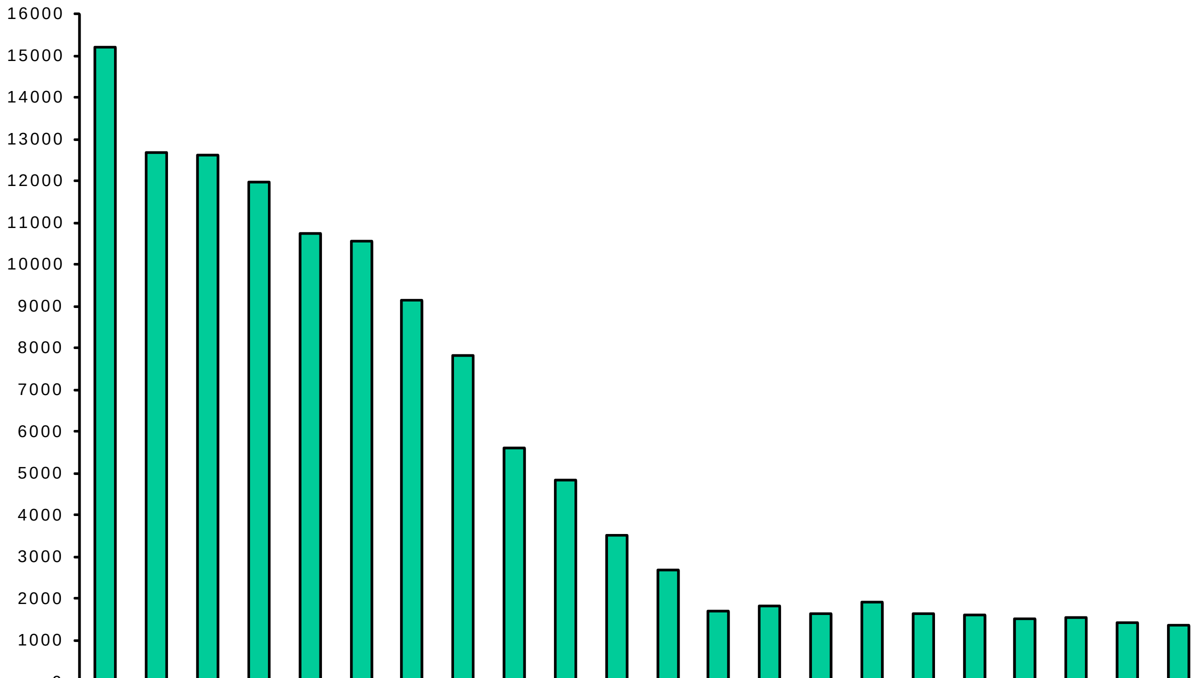
[23] A Type 3 leak is not immediately hazardous at the time of detection and can be reasonably expected to remain that way. However, Type 3 leaks shall be reevaluated during the next required leakage survey or annually whichever is less.

[24] PSC mandates a leak backlog less than 1600 leaks at the end of the year.

Figure 2-19: Leak Backlogs (1988-2009)



	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Backlog	15194	12687	12631	11971	10758	10573	9139	7826	5621	4847	3512

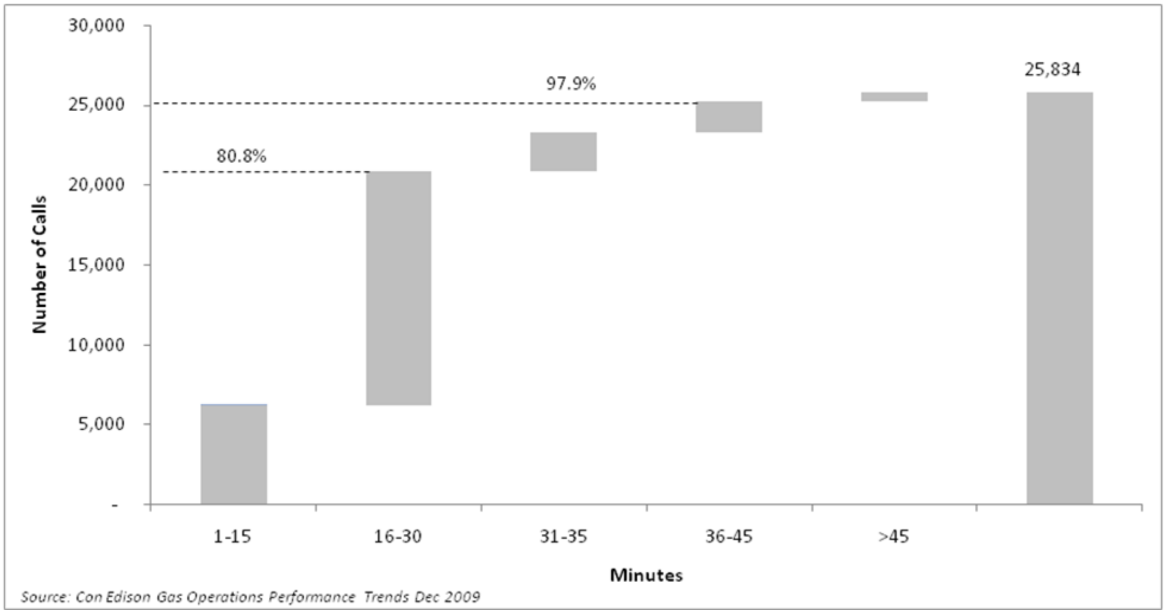
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Backlog	2689	1705	1824	1642	1923	1645	1602	1512	1539	1423	1378

2.6.3.3 Public and Employee Safety

Con Edison's commitment to public safety is evidenced by the investments the Company makes in reliability, pressure control, environmental performance, risk mitigation, and, most importantly, leak management programs. Despite these measures, incidents ranging in severity from gas leaks to explosions have occurred within our system. Con Edison has an emergency response system designed to act quickly and efficiently during an incident to minimize its severity.

During 2009, Con Edison responded to 25,834 emergency calls. Nearly 81% of these calls were responded to in less than 30 minutes – and nearly 98% were responded to in less than 45 minutes.

Figure 2-20: Emergency Response Times (2009)



Despite the challenges of timely responses in NYC's highly congested and densely populated urban area, Con Edison is working to continue to improve response times to safeguard the public. Further, through its risk mitigation a program, Con Edison is also seeking to improve and innovate the procedures utilized during an emergency protect life and property. For example, Con Edison is now adding "dispatch time" and "made safe" time to monitor. We also developed Code MuRRE (Multiple Resource Response Event), which is an alert to field personnel for situations that require an escalated response to gas events improve emergency response and evacuation.

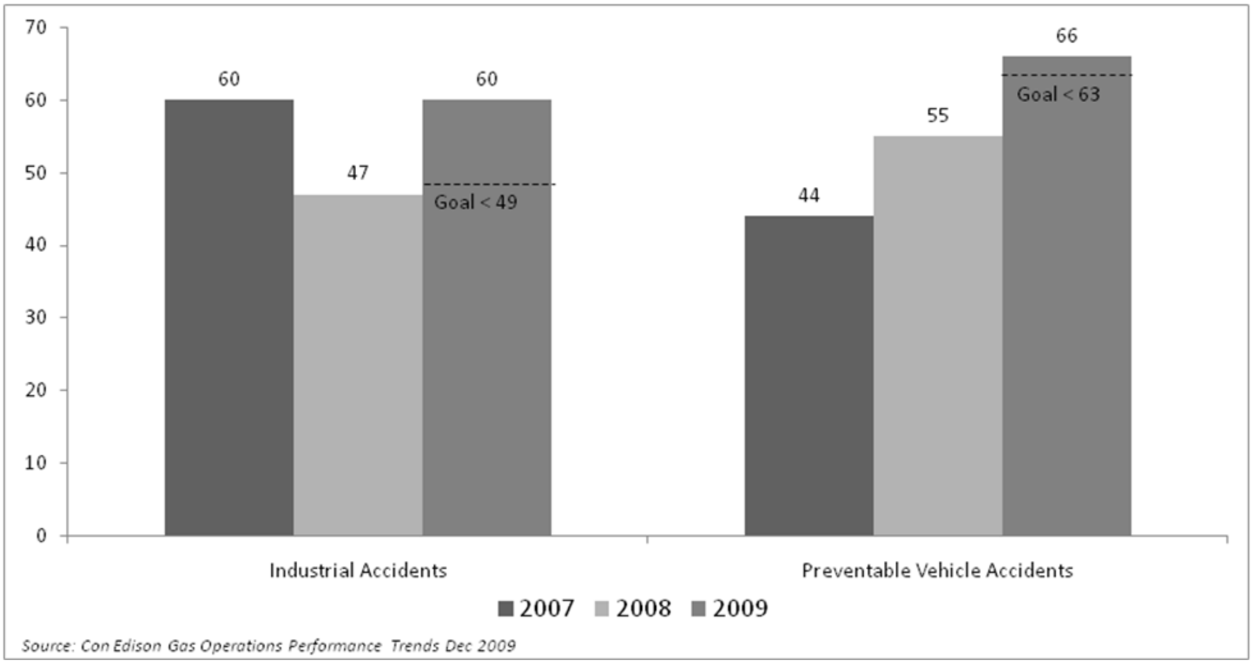
Employee safety is a top priority for Con Edison. We have a number of programs and guidelines in place to achieve an injury-free workplace. The main performance metric in the area of employee safety is the OSHA incidence rate.[25] The incidence rate is a normalizing indicator that captures the number of recordable injuries/illnesses per standard unit of 100 full-time equivalent employees (each working 2,000 hours per year). It is dependent upon the number of recordable injuries/illnesses experienced and the number of productive hours worked, which includes all straight time, compensable overtime, training hours, and restricted duty hours for both weekly and management employees.

Con Edison's current safety performance, as measured by the incidence rate, is at the midpoint of its industry peers. The 2009 company-wide incidence rate is 3.24, or approximately 3 injuries and illnesses per 100 workers. We believe there is significant opportunity for improvement, and have therefore established its reduction as a key objective for all operating groups. Our goal is to reduce this number by more than half, and achieve a rate of 1.50 or less by 2015. Gas Operations' 2010 goal is to reduce the OSHA rate by more than 25%. Through March 2010, the OSHA rate for gas operations was 1.89. During this period there were 5 industrial accidents (beating our goal of 12) and 8 preventable vehicle accidents (beating our goal of 16).

[25] The formula for calculating the incidence rate is: Number of Recordable Incidences x 100 x 2000 / Total Number of Productive Hours Worked.

Within Gas Operations, our 2009 industrial and preventable vehicle accidents also exceeded our 2009 goals.

Figure 2-21: Total Accidents



Our Environment Health & Safety group is working closely with all operating groups to make sure we achieve our safety goals, including providing appropriate tools and resources to ensure compliance with safety rules, performing comprehensive job planning and briefings, documenting site safety observations, and more broadly, to promoting a culture of personal accountability.

Con Edison's goals in this plan relating to the risks facing the Company are to:

- Continue to utilize our ERM process to systematically identify and prioritize emerging risks, develop risk mitigation strategies, and mobilize resources to execute those strategies
- Achieve an overall gas leak year-end backlog at less than or equal to 1600
- Respond to 75% or more of gas odors within 30 minutes
- Strive for continual improvement in employee and public safety by developing and executing innovative programs and processes

2.7 SUMMARY

This chapter provided an overview of Con Edison, our customers, our service area, and our system's historical performance. The chapter further described our plan objectives and plan development process.

The remainder of the GLRP addresses each element of the plan in further detail. Chapter 3 describes our anticipated sources of growth and our planning horizon estimates for gas demand. Chapter 4 describes our outlook on commodity availability, prices, and our strategic priorities for ensuring adequate supply reaches our service territory. Chapter 5 describes our infrastructure plan, in particular the programs and initiatives we undertake to maintain our system and to take on new customers. It further provides details on our capital plan estimates during the plan horizon as well as steps we've undertaken to manage our capital investments. Chapter 6 describes impacts to our customers, including rate and bill impacts. It further details feedback we received from our customer outreach efforts which was integrated throughout the plan. This chapter also provides some of our vision for how the customer will interface with Con Edison in the future. Our final chapter, Chapter 7 describes implications for our workforce, including skill needs and business continuity planning.

3.0 CUSTOMER NEEDS

In Chapter 2 (Section 2.3), we briefly described the process of developing the Gas Long Range Plan. In that section, we explained that we derived gas usage forecasts and introduced our 20-year volume and peak demand forecasts. This chapter provides additional detail on anticipated customer needs from economic growth, environmental regulation, and technology developments underlying our gas usage forecasts. This chapter reviews expected gas usage trends in four categories:

- **End-use Residential, Commercial, and Industrial**: explores evolving needs of our primarily residential and commercial customer base
- **Power and Steam Generation**: explores anticipated changes in the fueling needs of in-city generators
- **Distributed Generation**: explores growing interest in on-site generation as a heat and power alternative
- **Transportation**: explores resurrection of interest in natural gas vehicles in our service territory

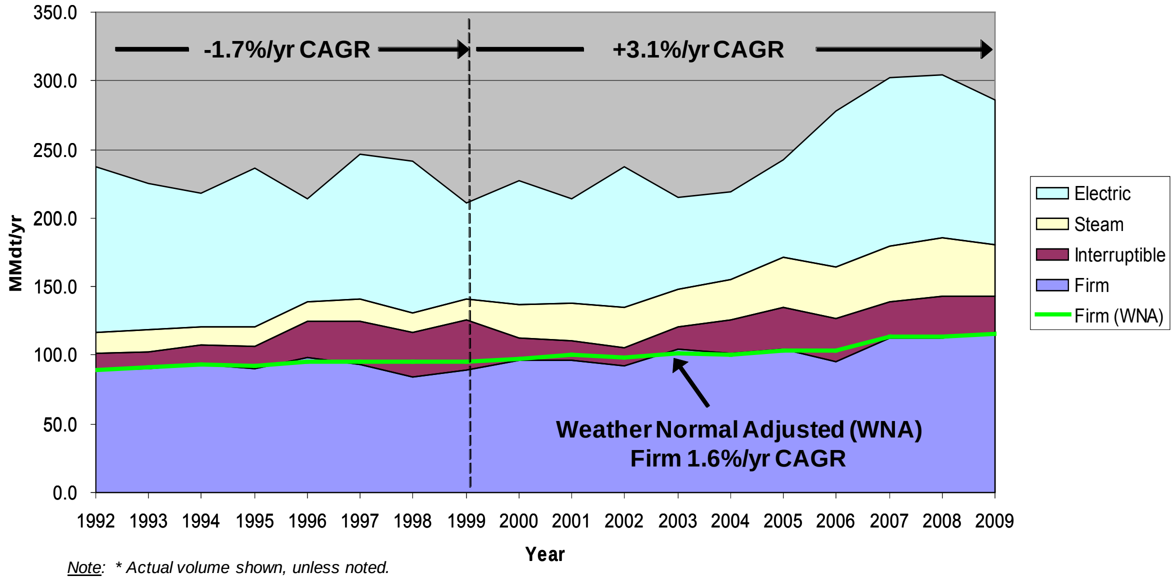
For each of the above four categories of gas usage, we developed three scenarios (plan, low, and high)[26] for volume and peak demand.

3.1 END-USE RESIDENTIAL, COMMERCIAL, AND INDUSTRIAL NEEDS

As we described in Chapter 2, Con Edison has approximately 1.1 million residential and commercial customers. Traditionally, growth in firm gas demand from residential and commercial uses has been dependent on the rate of economic growth. As seen in Figure 3-1 below, Con Edison's volume from firm gas demand has grown at 1.6% Compound Annual Growth Rate (CAGR) during the 17-year period from 1992-2009.

[26] See Chapter 2, Section 2.3, **Process of Developing the Gas Long Range Plan**, for a description of the Plan, Low, and High cases.

Figure 3-1: Historical Demand (1992-2009)



*Note: * Actual volume shown, unless noted.*

Given historical demand trends, immediate prior year experience, and assuming a modest economic recovery in early years of the planning period, we estimate that our typical full-service and transportation demand would grow at just under 1% CAGR. For each of our demand cases (plan, low, and high) we have adjusted this typical base demand for additional economic, environmental, and technology drivers to arrive at the projections used for our system plan. For end-use residential and commercial customers, three drivers affect our typical base demand: (1) potential for heavy fuel oil heating conversions to natural gas (2) potential for customer-owned distribution generation and combined heat and power (CHP) that use natural gas and (3) energy efficiency measures.

3.1.1 Potential #4 and #6 Fuel Oil Heating Conversions to Natural Gas[27]

Due to air quality and public health concerns, New York City Department of Environmental Protection (NYC DEP) has proposed regulation to ban the use of heavy fuel oil (#4 and #6) in building boilers. The Company will support the City's initiative and appropriately plan for its implementation. This section provides an overview of the expected regulation, its timeline, and its expected impact on Con Edison's service territory.

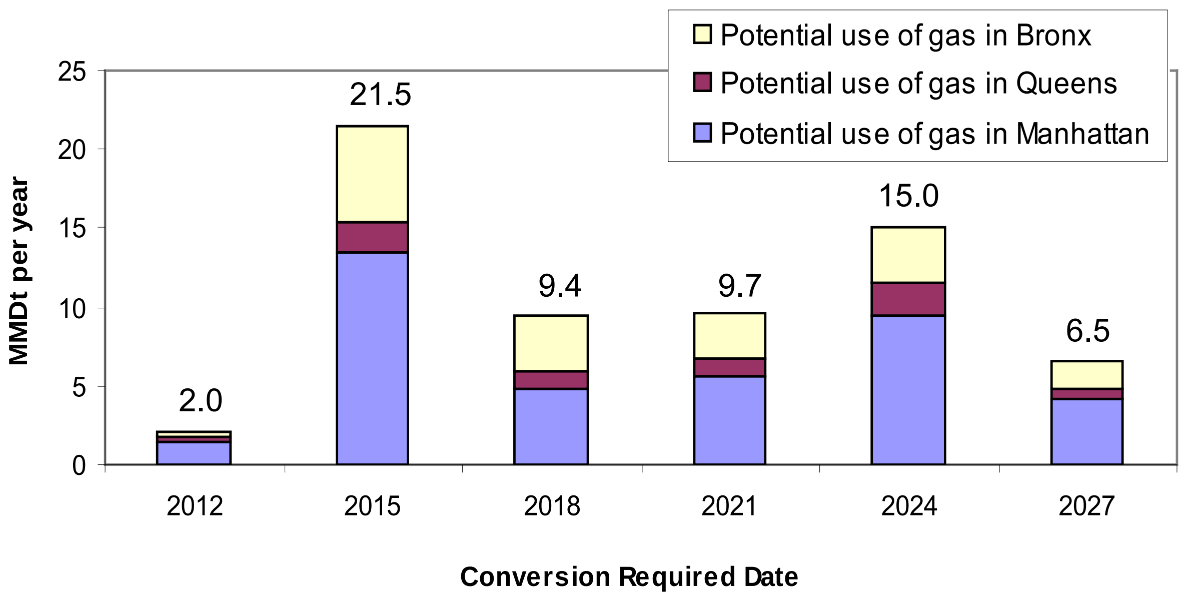
Overview of Proposed NYC Regulation

The current draft of proposed regulation would require all building users of #4 / #6 oil to convert boilers to #2 oil, natural gas or steam. At the time of writing this plan, NYC expects to issue the proposed regulation for comment by end of June 2010, at which time it would be subject to a further 60 day public-comment period.

[27] Please see Appendix B – GLRP Demand Forecast

The draft regulation currently proposes that conversions would be phased in based on age of boiler and are expected to occur between 2012 and 2027. Buildings would be granted up to two variances of up to three-years each that would allow them to delay conversion, if owners demonstrate economic barriers to conversion exist and/or, if natural gas were not readily available. All variances are expected to expire by 2030. As seen in Figure 3-2 below, a large number of boilers are expected to be affected by this regulation requiring conversion by 2015.

Figure 3-2: Expected Boiler Conversion Dates[28]



Implications of Proposed Regulation

The proposed regulation impacts approximately 7,500[29] buildings in Con Edison's gas service area, of which the greatest building density is in Manhattan and the west Bronx *(see Figure 3-3)*. If all 7,500 affected buildings converted to using natural gas only, their aggregate peak usage would be approximately 680 mdt/day, or 60% of current Con Edison's peak day usage. This demand would represent an annual (volume) use equivalent to 60 mmdt, or 52% of firm gas demand.

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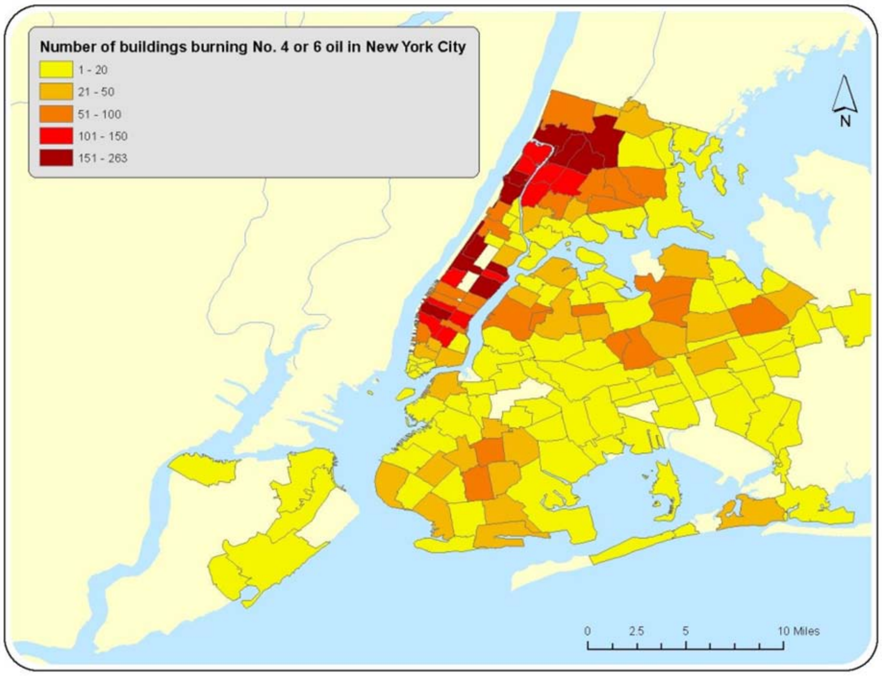
[28] Based on expiration of the certificate of operation

[29] Source: NYC Department of Environmental Protection (DEP).

Figure 3-3: Location of Heavy Fuel Oil Heating Buildings in Con Edison Gas Service Area



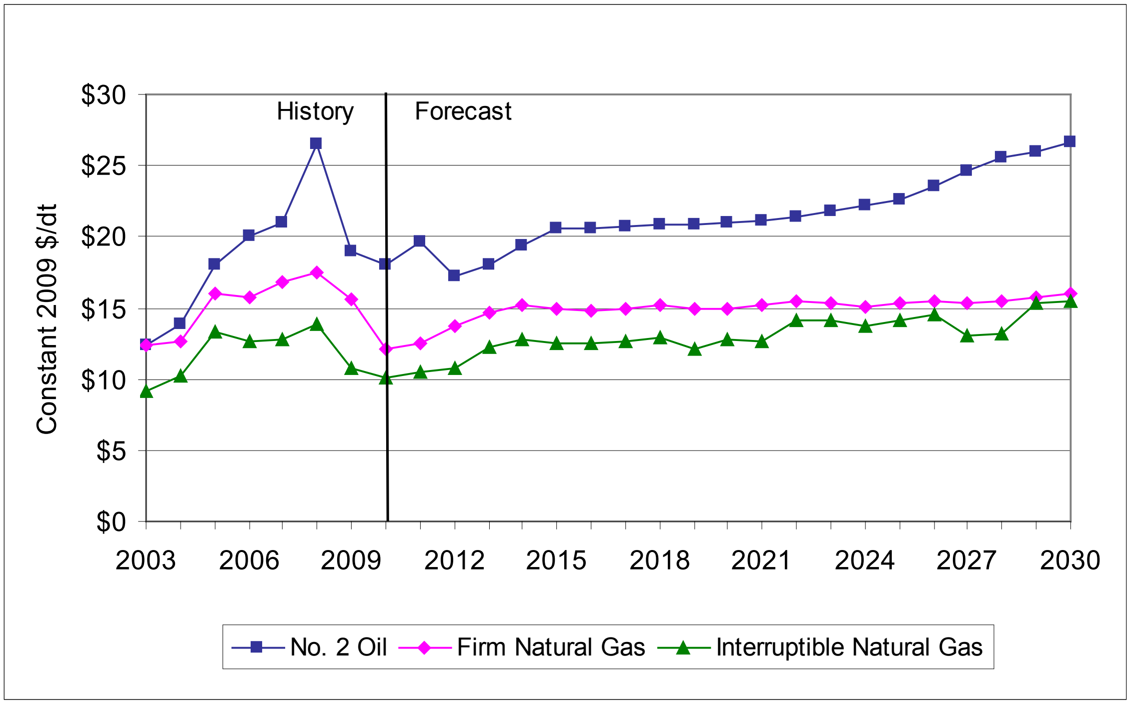
Heavy fuel oil conversions have the potential to significantly raise natural gas usage in the Con Edison gas service area, particularly impacting system planning and reinforcement in low-pressure areas such as Manhattan.

Conversions from heavy fuel oil to natural gas are an economic decision by customers, entailing consideration of three key cost factors:

1. **Fuel cost savings**: The expected future price of natural gas versus #2 oil

From our review of anticipated fuel costs, the Company remains confident that natural gas will remain a cost-competitive fuel for users.

Figure 3-4: Burnertip Natural Gas vs. #2 Oil Prices[30]



SOURCE: US Energy Information Administration and Henry-Hub (H-H) Average of Monthly NYMEX Settlement - Historical Annual Prices for NYH No.2 and H-H Natural Gas; Wood Mackenzie- Forecasted Annual Prices H-H and NYH No. 2; Con Edison Energy Management- Citygate average cost of fuel for Con Edison customers; Con Edison Rate Engineering- Citygate to burner tip cost of fuel.

As the chart shows, interruptible natural gas prices have been and are projected to remain below #2 oil prices. The price of firm natural gas has been at or below #2 oil, with the gap widening significantly since 2006. The margin is expected to widen over the forecast period. All gas and oil prices are in constant 2009 dollars per dt.

2. **Natural gas system connection**: The cost of connecting to Con Edison's natural gas system.

The Company has also determined that approximately 35% of affected buildings are relatively small as defined as customers with usage of less than 4,000 cfh. These customers can be connected to Con Edison's natural gas system with minimal cost and reinforcement. A further 16% of larger buildings are located within 100 feet of mains with adequate capacity (i.e., high pressure or large diameter low pressure mains), and could, therefore, be connected with reasonable investments. Another 20% of customers could be connected at higher, but still somewhat reasonable costs, by smartly grouping, or "clustering", connections through adequately-sized main extensions. Clustering would require motivating some customers to convert earlier than the regulation may require.

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[30] The delivery rates used to generate burner-tip prices for the #4/#6 oil analysis will be revised based on the rate model that was developed for the Gas Long Range Plan. Revision to be incorporated in a subsequent version of the GLRP.

3. **Building conversion costs**: The cost of retrofitting the building for natural gas use.

Buildings affected by this regulation will have some costs associated with changing oil-burning equipment to natural gas equipment. Further, some of the buildings may also require additional building retrofits like chimney liners, which can be costly. Preliminary research and customer outreach by the Company has yielded the sample conversion costs shown in Table 3-1 below.

Table 3-1: Sample Conversion Costs Based on Boiler Equipment and Building Information

Boiler Equipment Rating (CFH)	Conversion Cost excl Chimney Liner ($)[(a)]	Chimney Liner Cost ($)[(b)]
3,000	54,300	12,000
5,000	64,990	33,850
10,000	91,730	86,850
20,000	145,200	20,000
50,000	305,620	50,000

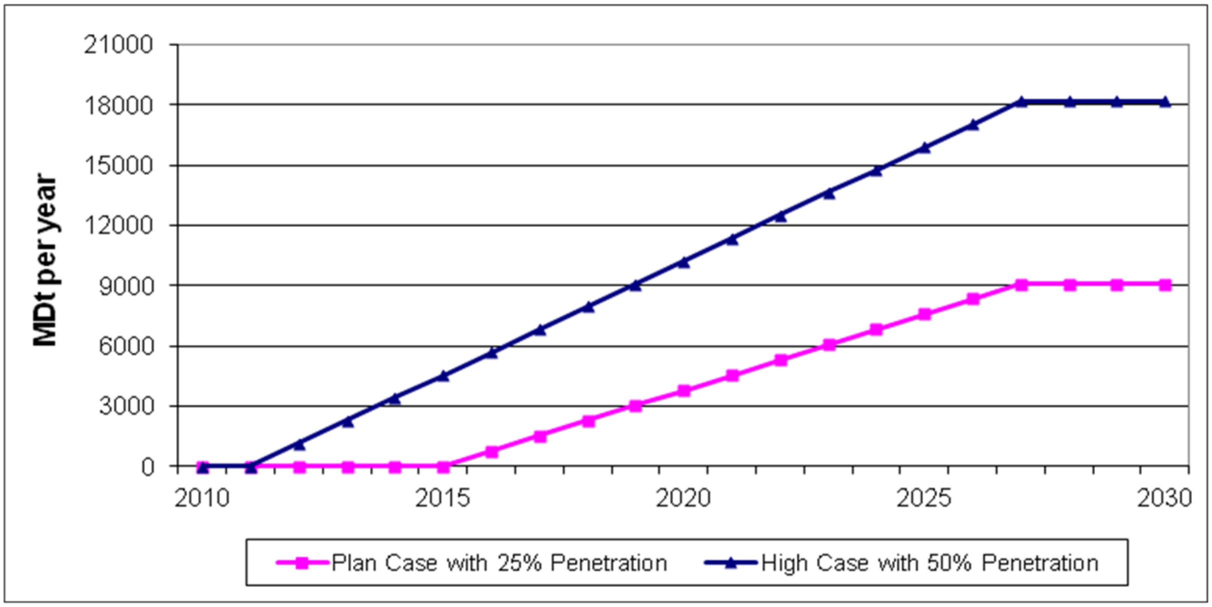
(a) Conversion cost represents estimated additional cost for a conversion to natural gas relative to a conversion to #2 oil; does not include cost of boiler or burners.
(b) Chimney liners may be required for conversions to natural gas; cost reflects typical number of floors for in building with equipment of rated capacity.

At the time of writing this plan, the regulation remains unpublished. Given this uncertainty, and the preliminary nature of the Company's analyses described above, we have incorporated a conservative estimate of heavy fuel oil to natural gas conversions into our current plan. Our current projected demand from heavy fuel oil conversions are as follows:

- Plan case: 25% of affected buildings (8 MMcf/h of peak hour load) will convert to natural gas
- Low case: none of the affected buildings will convert to natural gas
- High case: 50% of affected buildings (15 MMcf/h of peak hour load) will convert to natural gas

For each of these cases, we expect 60% of the conversions to be firm gas and 40% of the conversions to be interruptible demand.

Figure 3-5: GLRP Estimates for Potential Oil to Gas Conversions



The capital investments and rate impacts of the above conversions will be discussed in subsequent chapters. We expect to refine our estimates in future versions of this plan as the regulation evolves and as the Company's analysis is further developed from current customer outreach efforts.

3.1.2 Potential Conversions of Steam Customers to Natural Gas

From a planning perspective, GLRP has assumed that steam customers considering a conversion to natural gas could convert either to an onsite boiler or to a distributed generation application such as combined heat and power. For the purposes of this plan, we have assumed that any steam conversions to distributed generation would be driven by the customer's initial decision to reduce electric demand but choose combined heat and power for maximum energy efficiency and cost-effectiveness. The remainder of the steam conversions would be to on-site boilers, substituting steam for gas. Both types of conversion represent firm gas demand for Con Edison.

The low case assumes historical levels of conversion to continue over the 20-year planning horizon, equating to about 100 "average-sized"[31] customers; the plan case assumes another 50 "average-sized" customers to the low case; and the high case builds upon the plan case and assumes 50 additional large customers.[32] These three cases are summarized below.

- Plan case: assumes that approximately 315Mlbs/hr of steam load would potentially convert to gas
- Low case: no unusual incremental steam load would potentially convert to gas

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[31] Peak demand of the "average sized" steam customer is about 6 Mlb/hr.

[32] Peak demand of the average large steam customer is 18 Mlb/hr.

- High case: assumes that approximately 1,250 Mlb/hr of steam load would potentially convert to gas

3.1.3 Gas Energy Efficiency

The NYS PSC approved gas energy efficiency programs in Con Edison gas service territory through December 31, 2011. Only firm gas customers who pay the System Benefits Charge (SBC) are eligible to participate in these programs. The programs, therefore, currently exclude interruptible customers. Customers that convert from oil to firm gas are also eligible for gas efficiency rebates. Some programs are being administered by Con Edison and others by NYSERDA. No funding is currently approved beyond 2011. However, the PSC will be considering continuing providing further funding for gas efficiency programs for the period of 2012 – 2015, which will not be known until later in 2011, when the PSC has assessed the impact of these current gas efficiency programs.

Tables 3-2 and 3-3 show Con Edison participation in current Gas EEPS programs expected to yield an estimated 2.3 MMDt reduction in gas consumption during 2009-2011.

Table 3-2: NYSERDA Gas EEPS Programs in Con Edison's Service Area

NYSERDA Gas EEPS Programs	Program Savings (Dth, 2009-2011)	Description
Multifamily Performance	**175,126**	Uses a whole-building approach to serve multifamily customers in buildings greater than 50 units with both gas and electric.
Low Income Multifamily	**28,043**	Uses a whole-building approach to serve low-income multifamily customers in buildings greater than 50 units with both gas and electric, but can also work with smaller buildings if desired.
Industrial and Process Efficiency	**877,062**	Designed to address all Industrial customers with an emphasis on large gas customers with over 2MW of electric use and focus on key manufacturing sectors.
Existing Facilities	**20,105**	This program uses a whole building approach to provide assistance to facilities to install or enhance building management systems by offering vendors performance-based incentives based on Therm savings.
FlexTech	**13,143**	The program provides cost-shared technical assistance to all commercial and industrial customers, as well as institutional, municipal, not-for-profit organizations, and schools.
New Construction	**29,121**	This program provides technical and financial assistance to building owners and designers to adopt building designs that reduce electric energy consumption. Incentives are structured to provide increased emphasis on kW reductions and electricity load displacement.
Home Performance with Energy Star	**148,027**	The Home Performance with Energy Star (HPwES) program is a market transformation program that uses Building Performance Institute (BPI) accredited contracting firms to install comprehensive energy efficiency related improvements and technologies in 1-4 family homes and low rise residential buildings.
NY Energy Star Homes (New Construction)	**157,955**	New York Energy Star Homes program is an enhanced version of the US EPA Energy Star Qualified New Homes program. The program provides technical assistance and financial incentives to 1-4 family and low-rise residential home builders and Home Energy Rating Systems (HERS) Rater Providers. It encourages energy efficient construction techniques and requires the installation of high-efficiency HVAC equipment.
EmPower	**23,160**	The focus of EmPower New York^{SM} is on cost-effective electric reduction measures, particularly lighting and refrigerator replacements, as well as other cost-effective home performance strategies such as insulation, and health and safety measures. On-site energy use education provides customers with additional strategies for managing their energy costs.
Assisted Home Performance w EnergyStar	**17,112**	The Assisted Home Performance with Energy Star Program is designed to reduce the energy burden on low-income households.
Totals	**1,488,855**	

Table 3-3: Con Edison's Gas EEPS Programs

Con Edison Gas EEPS Programs	Program Savings (2009-2011)	Description
Residential Gas HVAC Program	**210,453**	Residential customers can receive uniform measure rebates for the installation of high efficiency gas heating and water heating equipment and controls
Multifamily Program	**373,298**	This program promotes energy efficiency in multifamily customers in the 5-50 unit range. Combination of several previously filed programs, this one will focus on energy surveys, recycling and replacement of inefficient refrigerators, rebates for high efficiency AC's and rebates for common area and building system measures.
Multifamily Low Income Gas Program	**50,718**	This program will offer equipment and weatherization assistance in the form of building-shell improvements to low income customers in multifamily buildings, specifically those in NYCHA and WCHA areas.
Commercial and Industrial Gas Efficient Equipment Rebate Program	**166,143**	This program promotes the purchase and installation of specific high-efficiency technologies, such as space-heating and water-heating equipment and building weatherization measures for commercial and industrial customers in existing facilities with incentives of 70% of the incremental or installed cost. Combination of previous C&I Prescriptive Program.
Commercial and Industrial Custom Gas Efficiency Program	**92,097**	This program offers performance-based financial incentives to customers installing non-traditional or emerging technologies that result in cost-effective energy efficiency savings and that are not covered by other programs. Incentives are on a therm savings basis. Combination of previous C& I Custom programs.
Totals	**892,709**	

Energy efficiency has the impact of reducing firm gas demand on the Con Edison system. For planning purposes, our demand cases reflect the following assumptions.

- Plan case: builds on our current 2009-2011 Gas EEPS projections and after 2011 assumes energy efficiency to grow at the rate equal to 50% of the potential identified in our gas energy efficiency potential study, resulting in total reduced firm gas consumption of 44 Mdt/day by 2030.
- Low case: builds on our current 2009-2011 Gas EEPS projections and includes codes and standards and low income programs, and after 2011 assumes energy efficiency to grow at the rate equal to 100% of the potential identified in our gas energy efficiency potential study, resulting in total reduced firm gas consumption of 85 Mdt/day by 2030.
- High case: the energy efficiency is the same as that in the plan case.

3.2 POWER AND STEAM GENERATION[33]

Approximately 50-55% of the gas volume on our system is delivered to some of the in-city electric and steam generators. This demand is generally considered interruptible demand and is not factored into system planning required for firm gas demand. Any reinforcements required by these customers are not part of rate base, but are paid for directly by customers. Generators are generally served directly off our transmission system.

3.2.1 Electric Generation

Con Edison (and all of NYC) purchases its power from the NYISO, which is the operator of the bulk power system in New York State, with a net installed capacity of 34,927 MW in 2009. NYISO sources generation capacity from ten different power plant owners within New York City.

[33] Please refer to the Appendix C: - GLRP #6 Oil Conversion to Gas for Electric and Steam

In 2009, in-city generators had a capacity of 12,042 MW from multiple fuels, providing flexibility in generation capacity. However, as seen in Table 3-4, nearly 75% of NYC's in-city generators rely on natural gas as a primary or backup fuel for generation.

Table 3-4: Electric Generation within Con Edison's Service Area

Primary Fuel	Generation Capacity (MW)	Type and (Number) of Units	Units with Back-up Fuel	Back-up Fuel(s)
#2 Fuel Oil	656.3	Gas Turbine (39)	16	• Natural Gas
#6 Fuel Oil	4,166,8	Steam turbine (10)	10	• Natural Gas
Kerosene[1]	1,189.9	Gas Turbine (51)	43	• Natural Gas
Natural Gas	3,909.5	Combined Cycle (8)	7	• #2 Fuel Oil (3) • Kerosene (2) • Kerosene and Jet Fuel (2)
		Gas Turbine (11)	NA	NA
		Steam Turbine (2)	NA	NA
		Combustion Turbine (2)	NA	NA
		Cooling Water (1)	NA	NA
Refuse (Solid Waste)	53.2	Steam Turbine (1)	NA	NA
Uranium	2,065.3	Nuclear Power (2)	NA	NA
Water	1.4	Hydro (3)	NA	NA
Total	**12,042.4**			

New York's existing generation fleet is expected to change in capacity and mix through 2030, mainly as a result of environmental regulations and increasing demand within NYS. The New York Power Authority (NYPA) has retired one unit within Con Edison's gas territory – NYPA Poletti. NYISO does not forecast need for new in-City generation over the next 10 years.

For planning purposes, our projections of gas needs for electric generation within our territory are based on the continued need for in-City generation to meet electric demand growth as electric transmission into NYC is limited, which is consistent with the projected electric supply mix within Con Edison's Electric Long Range Plan (ELRP).

- Plan case: is consistent with the ELRP plan case and projects gas usage for electric demand to grow at a little over 2% CAGR
- Low case: is consistent with our ELRP low case and projects gas usage for electric demand to grow at less than 0.5% CAGR
- High case: is consistent with our ELRP high case and projects gas usage for electric demand to grow at between 3.5-4% CAGR

With the current consideration of phasing out of the use of heavy fuel oil for heating within NYC, we believe in-city generators may be subject to increasing pressure during our planning period to reduce or eliminate use of #6 oil for generation. Of the in-city generation (with the retirement of the Poletti unit), nine units with a total capacity of 3,277 MW are fueled by #6 oil with natural gas back-up. All nine units are already capable of burning natural gas so there will be no requirement to convert them to natural gas fueling plants. However, if these generators are forced to become either firm gas or increasingly "non-interruptible" customers, their usage will result in an increased load of about 400 Mdt/day[34].

[34] Natural Gas is one alternative to complying with NOx RACT regulations.

3.2.2 Steam Generation

Con Edison owns the steam generation fleet within NYC and within Con Edison's gas service area. The fleet consists of fleet consists of seven major generation sites producing a total of 13,379 Mlb/hr of steam. Nearly 60% of this fleet's capacity is dependent on natural gas as a primary or backup fuel as shown in Table 3-5 below.

Table 3-5: Con Edison's Steam Generation Fleet

Generating Site	Units	Capacity (Mlb/hr)		Fuel
Loc 1	ER 10	1,600	6,016	Gas with Kerosene for Testing and Emergency
	ER 20	1,600		Gas with Kerosene for Testing and Emergency
	ER 60 (extraction mode)	830		Gas or #6 Oil
	ER 60 (drag valve mode)	150		Gas or #6 Oil
	ER 70	1,186		Gas or #6 Oil
	ER SSS	650		Gas or #6 Oil
Loc 2		978	978	Gas and 19 days Distillate
Loc3	High Pressure	1,300	2,008	#6 Oil
	Package	708		#6 Oil
Loc 4		696	696	Gas
Loc 5	Annex	950	1,331	#6 Oil with Continuous Gas Ignition
	Package	381		Gas or #6 Oil
Loc 6		750	750	#6 Oil with Continuous Gas Ignition
Loc 7		1,600	1,600	#6 Oil
Total		**13,379**		

With tightening NOx restrictions[35], and expected broadening of NYC's heavy fuel oil ban to in-city generators, we believe the remaining 40% of Con Edison's steam capacity may come under pressure to convert to natural gas. Six units have no gas-burning capability, this would entail conversions at the plants as well as incremental gas usage, particularly if compliance with regulation would convert them to either firm gas or increasingly "non-interruptible" customers.

For planning purposes, our projections of gas needs for steam generation within our territory are based on the resource plan within Con Edison's Steam Long Range Plan (SLRP).

- Plan case: assumes the conversion of 3 locations to natural gas, resulting in projected gas usage for steam generation to grow at about 0.4% CAGR
- Low case: assumes the conversion of 2 locations to natural gas and higher levels of defection of steam customers to on-site boilers, resulting projected gas usage for steam generation to grow at approximately 0.1% CAGR
- High case: assumes the conversion of 2 locations and 4 boiler at another location to natural gas, resulting in projected gas usage for steam generation to grow at about 1.4% CAGR

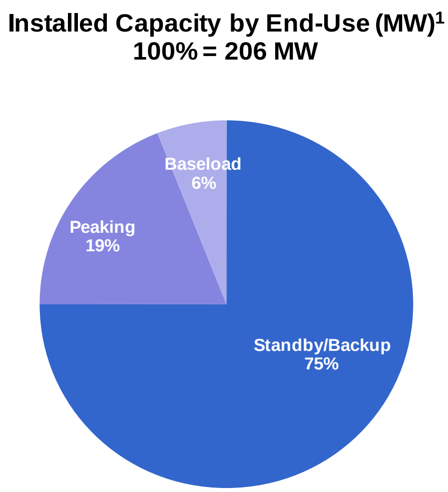
[35] NOx restrictions will result in a much greater reliance on natural gas. The costs associated with this compliance will be significant.

3.3 DISTRIBUTED GENERATION[36]

Distributed Generation (DG) is an electricity generating apparatus located at the customer's premises as opposed to a centralized station. Distributed generation is designed to serve some or all of the electricity needs of a customer using fuel sources that may include natural gas or renewable fuel sources such as solar or wind. Natural gas fueled technologies also offer the customer the extra benefit of using the heat byproduct of electricity generation for facility heating. Such technology is known as combined heat and power.

In most cases, customers do not choose distributed generation to allow them to disconnect from the grid; they choose it instead to offset or supplement some of the energy currently purchased. Customers can choose to use their distributed generation for emergency use only, to offset thermal energy requirements, for peak shaving, for total energy offset, or to produce surplus energy to sell back to the grid. Most of the current DG installations in CECONY's territory are for backup/standby power.

Figure 3-6: Uses of Distributed Generation in Con Edison's Service Area (2009)



The Company and its customers are beginning to explore other uses for DG. Con Edison is exploring ways to be more active in the adoption of DG adoption, while balancing in-city emissions concerns. As described in the ELRP[37], Con Edison's distributed generation strategy can be generally characterized as falling into three phases. In Phase I, Con Edison plans to continue partnering with customers and other stakeholders, including the New York State Department of Environmental Conservation, the New York City Department of Buildings, the Fire Department of New York, and distributed generation advocates, to facilitate the interconnection of distributed generation installations and examine the opportunity to pilot new projects and concepts. Based on the results of Phase I initiatives, Con Edison will be in a position in Phase II to promote adoption of distributed generation in

[36] Please refer to Appendix D: GLRP Assessment – Gas-Based Distributed Generation

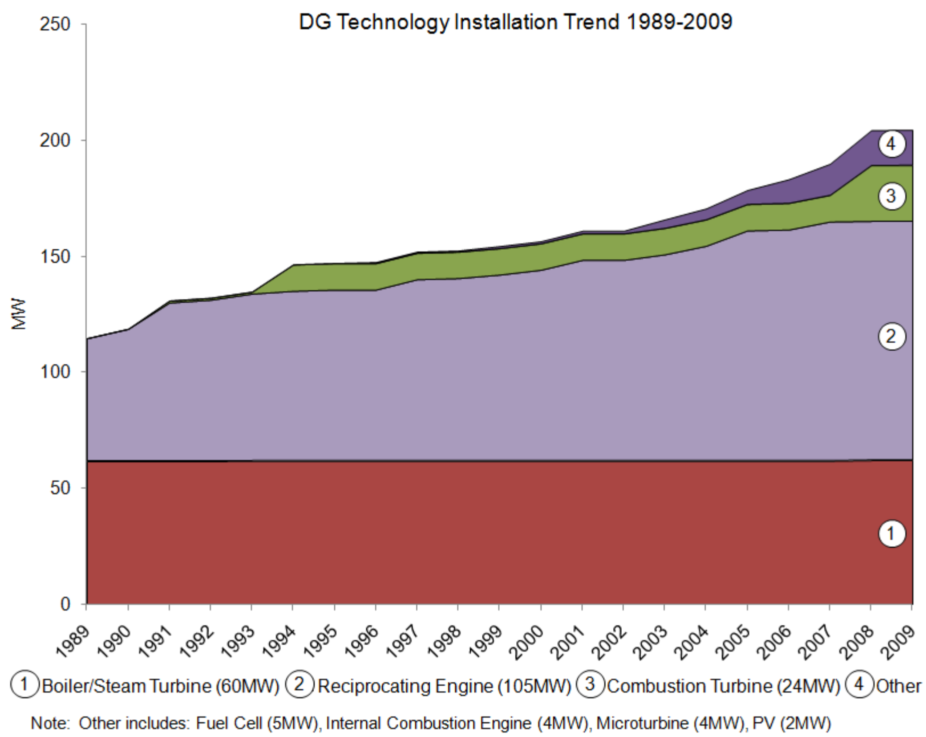
[37] Source: The Con Edison Electric Long Range Plan (ELRP) Chapter 3, for additional details about our Distributed Generation implementation plan, planned programs, and ongoing pilots.

areas of the service territory where it can be the most beneficial to meet customer and Company objectives, including: reducing cost, increasing reliability and lowering greenhouse gas emissions. Results of the first ten years will shape the subsequent strategy of the Company. Con Edison would hope to employ sophisticated technologies and policy enablers to take advantage of transformational opportunities.

The adoption of distributed generation is nothing new to Con Edison customers, who had installed as much as 110 MW as early as 1989. Over the last 20 years, periods of increased distributed generation adoption are observed from 1989 to 1994 and from 2004 to the present resulting in the current 206 MW installed in the Con Edison service territory (See Figure 3-7).

In the first period, 1989-1994, the method of choice for customers was reciprocating engines, which use a piston to produce energy and include the commonly known internal combustion engine, steam engine as well as the Sterling Engine. During this five year period 27 of these sites came online, each with a sizeable capacity, typically in excess of 1.2 MW.

Figure 3-7. Distributed Generation Installation Trend by Technology



The second wave of distributed generation in the last twenty years started in 2004. Although there have been more distributed generation installations in the last five years than at any time previous, the trend has been for smaller distributed generation installations focusing on renewable fuel sources. During this time there have been 195 separate distributed generation sites to come online within the Con Edison service territory. Of those, 126 (65%) are photovoltaic solar technology. As previously stated, these solar installations tend to be smaller; the total installed capacity from all 126 sites is roughly 2 MW.

Gas-fired DG technologies can meet the needs of a wide range of users in the residential, commercial, and industrial sectors. Multi-family buildings and hospitals were traditional adopters of DG. In recent years, adoption has grown more rapidly among residential customers, hotels, and transportation customers. The need to defer electric Transmission & Distribution (T&D) investments (such as substation construction) is also likely to be another source of gas-fired DG growth. A Con Edison study[38] has estimated that potential CHP projects could account for over 2,700 Dth of hourly peak gas usage. More than half of the potential gas usage from CHP systems would be in Manhattan, with several large projects scattered around the remaining divisions.

The Con Edison ELRP developed preliminary forecasts for distributed generation adoption, including technical and market potential[39] in the service territory. Technical potential measures the amount of adoption that is possible taking into account the physical availability of resources as well as any unique constraints of the service territory. Technical potential measures what is possible, but does not project actual adoption as it does not include any evaluation of cost. We use a preliminary estimate of technical potential as an upper bound and then make estimates about the cost of various technologies and fuel sources to arrive at an estimate of market potential, or what we could actually see in our service territory.

Due to availability of fuel, some distributed generation will utilize natural gas. A significant portion will utilize renewable fuel sources such as solar and, to a lesser extent, building mounted wind. Due to the intermittent nature of renewable fuels, these distributed generation installations will not be suitable for consistent base load generation in the absence of significant advancements in energy storage technology.

Taking all of these factors into account, the Company has estimated a technical potential of 19,200 GWhs, of which 12,000 GWhs are from renewable fuels with the remaining 7,200 Gwhs from natural gas. Currently, Con Edison customers use 55,000 GWhs of energy per year, making the technical potential of distributed generation close to 34% of total sales. Although this is a significant number, the actual market potential is significantly lower due to the cost of equipment, installation, and fuel. Con Edison, therefore, expects to see continued adoption of distributed generation in the service territory but at a tempered pace and consistent with forecasts made by New York State and city agencies. Estimated distributed generation penetration in terms of peak demand is illustrated in Figure 3-7.

In light of PlaNYC's goal of encouraging renewable DG, we believe that gas-fired DG will grow at a moderate pace while renewable DG grows more aggressively. Figure 3-8 further illustrates our plan case of gas-fired DG achieving 300MW of installed capacity by 2030, while renewable DG accounts for the balance 500MW in the targeted 800 MW of total installed DG.

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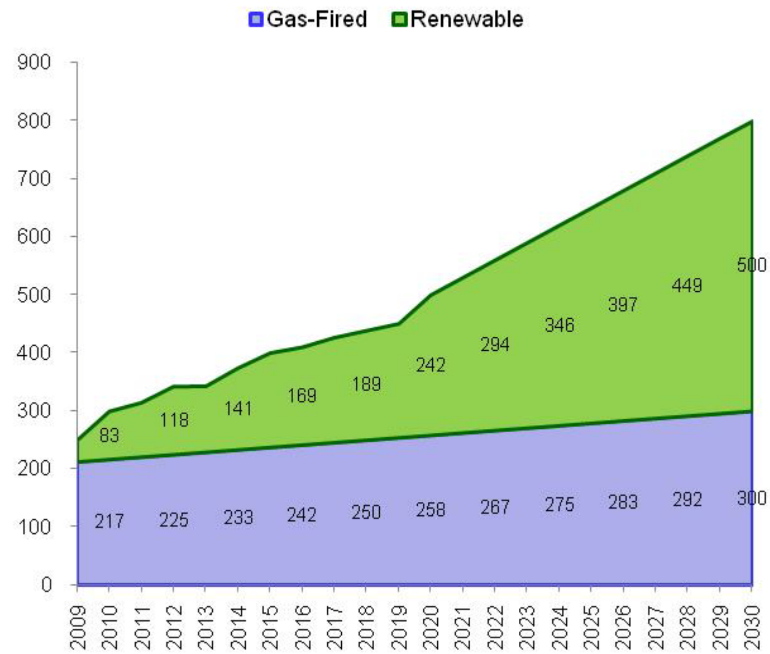
[38] Con Edison DG Cogen Study, 2008

[39] For additional detail about the ELRP technical and market potential forecasts, please refer to the Con Edison Electric Long Range Plan, Chapter 3.

Figure 3-8. Distributed Generation Market Potential[40]



The New York City government has expressed interest in distributed generation in the city's PlaNYC, and New York State recognizes the benefits of distributed generation in the New York State Energy Plan. The market potential forecasted by Con Edison is similar (800 MW for New York City and Westchester County), but lower than, the target set in the city's plan. Going forward, Con Edison will continue to work with the city, New York State and other agencies to fulfill its appropriate role in facilitating the adoption of clean distributed generation.

Gas-fired DG represents firm gas demand for Con Edison. For planning purposes, the GLRP has developed the following cases for gas demand from Distributed Generation:

- Plan case: Of the total 800 MW installed DG in 2030, 300 MW will be gas-fired DG
- Low case: Of a total of 675 MW installed DG (again consistent with the ELRP), only 175 MW will be gas-fired DG
- High case: Of a total of 800 MW installed DG in 2030, 500 MW will be gas-fired DG

[40] This market potential represents initial estimates. Additional engineering analysis may be completed to refine estimates at a later date.

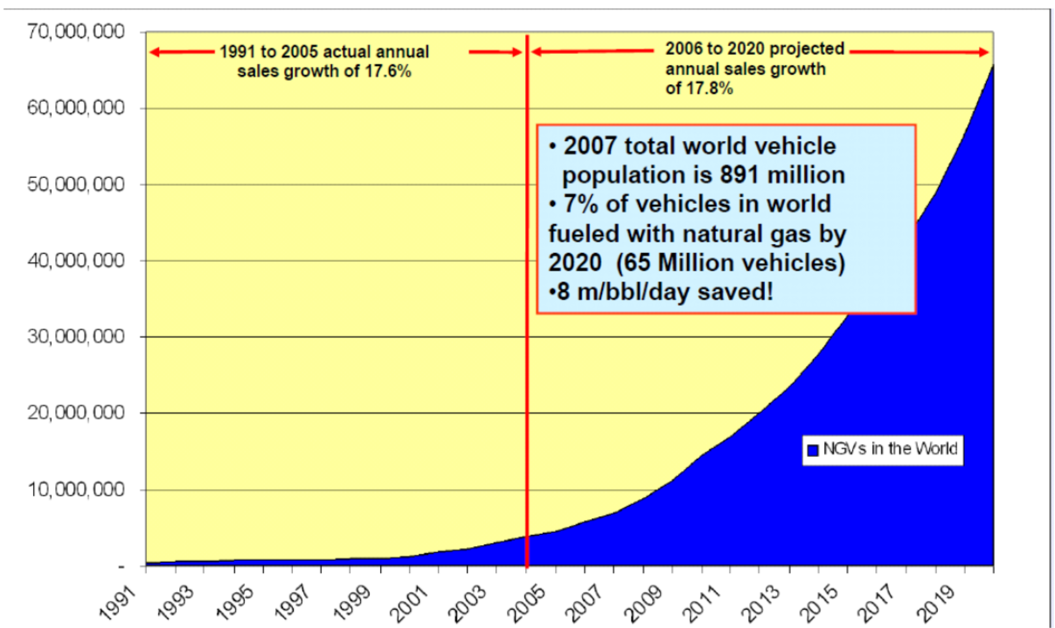
3.4 NATURAL GAS VEHICLES

The first internal combustion engine vehicle to run on natural gas was created in 1860 in Paris. They were first introduced to the US in the 1930s but were seriously considered only in the 1970s after the oil price hikes. Although the concept has been around for quite some time, natural gas vehicle adoption never took off in the U.S. due to various constraints:

- Cost of retrofitting gasoline cars for natural gas did not offset fuel price savings
- NGVs performed poorly (and had less appeal) than gasoline vehicles
- Natural gas fueling infrastructure was inadequate for long-haul needs
- Lackluster demand inhibited introduction of additional OEM models

As a result, there are only about 150,000 NGVs in the United States with a few states (California, New York, Utah) leading NGV usage. Meanwhile NGV adoption has been quite successful in other countries and the technology is mature and proven. Driven by a host of strategic factors (i.e., environmental benefits, fuel price economics, energy security) and government support (incentives and mandates), NGVs are projected to increase globally at a faster rate than prior years.

Figure 3-9: Actual and Projected Global NGV Growth



Source: NGV America

Economic and environmental issues have also coincided to create a burgeoning interest in alternate fuel vehicles in North America. Key concerns are:

- Energy Security and Independence: Approximately 70% of oil used for transportation is imported from politically unstable and/or hostile geographies
- Affordability and availability of oil as a continued transportation fuel in 20-30 years
- Size of the US trade deficit: Almost 70% of trade deficit goes towards importing oil for transportation

- Environmental concerns: Approximately one-third of carbon dioxide emitted from end-use sectors comes from transportation (almost 2 billion metric tons of carbon dioxide annually)
- Public Health concerns: Air quality concerns from burning oil and its effect on public health, such as respiratory diseases

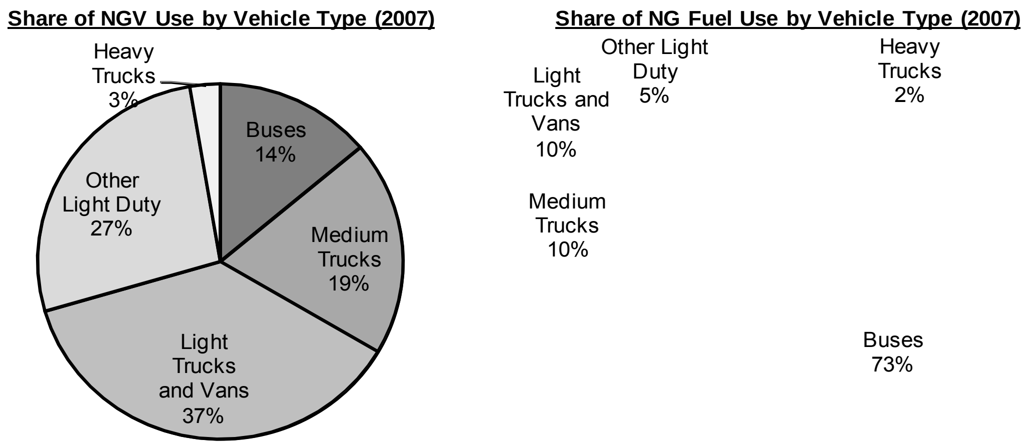
CNG, as an alternate transport fuel, is an ideal solution to many of these concerns:

- Natural gas is an abundant domestic resource, particularly with the recent discovery of large reserves of unconventional shale gas
- CNG and LNG prices are generally 20-50% below oil and diesel prices, with increasingly divergent (and delinked) oil and gas market prices
- Dollars spent on natural gas industry stay within the country
- NGVs create domestic jobs in the natural gas and automotive industries
- NGV's will result in increased utilization of the nation's current gas infrastructure
- Natural gas is the cleanest fossil fuel available
- Natural gas has a proven strong safety record due to its inherent properties (lighter than air, narrow range of combustion, ignition temperature, etc).
- Use of NGVs vs. conventional vehicles naturally results in improved air quality
- NGVs have potential for a renewable source component (i.e., biogas)

Despite its many benefits in aligning the nation's political and economic interests, CNG has lagged the Alternate Fuel Vehicle consciousness in the country. Interest has emerged in many Alternate Fuels, including electric, biofuels, hydrogen, and natural gas. Electric vehicles have dominated the national dialog due to a variety of reasons, including powerful support from automakers, electric, and coal lobbies. Electric vehicles have also developed consumer appeal and are viewed as a "cutting edge" choice. Most importantly, EVs benefit from being fuel agnostic, capable of leveraging cleaner renewable and nuclear technologies as they develop.

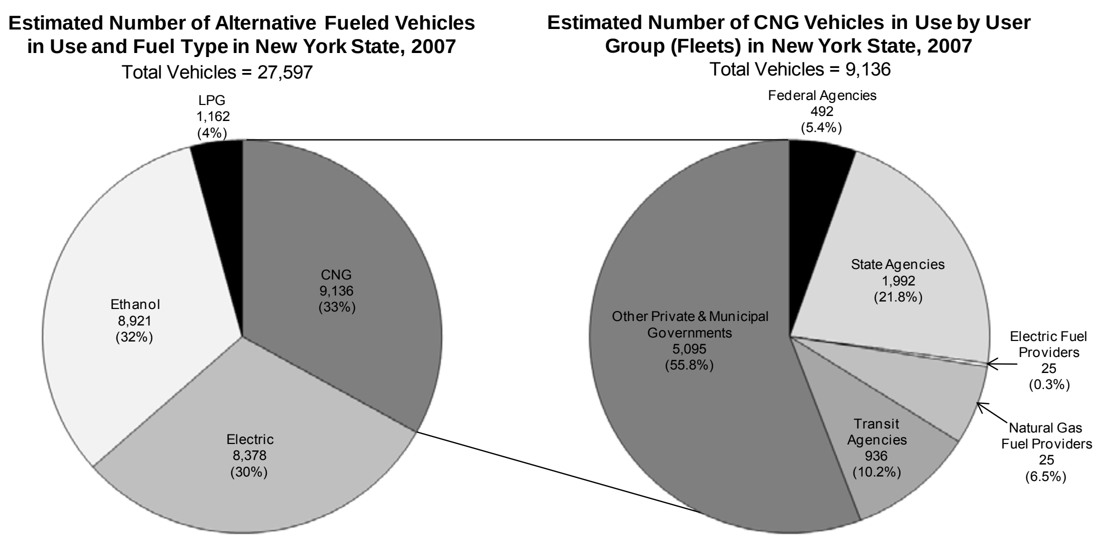
However, EVs also face some important limitations centered around limited vehicle range, inadequate battery storage technology (size and capacity), and lack of charging infrastructure. These limitations affect the applicability of electric vehicles in medium and heavy-duty vehicles or long-haul segments. Natural Gas Vehicles, on the other hand, are well-suited to serve these segments. Fleets today represent a significant CNG market, with light trucks and vans being the dominant vehicle types but buses consuming the most gas.

Figure 3-10: US Natural Gas Vehicles and Fuel Use by Vehicle Type (2007)



The state of New York has the second highest use of NGVs in the nation. In New York State, CNG is the most widely used alternative fuel, with private fleets and municipal governments being dominant users.

Figure 3-11: AFV and NGV Usage in New York State (2007)



Source: *Energy Information Administration/Alternatives to Traditional Transportation Fuels, 2007*

Alternative fuels are also a significant part of PlaNYC's strategy to reduce greenhouse gas (GHG) emissions from transportation. Specifically, PlaNYC has articulated the following transportation-related goals:

- Promote clean vehicles and reduce emissions from taxis, black cars, for-hire vehicles, school buses, and construction vehicles
- Reduce transportation emissions, currently at 22% of NYC's total GHGs, by 44% by 2030

To spur CNG growth, the federal, state, and local governments have introduced a significant number of incentives across several different dimensions. Some key recent initiatives include:

- Current tax programs are supporting natural gas vehicle deployment, but an expanded tax program (known as the NAT GAS Act) is very much in play and has the support of Senate Majority Leader Harry Reid (D-NV)
- Congress looks inclined to spend more money on natural gas vehicle related R&D in the Department of Energy's FY2010 budget
- Stimulus-related funding is driving 3,400 vehicle orders and 144 fueling stations, some in "corridors" in northeast and southeast markets

Further details on various government and utility initiatives can be found in the CNG Assessment located in the GLRP Appendix.

Given the increasing interest in Alternate Fuel Vehicles, the viability of NGVs as a mature, proven technology with an affordable fuel source, and increasing support for incentives, we believe that NGVs will grow among fleets in Con Edison's service territory. In other words, the GLRP assumes that NGVs will coexist with other AFVs – with the best application of NGVs being in fleets while EVs will grow in primarily in the private passenger and some light duty segments. Table 3-6 shows the estimated addressable market for fleets and estimated baseline for CNG vehicles in Con Edison's service area.

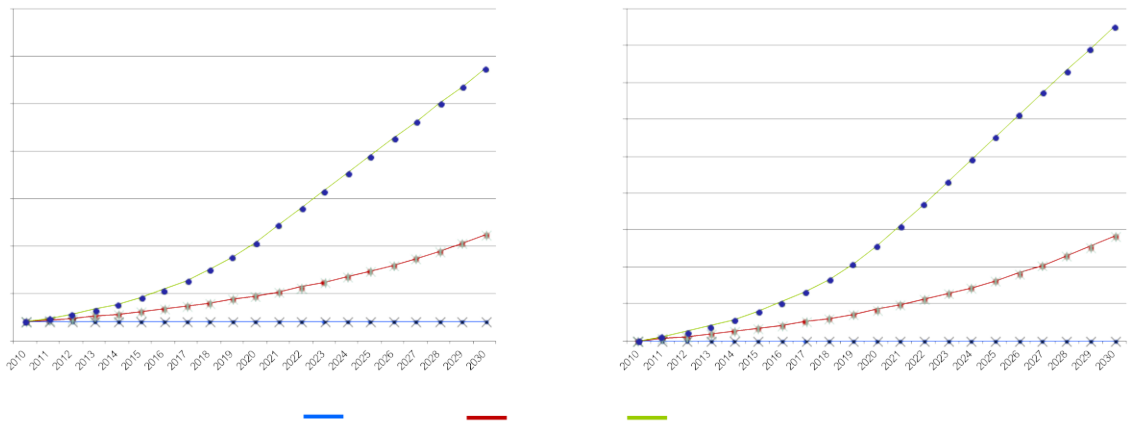
Table 3-6: Estimated Fleet Vehicle Population in Con Edison Service Area

Description	Number (Estimated)	Source
Total US Fleet Vehicle Population	7,721,000	Automotive Fleet Statistics as on 1/1/09
Total New York State Fleet Vehicle Population	494,918	Calculated using Bridge Strategy methodology based on demographic data and including an area (metro, large city, small city, village) classification factor.
Current New York State CNG Fleet Vehicles	9,136	Energy Information Administration
Total Fleet Vehicle Population in Con Edison Service Area	**109,769**	Calculated using Bridge Strategy methodology based on demographic data and including an area (metro, large city, small city, village) classification factor.
Current CNG Vehicles in Con Edison Service Area	**2,026**	1. Independent research from Gas Vehicle Report (Worldwide NGV statistics) suggests an average NGV to population ratio in the US of 0.49/1000 , implying 2,354 vehicles in CECONY territory 2. Some NYC CNG fleet counts are as follows: Buses – 482, Taxicabs – 300, Manhattan Beer Trucks – 30, CECONY vehicles – 30 (60 by year end), UPS - 15

Gas consumed by natural gas vehicles and discharged via CNG fueling stations, represents firm gas demand for Con Edison. For planning purposes, using the baseline of approximately 2,000 NGVs in Con Edison's service area, we have assumed the following cases:

- Plan case: assumes a 9% CAGR for CNG fleet vehicles. This growth rate is comparable to the ELRP assumption for EV growth rate in the private passenger segment. It assumes that current levels of incentives continue to exist and current mandated environmental regulations will be met
- Low case: assumes 0% CAGR for CNG fleet vehicles which has been the recent historical (2003-2007) experience for CNGs. This case assumes inadequate incentives for vehicle and infrastructure growth
- High case: assumes 17-18% CAGR for CNG fleet vehicles which is comparable to global growth projections. This case assumes greater incentives and the passing of proposed stringent environmental regulation

Figure 3-12: GLRP Estimates for CNG Vehicle and Station Growth in Con Edison Service Area



3.5 SUMMARY

3.5.1 Summary Demand Assessment

The customer needs described in this chapter were translated into gas load impacts. As explained in Chapter 2, Section 2.3.1, a standard gas forecast consists of two components: a volumetric forecast and a peak demand forecast. The volumetric forecast is a projection of annual gas consumption by firm and interruptible customers. The peak demand forecast is a projection of the maximum gas requirements that Con Edison's firm gas customers demand at a single point in time. Peak demand, or the maximum gas that our customers require at a single point in time, drives infrastructure investment because we must build to that demand even if it is a relatively infrequent occurrence. For the Con Edison gas system, firm gas peak demand occurs in winter when heating loads are the highest.

The annual volume and peak day demand charts reflecting these growth rates are shown in Figures 3-13 and 3-14 below. Annual gas demand is expected to increase 1.7% CAGR during the planning period while daily peak is expected to grow 1.2% CAGR.

Figure 3-13. Annual Gas Demand (MMdt)

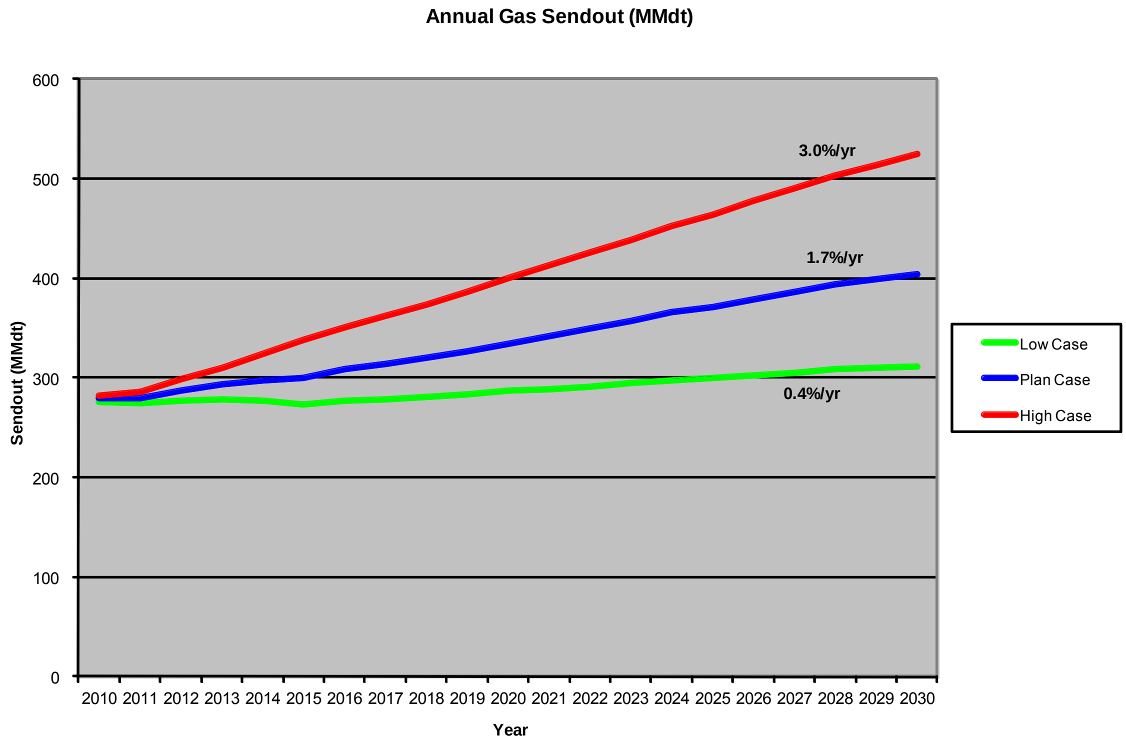
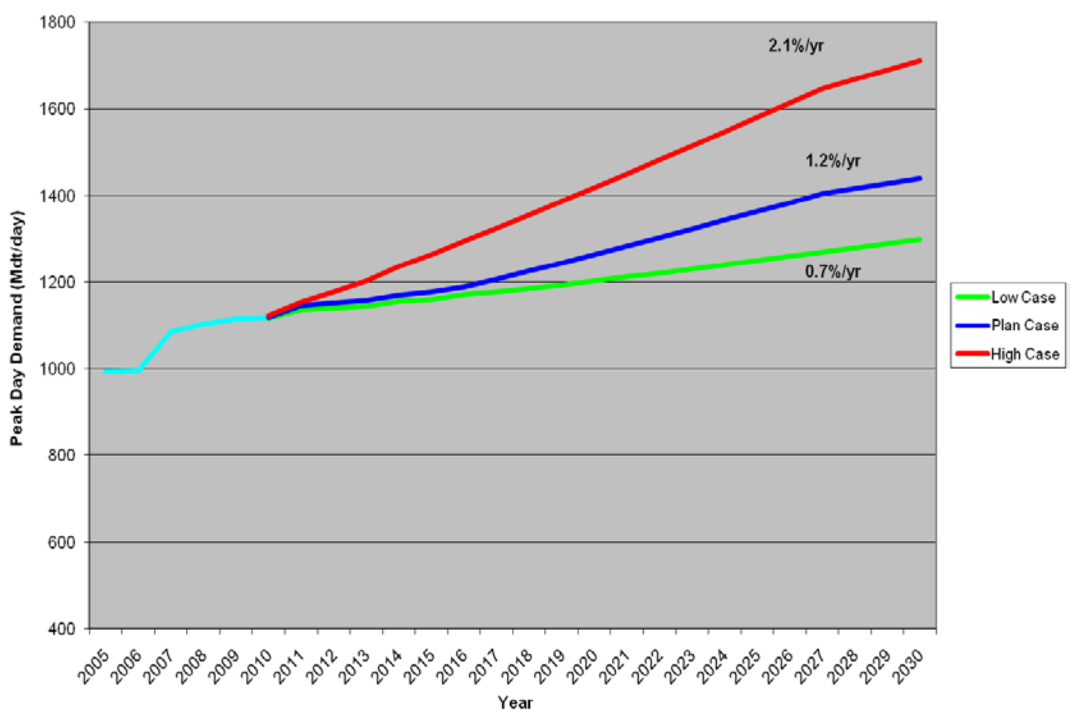


Figure 3-14. Daily Peak Demand Forecasts (Mdt/day)



3.5.2 Signposts

This plan assumes growing demand for natural gas based on abundant, affordable gas supplies (see Chapter 4: Natural Gas Supply Outlook) and key economic, regulatory, and technology drivers. Key demand signposts would include considerations that might change the gas supply picture (addressed in Chapter 4) or affect the key economic, regulatory or technology assumptions underlying the demand described in this chapter.

- **Economic recovery**: In the current low economic growth environment, the ability and appetite of many customers to pursue distributed generation, fuel oil conversions or natural gas vehicles is constrained due to reduced energy consumption and limited ability for customers to acquire the capital necessary to make large investments for conversions, equipment, or customer infrastructure.
- **Energy and Environmental Regulation**
  1. **NYC regulation of heavy fuel oil**: At the time of writing this plan, the regulation was not yet published. NYC expected to publish the proposed regulation for comment by end of March 2010 at which time it would be subject to a further 60 day comment period. No City Council or legislative action is required to issue the regulation.
  2. **Energy Efficiency mandates:** Monitor proposed federal, NYS, and NYC mandates for energy efficiency. In particular, adoption of more stringent building codes and standards, and application to new builds or retrofits, could have a significant impact on space heating demand.
  3. **New environmental regulation for local supply resources**: Regulation is likely to control the environmental impacts of distributed generation assets. This regulation is likely to change the economics of certain distributed generation technologies—particularly those powered by natural gas—and thus alter adoption patterns.
  4. **Enactment of Federal renewable portfolio standards and greenhouse gas legislation**: If Federal guidelines become stricter than New York State's goals, there may be an increased focus on the adoption of renewable distributed generation in order to reach policy and any other goals.
  5. **Further net metering legislation**: Favorable economic incentives for selling power back to the grid may drive distributed generation adoption. Con Edison supports the use of transparent subsidies. [41]
  6. **Environmental Regulation/Legislation:** Enactment of stringent clean air and GHG related laws will make alternative fuels such as CNG a viable option to reaching transportation policy goals
  7. **Government Incentives:** Incentives are a key driver to facilitate fuel oil conversions and distributed generation or CNG fueling infrastructure investments.
- **Technology Evolution**

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[41] Net metering, as a subsidy, is non-transparent, since the benefit provided to net metered customers cannot be calculated. The Companies support use of transparent subsidies. There are also social issues in net metering because it departs from basic cost-causation principles. At most, the State should allow net metering up to the existing 1% caps only and then begin to explore other methods. The Companies are concerned about the possible impact of oversized net metered resources on the system. Finally, fossil-fueled resources, even highly efficient combined head and power, should not be considered to be renewable power and should not be eligible for net metering." See Comments of Consolidated Edison Company of New York, Inc. and Orange and Rockland Utilities, Inc. on the Draft 2009 New York State Energy Plan

8. **Increased efficiency of natural gas end-use technologies or advancement in substitute technologies:** Further improvements in the efficiency of space and water heating technologies will increase energy efficiency gains and reduce per customer gas consumption. Further, advancement or promotion of substitute heating technologies (e.g., the electric heat pump) will reduce current end-use space heating demand.
9. **Advancement in distributed generation and storage technologies**—Improved cost profiles of distributed generation technologies will increase the economic viability and therefore adoption of distributed generation.
10. **Smart Grid enhancements to the utilities' distribution systems**—Technologies allowing bidirectional power flows as well as dispatchable distributed generation will increase the benefits of distributed generation for stakeholders.
11. **Evolution of Natural Gas Vehicle-related technology:** Development of additional OEM NGVs, home refueling technology, etc. would increase appeal and adoption of natural gas vehicles.

- **Price of natural gas and affordability relative to oil:** The competitiveness of natural gas compared to oil will drive heating oil conversions and natural gas vehicle adoptions. Natural gas prices are also a major driver of the cost of distributed generation. As prices decline, distributed generation adoption should increase, specifically with regard to internal combustion engines, microturbines, gas turbines, and fuel cells.
- **Change in customer mix (firm versus interruptible business):** Natural gas infrastructure planning and enhancements are based on firm gas demand. Factors like the anticipated competitiveness of natural gas compared to oil or increased air pollution regulation may encourage interruptible customers to become increasingly firm demand (for example, steam or electric generators). Such changes in customer mix could drive significant changes in infrastructure plans and costs.

4.0 NATURAL GAS SUPPLY OUTLOOK

The demand for natural gas for any end-use purpose is sensitive to the availability and price of natural gas. The purpose of this chapter is to provide an outlook for gas supply over the planning period. This chapter covers three key aspects of gas supply:

- The availability of natural gas resources (domestic and global)
- The wholesale competiveness of natural gas compared to other fuels
- The deliverability of natural gas to the New York City area

4.1 NATURAL GAS RESOURCE AVAILABILITY

4.1.1 Historical Reserves and Discoveries

Natural gas reserves in the United States peaked in the late 1960s at almost 300 trillion cubic feet (tcf). Gas reserves declined over the next 30 years to 164 tcf in 1998 due to depleted gas fields. At the same time, historically low prices did not encourage the exploration of harder-to-access gas. The discovery of natural gas in shale formations supported by the development of horizontal drilling and stronger prices have resulted in proved reserves[42] rising to approximately 245 tcf in 2008 – almost a 50% increase over the reserves known in 1998.

The rate of annual natural gas discoveries[43] has also tripled over the last decade as shown in Figure 4-1, with 66% of the increase in discoveries from 2002 to 2008 coming from unconventional (including tight sands and shale) gas discoveries. Shale gas will likely play a major role in foreseeable additions to proved reserves. The next section describes in more detail the role North American shale gas plays and its future potential.

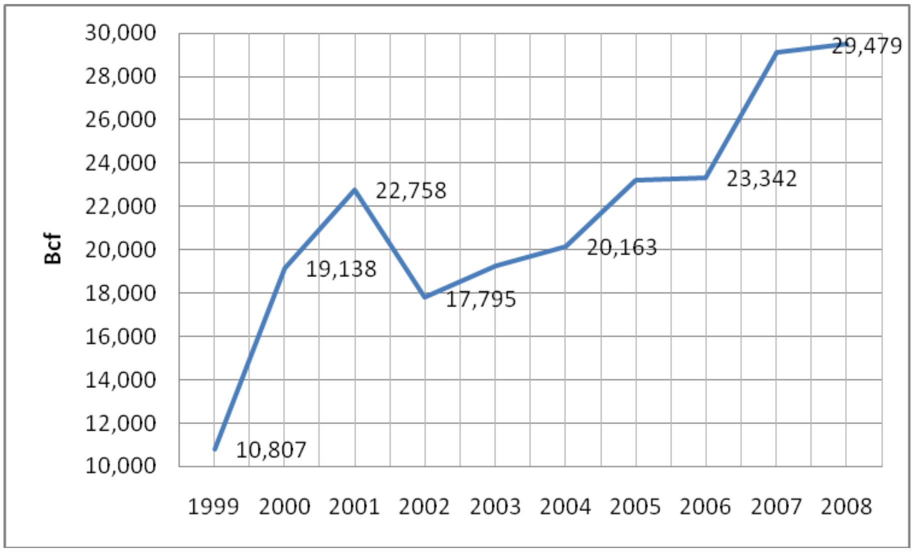
[42] Source: US Energy Information Administration. Please refer to Appendix F: GLRP Assessment - Gas Supply Outlook for further detail.

Proved reserves of natural gas as of December 31 of the report year are the estimated quantities which analysis of geological and engineering data demonstrate with reasonable certainty to be recoverable in future years from known reservoirs under existing economic and operating conditions. Volumes of natural gas placed in underground storage are not to be considered proved reserves.

Reservoirs are considered proved if economic producibility is supported by actual production or conclusive formation test (drill stem or wire line), or if economic producibility is supported by core analyses and/or electric or other log interpretations. It is not necessary that production, gathering, or transportation facilities be installed or operative for a reservoir to be considered proved.

[43] Natural Gas Discoveries are defined by the EIA as net proved reserve additions of natural gas from discoveries of new fields, identification of new reservoirs in fields discovered in prior years, and extensions (reserve additions that result from the extension of previously discovered reservoirs).

Figure 4-1: US Natural Gas Discoveries (1999-2008)

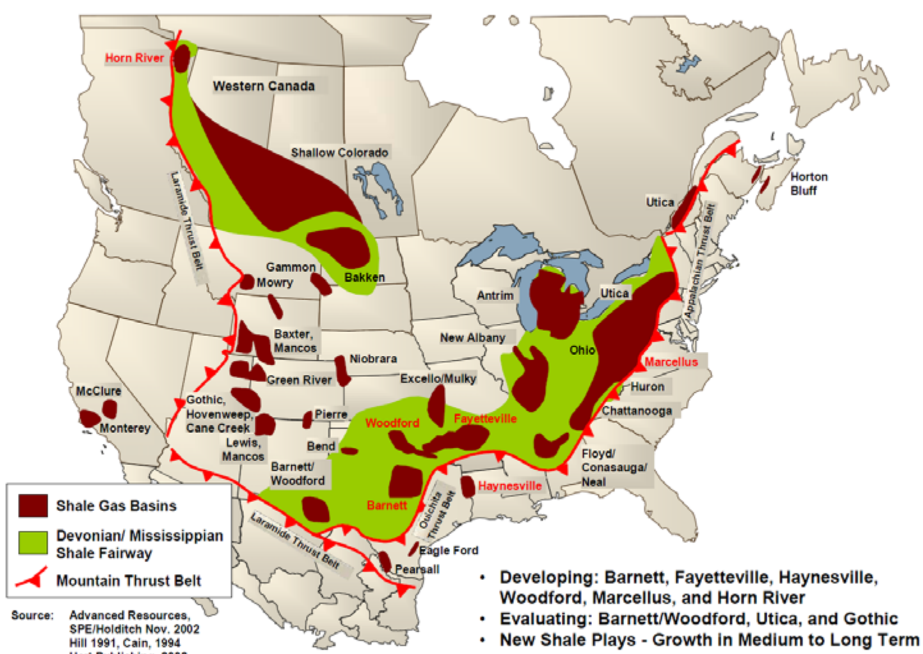


4.1.2 Projected Natural Gas Supplies

4.1.2.1 Shale Gas

Shale gas is an emerging type of unconventional natural gas deposit. The gas is distributed throughout the low permeability shale formations rather than accumulating in a more permeable reservoir. The occurrence of gas in this manner requires special production techniques that involve horizontal drilling into the gas-bearing formation, followed by hydraulic fracturing of the rock (exerting pressure in the gas well so high that it causes brittle rock to fracture) to release the gas from the rock. Shale gas developments are occurring over much of North America as shown in Figure 4-2.

Figure 4-2: North American Shale Gas Plays



The major shale opportunities are the Marcellus (located in West Virginia, Pennsylvania, and New York) and Haynesville Shale (Gulf region) plays. Promising shale plays are also emerging in Western Canada with the Horn River and Colorado shale gas basins.

The Marcellus shale is a significant emerging regional resource for New York City and for Con Edison. Cambridge Energy Research Associates (CERA) now projects deliverability of gas from the Marcellus shale to grow to 6 Bcf per day by 2018, which is more than half of the total Northeast Region requirements of 9 Bcf per day. The New York State Energy Plan also has a stated objective of leveraging in-state Marcellus gas for energy security and economic development reasons.

Development of shale gas is currently largely economic, but production is sensitive to the price of natural gas. The development of the shale plays is in early stages and there is not much data history. Current well economics being cited should provide ample incentives for continued development even at a gas price of $5 per Mdt[44]. If natural gas prices decrease significantly below $5.00 per Mdt, production of shale gas will likely decrease.

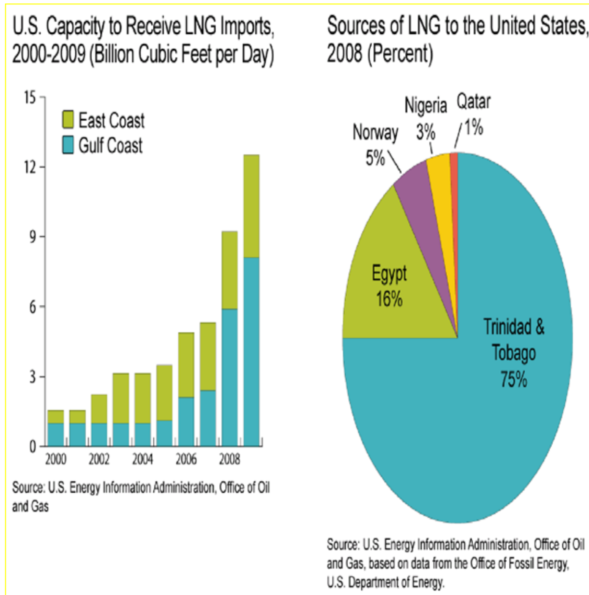
While the prospects for shale gas growth are substantial, the use of hydraulic fracturing has caused some environmental concerns. These concerns stem from the injection of large amounts of water into the gas well, concerns about the chemical composition of the injected fluids, fears that the fractured rock will expose local water wells to non-potable waters, and cases of the release of unacceptable levels of radiation. Environmental regulations related to hydraulic fracturing could limit the extent to which shale gas opportunities can be captured. Current concerns, reflected in proposed state regulations and potential federal legislation, will likely result in increased cost of well development and place some restrictions on where wells can be drilled, thereby limiting shale gas growth prospects.

4.1.2.2 Liquefied Natural Gas

Using best available data, the Congressional Research Service (CRS) estimates current global reserves of natural gas at 6,212.3 tcf. Several countries with large natural gas reserves have developed the capability to export natural gas in the form of Liquefied Natural Gas (LNG). Conversely, the U.S. has been developing LNG import capabilities due to an earlier projected supply-demand gap. Figure 4-3 illustrates that LNG terminal developers have increased U.S. receiving capacity by more than six times from approximately 2 Bcf per day to approximately13 Bcf per day since 2000.

[44] Bridge Strategy Group analysis based on various sources, including Tudor, Pickering, Holt & Co.

Figure 4-3: U.S. Capacity To Receive LNG Imports, 2000-2009 (Billion Cubic Feet per Day)



4.1.2.3 Renewable Gas

The New York State Energy Plan has a stated objective to develop renewable gas resources within New York State. The Plan provides draft estimates of less than 20 Bcf per year for potential biogas production across the state from:

- Waste Water Treatment Plants have estimated potential to produce 6.7 Bcf of Anaerobic Digester Gas (ADG) per year
- The state's 128 food and beverage manufacturing plants can produce an estimated 3.8 Bcf per year
- New York's farms are estimated to produce 9.0 Bcf per year

Of these state-wide resources, waste water treatment plants and food manufacturing plants present potential biogas opportunities for Con Edison. There are three potential waste water treatment facilities that could supply gas to Con Edison. Rough estimates of annual gas supply potential for each facility are provided by the NYC Department of Environmental Protection as follows:

- Bowery Bay in Astoria, Queens: 310 million cubic feet (mmcf) of gas per year that is vented
- Ward's Island / Randall's Island: 255 mmcf of gas per year that is vented and another 215 mmcf of gas that is flared
- Hunts Point, Bronx: 125 mmcf of gas per year that is flared

The economic business case for waste water treatment facilities as a source of biogas using anaerobic digester technology is still being evaluated. But, the environmental benefits of such technology are fairly clear, especially with respect to eliminating unburned vented gas, which has many times the green house gas (GHG) impact of carbon dioxide from burned gas. In addition, Con Edison's gas engineers have significant concerns about the quality of biogas and receiving this gas directly into the distribution system. National Grid is in the process of developing an anaerobic digester facility to receive gas from the Newtown Creek Waste Water Treatment facility and supply 2,750 homes in Greenpoint, and that project is being examined as a benchmark.

The Hunts Point Food Distribution Center in the Bronx is another potential source of biogas for Con Edison. This food center is comprised of parcels of land that are owned by NYC and leased to over twenty tenants, including the New York City Terminal Market (Produce Market) and the Fulton Fish Market.

The New York City Economic Development Corporation (NYEDC) has completed a feasibility study and is trying to interest various parties in developing an anaerobic digester system to produce biogas from food waste which can be used either to supply gas to Con Edison or to generate electricity. The study indicates that the gas produced would be in the range of 31 Mdt (roughly 30 mmcf) and could be used as gas supply to Con Edison's gas distribution system or alternatively to generate 3.1 million Kwhs of electricity per year. The physical concept was found to be feasible, but the economics are marginal. Work is continuing by the NYEDC on finding a developer for an anaerobic digester facility at this food distribution center.

Collectively, these four potential sources of biogas constitute a potential of less than 1 Bcf of annual gas supply to Con Edison. While the volume is small, there is an environmental benefit from capturing this gas instead of flaring or venting it. Hence, these sources are being evaluated as a potential source of gas supply or to be used to generate electricity at on-site facilities and possibly generating Renewable Portfolio Standard incentives. These studies are in process at the time of writing this plan. Con Edison will update its plans for biogas production in its territory as results of these studies become available.

4.2 NATURAL GAS PRICE AND VOLATILITY EXPECTATIONS

4.2.1 Overview

Over the past several decades, natural gas prices have steadily risen and have also been subject to significant volatility. Compared to previous decades, the first decade of this millennium saw a notable jump in natural gas prices due to shortage fears as well as extremely high levels of volatility, driven to some extent by market speculation. Given the recent improvements in resource availability outlook (see discussion in previous section), well-head gas prices are not expected to rise dramatically over the 20-year planning period. Gas prices will, however, likely continue to experience short-term volatility comparable to historical experience.[45]

4.2.2 Wholesale and City-Gate Prices

Wholesale Spot Prices for Oil and Natural Gas

As illustrated in Figure 4-4 below, changes in U.S. supply developments in the past three years have resulted in natural gas prices at the Henry Hub no longer tracking at its historical relationships of 60-90% of West Texas Intermediate Crude (WTI) prices. Natural gas prices are projected to exhibit a much lower relationship to oil prices (in the range of 35-50%) as a result of evolving gas supply developments and expected gas-on-gas competition. At these prices, we expect that natural gas will remain a competitive energy source for customers while providing sufficient economic incentive for producers to develop technology and wells for continued unconventional extraction.

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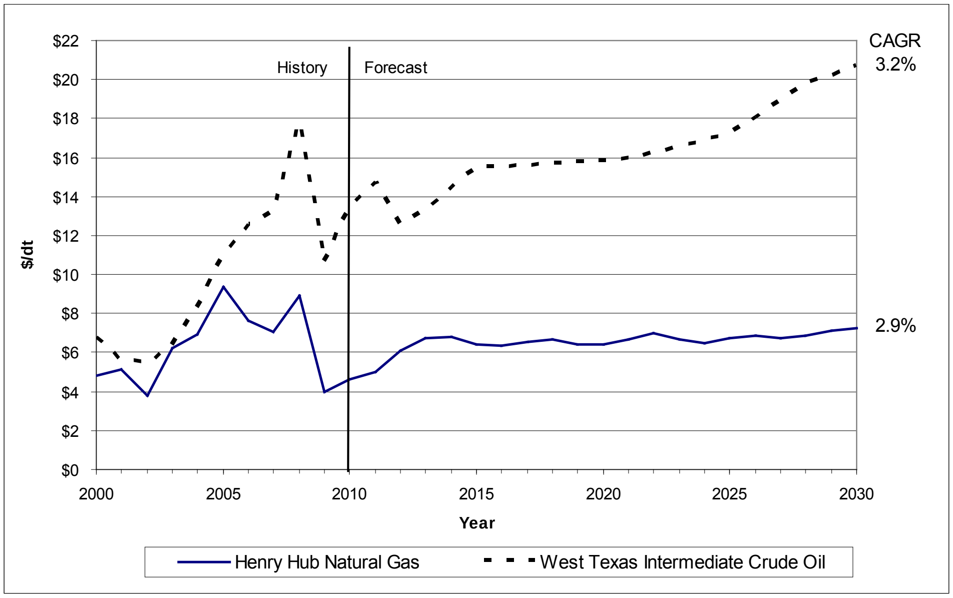
[45] Volatility could be restrained by changes such as increased gas storage, more long-term pipeline contracts, or government regulation.

Figure 4-4: Wholesale Spot Price Comparison - Gulf Coast



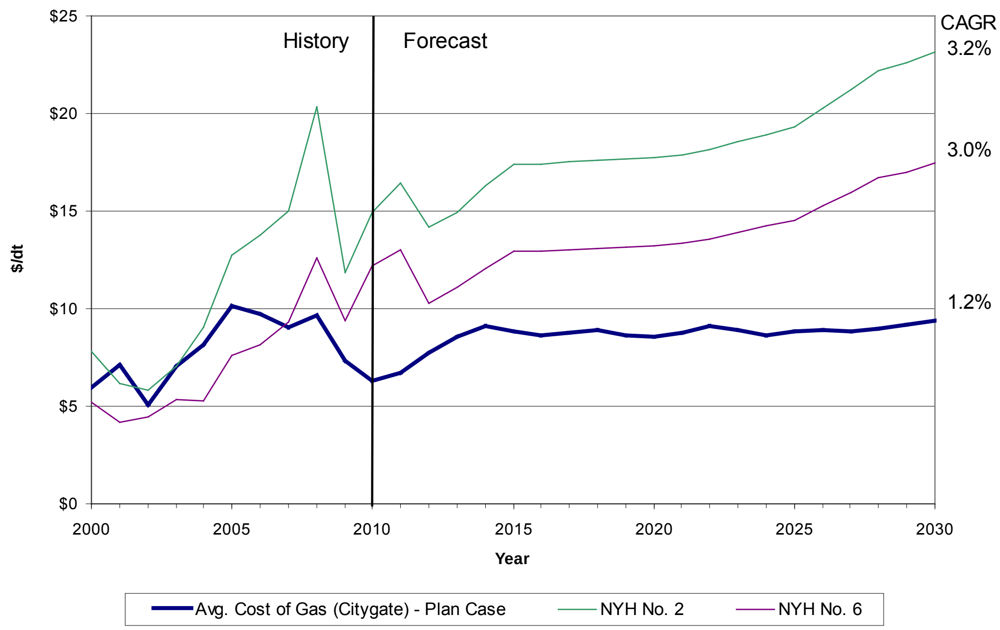
Source: Historical Annual Prices for WTI Crude Oil– U.S. Energy Information Administration and Henry Hub - Average of NYMEX Settlement; Forecasted prices for natural gas and WTI crude oil– Wood Mackenzie December 2009. All prices are in constant 2009 dollars per dt.

Although propane is produced from both crude oil refining and natural gas processing, its price is influenced mainly by the cost of crude oil. This is due to the fact that propane competes mostly with crude oil-based fuels. A recent study completed by the U.S. Energy Information Administration "Factors Affecting Propane Pricing" concluded that propane prices follow crude oil price trends. Propane prices occasionally spike, increasing disproportionately beyond that expected from normal supply/demand fluctuations. The main cause appears to reside in the logistical difficulty of obtaining resupply during the peak heating season.

City-Gate Prices

As shown in Figure 4-5, since 2008, Con Edison's citygate cost of gas for firm customers has held and is projected throughout the planning horizon to continue to hold a competitive advantage for natural gas on an average annual basis relative to No.6 and No. 2 fuel oil New York Harbor (NYH) prices. A discussion of customer burner-tip retail prices is contained in Chapter 3 of this report.

Figure 4-5: Con Edison's Citygate Cost of Gas for Firm Customers Versus #2 & #6 Oil



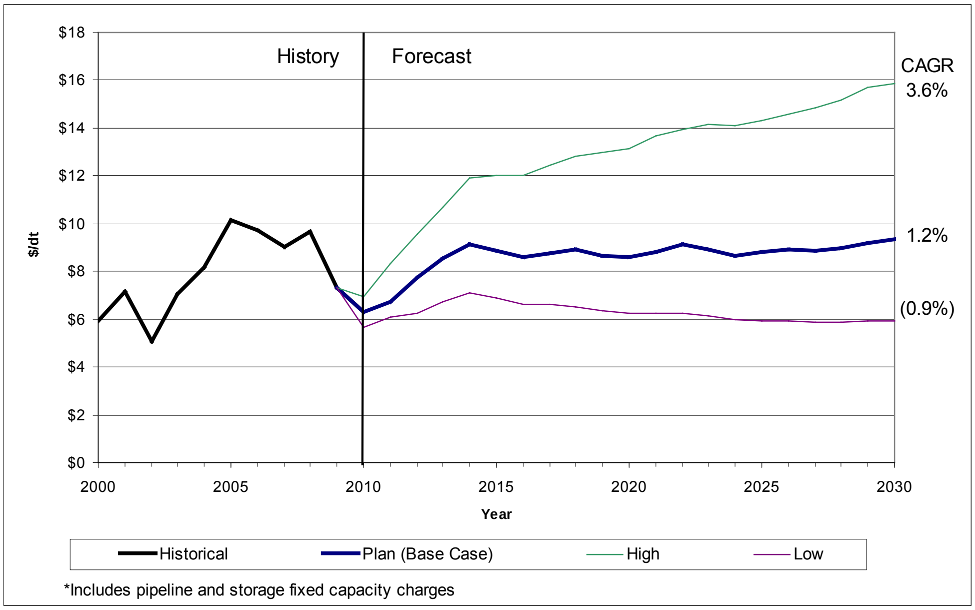
*Comparison of Con Edison's Citygate average cost of gas for firm gas customers versus No. 2 and No. 6 New York Harbor (NYH) oil prices. Gas cost includes pipeline and storage fixed capacity charges.

Source: Historical Annual Prices for NYH No.2 and No.6 – US Energy Information Administration and Henry Hub Average of Monthly NYMEX Settlement; Con Edison Energy Management, historical and forecasted citygate average cost of gas for firm customers. All prices are in constant 2009 dollars per dt.

4.2.3 Con Edison's Natural Gas Cost Forecast (Plan Case)

Con Edison's plan case analysis, shown in Figure 4-6, suggests that the citygate average cost of gas for firm customers (which represents the total cost of gas supply delivered to our system including the cost of pipeline and storage capacity) will remain on average within $7-9 per dt (in constant 2009 dollars), increasing at an compounded annual growth rate of 1.2% over the planning period.

Figure 4-6: Citygate Average Cost of Gas for Firm Customers



Source: Con Edison Energy Management, historical and forecasted citygate average cost of gas for firm customers. All prices are in constant 2009 dollars per dt.

4.3 THE DELIVERABILITY OF NATURAL GAS TO THE NEW YORK CITY AREA

The previous two sections of this chapter discussed the availability of natural gas beyond the citygate and the competitiveness of natural gas as a source of energy. This section now evaluates the delivery constraints of the New York City area and how they affect the supply of sufficient natural gas to the Con Edison gas system. Con Edison clearly recognizes the importance of having adequate pipeline capacity and storage contracts to deliver gas to our city-gates and reliably operate our gas system. A substantial portion of our planning activities is dedicated to that important business requirement.

4.3.1 Diversification of Con Edison's Natural Gas Supply

Con Edison has a diversified gas supply portfolio that will become increasingly diversified over the planning horizon in terms of regions and sources. Con Edison's traditional sources include the Gulf Coast production area (mostly on-shore and off-shore Texas, Louisiana and Mississippi) and Canadian gas (mostly from Western Canada in Alberta). In addition, Con Edison has storage capacity in both the Gulf Coast and Market area (mostly in Pennsylvania and New York) where gas is injected during off-peak periods and withdrawn and transported through pipeline capacity to meet the needs of customers during the winter season and high load periods.

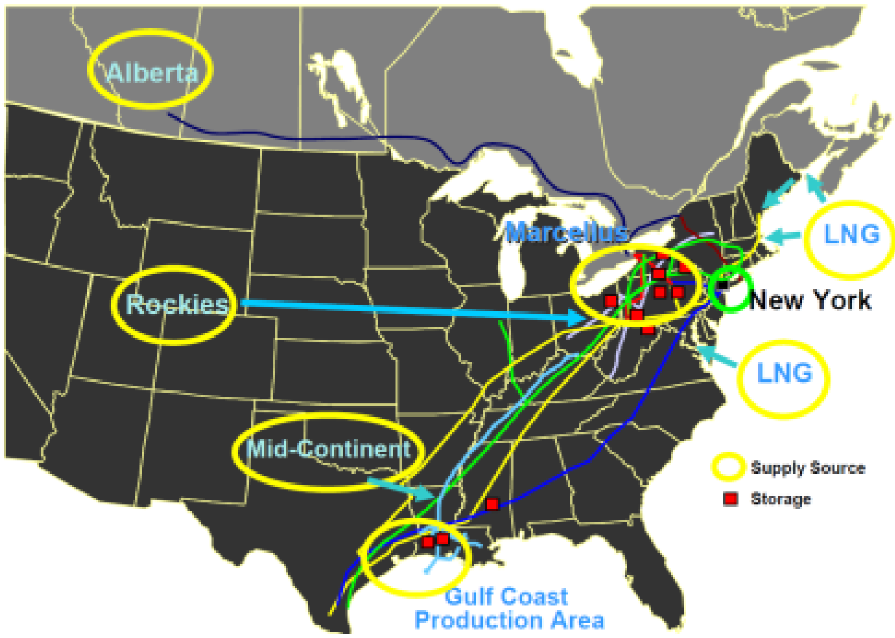
Newly developing sources include:

- The Marcellus Shale Play in Pennsylvania, southern New York State, and West Virginia
- The Mid-Continent Area (mostly shale plays in Texas, Louisiana, Arkansas, and Oklahoma)
- Rockies Gas (via the new REX pipeline)

Gulf and east coast LNG facilities.

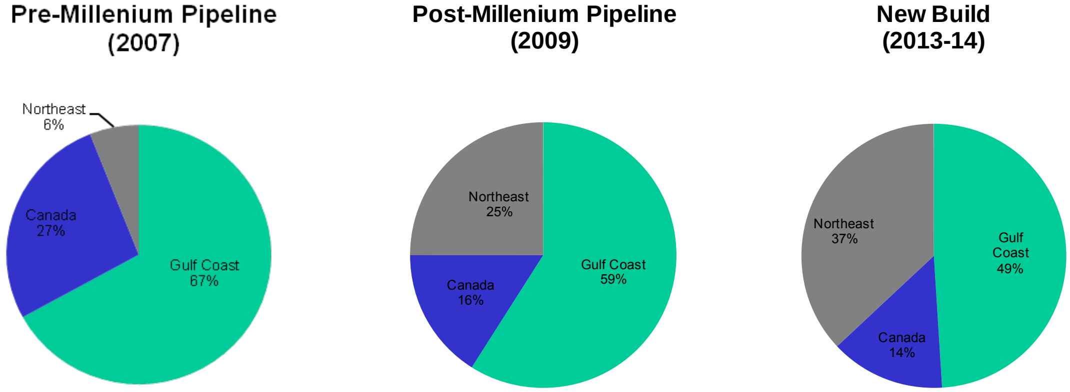
The map in Figure 4-7 shows these existing and developing sources of natural gas for Con Edison.

Figure 4-7: Con Edison's Gas Supply Sources



The charts in Figure 4-8 show the trend in the mix of our resource supply portfolio. Gulf Coast supply includes traditional Gulf Coast gas and LNG from Gulf Coast terminals. Mid-Continent supply largely includes shale gas from the Barnett, Haynesville, Woodford, Fayetteville and other Southwest shale plays. Northeast supply includes Appalachian, Marcellus, Rockies and East Coast LNG. New Build (2013-14) includes the new interconnection with Texas Eastern via the new Lower Manhattan station.

Figure 4-8: Changing Composition of Con Edison's Gas Supply



4.3.2 The Need for New Pipeline Capacity

Con Edison recognizes that there is a need for the construction of new interstate pipeline capacity to serve growing demand for natural gas in the New York metropolitan area. Given the high utilization level of existing interstate pipeline capacity in the region, new pipeline capacity must be developed. Con Edison supports the construction of new interstate pipeline capacity.

Additional gas supply will need to be provided through multiple points of delivery from the interstate pipeline systems into our service area. Associated gas distribution infrastructure expansion would provide the delivery capacity to serve the increasing service requirements of electric and steam generators and gas customers in a safe and reliable manner. Increased gas delivery infrastructure will enhance the ability of the region's gas system to withstand the loss of gas supply due to a contingency on the interstate pipeline or local distribution system, bring downward pressure on natural gas and electricity prices by reducing capacity constraints during peak periods, and reduce emissions from fossil fuels by increasing the availability of gas supply.

The construction and operation of pipelines entails impacts and risks that must be minimized. In a densely developed area, such as the New York metropolitan region, reconciling new pipeline construction with existing conditions is an extremely delicate undertaking. Con Edison believes that pipelines can be built and operated safely. However, the risks and consequences of unlikely events should be considered in the siting process. Co-location of critical infrastructure projects such as electric and gas distribution facilities is equally important to evaluate.

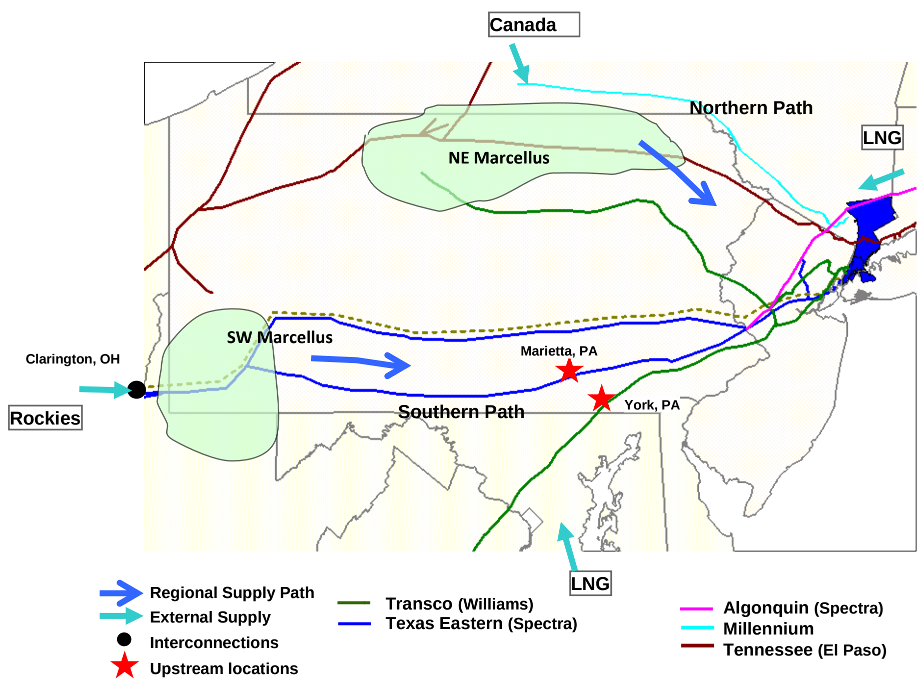
The Company's long-term strategy seeks to enhance the reliability of the Con Edison natural gas system and to reduce the impact to the system from the loss of an existing gas pipeline interconnection. It proposes the creation of a "header system" that would provide connectivity to numerous pipeline paths available from west to east through either northern (along New York State/Pennsylvania border) or southern (along southern Pennsylvania border) pipeline delivery paths.

The proposed "header system" would create connectivity to numerous pipeline paths available west to east through either northern or southern pipeline routes. The system would have the following benefits:

- Reduce high basis costs caused by congestion due to existing pipeline capacity constraints
- Create additional options and flexibility in selecting gas from various pipelines thereby reducing our fixed cost commitment for incremental capacity
- Provide an opportunity for supply diversity to source gas from both northern and southern paths of gas supply. It would provide access to developing regional supply opportunities, such as Marcellus Shale in Pennsylvania/New York area, LNG, deliveries from Rockies/Mid-continent or Canadian supply sources
- Provide enhanced reliability for the gas system through both the lateral and the header

New pipeline and storage infrastructure projects are being developed along both the northern and southern pipeline delivery paths to the metropolitan area as shown in Figure 4-10 below. This approach would provide us with maximum flexibility, enhanced connectivity, and allow us to take advantage of supply opportunities through a phased approach to meet our demand growth over the long-term (scalability).

Figure 4-10: New Natural Gas Capacity to New York Region – Upstream Pipeline Connectivity

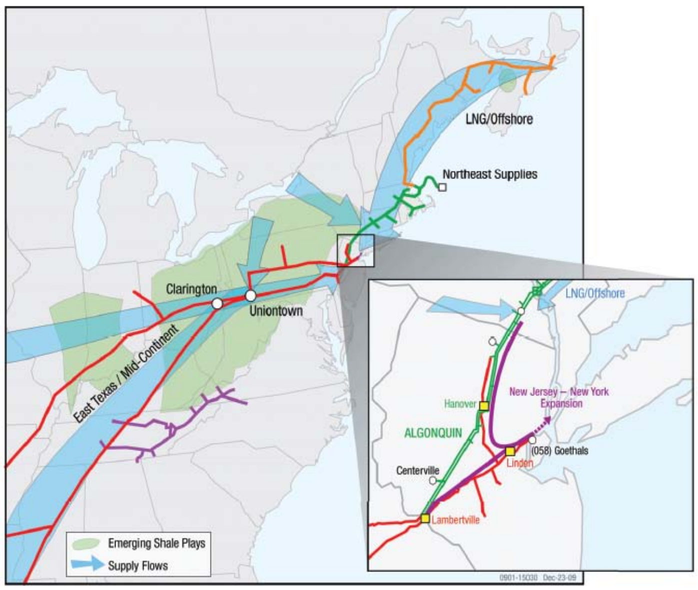


Source: Con Edison Energy Management

As mentioned in Chapter 2, in December, 2009 the Company entered into an agreement with Texas Eastern Transmission (a subsidiary of Spectra Energy) to build a new supply pipeline from Northern New Jersey to the west side of New York City via a new gate station as shown on the map in Figure 4-11.

Once the Texas Eastern project is in service, it will deliver new, critically needed natural gas supplies to the New Jersey and New York areas, including Manhattan. The project will have the ability to transport up to 800 Mdt/day of new natural gas supplies to the region. Shipper commitment has provided sufficient market support to proceed with the project, which is targeted to be in-service by the end of 2013. In the meantime, the Company will rely on other short term sources of supply from other pipelines.

Figure 4-11: New Jersey–New York Expansion Project & New Lower Manhattan Delivery Point



Source: Texas Eastern Gas Transmission

The New Jersey-New York Expansion Project (Texas Eastern/Algonquin Pipelines) and new Lower Manhattan Delivery Point (Spectra Project) provides the following benefits:

- Helps meet growing energy needs and strengthens the reliability of Con Edison's gas system
- Provides access to new supply sources and increases the diversity of Con Edison's pipeline supplier diversity
- Improves air quality in New Jersey and New York and helps achieve long-term goals of the New York State Energy Plan and PlaNYC

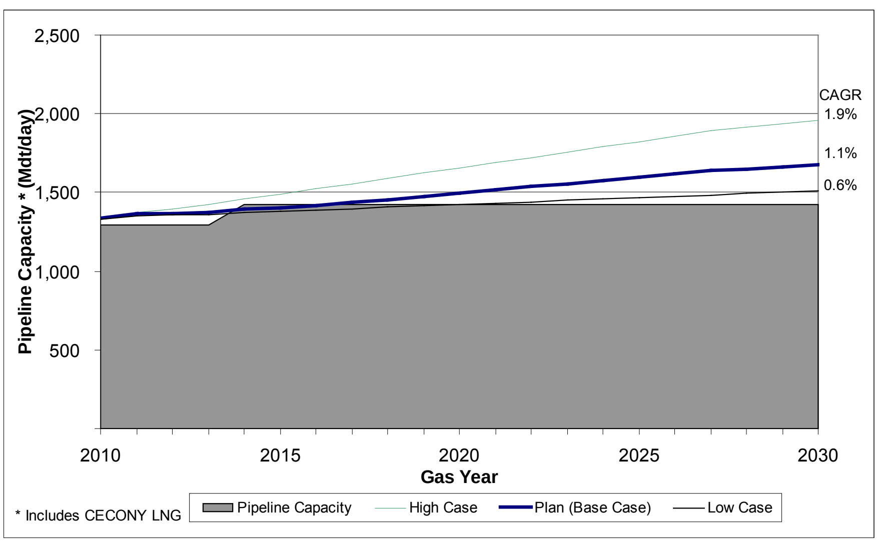
While existing Northeast pipeline capacity is constrained in general, there are a number of prospective pipeline expansion projects that will provide Con Edison increased access to supplies from Marcellus, the Rockies, East Coast LNG facilities and Eastern Canada.

The timing and volume of future pipeline expansion projects will be highly dependent on shipper commitments to long-term contracts and constructability. The economics of expansions to the pipelines will be a key determining factor in which of these pipeline projects will actually go forward. Con Edison will likely have to make some up-front commitments for firm capacity to assure development of projects beneficial to it, as was the case with the Texas Eastern agreement.

Con Edison's existing system (with the addition of the Texas Eastern interconnection in 2013) can accommodate additional delivery capacity at its major gate stations to meet some growth and contingency needs. But, at some level of incremental demand growth, reliability requirements will dictate the need for another gate station.

Con Edison's plan case analysis shown in Figure 4-12 indicates that additional capacity beyond the company's commitments in the Spectra Project will be needed by Year 2017 to meet the needs of our customers. Prior to the in-service of the Spectra Project and the new delivery point to Lower Manhattan, Con Edison will meet the needs of customers through a combination of short-term purchases of citygate delivered/peaking firm services. A minimum of a four year planning horizon is needed given the lead time required to develop and obtain regulatory approvals and construct a pipeline expansion project.

Figure 4-12: Projected Gap in Pipeline Capacity



Source: Con Edison Management

4.4 SUMMARY GAS SUPPLY OUTLOOK

4.4.1 Summary Assessment

Barring major unforeseen market or regulatory events, we expect that there will be adequate available reserves and supplies to meet the natural gas requirements of Con Edison's service territory over the planning horizon.

- While supplies from the Gulf Coast production area and Canada are declining, all other supply regions are increasing, including Marcellus shale gas, Mid-Continent shale gas, Rockies gas (which is also largely shale gas), LNG, and emerging shale gas development in Western Canada
- The Marcellus Shale play, in particular, promises substantial growth in regional supply possibilities at a lower delivery (cost) basis
- Shale gas well economics should support continued aggressive development
- There are risks related to increased environmental regulation of shale gas drilling (hydraulic fracturing), which could constrain growth of shale gas opportunities, but – at this stage – those risks do not appear to be significant enough to forestall significant growth in these development opportunities
- Prospects for supplies of renewable gas to Con Edison's customers are minimal

During the planning period, we expect that natural gas will remain an affordable energy source for customers while providing sufficient economic incentive for producers to develop technology and wells for continued unconventional extraction. Gas prices will continue to experience short-term volatility that will create some demand fluctuations from dual fuel, interruptible customers.

While there has been pipeline delivery congestion in the Northeast region, the outlook for delivery capacity of new supplies to Con Edison's system to meet projected demand growth is positive.

- Con Edison's existing system, with the addition of the Texas Eastern interconnection, will be able to handle some level of demand growth depending where in the system it occurs. At some point of demand growth, an additional gate station may be needed
- There are a number of proposed and in-process pipeline expansion projects that will relieve much of the congestion. Economics to the pipeline developers will dictate whether the proposed projects go forward, but it is expected that supply and demand for pipeline capacity will be balanced over the long term
- In most cases, Con Edison will have to make some form of up-front commitments to ensure development of projects that are beneficial to it

4.4.2 Signposts

This plan assumes growing demand for natural gas based on a gas supply outlook with abundant natural gas resources, a relatively low natural gas price, and the relative affordability of natural gas compared to alternate energy sources. Key supply signposts would include considerations that might restrict gas supplies, drive prices significantly higher than the predicted range, or conditions that might alter the price/availability of competing fuels.

- **Hydraulic fracturing Regulation**. Hydraulic fracturing fluid contains hydrochloric acid (HCL) and other toxic chemicals to improve its performance in holding open fractures and lubricating wellbores. Spills have created a great deal of concern and the threat of environmental oversight by the federal Environmental Protection Agency (EPA) under the federal Safe Drinking Water Act due to incidences of contamination of water tables and groundwater supplies. Recently, there have been cases of fines and ordered shutdowns of drilling sites by state and local environmental agencies. Industry officials insist that any environmental concerns are being adequately addressed by state and local authorities and don't require the oversight of the EPA.

Versions of the Fracturing Responsibility and Awareness of Chemicals Act (the FRAC Act) are also under consideration in both the US House and Senate. Both would give the EPA authority over the hydraulic fracturing process under an extension of the Safe Drinking Water Act. Further, New York State has proposed regulation of hydraulic fracturing in the Marcellus shale, particularly in watershed areas. New York City is currently reviewing and responding to the state regulations and local officials are particularly concerned about the protection of the City's watershed.

Con Edison will monitor the progress of proposed city, state, and federal legislation/regulation regarding hydraulic fracturing. Rules that would adversely impact well-development economics or restrict large areas of gas fields from exploration will reduce resource availability.

- **Natural Gas Prices (and Volatility)**. Con Edison will monitor well-head gas prices and industry projections to determine if prices are rising significantly beyond the predicted ranges. The Company will also monitor volatility to watch for any extreme or longer-term trends that might reduce demand.
- **Price of Oil (and Propane).** The key to sustained demand for natural gas is its relative affordability compared to other fuels such as oil and propane. Con Edison will monitor major trends in oil, as well as prices of oil and propane for early indications that the prices of natural gas, oil, and propane are not following predicted paths.

If any of the above signposts indicates a change in the gas supply outlook, Con Edison will need to review demand impacts and revisit capital expenditures and customer programs targeted at new growth.

5.0 GAS INFRASTRUCTURE PLAN

This chapter describes the programs within the gas infrastructure plan. It provides an overview of the types of work and investments required to maintain our system and to serve new customers. The chapter further details our system design and asset management strategies to efficiently manage our planned investments. We then provide investment projections for the plan duration and expected benefits of our planned investments. Finally, we discuss some uncertainties to be monitored and managed during the plan period.

5.1 GAS INFRASTRUCTURE PLAN OVERVIEW

As described in Chapter 2, Con Edison's gas service territory is composed of 471 square miles located in Manhattan, Bronx, northern Queens, and Westchester County (except Northern Westchester). Con Edison serves approximately 1.1 million firm customers and 1,100 large volume interruptible customers, seven of which are in-city gas fired power generation plants.

Our gas system consists of more than 4,320 miles of main, transporting approximately 300 million dekatherms (MMDt) of natural gas annually. Con Edison has gas mains installed under almost every street and/or sidewalk in our service territory (aside from Northern Westchester). These mains are installed alongside other underground facilities such as electric, telephone, and cable television ducts and water, steam, and sewer mains.

The programs outlined in our infrastructure plan help Con Edison manage a large, complex, logistically challenging, underground gas transmission and distribution infrastructure designed to the rigorous reliability and safety standards that our customers have come to expect from us. At a high level, our current infrastructure initiatives represent three broad activities as shown in Figure 5-1:

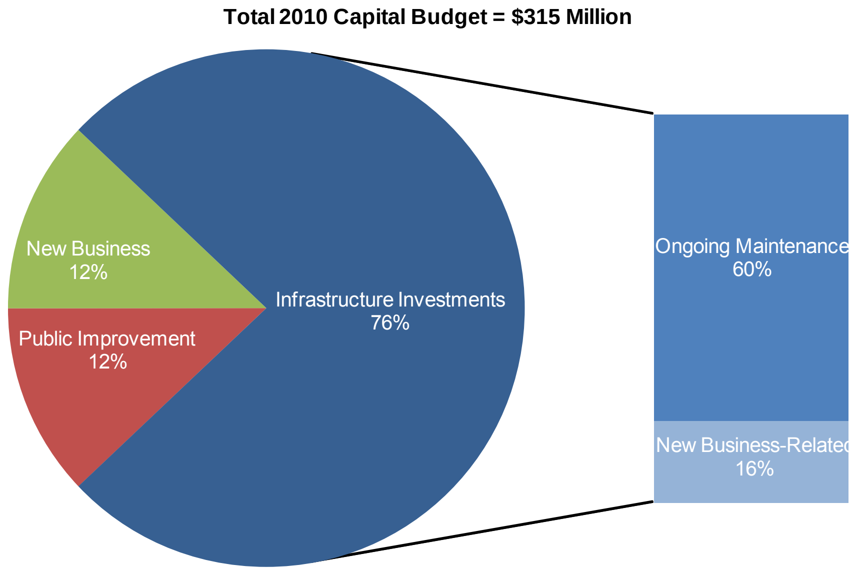
1. **Maintaining and reinforcing our infrastructure**. Infrastructure investments in this category are designed to maintain pressures for system reliability, to reduce leaks to maintain system integrity and safety, and to accommodate new load on the system. The programs in this category represent two types of investments:

- Ongoing maintenance required to replace or repair system components
- New business-related investments designed to reinforce or upgrade the system to accommodate new load

  Assets managed under this category include pipes, regulator stations, valves, couplings, etc. In 2010, this activity represents 76% of our investments.

2. **Connecting new customers to our system**. Expenditures in this category represent the cost of installing new services or pipes to connect new customers to our system. In 2010, this activity is expected to represent 12% of our investments.
3. **Undertaking Public Improvement projects**. When a municipality decides to perform work under its streets, that work is often complicated by the presence of our facilities. Under those circumstances, the Company has the legal obligation to remove or otherwise protect its facilities to accommodate the municipal activity at our—and therefore our customers'—own cost. In 2010, this activity is expected to represent 12% of our investments.

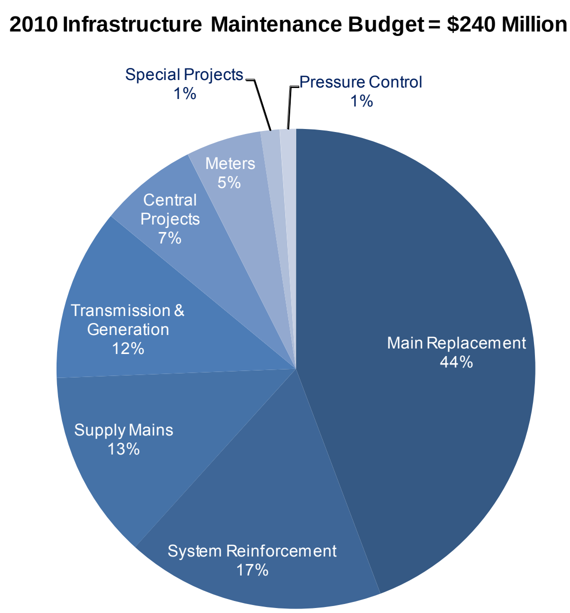
Figure 5-1: Gas Infrastructure Plan (2010 Budget)



Infrastructure Investments (Ongoing Maintenance and New Business-Related)

As stated above, programs and projects in this category are targeted at ongoing infrastructure maintenance (repairing or replacing components of the system) or new business-related (reinforcing or upgrading existing infrastructure) to maintain pressures for system reliability, to reduce leaks to maintain the system's integrity and safety, and to accommodate new loads. Figure 5-2 shows the various programs that make up our infrastructure investments.

Figure 5-2: Infrastructure Investments (2010 Budget)



- **Main Replacement Program**: This category is the largest component of our infrastructure maintenance plan and involves condition-based replacement of cast iron and unprotected steel distribution mains with plastic or cathodically-protected steel pipe to reduce leaks and maintain system integrity. The level of main replacement is generally mandated by our regulators during each rate case agreement. Replacement is prioritized using a statistical computer program that considers main conditions (material, age, and size), risk, and economic factors.
- **System Reinforcement**: This category includes installation and replacement of gas mains in areas where pressures do not meet the current design criteria based on the prior winter's system performance and emergency replacement of low pressure cast iron mains. It further includes replacement of services for various reasons, including non-leaking services associated with distribution main replacements, vintage unprotected steel services, and services without curb (outdoor shutoff) valves. This category of expenditures addresses reliability, system integrity, and accommodation of new load.
- **Supply Mains**: This category of projects entails upgrades to or replacement of portions of the 700 miles of critical facilities comprised of the key regulator stations and medium-pressure, large-diameter backbone systems in the distribution system. The plan extends existing systems to meet new loads, eliminates piping constraints, replaces known corroded pipes, and provides reliability and contingency tie-ins to large-sized radial systems.
- **Transmission and Generation**: This category primarily focuses on replacing segments of the gas transmission system that operate greater than 20% of the Specified Minimum Yield Strength (SMYS) and are constructed of lower ductility pipe than currently used in our new transmission mains. The objectives of these investments are to bring the entire gas transmission system to a more uniform pressure and to reduce the risk of pipe failure. This category also includes the installation of remote operated valves (ROVs) to rapidly isolate desired sections of the system for damage control or repair purposes. The projects will maximize supply flexibility and deliverability and help us meet electric load-generating requirements.
- **Central Projects**: This plan category involves maintenance and upgrades to the facilities and equipment within our LNG storage facility and our various tunnels. It also includes the purchase, refurbishment, and testing of gas meters and related devices in compliance with the regulatory commission's standards.
- **Meters**: This program involves the purchase and installation of meters for new customers or replacement of existing meters where capacity has increased. Meters are essential for recording actual customer gas usage, which is currently the basis for billing the customer.
- **Special Projects**: As its title indicates, this category is reserved for select, high priority special projects like information system upgrades. A current example is the mapping system upgrade which is part of the foundation of the Company's program to migrate to a single mapping platform for all business units.
- **Pressure Control**: This category focuses on remote monitoring and control upgrades to regulator stations, replacing components (regulators, valves, strainers, etc.), replacing corroded gauge lines and uncoated pipe, and waterproofing manholes.

New Business

New business investments involve the installation of new gas mains and/or services to provide gas service to new customers or to existing customers with increased load. Most jobs are small jobs requiring a single service and in some cases, a short main extension. In the case of traditional growth, major customer projects (capital costs estimated to be $100,000 or greater) accounted for 15% of the services, 50% of the mains, and 15% of the budget.

As noted above under "Infrastructure Investments", new business also requires infrastructure reinforcement or upgrade investments, including system reinforcements, new district regulators, upgrades to supply mains, and pipe replacements required to provide for growth and maintain proper delivery pressures.

Public Improvement

In a city as congested as New York, Con Edison's gas infrastructure must share the space under the city's streets with other utility facilities, such as telephone and cable TV owned by private companies, and also with sewer and water systems owned by municipalities. When a municipality decides to perform work under its streets, that work is often complicated by the presence of our facilities. Under these circumstances, the Company has the legal obligation to remove or otherwise protect its facilities to accommodate the municipal activity but the Company is not entitled to be reimbursed for the costs it incurs to do so.

When a City or a municipal entity plans to perform work within these streets and is prevented from completing the proposed plan due to other facilities being in the way, the term "interference" is used. Interference can be direct or indirect. A direct interference means that the existing facility needs to be moved to accommodate and provide space for the new facility, which usually results in a capital expense.

If the City of New York or a municipality performs work, such as installing new or upgrading water mains, sewers, catch basins, curbs, and sidewalks etc. around a Con Edison facility, then Con Edison must bear the cost to move, replace its facilities affected by the City's or municipalities proposed construction activity. Often the facilities replaced have many years of useful life left. Due to the cause of the work, we have little control over the amount or timing of public improvement investments required. However, we do apply the same capital expenditure management practices (described in Section 5.2 below) to this part of the plan as for our infrastructure maintenance and new business work. In recent years, we have spent approximately $30-35 million annually in public improvement projects and we expect that level to continue during the plan period.

5.2 DEVELOPING THE GAS INFRASTRUCTURE PLAN

This section 5.2 discusses how we define and develop the set of initiatives that make up our infrastructure plan. It describes our overall approach to asset management and how the various processes within asset management drive to the infrastructure plan. We describe the system design criteria that govern our infrastructure. We also provide an overview of the iterative processes of tailoring our system design, and our project prioritization approaches which help us refine our infrastructure plan. In this section, we also highlight our robust Research & Development (R&D) program which feeds our system design and asset management approaches with new materials and innovative technologies. Section 5.3 will describe how some of our key initiatives use alternative approaches and asset management to manage costs. Section 5.4 will discuss our estimated 20-year capital expenditures and Section 5.5 will describe the expected plan performance against key performance standards.

The development of a gas infrastructure plan is driven by a family of processes known collectively as **Asset Management**. We define Asset Management as the set of business processes used to decide, plan, and oversee how infrastructure assets will be managed as appropriate to achieve a specified set of performance standards at the least cost over the life of the assets.

An effective asset management program should provide structure for maintenance and asset replacement activities. Our asset management programs and processes evaluate the performance, cost, and risk characteristics of the components that, collectively, make up our gas transmission and distribution system. We use various methods and tools to monitor, analyze, and control our assets to produce our best estimate of optimal performance of our gas assets, asset classes, and the overall gas system. The information we capture and analyze provides the basis to evaluate and compare the performance across various components or asset classes to assure that we are targeting our programs properly and therefore capturing the maximum value out of the money we spend on asset maintenance, repair, and replacement.

Key elements of the family of asset management processes include:

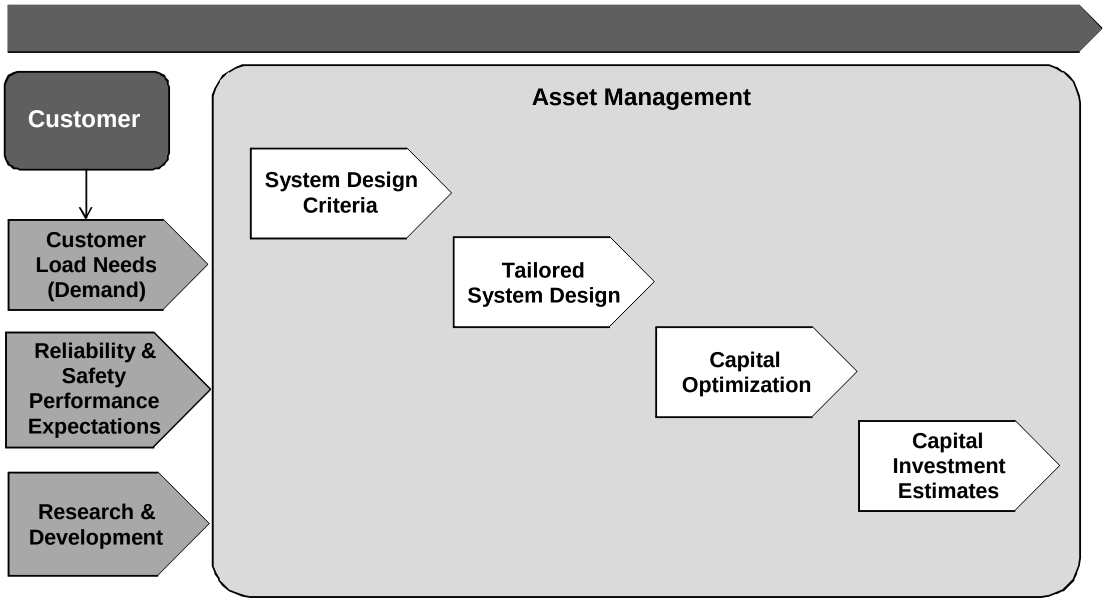
- Establishing key performance standards
- Defining system design criteria to meet regulatory requirements and internally specified performance standards
- Employing tailored system design approaches
- Integrating the demand forecast in conjunction with the system design standards to understand the system requirements to meet customer needs while meeting performance standards in terms reliability, system integrity, and safety
- Optimizing capital spend to achieve targeted system capacity, reliability and integrity requirements. This consists of:
  - Deciding how much total capital is needed to maintain existing gas assets and to add new assets
  - Deciding how to allocate that total capital among a number of candidate projects in a manner that maximizes the value to be captured (project prioritization and selection)
- Monitoring and managing system performance

While the generic term “asset management” also covers the operational execution of infrastructure asset management plans, infrastructure-related asset management is generally defined as the analytical, planning, decision-making, and management oversight of the management of assets, and Asset O&M is generally considered a separate business process that executes the infrastructure plans.

The rest of Section 5.2 will describe Con Edison’s approach to its asset management processes and how these are being improved in the current long range planning initiative.

Figure 5-3 below shows how the gas infrastructure plan is developed. The customer is our source for expected load needs as well as reliability and safety standards. Research and Development (R&D) initiatives determine the types of technologies and applications we use in our asset management process. Our System Design Criteria are developed to manage the infrastructure to the expected performance levels and drive the overall asset management component of the infrastructure plan. Infrastructure requirements are put through rigorous iterations of tailored system design, capital estimations, and ultimately a project prioritization to produce an Infrastructure Plan.

Figure 5-3: Gas Infrastructure Plan Development Process



5.2.1 Establishing Key Performance Standards

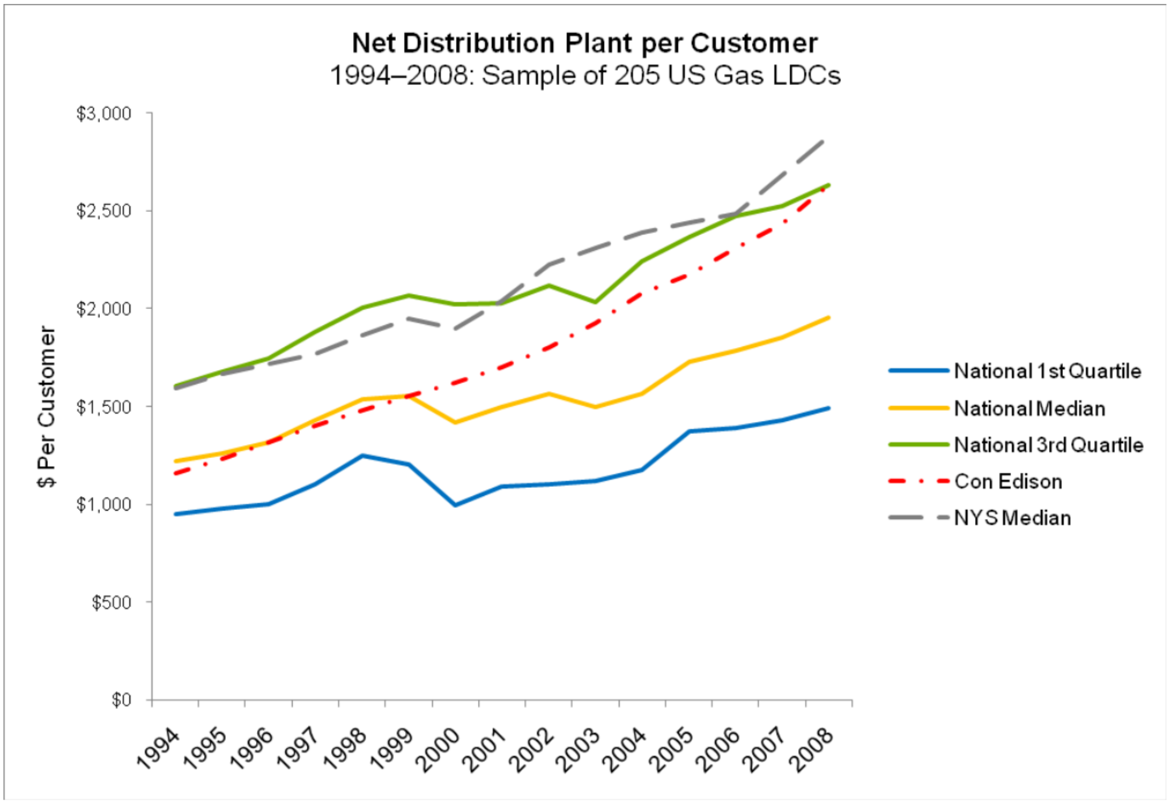
Con Edison has established performance standards that are mainly in the areas of system safety and system reliability.

- Our Company-wide goal for employee safety is to reduce our OSHA (Occupational Safety and Health Administration) Incidence Rate to 1.5, or approximately 1.5 injuries and illnesses per 100 workers per year by 2015, from 3.24 in 2009. If achieved, an incidence rate of 1.5 would be in the current top quartile among industry peers.
- Our reliability standard is to minimize customer outages. We currently have a zero-contingency system design, which means that if we lose a gate station on a cold winter day, there is a high likelihood that there will be customer losses. Therefore we are moving to a one-contingency standard (“N-1”) as the future standard, such that we will be able to lose any gate station (other than those that feed radial systems) and not lose customers due to system redundancies. Achieving that standard will require a new gate, interconnect piping and control valves, as well as redundancy work in Westchester. These investments will take at least 5 years and require capital spend greater than $215 million.
- In addition to the contingency planning, we also aim to minimize customer outage time and measure our success using a customer outage index. This index is calculated as (the total customer hours requiring service minus the total customer-hours of interruption during the year) divided by the total customer hours requiring service. Currently, our target for this index is 99.99%.

5.2.2 Defining System Design Criteria

Our system is designed to rigorous system design criteria to deliver gas service safely and reliably. The system must also be flexible enough to accommodate new customers or increased load from existing customers. Con Edison has been successful at maintaining an extremely robust system with minimal redundancy. As shown in Figure 5-4 below (and discussed previously in Chapter 2: Introduction), Con Edison's asset intensity is well below the NYS median and has ranged between median to 3rd quartile nationally.

Figure 5-4: Asset Intensity Summary



The key to our success has been the ability of our central engineering group to evaluate all operating areas and balance their needs with available funds. Our mission is to always look at the long range solution and incorporate that view in addressing today's needs. We have a holistic approach in addressing infrastructure requirements.

Con Edison's gas transmission and distribution systems are designed to meet the requirements of the gas safety code: NYS Codes, Rules and Regulations Part 255[46]. In addition to Part 255, Con Edison's gas transmission and distribution systems are subject to a variety of federal, state, and city regulations along with standards published by professional organizations. Some of our key influencers include:

- Department of Transportation (DOT) Part 192 of Title 49, Code of Federal Regulations

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[46] NYS PSC Code Part 255 prescribes minimum safety requirements for the design, fabrication, installation, inspection, testing and operation and maintenance of gas transmission and distribution systems, including gas gathering lines, gas pipelines, gas compressor stations, gas metering and regulating stations, gas mains, service lines, gas storage equipment of the closed pipe type fabricated or forged from pipe or fabricated from pipe and fittings, and gas storage lines not covered by 49 CFR 192.

- NYS Codes, Rules & Regulations, Title 16, Parts 225, 226, 255
- Federal Energy Regulatory Commission (FERC)
- Environmental Protection Agency (EPA)
- NYC and Westchester Municipal Building Codes
- NYC Department of Environmental Protection (DEP) and NYS Department of Environmental Conservation (DEC)
- Professional standards, for example, the American Society of Mechanical Engineers (ASME), American National Standards Institute (ANSI)

The Con Edison gas system's capacity is designed to a rigorous "*zero-degree day" standard*: to meet the load requirements of all firm customers[47] 365 days per year, 24 hours per day, provided that the average of 24 hourly temperatures in a calendar day does not fall below 0 °F, and the average temperature for any one hour does not fall below –10 °F (design hour).

The purpose of these design criteria is to govern key reliability, safety, and system integrity conditions:

- Maintain the reliability of supply mains in the event of an outage to a gate station or critical regulating station
- Maintain the reliability of the transmission system
- Reduce the potential of incoming gas leaks each year
- Maintain the system at optimal operating pressures while satisfying detailed design basis conditions

As described in Appendix G: Overview of Gas System Design Criteria, the Company's rigorous and detailed design criteria lay out specifications for appropriate operating pressures, pipeline material, main replacement criteria, regulator station specifications, tunnel specifications, service connection specifications, performance, and contingency specifications.

Our system design criteria are reviewed and updated as necessary. Our zero-degree standard is currently under review for historical validity and regional benchmarks. This review will be completed later this year. We have also recently updated our transmission design specifications, which we describe in Appendix G: Overview of Gas System Design Criteria.

5.2.3 Employing Tailored System Design Approaches

Our design specifications also have built-in flexibility, establishing alternatives and providing criteria for choosing among those alternatives. For example, our design criteria specify that District Regulating stations shall be installed in lieu of piping installation or replacement when the estimated station cost is less than the estimated piping cost, provided that the options have similar reliability impacts. Another example is integrating the Bronx and Westchester high-pressure distribution system to avoid the costlier transmission upgrade in that area. In the past, we have utilized the more economic alternative to achieve the desired benefits, and intend to continue applying that guideline to all new business in the future.

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[47] For Off-Peak Firm and other non-firm customers, Con Edison's obligations are less stringent, allowing interruptions at higher temperatures or for other reasons

Wherever economically justified, we connect new services to the highest pressure main available on the street to enable us to scale up quickly (and without the extra costs of additional digging and a new connection) if a customer's load increases. When replacing mains, we strategically replace small-diameter, low-pressure main with larger-diameter mains to accommodate bigger loads. Such tailoring of our system for future new business, particularly in Western Manhattan, is especially important as anticipated new loads (heating oil to natural gas conversions, distributed generation, steam to natural gas conversions) are larger than our current average customer size. Alternatives like district regulating stations or larger diameter mains will help reduce the capital costs required for us to support new customer demands.

The gas system's reliability is highly dependent on appropriate pressure levels and controls throughout the system. Peak demand pressures are often set for extended periods, but are necessary only a small fraction of the time. Higher-than-necessary system pressure also intensifies leakage. Manual, periodic pressure regulation is labor-intensive and expensive as it entails visits to regulator stations to adjust District Regulator set points. Automatic regulation, which involves the installation of control systems to adjust District Regulator set points, is more economic and provides near-real time pressure control.[48] Con Edison's design criteria specify that regulating stations should have smart controls to optimize system operating pressures which enhance reliability as well as reduce leaks and methane emissions. We have a prioritization system in place for upgrading older stations with smart controls and specify that new stations must be capable of accepting such controls. Also, we have lowered the pressure of the High Pressure systems in Queens and Westchester. The reduced pressure allows for increased reliability to increasing capacity and adds to public and employee safety.

5.2.4 Integrating the Demand Forecast

Con Edison has had a solid approach to forecasting demand for many years, but as part of this planning process, we have expanded the analysis and have increased the involvement of a number of corporate organizations to ensure better integration among the various planning efforts that are taking place around the Company. As described in Chapter 3: Customer Needs, for this current planning effort, we developed the demand forecast for three different cases (plan case, high case, and low case), and we built the forecast up from a number of component parts:

- **Traditional Demand**: Historically, demand for gas service has increased in our service territory because of economic development, which increased either residential or commercial developments requiring gas service. Historically, peak day demand has grown at 1-2% CAGR. We anticipate that this growth will continue at nearly 1% CAGR during the plan period.
- **Incremental Demand**: Beyond the traditional determinants of growth, we expect environmental and air quality concerns to drive firm gas demand growth in four main areas (see Chapter 3: Customer Needs for a detailed discussion of these incremental sources of growth):

    1. **#4/#6 Heating Fuel Oil Conversions**: Driven by air quality and public health concerns, NYC has proposed a regulation to phase out the use of heavy fuel oils for space heating. The regulation recommends a conversion to #2 oil or natural gas. With the expected competitiveness of natural gas prices compared to oil, we

[48] Con Edison invented automatic pressure control (Grid Boss) and algorithmic control (smart regulators) via R&D projects. A more detailed discussion of our R&D efforts follows later in this chapter.

expect a good proportion of customers to convert to natural gas, largely depending on their initial costs of conversion such as equipment and building retrofits. We expect heating oil conversions to be our largest source of incremental demand/growth during the plan period.

2. **Distributed Generation:** Distributed Generation (DG), in various applications, could be a way for Con Edison and its customers to reduce their dependence on the existing electric grid by offsetting power consumption from traditional centralized power plants. We understand the value of DG to certain types of customers and expect continued, moderate growth of DG across our service area, particularly in Manhattan, where the electric system is the most vulnerable.

3. **Natural Gas Vehicles:** There is a burgeoning interest in alternate fuel vehicles, especially electric vehicles, driven by the interest in managing our carbon emissions. Natural gas's many benefits, such as a domestically-available, clean fossil fuel, combined with the maturity of the technology, make CNG a viable transportation option, particularly for fleets. The state of New York has the third highest number of NGVs in the nation, and we expect this support to continue.

4. **Steam to Natural Gas Conversions:** We also expect to see some steam customers to switch to natural gas during the plan period. Customers could either switch to natural gas to simply fulfill heating needs in lieu of steam, or install a combined heat and power system using natural gas as the fuel.

In both traditional and incremental demand categories, growth is offset by energy efficiency programs which reduce the overall consumption of energy.

5.2.5 Optimizing Capital Investments

Capital optimization is comprised of two processes: 1) establishing the total amount of available capital for each year and 2) allocating that capital to the project portfolio that will produce the most value.

Sizing the total available capital budget is done as a collaborative effort between Con Edison's financial (Rate Engineering, Finance and Accounting) and Gas Engineering departments. The financial group analyzes the amount of capital that can be spent without putting too much upward pressure on rates and customer bills. Various levels of capital spend are run through a rate impact model to determine the impact on the average rate and average customer bill. The gas engineering group brings to the collaboration a prioritized list of projects with the associated cost estimates for each. As a result of the interaction between the financial group and gas engineering, a total capital budget is agreed upon.

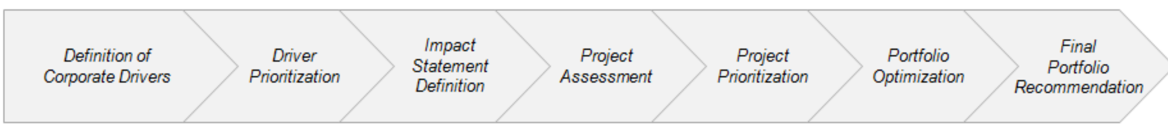
Our Capital Optimization process has undergone some significant improvement. The Company has developed a comprehensive spending optimization process using a newly structured process supported by a software tool. This process is implemented within the overall planning process and allows us to develop business cases and to evaluate alternatives in the development of our plan. Capital Optimization allows us to attain objectives by helping us evaluate projects system wide, and make trade-offs among competing projects across operating units through standardized analytical and comparison methods and guidelines. An illustrative example of an improvement in our capital optimization process results from a study of the optimal rate of main replacement done by an external expert. This study (referenced below) has helped us pinpoint the optimum level at which main replacements will reduce leaks versus incremental cost.

Through this Capital Optimization process the Company will ensure that resources are efficiently used to reduce risks, improve system performance, and otherwise generally meet strategic objectives. The process has the following objectives:

- Provide a consistent set of evaluation guidelines and tools for all business units
- Develop an optimized project portfolio work plan with the appropriate balance of performance, cost, and risk
- Leverage a more analytical approach for project/program initiation, evaluation, and closeout
- Create "what if" scenarios to improve decision-making for long and short term plans
- Improve monitoring and tracking of project/program performance
- Provide valuable and comprehensive information to regulators

The main steps of our Capital Optimization process are shown below:

Figure 5-5. Capital Optimization Process



Corporate Drivers

The Company employs a streamlined cost management process to develop its capital investment and annual operating expense needs. Each group develops a forecast of its needs, identifies necessary projects, and develops a budget and work plans for the coming year. In developing these plans we focus on ensuring the system has sufficient capacity to meet customer needs and on maintaining our existing infrastructure. Our corporate strategic objectives, or drivers, listed below, are incorporated into budget development to determine the appropriate level of Capital and O&M expenditures.

- Provide reliable service
- Reduce costs to the customer
- Satisfy customer needs
- Increase energy efficiency
- Be responsible stewards of the environment
- Enhance external relationships
- Strengthen the company's support activities
- Strengthen the company's human resources
- Reduce and manage risk
- Improve public and employee safety
- Grow through regulated expansion
- Build on successes of the competitive energy businesses

Driver Prioritization

These objectives are given a weighting by executive management from across the organization. The result is a quantitative weighting system for prioritizing projects based on their support of each corporate driver.

Impact Statement Definition

To quantitatively evaluate each project's strategic value, a working group of subject matter experts writes "impact statements" for each of its applicable corporate drivers. These serve as an objective and well-defined guide for quantifying the impact of each project on the corporate drivers. For example:

- Cost impact is measured in terms of dollar savings within five years of project implementation.
- Risk mitigation is measured by the project's Risk Priority Number (RPN), which is based on three factors; severity, likelihood, and controllability. An asset optimization committee rates the program within 5 levels; None, Low, Moderate, Strong, and Extreme, based on the impact of the program in mitigating a particular risk. Historical performance data and risk simulations are used to assist in assigning the levels.

Project Assessment

The optimization process starts with the assessment of projects or programs. The starting point for the assessment of a project is a review of its "white paper," which is a detailed cost-benefit analysis that follows a structured template that provides a consistent, comparative basis for review of programs within the portfolio. Key elements of the template are:

- Work description
- Justification
- Alternative designs
- Risk of no action
- Financial and non-financial benefits
- Technical analysis
- Sensitivity analysis
- Project relationships
- Estimated completion dates
- Current status
- Current working estimate of funding requirements

This allows a consistent set of guidelines for program owners to review, and ensures the process is timely during the budget cycle. A software application was developed to allow for ease of submittal and tracking among many program owners and business units.

Project Prioritization

With all business case components properly captured, the Company can measure the portfolio's cost, benefits and weighted strategic value. These allow the Company to analyze all projects as an integrated portfolio, with total cost, savings, and return on investment. Other filters specific to each group can also be applied.

The Capital Optimization software can analyze all programs, and produce a graphical depiction of the portfolio with multiple combinations of the above criteria in up to 4 axes. For example, a graph can compare programs in terms of their strategic value, benefit, cost, and asset type.

Portfolio Optimization and Final Recommendation

A holistic approach to cost management leverages an asset optimization process that can optimize T&D investments against multiple constraints to reach goals and objectives.

This process provides for system-wide program comparisons through standardized analytical methods and guidelines, governed by a centralized group of subject matter experts. A rigorous benefit analysis methodology enables timely, informed decisions with increased transparency, and improves alignment in project and program management.

Benefits of Capital Optimization

Our capital optimization process has three key benefits: enhanced analytics, lower life cycle costs per asset, and centralized asset management. The emphasis on improved data collection, the conversion of data into useful information, monitoring of performance metrics, modeling, and scenario planning will ensure an appropriate balance of short- and long-term initiatives that are focused on maximum value capture. The structured and consistent evaluation of programs will result in more regular reviews of specifications and procedures. This is expected to result in lower life cycle costs per asset. The decision-making process will shift from a decentralized approach to a more centralized approach. We have begun forming centralized asset management committees that will oversee the process from program initiation, prioritization, monitoring, evaluation, and close-out.

5.2.6 Monitoring and Managing System Performance

We constantly monitor the performance of our gas T&D assets through tracking of key performance indicators through our monthly Gas Operations Performance Trends report. This is a detailed 80-page report that provides the latest results and historical trends on:

- Incoming Leaks
- Leak backlogs
- Leak repairs
- Leakage survey
- Time and cost per unit worked
- Units of work accomplished
- Budgets (actual versus budget)
- Environmental, Health and Safety
- Pipeline Integrity (assessment)

In addition to the metrics listed above, the PSC also requires us to monitor specific metrics that represent our customer service and reliability performance. As a result of the rate case agreement with the PSC, specific goals and performance measures for Con Edison were developed and are monitored on an ongoing basis, and penalties are incurred if these thresholds are not met. The PSC may change the thresholds for each rate case period. The PSC Performance Measures targets established for these metrics for the next rate case period are:

- Customer satisfaction greater than 88.1%
- Total annual system gas leak backlog of 1,400 leaks or fewer by the end of 2011, 1,375 or fewer by the end of 2012, and 1,350 or fewer by the end of 2013
- Workable (more serious) gas leak backlog of 55 leaks or fewer by the end of 2011, 45 or fewer by the end of 2012, and 40 or fewer by the end of 2013
- Response time of 45 minutes or less for at least 90% of gas leak calls
- Response time of 30 minutes or less for at least 75% of gas leak calls
- Damages from mismarks of less than 0.50 per 1,000 one-call tickets

- Damages to company gas facilities by company or company contractor employees of 0.33, 0.30 and 0.25 or less per 1,000 one-call tickets in 2011, 2012 and 2013, respectively
- Total number of damages to company gas facilities of 2.20, 2.10 and 2.00 per 1,000 one-call tickets in 2011, 2012 and 2013, respectively
- To remove from service a total of 150 miles of leak-prone gas main in the three year period between 2011 and 2013

This report is reviewed monthly and where there are variances from plan, decisions are made regarding whether to adjust project schedules to accommodate raising the priority of lower priority projects to accommodate immediate needs and risks.

5.2.7 Asset Management Summary

As we have added more sophisticated monitoring on our asset management processes, we have been able to continue our journey away from simple age-based asset maintenance to more condition-based asset maintenance. By gathering and analyzing increased amount of asset condition data that is of higher quality, we are better able to understand performance trends of the various asset classes. Additional monitoring may allow us to alter maintenance cycles, extend the useful life of various components, improve the design of specific assets, and predict and prevent asset failures. As will be discussed in the R&D section below, we are adopting new trenchless, condition-assessment technologies that allow us to assess the condition of pipes without major trenching.

The Company has realized, and will continue to realize, significant benefits from its targeted efforts to identify and implement the best mix of replacements, maintenance, and repair. The types of benefits realized include:

- Reduction in replacement volume—Equivalent or improved gas system reliability and safety at a reduced level of replacement investment due to monitoring that can pinpoint small problems that can be repaired before they become more widespread and require replacement.
- Reduction in replacement unit cost—Reduced unit replacement costs as more replacement events occur according to schedule and prior to failure. Replacement of failed components is generally more expensive as it disrupts planned work, causes overtime labor costs, and typically takes longer to accomplish.
- Reduction in operations and maintenance cost—While we expect to realize increases in some operations and maintenance categories due to the broader deployment of monitoring technologies, we expect lower overall maintenance requirements due to the replacement of obsolete components with improved materials and designs.
- Reduction of system and public safety risks—Prevention of emergency failures, which have unpredictable consequences.

Improvements to our asset management practices have resulted in better decision-making capabilities and processes. Our practices have been enabled by enhanced monitoring of assets' condition and improved data collection systems, and advanced decision-analysis and modeling capabilities. We continue to define preferred design standards, data collection and analysis needs, and maintenance practices incorporating the best available industry knowledge and technology.

5.3 RESEARCH & DEVELOPMENT[49]

Con Edison Gas R&D is very involved with two major gas industry research & development consortia (NYSEARCH & OTD[50]). Between the two entities, we are funding 58 projects that address various areas important to the gas industry such as leak detection and pinpointing, third party damage, trenchless technologies, repair technologies, facility locating, corrosion mitigation, gas interchangeability, pipeline integrity, and environmental, health & safety.

Con Edison has a well established program that identifies, prioritizes, secures funding, and manages research, development and demonstration (R&D) projects. R&D is particularly important to Con Edison because no other gas utility faces the same level of customer density and underground utility congestion. Con Edison's average customer density per city block is substantially higher than that of most other utilities, resulting in higher cost of more customer shut-offs in order to maintain a section of main. Utility congestion under the streets is also the highest of any gas utility in this country making the cost and complexity of maintaining our systems higher than other gas utilities. Utilities alongside Con Edison gas mains include:

- Underground electric lines
- Steam lines
- Water lines
- Telecommunication lines
- Sewer piping
- Subway infrastructure
- Vehicular infrastructure
- Old trolley tracks and yolks
- Various auxiliaries that support traffic lighting, street lighting, and fire department pull boxes

New York City codes further complicate matters by not allowing us to install plastic pipe within 35 feet of a steam main. Working with steel mains and steel services is much more expensive in terms of the material, the installation, and its maintenance.

Also, NYC's Department of Transportation (DOT) has very restrictive requirements for street access with limited timeframes available for maintenance work (usually at night), which is further complicated by night time noise restrictions. Con Edison also faces the usual other gas T&D challenges, including third party damage, gas interchangeability issues, graphitic corrosion, and a host of environmental, health and safety issues.

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[49] Please refer to the Appendix H: New Technology Development Outlook for additional detail on Con Edison's Gas Research & Development program.

[50] Operations Technology Development (OTD) is a not-for-profit established in May 2003 to facilitate voluntarily funded, collaborative research on issues relating to gas operations and infrastructure, with a focus on reducing operating costs, enhancing safety, and increasing the operating efficiency of natural gas distribution systems. OTD's membership has grown to 18 members, representing utilities throughout the United States.

Hence, it is important to develop new technologies, processes and methodologies (business solutions) that require less trenching and support easier location of and access to the sections of main that we need to inspect and repair.

The objective of the R&D program is to match the needs of Company Operations with opportunities for new business solutions in the form of technologies, processes and methodologies to accomplish the following objectives:

- Reduce or minimize operation and maintenance costs with new technologies or alternative processes and methodologies
- Maintain or enhance the reliability of gas service to customers
- Enhance the safety and well being of our employees, customers, and the overall public
- Enhance environmental excellence

The R&D group works closely with Gas Operations employees to identify areas in which there is a need for new technologies, processes, and methodologies. Meetings are conducted with every department to explore new ideas, establish priorities, and discuss the status of existing projects. The R&D group conducts “road shows” where they present select projects to first-line operations managers to educate them on newly emerging products and methods and to solicit ideas for further improvement on their operations. They also conduct periodic brainstorming sessions and technology fairs to discuss problems with various gas departments, solicit ideas for new projects, and showcase new technologies. This results in a highly customer-driven process, where the customer is the Gas Operations function.

The R&D group also maintains regular contact with other utilities, gas trade groups, universities and technology developers as a further source for new ideas, including:

- Gas Technology Institute (GTI)
- NYSEARCH
- Operations Technology Development (OTD)
- Sustained Membership Program (SMP)
- American Gas Association (AGA)
- American Gas Foundation (AGF)
- Northeast Gas Association
- Water Research Foundation (formerly AWWARF)
- Various utilities including National Grid, Gaz de France and Tokyo Gas
- Federal government organizations such as DOT – Pipeline and Hazardous Materials Safety Administration (DOT PHMSA) and the Department of Energy (DOE)
- International Gas Research Committee
- National and international private organizations

Once a potential new business solution is identified, a user/sponsor is obtained within Gas Operations to assist in preparing a cost/benefit justification for the appropriate R&D project. In all cases, an analysis of candidate projects is made, with potential advantages reviewed against financial and human resources required for successful development, to arrive at the right amount of investment. A number of factors is considered in the evaluation of a candidate project, including:

- Potential Benefits
- Estimated cost
- Probability of success
- Likelihood of commercialization and deployment

While emphasis is placed on those projects with the possibility of near-term and mid-term benefits, long-term development initiatives (greater than five years) are also addressed where the potential benefits warrant. This overall approach facilitates a consistent comparison of the various candidate solutions and their associated projects and aids in project selection and prioritization.

Once a project is selected and launched, the user/ sponsor Gas Department provides support as the project progresses through its development phases through to field demonstration. The user/ sponsor organization implements the product if it is successfully developed and demonstrated. Most projects are conducted in phases to minimize investment in projects which, as they develop, appear less likely to be successful. R&D projects are staffed and managed in one of two ways:

1. Internal to Con Edison: R&D projects that are internally staffed and managed within Con Edison. Once a project is selected and launched internally, the user/sponsor Gas Department provides support as the project progresses through its development phases through to field demonstration. The user/sponsor organization then adopts the solution if it is successfully developed, demonstrated, and commercialized.

2. Collaborative: R&D projects that are conducted in collaboration with other organizations such as those mentioned above. These projects follow a similar process to that described above in the prioritization, funding and management of projects, although it is usually the case that another organization develops the cost/ benefit analysis, provides the majority of the staffing, and manages the project. The R&D group – in conjunction with the user/ sponsor – monitors the project progress, acts in an advisory role in addressing issues as they emerge, and participates in the work as appropriate.

Con Edison's Gas R&D process has resulted in (and continues to result in) a number of important successes Table 5-1 lists examples of these successes. Given what was stated above about the unique circumstances of our service territory, those technologies that reduce the amount of trenching required ("trenchless technologies") are of particularly high value as noted in Table 5-1, which shows R&D projects that we have completed or are near completion. The stages of adoption indicate the maturity of the technology in the market. Our completed projects are those that have at least passed the demonstration phase of technology development and are at various stages of deployment within our gas system.

1. Demonstration: the technology has been nearly fully developed and its viability is being tested in our system
2. Commercialization: the technology is available for deployment
3. Early Deployment: we have begun to implement the technology in certain areas of our system

Table 5-1: Recently Completed and Nearly Completed R&D Projects

PROJECT	ANTICIPATED BENEFITS	STAGE OF ADOPTION
Large cast iron joint sealing robot ("CISBOT") for 16" to 36" Cast Iron mains	Device that goes in the pipe and can seal up to 40 cast iron joints from one small excavation	Demonstration
EXPLORER II robot for 6" & 8" and TIGRE robot for 20" to 26" live gas condition assessment for unpiggable lines	Performs condition assessment of unpiggable piping with minimal trenching.	Demonstration
Non-Interruptible Meter Changeout (NIMCO) DBS - Large Diameter Tool Development	Enables customer meter change-outs without interruptions and without methane emissions	Demonstration
Ultra Violet ("UV") light train to rapidly cure Cured In Place Linings ("CIPLs)	Allows for complete curing of a liner that has been used to rehabilitate a gas main in 8 hours and reduces outage time for the customers by more than 50%. This trenchless technology process developed through OTD can be used in high customer density areas where previously only open trenching with 24 hour customer shut offs were required	Demonstration
Thermal Spray Coating	Provide the best coating performance so far for outdoor piping applications. This coating process developed by GTI will greatly reduce the frequency of recoating outdoor equipment subjected to corrosion, such as meter stations	Demonstration
Special tools for the no-blow deployment of plugs, stoppers and standpipes in 3", 4", 6", 8" and 12" diameter metallic low pressure mains	Allow the worker to safely replace service tees or valves without release of methane to the atmosphere. This will improve worker and pedestrian safety as well as reduce greenhouse gas by reducing methane emissions	Demonstration
New needle bars for bar holing, a new, more improved excavation technology	Improves efficiency and safety	Demonstration
Live gas main inspection and repair device (GRISLEE)	Used for condition assessment and repairs of steel gas mains	Commercialization
4", 6" & 8" modified **ConSplit** machines, which are pipe-splitting technology that allow for pulling a new larger plastic or steel service through an existing main by splitting/ breaking the existing main	Reduced cost of not having to trench, remove and replace cast iron main	Early deployment
New mule lifting device	Reduces soft tissue injuries	Early deployment
New State-of-the-Art Intrinsically-Safe phones	Improves safety to emergency responders communicating by phone in hazardous areas.	Early deployment
GreenPatch environmentally-friendly asphalt paving material	Environmentally friendly asphalt paving material that makes it safer to handle because it eliminates toxins in playground and street repairs. It also reduces the possibility of dispersing toxins into ground water	Early deployment
No-dig anode installation method	Prevents main corrosion on an existing steel main or service without the need for excavation. This method has demonstrated cost savings due to reduction in excavations as well as preventing corrosion.	Early deployment
Application of high temperature epoxy spray	Enables rehabilitation of mains near steam mains and avoids replacement of the main and associated excavation costs	Early deployment
GasFindIR Infrared Camera Evaluation for detection and location of natural gas leaks (plumes)	Improve emergency response	Early deployment

In addition to the completed projects listed above, we have an ongoing portfolio of R&D projects that we are conducting. The current R&D portfolio of projects is in various stages of development from basic research to demonstration. We have detailed our R&D portfolio in Appendix H: New Technology Development Outlook.

5.4 KEY GAS INFRASTRUCTURE PLAN INITIATIVES

Using the infrastructure plan development, prioritization, and management strategies described in Section 5.2 and the new demand sources (e.g., oil conversions) discussed in Chapter 3, we developed a 20-year gas infrastructure plan based on existing distribution and transmission master plans. This section describes some key gas infrastructure plan projects and programs. These initiatives represent examples of how the processes described in Section 5.2 come together in actual initiatives.

5.4.1 Bronx-White Plains Transmission Project

The Bronx Border to White Plains transmission project in Westchester was originally planned to be a multi-year project to install approximately 54,000 feet of new 36-inch steel transmission pressure main looping the existing 24-inch steel transmission pressure main from the Westchester/Bronx Line to the Tennessee White Plains gate station outlet. The 24-inch transmission main is the oldest in our system, and is constructed of lower strength steel joined with mechanical couplings. The new main will replace the lower ductility pipe with transmission pipe that is made of steel that is stronger and more resilient.

This project was intended to achieve several key outcomes:

- Deliver gas from the Bronx further into Westchester, thereby withstanding the loss of the White Plains gate station, diversifying the supply and reducing dependency on the critical White Plains gate station and the associated Gulf Coast supply
- Help offset the loss of the northern Manhattan station
- Allow the future downgrade of the MAOP of the existing 24-inch line to operate at less than 20% SMYS (downgrade would be on t he older brittle pipe that may rupture before it leaks)

The original estimated expenditure for this project was approximately $350 million over the next 15 years. After reexamining design and cost options, revised estimates now show a total expense of $200 million. We are currently exploring additional alternate plans for this project that may allow us to further reduce the cost of this project while achieving the same benefits. Some of the cost reduction options under consideration are:

- Leverage the Bronx and Westchester high-pressure distribution system to reduce the need to upsize the transmission main
- Upgrade the 20-inch transmission main on the east side of the Bronx, from 245 psig to 350 psig. This includes installing a new crossing at the Bronx River and a regulator station at the Bronx - Westchester Border. This will enable more gas to be sent north and offset some of the supply in the event that the White Plains gate station is lost.
- Eliminate 36-inch loop, thereby eliminating significant cost of digging in rock to install new loop. Alternatively, we would examine the feasibility of installing another gate station to enable us to withstand the loss of the White Plains gate station and GR-199, which feeds gas northward.
- Replace sections of the Bronx - Border to White Plains 24-inch line with larger pipe. This effort may include the use of new technologies, such as installing new transmission-quality liner currently in use in Germany.

5.4.2 Distribution Main Replacement Program

The Main Replacement Program involves condition-based replacement of cast iron and unprotected steel distribution mains with plastic pipe to reduce leaks and maintain system integrity. As mentioned above, we have a holistic approach to our system planning. An example of this is the integration of the Distribution Integrity Management Program (DIMP) requirements with the Main Replacement Program. To help reduce risk and avoid incidents, we have built a pipe selection process that addresses risk and prioritization for the replacement of approximately 60% of the distribution assets (the remaining 40% is already plastic piping). This and other planning efforts come together as an integrated capital program to address an aging system, provide for load growth, and has consistently received support from our regulating authorities.

Of all the New York State utilities, Con Edison has the highest number of leaks reports issued annually. Leak repairs are a major component of our overall O&M costs, totaling approximately $25 million per year. In recent years, main replacement has become a stronger focus in our capital expenditure program, with a significant improvement in system integrity as a result. Our guidelines for the types of main requiring replacement are as follows:

- A quantity of small diameter bare steel and unprotected coated steel mains shall be replaced each year to maintain the current level of incoming leak reduction
- Cast iron distribution mains shall be replaced when criteria for interference and criteria for replacement and retirement are met
- All intermediate pressure cast iron gas mains 8" and smaller shall be replaced or downgraded

The level of main replacement is generally mandated by our regulators during each rate case agreement. In 2008, the Department of Public Service engaged the Liberty Consulting Group to conduct an in-depth audit of Con Edison's management process across its business units. One of the recommendations from this audit was for the gas business to evaluate and optimize its existing Main Replacement Program. In response to this recommendation, Con Edison retained the services of an external consultant (ZEI Inc) to conduct an investigative study[51] to:

- Evaluate the existing and future condition of our gas infrastructure by utilizing existing soil sample data from previous ZEI study conducted in 1988, recent repair data, current material inventory data, and cast iron samples provided
- Determine the appropriate rate of main replacement to ensure consistent system improvement
- Evaluate the company's cast iron and unprotected steel gas distribution main system and establish the required annual replacement levels to ensure a safe and reliable gas system

The overall objective of the study was to establish the required annual replacement levels for the Company's cast iron and unprotected steel gas mains to maintain system integrity. ZEI conducted detailed analyses on our system and determined the point of diminishing returns for main replacement. The study concluded that:

- Leak reduction rates remain constant at 35 miles of main replacement annually. This is the minimal level of main replacement required to maintain our system integrity. The optimal level of benefits is achieved with 50 miles of replacement.
- Leak reduction rates increase as the rate of annual main replacement increases to 50 miles per year but the incremental, quantifiable benefits are negligible from 35 to 50 miles of main. Figure 5-6 shows that, beyond 50 miles of annual replacement (20 miles of unprotected steel and 30 miles of cast iron main replacement), we would start to see diminishing improvement in leak reduction rates.

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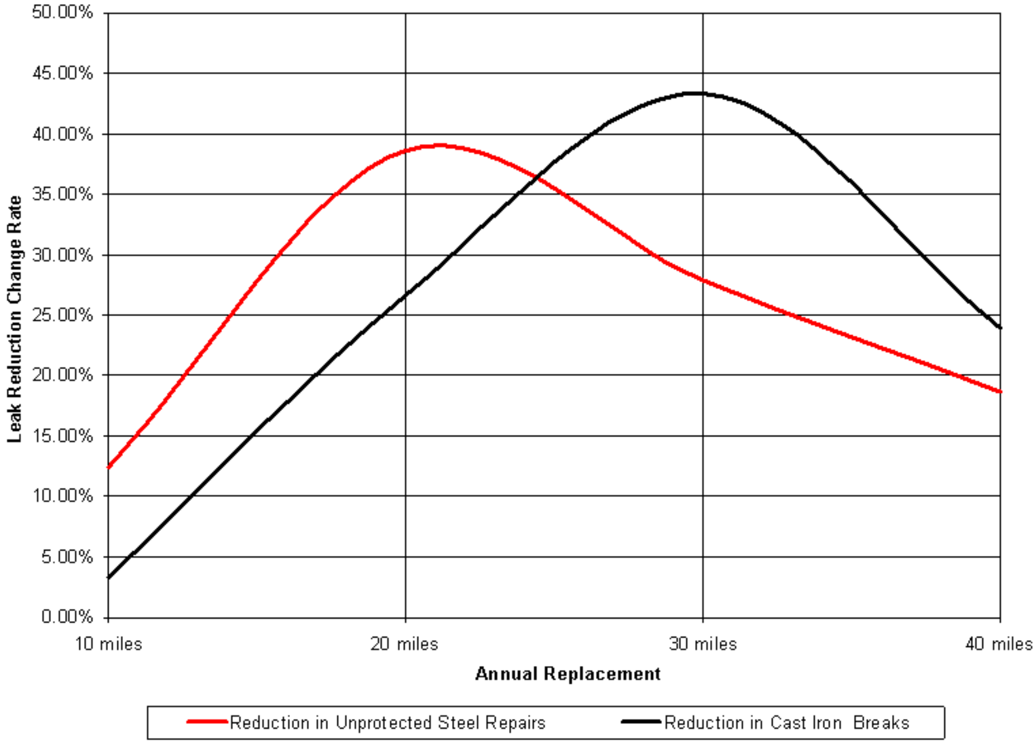
[51] Please refer to the Appendix A: Gas Main Replacement Study for additional details regarding this study and its findings.

Figure 5-6: Main Replacement Impact on Leak Reduction Rates



In 2008 and 2009, Con Edison replaced 55 miles of main annually – 45 miles under our main replacement program and 10 miles during interference projects. For the GLRP Plan Case, we plan to replace an average of 50 miles of main per year – 40 miles under the main replacement program and a continued 10 miles of interference-related replacement. The 40 miles of main replaced annually under this program would consist of 20 miles of cast iron main, 15 miles of steel main, and 5 miles of couplings on small diameter high pressure steel mains. This program would allow us to avoid an estimated 1,207 leak repairs and 23 main breaks annually resulting in annualized O&M savings of over $5 million through 2035. We expect this program to cost us approximately $85 million annually.

In addition to the financial benefits of leak avoidance, main replacement has the additional benefits of avoiding:

- The potential loss of life, injury, and/or property damage,
- Negative public reaction/public perception and associated public relations costs,
- Litigation damages not covered by insurance,
- Insurance deductibles and increases in insurance premiums

To prioritize where we replace main on our distribution system, we use a gas mains replacement (MRP) statistical computer program that considers main conditions, risk, probability, and economic criteria. The MRP estimates the likelihood of failure of individual main segments from historical data, including main size, diameter, age, material, and operating pressure, and uses several prioritization criteria (throughput, localized repair history, proximity to schools, targeted replacement age, and soil stability) to identify sections of main that require replacement.

5.4.3 Supply Mains Program

In the distribution master plan, we have described our approach to the replacement of larger diameter supply mains. These supply mains are the backbone systems which transport gas from the transmission mains to the distribution system. Our master plan incorporates the replacements due to pipe constraints and pipe integrity issues. Overlapping these criteria provide two justification criteria for replacing. It therefore helps provide supply for customer's growth and help reduces leakage because these sections have integrity issues.

5.4.4 Winter Load Relief

Winter Load Relief is an ongoing annual program that involves the installation and replacement of gas mains for system reinforcement in areas where pressures do not meet the PSC system pressure codes and our current design criteria on a design hour based on the prior winter's system performance. Without this program, the system low-points and downstream regulator inlet pressures identified could fall below the requirements and possibly result in customer outages on the coldest winter days. Because system reinforcement is such a costly task, when performing Winter Load Relief, we seek to maximize system benefits with the least amount of reinforcement.

5.4.5 Meter Replacement

The PSC requires gas meters and related devices to conform to specific accuracy standards; meters that fail to meet these standards are removed and either retired or refurbished. Gas meters are used for new business, meter replacements to comply with PSC requirements, and to replace meters for cause. Approximately 75 % of the meter inventory is maintained through new meter purchases and the remainder from refurbished meters.

The level of meter replacement we are mandated to perform represents a significant capital and operational cost, and an inconvenience to our customers. To reduce meter replacement costs and service interruptions in the future, we will explore new ways to replace meters without causing interrupting service and without the need to gain access to customer premises.

5.4.6 New Business-Related Investments

Looking beyond 2010, to support peak-volume traditional growth in the Plan Case, we will need to construct two new distribution regulator stations per year to accommodate demand across the distribution system. In addition to these regulator stations, we would need to construct associated pipes and services to serve new customers; we would also need to perform necessary infrastructure upgrades and reinforcements associated with new customer growth.

In addition to ongoing investments, for all three cases, we have also projected expected investments required to support incremental growth (#4/#6 oil conversions, distributed generation, natural gas vehicles, steam to gas conversions)[52] beyond traditional new business. For this additional growth, we would need to install new regulator stations when and where load concentrations occur, and would also incur the cost of connecting incremental new customers as necessary.

[52] Sources of incremental growth and estimates for Plan, Low, and High Cases can be found in Chapter 3: Customer Needs.

5.4.7 Increased Adoption of New Technologies

The R&D group has completed or is in the process of completing a number of internal or collaborative successful R&D projects that are in various stages of adoption by the Gas Operations areas. The most impressive recent successes have involved trenchless technologies that collectively allow the Company to repair or rehabilitate gas mains without the need to excavate and create an open trench. These technologies not only reduce the need to excavate (along with the associated cost savings), but they also reduce traffic congestion and combustion emissions from trenching equipment and utility vehicles; they improve safety for pedestrians and workers; and they reduce noise due to excavation activities.

Illustrative examples on recent trenchless technology successes include:

- Development of a No-Dig Anode Installation Method to install a 17 lb. anode, which prevents main corrosion on an existing steel main or service without the need for excavation. The process utilizes a drill, 5"-diameter hole saw and mini-vacuum excavation to make a hole through an existing Cathodic Protection Test Station and into the adjacent soil for placement of the new anode. This method has demonstrated cost savings due to reduction in excavations and in corrosion prevention, thus reducing leak repairs.
- Field demonstration of an Ultra Violet (“UV”) light train to rapidly cure Cured In Place Linings (CIPLs) used to rehabilitate piping by lining steel or cast iron mains. This process allows for complete curing of the liner in 8 hours and reduces the outage time for the customers by more than 50%. This trenchless technology process can be used in high customer density areas where previously only open trenching with 24 hour customer shut offs was the alternative.
- Early implementation of ConSplit, a trenchless technology that pulls a new plastic pipe through an existing steel pipe that is burst with a splitting head and expanded to allow the larger diameter new pipe to be inserted. This minimizes the displacement of soil and minimizes ground movement. This is currently being deployed in Westchester, where there are generally fewer foreign facilities that could potentially be impacted, to replace 4”, 6” and 8” diameter cast iron pipes.

Other recent successful R&D projects include:

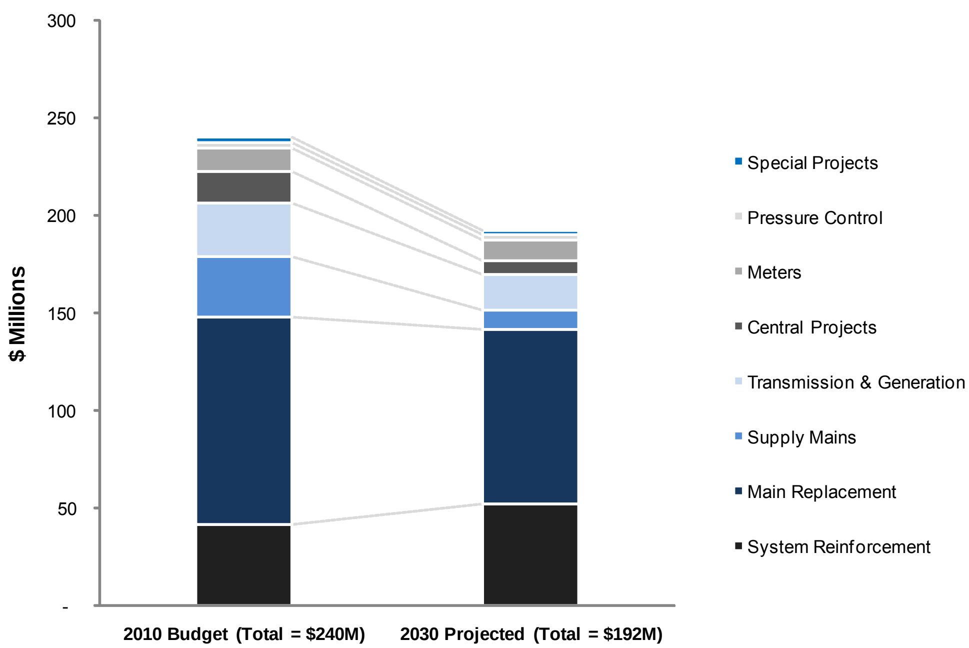
- Demonstrated a field coating application using thermal spray technology on a meter station. The evaluation confirmed that thermal sprays with primers provide the best coating performance so far for outdoor piping applications. This coating process will greatly reduce the frequency of recoating outdoor equipment subjected to corrosion, such as meter stations.
- Completed development of special tools for the no-blow deployment of plugs, stoppers and standpipes in 3”, 4”, 6”, 8” and 12” diameter metallic low pressure mains. These tools will allow the worker to safely replace service tees or valves without release of methane to the atmosphere. This will improve worker and pedestrian safety as well as reduce greenhouse gas emissions.
- Demonstrated the application of high temperature epoxy spray to rehabilitate leaking gas main. The demonstration was applied to 220 feet of 16” diameter corroded low pressure gas main in close proximity to a steam main where standard lining systems could not be used. This avoided replacement of the main and associated excavation costs. The process was developed by Pipeline Integrity Management, Inc. and has been used in the water and sewer industry, but less so in the gas industry;

Gas Operations has historically incorporated successful R&D projects into our work processes and project designs. For example, trenchless technologies like the roll down, CISBOT[53], and ConSplit[54] are routinely evaluated as alternatives approaches to main replacement. As discussed previously in Chapter 2, Con Edison also pioneered smart controls like Grid Boss which is a design preference for our regulator stations. We are committed to continuing to incorporate new technologies into our work. Our planned capital investments reflect approximately $8 million in savings over the plan period to account for productivity and technology improvements.

5.5 CAPITAL INVESTMENT PROJECTIONS (PLAN CASE)

Each of the initiatives discussed above was designed to help us achieve our goals to provide our customers with the safe and reliable performance they have come to expect at a reasonable cost. By 2030, with the initiatives and approaches described in Section 5.3, we plan to have achieved a 20% reduction in infrastructure investments associated with maintenance and new business compared to 2010 levels.

Figure 5-7: Optimization of Ongoing Maintenance and New Business-Related Infrastructure Investments (Plan Case)



We expect to realize infrastructure savings from the following cost management efforts:

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53 CISBOT is a robotic cast iron joint sealing robot that seals cast iron pipe joints in live gas mains. Working inside live 16" to 36" live low pressure gas mains, CISBOT can seal up to 40 joints through one small access pit.

54 A ConSplit tool is launched into an existing pipe at an entry pit and pulled through the pipeline to an exit pit. The old pipe is split open and expanded out into the soil, allowing a polyethylene pipe to be pulled into the enlarged hole immediately behind the ConSplit tool

- In addition to the MRP, which targets our distribution mains, our **Supply Main program** also involves replacement of cast iron and unprotected steel mains in our backbone system. For both of these programs, Con Edison has incorporated productivity and technology-related changes worth $8 million. Where possible, Con Edison intends to use trenchless technologies (CISBOT, ConSplit, etc.) to reduce the costs of main replacement. We also will increasingly use less invasive technologies to rehabilitate mains instead of replacing them thereby managing our assets more efficiently.
- We have also applied a critical eye to our proposed ongoing **transmission investments**. As a result of the approval of a new gate station in Lower Manhattan (expected to come online in 2014), we have deferred $75 million for an expensive new transmission main from **Astoria to Ravenswood**.
- Our ongoing capital investments build in **productivity and technology-related savings** across all categories, including system reinforcements which represent another 10-15% of our current investments.
- We have also agreed to a **lower rate of meter replacements** with the PSC which will realize some savings. We would like to extend these meter-related savings by giving residential cooking gas customers a "flat-billing" option. Flat-billing allows us to charge cooking gas customers a flat rate for gas usage, eliminating the need to read, maintain, and replace meters in individual units in multi-family dwellings.

We intend to bring new customers on to the system as efficiently as possible. Toward this end, we plan to lower the cost to reinforce the system by installing regulators where possible instead of installing additional pipe in the ground. We further plan to actively pursue the "clustering" of conversion candidates whereby we encourage customers in close geographic proximity to convert to natural gas at the same time to minimize excavation and paving, reinforcement, conversion, and connection costs.

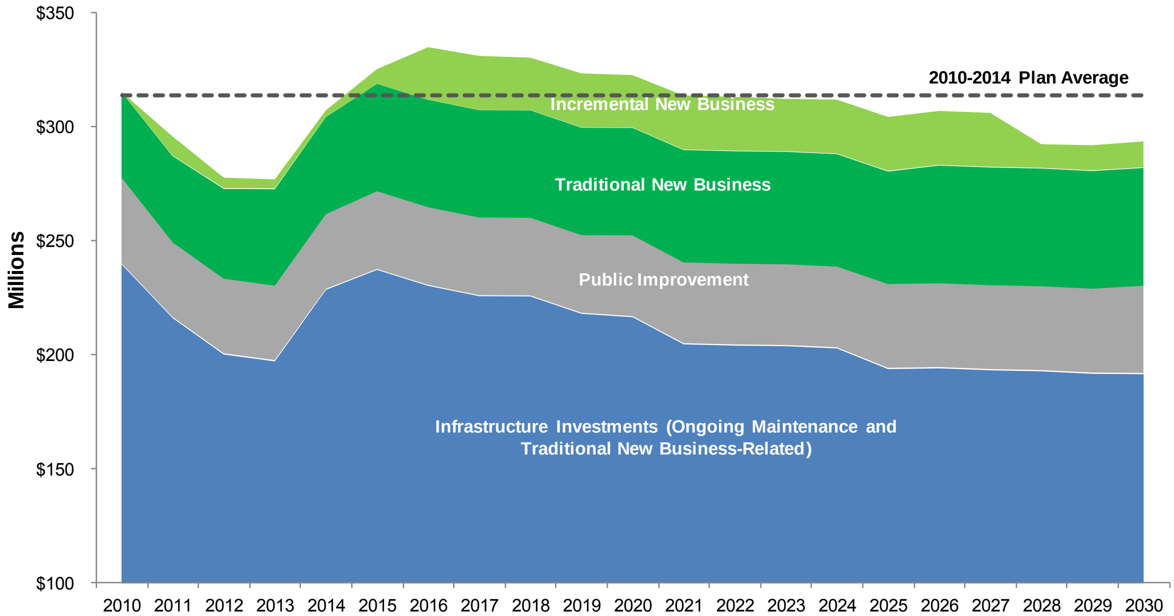
As with all of our work, we will endeavor to realize productivity and technology-related gains wherever we can, including public improvement projects. We often combine main replacement efforts during a public improvement project. Our plan accounts for an additional 10 miles of distribution main replacement during public improvement projects, in addition to the 40 miles accounted for in our main replacement program. We also collaborate with the other entities involved to benefit from common project elements (for example, a common trench) to reduce costs and disruption.

The Company's overall capital investment profile is presented in Figure 5-8. At our current investment trajectory, we would be investing approximately $313 million annually for public improvements, infrastructure maintenance, and traditional new business. This equates to a cumulative investment of $6.5 billion during the plan period.

Offsetting our significant reductions in infrastructure maintenance expenditures, we expect to have experienced about 38% growth in capital investments for connecting traditional new business. Public Improvement investments levels are expected to remain approximately flat during the plan period. Overall, we expect to save $428 million cumulatively (excluding incremental new business growth) from our current budget levels.

With some of the incremental demand we discussed in Chapter 3, we expect to incur additional cumulative capital investments of $342 million. Despite increases in traditional and incremental demand, we still expect our total capital investments to average $309 million annually in 2010 dollars, which would result in total cumulative savings of $86 million during the plan period. The combination of flat capital expenditures and increased sales will help reduce the upward pressure for rate cases and customer bill impacts, as discussed in the next chapter, Chapter 6.

Figure 5-8. Gas Capital Investment Expenditures (2010-2030, Plan Case)



5.6 PLAN PERFORMANCE

To support the development of the plan we created a capital investment database and analytical model to evaluate the impact of programs and initiatives. Capital investment projects were evaluated for impacts on performance, risk, and cost characteristics of the gas system. This analysis is consistent with the Company's asset management practices, annual capital expenditure prioritization process, and our focus on enterprise risk management.

Our analytical model has helped us estimate the level of benefits we expect to see from our capital investments. We have projected the Operations and Maintenance (O&M) savings, Incoming Leak Reduction (as an indicator of system integrity) and the avoided Methane Emissions we expect to achieve through investing in our system infrastructure. We are also in the process of developing a system-wide measure of gas service reliability, which we plan to incorporate into the analytical model. The reliability measure will incorporate factors such as pressure maintenance and probability of customer outages.

Investments to upgrade and enhance the system will reduce future operations and maintenance expenditures. For example, replacing small diameter, cast iron pipes will reduce the operations and maintenance costs required to repair leaks in those parts of the system by about $17 million cumulatively during the plan period. From 2010 to 2030, Con Edison expects to realize a total of roughly $46 million in operations and maintenance savings or approximately 2.5% of gas transmission and distribution operation and maintenance costs. Figure 5-9 shows the expected cost savings from the avoidance of operational and maintenance costs associated with system leaks and equipment failures. We expect that our planned level of capital investments will result in average savings of $2.2 million per year.

Figure 5-9. Gas O&M Savings, 2010-2030 (Plan Case)

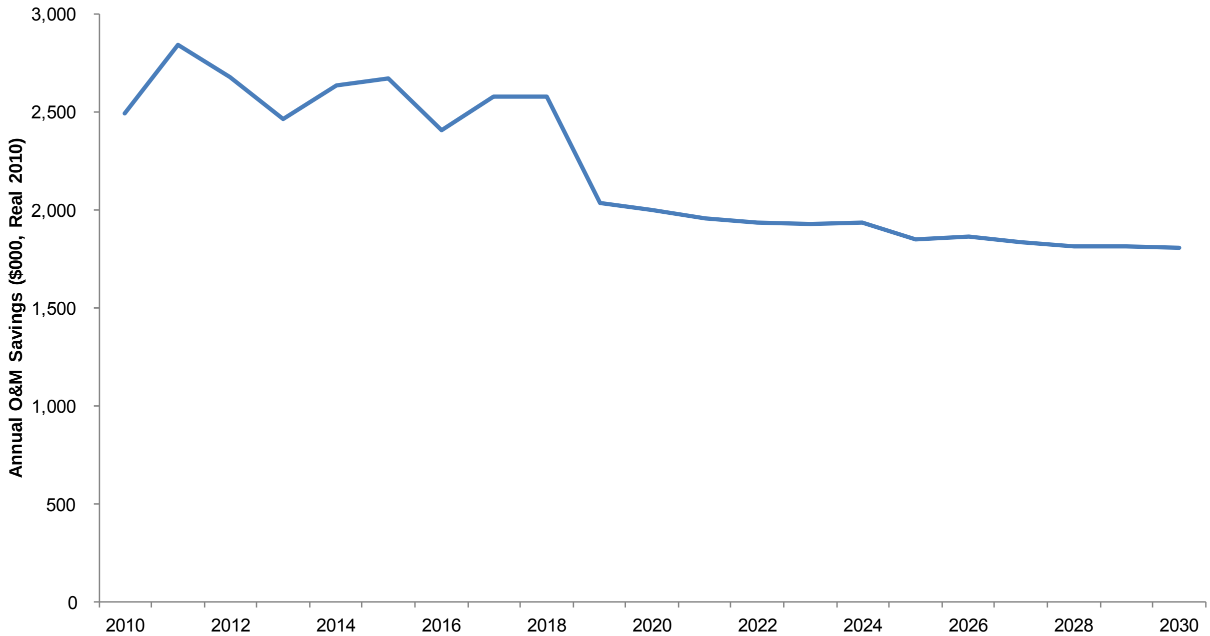


Figure 5-10 shows our expected incoming leak reduction as a result of our planned capital expenditures to replace and refurbish leak-prone mains and services. We anticipate an average annual reduction of about 180 incoming leaks.

Figure 5-10. System Integrity and Leak Management, 2010-2030 (Plan Case)

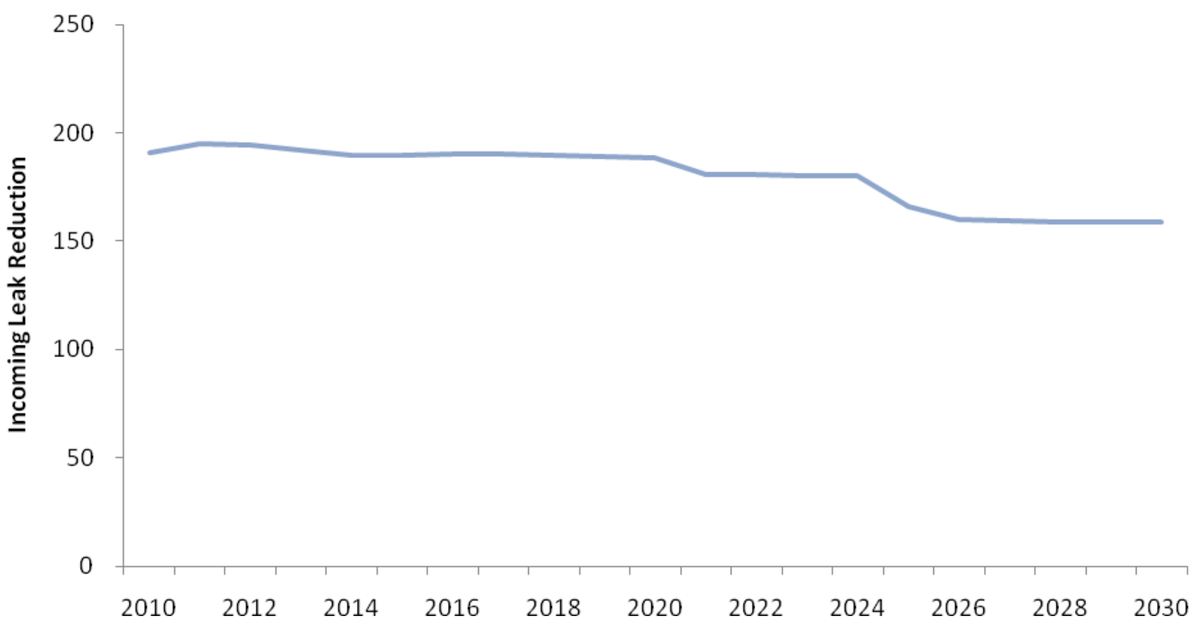
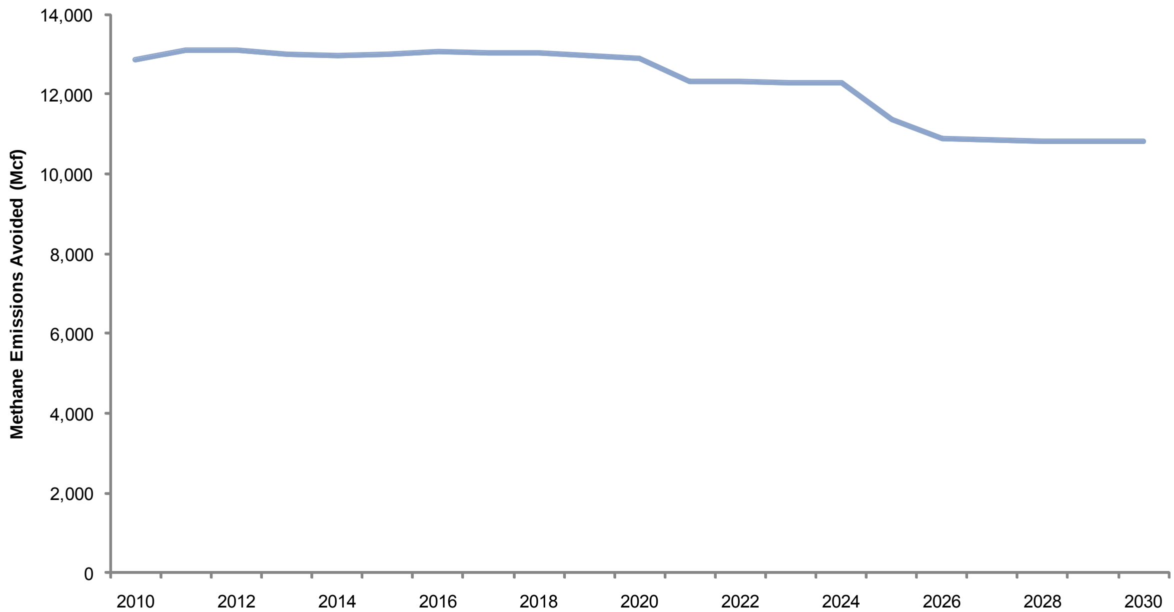


Figure 5-11 indicates that we expect to reduce our methane emissions due to leaks by about 12,300 Mcf per year.

Figure 5-11: Environmental Performance, 2010-2030 (Plan Case)



5.7 SUMMARY

5.7.1 Summary Infrastructure Plan and Capital Expenditures

Con Edison's Gas Operations has historically developed detailed 10-year infrastructure plans. For the Gas Long Range Plan, these plans were modified to account for new sources of demand and were extended out to twenty years. The existing plans were also revised for new project approaches, technologies, and performance levels.

The customer is our source for expected load needs as well as reliability and safety standards. Our System Design Criteria are developed to manage the infrastructure to the expected performance levels. The combination of the expected customer demand and the system design criteria drives our infrastructure requirements. These infrastructure requirements are put through rigorous iteration of tailored system design, asset management practices, capital estimations, and ultimately a project prioritization to produce an Infrastructure Plan.

The programs outlined in our infrastructure plan help Con Edison manage a large, complex, logistically challenging, underground gas transmission and distribution infrastructure designed to the rigorous reliability and safety standards that our customers have come to expect from us. At a high level, our current infrastructure initiatives represent three broad activities:

1. **Maintaining and reinforcing our infrastructure**. Infrastructure investments in this category are designed to maintain pressures for system reliability, to reduce leaks to maintain system integrity and safety, and to accommodate new load on the system. The programs in this category represent two types of investments:

- Ongoing maintenance required to replace or repair system components

- New business-related investments designed to reinforce or upgrade the system to accommodate new load

  Assets managed under this category include pipes, regulator stations, valves, couplings, etc. In 2010, this activity represents 76% of our investments.

2. **Connecting new customers to our system**. Expenditures in this category represent the cost of installing new services or pipes to connecting new customers to our system. In 2010, this activity is expected to represent 12% of our investments.
3. **Undertaking Public Improvement projects**. When a municipality decides to perform work under its streets, that work is often complicated by the presence of our facilities. Under those circumstances, the Company has the legal obligation to remove or otherwise protect its facilities to accommodate the municipal activity at our—and therefore our customers'—own cost. In 2010, this activity is expected to represent 12% of our investments.

At our current investment trajectory, we would be investing approximately $313 million annually for public improvements, infrastructure maintenance, and traditional new business. This equates to a cumulative investment of $6.5 billion during the plan period.

By 2030, with the initiatives and approaches described in Section 5.3, we plan to have achieved a 20% reduction in infrastructure maintenance investments compared to 2010 levels.

Offsetting our significant reductions in infrastructure maintenance expenditures, we expect to have experienced about 38% growth in capital investments for traditional new business which we are required to serve. Public Improvement investments levels are expected to remain approximately flat during the plan period. Overall, we expect to save $428 million cumulatively (excluding incremental new business growth) from our current budget levels.

With some of the incremental demand we discussed in Chapter 3, we expect to incur additional cumulative capital investments of $342 million. Despite increases in traditional and incremental demand, we still expect our total capital investments to average $309 million annually in 2010 dollars, which would result in total cumulative savings of $86 million during the plan period.

5.7.2 Signposts

This infrastructure plan assumes declining costs for baseline investments based on stable, flat input prices for labor and materials. Further, the demand projections are uncertain, and the plan assumes productivity improvements from as yet unknown technologies. Con Edison will actively monitor these signposts and act quickly if these signs are invalidated by the market.

- **Input Prices:** The current plan does not account for any unusual spikes in the costs of our labor or commodity inputs. High oil prices, for example, could affect the costs of manufacturing our materials and components, while healthcare reform could adversely impact our payroll costs.
- **Effect of Climate Change on Infrastructure and Operations**: A recent climate change study that was conducted for NYSEARCH member utilities covered the effect of climate change during the periods 2005-2025 and potential impacts on LDC infrastructures. A few of the findings are as follows:

  1. Hotter summers may lead to more demand for power generation which would increase demand for natural gas. This could impact capacity of transmission lines.

2. Increased freeze/thaw cycles which could affect cast iron piping and couplings. Con Edison's Gas Engineering and R&D are currently conducting a study on the effect of freeze/thaw cycles in Queens to discover the cause of leaky couplings in that area. These findings together with the subject study's conclusions may be useful for predicting future impacts to the distribution system.

3. Increased frequency of rain will cause flooding. Con Edison's Gas Engineering and R&D are working on a design for a vent line protector for households in flood prone areas. More frequent flooding of regulator vaults may need to be addressed in the future.

- **Regulatory Uncertainties**: Pipeline integrity and distribution integrity management, as they stand today, are accounted for in our capital budget and in our R&D projects. Future changes to this regulation or other similar regulation could add significant costs to our capital expenditures.
- **Gas quality/interchangeability**: There has been considerable debate in the industry in the last decade about the interchangeability of different gas sources (Canadian gas, LNG, biogas, etc.) in pipelines, distribution infrastructure, and end-use applications. Lingering concerns around this issue, particularly related to LNG and biogas will continue to be evaluated by Con Edison.
- **Technology Uncertainties**: Our plan builds in productivity gains from R&D and new technologies. If these technologies do not materialize, our capital budget could be significantly impacted. For example, we are currently demonstrating a corrosion monitoring system in cased piping environments which would help meet new federal DOT PHMSA regulations taking effect in 2012 that require that distribution gas mains be periodically assessed for integrity management. If this or a similar technology is not feasible, Con Edison's only alternative is to excavate cased piping to check for corrosion.
- **Demand Uncertainties**: Natural gas infrastructure planning and enhancements are based on firm gas demand. Factors like the anticipated competitiveness of natural gas compared to oil or increased air pollution regulation may encourage interruptible customers to become increasingly firm demand (for example, steam or electric generators). Such changes in customer mix could drive significant changes in infrastructure plans and costs.

6.0 ENHANCING CUSTOMER EXPERIENCE

6.1 OVERVIEW

Over the next twenty years, customer use of natural gas is expected to increase. This may result from a combination of economic growth, a greater perception of value, and increasing awareness of the role natural gas can play in terms of environmental improvement and domestic energy security. In this context, applications for direct use of gas may be more prevalent in this market, such as boiler conversion from oil, natural gas vehicles and efficient central and distributed generation of electricity. And in parallel, technology will continue to transform the nature of information exchange with customers and their 'beyond the meter' devices, and how consumers of all energy services interact with their suppliers.

Each of these factors will shape customer expectations of their service experience with Con Edison.

Understanding value is central to the customer experience. Over the next 20 years, on-going dialog on value will remain a critical piece of our customer interaction, and executing well on all aspects of service will enhance the perception. Providing new gas service to customers, helping them with new applications, and improving efficiency are important opportunities to demonstrate value.

Other aspects of the customer experience can be equally important. Greater overall usage will require continued system expansion and asset management programs. Construction and maintenance are visible activities in the communities we serve, and also require clear communication and management of expectations. Safety awareness and processes around these are fundamental to our service.

Less visible, but equally important are the challenges to information services – billing, communications, integration of field activities – and integrating, analyzing and securing more information from more devices. For an increasing number of customers, the dialog will be more information based – responding to their needs for information and preferences for a wider variety of personal and electronic interaction.

Enhancing the customer experience is one of the key strategic objectives outlined in this plan. We view the rapidly changing environment as a call to action to ensure that we are prepared to put systems in place to meet the challenges ahead, and in terms of delivering value, the entire plan is focused on that goal. We know customers do not desire rate increases and also have expectations of service commensurate with what they pay. This is a difficult balance to achieve, particularly given the diversity of the Con Edison customer base and the need to constantly maintain the gas delivery infrastructure. Nevertheless, it is one that the Company must successfully accomplish.

Customer needs are a critical factor in the design of our processes and systems and the training of our people. This will be evident in the following sections of this chapter of the plan.

First, we will summarize some recent customer research conducted to support this planning effort. Specifically, we performed the research to better understand our customers' perspectives on service, reliability, and the cost of heating and cooking fuels. Our findings from the research indicated that overall, customers value reliability, prefer that we are proactive with our investment programs rather than reactive, and understand that there are significant costs associated with maintaining a complex system that meets their expectations.

The research is not intended to be a once-and-for-all effort and we will conduct additional research on a continuing basis to ensure that we are aware of customers changing attitudes and needs. Next we will outline key improvements to the customer experience, and how they will be implemented over the 20 year timeframe. Monthly customer charges are an important consideration. In section 6.4 we present an analysis of the 20 year trajectory of gas bills based on the customer initiatives and all other infrastructure considerations discussed in this plan. Finally, we identify signposts that would lead to a re-examination of the strategy for enhancing the customer experience.

6.2 CUSTOMER PERSPECTIVES

The gas we provide affects the lives of our customers every day.

By volume, the vast majority of our interactions are with our residential and smaller commercial customers. Our customer service representatives handle approximately 60,000 gas-related calls every year. Based upon current and historical levels of interaction, we expect customers will continue to look to us as a primary contact in addressing their concerns. As customers select new gas appliances and applications, convert from heating oil usage to gas, and as customers investigate ways to reduce bills and use energy more efficiently, we expect an even broader range of questions in the future. Examples are noted below. Although none of these topics are truly 'new', improving our ability to address these concerns will result in a better customer experience, and in some cases, reduce company costs as well.

- Make energy choices among commodities (natural gas v. oil, propane, steam or electric)
- Decide among competing technologies (distributed generation v. direct applications, gas-fired v. renewable distributed generation, electric v. geothermal v. gas heating etc.)
- Energy conservation advice and participation in energy efficiency programs
- Cooking applications
- Heating applications, including conversion from oil to gas
- New service or service upgrade requests
- Gas leakage / safety reporting and inquiries
- Bill and credit payment and inquiries
- Outage notification and restoration inquiries
- Special services regarding elderly, blind, disabled, direct debit, electronic billing, voluntary time of use
- Community and government stakeholder issues

For our largest customers, we will continue to enhance our ability to identify and address issues in the context of their complex and often unique business situations.

In addition to direct contact from customers, we maintain active dialog with community-based organizations, civic leaders, advocacy groups, concerned citizens and public officials throughout the year in various forums. Our public affairs staff interacts with homeowners, renters, small business owners, and community leaders at numerous events, including community and employer events, environmental fairs and senior events. We conduct at least one annual conference for community-based and social service organizations, and we interact with countless numbers of elected officials and community boards. This type of interaction is expected continue throughout the course of the plan.

To benchmark our performance, and ensure we are aware of relevant concerns, we participate in JD Power surveys of residential and business customers for gas and electric utilities. In addition, we conduct surveys on customer satisfaction, as well as on our information and education programs to identify their effectiveness. We actively use the feedback we receive from each of these areas about customer concerns, information requirements, and expectations. We also utilize professional facilitators to conduct focus groups related to key topics such as bill design, reliability, and affordability.

6.2.1 Objectives for Customer Research to Inform the Plan

Success in defining and executing this plan is dependent on a strong partnership with our customers. Gathering feedback on key issues directly from our customers allowed us to build on our daily interactions with them and better understand customers' energy needs and priorities. **What we learned helped refine the objectives of this plan and confirmed our belief that customers value reliability, prefer that we are proactive with our investment programs rather than reactive, and understand that there are significant costs associated with maintaining a complex system that meets their expectations.**

We conducted qualitative research with the following groups of customers:

- Residential consumers (single family homeowners, condominium owners and renters)
- Small business customers (small commercial and small business owners)
- Landlords (overseeing fewer than 50 units)
- Large business customers (energy managers, property managers, and fleet managers)

For residential customers, we conducted focus groups in New York City, including participants from all gas service area boroughs; and in Westchester County; and across a range of ages and incomes.

Similar focus groups were conducted for small business customers in the gas service areas of New York City and Westchester County, including a diverse and representative set of business categories and business sizes.

Large business customers were contacted in a series of telephone interviews with top executives and managers.

In these focus groups and interviews, we sought input on a range of issues including:

- Perceptions of energy costs
- Current energy sources for heating, cooling and cooking
- Why they use these sources
- Satisfaction with current energy sources
- Current conservation efforts
- Interest in/use of distributed generation including gas, solar or renewable energy
- Perceptions of "energy of the future"

- Key priorities in choosing energy sources (cost, reliability, safety, environmental)
- Perceptions of heating oil
- Perceptions of natural gas (reliability, safety, and environmental friendliness)
- Perceptions of natural gas prices (volatility and predictability vs. oil)
- Expectations about future natural gas use (will use increase or decrease)
- Factors weighing on decisions to switch from oil to natural gas or vice versa
- Awareness of incentives to convert to natural gas
- Awareness and perceptions of natural gas infrastructure
- Support for new infrastructure projects, including support for rate increases to fund these projects

6.2.2 Outreach Results

The input from our customers helped us refine our plan. The research provided valuable insight on how customers view the nature of "affordable and safe gas service".

The Company recognizes that our customers have very high expectations of how we deliver gas and conduct business in our service territory. We need to understand how customers feel about us and do our best to address their needs. Every day, in our plans and operations, we balance what it takes to provide high reliability and safety with the need to keep costs down. While some customers are very skeptical, most in our focus groups understood there is a cost associated with maintaining the benefits of service they receive.

Overall, customers value reliability, prefer that we are proactive with our investment programs rather than reactive, and understand that there are significant costs associated with maintaining a complex system that meets their expectations. Customers did not universally support significant rate increases for "improvements" and were reluctant to pay more for fixing "problems that do not appear to exist". The general view, however, was that customers were willing to tolerate a small increase in rates as long as they were educated on what the maintenance and improvements expenditures were for.

The following points summarize comments from the residential, small business and landlord customers in our focus groups.

On attitudes, opinion, and image of natural gas

For the most part, natural gas is something people take for granted, in large measure because it is so convenient and so reliable that they never need to think about it. Gas distribution occurs out of sight. There are no gas lines above the City or gas trucks driving around. It's silent, out of sight, and therefore out of most New Yorker's minds. With Con Edison as the only distributor in this area, there isn't a lot of comparison shopping involved in getting natural gas delivery, so they don't have to think about the product or the details.

Natural gas itself does have a very strong image and is considered to be environmentally friendly, reliable, and efficient, especially in comparison to heating oil. It is by far the preferred source for cooking. However, customers noted some safety concerns, talking about the possibility of explosions. This was not a top-of-mind concern and does not appear to have much impact on decision-making. Overall, natural gas is seen as the fuel of the future – when people think about switching fuels, they think about converting *to* natural gas, not *from* it.

On support for rate increase for infrastructure maintenance and improvements

In general, customers favored a proactive approach to investment in infrastructure, agreeing that it was better to be proactive than wait for problems to arise. Beyond that, however, there were concerns around the need for rate increases to support "improvements" especially if they did not understand what the money was being used for. Our current record of reliability actually tends to negate any potential "me" benefit – "more reliable" simply doesn't mean anything.

Unlike the electrical infrastructure, where everyone has experienced outages and worries about them, Con Edison's gas service is so reliable in all weather and all conditions that <u>awareness and understanding of the natural gas infrastructure is almost zero</u> among residential consumers. They typically do not think about it. Even among smaller landlords (who pay the heating bills for all their tenants), understanding of the natural gas infrastructure is very limited. A few participants with energy-intensive businesses (e.g. manufacturing, cooking, baking) were more knowledgeable.

Overall, based on an understanding of the size, complexity and importance of the natural gas network, customers were almost unanimous in the view that an increase of perhaps 3-5% of the total Con Ed delivery charge on an annual basis would be reasonable.

On heating oil

Most heating oil customers appeared to be happy with that fuel but acknowledged some downsides that were a cause for concern including the view that oil is less environmentally friendly, it comes primarily from the Middle East leaving the US vulnerable to price spikes driven by political developments and/or financial speculation, and the reliance on delivery crews to fill oil tanks when the oil runs out even in snowstorms or other inclement weather.

On gas vs. oil

Broadly speaking, customers tended to see natural gas as a fuel of the *near* future or, at least, more of a fuel of the future than oil. Most participants felt that natural gas prices were lower and less volatile than oil prices, though not in a way that is permanent enough or significant enough to drive action. Many customers talked about how they had switched or had considered switching from oil to gas, but none talked about the reverse switch. Overall, the cost-benefit analysis appears to be favoring natural gas but the main drawback to switching from oil to gas is the high upfront conversion cost.

On switching from oil to gas

When it comes to individual homes or properties, most customers are not actively reconsidering on a daily, or even yearly, basis whether they should switch to or from natural gas. Most customers simply use whatever fuel was in the building at the time it was occupied or acquired, and the overriding sentiment is "If it ain't broke, don't fix it". Most only consider switching from oil to natural gas at the time that their burners go out or other, major maintenance is required. They are not interested in converting proactively.

When considering the benefits of switching from oil to natural gas, most residents are looking at a pay-back timeline of up to three years; if it will take longer than three years to recoup the costs of switching fuels, customers are unlikely to do it. Landlords and small businesses are willing to look at a slightly longer payback timeframe of three-to-five years but many appeared to be more inclined to switch if they could get a rebate for the conversion – but there is little awareness of the specific rebates and incentives available.

Advance knowledge that Con Ed would be opening up the street near them (thus reducing the cost of running the proper sized line to them) would be something that would make customers look at the idea of converting and assess total costs. Other key considerations for switching include the smell and mess from oil, and concerns about environmental regulations regarding oil tanks in houses (and especially in-ground tanks). Some customers cited the freed up space from not needing an oil tank as a major bonus from conversion.

Key priorities in decision-making

When asked about what kind of fuel to use and whether to switch to natural gas, the top consideration for everyone was price: cost of fuel and cost of conversion. Cost of fuel currently favored natural gas, but cost of conversion did not. There was a sense that there might be, or even probably were, some rebates or incentives to convert to natural gas, but no one knew anything specific. Customers who were currently using heating oil felt very strongly that it was important to publicize information about incentives, especially given the large costs associated with conversion. Environmental concerns (which strongly favored conversion to natural gas) was definitely an important topic, and would be an influential factor for some of the customers.

For landlords, the environment issue was less of a factor – their properties are a revenue-generating business. Unless it became a direct factor in attracting tenants, environmental concerns are not a driver. If they were in the market to buy a house, most tenants would definitely prefer natural gas – but price, location, and the house itself would be the ultimate considerations.

On energy costs

Many customers indicated that they looked carefully at their bills each month. For some, it was a part of a total Con Edison gas & electric bill, which made it harder to pay attention to just the natural gas part of the bill. For residential tenants, condo and co-op owners, and small business tenants, heating and cooling were included in the rent, so they had no feeling of control over costs.

On current usage

Customers included users of natural gas and heating oil. Oil users almost exclusively used #2 heating oil – but not all were 100% sure of the grade of oil they used. The vast majority had "inherited" their current system; it had come with the building. For the most part, participants were satisfied with their current arrangements – even for those with high heating bills it was difficult to do much about it.

Customers were however, conscious of things they could do proactively to lower their bills including programming their thermostats to turn the heat down at night and during the parts of the day while they were away to save on their bills, and adding more insulation and replacing windows.

Residential landlords, however, were constrained by legal requirements to keep heat at specified levels, and by the desire to keep tenants happy and reduce tenant turnover. Most businesses and commercial landlords followed patterns very similar to residential users; commercial landlords didn't want to lose tenants, and small businesses didn't want to alienate employees or clients. Manufacturing plants and companies involved in commercial cooking or baking were most likely to pursue aggressive and sophisticated efforts to increase efficiency and lower energy bills were – in these situations the cost of energy was a much larger portion of their total business cost

Among residential tenants and condo/co-op owners, many did not even know whether their buildings used oil or natural gas (they ended up checking with the owner or building maintenance prior to the focus groups).

On conservation efforts

Conservation was on people's minds; implementation was, however, something of a challenge. As mentioned above, many customers had already taken steps to reduce energy consumption, including turning down their thermostats at night or installing thermostat timers. Some had also taken steps to upgrade their homes—such as adding insulation or replacing windows—to keep energy consumption down.

When replacing equipment, customers indicated that they were likely to consider energy-efficient alternatives to their current technology. Converting from one kind of fuel to another (i.e. converting to natural gas), however, was much more of a financial and logistical challenge.

On alternative energy and the "Energy of the Future":

Some customers saw fuels other than natural gas as the 'energy of the future.' Quite a few customers mentioned an interest in solar or other forms of renewable energy, both on environmental and cost-savings grounds. Some had looked into it but hadn't gone ahead because of costs and because of the feeling that there wasn't enough sunshine in this area to justify the expense. They saw solar as being more suited for Arizona and other sunny parts of the country. As costs for solar panels come down, however, they would become more interested. Some were interested in windmills, but that was not seen as practical in urban or even suburban areas. Biofuels were mentioned, but mainly as part of the larger renewable picture, not really as a fuel for home heating

A few mentioned nuclear energy as the energy of the future; those who favored this idea saw it as being potentially a major source of power. To some extent, when talking about the energy of the future customers were wary of worrying about the natural gas infrastructure 30 or more years out since the thought was that we might be using something entirely different by then.

Large commercial customer comments

- Every customer we interviewed was already engaged in some form of energy management and looking for ways to reduce, or at least stabilize gas consumption
- Because of the increasing demand for gas that most of these customers anticipated in the years ahead, they wanted the needs of the system to be addressed proactively, even if it meant slightly higher rates
- Although the gas infrastructure was adequate for today, demand would continue to increase, and the system and system capacity would need to continue to increase to meet future needs
- None of them saw getting off the grid as a realistic or desirable option in the foreseeable future
- Although there is interest in distributed generation, most had been considering solar but were finding out that solar was hard to implement in older buildings in a highly built-up urban environment

The feedback described above reinforced and helped refine the objectives of our plan, as discussed below.

Commentary on affordability

The customers in all our focus groups felt that for the most part the amount of their bill is fair. Despite efficiency efforts, some residential customers did not feel they could do much to control their bills. Naturally, every customer would like to see their bills decrease, but there was general acceptance that the gas system needs continuous investment to provide reliable and safe service. Some were concerned about the tax components. When presented a graphic representation of the components of the bill: delivery, supply, and taxes and fees, customers stated that, in general, the taxes and fees included in the bill were too high.

A few customers expressed the view that rates should not go up at all. They did not see why they should pay higher rates as a result of expansions to the system for future homeowners to enjoy the benefits as they themselves may sell their properties within the next couple of years.

Large commercial customers were more tolerant about the need for future rate increases as they tended to better embrace the need for proactive maintenance.

All of our planned infrastructure investments (discussed in Chapter 5: Infrastructure Investments), and the customer initiatives discussed in this chapter, are reflected in our projection of the customer bill in 2030, shown at the end of this chapter.

6.3 ENHANCING THE CUSTOMER RELATIONSHIP

We anticipate a rapidly changing environment in our industry over the next two decades primarily from growth in gas demand, and this plan will help to prepare for that. One key strategic objective pertains to our relationship with our customers and ensuring that our systems and processes are able to support this objective. For example, we plan to use new media, as appropriate, to expand our communication and customer service programs. We will also use new technology, including improvements to our internal systems, to make it easier for customers to do business with us and foster more interactive communication and collaboration that can eliminate the need for a customer to take the time to contact us.

Consistent with our environmental goals, and the expectations and concerns of some customers, we will also search for effective ways to increase awareness of energy efficiency via energy management tools, incentives, and education.

Our objectives are as follows:

- Provide a more efficient and effective, customer service experience
- Provide dedicated account managers for large commercial customers
- Expand ability for customers to access information on their own terms
- Empower customers with information and tools to manage their gas bills
- Support integration of information and communication systems

The next section shows the key initiatives that we will pursue, within the context of the objectives for enhancing the customer relationship.

6.3.1 Objectives to Enhance Our Customers' Experience

Provide a More Efficient and Effective, Customer Service Experience

Our call center allows customers to access information through streamlined, automated options and, when necessary, gain easy access to employees with specialized knowledge. Interaction with customers is made more effective through an adaptable and responsive call distribution system that provides specialized service. It routes calls requiring customized, vital messaging in emergency and non-emergency situations, and provides self-service options. Through the implementation of enhanced contact center technology and workflow improvements, we will make it easier for customers to communicate with us. Enhanced speech-enabled interactive voice response (IVR) in the near future, will give customers more control over their inquiries. Our Call Center offers translation services and representatives that speak a variety of languages so that customers are able to speak to the Company in their native language.

Provide Dedicated Account Support for Large Commercial Customers

Large commercial customers appear to have unique needs, involving relatively more sophisticated energy management programs. To better understand their needs and provide value solutions that will benefit both these customers and Con Edison, we will explore providing them with dedicated account support to enhance ongoing and frequent interaction, to ensure necessary / required and cost effective solutions are provided.

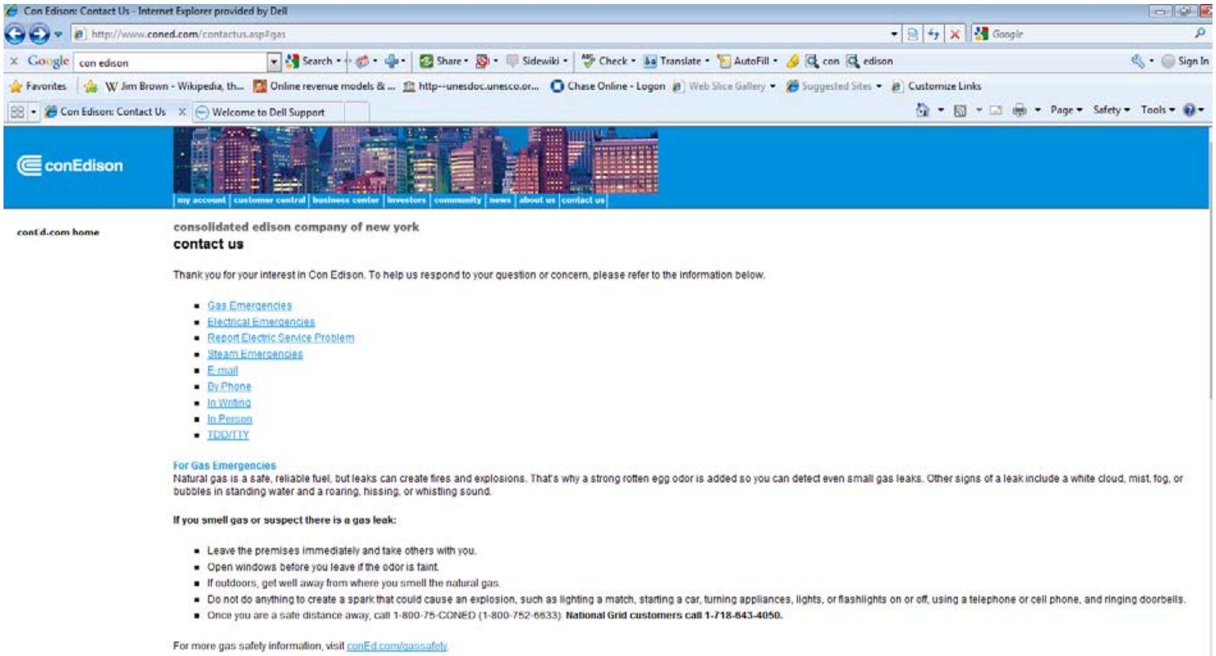
Expand Ability for Customers to Access Information on Their Own Terms

Customers communicate with us by phone through interactive voice response and through our customer service representatives, via the Internet, and mobile devices. We continue to provide an expanding menu of services in various mediums. For example, over 50,000 customers receive their bills electronically. Enhancements in information technology, and increasing customer preference for electronic communications, along with a proliferation of devices, will substantially increase this customer segment.

Web Services

More of our customers want to conduct their business online. In response, we must expand our web services and communication links to enable the next generations of mobile devices. Today, for example, we provide gas safety information and ways to contact us in case of gas emergencies on our website (Figure 6-1). We are also upgrading our energy efficiency programs site in order to make it easier for customers to select and enroll in programs.

Figure 6-1. Web-Based Information



We plan to further enhance our customer web interfaces. Upgraded technology will be implemented to transform the site into an expansive electronic communication platform. In addition to paying bills, residential and small commercial customers will be able to conduct a home energy audit, analyzing their bills and usage, and get energy savings tips including heating savings.

While many internet applications work poorly on traditional cell phones, mobile smart phones can be a useful way to report an outage, make a payment, and get account balances. With these limitations and opportunities in mind Con Edison partnered with Usablenet, Inc. to develop a mobile version of our website. Customers are now able to use their mobile devices to:

- Pay their bills
- Enter meter readings
- View gas emergency instructions
- View carbon monoxide emergency instructions
- View their current account balances
- View their payment histories
- View their billing histories
- View/update their account information
- Obtain payment extensions

In storm and emergency situations, we will continue to build on our current practices of seeking out advanced methods for customers to report gas service problems. We will examine new communication techniques and mediums to provide customers with updated information in a more efficient, effective manner.

New Service Connections

We also plan to improve the experience of customers and developers setting up new accounts. In recent years Con Edison has made improvements to this process by streamlining business processes and launching an Internet-based project center, which provides a self-service facility for contractors, developers, and customers to process and track new service requests.

Although this web-based front end interface is a step in the right direction, it is somewhat constrained by the mainframe system from which it obtains its data. We plan to replace the existing mainframe with an updated information system that will streamline case workflow and provide enhanced updates to contractors, developers and customers. The new and improved project center will provide customers and service reps with information specific to new service requests. The web portal and interactive voice response (IVR) will be tied to this new system, allowing for expanded self-service options, as well as access to case-specific information twenty-four hours a day.

Pricing and Incentive Programs

We strive to provide customers with information, flexible billing options to manage their energy costs and volatility, and tools to help them manage their bills. Level billing for heating is valued by several of our customer segments as an option that provides predictable payments each month and helps customers spread gas costs during the course of the year and avoid winter spikes in gas bills. Specifically, under these programs, customers make lower monthly payments of gas bills during peak winter months in exchange for higher bills in the summer.

We are also participating in a collaborative effort with ESCOs and other parties to consider alternatives to the current rate structure, including flat billing, to improve the ability of ESCO to market to gas cooking only customers.

With flat billing, we would convert some of the gas cooking customers to a fixed monthly charge similar to the minimum charge imposed on a gas cooking customers who use no gas in a monthly billing period. The application of a fixed monthly charge to recover all the costs of serving the customer would mean that the customer’s service would not need to be metered. If a meter were present on the customer’s service, Con Edison would no longer read the meter. The customers in the fixed rate billing group would be those who have gas meters located within their apartments and historically the use of gas has been less than 5 therms monthly; if the customer has directly metered electric service, the meter is located outside of the customer’s apartment. Currently, Con Edison is required to attempt to read each such meter on a monthly basis because billing is based on usage. Our proposal for a fixed monthly charge eliminates the requirement for the monthly meter read. Approximately 675,000 gas meters are used for cooking purposes only, and those customers typically receive a minimum bill each month. The subset of those accounts, accounts with the gas meter in the apartment, consists of about 114,000 meters. Manhattan has approximately 76,000 of these meters using 5 or less therms per month and the Bronx has 38,000 of these meters with similar usage. The full explanation of our proposal is detailed in our last rate case filing.

Energy efficiency measures for gas cooking will come primarily from appliance efficiency programs, and not from incenting customers to use less gas when cooking. The impact on energy efficiency will be very small with a flat billing option described in the Category “C” Meter Replacement Program below. As the annual usage per customer in this category of meters is very low and primarily for cooking, we believe the cost savings outweigh energy efficiency considerations in this area of gas usage. We have not identified any drawbacks of converting some customers to the flat billing option. If approved, we expect increased flat-billing to realize approximately $2.0 million/year in meter purchases and removal/installation costs.

When supported by information and programs to align incentives, the way our customers consume energy can change. Towards the objective of enabling customers to have more control of their energy costs, we will also continue to pursue a variety of energy efficiency and peak demand response programs. These include direct load control and existing programs for interruptible customers to curtail when peak forecasts are reached. Some of these programs may be supported by the deployment of necessary metering infrastructure.

Customer Education

Customer and community education is an on-going effort and the Company actively conducts seasonal and topical education programs. The goal is to engage and educate customers while collecting their feedback regarding issues that matter most.

We continually evaluate how and where we communicate with customers. We are currently working to make it easier for customers to do business with us on our corporate website. To reach our customers in new venues, we recently launched a Facebook site, and are using Twitter to advise customers about energy efficiency programs, and conservation tips. We continue to evaluate new media opportunities and new technology as potential communication outlets.

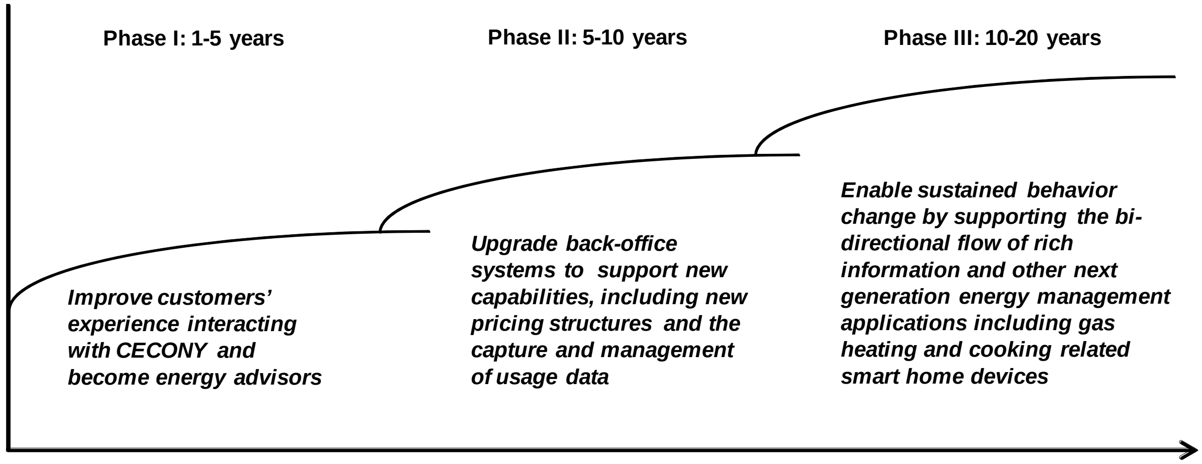
Support Integration of Information and Communication Systems

It is important to note that our customers interact with the Company for more than just gas. Many of our gas customers are also customers of the electric and/or steam businesses, and it is our objective to streamline the communication required to receive information about our other service offerings.

6.3.2 Implementation Plan

We plan to implement our programs in three phases. In Phase I, we will continue to improve customers' interactions with Con Edison and begin to develop our employees, systems, and processes to move beyond responding to inquiries to be better able to advise customers on energy issues. In Phase II, we will upgrade back-office systems to support capabilities including new pricing and billing structures. In Phase III we aim to be able to support full, rich, automated information flow between Con Edison and our customers in order to enable new technologies aimed at gas heating and cooking related "smart home" devices, and other energy management initiatives.

Figure 6-2. Customer Operations' Implementation Plan



Phase I

We have a number of initiatives under way or planned for the near future to improve the effectiveness and efficiency of customer interactions. These enhancements will provide customers with additional information and more self-service options.

Using new technology, we will make it easier for customers to do business with us on the Web including mobile web sites on smart phones, iPads, etc. Customers will be able to obtain instant and complete answers to routine inquiries. Transactions will be simplified. Advanced self-service options will facilitate the resolution of customer bill inquiries, and will give access to energy use analysis (i.e., on-line energy audit). This web interface will actively guide the customer in identifying conservation and efficiency measures that could reduce energy use and bills. The easy-to-access services and information on the website will also be made available to mobile devices, such as PDAs and cellular phones. Overall, we will continue to pursue initiatives to promote customers' use of web connections as new technologies emerge.

Upgrades to the contact center are expected to allow company staff to answer customer calls faster and better. This will create a more flexible, responsive phone system and call center to meet customers' changing demands for information and heightened service. This will be accomplished through the replacement of the Company's automatic call distribution phone system, and other enhancements to the call center.

The Company's Interactive Voice Response (IVR) system will be upgraded to a speech-enabled IVR platform. This upgraded IVR should streamline the experience for customers. This new system will provide "virtual hold technology", which offers customers the opportunity of a returned phone call, instead of holding for a representative.

Expanded customer education programs will provide progressive efforts to educate, inform, and guide customers in the management of their gas use and bills. We will address the need for increased education and information on energy efficiency and conservation. Future outreach and education initiatives will focus on more customized educational campaigns. The Company will also continue to develop alternate forms of education and outreach via web-based systems and smart phone communications. This outreach will be conducted in coordination with our expanded energy efficiency and demand response portfolio, which offers customized programs for each customer segment to better control their gas costs. We will train our employees to facilitate the implementation of demand side management applications as an option for customers.

We will also pursue additional communication channels for customers to report gas service problems. Potential upgrades being considered include accident and emergency response measures that will increase communication through the use of text messaging, e-mails, and website reporting. New communication tools are being studied to improve our interactions and warning notifications to special needs customers.

It is important to maintain a billing system with the required flexibility to support the current and future operating environment. Upgraded programming will facilitate integration and interface with other systems. These upgrades will enable new and emerging rate structures.

Phase II

Instead of responding to customer inquiries, our customer operations team will analyze data and actively contact customers about issues, or opportunities for customers to benefit from additional programs or changes in consumption behavior. The installation and build-out of a new Customer Service System (CSS) is expected to be a multi-year effort starting in 2017 and lasting three to four years. With the new CSS, we will be able to manage real-time customer data, and aggregate it with other customer data repositories. We will make our customer service effort more active by using the vast amount of available data.

This data can also support more detailed analysis on the best service options for the customer, in term of price, tariff and commodity.

In Phase II, we will be able to offer year round affordable billing to a broad set of customers. This will be achieved through the installation of digital meters which capture and transmit usage data per building, and receive pricing and other information.

In addition to home heating and cooking, we expect that during Phase II, increased customer fleet use of CNG vehicles will rise. Moving from gas (petroleum) stations to CNG stations will dramatically change how customers' rely on the Company, and view the role and value of natural gas.

As customers have a broader involvement with natural gas applications, it will change the way we operate our business. We plan to work with customers, manufacturers, regulators, and industry associations to design mutually-beneficial programs for providing these fueling options. We will start by proactively working with commercial fleets proactively, where fueling can be centralized and the implications to our system utilization are isolated in one area.

Finally, forecasts of increased costs of electricity may push some customers to consider and adopt distributed generation technologies in order to supply their own. In the right setting, distributed generation can offer benefits for those customers with the knowledge and interest in installing them. We, as the gas operations business, will support those customers and supply them with natural gas.

Phase III

A key uncertainty is when customers will adopt CNG in a significant way. When they do, customers will desire greater CNG station availability. The same uncertainty is around the magnitude of gas boiler conversions from oil. Gas heating demand growth through conversions, distributed generation, and CNG vehicles will increase customer usage of gas while building envelope efficiency and appliance efficiency will limit the rate of growth. Customers will seek automated ways to take advantage of the increase in information available to analyze their own energy use in order to find efficiencies and cost savings. We are committed to partnering with customers by providing information and answering customer inquiries.

Although some of the technologies we discuss here are still in their infancy, we believe the future of gas demand growth will occur in the planning horizon. The following description provides a glimpse of what may lie ahead.

The term “smart home” refers to a residence that, among other things, may use a home area network to manage and communicate with a number of different systems (e.g., home security, home heating, data transfer) and components (e.g., air conditioner, heater) of the residence.

Climate control system—Offers the user fine-grained customization and control over the temperature of the home, and provides increased information about, and control of, the devices that heat and cool the home (e.g., boiler and air conditioner). Additional control will allow customers to respond to signals from the utility letting them know when gas supply prices are high and it may be desirable to reduce gas consumption.

- **Home area network**—Enables the home owner to manage the communication between devices in the home. In addition, users will be able to access their local network, and configure devices and the home controller from any location via the Internet.
- **Data exchange**—Enables the customer to share some of the data collected by their devices with the Company so that it can construct optimal usage profiles. The utility will also be able to aggregate information from many users to identify opportunities for efficiencies, and ultimately customer bill reductions.
- **Distributed generation**—Offers customers the opportunity to manage and control their distributed generation assets through the central controller. In this scenario, distributed generation is monitored by the home, which alerts home owners of issues that arise, or when distributed generation is not being optimally utilized.

Some of these technologies, including home area networks and distributed generation technologies, are being tested as part of the Company’s Long Island City Pilot, as discussed in Chapter 5 of the Electric Long Range Plan.

As part of the Long Island City Smart Grid demonstration, we have incorporated 200 gas meters in our plan to demonstrate the operation of Gas AMI, or Advanced Metering Infrastructure. This is different from the current deployed technology called AMR, or Automated Meter Reading, because the meters are read remotely and automatically without the use of meter readers. The Gas AMI technology would be demonstrated in concert with electric smart meters, or AMI. In the demonstration we are using Silver Spring Networks mesh network to supply the last mile communications solutions for electric smart meters, distribution assets and Gas smart meters. The Silver Spring Gas smart meter equipment is called a ‘Gas IMU’ which stands for Gas ‘Interface Management Unit’. This is essentially a unit that is installed on an existing meter to read the meter and send this reading wirelessly to the last mile communications network, and ultimately to Con Edison.

Currently the Gas IMU technology communicates with the wireless mesh network established by the electric smart meters. The IMUs are battery powered and do not require a separate power source, thus to conserve the battery power, they are not always on and "wake up" to join the electric meter wireless mesh network on periodic intervals to send their readings. There is no control function or additional meter information supplied through the Gas IMU, but this is a possibility for future development and improvement. While developing the IMU technology will be championed by the market and companies like Silver Spring Networks, Con Edison would find it useful to receive pressure information through the smart grid network, as well as have the ability to add two way communication and control. The technology to do this is not yet available, but as it becomes more advanced we will look to demonstrate these new functionalities to gain experience with the proper implementation and benefits it can deliver.

The above description includes only a small sampling of potential devices and complexities of the smart home, and does not include any mention of the broad range of emerging commercial and industrial applications of energy management and building automation. We will be prepared to support our customers' changing energy management needs and we expect to work with customers in developing solutions, analyzing data, and providing knowledgeable support to realize their objectives.

6.4 GAS LONG RANGE PLAN IMPACT ON CUSTOMER BILLS

All of the programs discussed in section 6-3 will help us to enhance the customer experience over the planning horizon. Much of this plan has illustrated our infrastructure investment projects and programs. These programs will minimize risk and provide the high reliability and safety our customers have come to expect.

The investment plan that supports these projects and programs leads to the following projections for the customer bill. We strive to minimize customer bills and have outlined in this document several programs and initiatives to manage our infrastructure costs as well as to work directly with customers to manage their energy expenditures. While we will continue to make every effort to keep our transmission and distribution rates down, it is important to convey that market and policy forces outside of our control will impact our customers' bill. In particular, the composition, availability, and affordability of gas supply may experience changes over the 20-year planning horizon.

6.4.1 Tax Implications

Beyond the cost projections set forth in this study, there are additional opportunities to moderate customer bills, we will continue to leverage technological advances as new technology becomes available and to improve efficiency and also to support efforts to lower the tax component of customer bills and to achieve additional regulatory reforms.

CECONY has consistently advocated on behalf of customers that New York's state and local governments reform utility taxation because of the regressive nature of utility taxes. Our legislative strategy is to reduce those taxes unique to the Company or the handful of private utilities remaining in the City or the State. We plan to implement this strategy by proposing legislation to change the basic structure of taxation of public utilities in New York.

CECONY's energy services in New York City and Westchester County are subject to a plethora of taxes, assessments that function like taxes and fees which are in turn built into utility bills. Federal and state income taxes are a principal source of CECONY's tax payments, but CECONY's tax burden stretches far beyond income taxes. State and local gross receipt taxes, sales and use taxes and surcharges on utility company purchases, various other "assessments" and, above all, local property taxes (including special franchise taxes) add to our customers' bills.

Property taxes are used to finance local governments and public schools. The funds raised via the property tax levy are often a major revenue source for municipalities. In the current economic climate, there is increasing pressure on governments to either raise property taxes or cut services.

The Company has been and remains very concerned with high property taxes in our service territory and the impact of these taxes on customer bills. We have voiced and demonstrated our concern through the pursuit of litigation and legislation for decades. The Company has periodic meetings with the City Department of Finance and the City's Legal Department to discuss property tax issues, both to try to settle past litigation and to discuss legislative initiatives. Our strategy to control property taxes consists of legislative initiatives, litigation initiatives, and compliance initiatives.

6.4.2 Customer Bill and Delivery Rate Impacts

Rate trajectories have been developed based on our investment plan. The key components of our rates are supply and delivery charges, and associated taxes and fees.

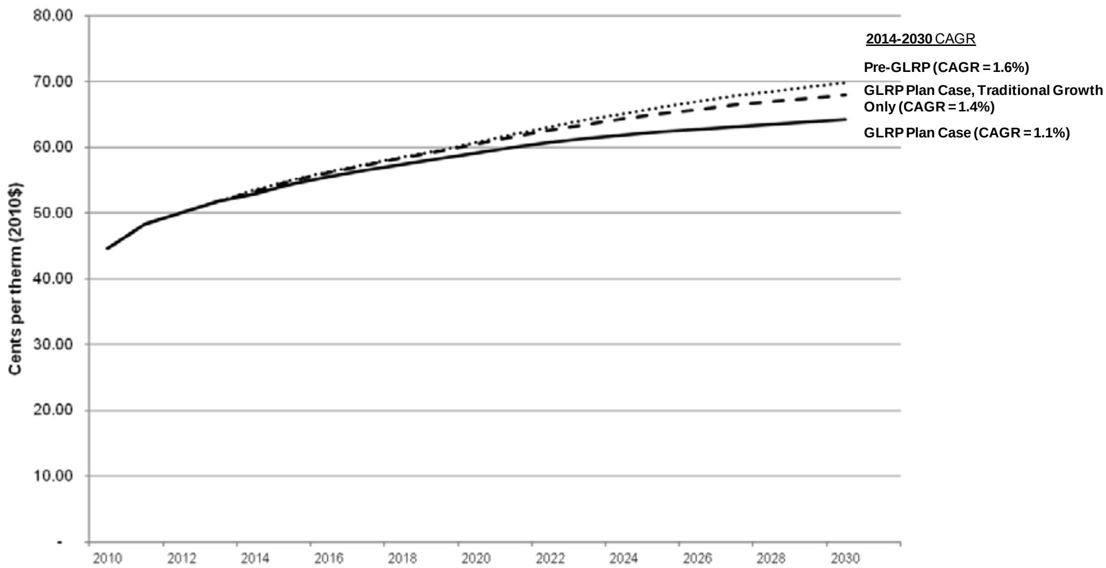
To determine the impact on rates, we conducted bill impact analysis on our entire heating customer base as well as for a typical space heating residential (SC3 customer class[55]) and commercial heating (SC2H customer class) customer, and modeled delivery rates for two main scenarios – one based on a combination of a streamlined version of our current capital expenditure projections and our historical growth projections (GLRP Plan Case: Traditional Growth Only scenario), and another based on the GLRP Plan Case: Traditional Growth Only scenario plus conservative estimates of incremental growth, our Plan case (GLRP Plan Case scenario).

The incremental growth is primarily a result of potential oil to gas conversions, new technologies such as increased CNG usage, and increased distributed generation. We also modeled a baseline (Pre-GLRP) scenario which represents our current capital expenditure trajectory ($313 million annually prior to capital optimization efforts described in Chapter 5: Infrastructure Plan).

The rate of increase in delivery rates is lower with growth as costs are spread over a larger customer base, as illustrated in Figure 6-3. Growth moderately in excess of our plan case and spread ratably over the service area would serve to spread costs over a larger base and therefore moderate rate impacts. The company will monitor growth on an ongoing basis, both over an entire area or focused in a discrete area that could trigger significant new investment, to determine positive or negative impacts on rates and any other impacts.

[55] A typical space heating residential customer (SC3 customer class) is a single family dwelling or individual apartment in a multi-dwelling building with an average monthly load of approximately 137 therms.

Figure 6-3. Delivery Rates for Total Firm Customer Base[56]

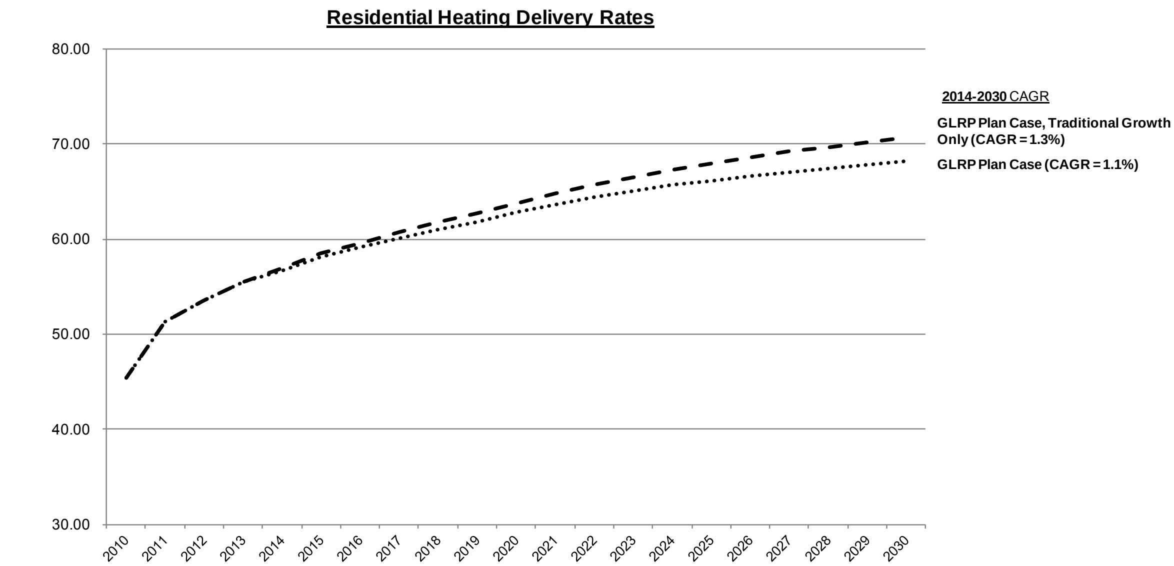


Source: Customer Impact Summary 07.10.2010, Scenarios 5A, 6A, 7A

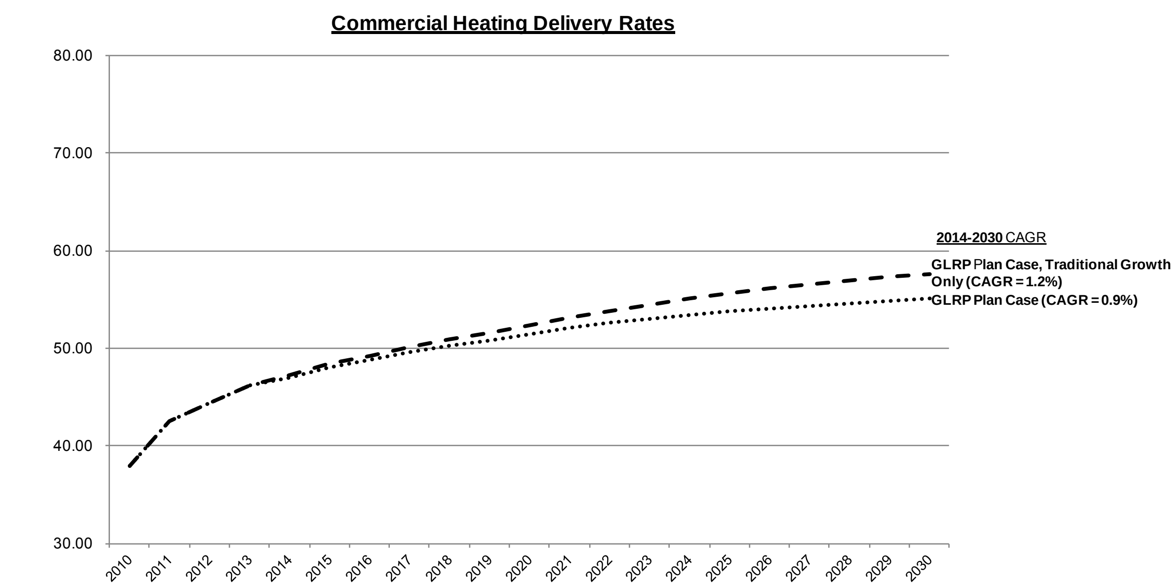
The increased growth on our system benefits residential and commercial customers as shown in Figure 6-4 below.

[56] Corresponding CAGRs for 2010 to 2030 are as follows: Baseline (pre-GLRP) = 2.2%; GLRP Plan Case: Traditional Growth Only = 2.0%; GLRP Plan Case = 1.7%

Figure 6-4. Delivery Rates for Residential and Commercial Heating Customers[57]



Source: Customer Impact Summary 07.10.2010, Scenarios 1A, 2A; based on SC3 (1-4) heating customers with an average monthly load of 137 therms



Source: Customer Impact Summary 07.10.2010, Scenarios 3A, 4A

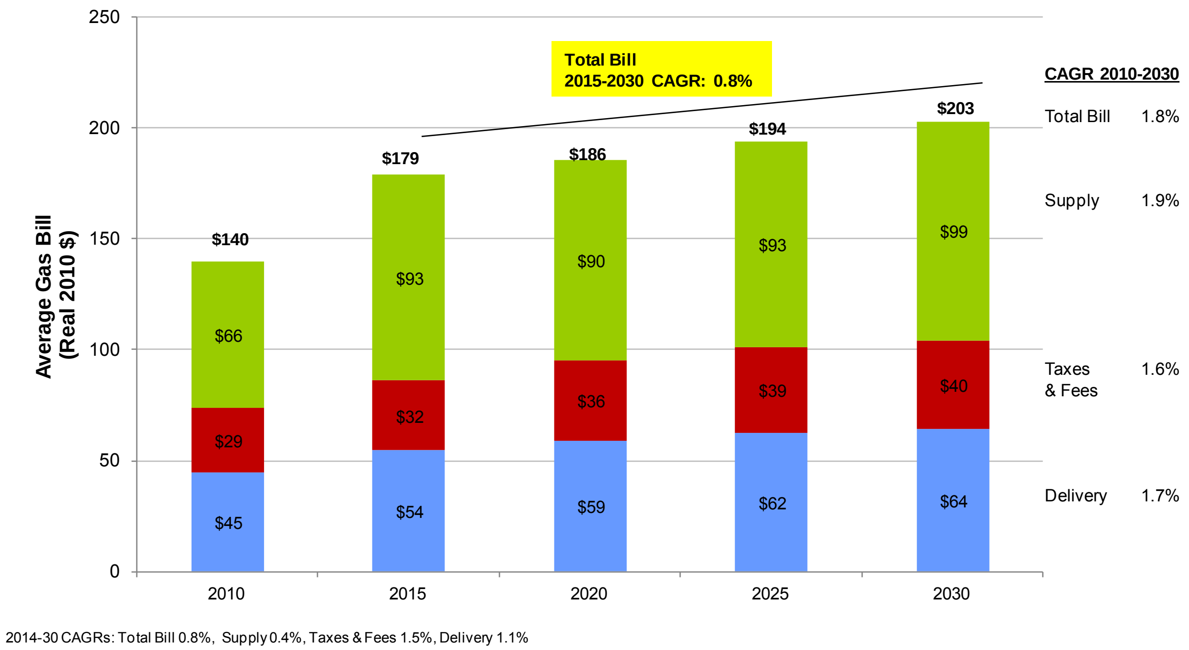
The estimated impact of all of our planned investments, along with projected growth opportunities and cost increases to the supply and tax portions of the bill, is expected to be an 2010-30 average annual

[57] Corresponding CAGRs for 2010 to 2030 are as follows:

- Residential Heating: GLRP Plan Case-Traditional Growth Only = 2.1%; GLRP Plan Case = 2.0%
- Commercial Heating: GLRP Plan Case-Traditional Growth Only = 2.0%; GLRP Plan Case = 2.0%

increase of approximately 1.8% (from $140 a month in 2010 to $203 a month in 2030 in 2010 dollars) on a real basis for our entire customer base (as seen in Figure 6-5).

Figure 6-5. Total Gas Bill Impact for All Firm Customers



The equivalent increases for residential heating customers are 2.0% (from $189 a month in 2010 to $287 a month in 2030, in 2010 dollars) a significant improvement over historical bill increases[58] as shown in Figure 6-6.

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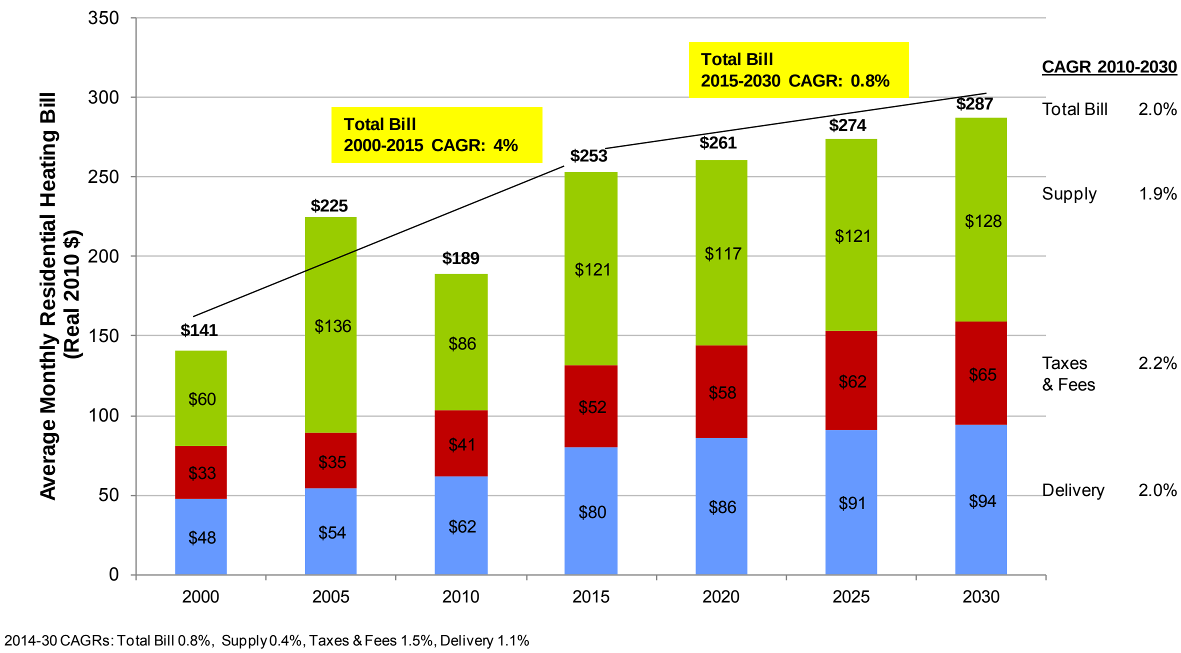
[58] The increase in the total bill from 2000 to 2005 was ~ $84.59 or ~60%. This increase was primarily due to a 127% increase in the cost of supply (excluding taxes) of $76.35. In addition, the delivery costs portion of the bill increased 12.5% or $5.96 (excluding embedded and other taxes) reflecting rate increases that was implemented in October of 2002 and 2004. The percentage mix between supply and delivery cost including taxes was approximately 47%/53% in 2000 but shifted to 65%/35% in 2005.

The decrease in the total bill from 2005 to 2010 was ~$36.67 or 16%. This decrease was primarily due to a 37% or ~$50.47 decrease in the supply cost (excluding taxes). Delivery cost (excluding embedded and other taxes) increased 16% or $8.49. The percentage mix between supply and delivery cost including taxes was approximately 48%/52% in 2010.

Figure 6-6. Total Gas Bill Impact for Residential Heating Customers



6.5 SIGNPOSTS

Concern about global climate change and the environment, the associated requirements to convert to more environmentally friendly fuels, combined with commodity price increases in a weakened economy has brought the issue of energy demand front and center. The rate at which the broader economy recovers will drive not only energy demand, but significantly affect energy prices and drive the adoption of new technologies. In turn, these actions will drive the changes needed by the Company to be responsive to customers. We will monitor the following signposts to determine if and when adjustments to the previously outlined plan need to be made.

- **Customer needs**—Customers' energy needs tend to fluctuate given changes in their lifestyles, work situations, personal circumstances, and as a result of innovations in technology, fluctuations in the economy, and changing energy prices. Particularly, gas heating demand resulting from conversions to cleaner fuels will increase. Continual dialog with our customers, whether via outreach or customer research, will ensure we continue to be aware of our customers' priorities.
- **Adoption of new technologies**—Integration and adoption of new technologies into the lives of our customers drives the speed at which we need to make the necessary upgrades to the gas system. Specific markers to look for include requests for DG and the penetration of CNG vehicles.
- **Growth of new media**—Adoption of new media, offers additional opportunities for Con Edison to interact with customers. Continuous customer feedback helps us understand emerging issues within our stakeholder groups, as well as identify gaps that may exist between stakeholder expectations and company actions.
- **Firm versus interruptible customers**—Between Con Edison's two major customer groups of firm and interruptible customers and within each of those groups, the company charges

customers of different classifications different rates based on its rate and tariff structure, but provides full service to all the customers. Interruptible customers are typically provided with discounted rates but have their service turned off during peak times when the system is overloaded. As the volume of interruptible customers increases in absolute terms as wells as in proportion to firm customers, primarily as a result of oil to gas conversions and increased power generation, the interruptible customers will have to pay for greater portions of infrastructure costs (both capital and O&M).

As uses of and needs for natural gas change over the next twenty years, so too will the ways in which we interact with our customers. Throughout this evolution we will remain committed to balancing affordability, reliability and safety with the need to make the necessary gas infrastructure investments. In addition, we will provide our customers with the tools to better manage their gas use. To carry out these objectives, we will take advantage of innovative technologies and provide our employees with the necessary skill sets, as explained in the next chapter.

7.0 IMPROVING PROCESSES AND SKILLS

7.1 OVERVIEW

To facilitate the successful implementation of the Gas Long Range Plan, we will develop new skill sets, processes, and systems. We will focus on the following five key areas:

- Developing an Integrated Long-Term Planning Process
- Leveraging and Expanding our Capital Optimization Model
- Managing our Growth
- Improving Public and Employee Safety
- Improving our Focus on Cost Management
- Enhancing Organizational Skills

7.2 LONG RANGE PLANNING PROCESS

We plan, manage and maintain a complex gas system and strive to do so in a consistently safe, reliable and cost-effective manner. We collaborate with stakeholders and experts to ensure we deliver high quality gas service to our customers in Manhattan, The Bronx, Queens (1st and 3rd Wards), and Westchester County.

In developing the Gas System Long Range Plan, we performed an assessment of our current transmission and distribution (T&D) system planning process. The initiatives that are identified for process improvement are grouped into three key categories which are described below:

Figure 7-1. Planning Process Areas of Focus

Strengthen Linkages and Integration Across the Company

We have historically developed 5 and 10 year plans for gas system projects. Our planning process is built on standardized and tested methods of design and has produced a system that performs to high levels of reliability and safety. We evaluate individual investment projects based upon several key factors and are improving project evaluation by prioritizing and aggregating programs in a way that allows us to better determine their collective impact on the growth, performance, cost structure, and risk profile of the gas system.

Integration and communication among groups will be accomplished by establishing clear oversight and responsibility for the planning process. Before divestiture of the Company's generation assets, a central planning group guided an integrated planning process. While many elements of that group still exist within the Company, they are less centralized today. We are reexamining the organization structure to determine what will be the appropriate structure for the company going forward to guide an integrated planning process.

The Gas Long Range Plan will be regularly reviewed under different scenarios for demand, commodity prices, and other aspects of the business environment. Scenario planning will be supported by the identification, development, and maintenance of "information platforms." Information platforms are a set of processes that allow the Company to better track internal and external information that is critical to both short- and long-term planning. Ultimately, information platforms are meant to provide the Company with the information necessary to perform effective strategic planning. Some of the data tracked are market trends, regulatory developments, technology development, commodity prices, and knowledge developed through Con Edison pilot projects. Scenario planning, supported by these information platforms, will allow the Company to operate under a common set of assumptions regarding our business environment. Some of the major planning activities that will be better integrated are long-term demand forecasting, long-term integrated resource planning including demand and supply side solutions, the coordination of budgeting decisions, and the regular assessment of project performance.

Implement a More Systematic Approach to Investment Evaluation and Trade-Offs

A standardized methodology for evaluating business cases will enable effective prioritization of investments across the Company. It will include the ability to make trade-offs to reach the right balance of cost, performance and risk. Performance management will be refined by centrally-tracking projects throughout their lifecycle, and by regularly reviewing them against strategic, financial, and operational goals.

We have recently piloted a Capital Optimization process that enables the collaborative evaluation of project plans. The process is driven by recently refined corporate strategic drivers. We developed a quantitative weighting system for prioritizing projects based on their support of each driver. This was done using an objective and well-defined guide for quantifying the impact of each project on the strategic drivers. Projects are prioritized based on their cost, benefits, and weighted strategic value. This process allows the Company to make trade-offs across projects, in order to build an investment portfolio that reflects the strategic, budgetary, regulatory, and technical priorities of the Company.

We are currently implementing the Capital Optimization process within our Electric T&D, Gas, and Steam operations. The ultimate goal is to refine and deploy the process across the entire Company, and determine the overall capital budget with clearly-identified short- and long-term costs and benefits. In time, we plan to evaluate the maintenance programs using this process.

A more detailed description of the software tool and process is provided in section 7.3.

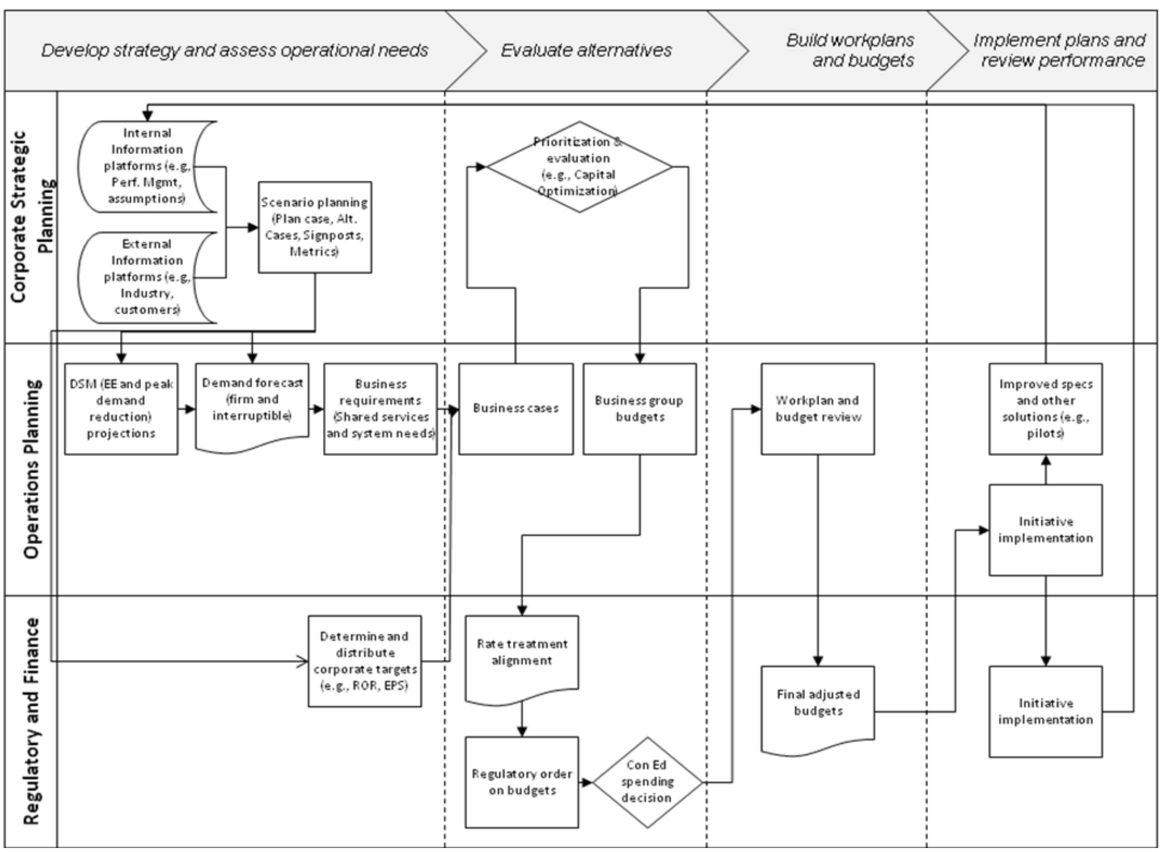
Align Strategy Development with Corporate Budgeting Cycle

The strategic management process will leverage the Gas Long Range Plan and the Capital Optimization tool to link planning and investments to the corporate strategy. The main steps of this process are outlined below:

- Strategy is developed based on scenarios for market conditions, internal competencies, and assets
- Project plans and budgets are developed and adjusted based on quantitative analysis of performance, cost, and risk indicators identified for the short- and long-term
- Initiatives are implemented and monitored against our Key Performance Indicators (KPIs)
- Performance data and other information of strategic importance (information platforms) are continually analyzed and aggregated for strategy development

Figure 7-2 shows the flow of this annual process.

Figure 7-2. Planning Process



Step One: Develop strategy and assess operational needs:

- Essential strategic information, or “information platforms”, are identified, developed, and maintained in order to better track market trends, gas supply and prices, regulatory developments, intellectual capital, etc.
- The Gas System Long Range Plan is regularly reviewed under evolving real conditions and different hypothetical or probable scenarios for demand, gas prices, new technology implementation and adaption, and other aspects of the business environment
- Central and operating area groups determine their business requirements (shared services and system needs) based on the load forecast (both firm and interruptible), current infrastructure capability, safety and reliability goals, ongoing maintenance, regulatory requirements, and customer interconnections
- Management provides budget guidance to groups based on scenario planning and corporate targets

Step Two: Evaluate alternatives:

- Business groups build business cases using standardized templates with all the cost, benefit, timing, and operational considerations clearly outlined for prioritization and evaluation
- Project business cases are prioritized and evaluated through a collaborative process called the Capital Optimization process, which includes both corporate and operational stakeholders. As these processes are improved, this would include O&M programs as well as they will work in an integrated fashion to improve system performance and safety over time.
- Once projects are adjusted to reflect the strategic, budgetary, regulatory, and technical priorities of the Company, the resulting Business group budgets are submitted for approval

Step Three: Build work plans and budgets:

- Business groups review work plans and budgets based on the Company’s investment decisions
- Budgets are finalized and set

Step Four: Implement plans and review performance:

- Work plans are implemented
- Improved specifications and other solutions resulting from the Company’s initiatives are tracked and integrated into the strategy and operational protocols through internal information platforms
- Initiatives are centrally tracked and regularly reviewed against strategic, financial, and operational goals
- Performance feedback loops are established to provide new inputs to existing program evaluation or to confirm expected outcomes and to assure optimal performance of annual and long-term initiatives
- Budgets are adjusted internally as real-time conditions unfold to assure we are supporting our vision, mission, corporate strategic objectives, and plan themes

One of the strategic implementation enablers will be the improvements to our cost management practices, which will monitor performance against financial objectives. We are working to improve the tracking of project financial performance to provide greater transparency at more granular levels. Section 8.4 of this chapter explains the planned improvements to this process in further detail.

7.3 CAPITAL OPTIMIZATION

In our ongoing efforts to refine our decision making process for allocating funds between various investment opportunities, the Company has developed a comprehensive Capital Optimization process using a software tool. This process is implemented within the overall planning process and allows us to develop business cases and to evaluate alternatives in the development of our plan. Capital Optimization allows us to attain objectives by helping us evaluate projects system wide, and make trade-offs across operating units through standardized analytical methods and guidelines.

Please see Chapter 5 for a detailed discussion of our Capital Optimization process.

7.4 MANAGING OUR GROWTH

We are taking a proactive and integrated approach to managing demand growth. Our first priority, however, is to maintain safe, reliable, and reasonably-priced gas service for our existing customers and we will continue to encourage demand side management to reduce peak demand and overall energy use. We are carefully planning for area-specific loads to meet the environmental goals of the community arising from conversions from heating oil, gas-fired distributed generation, and natural gas vehicles. We will assess the implications of any additional firm and interruptible demand on the gas system and reinforce the system as needed in a responsible manner with minimal rate impact on our customers to ensure that the gas system has the required infrastructure capability at all times to accommodate the new loads.

We will determine and employ the appropriate level of marketing required to proactively target and attract customers to capture the value of growth for a broader rate base. Additionally, we will continue to explore and provide analytics to help customers make fuel switching decisions involving tradeoffs between steam, gas, and distributed generation.

7.5 IMPROVING EMPLOYEE SAFETY

Employee safety is a top priority for Con Edison. We have a number of programs and guidelines in place to achieve an injury-free workplace. The main performance metric in the area of employee safety is the OSHA incidence rate.[59] The incidence rate is a normalizing indicator that captures the number of recordable injuries/illnesses per standard unit of 100 full-time equivalent employees (each working 2,000 hours per year). It is dependent upon the number of recordable injuries/illnesses experienced and the number of productive hours worked, which includes all straight time, compensable overtime, training hours, and restricted duty hours for both weekly and management employees.

Con Edison's current safety performance, as measured by the incidence rate, is at the midpoint of its industry peers. The 2009 company-wide incidence rate is 3.58, or approximately 4 injuries and illnesses per 100 workers. We believe there is significant opportunity for improvement, and have therefore established its reduction as a key objective for all operating groups. Our goal is to reduce this number by more than half, and achieve a rate of 1.50 or less by 2015.

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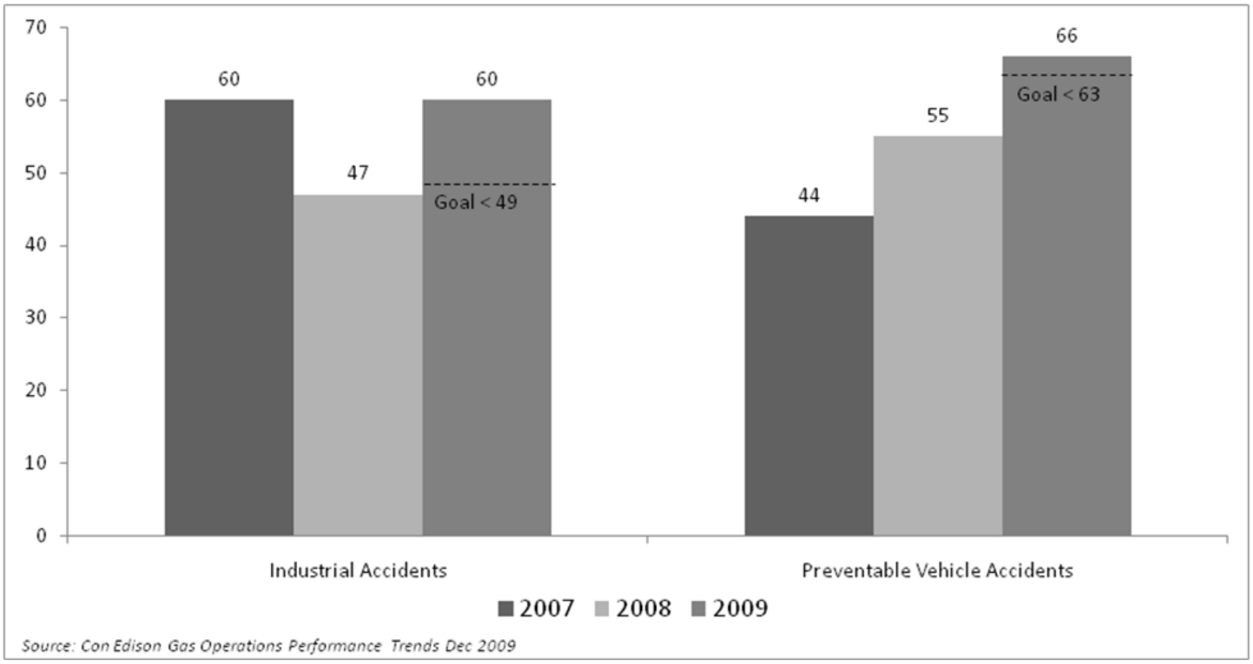
[59] The formula for calculating the incidence rate is: Number of Recordable Incidences x 100 x 2000 / Total Number of Productive Hours Worked.

Within Gas Operations, our 2009 industrial and preventable vehicle accidents also exceeded our 2009 goals. Our 2010 goal is to reduce the OSHA rate by more than 25%.

Figure 7-3: Total Accidents



Our Environment Health & Safety group is working closely with all operating groups to make sure we achieve our safety goals, including providing appropriate tools and resources to ensure compliance with safety rules, performing comprehensive job planning and briefings, documenting site safety observations, and more broadly, to promoting a culture of personal accountability.

Con Edison's goals in this plan relating to the risks facing the Company are to:

- Continue to utilize our ERM process to systematically identify and prioritize emerging risks, develop risk mitigation strategies, and mobilize resources to execute those strategies.
- Strive for continual improvement in employee and public safety by developing and executing innovative programs and processes.

7.6 CONTINUED FOCUS ON COST MANAGEMENT

We have made significant investments in time and resources to provide our people with the skills and tools necessary to effectively track and manage costs. Costs are monitored against a set of key performance indicators (KPIs) that are used not just to highlight strengths and identify opportunities for improvement, but also to promote a culture of accountability. For example, these KPIs are used to ensure safe and reliable performance which is a benefit to our customers and to align management employee salaries to the Company's performance. The periodic monitoring of these indicators helps us make mid-course corrections, as necessary.

A key theme of this plan is to assure our gas service is and remains reasonably priced for the people in our service territory. We have reviewed our cost management processes to accomplish this goal.

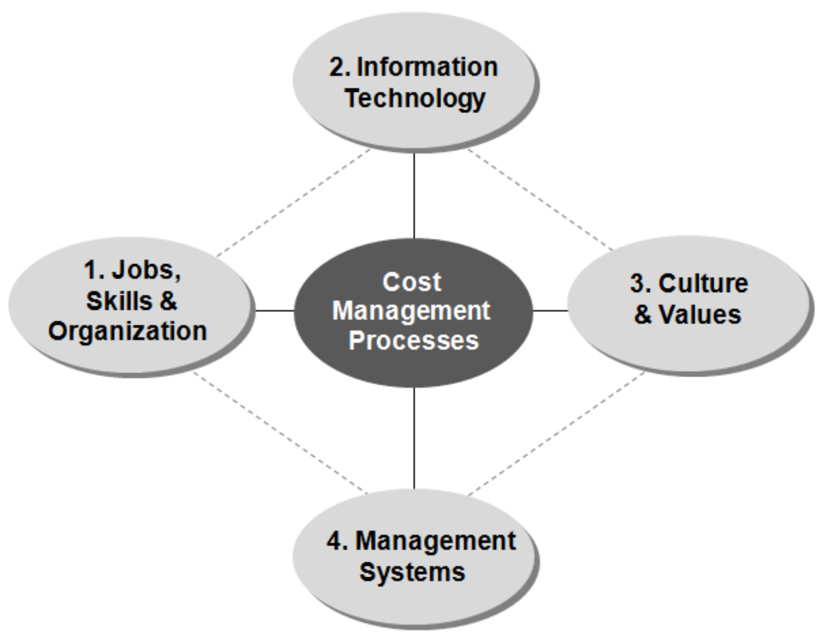
In early 2009, we began assessing current cost management practices in a three-pronged approach using internal surveys, industry benchmarking, and third-party evaluations. The Company surveyed 270 finance and operations employees, and performed follow-up focus groups and interviews with subject matter experts. To better understand the Company's performance against industry peers, we surveyed the cost management practices of leading utility and non-utility companies across the country. We identified opportunities to define, communicate, and institutionalize a formalized corporate approach to cost management. The changes we will make conform to the following objectives:

- Integrate planning, management, and review processes to integrate financial and field operations and establish the aligned priority for cost management
- Enable an action- and deliverable-oriented approach by defining and building skills of and developmental career paths for cost management personnel
- Identify and implement an organizational structure that balances consistency in policies and practices, alignment of activities to priorities and goals, oversight and direction, partnership with stakeholders, independence of cost management personnel and opportunity for employee development
- Better integrate project management concepts into work practices and procedures

Components and Implementation Plan

We will improve our cost management practices in the following four key areas: jobs, skills, and organization; information technology; culture and values; and management systems. Ultimately, the process will allow tracking financial performance from planning to project execution. The appropriate information technology systems will provide end-to-end performance monitoring and transparent reporting tools.

Figure 7-4. Four-Point Implementation Program for Cost Management Improvement



The main components of the cost management initiative are grouped within these areas:

4. Jobs, Skills & Organization

- **Strengthen Financial Analysis Capabilities**—Strengthen analytical skills across the Company, combined with an understanding of operations. Establish and coordinate training programs throughout all organizations to ensure consistency and minimize the loss of knowledge due to attrition. Establish career paths for financial personnel, and include job rotations to broaden employee exposure to field operations.
- **Launch a Program on Utility Economics and Key Financials**—Develop programs on utility economics and key financial management principles for all new management employees. Include this program in the supervisor training and development curriculum. Make an online version of the program available to all employees.

5. Information Technology

- **Improve the Estimating Process**—In parallel with developing the reporting tool, improve work management systems to enhance estimating accuracy. The "Estimated vs. Actual" tool described below can be used to validate or refine estimating assumptions on a periodic basis.

6. Culture & Values

- **Align Key Players**—The roles and responsibilities of all professionals will be more clearly defined across the entire process, with an emphasis on creating a deliverable- and action-oriented culture. Establish clear accountabilities for estimating accuracy, tracking of results, analyzing variances, and implementing corrective actions.
- **Enhance Cost Awareness**—Promote cost-awareness as a core value across corporate and operational functions. Institute processes that support the careful balancing of key priorities such as cost, reliability, and risk. Successful prioritization of expenditures will require that employees have a solid understanding of field operations. This will facilitate inter-organizational communication and enhance the effectiveness of financial analysis.

7. Management Systems

- **Standardize Project Management**—Standardize the project management function across the Company.
- **Establish KPIs for Capital**—KPIs are heavily weighted toward O&M performance. Establish a significant weighting for the performance of capital projects.

7.7 ENHANCING ORGANIZATIONAL SKILLS

Skill Evolution

Our workforce of 2030 will look very different from today's workforce. In looking out over the period of the next 20 years, our workforce – at all levels - will need stronger analytical skills. This is because each of the plan themes outlined in this report will require significantly enhanced analytical work. The integrated management of new demand and supply resources, will require a new, more complex level of planning and dispatching. Tailoring system design will require quantitative evaluation of several options to meet customer demand, reliability and safety constraints. Improving asset management and mains replacement and increasing monitoring and control of the system will require the processing and analysis of large volumes of data, from load and pressure flow analysis to condition-based maintenance. Managing the customer experience will be transformed by the availability of new information and data and the exponential increase in customer service requirements to explain and make the data easily understood and actionable by customers. Jobs throughout the organization will become more complex and we expect that new jobs will be created to meet the great demand for analytical skills.

We will seek other opportunities for improving our skill sets in order to successfully execute the Gas System Long Range Plan:

- **Advanced understanding of technology**—Some equipment which we plan to deploy over the next 20 years may have more capabilities and will be much more technologically complex, than much of what we have in our system today. We will replace our current equipment gradually, not all at once. But as we shift gradually to a more complex gas system, we need to have a parallel shift in our people's technical skills, from planners to engineers to operators and line mechanics.
- **Improved planning and problem solving**—Utilities rely on standards for good reason: so that capable engineers can determine the best way to ensure desired results and operators can implement them systematically. As equipment, systems, and approaches offer changes at an increased pace, however, we need to be able to problem-solve more quickly and incorporate new solutions into our plans more readily.
- **Ability to utilize real-time data in the field**—The salient characteristic of all the technologies associated with a more nimble, safer and more intelligent gas system is a higher, and more real-time, volume of information about equipment condition, corroded pipes, leakages,, etc. The highest value of this information is that our people in the field will be able to receive, digest, and use it in real time, which involves both equipment and the skill to know how to make the information actionable.
- **Improved communications for customer service activities that advise customers on energy choices**—We have an important educational role to play, and advising and educating residential and small commercial customers about energy decisions and efficiency issues is a skill that will needed by more of our employees.
- **The ability to adapt to change both individually and as an organization**—Flexible and adaptable organizations and employees can perform much more effectively in ever-changing business environments.
- **Focus on creating a tighter linkage between strategic planning and operational planning**—We need to greatly strengthen the degree to which our operating unit planning is ultimately driven by our strategic planning. Strategic planning, in turn, needs a stronger focus on improving value for our shareholders. Only in this way will we be able to secure, over the long run, the financing needed to provide our customers with the quality of gas service they require, and drive the resulting priorities through to execution.
- **Systematically incorporate customer and regulatory/governmental needs into operational planning**—While we seek in good faith to accommodate changing needs of our customers and public policymakers, we need to include them more systematically among the considerations which are driving our strategic and high-level operational planning.
- **More quickly and more thoroughly incorporate learnings from R&D into operational planning**—Con Edison has among the most advanced R&D activity sets of any utility in America. We need to develop systems and habits that will drive us to incorporate their results much more quickly and thoroughly into our strategic and operating plans, and into future revisions of the Gas System Long Range Plan.
- **Leadership skills should complement technical skills**—Con Edison should ensure its next generation of leaders possesses the leadership and communications skills needed to enhance relationships with its customers and other stakeholders. Resources should be committed to develop these skills at all levels.

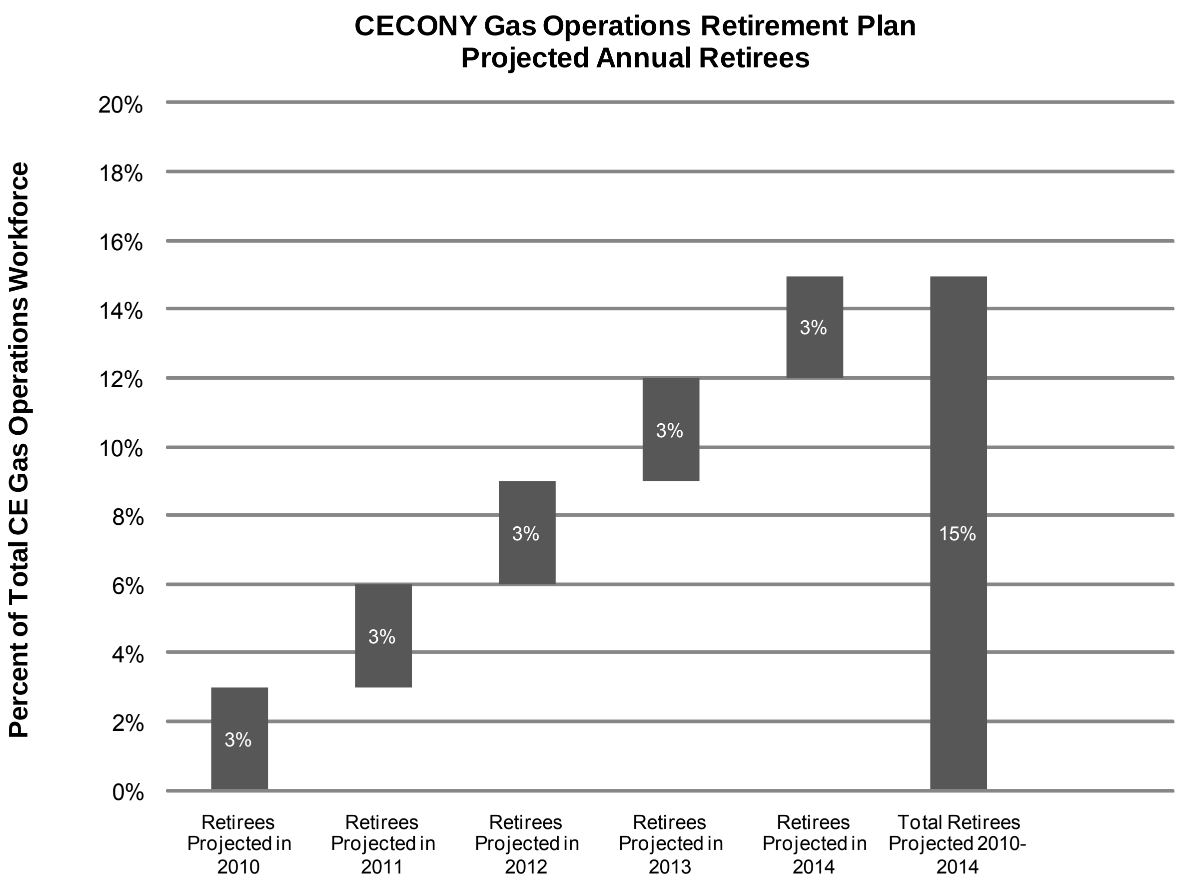
We recognize that we are one of many influencers in the energy market. There are areas where our efforts in customer outreach and education will be complementary to those of other players in the market. For example, entities which provide assistance to customers with respect to energy efficiency play an active role in educating and promoting the transformation of our market. This means that energy efficiency, and more broadly, a conservation mindset, will develop as a result of both our efforts and those of other market players. The Company remains committed to developing the skills needed to enhance our relationship with customers in a changing business environment, and will continue planning (as we do today with our load forecasts) for internal and external factors that shape this relationship.

Strategic Workforce Planning

We are working on plans to ensure we fill the work force gaps that could exist in the future.

We have identified two major workforce issues common to gas utilities across the country and relevant to the Gas Long Range Plan. First, workforce demographics are a concern, with a growing number of workers close to retirement and an influx of young, inexperienced workers. Based on the demographics of our workforce, and the structure of our retirement plan[60], we project that over the next five years, an average of 3% of our workforce will retire annually. This means that we expect that about 15% of our employees will retire between 2010 and 2014.

Figure 7-5. Retirement Eligibility[61]

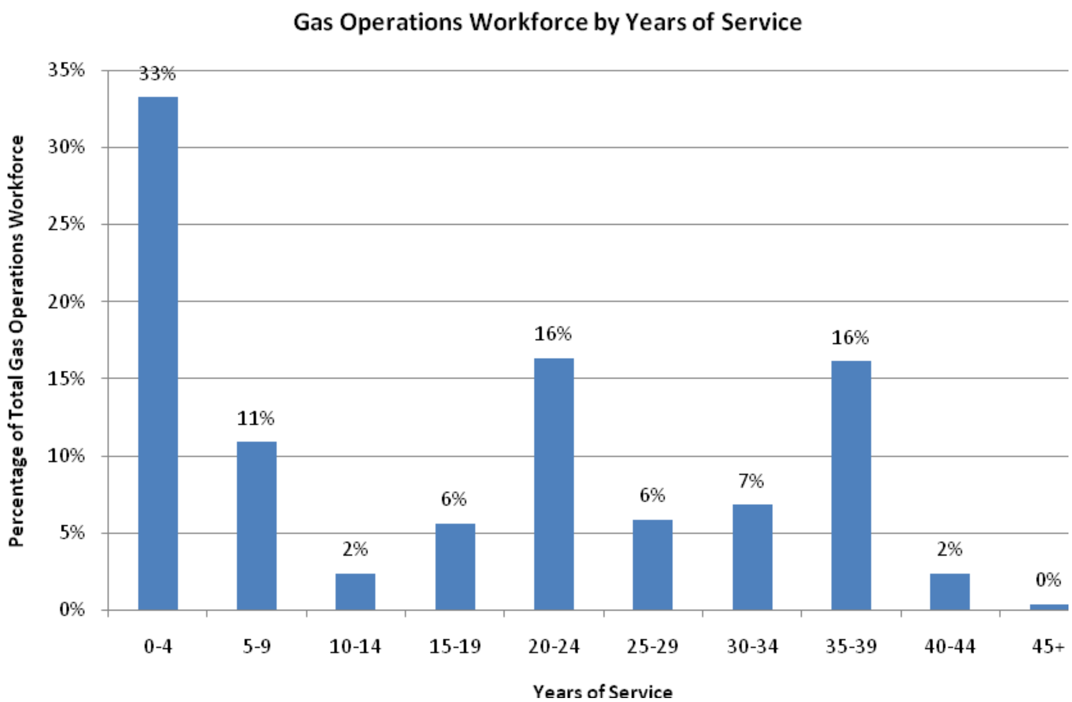


[60] Employee retirement eligibility and benefits at Con Edison are determined through a point system. The point system works by combining the age of the employee with their years of service. Employees are eligible to retire once they have 75 points.

[61] Study includes CE Gas Operations

At the other end of the spectrum, 44% of our workforce has been employed at Con Edison for less than ten years, and 33% for less than five years, as show in Figure 7-6. This demonstrates that a large number of new employees that require comprehensive training programs are coming into the organization. This situation is even more pronounced at the non-management staff level, where about 50% of the workforce has been employed at Con Edison for less than ten years, and about 40% for less than five years. Training objectives must address the steep learning curve to enable new employees to quickly develop functional knowledge and be effective on the job. Field personnel, for example, participate in apprenticeship programs coupled with formal hands-on training, to provide them with the necessary skill sets to qualify for promotions and increasing responsibilities.

Figure 7-6. Years of Service[62]



We will address these demographic issues via the following strategies.

- Systematic knowledge management and transfer to ensure we do not lose critical organizational capabilities as this workforce retires
- Systematic and thorough training for critical job categories
- Supplementing the first two initiatives with experienced external candidates as required

The second workforce issue identified is that the skills, jobs, careers and majors that will be in demand tomorrow may not exist today. Field personnel and customer service representatives will require new skills to work with innovative technology. These skill gaps have been identified and are being addressed by building strategic partnerships with local high schools, community colleges, and universities.

[62] Study includes CE Gas Operations

We are currently developing capabilities to perform ongoing strategic workforce planning, which will help us proactively manage our workforce into the immediate and longer term future. The information platforms discussed in section 7.2 will enable monitoring of the internal and external business environment as a key element of strategic planning. In the short-term, this involves identifying key skill gaps 3 to 5 years out, and developing and updating an ongoing strategy to fill those gaps – through hiring, developing internally, or a mix of both. We expect to manage the longer term implications on skill gaps by carefully monitoring the relationship between industry trends, Con Edison strategic direction, and internal capabilities. This will ensure we are well positioned for the future, attracting talented people, providing the necessary training, development, benefits, job satisfaction, and career growth, thereby minimizing turnover. Going forward, this skill gap analysis will be a standard activity in our workforce planning initiatives.

Highest Commitment to Employee Training

Training is the most significant investment we can make. The Learning Center is a corporate education facility where we train and test employees in the skills they need to safely and productively perform their work. The Learning Center includes classrooms and hands-on labs for real-life learning. Instructors are a combination of former field, office and line personnel. The courses available at The Learning Center fall into two general categories: Skills and Leadership.

Training employees in 'hands-on' skills for new positions is a high priority at The Learning Center. But the type of employee we are training today and the organizational needs differ from the past. We have shifted from providing veteran employees with new skills for different jobs to providing new employees with new and enhanced skills for more complex jobs. All of our newly hired employees require basic training and then skill-enhancement training as they move through their career paths. We also provide refresher training for existing employees. This increase in training demand has compelled us to look at new instructional methods, such as eLearning, simulation training, and self-study courses.

It has become increasingly important to look toward recruiting the company's future leaders into programs such as the Growth Opportunities for Leadership Development (GOLD) program, an intensive, 18-month entry-level rotational program for recent college graduates. We have adapted our training curriculum to provide leadership and analytical skills, as well as career advice, to develop and prepare employees to manage the Con Edison of tomorrow.

An additional priority of both The Learning Center and Talent Management is to develop employees with a greater sense of business acumen. This involves classroom discussions of such topics as ethics, open communications, lessons learned from incidents and audits, and continuous improvement.

There are four key principles that guide us:

- We will incorporate our values and the principles into all our programs.
- We will provide employees with the right skills, for the right job, at the right time. Since 2001, Con Edison has lost many highly skilled, experienced employees through retirement. To continue to operate and maintain the most complex energy system in the world, we must train and develop employees with the highest technical and managerial skills.
- All of our training programs will be tied directly to performance on the job. We work in partnership with line organizations to ensure that students are exposed to the skills, procedures, and

equipment needed to do their job efficiently and safely. The key to effective "performance-based" training is alignment with operating organizations. Our courses must be linked to "real world" tasks and experiences. Many training facilities and laboratories were designed to simulate conditions in the field.

- We will maintain a team of experienced, professional instructors and managers who are subject-matter experts from line organizations. We provide new instructors with training in such topics as presentation skills, curriculum development, and innovative instructional techniques; however, there are no “lifetime" teachers at The Learning Center. In order to stay familiar with the realities of the field, our instructors are expected to rotate back to operating organizations after a three to five-year assignment at The Learning Center.

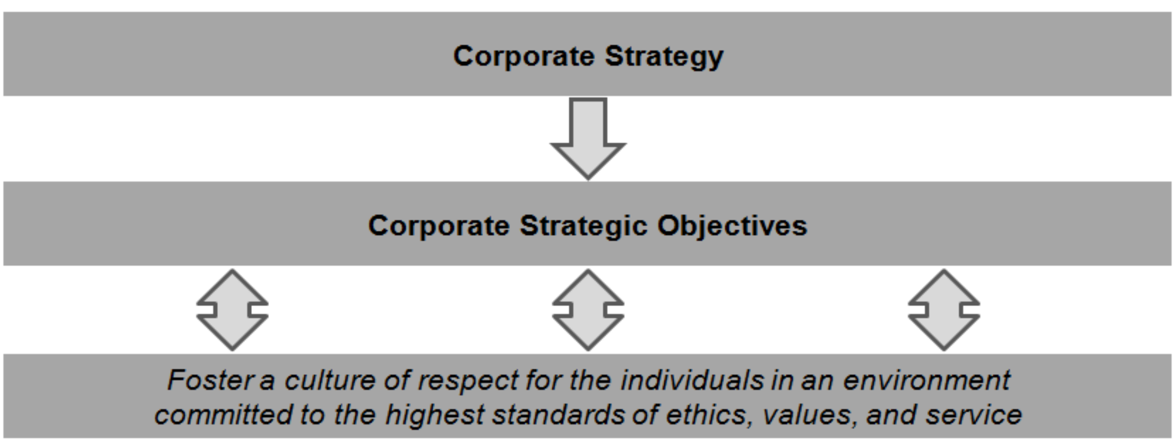
Strong Linkages Between Human Resources and the Operating Companies

We recognize that a strong human resources organization, with a clear vision and set of tools, is needed in order to prepare for the changing skill sets needed to manage the business.

In 2007, an enhanced human resource strategy was introduced to the corporation. This strategy resulted from the work of a team of leaders both from line and human resource positions. The objectives of the human resource strategy are to achieve superior business performance through talented employees, engaging work and continuous learning. The strategy consists of four key components: attraction, development, retention, and our corporate values. Each of the components consists of various programs that support them.

Figure 8-9 outlines our human resource strategy map, which shows the linkage between corporate strategy (including the Gas System Long Range Plan), corporate strategic objectives such as reliability and safety, and the core functions of the Human Resources organization.

Figure 7-7. Human Resources Strategy Map



7.8 SIGNPOSTS

Changes in the skills of our workforce will impact our ability to operate with the efficiency and consistency we value. Through strategic workforce planning, we will monitor and identify potential skill gaps and address them through resources such as training (e.g., The Learning Center), systematic knowledge management, career management, and hiring.

One of the goals of our new vision for planning is that all functions are aligned to maximize planning effectiveness, and to ensure ease of communication and collaboration with stakeholders such as regulatory bodies.

As the economy evolves, the elements of our business environment that affect our finances and operations may shift. We will closely monitor our business environment through established information platforms. This will ensure that our Enterprise Risk Management, Scenario Planning, and Capital Optimization processes reflect any shifts in the relative impact and importance of external factors on planning, cost management, and skill gaps.

8.0 SUMMARY

8.1 CHALLENGES

Planning for this more responsible energy future begins with understanding our internal and external challenges.

8.1.1 Internal Challenges

In the next twenty years, variables that will challenge and redefine the basic assumptions of gas delivery, from economic drivers to technological innovations and customers' increasing ability to control their usage, will change the landscape upon which Con Edison and other utilities operate. As we have been for the past 150 years, we continue our commitment to provide reliable and safe gas service at an affordable cost to customers for years to come. Reliability, safety, and affordability are the guiding principles of our long range plan. We hold ourselves as responsible for the quality of service we provide as we do for the financial impact it has on our customers.

To address internal challenges, we need to adapt our planning, design, and operational practices. As in the past, we will continue to build and maintain the necessary gas delivery infrastructure. To achieve excellence in this pursuit, we will introduce and implement innovative approaches as compared to what were previously standard practices. We will establish improved planning processes that leverage quantitative measures to optimize our project and program investment portfolio, and further to continuously prioritize and incorporate feedback into that process. We will continue to reevaluate our traditional design standards to find lesser-cost solutions to meeting our customers' growing and changing needs, and furthermore our designs will need to provide greater flexibility than ever before. To reduce our overall cost structure, we need to continue to reevaluate our operational practices and continue to enhance our cost management practices. In short, will plan for change, implement design and operational practices that support those changes, and meet the changing needs of our customers, while providing safe, reliable service in a cost effective manner.

We are as proud to serve the New York metropolitan area as we are to be one of its citizens; being one of its oldest citizens, however, has its impacts. We operate some of the largest and most complex infrastructure systems in New York's metropolitan area. To meet our customers' needs, we utilize a tremendous amount of assets, and after they are built, they must be maintained. The majority of our annual capital investment portfolio over the next twenty years will be dedicated to replacement of this infrastructure. Our focus will be on maintaining a sound infrastructure at the lowest cost possible. Past industry practices have focused on a time-based approach to asset management and to increase our efficiency we are using analyses and models to adopt a condition-based approach. We will need to implement both traditional and innovative design solutions. To further reduce the impact of these assets on our customers' bills, we need to focus on increasing our asset utilization through growth.

Excellence demands that these challenges are addressed with a keen awareness of the impact we have on our customers; for this reason, our standing responsibility to provide safe and reliable service to our customers will be balanced by efforts to mitigate bill and rate increases. Reliable and safe service is an expectation of our customers, and we consider it a mighty challenge to balance these expectations with lower and reduced costs, but it is a balance we will aggressively pursue. Addressing these challenges will give customers the same levels of reliability and safety they have today with less risk of large scale prolonged disruptions to natural flows of everyday business and life. To our customers, outages which can affect building heating or power generation have a social, economic and public safety concerns in high-rise and densely populated areas.

8.1.2 External Challenges

Currently, our delivery charges constitute about 40% of our typical residential winter heating bill. The supply rate constitutes about 52% of an average residential winter heating bill (See Chapter 2, Figure 2-11). Since customers purchase their gas supply from a range of competitive suppliers, the supply rate is largely outside of Con Edison's purview. As much as practical, Con Edison's gas supply for its full service customers is developed from the least cost options available to the Company. The supply portion of our customer bill is directly related to the market price of gas, which is itself highly dependent on seasonal variations in demand and fluctuating supply and storage levels. Many of these core cost factors have been characterized by significant volatility in recent years.

Approximately 20% of the total bill and nearly 32% of the delivery portion of the bill is due to taxes and fees (see Chapter 2, Section 2.5.2). These are largely out of the control of the Company yet contribute to the upward pressure on bills. We will continue our dialog with government and tax authorities to ensure full transparency of all components of the bill and to work toward minimizing upward pressure on our customers' bills. We have consistently advocated on behalf of our customers that New York's state and local governments reform utility taxation because of the regressive nature of utility taxes. In the current economic climate where commercial customers and generators of gas are seeking to reduce their energy costs, high taxes and fees imposed on a utility drive the cost of energy up, providing an incentive to explore other options. Loss of commercial customers would leave Con Edison's residential customers to bear even higher costs to the detriment of New York's economic viability.

Taxes for CECONY, and therefore for our customers, are principally comprised of four components: property taxes, income taxes, revenue taxes, and sales taxes charged to customers. For the purposes of this plan, the tax rates were held steady for the duration of the plan horizon. However, the assessed value of property taxes, the largest contributor to the tax portion of our customer's bill, increases over time with new capital infrastructure expenditures. The customer bill also includes fees collected for governmental entities. The System Benefits Charge surcharge is a mandated fee that finances energy efficiency programs administered by the New York State Energy Research and Development Authority (NYSERDA). The System Benefits Charge funds programs that have been determined by the Public Service Commission to be inadequately addressed by New York's competitive energy markets. In addition, the 18-a assessment fee is imposed by the New York State Legislature for the support of the State's General Fund.

It should be expected that this challenge will continue during the 20-year term of this plan, i.e., there will be a continuing tendency to raise taxes through the utility bill and use the utility bill to fund worthy social-environmental goals that would be more appropriately funded from general taxation revenues.

8.2 CONTINUALLY IDENTIFYING OPPORTUNITIES TO REDUCE COSTS

8.2.1 Savings Achieved through Planning Process

Of the total 20-year GLRP capital expenditure illustrated in Figure 5-1 of Chapter 5, 60% is allocated to the Company's asset management and equipment replacement, while 28% is used for system expansion to meet customer demand. This means that the majority of the Company's spending is required for maintaining the safety and reliability of the existing gas infrastructure. It is therefore critically important to us that we optimize the management of component maintenance, repair, and replacement decisions to minimize cost impact to our customers.

Cost considerations are a major part of our planning process, and we're continuously looking for ways to do things better. Our strategy is to invest in infrastructure enhancements only when less expensive alternative solutions are not available to sustain existing reliability levels, provide for localized delivery capacity needs, and ensure employee and public safety. Through the efforts of this long range planning process, we have been able to identify $48 million or a 20% reduction in ongoing maintenance and new business-related infrastructure investments over the twenty year horizon (see Chapter 5, Figure 5-7). Major savings have come from our efforts in managing system expansion, using tailored and innovative approaches to system design and better managing our existing assets (explained in greater detail in Chapter 5).

As we expand and invest in our infrastructure over the next 20 years to meet the expected growing customer energy requirements, we will continue to manage our existing assets to implement better designs, make better purchase decisions, and better manage our inventory so that we can provide maximum benefit for our customers at the most reasonable price possible.

8.2.2 Con Edison Supported Reforms to Reduce Customer Costs

There are a number of governmental and policy reforms that the Company could pursue to reduce its gas costs for its customers. They can be divided into: (1) tax reforms; (2) financing reforms; (3) ratemaking reforms; (4) operational reforms; (5) customer service reforms; and (6) social policy reforms. Examples of each are set forth below.

Tax Reforms

- **Property Taxes**—The property tax classification system in New York City is outmoded and should be examined from the point of view of modernizing the tax system and achieving a more equitable approach to property taxation. These taxes are beyond the Company's direct control. By reducing these taxes, we can reduce our customers' bills, thereby increasing the affordability of the services we provide.

Financing reforms

- **Low Cost Financing**—Con Edison customers would benefit from low cost financing. For example, at one time, Con Edison had access to tax-exempt financing from the New York State Environmental and Research Development Authority (NYSERDA). Savings from tax-exempt debt are available to lower gas rates. Con Edison has been unable to issue tax-exempt debt since 1994. Among other things, Con Edison's bond rating is not at a level that would make the Company eligible for the NYSERDA program without costly and difficult to get credit support.
- **Capital Recovery**—Faster capital recovery of utility investments, while potentially increasing bills in the short terms, would reduce long term rate pressure, and over time lead to lower bills.

Ratemaking reforms

- **Performance-Based Ratemaking (PBR)**—The Public Service Commission's implementation of PBR could align investors' and customers' interests in more efficient operations by modifying rate plan frameworks to provide utilities with stronger incentives for achieving efficiencies.

Operational reforms

- **Equipment Inspection Program**—Currently-required equipment inspection cycles may be capable of reform to achieve operating goals more efficiently (e.g., extension of required inspection cycle from 5 years to 10 years may be feasible and would significantly reduce maintenance costs).

Customer service reforms

- **Customer Service Centers**—Customer service centers were once common in many industries, but they have been phased out. The current requirement for availability of face-to-face customer service in each borough or county may be an unnecessary cost.
- **Call Center Staffing**—With the growth in other methods of communication, call center requirements can be reviewed from the standpoint of cost, e.g., reduction in the service hours for non-emergency calls and requirements for toll-free telephone service.

Social policy reforms

- **Joint Bidding**—Expand joint bidding on interference work (currently applicable only in limited areas of Manhattan) that would make public improvement work more efficient and less costly.

8.3 CUSTOMER BILLS

As a Company, our goal is to provide the best option for our customers' energy service needs, and our customers have come to expect the highest service reliability from us. We want to be easy to work with, effective in our services, and an important supporting player in the local economy and our customers' lives. We want to enable the next evolution in energy delivery infrastructure and operate a safe and reliable system. We also will continue to plan, design, and manage our system in a cost effective manner, and to seek ways to advance the performance of our people and our infrastructure.

We will continue to do everything we can to keep our costs down and to help customers control their energy costs while maintaining the highest levels of service reliability and system safety. The delivery rate covers costs to build and maintain our transmission and distribution assets as well as to maintain and operate the customer billing and other operations platforms to service customers. Other components of the bill include supply costs and taxes and fees.

From our efforts to implement the plan initiatives, we project a bill increase slightly above the rate of inflation. Planned investment levels along with projected increases in the cost of supply will increase a typical New York City residential customers' monthly gas bill from $140 today to $203 in 2030, an average compound annual growth rate (CAGR) of 0.8% from the end of our current rate settlement in 2014 through 2030. Our delivery charges, representing the cost of transporting energy from the point of supply to the Con Edison system to the customer, is expected to constitute about a third of the typical residential bill; the remaining two thirds are attributable to costs of supply and costs to cover taxes and fees.

We strive to minimize customer bills and have outlined in this document several programs and initiatives to manage our infrastructure costs as well as to work directly with customers to manage their energy expenditures. We will continue to make every effort to keep our transmission and distribution rates down, nevertheless, as described above, market and policy forces outside of our control will continue to affect our customers' bills.

As discussed throughout this plan, we see the objective to better manage costs to our customers as an imposing challenge, but one which we intend to pursue and achieve. We will continue to explore and implement ways to reduce rate and bill costs for our customers and operate our system in the most cost efficient way possible, while delivering the benefits of safe and reliable gas service to customers in an innovative and environmentally responsible way.

8.4 SUMMARY

The Gas Long Range Plan provides us with a roadmap for our gas system for the next twenty years. This plan guides us toward a responsible energy future for our customers, using a safe, reliable energy resource that is both environmentally responsible and affordably priced. Building that future will require that we meet the challenges described in this plan by maintaining the gas infrastructure necessary for the transmission and distribution of gas, and expanding it in an efficient way to meet new demand. This comprehensive plan is a holistic way to effectively integrate our gas system infrastructure plans with non-infrastructure related elements of our business, such as demand, supply, and environmental drivers. The plan considers ongoing improved asset management for existing infrastructure and a tailored approach to design that includes alternatives and innovative technologies. The plan also provides a framework that links short-term projects and long-term actions to our goals and objectives.

To develop the forecasts for gas demand and a supply outlook, we made assumptions regarding potential environmental and regulatory requirements, economic trends, and included possible technological advances to develop three forecasts for potential customer demand. We used the Plan Case demand forecast to develop the infrastructure projects and programs in this plan. Our plan was developed under considerable uncertainty (i.e., technological, regulatory, and economic) and as a result we identified key signposts that we will monitor and use to adapt our plan as changes occur. This first long range plan is intended to be a living document, with assumptions that will be refined in future versions.

Throughout development of the plan, we measured our performance by showing the expected benefits of our projects over the long-term, managed our costs to keep in mind rate and customer bill impacts, and sought to maintain gas system reliability and safety.

We discuss a phased implementation plan that will put the Company on track to meet the challenges we foresee today and position us to deal nimbly with new challenges as they emerge. In the next twenty years, our plan calls for maintenance and expansion-related investments of nearly $6.5 billion in capital investments (in real 2010 dollars) in our gas delivery system, or an average of $309 million a year. Ongoing investment in our gas infrastructure is necessary in order for the Company to be able to continue to meet the energy demands of our customers in a safe and reliable manner. This level of investment along with expected increases in the price of supply offset by the beneficial impact of growth results in an average annual increase in rates of 1.1% from the end of our current rate settlement in 2014 to 2030 (see Chapter 6, Figure 6-3).

We remain sensitive that any rate increases impact our customers and we strive to keep rates as flat as possible. We fully recognize the importance of mitigating cost increases to our customers, and we are committed to keeping costs down as much as possible through continued cost management, efficiencies and innovations. We are committed to rigorously pursue regulatory and tax reforms as well. We are also mindful of the Company’s need to continue to attract large amounts of capital on reasonable terms.

We also recognize that utilities can play a key role in helping the federal, state and local governments meet their energy policy objectives. We are committed to working with various stakeholders (our customers, the community, legislators, regulators, and others) in order to implement our plan successfully.

Appendix A

Gas Main Replacement Strategy

Outline

- Liberty audit recommendation 35
- Benchmarking
  - NYS gas utilities
  - National gas utilities
  - NYC DEP (cast iron only)
  - Other countries (cast-iron only)
- ZEI
  - Project scope
  - Replacement strategy
- Recommendations and conclusions

Liberty Audit Recommendation

Conclusion #6:

– **Maintain current information about CECONY leak prone pipe.**

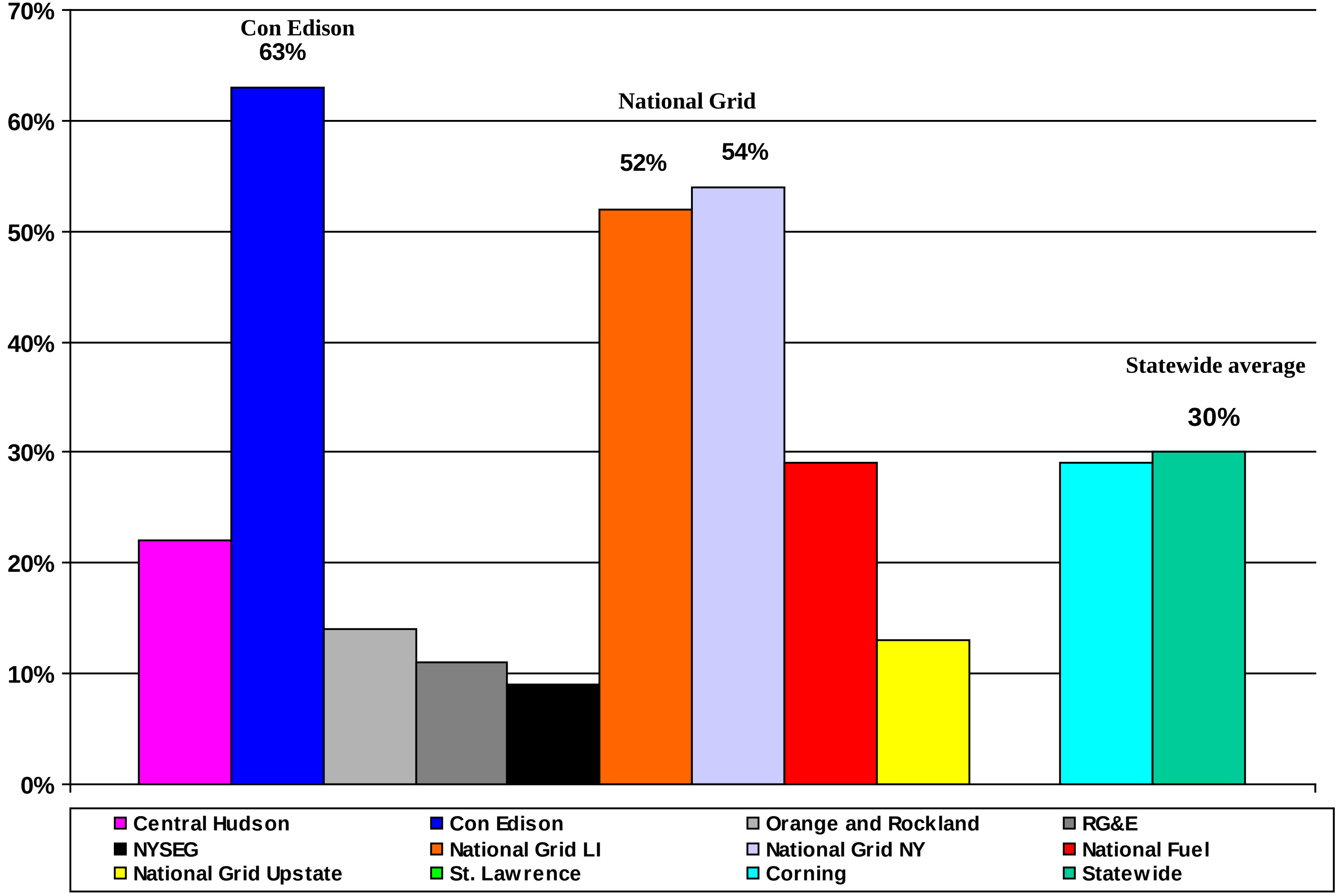
Recommendation #35:

– **Maintain current information about CECONY's leak-prone pipe. (Optimization of Main Replacement Program)**

Benchmarking

NYS Gas Utilities

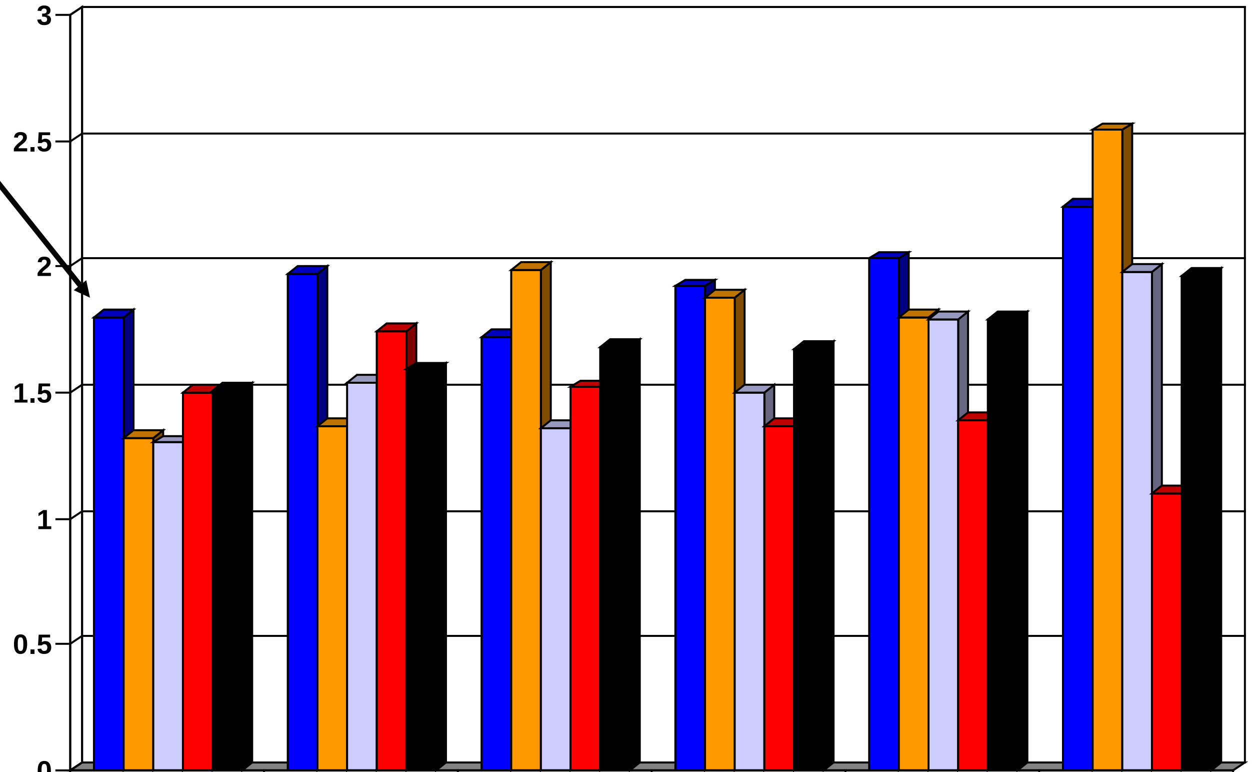
2008 – Cast Iron & Unprotected Steel Gas Main Inventory (Percent of Total)



Leaks Discovered/Mile

(Cast Iron & Unprotected Steel Mains)

In 2008, we have the most leaks per mile



	2008	2007	2006	2005	2004	2003
Con Edison	1.8	1.97	1.72	1.92	2.03	2.24
National Grid LI	1.32	1.37	1.99	1.88	1.8	2.54
National Grid NY	1.3	1.54	1.36	1.5	1.79	1.98
National Fuel	1.5	1.74	1.52	1.37	1.39	1.1
Statewide Average	1.51	1.59	1.68	1.67	1.79	1.96

Main Replacement Programs
Comparison between Con Edison and National Grid

National Grid LI

- An average of 60 miles per year x 3 years = 180 miles total replacement with a minimum of 50 miles per year
- Represents a 1.52% replacement per year
  - (60 miles / 3927 miles at 2008 year end)

National Grid NYC

- An average of 30 miles per year with a minimum 25 miles per year
- Represents a 1.38% replacement per year
  - (30 miles / 2169 miles at 2008 year end)

Con Edison

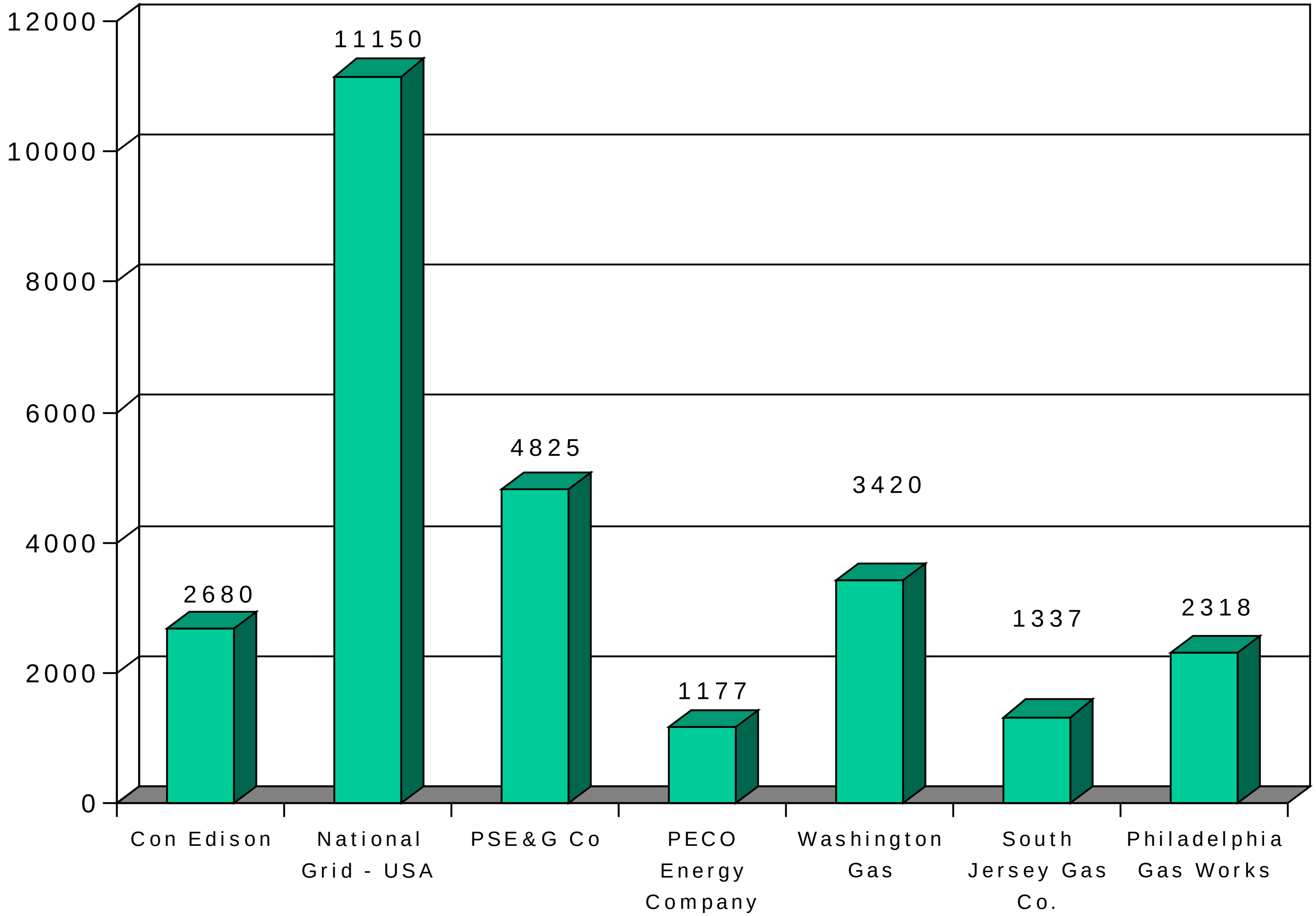
- An average of 40 miles per year X 3 years = 120 miles total replacement with a minimum of 30 miles per year
- Represents a 1.49% replacement per year
  - (40 miles / 2680 miles at 2008 year end)

Benchmarking
National Gas Utilities

AGA Benchmarking Beyond NYS

- Surveyed AGA members to determine cast iron and unprotected steel pipe inventory and accelerated main replacement efforts
- 29 Companies responded
- Isolated 7 utilities to compare our inventory to other utilities (Companies having greater than 1,000 miles of cast iron and unprotected steel pipe)
- Two other gas utilities replace a greater percentage of cast iron and unprotected steel pipe

AGA Benchmarking Beyond NYS
Inventory of Cast Iron & Unprotected Steel



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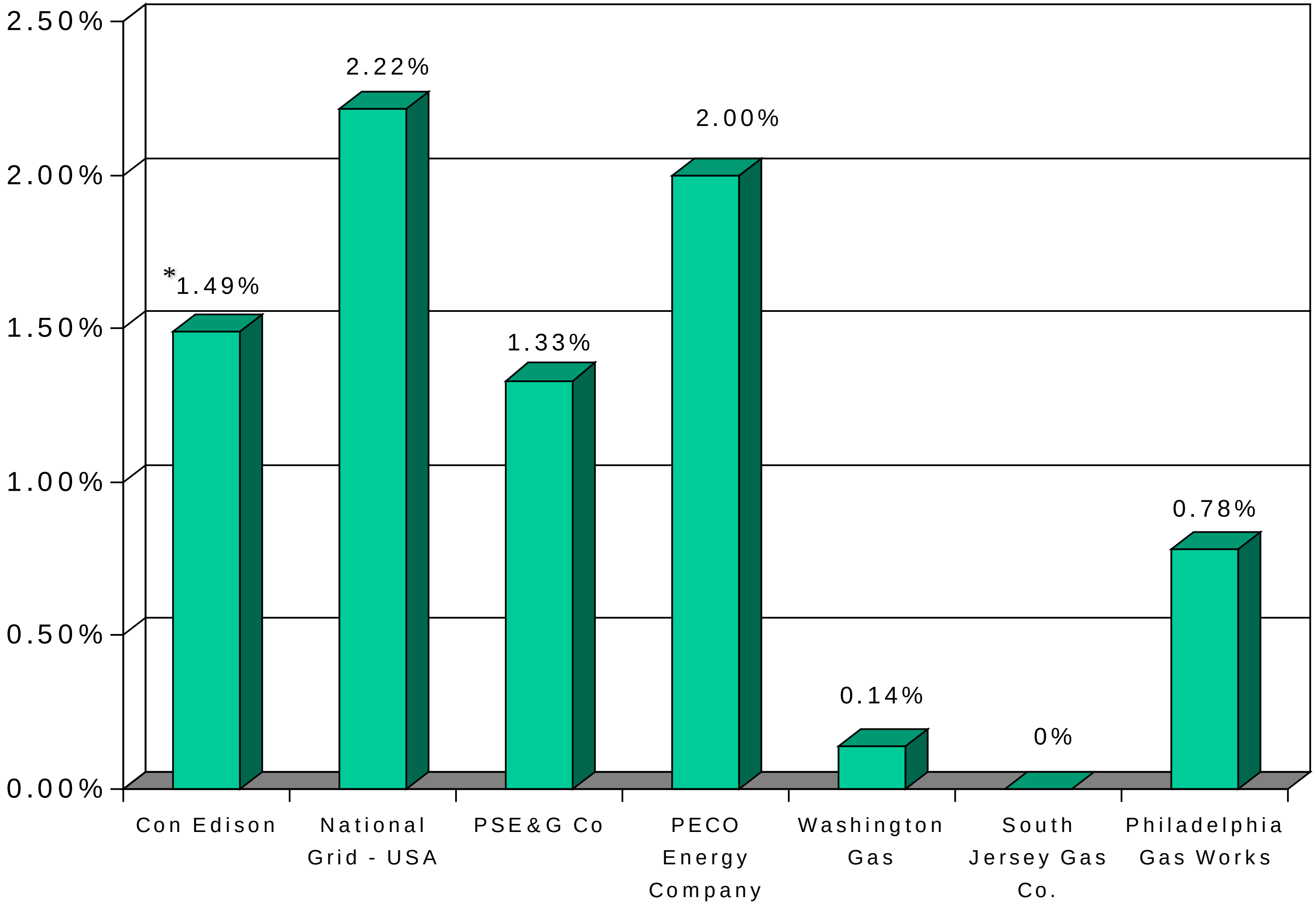
AGA Benchmarking Beyond NYS Annual Replacement Programs



*Based on 40 miles of replacement

Benchmarking
NYC DEP

(Cast Iron only)

Con Edison Compared to NYC DEP

Con Edison	NYC DEP
4323 miles gas distribution mains	Over 6,600 miles of pipe
1360 miles of cast iron Almost all of the cast iron inventory was installed before 1930	6,200 miles of cast iron 2,200 miles installed prior to 1930 unlined cast iron 2,400 miles installed between 1930 and 1969 cement lined cast iron pipes 1,600 miles installed after 1970 cement-lined ductile iron
Over **70%** of cast iron inventory is greater than 100 years old	Approximately **7%** of water mains are over 100 years old
Average of 150 cracks/breaks on cast iron per year .11 cracks per mile of cast iron (150/1360)	Average of 550 – 650 cracks per year .13 cracks per mile of cast iron pre-1970 vintage (600/4600)
Original 2010 Capital Budget plan is to replace 20 miles of cast iron	Main Replacement program to replace 60 miles of cast iron pipe In 2008, requested the replacement of 80 miles of cast iron pipe, but funding is delayed
Overall replacement targets (20 miles of cast-iron main replacement per year) Inventory of 4”-8” cast iron main = 1054 miles Annual replacement of 1.47% of cast iron inventory	Overall replacement targets Annual replacement of cast iron inventory (pre-1930) similar to CECONY inventory = 2.7%

Benchmarking

Other Countries

(Cast Iron only)

Benchmarking of International Gas Distribution Cast Iron Network

Country	Inventory of cast iron	Replacement Strategy	Percentage of Replacement
Italy	Approximately 1,600 miles of gray cast iron	Eliminate all cast iron by 2014 (average annual replacement = 267 miles)	16.68% annual replacement
United Kingdom	Approximately 144,000 miles of gray cast iron	Eliminate all gray cast iron in 30 years (average annual replacement = 4,800 miles)	3.33% annual replacement
Netherlands	Approximately 16,000 miles of gray or ductile cast iron	No accelerated efforts to replace existing cast iron	None
Switzerland	Approximately 4,000 miles of cast iron	No accelerated efforts to replace existing cast iron	None
Germany	Approximately 2,300 miles of gray cast iron and 15,000 miles of ductile cast iron	1997 to 2007 – program to replace all small diameter gray cast iron	Completed
Belgium	Approximately 1,500 miles of cast iron	No accelerated efforts to replace existing cast iron	None

Benchmarking Summary

- Con Edison has the highest leaks per mile rate of any NYS gas utility

- While we have shown a downward trend in our leaks discovered and leaks per mile, we remain the highest leaks per mile

- In NYS, Con Edison has the greatest percentage of cast iron and unprotected steel pipe inventory (approximately 63% compared to the next highest, which is National Grid NY at 54%)

Benchmarking Summary (Continued)

- On a national level, our replacement strategy is relatively in line with companies that have a comparable pipe inventory
- Our replacement strategy is relatively in line with NYC DEP for cast iron
- Some other countries have already replaced or have active programs to address small diameter cast iron mains. Italy and United Kingdom currently have a much more aggressive cast iron replacement program than Con Edison

Annual Replacement Rates

Utility	Annual Replacement Rate
Con Edison	1.49%*
National Grid NYC	1.38%
National Grid LI	1.52%
National Grid (USA)	2.22%
PECO Energy	2.00%
PSE&G	1.33%
Philadelphia Gas Works	.78%
Total average	**1. 53%**

* Based on 40 miles

ZEI Project Scope

As a result of Liberty Audit recommendation #35, Con Edison retained the services of ZEI, to conduct an investigative study to:

- Evaluate the existing and future condition of our gas infrastructure by utilizing existing soil sample data from previous ZEI study conducted in 1988, recent repair data, current material inventory data, and cast iron samples provided
- Determine the appropriate rate of main replacement to ensure consistent system improvement
- Evaluate the company’s cast iron and unprotected steel gas distribution main system and establish the required annual replacement levels to ensure a safe and reliable gas system

Evaluation Methodology

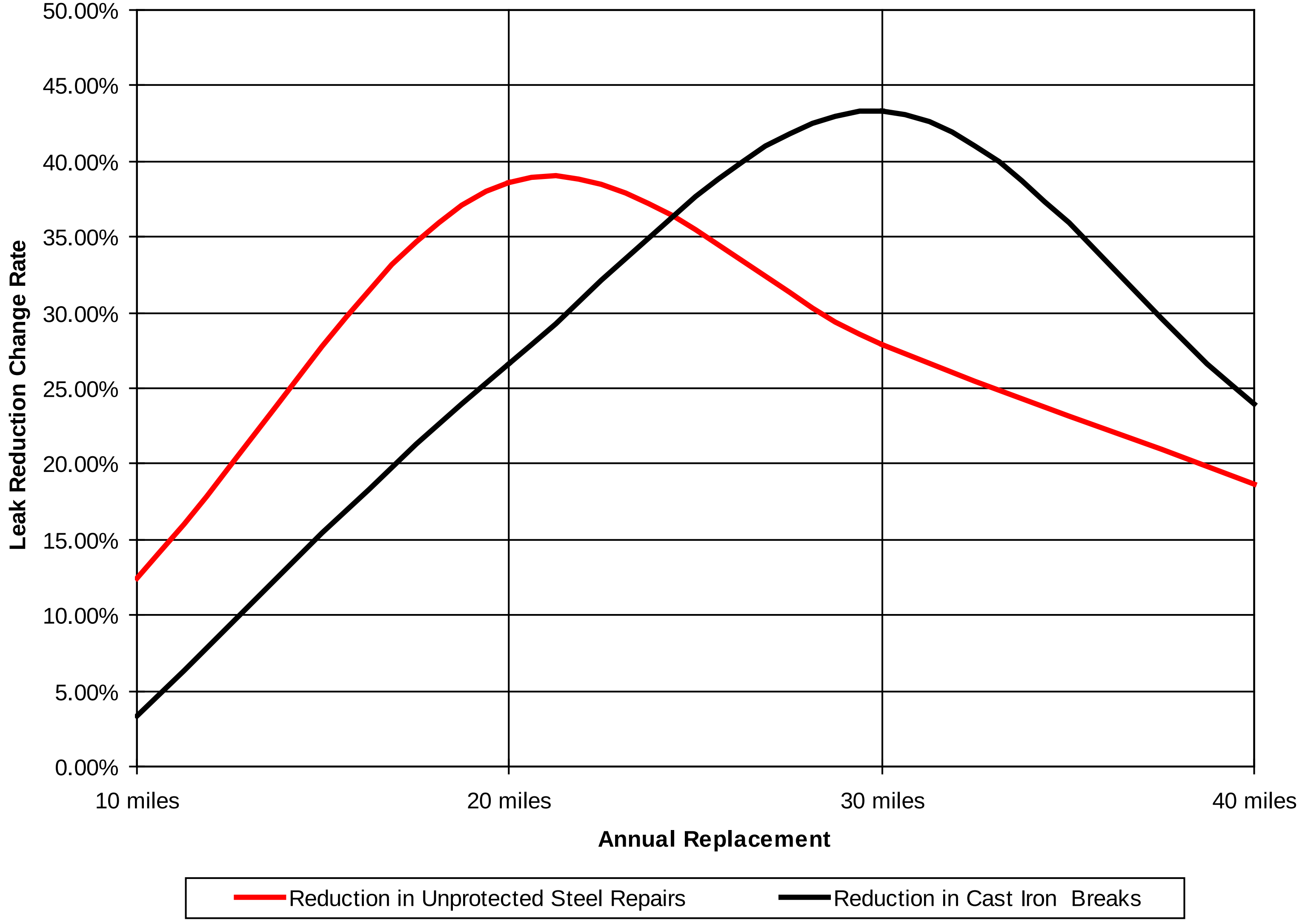
ZEI used two separate approaches to evaluate the future performance of Con Edison's cast iron and unprotected bare steel main.

- Statistical Analysis – utilizes leak repair data over a six-year period
- Rational Analysis – utilizes engineering principals and theoretical models to analyze the effects of such factors as:
  - Pipe size
  - Condition
  - Soil type
  - Effect of frost
  - Vehicular and other loads

Replacement Program

- ZEI provides various replacement schedules identifying the impact on leak repairs
- ZEI provided analysis for the points of diminishing returns
- CECONY can define the desired end-state and should re-evaluate periodically leak repair trends

Replacement Strategies Impact on Leak Repairs



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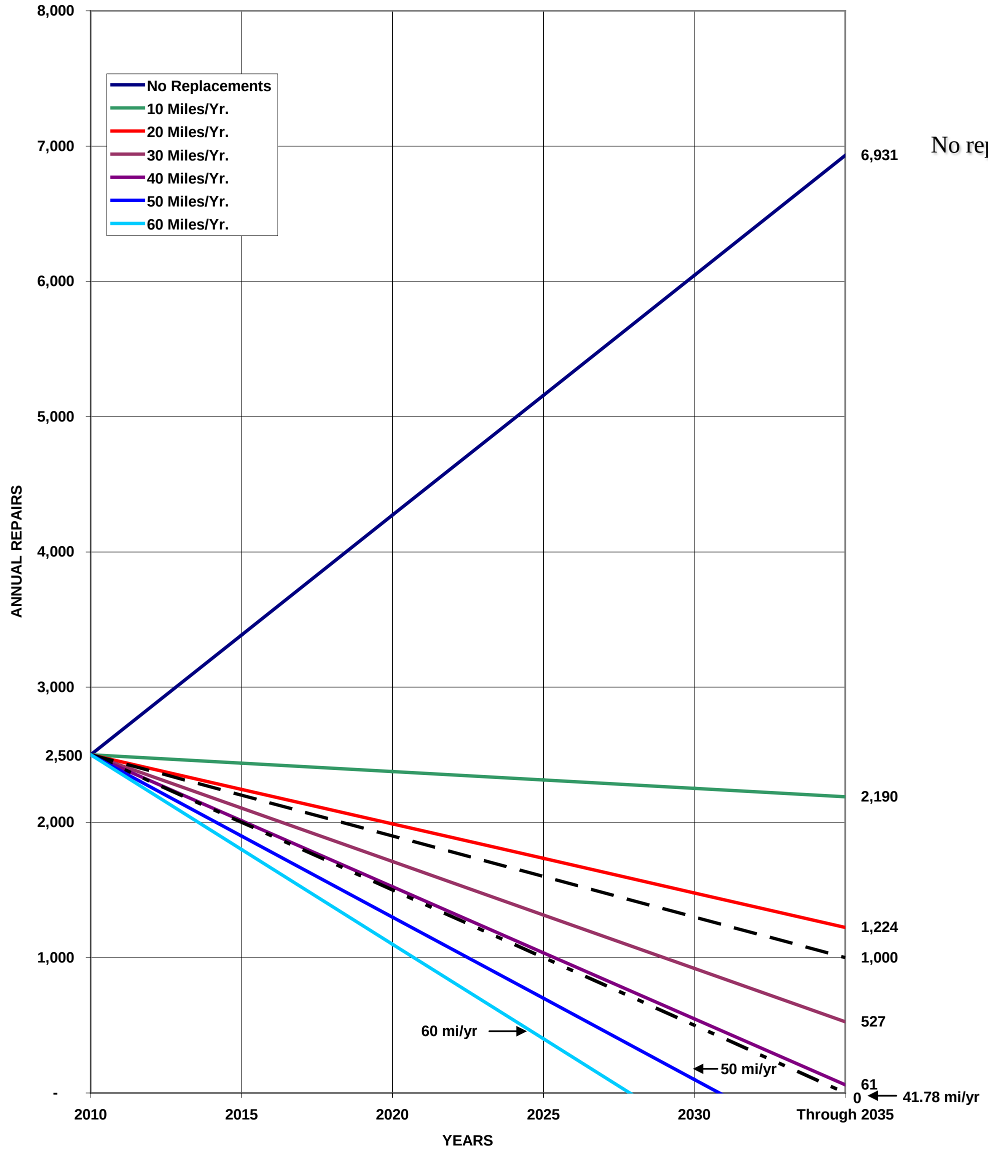
Points of Diminishing Returns
(8" and smaller)

Bare Steel Main Replacement versus repairs by 2035				
	Repairs per year	Reduction from current state	Rate of leak change	Change from one target to the next
Current state	2500			
No replacement	6931	-4431	177.24%	
10 miles	2190	310	-12.40%	12.40%
20 miles	1224	1276	-51.04%	38.64%
30 miles	527	1973	-78.92%	27.88%
40 miles	61	2439	-97.56%	18.64%

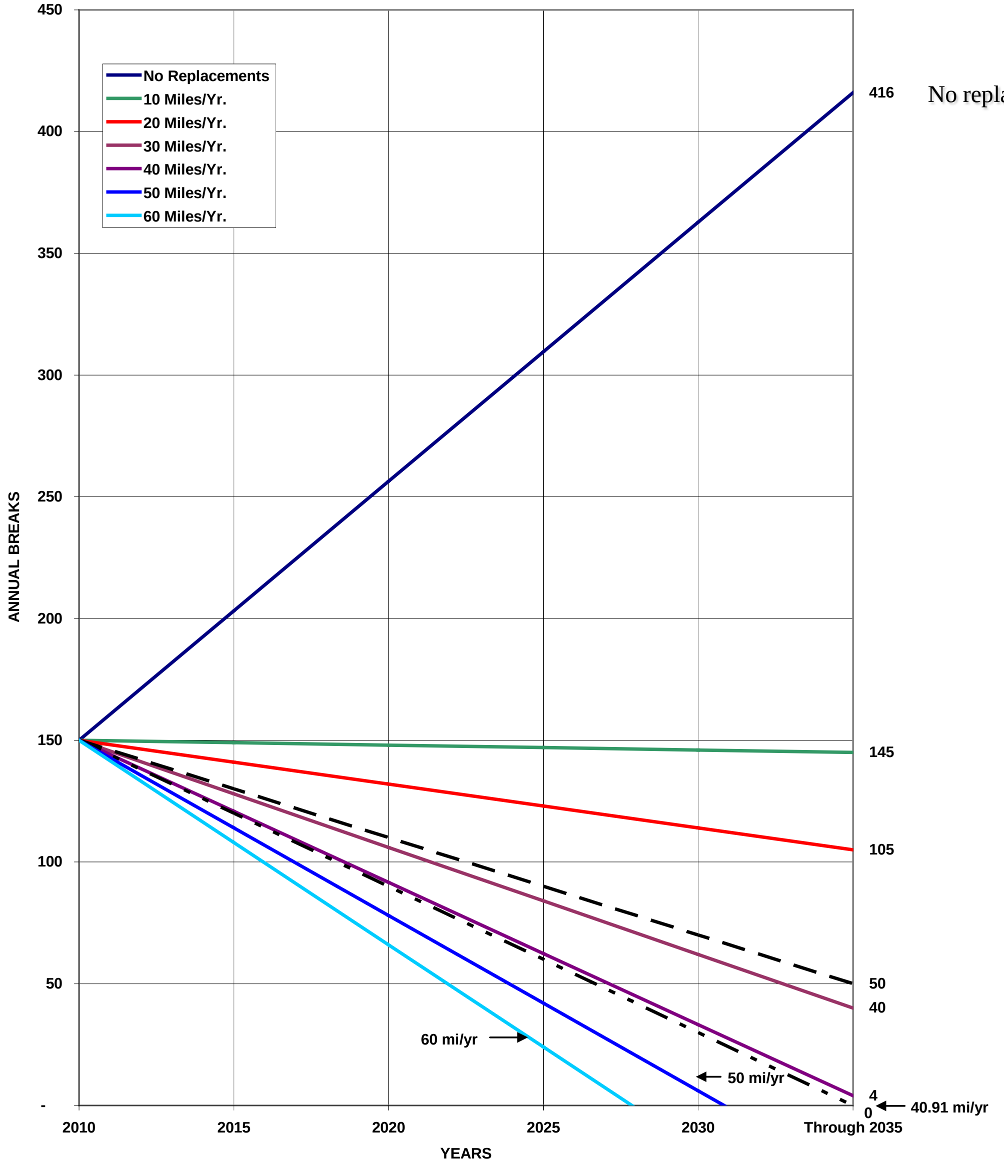
Cast Iron Main Replacement versus breaks by 2035				
	Cracks per year	Reduction from current state	Rate of leak change	Change from one target to the next
Current state	150			
No replacement	416	-266	177.33%	
10 miles	145	5	-3.33%	3.33%
20 miles	105	45	-30.00%	26.67%
30 miles	40	110	-73.33%	43.33%
40 miles	4	146	-97.33%	24.00%

Steel Replacement Compared to Future Leak Repairs



No replacement

Cast Iron Replacement Compared to Future Breaks/Cracks



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Potential Program Schedules

Annual Schedule	Annual Cast Iron Breaks By 2035	Annual Bare Steel Repairs By 2035
Current State	150	2,500
No replacement	416	6,931
10 miles	145	2,190
20 miles	105	1,224
30 miles	40	527
40 miles	4	Inventory completed

Incremental Impact to Rate Payer

- Every 10 miles of gas main would increase / decrease the levelized annual gas rate request by approximately $3.3 million

- Total levelized annual rate case increase request is $115.5M

- A 5 mile reduction would result in an estimated $113.9M total levelized annual rate case increase request

Annual Replacement

Provides a measureable reduction in the most hazardous types of leaks

Hazard	Main Replacement Program	Justification
Cast iron breaks	20 miles – cast iron	By 2035, breaks would be reduced by 30%. (10 miles keeps the status quo)
HP corrosion leaks	10 miles - steel	By 2035, incoming leaks repairs will be reduced by 12.4%. (No replacement would increase nearly triple the present leak repair rate)
HP coupling leaks	5 miles – 2" HP steel	Eliminate small diameter high pressure steel mains joined by couplings in areas experiencing increased failures
Total	35 miles	

Replacement Cost/Benefits Actual

		COST	BENEFIT	
Main Replacement Strategy		**Annual Capital Budget Costs ($000)**	**Average Annualized Leak Repair & Response Reduction***	**Average Annualized O&M Savings* ($000)**
35 miles	10 miles of steel 20 miles of cast iron 5 miles of couplings	$75,322	956 – repairs 23 – breaks	$4,187
40 miles	15 miles of steel 20 miles of cast iron 5 miles of couplings	$85,477	1,207 – repairs 23 – breaks	$5,261
50 miles	15 miles of steel 30 miles of cast iron 5 miles of couplings	$109,378	1,535 – repairs 57 – breaks	$6,805

*Based on 25 years of main replacement

Replacement Cost/Benefits Revenue Requirements

Main Replacement Strategy		COST		BENEFIT	
		Current Dollars Sum of Carrying Charges ($000)	Present Value Sum of Carrying Charges ($000)	Annualized Leak Repair & Response Reduction	O&M Savings Sum Present Value ($000)
35 miles	10 miles of steel 20 miles of cast iron 5 miles of couplings	$10,991,914	$2,214,766	956 – repairs 23 – breaks	$56,094
40 miles	15 miles of steel 20 miles of cast iron 5 miles of couplings	$12,488,108	$2,518,802	1,207 – repairs 23 – breaks	$96,466
50 miles	15 miles of steel 30 miles of cast iron 5 miles of couplings	$15,972,877	$3,220,380	1,535 – repairs 57 – breaks	$124,573

Based on 25 years of main replacement

Replacement Benefit
Type 1 Leak Reduction

Main Replacement Strategy		BENEFIT	
		Total Type 1 Leak Repair Reduction*	**Average Annualized Type 1 Leak Reduction***
35 miles	10 miles of steel 20 miles of cast iron 5 miles of couplings	9,062	362
40 miles	15 miles of steel 20 miles of cast iron 5 miles of couplings	11,385	455
50 miles	15 miles of steel 30 miles of cast iron 5 miles of couplings	14,728	589

*Based on 25 years of main replacement

Additional Benefits of Significant Leak Avoidance

Reduces the risk of:

- Potential loss of life, injury and/or property damage
- Negative public reaction/public perception
- Adverse financial consequences
- Litigation damages (not covered by insurance)
- Payments up to insurance coverage (deductibles)
- Increases in liability insurance premiums

Summary and Recommended Strategy

- Benchmarking indicates that we are relatively in line with other utilities
- ZEI identified the points of diminishing returns
- ZEI identified the impacts of various replacement levels
- We are currently reviewing the impact of various levels of main replacement
- We will continue to re-evaluate the impacts annually

Gas Main Replacement Program

~ Prioritizing Replacement Sections ~

MRP Methodology

- Estimates likelihood of failure of individual main segments from historical data
  - Main size, diameter, age, material, operating pressure
  - Incorporates area repair history to indicate potential leaks and breaks of similar individual main segments
- Separate model for steel and cast iron
  - Steel: calculates MCF (Mains Corrosion Factor)
  - Cast Iron: calculates MFF (Mains Fracture Factor)

MRP – Prioritization Algorithms

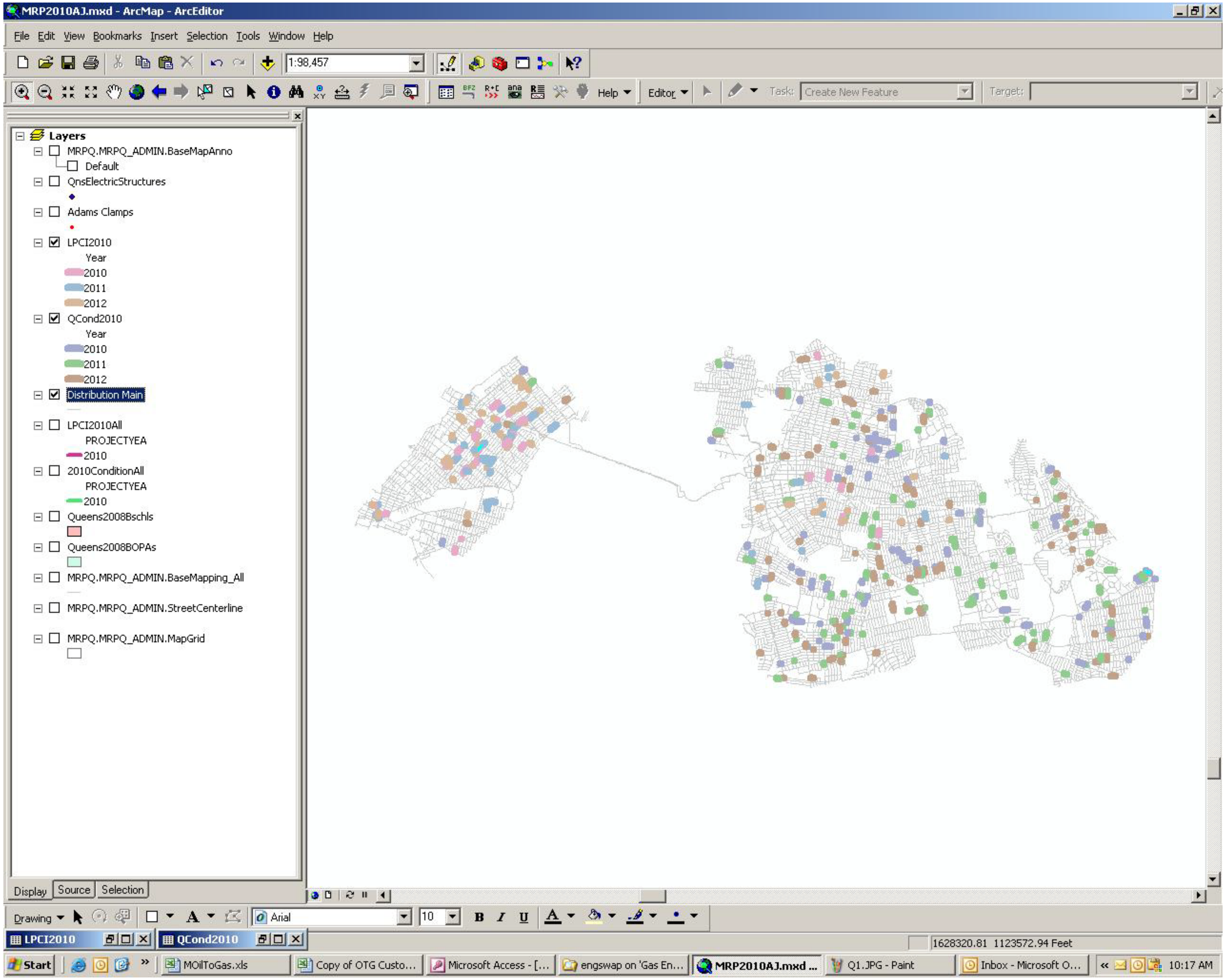
- Condition Model for Steel
  - MCF
  - Clamp count (localized repair history)
  - Proximity to schools
  - Targeted replacement (1950s vintage 2” coupled mains)
- Risk Model for Cast Iron
  - MFF
  - Clamp count (localized repair history)
  - Proximity to schools, electric structures, critical facilities
  - Targeted replacement (pre-1900s)
  - Unstable soil

Replacement Priority Report

CAST IRON RISK MODEL					
YEAR: 2010					
RANK	PIPE		LENGTH	MRP SCORE	PIPE ID
1	6	CI	183	6.09	200753755
2	6	CI	226	5.68	200884880
3	4	CI	128	5.42	800732056
4	4	CI	82	5.41	200881848
5	4	CI	40	5.31	200790253
6	6	CI	112	5.22	200732149
7	6	CI	42	5.16	200740637
8	4	CI	63	4.98	200881854
9	4	CI	168	4.98	200743335
10	4	CI	154	4.93	200758580
YEAR: 2011					
RANK	PIPE		LENGTH	MRP SCORE	PIPE ID
1	6	CI	46	4.26	800854662
2	4	CI	62	4.26	200865133
3	4	CI	64	4.25	200803914
4	6	CI	184	4.23	200808635
5	6	CI	185	4.22	200744877
6	6	CI	152	4.21	800632061
7	4	CI	85	4.19	200744855
8	6	CI	30	4.14	800242963
9	6	CI	129	4.10	200806840
10	6	CI	39	4.10	800748375
YEAR: 2012					
RANK	PIPE		LENGTH	MRP SCORE	PIPE ID
1	4	CI	101	3.76	800901512
2	6	CI	6	3.75	200880214

STEEL CONDITION MODEL					
YEAR: 2010					
RANK	PIPE		LENGTH	MRP SCORE	PIPE ID
1	2	Bare Steel	123	8.60264513543	800166598
2	2	Bare Steel	106	7.77915031884	200583361
3	4	Bare Steel	127	6.93527357092	800285586
4	2	Bare Steel	239	6.92218585311	200707049
5	4	Bare Steel	136	6.90045176258	800022097
6	2	Bare Steel	149	6.88297544628	200707050
7	4	Bare Steel	70	6.68580975704	200701723
8	2	Bare Steel	167	6.55534931307	800264200
9	6	Bare Steel	213	6.32492289988	200704762
10	2	Bare Steel	85	6.32389716554	800085288
YEAR: 2011					
RANK	PIPE		LENGTH	MRP SCORE	PIPE ID
1	2	Bare Steel	58	5.42582207323	800286737
2	4	Bare Steel	74	5.27161176317	800028118
3	4	Bare Steel	210	5.26963176064	800269525
4	2	Bare Steel	4	5.22964321923	800055884
5	2	Bare Steel	34	5.21618425313	200810202
6	2	Bare Steel	1	5.21618425313	200707088
7	4	Bare Steel	67	5.20679398462	200853710
8	2	Bare Steel	148	5.16744065153	800372275
9	6	Bare Steel	124	5.16086033616	800193573
10	4	Bare Steel	158	5.14769970542	200678836
YEAR: 2012					
RANK	PIPE		LENGTH	MRP SCORE	PIPE ID
1	2	Bare Steel	10	4.94244748382	800207271
2	2	Bare Steel	60	4.91635418853	800180225

Replacement Priority Map



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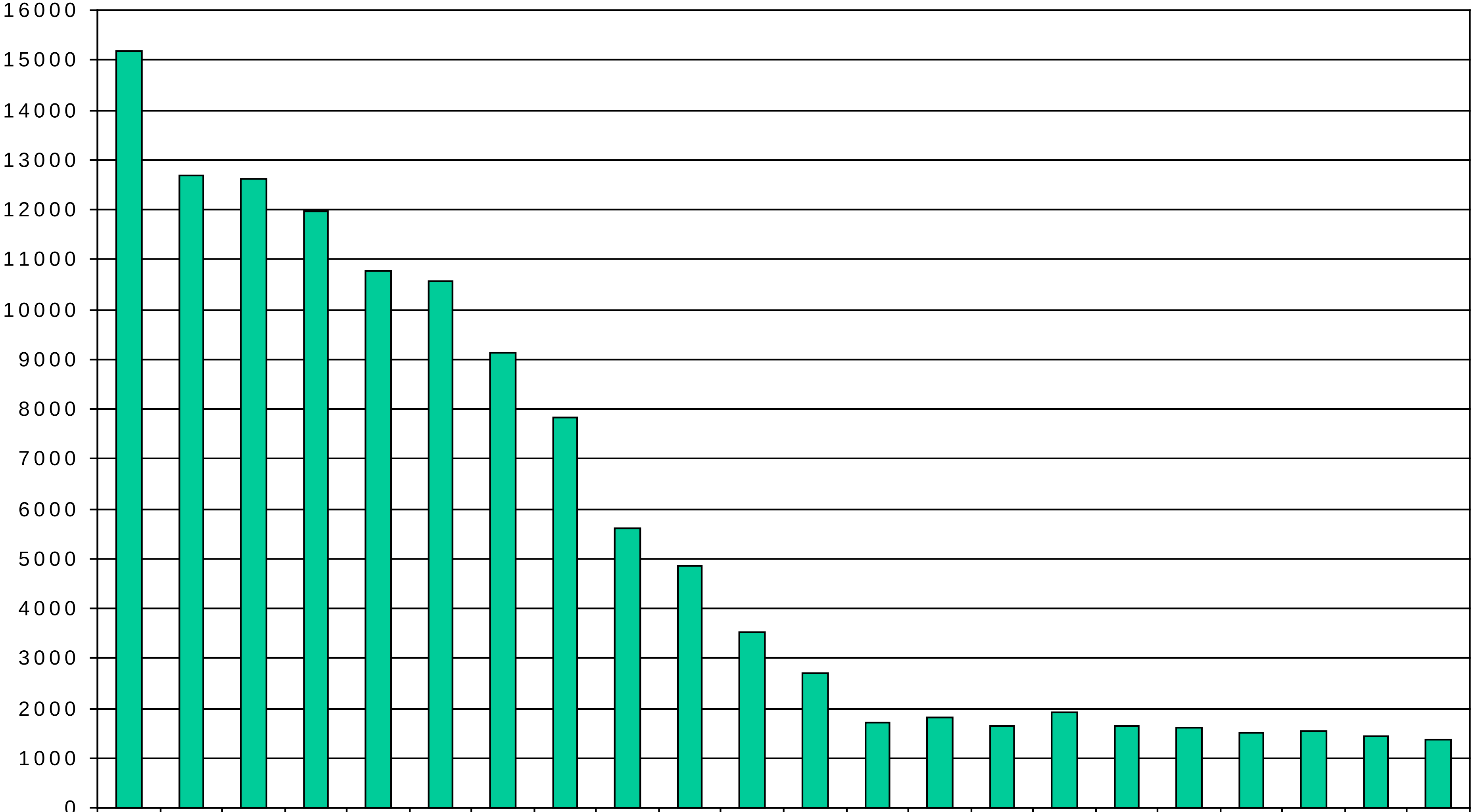
Leak Backlog Performance



	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Backlog	15194	12687	12631	11971	10758	10573	9139	7826	5621	4847	3512	2689	1705	1824	1642	1923	1645	1602	1512	1539	1423	1378

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Appendix B

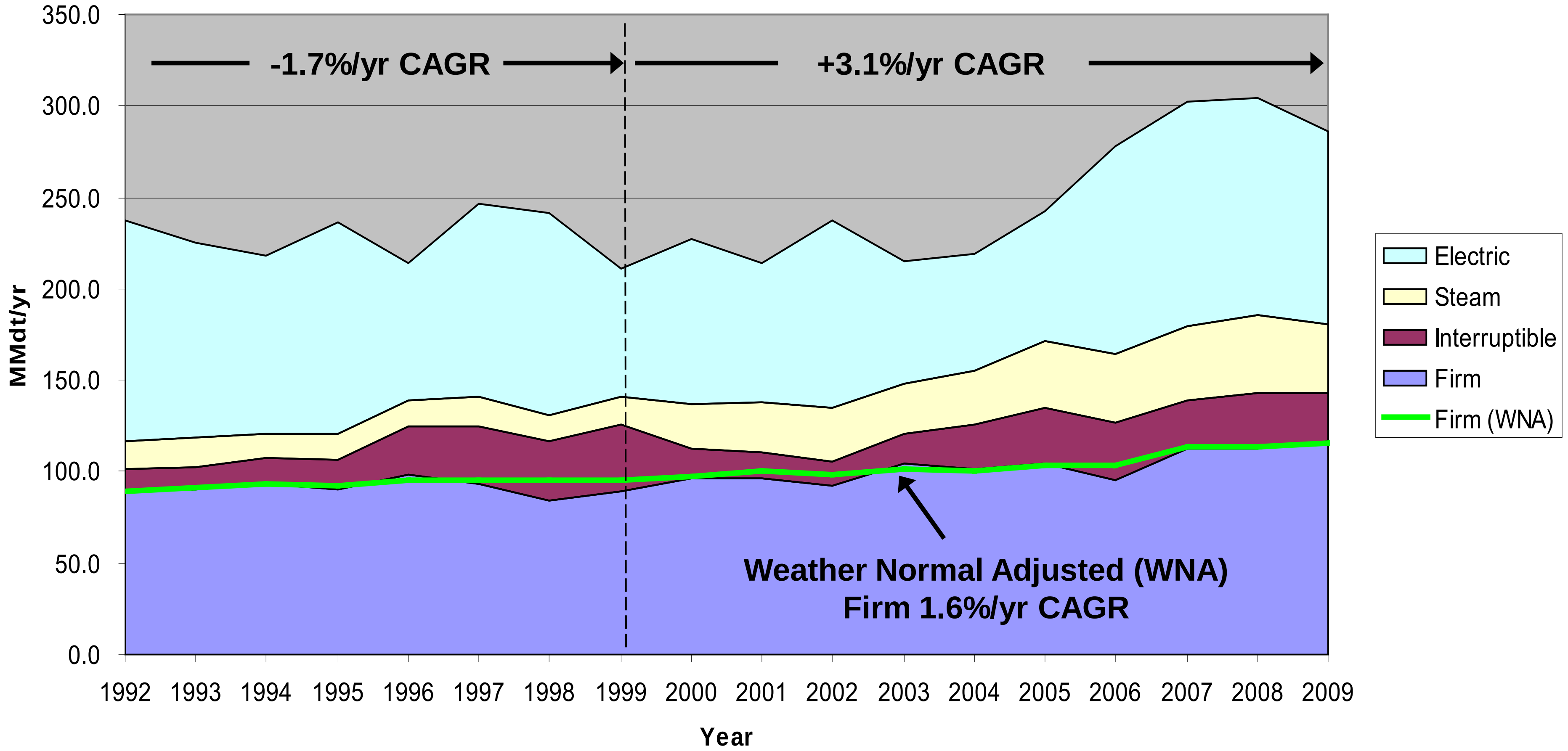
Gas Long Range Plan
Demand Forecasts

April 23, 2010

Outline

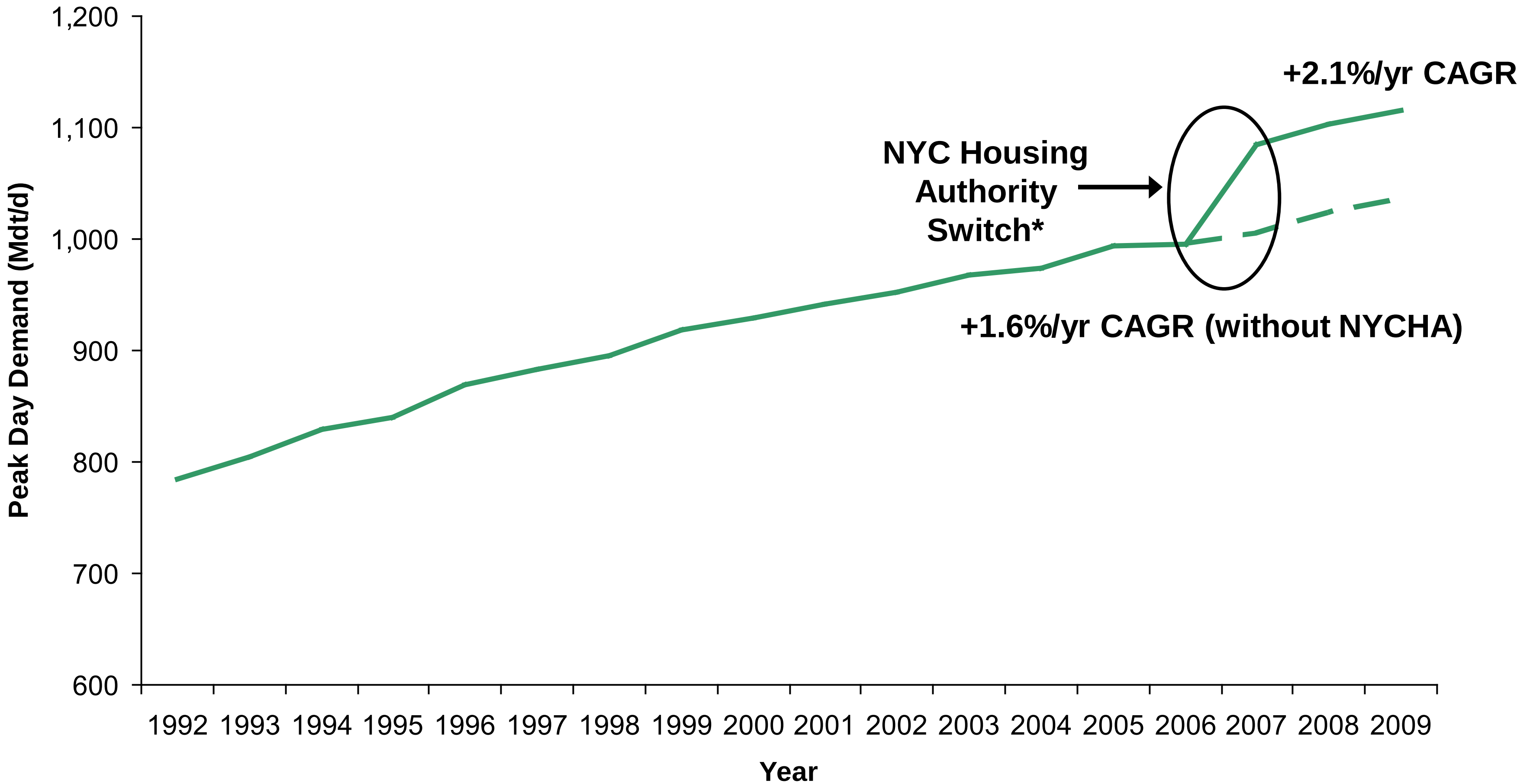
- Historical Demand (Annual and Peak)
- Demand Forecast
- GLRP Methodology and Assumptions
  - Uses of Natural Gas
  - Developing the Demand Cases
  - Potential for Conversions from #4 / #6 Oil
- GLRP Peak Day Firm Demand
- Summary

Historical Demand
Actual Annual Volume (MMdt/yr)*



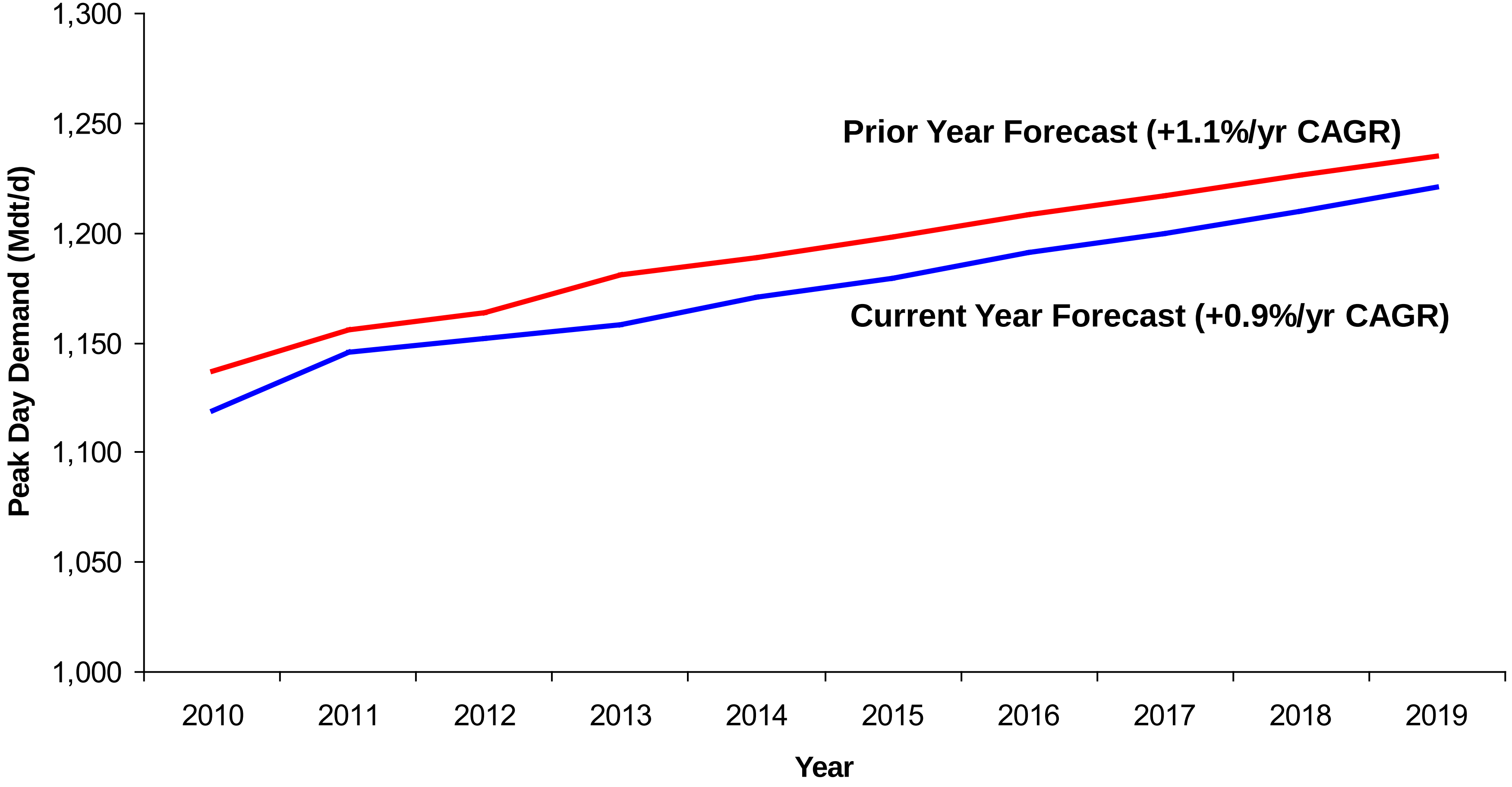
Note: * Actual volume shown, unless noted.

Historical Demand
Normalized Peak Day Demand (Mdt/d)



Note: Assumed NYCHA will remain firm after switching over from interruptible in 2007, because the federal government would pay for NYCHA fuel expense but NYCHA would be responsible for any penalties for non-compliance with interruptible service.

Demand Forecast (2010-2019)
Current and Prior Forecasts (Mdt/d)



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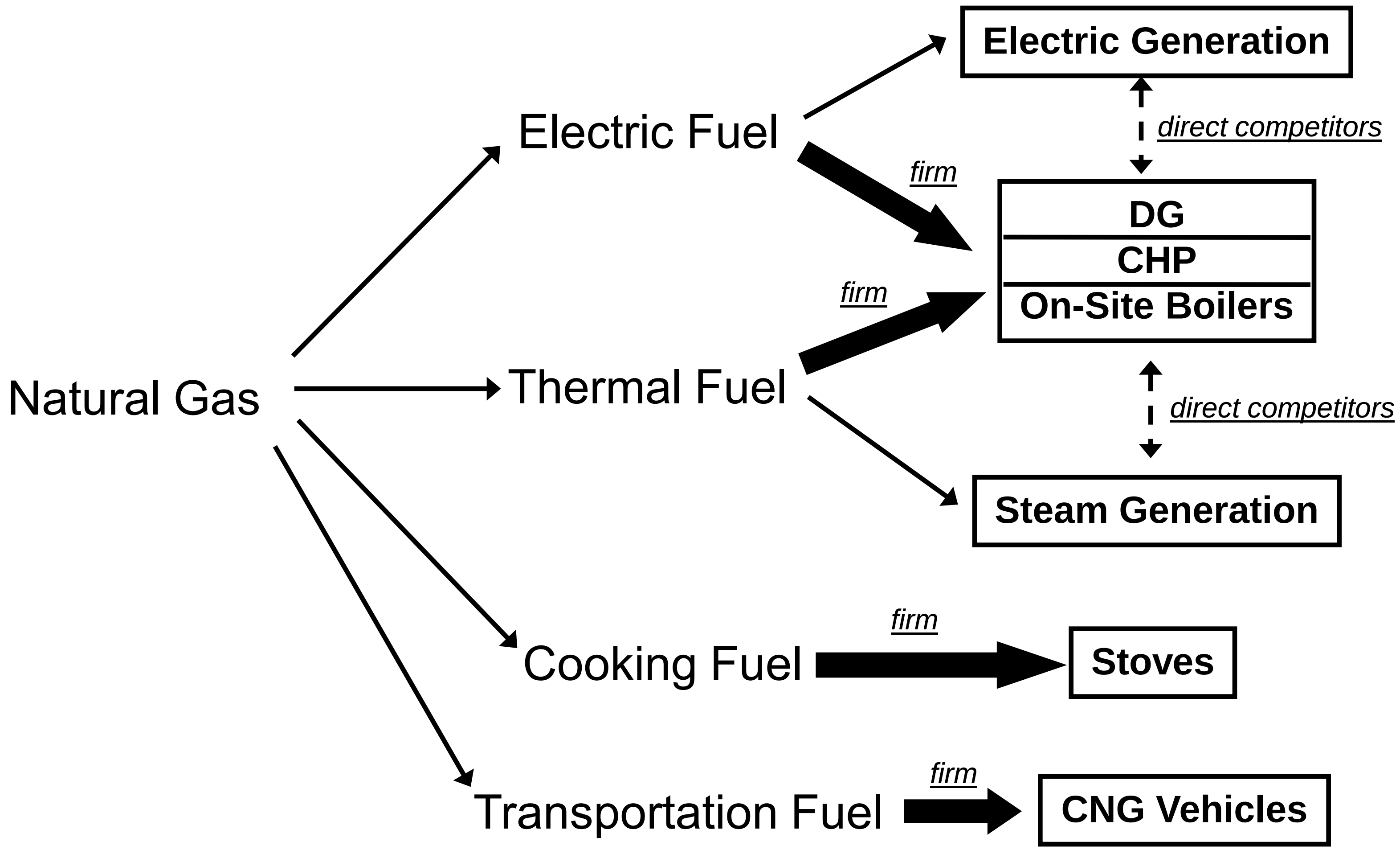
GLRP Methodology and Assumptions
Uses of Natural Gas



GLRP Methodology and Assumptions
Developing the Demand Cases

- Extend the 2010-2019 natural gas firm demand forecast to 2030
- Incorporate common elements from the ELRP and SLRP demand cases
  - Distributed generation
  - Combined heat and power
  - On-Site boilers
- Incorporate the new demand drivers (specific to gas)
  - # 4 / # 6 oil to gas conversions
  - CNG vehicles
- Assume no increase in firm demand for electric and steam generation
  - Generation owners will continue to contract on a non-firm basis

Conversion Potential
Background

2007

Mayor's PlaNYC 2030

2009

Target Improved Air Quality
- #4 & #6 oil

2010

Pending DEP Regulation
- Prohibit #4 & #6 oil

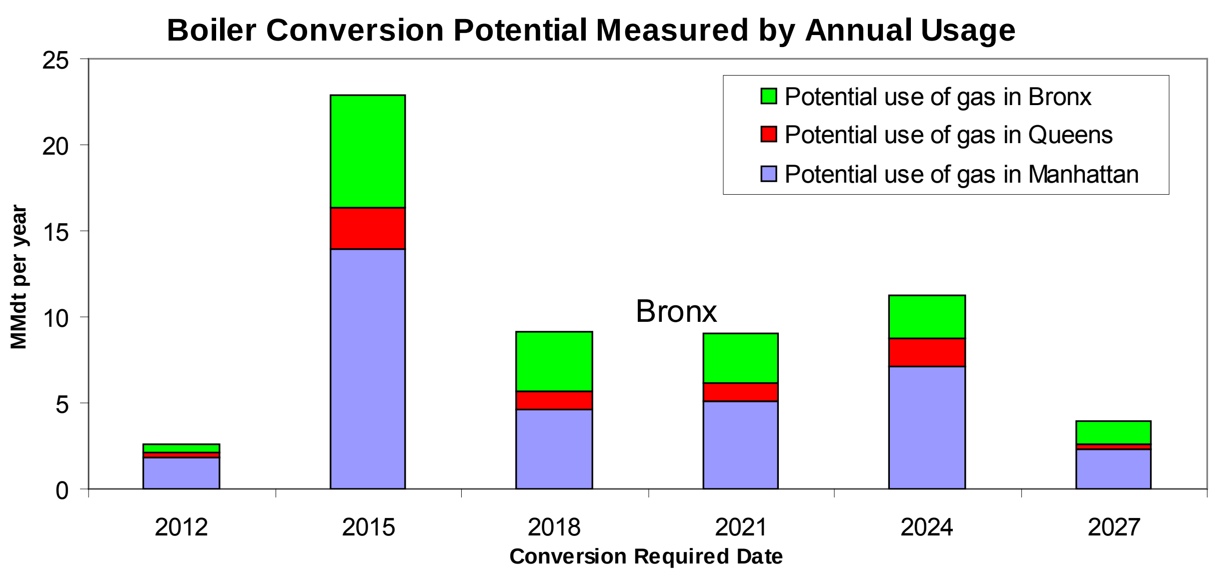
2012-2030

9,000 NYC Buildings
- 20 year phase-out

Conversion Choices
-#2 oil, Gas, (Steam)

Conversion Potential
Proposed NYC DEP Regulation

- Would require all users of #4 & #6 oil to convert boilers to #2 oil and/or natural gas
  - Conversion to steam also possible
- Timing phased in based on age of boiler; to run from 2012 to 2027
- Up to two variances of three years each available
  - if "natural gas not readily available"
  - if cost to bring gas to property line exceeds $100,000
- All variances would expire at end of 2030



Note: Dates based on expiration of operating permits; draft rule would permit variances that could extend conversion dates.

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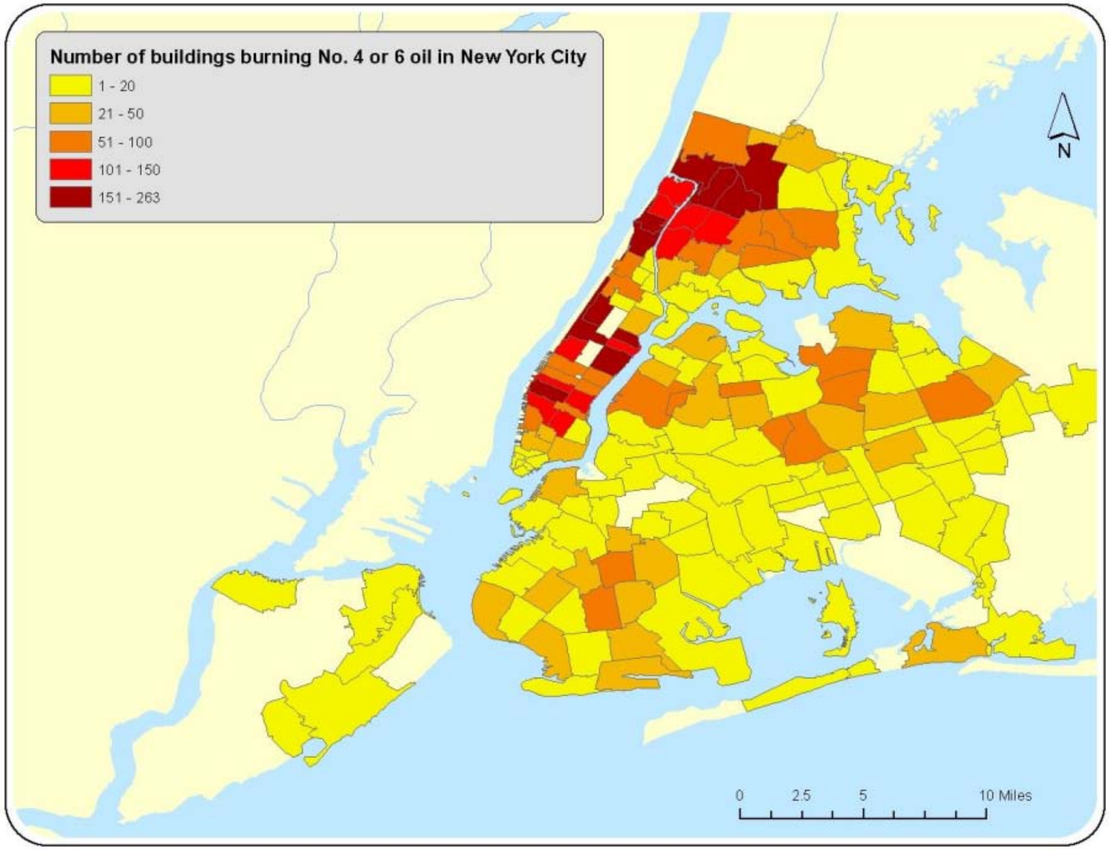
Conversion Potential
Largest Building Density in Manhattan and the west Bronx

- Information from DEP-supplied database of certificated units
- Approximately 7,200 buildings in CECONY gas service area
- Equivalent to 50 MMcfh of connected load
- Aggregate peak day equivalent of 680 Mdt/d, or 60% of current peak day
- Annual use equivalent to 60 MMdt, or 48% of firm and interruptible distribution demand



Source: NYC

Conversion Potential

2030 Forecast Assumptions

Assessment Case →	Low	Plan	High	Total Conversion Potential
Percent of #4/#6 oil market converting to natural gas	0% of Market	25% of Market	50% of Market	100%
Hourly Peak (non-coincident)	-	8.0 MMcf/h	15 MMcf/h	50.0 MMcf/h
Max Daily Peak (coincident)	-	102 Mdt/d	204 Mdt/d	680 Mdt/d
Annual Volume	-	15 MMdt/yr	30 MMdt/yr	60 MMdt/yr
Firm	-	9 MMdt/yr	18 MMdt/yr	-
Interruptible	-	6 MMdt/yr	12 MMdt/yr	-
Gas Service Type				
Firm/interruptible mix	-	60%/40%	60%/40%	-
Incremental Firm Peak Day (excludes interruptible)	-	102 Mdt/d	204 Mdt/d	-
Current GLRP for the next 20 years	None of the No. 4 / No. 6 oil conversion goes to gas	15% of No. 4 / No. 6 oil conversion goes to firm (plus 10% to interruptible) gas	30% of No. 4 / No. 6 oil conversion goes to firm (plus 20% to interruptible) gas	

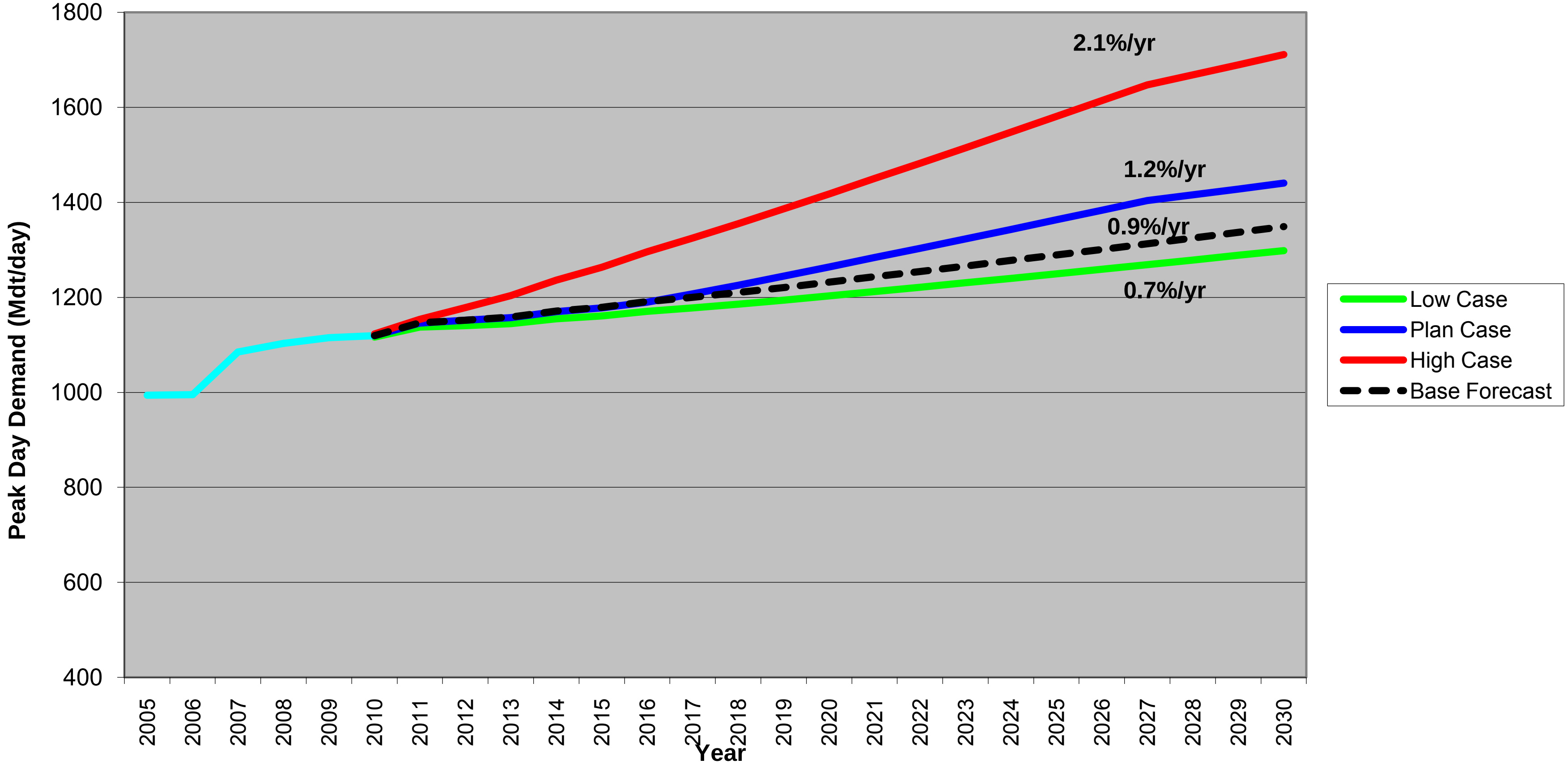
GRLP Peak Day Firm Demand
Summary of Assumptions

FIRM DEMAND

Incremental Demand: Economy through CNG Vehicles

Key Drivers	**Low Demand Sensitivity**	**Plan Case**	**High Demand Sensitivity**
Historical Growth		0.9%	
Economy	Moderate growth	Moderate growth	High growth
Gas Energy Efficiency Programs	Enhanced amount	Modest amount	Modest amount
No. 4 / No. 6 Oil Conversion to Firm Gas	None	15% of max	30% of max
Gas-Fired DG / CHP by 2030	175 MW	300 MW	500 MW and 650 Mlb/hr steam
Steam Customers Switching Over to Gas-Fired On-Site Boilers by 2030	1,250 Mlb/hr steam	None in addition to normally lost business	None in addition to normally lost business
CNG Vehicles	No additional	10,000 additional vehicles	30,000 additional vehicles

GLRP Peak Day Firm Demand



Summary

- Potential conversions from #4 / #6 oil represent the single largest growth driver
- Distributed generation and combined heat and power also represent significant growth opportunities
- Any increases in firm demand from electric and steam generation would only increase gas supply and infrastructure needs

Appendix C

#6 Oil Conversion to Gas for Electric and Steam Generation

GLRP Assessment

March 2010

The generation fleet in Con Edison territory includes electric and steam units fueled by #6 oil that may need to be converted to natural gas units

Overview

- The generation fleet within Con Edison gas service territory consists of both electric and steam power plants
- Most of the electric and steam generation units are fueled by natural gas as the primary or backup fuel (dual fuel capability)
- About a third of the electric generating capacity is fueled by residual oil, also referred to as #6 fuel oil, with natural gas backup
- Just under half of the steam generating capacity is fueled by #6 fuel oil with no capability to be fueled by natural gas
- NYC is planning to introduce regulations to phase out the use of #4 and #6 fuel oil for heating purposes to improve air quality, with target substitute fuels being either #2 oil or natural gas. This assessment discusses whether generation units fueled by #6 oil could also be candidates for future conversions to improve air quality and **reduce cost**
- Conversion of #6 oil fueled generation units to natural gas fueled units will increase gas demand and require gas system strengthening paid for primarily by the unit owners, if they remain interruptible customers
- As new generation plants are added or existing ones repowered over the next twenty years to meet increasing demand and clean air regulations, such plants are likely to be powered by cleaner burning fuels including natural gas, potentially impacting CECONY's gas business significantly

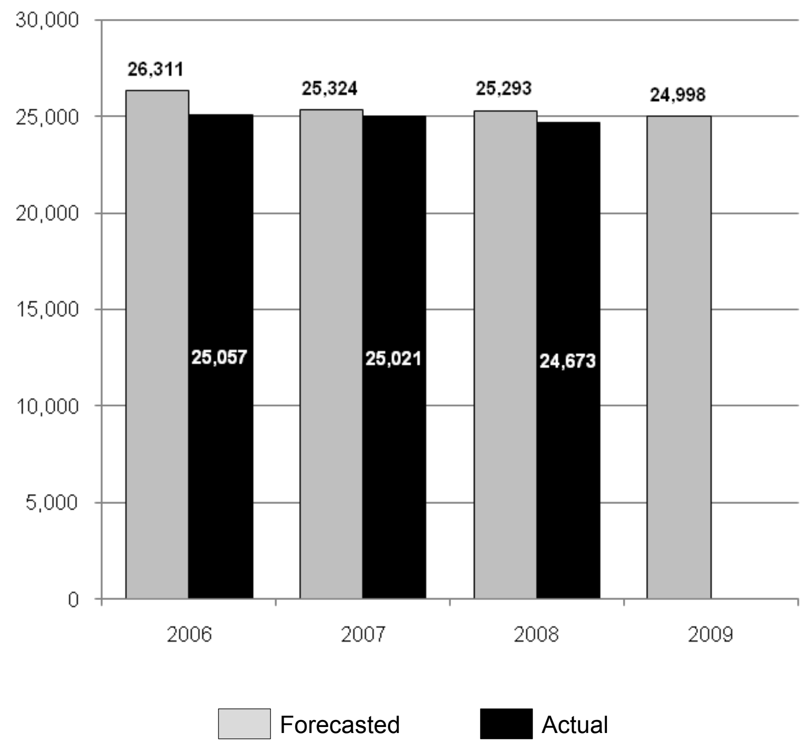
This document identifies current electric and steam generation units fueled by #6 oil, likely to be impacted by oil conversions to gas and the resulting impact on CECONY's gas business

CECONY purchases its electric power from NYISO, which had a net installed capacity of 34,927 MW in 2009

NYISO Peak Load and Capacity Assessment

Installed Capacity (ICAP)		39,948 MW
Net Capacity Purchases and Sales	+	85 MW
Scheduled Generation Outages	-	3,041 MW
Allowance for Unplanned Outages	-	2,065 MW
Net Capacity for Load		**34,927 MW**
NYISO Forecast – Winter Peak	-	24,998 MW
Available Reserve	=	9,929 MW
Operating Reserve Requirement	-	1,800 MW
Net Margin		**8,129 MW**

Actual and Forecast Winter Peaks (MW) - NYISO



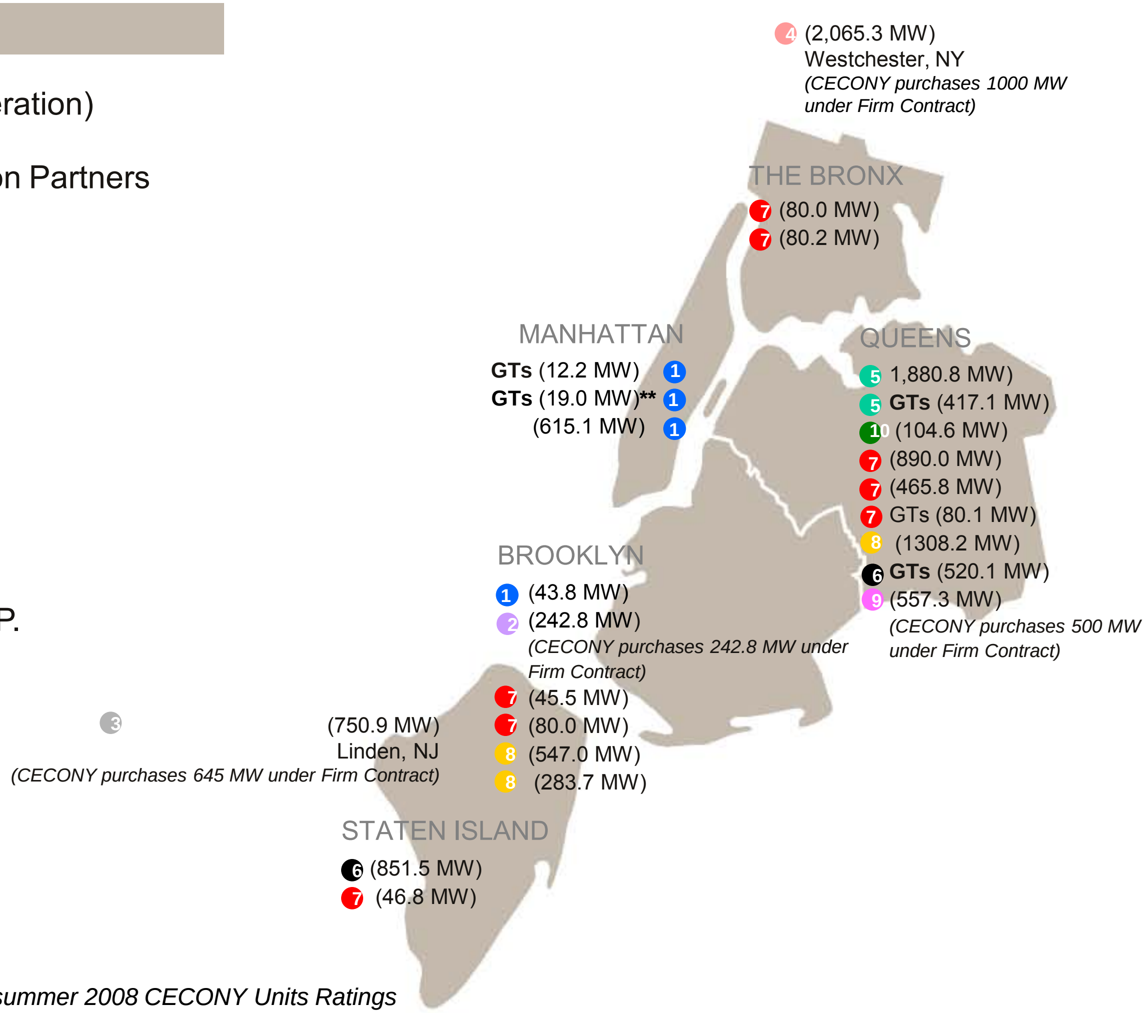
Source: NYISO OPERATING STUDY WINTER 2009-10, Approved by NYISO Operating Committee December 10, 2009

NYISO sources generation capacity within New York City from a number of different power plant owners

New York City Electric Generation Resources*

POWER PLANT OWNERS

1. Con Edison (steam/electric generation)
2. Brooklyn Navy Yard Cogeneration Partners
3. GE Energy Financial Services
4. Entergy
5. TransCanada
6. NRG Energy
7. NYPA
8. Astoria Generating Company, L.P.
9. Astoria Energy
10. Calpine



**Based on NYISO 2009 Load and Capacity Data and summer 2008 CECONY Units Ratings*
***GT #2's summer capacity was not reflected in 2009 Gold Book because of tailed DMNC test for this period.*

In-city generators have a capacity of 12,042 MW and are diverse, providing flexibility in generation capacity

CECONY Service Area Electric Generation Fleet

Primary Fuel	Generation Capacity (MW)	Type and (Number) of Units	Units with Back-up Fuel	Back-up Fuel(s)
Kerosene[1]	1,189.9	Gas Turbine (51)	43	• Natural Gas
#2 Fuel Oil	656.3	Gas Turbine (39)	16	• Natural Gas
#6 Fuel Oil	3,990.5	Steam turbine (9)	9	• Natural Gas
Natural Gas	4,085.8	Combined Cycle (8)	7	• #2 Fuel Oil (3) • Kerosene (2) • Kerosene and Jet Fuel (2)
		Gas Turbine (11)	NA	NA
		Steam Turbine (3)	NA	NA
		Combustion Turbine (2)	NA	NA
		Cooling Water (1)	NA	NA
Refuse (Solid Waste)	53.2	Steam Turbine (1)	NA	NA
Uranium	2,065.3	Nuclear Power (2)	NA	NA
Water	1.4	Hydro (3)	NA	NA
Total	**12,042.4**			

Units fueled by #6 oil have a total generating capacity of 3,990.5 MW but include NYPA's Poletti 1 unit, which has since been retired (February 2010), resulting in a residual capacity of 3,100.5 MW (26% of total capacity)

1. Kerosene is at times referred to as #1 Fuel Oil

Source: CECONY (January 2010)

Of the in-city generation (with the retirement of the Poletti unit), eight units with a total capacity of 3,101 MW are fueled by #6 oil with natural gas back-up

Units Fueled by #6 Oil

Owner, Operator, and/or Billing Organization	Units	Capacity (MW)		Fuel
AG Company	3	369.9	1116.6	#6 Oil with Natural Gas Back-up
	4	373.6		#6 Oil with Natural Gas Back-up
	5	373.1		#6 Oil with Natural Gas Back-up
CECONY	6	133.5	318.2	#6 Oil with Natural Gas Back-up
	7	184.7		#6 Oil with Natural Gas Back-up
TCR, LLC	ST 01	355.5	1665.7	#6 Oil with Natural Gas Back-up
	ST 02	355.0		#6 Oil with Natural Gas Back-up
	ST 03	955.2		#6 Oil with Natural Gas Back-up
Total		**3,100.5**		

Since all the eight units are already capable of burning natural gas, there will be no requirement to convert them to natural gas fueling plants, as such no incremental demand in gas usage is expected unless any plan to become firm customers

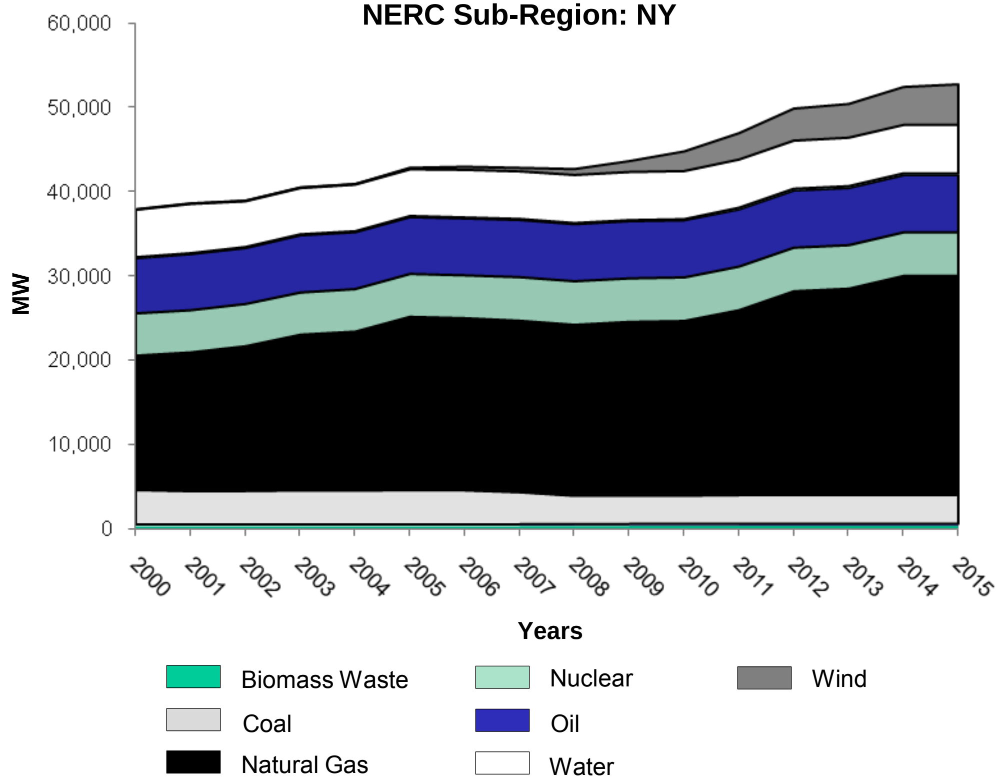
Source: CECONY

The existing generation fleet is expected to change in capacity and mix through 2030, mainly as a result of environmental regulations and increasing demand statewide

Major Environmental Regulations Driving Change[1]

- **New York State Energy Plan Strategy 2:** Support development of in-state energy supplies (the State recommends programs to increase the proportion of renewable generation to 30% demand by 2015)
- **PlaNYC Initiative 8:** Facilitate repowering and construct power plants and dedicated transmission lines (between now and 2015, the City will pursue strategies to increase supply from cleaner power plants)
- **PlaNYC Initiative 10:** Support expansion of natural gas infrastructure (new power plants will both require the use of natural gas, the cleanest-burning fossil fuel, already fueling 80% of New York City's power plants and more than 25% of all energy used in buildings)
- **PlaNYC Initiative 11:** Foster the market for renewable energy (The City projects that biomass can provide a plentiful source of energy, producing as much as 450 MW, the equivalent of a medium sized power plant)

Historic and Future Plant Capacity
NERC Sub-Region: NY



Natural Gas capacity is expected to increase as a percentage of total from **46%** in 2010 to **49%** in 2015

1. Summaries are in Appendix

Source: GLRP Environmental Assessment, SNL Financial.
Note: Future capacity is based on actual planned/under construction projects, and not based on any projections of unreported new developments or retirements

Changes to NYISO's sources since Winter 2008 – 2009 include the retirement of one unit within our territory - NYPA Poletti

Planned Changes to NYISO Generation Resources

Retirements	**985 MW**
Westover 7	40 MW
Greenidge 3	55 MW
Poletti (February 2010)	890 MW
Additions	**938 MW**
Seneca Energy Uprate	6 MW
Sherman Island Uprate	9 MW
Steel Winds II Uprate	14 MW
Gilboa 3 Uprate	30 MW
Altona Wind Farm	98 MW
Chateaugay Wind Farm	107 MW
High Sheldon Wind Farm	113 MW
Canandaigua Wind Farm	125 MW
Wethersfield Wind Farm	126 MW
Caithness Comb. Cycle Plant	310 MW

New York City Capacity, Load and Reserve Table

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
NYC Peak Demand	11,725	11,775	11,815	11,925	11,995	12,065	12,180	12,320	12,430	12,550
NYC Capacity Requirement (80% of NYC Peak Demand)	9,380	9,420	9,452	9,540	9,596	9,652	9,744	9,856	9,944	10,040
Existing*	10,526	9,936	10,436	10,936	10,827	10,827	10,827	10,827	10,827	10,827
Linden VFT	300	--	--	--	--	--	--	--	--	--
SCS Phase 2	--	500	--	--	--	--	--	--	--	--
Hudson Transmission	--	--	500	--	--	--	--	--	--	--
Poletti Retirement	(890)	--	--	--	--	--	--	--	--	--
Astoria NRG GT Rtmts	--	--	--	(109)	--	--	--	--	--	--
Total	9,936	10,436	10,936	10,827	10,827	10,827	10,827	10,827	10,827	10,827
Margin	556	1,016	1,484	1,287	1,231	1,175	1,083	971	883	787

The second SCS Astoria unit is scheduled to come on line in 2011. The NYISO is currently updating their Reliability Needs Assessment, which they are also assuming the Hess Bayonne unit (in NJ) to be interconnected via submarine cable into Gowanus in 2011, i.e., no additional usage on our gas system

*Includes 547 MW Selective Catalytic Reduction plants (based on average of the historical summer 2007 – 2009 enrollments) and 37 MW distributed generation (NYU and Co-op City)

Although NYISO is planning a number of changes to its overall generation sources, there does not appear to be a need for new in-City generation over the next 10 years

Source: NYISO OPERATING STUDY WINTER 2009-10, Approved by NYISO Operating Committee December 10, 2009

CECONY's steam generation fleet consists of seven major generation sites producing a total of 13,379 Mlb/hr of steam

Site	Capacity (Mlb)
Loc 1	6,016
Loc 2	978
Loc 3	2,008
Loc 4	696
Loc 5	1,331
Loc 6	750
Loc 7	1,600
Total	**13,379**

Source: CECONY

A breakdown of the steam generation fleet, aligning specific units to their primary fuels, shows a prevalence of #6 oil usage

CECONY's Steam Generation Fleet

Generating Site	Units	Capacity (Mlb/hr)		Fuel
Loc 1	ER 10	1,600	6,016	Gas with Kerosene for Testing and Emergency
	ER 20	1,600		Gas with Kerosene for Testing and Emergency
	ER 60 (extraction mode)	830		Gas or #6 Oil
	ER 60 (drag valve mode)	150		Gas or #6 Oil
	ER 70	1,186		Gas or #6 Oil
	ER SSS	650		Gas or #6 Oil
Loc 2		978	978	Gas and 19 days Distillate
Loc 3	High Pressure	1,300	2,008	#6 Oil
	Package	708		#6 Oil
Loc 4		696	696	Gas
Loc 5	Annex	950	1,331	#6 Oil with Continuous Gas Ignition
	Package	381		Gas or #6 Oil
Loc 6		750	750	#6 Oil with Continuous Gas Ignition
Loc 7		1,600	1,600	#6 Oil
Total		**13,379**		

Units fueled by #6 oil have a total generating capacity of 8,505 Mlb/hr and include Loc 7(owned by CECONY) and Loc 2 which both deliver steam into CECONY's steam system but are in CECONY's territory

Source: CECONY

Three of the units fueled by #6 oil as well as Loc 6 and Loc 7, a combined capacity of 5,308 Mlb/hr or 40% of total capacity, have no gas burning capability

Steam Generation Units in CECONY Gas Service Territory Using #6 Fuel Oil with No Natural Gas Burning Capability

Generating Site	Unit	Capacity (Mlb/hr)	
Loc 3	High Pressure	1,300	2,008
	Package	708	
Loc 5	Annex	950	950
Loc 6		750	750
Loc 7		1,600	1,600
Total		**5,308 Mlb/hr**	

Steam Long Range Plan Options Involving Gas

In recent years oil prices are and have been higher than gas prices for the steam plants. The SLRP[1] has the following strategies that will involve the Gas supply:

- Convert Loc 5 from oil to gas
- Convert Loc 3 from oil to gas
- Retire Loc 7 boilers
- Install CCGT turbines at Loc 7 to supply steam and electric Load
- Contract for peaking steam capacity to minimize package boiler operation at Loc 6 and other plants.
- Retire Loc 6 package boilers
- Add New CHP/DG units to supply new steam demand growth if required

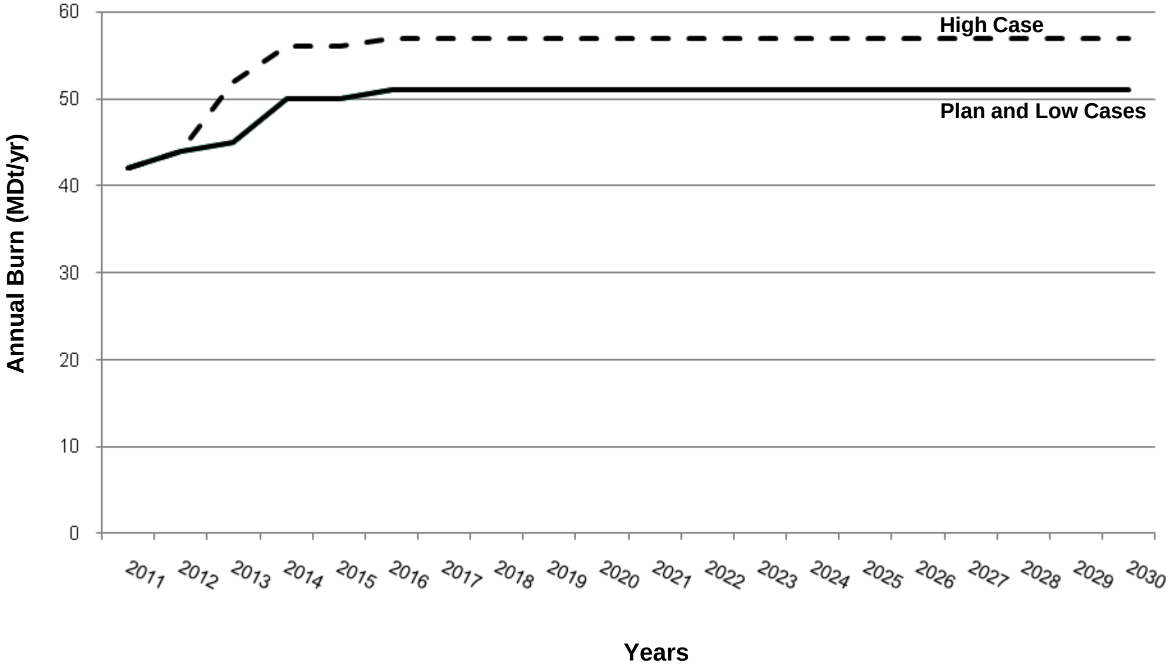
1. Steam Long Range Plan

Since the three units and two additional sites have no current capability to burn natural gas as fuel, there may be a requirement to convert them to natural gas fueling plants based on strategic options available to the Steam Operations Group, resulting in incremental demand in gas usage

Source: CECONY

Based on the Steam Long Range Plan objectives and assumptions, three cases (high, plan and low) are derived for the additional gas demand from converting steam and electric systems from #6 oil to gas

Gas Demand from #6 Oil to Gas Conversion for Steam and Electric Systems



Assumptions

- Loc 5 full gas conversion in place by November 2011
- Loc 3 gas conversion in place by December 2013
- Loc 7 new co-generation (cogen) in place by December 2013
- NOx RACT (Promulgated Limit of 0.15lb/MMbtu) in place by January 2012[1]

Notes

- Loc 3 & 5 for both Plan and Low cases
- Loc 3, 5 & 7 for High case

- **For the plan and low cases, it is expected that the generators (as interruptible customers) will pay for all the reinforcement to the gas system that is required, and there will be no additional capital expenditures for Gas Operations**
- **However, for the high case, from December of 2013 onward, approximately 1,000 Dt/h will be required as non-interruptible (as are the ERRP Units) for the duct burners on the small cogen units installed a Loc 7**

1. Analyses to be conducted to confirm if foregoing daily limits will comply with future NOx ract limits

Source: Steam Long Range Plan (SLRP)

Signposts: There are a number of external factors likely to impact #6 oil conversions to gas that must be carefully monitored by CECONY

Major #6 Oil Conversion to Gas Related Signposts

- **Environmental Regulation/Legislation (NOx, SOx and CO_2):** Enactment of stringent clean air and GHG related laws will influence the rate and magnitude of conversions from #6 oil to gas

- **Oil and Gas Market price Differentials:** Historically oil prices are and have been higher than gas prices for the steam plants. Continued increase in the price differential, primarily as a result of expected low gas prices, will impact the rate and magnitude of conversions

- **Firm versus Interruptible Customers:** Generation plants have traditionally been interruptible customers. Although conversions from interruptible to firm customers are not anticipated at this time, potential requests for conversions in the future cannot be completely ruled out. This will not only impact gas peak demand but also CECONY capital expenditures

December of 2013 and forward, approximately 1,000 Dt/h will be required as non-interruptible (as are the ERRP Units) for the duct burners on the small cogen units installed at HA under this case

Appendix D

Gas-Based Distributed Generation

GLRP Assessment

January 2009

Distributed generation can have strategic benefits for CECONY particularly if it is actively utilized to alleviate constraints on the electric system

Benefits of Distributed Generation

- **Meet Customer Requirements:** Customers increasingly approaching CECONY for interconnection and rate design as well as policies for electric supply-side DG (e.g. net metering)
- **Improve Cost Effectiveness of Electric T&D System:** Reduction and/or deferral of electric system reinforcement investments due to reduction of peak demand in local load pockets and resultant reductions in peak loading on distribution transformers
- **Reduction in Electric Purchased Power Expense:** Integration of more efficient energy sources and lower line-losses from co-location may reduce kW and kWh purchases
- **Enhanced Electric Grid Performance:** DG integration into the secondary network will result in increased reliability and stability of the distribution network during multiple contingencies by reducing peak loading of distribution transformers
- **Environmental Sustainability:** Co-located and/or efficient distributed resources realize significantly less line loss than central resources reducing the GHG impact of electricity. In addition, utility promotion of renewable DG such as PV, small wind, and small hydro may play a significant a role in achieving RPS goals
- **Supply Portfolio Diversification:** The Company can incorporate diverse technologies and fuel sources. DG also creates an opportunity to reduce financial risk through small geographically dispersed projects
- **Economic Development:** Opportunity to drive job creation around specific technologies and project construction. This has been jumpstarted with Federal stimulus funds

Source: Bridge Strategy Analysis

Gas-fired DG technologies can be used in a variety of applications to perform specific functions

Combined Heat & Power

Combined Heat and Power	• Description: End users with significant thermal and power needs can generate both thermal and electrical • energy in a single combined heat and power system; can substantially increase efficiency of energy utilization, resulting in lower operating costs and emissions reductions • Important DG characteristics: high useable thermal output; low maintenance costs; low emissions; high reliability

Power-Only Applications

Base Load / Remote Power	• Description: For commercial and industrial applications in high electric price areas or in specialized situations, such as remote sites or availability of low cost (or no cost) waste fuels • Important DG characteristics: High electric efficiency; low maintenance costs; low emissions; high reliability; multi-fuel capability
Utility-Based Grid Support	• Description: used by an electric utility to provide ancillary services at the T&D level, or to replace or defer T&D investments • Important DG characteristics: low installed costs; low maintenance costs; high reliability
Demand Response Peaking	• Description: utility offers capacity and/or commodity payments for very limited hours of use; typically require as few as 50 hours/year to as many as 400 hours/year • Important DG characteristics: Low installed cost; low maintenance fees, quick start-up
Customer Peaking	• Description: can be used to reduce utility demand charges, defer retail electricity purchases during high-price periods, or to secure more competitive power contracts from energy service providers by smoothing site demand or by allowing interruptible service • Important DG characteristics: Low installed cost; low maintenance fees, quick start-up, high efficiency
Premium Power	• Description: either provide high-quality power to sensitive-load customers at a higher level of reliability and/or higher power quality than is typically available from the grid; current approaches employ on-site generation as the primary power source and the grid as back-up • Important DG characteristics: high efficiency; low maintenance costs; high reliability; clean power output; low emissions
Backup Power	• Description: Backup power systems provide power only when primary source is out of service; often required for customers such as hospitals and water pumping stations and also for customers with high forced outage costs (e.g. retail, telecommunications, process industrials) • Important DG characteristics: Low capital costs; black start capability; high reliability; low fixed maintenance costs

Source: "Gas-Fired Distributed Energy Resource Technology Characterizations" – Gas Research Institute and National Renewable Energy Laboratory, November 2003

Gas-based DG projects in CECONY's service territory can potentially impact gas load or fuel supply

	1 Load Increasing DG	2 Load Decreasing DG	3 Fuel Supplying DG
Description	• Uses natural gas to produce energy using a combined heat and power (CHP) or co-firing technology • Energy may be used by the customer for continuous or backup power, or dispatched to grid	• Customer foregoes the use of at least some natural gas by producing its own gas and uses it at its premises to generate energy	• Customer supplies gas back to Con Edison • Gas can be from a non-natural gas source (e.g. biogas), which needs to be upgraded to pipeline-quality gas for use in Con Edison's distribution system
Implications for Utility	• Consumes more natural gas from utility – demand increases • System would likely require reinforcement for high-pressure demand	• Customer consumes less gas from utility – demand decreases	• Demand is not impacted • Utility can buy "green" fuel to supplement its natural gas supply
Relevance to CECONY	• High	• Low	• Low
Case Examples	• New York Presbyterian Hospital	• NYPA – Hunts Point, 26th Ward and Red Hook Water Pollution Control Plant cogeneration	• National Grid – Fresh Kills landfill gas recovery; Newtown Creek wastewater treatment gas recovery

DG technologies can meet the needs of a wide range of users in the residential, commercial, and industrial sectors; many are applicable in CECONY's territory

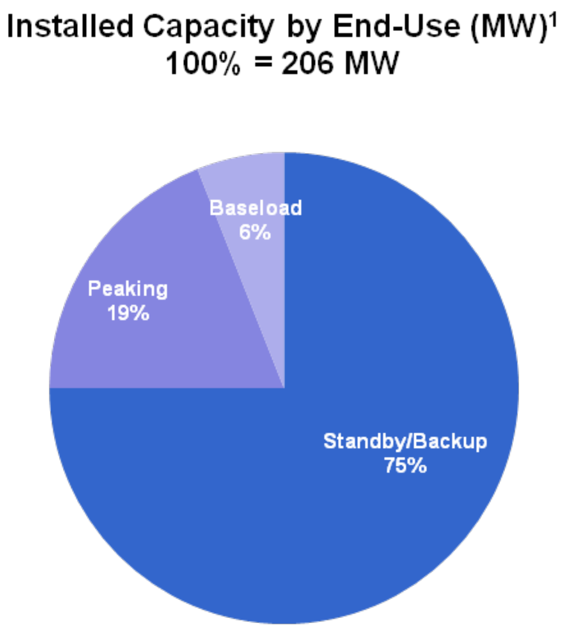
Applications and Markets for Gas-Fired DG Technologies

DG Technologies	Standby Power	Baseload Power	DR Peaking	Customer Peaking	Premium Power	Utility Grid Support	Combined Heat & Power	Applicable Market Sectors
Reciprocating Engines (50 kW to 5 MW)	X	X	X	X	X	X	X	• Commercial buildings • Light industrial • Utility grid • Waste fuels
Gas Turbines (500 kW to 50 MW)		X		X	X	X	X	• Large Commercial • Institutional • Utility Grid • Waste Fuels
Steam Turbines (500 kW to 100 MW)		X			X		X	• Institutional • Buildings/ Campuses • Industrial • Waste Fuels
Microturbines (30 kW to 250 kW)	X	X	X	X	X	X	X	• Commercial buildings • Light industrial • Waste fuels
Fuel Cells (5 kW to 2 MW)		X			X	X	X	• Residential • Commercial • Light industrial

Source: "Gas-Fired Distributed Energy Resource Technology Characterizations" – Gas Research Institute and National Renewable Energy Laboratory, November 2003

Most of the DG installations in CECONY's territory are for backup/standby power; but the company and its customers are beginning to explore other uses for DG

Uses for DG in Con Ed's Territory



Peaking: PV, Combustion Turbine

Standby: Reciprocating Engines

Baseload: ICE, Microturbine

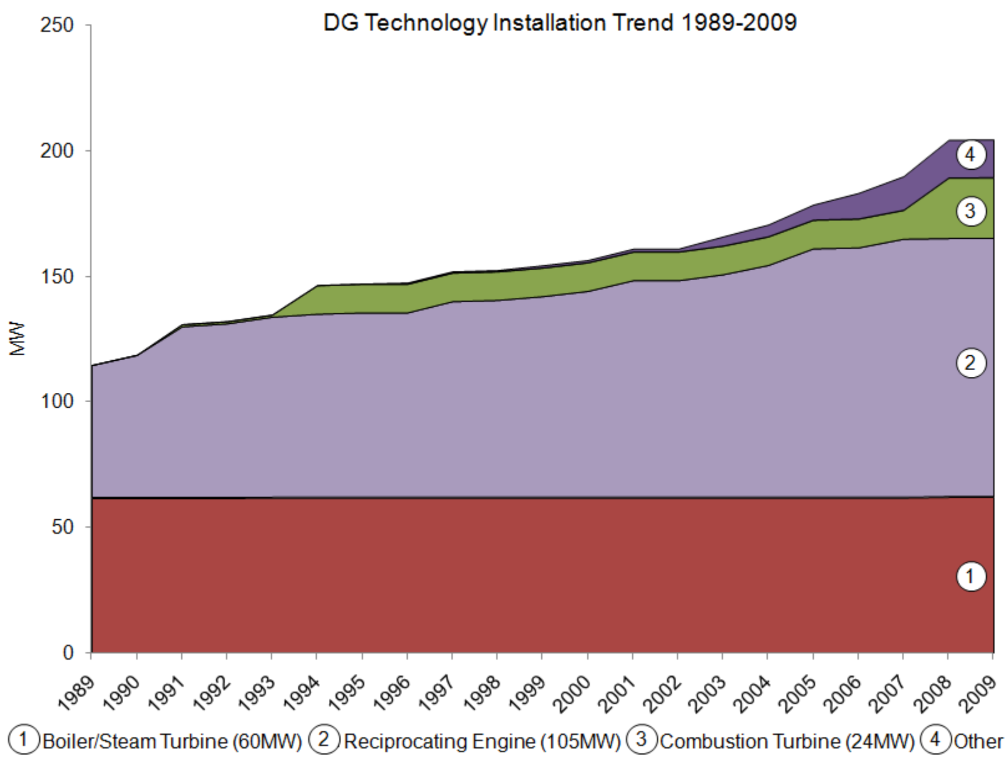
Not Included: Steam Turbine

- Con Edison previously played a passive role in DG implementation but the company is now starting to see that DG could be used in demand response situations to help manage infrastructure investments
- Natural gas CHP is likely continue to be the dominant DG application in ConEd's territory, even with solar DG applications growing
- Con Edison is beginning to explore ways to be more active in the adoption of DG adoption, while balancing in-city emissions concerns
  - Participating in pilot program with Verizon to help address localized grid issues
  - Exploring potential to offset costly substation investments with DG

1 **Source:** DOE, Internal interconnection data (Strategic Planning assumptions) as of August 2009 DG of 20 MW maximum

Policies and incentives drive DG adoption – renewable DG growth has outpaced tradition gas-fired DG in recent years due to stronger support from government and utilities

Current DG Install Base



Note: Other includes: Fuel Cell (5MW), Internal Combustion Engine (4MW), Microturbine (4MW), PV (2MW)

1989 – 1994

- DG growth stemmed from Reciprocating Engine installations primarily in the healthcare sector.
- There were 27 of these installations with an average size of 1.2 MW

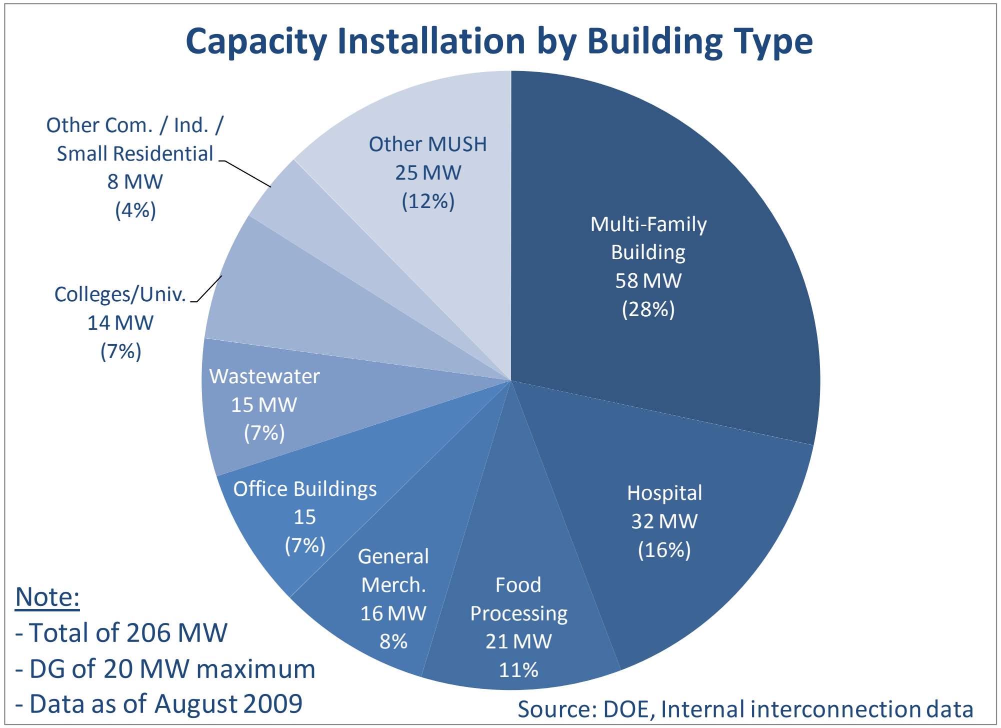
2004 - 2009

- The second high growth period is comprised of 195 installations.
- Traditional technologies continue to be adopted however, at a much lower rate. In 2004, new technologies emerge and spur growth.
- 126 (65%) of these installations are solar PV, representing 4% of the added capacity (1.7MW).
- Capacity comes primarily from reciprocating engines (14 MW) and combustion turbines (12.7 MW).

Source: Con Edison Strategic Planning Group, ELRP analysis, and DOE data

Multi-family buildings and hospitals were traditional adopters of DG; in recent years, adoption has grown more rapidly among residential customers, hotels, and transportation customers

Current DG Install Base



Building Type	Capacity CAGR (10 Yr)	Count CAGR (10 Yr)
Residential	62.35%	56.09%
Unknown	9.88%	29.15%
Misc. Services	28.11%	25.99%
Hotels	41.75%	24.14%
General Merch. Stores	2.64%	24.14%
Transportation	25.05%	22.03%
Office Buildings	11.06%	18.19%
Utilities	46.53%	16.65%
Wastewater Treatment	1.83%	14.93%
Air Transportation	27.42%	12.98%
School	15.62%	12.98%
Multi-Family Building	1.48%	12.66%
Nursing Homes	14.84%	9.43%
General Gov't	20.44%	8.01%
Museums/Zoos	0.60%	8.01%
Food Processing	1.00%	7.12%
Hospitals/Healthcare	3.49%	6.75%
Chemicals	10.45%	5.84%
Laundries	3.48%	4.61%
Rubber/Plastics	0.56%	4.61%
Colleges/Univ.	0.22%	4.61%
Amusement/Recreation	1.21%	3.81%

Note: approximately 2,000 MW of NYPA load is not included

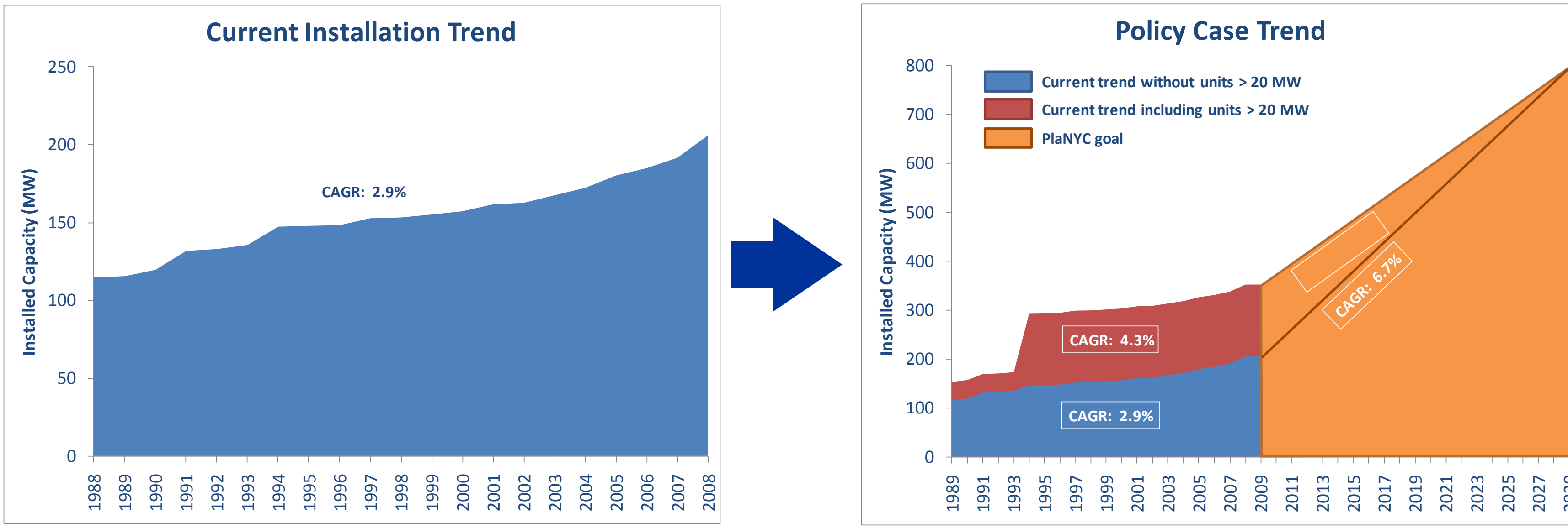
Observation:

Data on current installations may be skewed since customers must report new installations, but often do not report when a DG installation reaches end of life and is not being replaced

Source: Con Edison Strategic Planning Group, internal and DOE data

PlaNYC has set a goal of 800 MW of DG for New York City by 2030, which would more require more aggressive adoption than historical growth rates

DG Growth Trend and Future Targets



Observations:

- Con Edison limits the definition of DG to 20 MW, which excludes large installations such as JFK airport (~100 MW). The PlaNYC goal for DG does not discount these installations.
- DG capacity has grown at a CAGR of 2.9% over the last 20 years, however if larger units (over 20 MW) are accounted for, the CAGR jumps to 4.3%.
- Without large installations, the CAGR needed to achieve PlaNYC goals is 6.7%, versus 4.0% with them.

Source: DOE, Internal interconnection data, ConEd website

Several key factors will determine the extent to which gas-based DG is adopted among Con Edison's customers

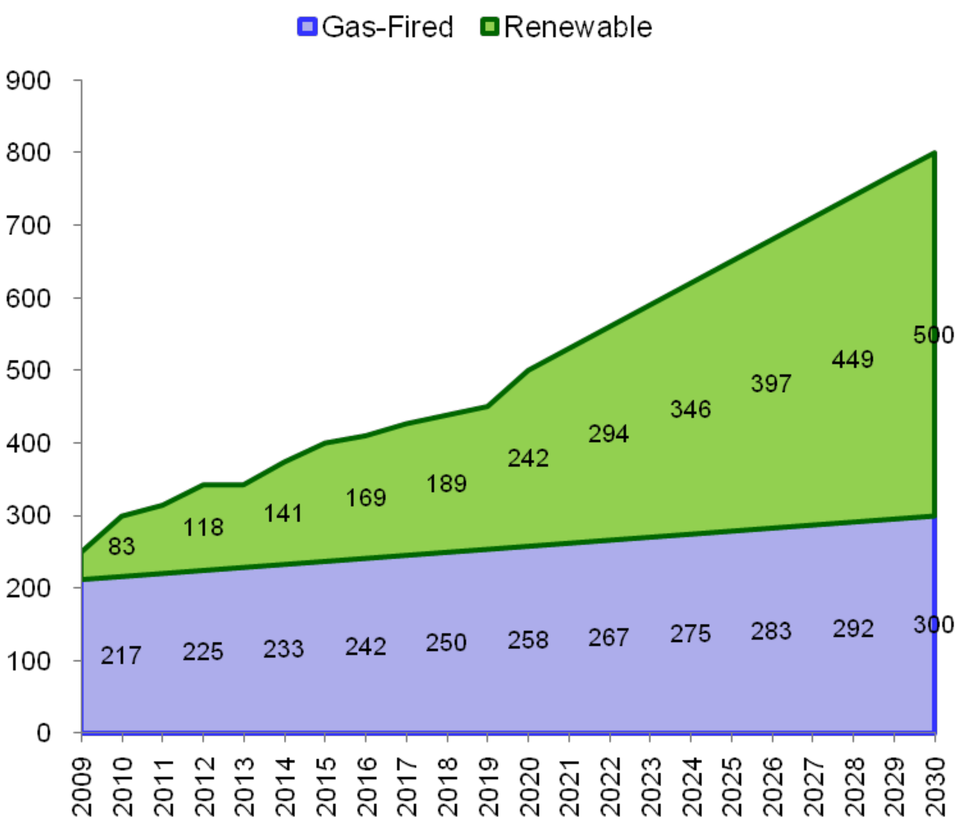
Key Drivers of Distributed Generation
• **Environmental Policy** – Pending carbon emissions legislation may encourage switching to natural gas-fired generation; also, New York state has set a goal of "45 by 15" – which would have 45%of the state's electricity needs come from renewable energy sources and improved energy efficiency by 2015 • **Government Rebates and Incentives** – NYSERDA has introduced various incentive programs, targeting a broad range of customer segments, to encourage the adoption of energy efficiency and clean energy applications • **Technology and Infrastructure Enablers** – DG technologies are constantly being developed and evolved and are rapidly becoming more affordable; new energy sources require transmission and distribution infrastructure, safety, permitting, and interconnectivity procedures • **Utility Drivers** – Con Edison can develop a DG strategy and acquire the resources necessary to implement it; sufficient resources are required to address customer issues, process applications and track implementation • **Fuel Price Volatility** – Natural gas-fired DG may be a way for customers to mitigate risks associated with increasingly volatile oil prices • **Regulatory Enablers** – DG may require new tariff structures for customers; e.g. gas tariffs may need to be revised for large CHP customers

We have projected total DG to be 800 MW by 2030 to comply with plaNYC's goal; gas-fired DG will continue to grow at a moderate rate while renewable DG grows more aggressively

Projected DG Install Base

PRELIMINARY

CECONY DG Projection Base Case



Expected DG Gas Demand by 2030

	Low Case	Base Case	High Case
Renewable DG (MW)	500	**500**	300
Gas-fired DG (MW)	175	**300**	500
Gas DG Energy (GWh)	527	**904**	1,507
Annual Gas Req. (MMDT)	5.88	**10.09**	16.81
Peak Day Req. (MDT/day)	16.12	**27.64**	46.06
Peak Hour Req. (MDT/hour)	1.95	**3.35**	5.58

Source: Bridge Strategy Group, ConEdison Energy Management analysis

The need to defer electric T&D investments (such as substation construction) is a reason for CECONY to drive gas-fired DG growth

Areas of Heavy Electric Investment

Planned New Electric Substations	Expected Completion	Expected Cost
Upper East Side Substation Installation	2020	$375 M
West Side Substation	2026	$404 M
Brooklyn substation 1	2020	$268 M
Brooklyn substation 2	2027	$491 M

Observations

- The most vulnerable areas in the electric system appear to be in central and lower Manhattan – there are infrastructure planning implications of installing DG in these areas
- Further investigation is required on how much substation investment could be offset by DG installations

Source: Bridge Strategy Group analysis

Potential CHP projects could account for over 2,700 DT of hourly peak gas usage; nearly 70% of this usage would be on service adequate areas of the gas system

Pressure System	Potential Hourly Peak Usage (DT)	Percentage of Total
High Pressure, Adequate Service	**1,114**	**41%**
Medium Pressure, Adequate Service	**23**	**1%**
Low Pressure, Adequate Service	**712**	**26%**
New Business Pending	315	12%
Low Pressure, Need Reinforcement	537	20%
Unknown Service Adequacy	8	0%
Total	**2,709**	**100%**

Source: Con Edison DG Cogen Study, 2008

Implications of DG for Gas Business

- Gas-fired DG represents an increase in gas load for Con Edison
- Installations of gas-fired DG will require reinforcements of the gas distribution system in some regions
- The potential for Distributed Generation is substantial – the extent of customer conversion will depend on
  - Active marketing to customers
  - Analysis of individual customer needs and economics
  - Availability of incentives, programs to encourage conversion/installation
- Programs will require a strategic segmentation of the customer base to identify which groups of customers are most likely to adopt DG

Appendix E

CNG Vehicles

GLRP Assessment

December 2009

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- Introduction
- Global Natural Gas Vehicle (NGV) Overview
- US Compressed Natural Gas (CNG) Overview
- New York State Perspective
- Implications for CECONY
- EVs as Part of CECONY's Alternative Vehicle Fuel Strategy
- Conclusions

Alternative fuels are a significant part of New York City's strategy to reduce greenhouse gas (GHG) emissions from transportation

Overview

- New York has been a leader in developing and adopting transportation programs that improve energy efficiency and air quality
- The Clean Fueled Vehicles Council (CFVC), chaired by the Office of General Services, has been a major force in acquiring alternative fuel vehicles and developing the supporting fuel infrastructure necessary to support its own fleet of vehicles
- The CFVC led the development of fueling infrastructure to support dedicated electric vehicles, compressed natural gas (CNG) vehicles, propane vehicles, and biofuel vehicles including ethanol (E-85), and biodiesel
- Through the CFVC's efforts, New York State's alternative fueled vehicle fleet has grown from 383 vehicles acquired during the first year of the CFVC's existence in 1998 to 8,529 vehicles as of September, 2008, which represents 57% of the State's light duty vehicle fleet
- The CFVC has also supported CNG, diesel dual-fuel vehicles, and biodiesel infrastructure for heavy duty fleet and was instrumental in establishing the CNG and ethanol fueling infrastructure to support the State fleet
- In 2007, there were a total of 60 State-built Compressed Natural Gas (CNG) fueling sites

Primary Alternative Fuel Options for CECONY

- There are two primary alternative fuel options worth considering as part of CECONY's alternative fuel vehicle strategy: Electric Vehicles (EVs) and CNG vehicles
- Both options are expected to help New York achieve its Federal, State, and City targets concerning GHGs
- CECONY has already conducted studies on EVs and an EV assessment has developed as part of the Electric Long Range Plan (ELRP)
- Although EVs are currently perceived as the preferred alternative fuel vehicle strategy for CECONY to support, significant challenges continue to exist with EVs and a complementary CNG vehicle strategy may be worth pursuing as well
- CNG vehicles have their own unique challenges but in some customer situations (such as fleet applications) may be a better fit than EVs as an alternative fuel option

This document is primarily an assessment focused on Compressed Natural Gas (CNG) as an alternative fuel

Source: Transportation Issue Brief New York State Energy Plan 2009

There are many viable alternative fuel options, some offering very significant emission reduction and energy security opportunities

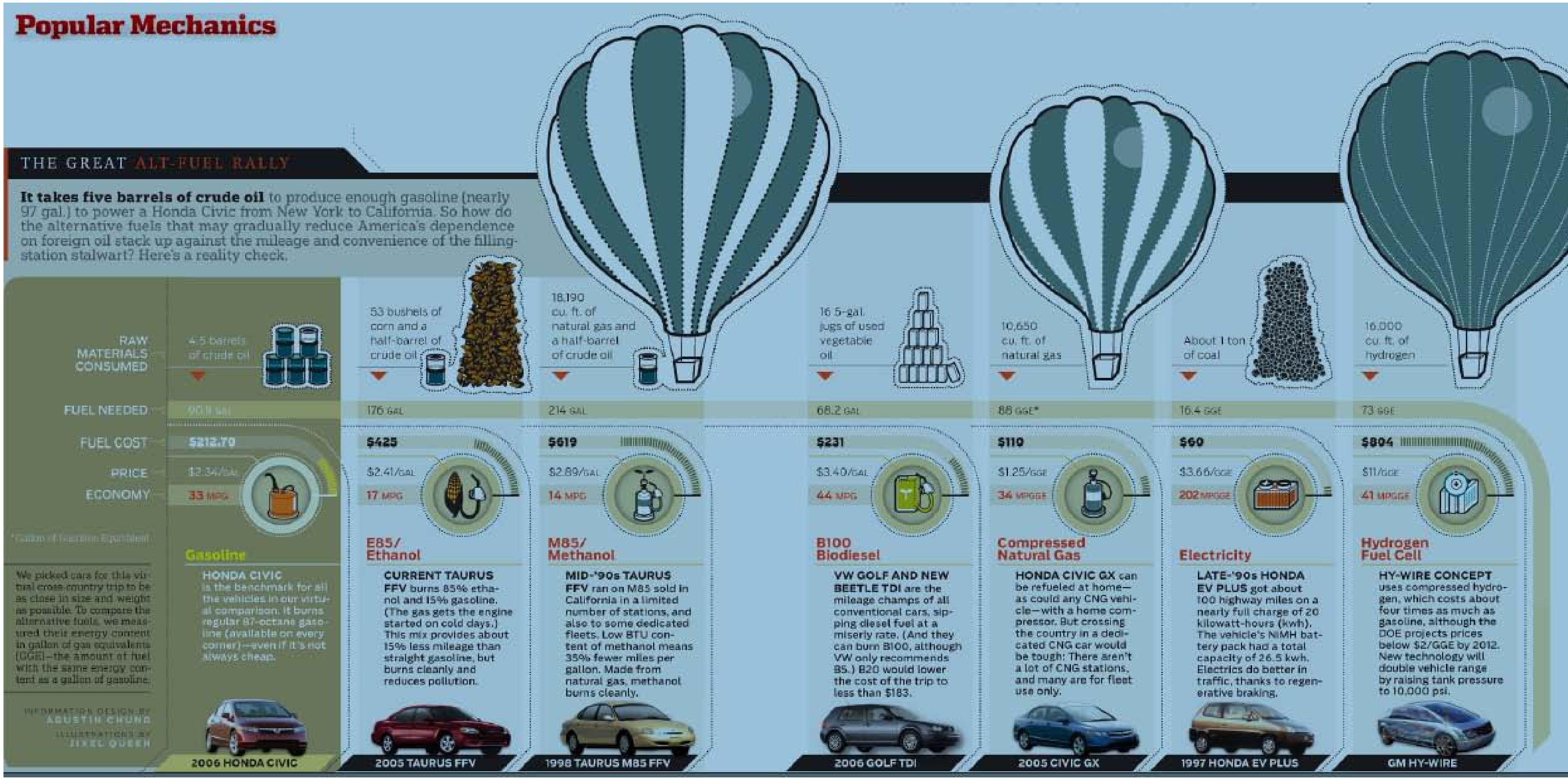
Comparison of Characteristics of Select Alternative Fuels

Fuel Type	Gasoline	Biodiesel	CNG	EV and HEV	Ethanol (E85)	LPG	Hydrogen
Main Fuel Source	Crude oil	Soy bean oil, waste cooking oils, yellow grease, any vegetable oil	Underground gas reserves	Coal, nuclear, natural gas, hydro and other renewable sources	Corn, grains or agricultural waste	Underground gas reserves and crude oil (refining)	Natural gas, methanol and other energy sources
Applications	All vehicles with regular engines	Light duty (LD) and heavy duty (HD) diesel vehicles	LD fleets, buses, mid-HD trucks, LNG for HD long dist. vehicles	Neighborhood EVs (NEVs) incl. campus & planned communities, electric transits	Many LD vehicles (as flex-fuel running on either E85 or gasoline)	LD passenger-medium duty delivery trucks	Prototypes available but no vehicles currently available for sale
Manufacturers	All major gasoline engine OEMs	All diesel engine manufacturers	All major OEMs of LD & HD vehicles offer bi-fuel & dedicated CNG models, engine retrofits common also	GEM[1], Ebus, Adv. vehicle systems, Orion, TransTeq, Tesla, major OEMs	Chrysler (minivan), Ford (Explorer, Taurus, Ranger), GM (Suburban, Tahoe, Yukon, GMC)	Ford (F150 pickup), GM (Chevy Express, GMC van)	TBD
Vehicle Costs Compared to Gasoline Vehicles	NA	No Incremental Cost	From +$3,600 (Honda Civic) to +$60,000 (40 ft transit buses)	From +$6,500 GEM to +$450,000 TransTeq 116 bus	No incremental cost	From +$3,000 to +$5,000	TBD
Emission Reductions	Produces harmful emissions	B20 / B100 **CO** 12.6% / 3.2% **HC** 11% / 6.3% **NOx** +/- 2% / +/- 10% **PM** 15% / 70%	**CO** 90 - 97% **HC** 50 - 57% **NOx** 35 - 60% **PM** 90 - 97%	EVs - Potential zero emissions if solar charged HEVs - Significant reductions over conventional	**CO** 40% **HC** 15% **NOx** 10% **PM** 20%	**CO** 30 - 35% **HC** 20 - 40% **NOx** 15 - 99% **PM** 80 - 95%	Zero emissions for fuel cell option, and only NOx for internal combustion option
Refueling Infrastructure	Available of all fueling stations	Easily blended in existing diesel pumps and tanks	Up to $90,000 for small to medium fleets and $250,000 for large fleet refueling	110 volt outlets for NEVs. 220 fast charge available for transit application	Existing infrastructure with rubber hoses and nozzles to prevent corrosion	$10,000 to $12,000 cost paid for by fuel provider	Very few fuel stations available for private use
Energy Security Impacts	Manufactured using imported oil, a non-energy secure option	Domestically produced an recycles urban and agricultural waste	Domestically produced. US has vast natural gas reserves	Electricity is produced from domestic resources	Ethanol is produced domestically and it is renewable	Most widely available alt. fuel but 45% from oil	Hydrogen can be produced by domestic renewable sources

Source: Triangle Clean Cities, and US Department of Energy and National Biodiesel Board

A 2007 study[1] comparing alternative fuels concluded that electricity was the cheapest option[2], despite the slow charging rate, with a fuel cost of $60 compared to $110 for natural gas and $213 for gasoline

Comparison of Performance of Select Alternative Fuels



1. The study imagined a rally from New-York to California and calculated how different types of cars would perform in terms of raw material consumption, fuel need, fuel cost, and mileage, and was **based on 2007 fuel prices**
2. **Despite the low fuel cost, EVs have significant "fueling" limitations (The normal working range of battery is about 50-130 miles and it takes about 6-8 hours to recharge completely)**

Source: Popular Mechanics, 8/2007

Having been around for many years, and with comparable fueling rates to petroleum[1], CNG has proven to be a viable alternative fuel to petroleum, offering cost and environmental benefits

CNG's Offer

- **Plentiful Supply** – Natural gas reserves are twice as plentiful as crude oil with ~98% of the natural gas used in the US coming from the US and Canada. It is projected that we have 118 years of recoverable natural gas resources in the US
- **Affordable** – On the average, it costs 1/3 less, at today's prices, to fill a vehicle with natural gas than with gasoline, and since most of our supply will come from within the US, natural gas prices are not expected to be subject to the outside political and economic pressures seen in the oil market
- **Existing Distribution Infrastructure** – Transporting fuel to all corners of the country is the biggest challenge facing any alternative fuel, but with 1.5M miles of gas pipe and distribution lines crisscrossing the US, natural gas is available to nearly every street and community, eliminating the need for the kind of massive investments or build-out that other alternative fuel options require
- **Proven Vehicle Fuel** – There are nearly 10 million natural gas vehicles in the world made by most major car companies, from Ford to General Motors to Honda to Mercedes Benz. No other alternative fuel has the ability to displace 100% of the petroleum used in heavy-duty vehicles and many municipalities in the US, including Washington D.C., use natural gas vehicles and buses
- **Clean Fuel** – Natural gas vehicles produce 22 to 29 percent less GHG emissions than diesel or gasoline vehicles, respectively, and also generally produce less urban pollutions

1. CNG vehicle tanks can be filled via a "fast fill" option in about the same amount of time it takes to fuel a comparable petroleum vehicle

Source: NGV America website and NGVAmerica – Issue Brief on the Case for Natural Gas, The Most Abundant, Clean, and Cost Efficient American Fuel

CNG fuel takes up less space than petroleum, and has unique storage and fueling characteristics that can match petroleum fueling rates

Natural Gas Fuel Storage

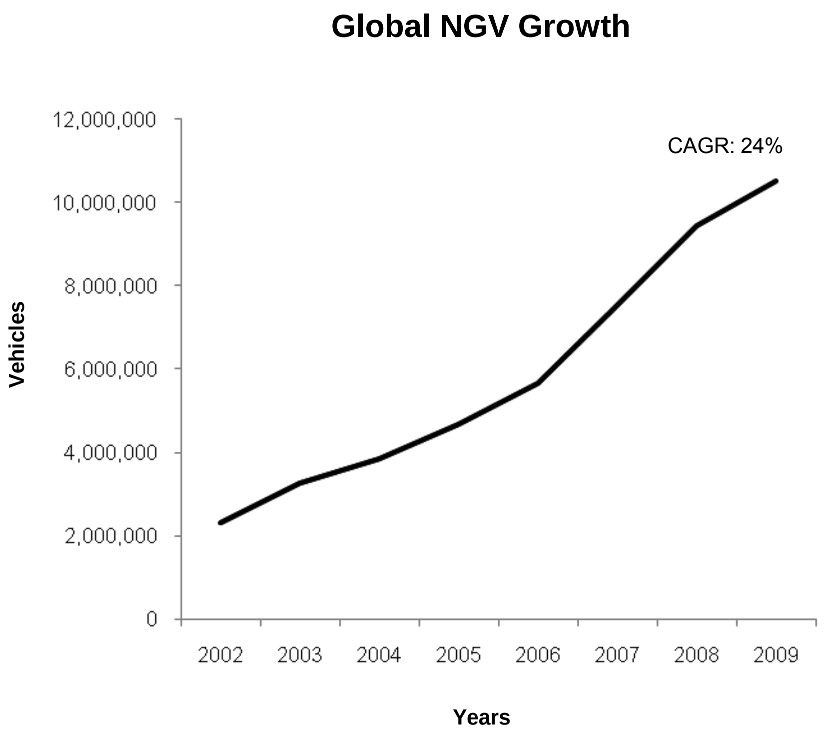
- **CNG**
  - CNG is stored on board vehicles in high-pressure (3,000-3,600 pounds per square inch) in tube-shaped cylinders that are attached to the rear, top or undercarriage of the vehicle
  - The cylinders meet very rigorous safety standards and are made of high-strength materials designed to withstand impact, puncture and, in the case of fire, their pressure relief devices (PRDs) provide a controlled venting of the gas rather than letting the pressure build up in the tank
- **LNG**
  - **Natural gas may also be stored on-board in the form of liquefied natural gas or LNG**
  - To become LNG, natural gas must be cooled to –260 degrees Fahrenheit. In order to keep the LNG cold, LNG is stored on-board vehicles in thermal storage tanks. In other words, sophisticated thermos bottles
  - The biggest advantage of LNG over CNG is space requirements. LNG requires only 30 percent of the space of CNG to store the same amount of energy

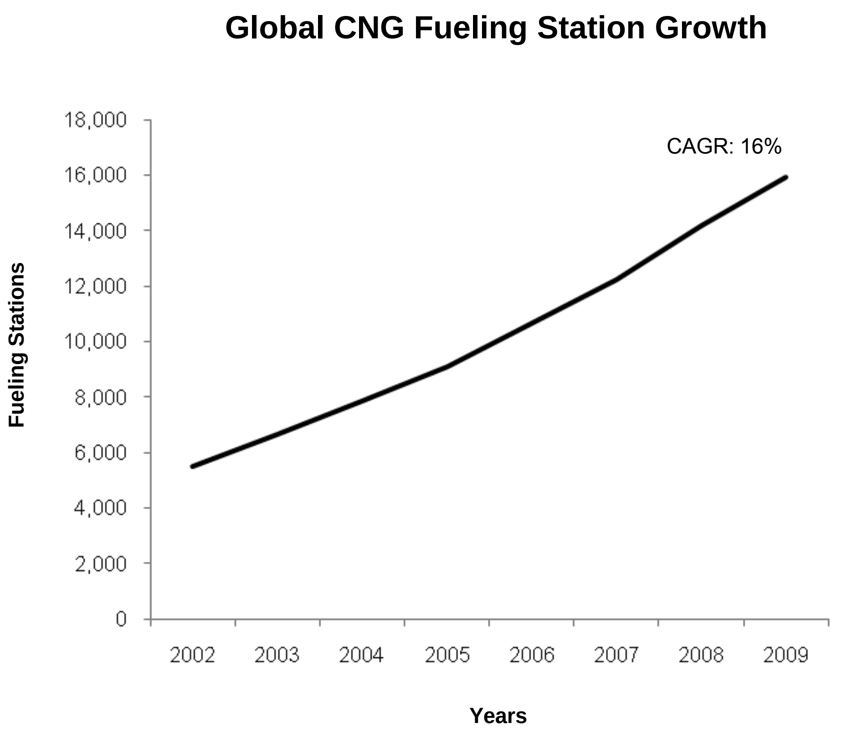
CNG Fueling Fundamentals

- At **CNG** stations, the gas is typically taken from the local gas utility's line at low pressure, compressed and then stored in the vehicle's storage tanks at high pressure
- There are basically two types of fueling equipment – fast-**fill** and **time-fill**
  - In fast-**fill**, the combination of a large compressor coupled with a high-pressure storage tank system (called a cascade) fills the tank in about the same amount of **time** it takes to fuel a comparable petroleum **vehicle**
  - A **time-fill** system does not have a storage system and has a much smaller (and less expensive) compressor. It typically refuels vehicles overnight at a rate of about one gallon per hour

Source: NGVAmerica

The number of Natural Gas Vehicles (NGVs) and CNG fueling stations have grown significantly over the past several years, with NGVs growing at a faster pace





Years	2002	2003	2004	2005	2006	2007	2008	2009
Ratio of Vehicles per Station	421	488	491	516	530	618	666	660

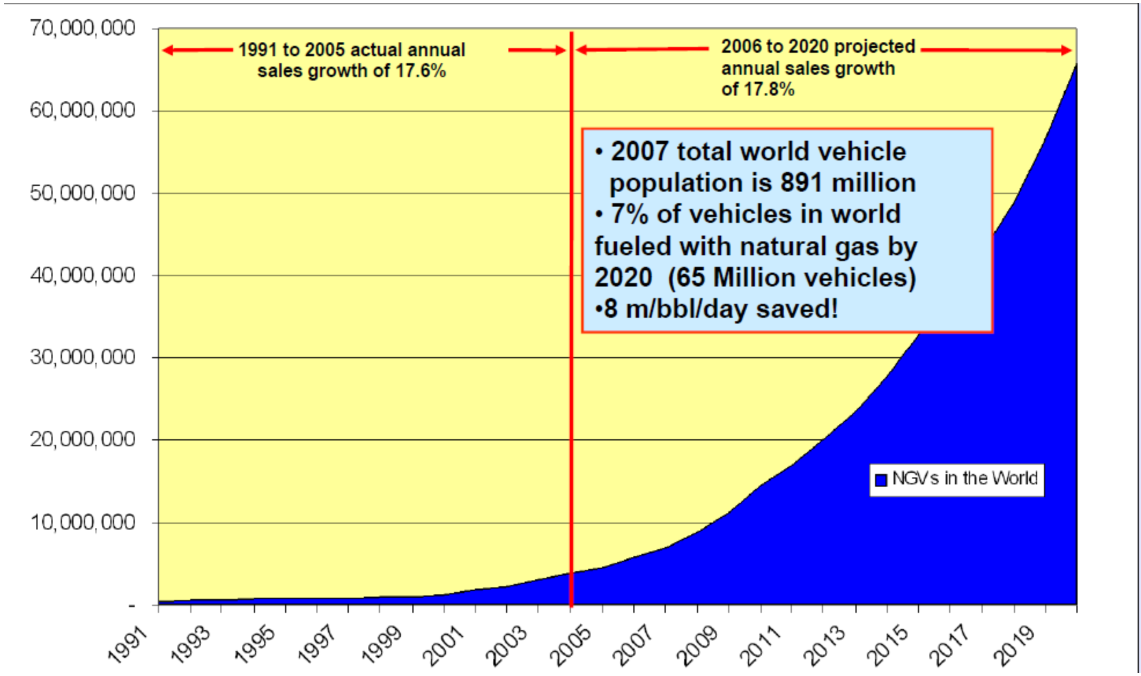
Source: The Gas Vehicle Report, September 2009

Driven by a host of strategic factors and government support, NGVs are projected to increase globally at a faster rate than prior years

Primary Growth Drivers

- Environmental benefits
- Economics (fuel prices)
- Energy Security
  - Reduction of dependency on oil exports from unstable parts of the world (e.g. US)
  - Substitution of domestic oil use by natural gas with aim of increasing oil exports (e.g. Venezuela, Iran)
- Government incentives
  - Cash rebates, exemptions from congestion charges, tax benefits (road, income, fuel etc.)
  - Free parking (lanes at airports, train stations etc.)
- Government mandates
  - Venezuela: 40,000 NGVs
  - Iran: As many that can be converted
  - India: Diesel buses, 8 regions and more to expand

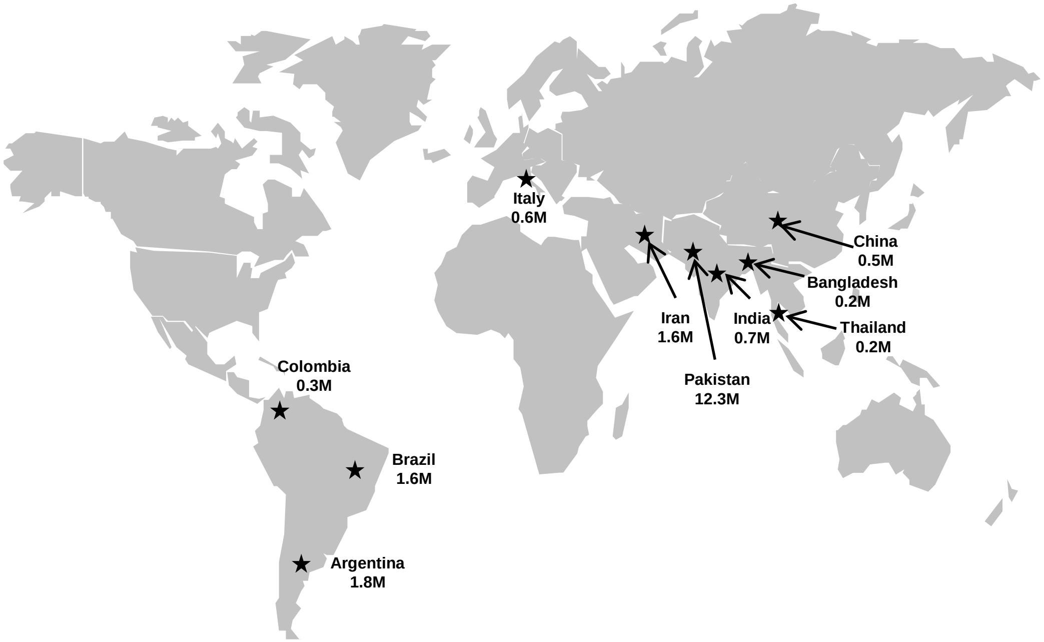
Worldwide NGV Growth Actual / Projected



Sources:
1. NGVAmerica – Annual NGV Conference Summit, 09/21/09
2. The Gas Vehicle Report – September 2009

There is widespread use of NGVs in many parts of the world, with Pakistan and Argentina being the dominant users

Natural Gas Vehicles (NGVs) in the World



World Total

Number of NGVs: **10.89 million**	Number of Existing Fuel Stations: **16,278**	Number of Fuel Stations Under Construction: **2,607**

NGVs Top 10 Countries

Country	# of NGVs	# of CNG Fuel Stations	NGV % of Total Vehicles
Pakistan	2,250,000	3,000	32.0%
Argentina	1,793,000	1,835	22.8%
Iran	1,638,000	981	10.3%
Brazil	1,614,000	1,769	6.3%
India	700,000	500	5.0%
Italy	588,000	732	1.3%
China	500,000	1,339	1.0%
Colombia	296,000	458	18.5%
Bangladesh	180,000	463	21.1%
Thailand	158,000	369	1.5%

It is noteworthy that the US is not a leading global user of CNG as an alternative transportation fuel and does not feature among the top 10

Source: NGVAmerica – Annual NGV Conference Summit, 09/21/09

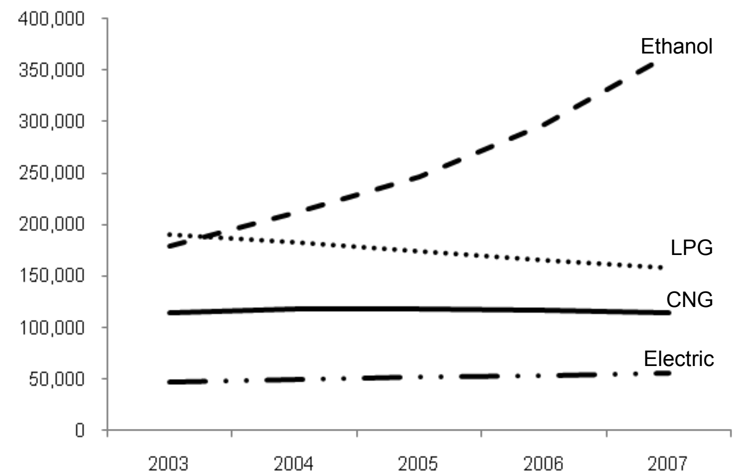
Despite abundant domestic fuel supplies and environmental benefits, CNG has not grown its share of the US alternative fuel vehicle market over the past several years

Natural Gas Vehicle (NGV) Facts

- Over 120,000 Natural Gas Vehicles on U.S. roads today and over 8.7 million worldwide
- Largest US markets are California, New York, and Utah
- Over 1,100 NGV fueling stations in the U.S., over half available to public
- Natural gas costs, on average, one-third less than conventional gasoline at the pump at today's prices
- Over 50 different manufacturers produce 150 models of light, medium and heavy-duty vehicles and engines
- Roughly 22 percent of all new transit bus orders in the US are for natural gas
- Natural gas is sold in gasoline gallon equivalents (GGEs). A GGE has same energy content (124,800 BTUs) as gallon of gasoline

Number of Alternative Fueled Vehicles in Use by Fuel Type in US, 2007

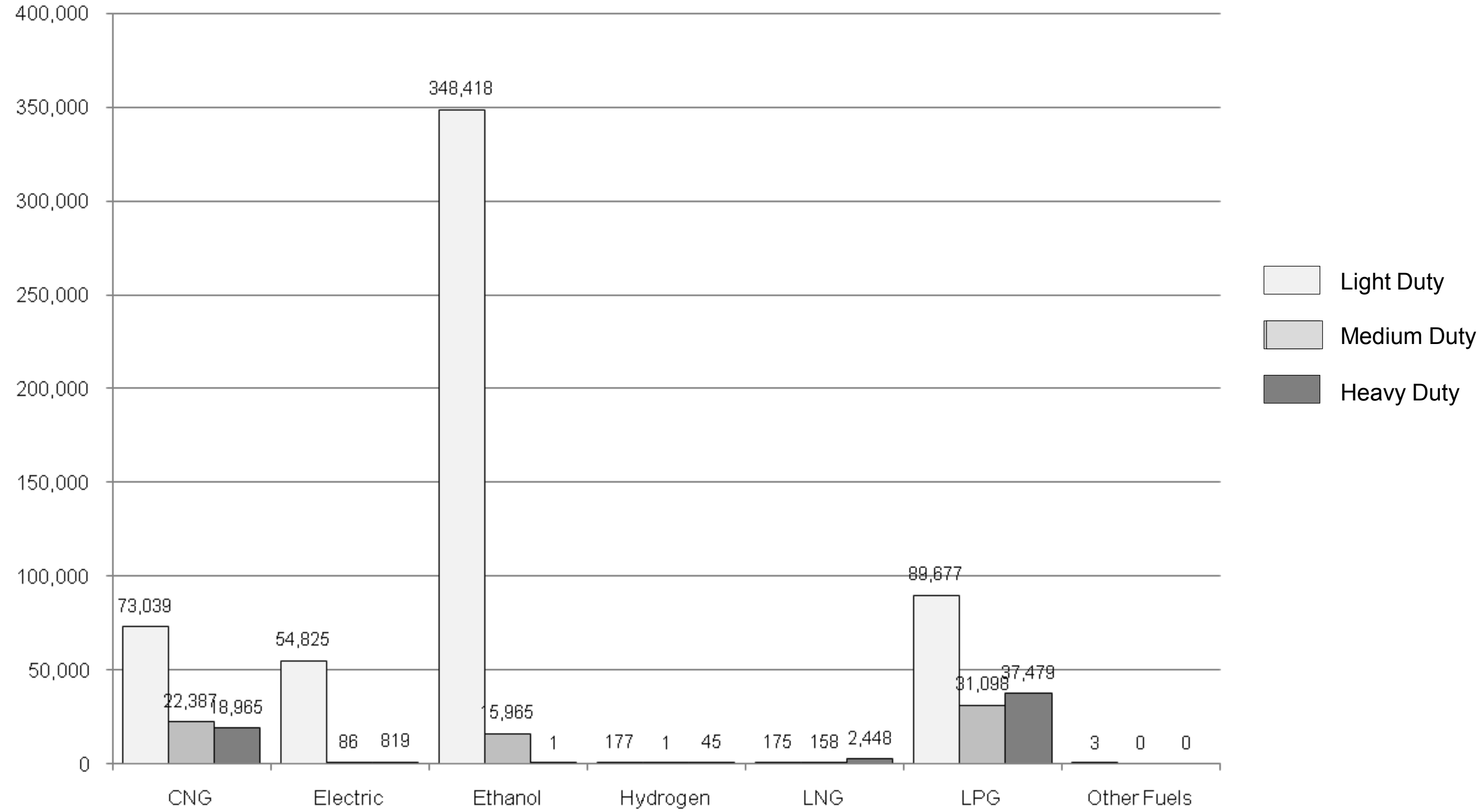
Fuel Type	**2003**	**2004**	**2005**	**2006**	**2007**
CNG	114,406	118,532	117,699	116,131	114,391
Electric	47,485	49,536	51,398	53,526	55,730
Ethanol	179,090	211,800	246,363	297,099	364,384
Hydrogen	9	43	119	159	223
LNG	2,640	2,717	2,748	2,798	2,781
LPG	190,369	182,864	173,795	164,846	158,254
Other Fuels	0	0	3	3	3
Total	**533,999**	**565,492**	**592,125**	**634,562**	**695,766**



Sources: The California Air Resources Board (CARB), Alternatives to Traditional Transportation Fuels 2007, EIA April 2009

In the US, among vehicle types, CNG represents the second most widely used alternative fuel in the medium and heavy duty categories, and third in the light duty category

Estimated Number of Alternative Vehicles in Use by Fuel Type and Major Weight Class in US, 2007



Source: Energy Information Administration/Alternatives to Traditional Transportation Fuels, 2007

A breakdown of the vehicle weight classes for CNG vehicles shows buses dominate in the heavy duty category, while pickup trucks dominate in the medium, and light duty categories

Estimated Number of Alternative Vehicles in Use by Fuel Type and Detailed Weight Class in US, 2007

Light Duty

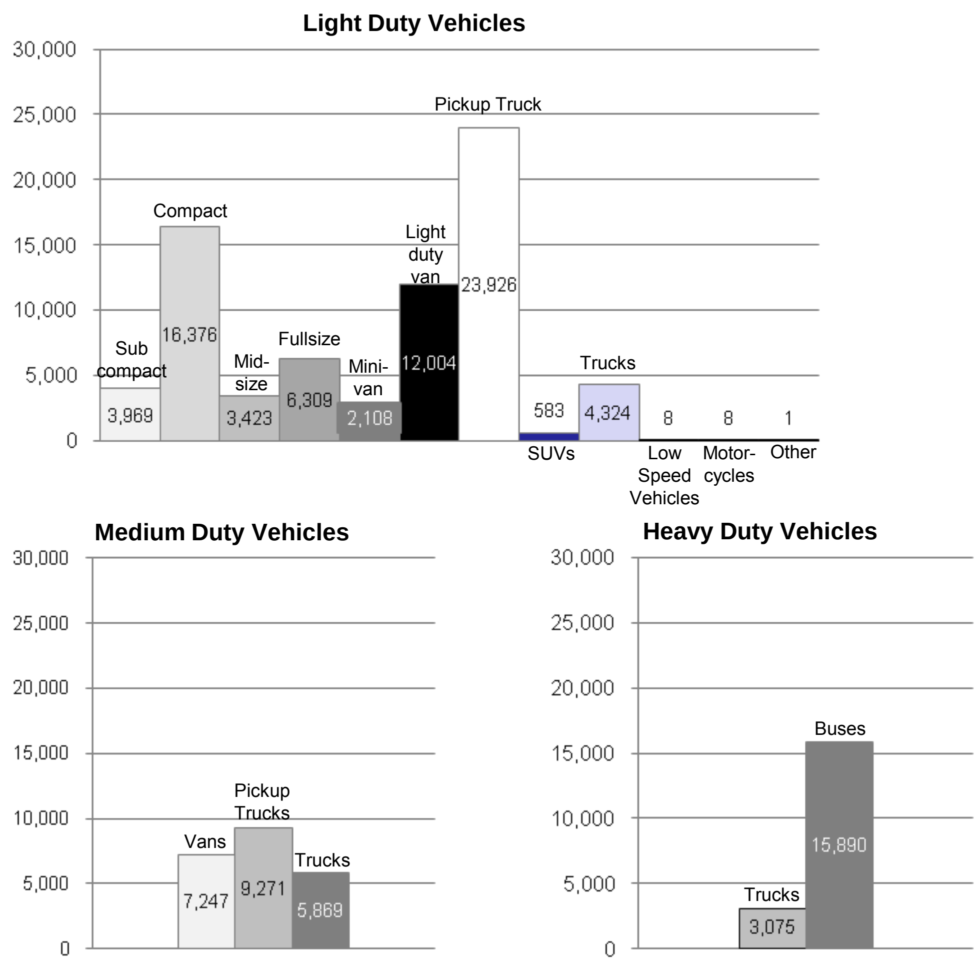
- Pickup trucks dominate usage within the light duty category
- Compacts and light duty vans also show significant usage
- Total usage in this weight class is approximately 73,000 vehicles

Medium Duty

- Pickup trucks dominate usage within the medium truck category
- Total usage in this weight class exceeds 22,000 vehicles

Heavy Duty

- Buses dominate usage in the heavy duty category
- Total usage in this weight class is approximately 19,000 vehicles



Source: Energy Information Administration/Alternatives to Traditional Transportation Fuels, 2007

In spite of its advantages, CNG has implementation constraints that must be overcome for widespread adoption and growth to occur

CNG Implementation Constraints

- High Cost, and Lack of Infrastructure
  - Partial absence of gas pipeline networks
    - Most rural areas
    - Some regions
    - City cores
  - Cost of refueling equipment
    - Phill home refueling for Civic GX
    - $3,000-$4,000 capital cost
    - $1,000-$2,000 installation
    - Amortized fleet refueling facility costs
    - $0.59/GGE best case
    - $1.15/GGE worst case
  - Large space requirements for fuel storage
    - Larger space requirement than conventional gasoline vehicles
    - On-board storage tanks take up additional trunk space
- Disinterest of Utility Partners – how to get them reengaged
- Product Cost
  - CNG option for cars adds $5,000 premium before incentives
  - CNG option for heavy trucks and buses adds $10 - $30,000 premium
- Product Availability
  - Only one passenger car, produced in 1,000s[1]
  - No light truck under 8,500 lb GVW
  - 2 of 4 diesel engine conversions not available in 2010
  - GM abandons medium duty – will engines for Baytech conversions remain?
  - Ford so far does E-series vans – Pickup trucks
- Perceptions – Reliability of:
  - Vehicles
    - Diesel — diesel reliability with new after-treatment
    - Gasoline — reliability of CNG vs. gasoline
  - Government commitment (fluctuation of incentives)
  - OEM commitment (post 2002 collapse of offerings)
- Emissions Testing Data
  - Reliable on-road criteria and GHG emissions data on how HD NG compares with other fuels/technologies would be beneficial
  - Early tracking of this will be helpful since the best technologies meeting the standards will be in use for a decade or more

1. General Motors produces 18 different CNG models under its various global brands but sell none of them in the US today

Source: US Department of Energy, Natural Gas Vehicles – Status, Barriers, Opportunities

In particular, until adequate fueling infrastructure is developed for consumers, CNG is most practical mainly for fleets

Fleets as Candidates for CNG Vehicles

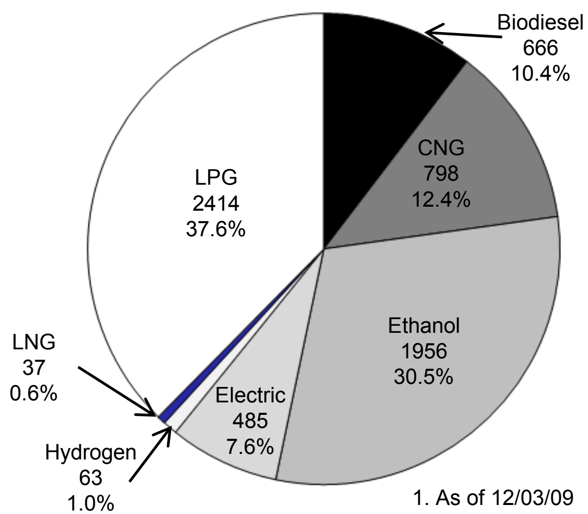
- Any fleet operator – for example, taxi cabs, utilities, and express delivery firms – whose vehicles go back to 'the barn' every night are candidates CNG vehicles
- Over-the-road truckers frequently run the same routes and stop in the same places on a regular basis to eat, rest and refuel along their routes
- Conversely, batteries are not advanced enough to efficiently power heavy trucks
- In addition to over-the road trucks, there are a growing number of transit companies and agencies converting to natural gas buses
- AT&T is converting 8,000 vans and trucks, over the next five years, to natural gas vehicles in the single largest commitment ever by a U.S. corporation toward using alternative fueled vehicles
- New York City is currently planning to expand its CNG bus operations by purchasing an additional 300 buses and converting two depots to CNG
- The use of CNG for consumer vehicles is likely to remain limited as vehicle options are limited today

Sources: Bridge Strategy, AT&T, US Department of Energy

CNG Infrastructure Station Mix

Note: Passenger vehicles are likely to be limited as a customer base

US Alternative Fuel Station Count / Share by Fuel Type[1]



Fuel Types	~ Vehicles per Station Ratio
CNG	143
Electric	115
Ethanol	186
Hydrogen	4
LNG	75
LPG	66

1. As of 12/03/09

Fleets today represent a significant CNG market, with light trucks and vans being the dominant vehicle types but buses requiring most gas usage

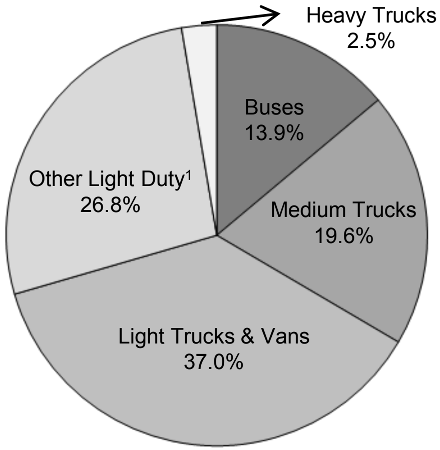
Fleet examples with growing use of CNG Vehicles

- Taxi cabs
- Street sweepers
- Transit buses
- School buses
- Airport shuttles
- Over-the-road trucks
- Ice resurfacers
- Refuse haulers
- Delivery trucks
- Forklifts

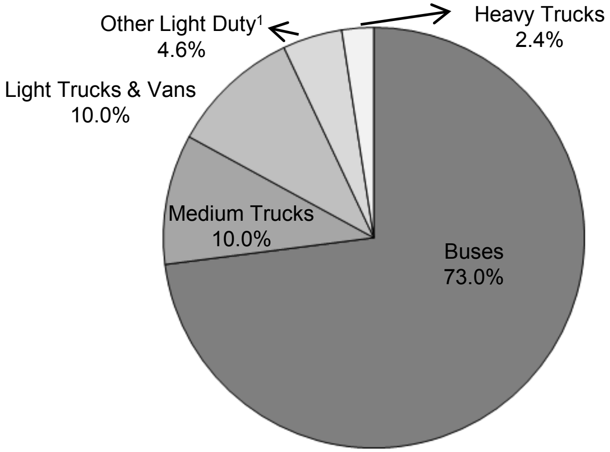
Types of Available Vehicles / Engine Models

- Light Duty Vehicles
  - Passenger car: Honda GX
  - Trucks: None
- Medium and Heavy duty Trucks
  - Baytech GM 6.0L and 8.1L SI conversions (pickups, vans etc.)
  - Ford E-series vans w/5.4L and 6.8L SI engines
  - Emissions Solutions 7.6L Navistar diesel conversion
    - School buses, cutaway shuttles, work trucks
  - Cummins-Westport 8.9L Cummins diesel conversion
    - Refuse, transit, D4 school buses, street sweepers, yard hostlers

Shares of Natural Gas Vehicle Use by Vehicle Type, 2007



Shares of Natural Gas Fuel Use by Vehicle Type, 2007



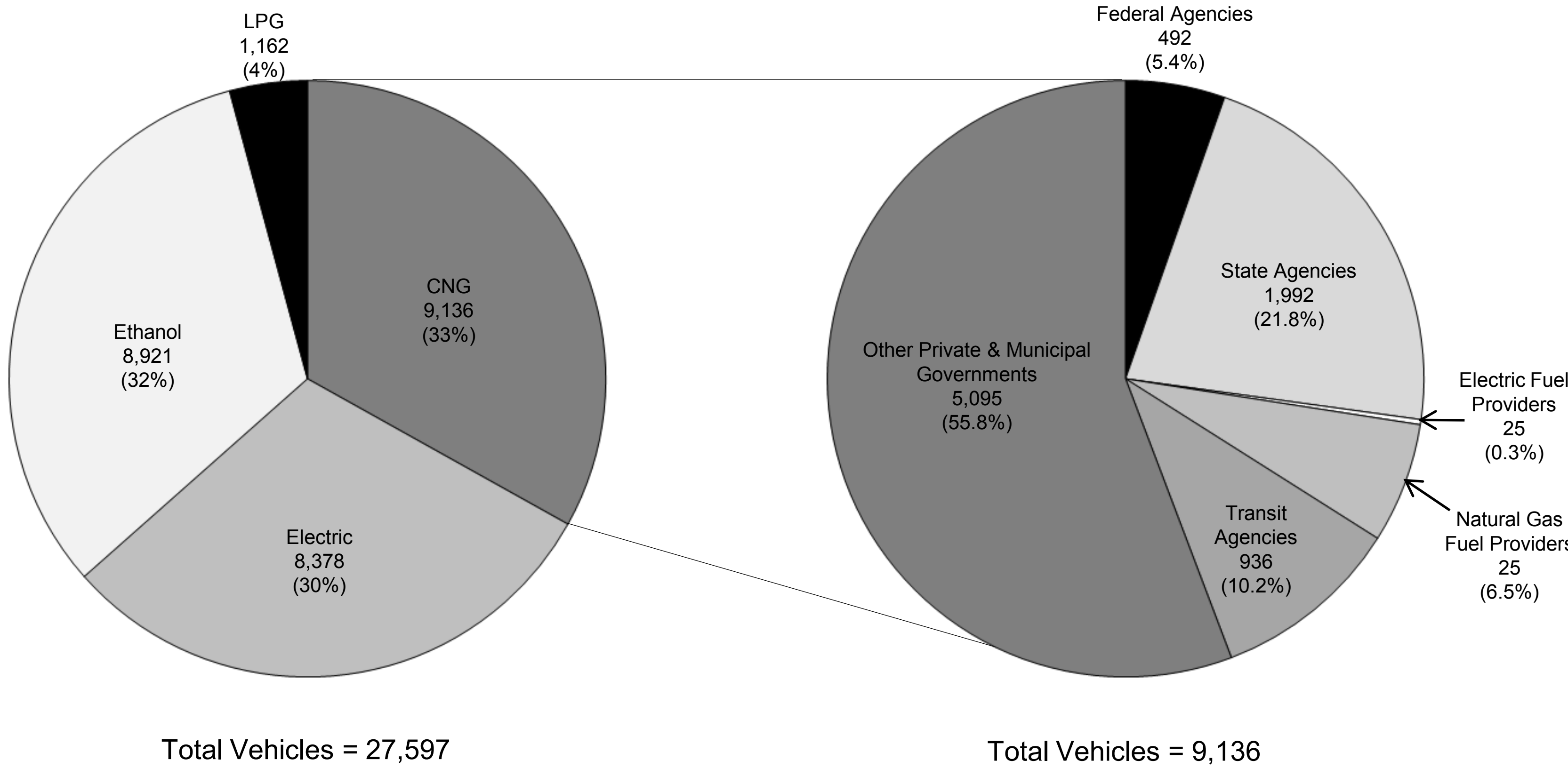
Source: US Department of Energy, Natural Gas Vehicles – Status, Barriers, Opportunities

1. Includes Automobiles, SUVs, and Motorcycles

In New York State, CNG is the most widely used alternative fuel, with private fleets and municipal governments being dominant users

Estimated Number of Alternative Fueled Vehicles in Use and Fuel Type in New York State, 2007

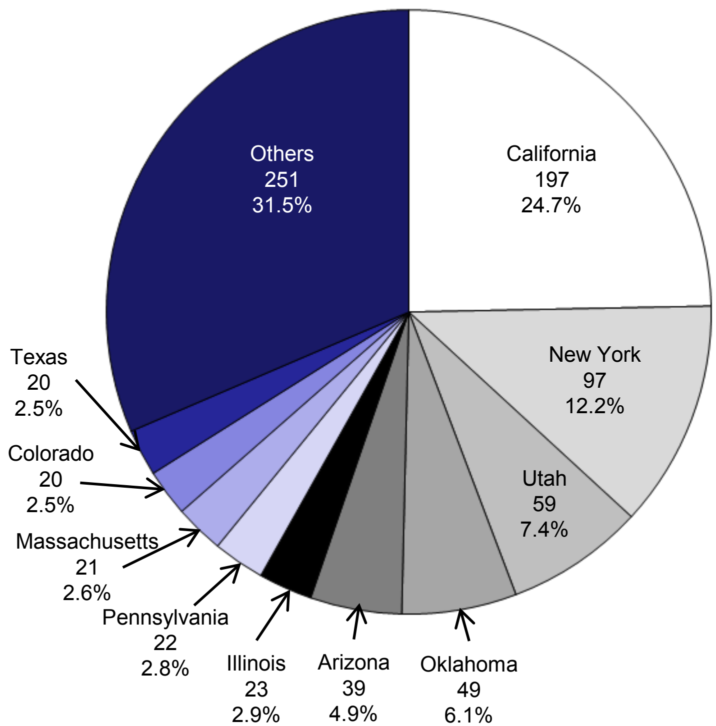
Estimated Number of CNG Vehicles in Use by User Group (Fleets) in New York State, 2007



Source: Energy Information Administration/Alternatives to Traditional Transportation Fuels, 2007

With 97 stations, New York ranks second among States with the most number of CNG stations, 12 of which are in CECONY's service territory

Top 10 States with the Most CNG Stations, 2009



Number of CNG Stations

Location	CNG Stations	
US	798	
New York State	97	
CECONY Service Territory	12	3 are private – government only 2 are private access only 6 are public – card key at all times 1 is PLANNED – not yet accessible

Out of the 12 CNG stations in CECONY's territory, only 6 appear to be available to the public, and more will be required for widespread adoption to occur

Source: Energy Information Administration/Alternatives to Traditional Transportation Fuels, 2007

Widespread adoption of CNG can reduce significant amounts of New York City's urban emissions and GHG emissions from vehicles

Urban Emissions

- The NGV Honda Civic GX is recognized by the U.S. EPA as the cleanest commercially available, internal-combustion vehicle on earth and rated by the California Air Resources Board as meeting the very stringent AT-PZEV standard
- In gasoline vehicles, evaporative and fueling emissions account for at least 50% of a vehicle's total hydrocarbon emissions. Dedicated NGVs can reduce exhaust emissions:
  - Carbon monoxide (CO) by 70%
  - Non-methane organic gas (NMOG) by 87%
  - Nitrogen oxides (NOx) by 87%
  - Carbon dioxide (CO2) by almost 20% below those of gasoline vehicles
- NGVs produce far less urban emissions than gasoline or diesel vehicles. Even with the stringent 2007 EPA heavy-duty engine emission standards, NGVs will be producing only 1/6 the NOx of comparable diesel engines

Greenhouse Gases

- Per unit of energy, natural gas contains less carbon than other fossil fuels, and produces lower carbon dioxide (CO2) emissions per vehicle mile traveled
- While NGVs emit methane, another principle GHG, increase in methane emissions is more than offset by a substantial reduction in CO2 emissions compared to other fuels
- Gasoline and diesel fuels produce approximately 94 – 95 grams of CO2 equivalent emissions per MJ based on wheel-to-wheel analyses. As transportation fuel, natural gas can reduce GHG emissions by 20 – 29% compared to diesel and gasoline
- In the future, these benefits could increase as natural gas supplies increasingly may be blended with renewable natural gas, biomethane which reduces carbon emissions by almost 90% when compared with gasoline and diesel fuel
- Preparing for CNGs also helps meet the Federal, state, and city environmental objectives and specific goals to increase the penetration of alternative fuel vehicles

Environmental Targets Impacting New York

Legislation / Sponsor	Description
Federal Legislation	• Pending GHG legislation would require a reduction of CO2 by 80% by 20250
New York State Energy Plan	• Retain Air Quality programs and establish a companion program for programs that reduce GHGs
PlaNYC	• Promote clean vehicles and reduce emissions from taxis, black cars, for-hire vehicles, school buses, and construction vehicles • Reduce transportation emissions, currently at 22% of NYC's total GHGs, by 44% by 2030

Source: The California Air Resources Board (CARB)

The good news for CNG is that there are promising signs that legislators are seriously viewing it as an alternative fuel opportunity

"We must get serious about using cleaner burning natural gas and renewable energy, and this legislation is a strong step in the right direction." Sen. Harry Reid in introducing NGV bill (7/8/09)

"Our economic crisis has shined a spotlight on the urgent need for alternative, cleaner and cheaper sources of energy that we don't have to import. By making it easier and cheaper to own a vehicle that runs on natural gas, we can help families save money on energy, create new manufacturing jobs and clean our air." Sen. Robert Menendez

"I believe strongly that an extra push is needed to spur the greater use of natural gas and to get more gas-fueled vehicles on the road. Utah is in a position to lead the US in NGV use and refueling station placement. Governor Huntsman has helped promote making the state's major north-south highway, Interstate 15, an NGV corridor." Sen. Orin Hatch

Colorado Gov. Bill Ritter announced that his energy office applied to the US Department of Energy for a $10 million grant to dramatically expand compressed natural gas's use as a transportation fuel in the state

Source: ACI Services Inc. & Cambridge Cryogenic Technologies LLC July 22, 2009

To spur CNG growth, the government has introduced a significant number of incentives across several different dimensions

Summary of CNG Government Incentives

Financial Incentives Focus Area	# of Federal Programs	# of State Programs	# of City Programs	# of Utilities Programs[1]	Total Number of Programs
Infrastructure Development	1	4		1	**6**
Product (Fuel) Development	1	1			**2**
Technical Assistance		2			**2**
Vehicle Acquisition	6	2	2		**10**
AFV Air Quality Improvement Program	2				**2**
Fuel Distribution		1			**1**
Fuel Usage Taxes	1	1			**2**
Total	**11**	**11**	**2**	**1**	**25**

- Current tax programs are supporting natural gas vehicle deployment, but an expanded tax program (known as the NAT GAS Act) is very much in play and has the support of Senate Majority Leader Harry Reid (D-Nev.)
- Congress looks inclined to spend more money on natural gas vehicle related R&D in the Department of Energy's FY2010 budget
- Stimulus-related funding is driving 3,400 vehicle orders and 144 fueling stations, some in "corridors" in Northeast and Southeast markets

1. National Grid Infrastructure Rebate Incentive Program

Source: U.S. Department of Energy (Details are presented in Appendix)

In particular, the recent Stimulus Package[1] provides billions in new funding for programs that could potentially benefit CNG vehicles

ARRA[1] Stimulus Funding for Natural Gas Vehicles

Of primary interest to the natural gas vehicles industry are the following:

1) Department of Energy Pilot Program for alternative fuel, infrastructure and advanced technology vehicles - $300 million;
2) U.S. EPA Diesel Emission Reduction Program - $300 million;
3) Federal Transit Administration capital expenditures - $8.4 billion;
4) Department of Energy Block Grants for Energy Efficiency and Conservation - $3.2 billion; and
5) General Services Administration Federal Fleet acquisition of fuel efficient vehicles - $300 million

The level of funding provided for many of these programs is unprecedented and the time frame for awarding funding is extremely ambitious. State and local government authorities are scrambling to figure out how to distribute availability funding and how to bid on competitive solicitations. The passage of ARRA creates a huge opportunity for our industry to assist local governments in understanding how these funding opportunities work and also in putting together eligible projects

1. American Recovery and Reinvestment Act of 2009 (P.L. 111-05)

Source: US Department of Energy

From CECONY's perspective, the addressable market for CNG is defined by the 110,000 fleet vehicles in its service territory

Estimation of Fleet Population in CECONY Gas Service Territory

Description	Number	Source
Total US Population	304,059,724	2009 Estimate based on 2000 Census
Total US Fleet Vehicle Population	7,721,000	Automotive Fleet Statistics as on 1/1/09 (see Appendix)
Average Fleet Vehicle per Person[1]	0.0254	Calculated
Total New York State Population	19,490,297	2009 Estimate based on 2000 Census
Total New York State Fleet Vehicle Population	494,918	Calculated[1]
Total CECONY Gas Service Territory Population	4,803,096	CECONY data
Total CECONY Fleet Vehicle Population	**109,769**	**Calculated[1]**

1. Calculated using Bridge Strategy methodology based on population data from census and including an area (metro, large city, small city, village) classification factor. Area classification factors have to be applied to average to reflect expected fleet population based on typical fleet statistics found in each area type

Source: Bridge Strategy Analysis

Out of the 110,000 fleet vehicles in CECONY's service territory, 2,000 are estimated to be CNG vehicles, projected to grow at a CAGR of 9%

Estimation of CNG Fleet Population in CECONY Gas Service Territory

Description	Number
New York State Fleet Population	494,918
CECONY Territory Fleet Population	109,769
New York State CNG Fleet Population[1]	9,136
CECONY Territory CNG Fleet Population[3]	2,026[3,4]

Projected Growth (2010 to 2030) Estimates (3 Cases – High, Medium, Low)

Case	2010 to 2030 Projected CAGR (%)	Rationale / Assumption
High	• 17.8% (2010 to 2020) • 1 MDt/day (2020 to 2030)	• 2006 to 2020 projected global CNG vehicle growth (ref. p. 9)[2], followed by linear growth from 2020 to 2030 as a result of competitive fuels • Increased incentives • Proposed stringent environmental regulations are met
Medium (Plan)	• **9.0%**	• **Similar growth rate to that assumed for EVs** • **Current levels incentives, and current mandated environmental regulations are met**
Low	• 0% (Flat)	• Historical (2003 to 2007) US CNG vehicle growth (ref. p. 11) • Inadequate incentives (historical levels)

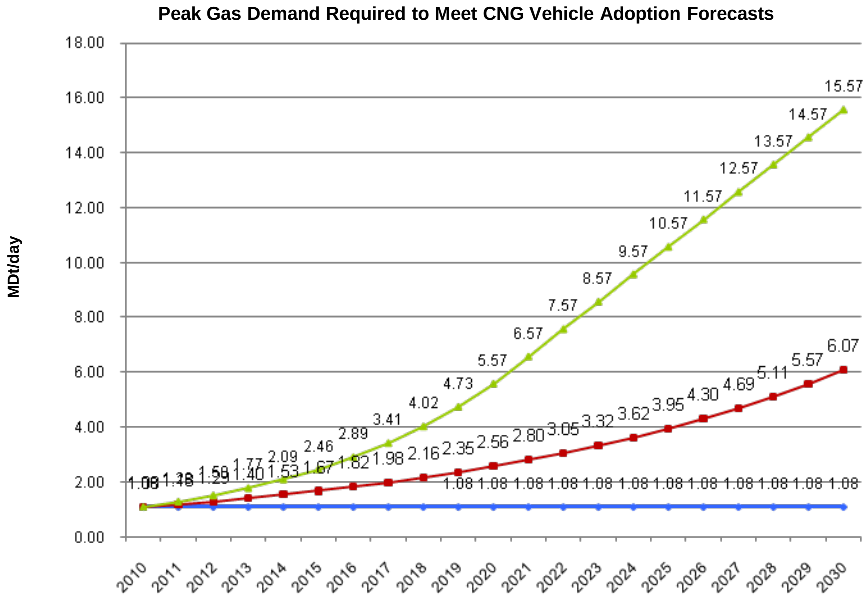
Most of the growth in CNG vehicles will likely come from buses and large commercial trucks, however, adoption and growth will not materialize unless incentives are sufficient to overcome constraints that have prevented adoption to date. **It should be noted that CECONY is planning on adding another 30 CNG vehicles to its CNG fleet, doubling its size**

1. See Slide 17
2. Reference also Green Car Congress – Forecast Report : Global Natural Gas Vehicle Fleet to Reach 17 Million by 2015, 11 December 2009 (report projects US NGVs will grow at a CAGR of 17.7% from 2008 to 2015 (This growth rate may sound promising but only amounts to 31,000 new CNG vehicles in the US in 2015)
3. Independent research from Gas Vehicle Report (Worldwide NGV statistics) suggests an average NGV to population ratio in the US of 0.49/1000 , implying 2,354 vehicles in CECONY territory
4. Some NYC CNG fleet counts are as follows: Buses – 482, Taxicabs – 300, Manhattan Beer Trucks – 30, CECONY vehicles – 30 (60 by year end), UPS - 15

Source: Bridge Strategy

With the right incentives in place, CNG vehicles could increase gas demand by up to 6.1 MDt/day by 2030

Projected *Gas* Demand Impact of *CNG* Vehicle Adoption in CECONY Territory



Implications of Increased Demand for Gas Load to Support CNG Vehicles

- Gas demand[1] is expected to be 1.1 MDt/day (low case), 6.1 MDt/day (medium case), and 15.6 MDt/day (high case) by 2030
- All CNG customers are expected to be firm customers and add to load during the peak winter day
- Based on current plan load forecasts, peak winter day load in 2030 is 1441 MDt/day, implying a total peak demand day load of 1447.1 MDt/day

Assumptions:
1. Average vehicle miles traveled per day = 65 miles (24,000 miles annually)
2. Average gasoline fuel efficiency = 15 miles per gallon (~25% of fleets are buses with typical fuel efficiency ~6 miles per gallon)
3. BTUs per gallon of gasoline = 125,000
4. BTUs per Dt = 1,000,000

Source: CECONY

CECONY is planning for EV growth but significant industry challenges need to be overcome for widespread adoption to occur

CECONY EV Objectives

- Reduce T&D Infrastructure Investments and Power Purchase Costs:
  - Circuit level planning and measured integration of EV load into the grid will be important so as not to overload individual circuits where EV penetration is high
  - Tap into EVs as a storage option to offset demand growth and/or offset expensive peak-time power purchases
- Lower customer bills
  - Facilitation of EVs will lower customers overall expenses on energy by offsetting expensive gas with inexpensive electricity
  - Off-peak charging will limit the increase in electric bills from EVs, and the potential of Vehicle-to-Grid (V2G) power would allow owners to sell back electricity acquired from the grid when their PHEVs are plugged in at home
- Improve Environmental Profile and Meet Federal, New York State, and New York City Targets
  - EVs will help meet Federal, state, and city objectives to increase the penetration of alternative fuel vehicles
  - Widespread adoption of PHEVs can reduce GHG emissions from vehicles by more than 450 million metric tons by 2050
- Enhance Reliability
  - Forecasting for EVs at circuit level will avoid negative impacts on reliability from unforeseen load spikes from EV penetration
- Diversify Supply Portfolio
  - V2G storage applications can help diversify the supply portfolio and reduce financial risks and volatility from reliance on large-scale centralized resources.

Industry Challenges

- Limited driving range, entirely predicated on the design of the batteries. The batteries for electric vehicles need to supply the required energy for the driving range, they have to be light and have the required power density
- Battery development is constrained by inherent tradeoffs between five main battery attributes: power, energy, longevity, safety, and cost. Two leading battery designs rely on nickel-metal hydride and lithium-ion
- Other battery technologies are in various stages of development and many different types of chemical combinations are currently being tested to achieve the energy storage density needed to encourage widespread adoption of PHEVs.
- Design of local utility tariffs to accommodate not just local PHEVs and EVs but also allow PHEVs and EVS from other areas the ability to recharge. This universality of fueling capability throughout the nation must be resolved; no one will buy a car that can't be filled up outside of one's own region.
- Billing is a technical issue that must be addressed through innovative smart grid technology. This will require an integrated communications infrastructure and corresponding price signals
- Smart chargers enabled by the Smart Grid will help manage the distribution infrastructure and allow for accurate billing.
- Continued support for alternative fuel vehicles, including current and proposed policies and plans such as Federal policy, potential national renewable portfolio standards, and pending GHG legislation, state and city plans

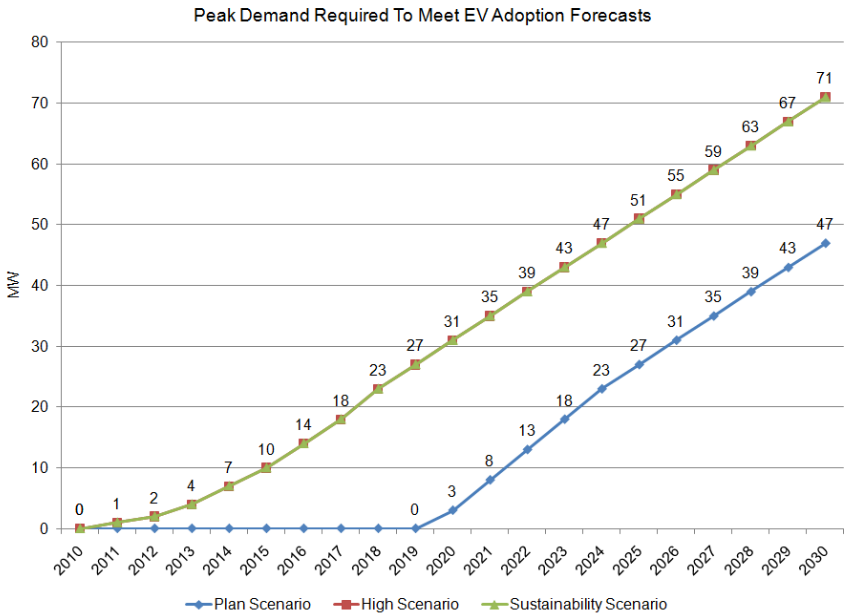
Source: Electric Long Range Plan

Growth in EVs in CECONY's service territory will be accompanied by increased demand for electricity generation

Implications of Increased Demand for Electricity Generation to Support EV Growth

- Refueling of EVs is expected to occur mainly at night during the off-peak electricity usage periods
- Off-peak for electricity usage (night times) coincide more with peak gas demand particularly during winter
- As electricity generators are interruptible, it is not expected that electricity generation for EVs will significantly impact gas demand during the peak winter day
- It is expected the electricity generation during the peak winter day will be mainly from Wind and/or Nuclear
- Though unlikely, if required, any potential costs for reinforcing the gas system to accommodate increased gas demand will be the responsibility of the electric generators

Projected *Electric* Demand Impact of Electric Vehicle Adoption in CECONY Territory



In CECONY's electric long range plan, the high and sustainability scenarios represent the highest electric demand forecasts for EVs reaching 71MW by 2030

Source: Electric Long Range Plan

CECONY will have to reinforce its gas system to handle the increased demand from a dual CNG and EV strategy

Implications of EV Strategy

- It is expected that most EV recharging will occur overnight when electric usage is low but gas usage is high
- The overnight recharging is not expected to increase gas demand during peak winter time, as required increase in electricity generation during this time will likely be from Wind of Nuclear
- Furthermore, as the electricity generators are interruptible customers, no increase in gas demand is expected
- In the unlikely event that system reinforcement is required, the electric generation customers will pay for infrastructure reinforcement as well as any service laterals required

Implications of CNG Strategy

- CNG customers will generally be considered to be firm gas customers
- Appropriate classification for gas refueling stations needs to be validated (as an example, emergency fleets may be firm customers while others may not)
- Marketing and regulatory outreach may be required once customer classifications are determined and finalized
- As a result of the expected increase in firm gas demand of 6.1 MDt/day in 2030 (0.42% of current gas demand plan of 1441 MDt/day), some localized strengthening of the gas system may be required depending on the location of the fueling stations
- The infrastructure reinforcement required will be determined using the Stoner Network analysis. The load will be added to the models and compared to the base model. Reinforcement is added to the model to bring it to an acceptable range

As a multiple commodity utility, CECONY can support both EV and CNG growth to meet both fleet and consumer needs

Source: Electric Long Range Plan, and Bridge Strategy

Signposts: There are a number a major external factors, likely to impact CNG adoption that must be carefully monitored by CECONY

Major CNG Adoption Related Signposts

- **Commodity Price Volatility:** The market price of natural gas, particularly in comparison to gasoline, as the predominate fuel for CNG is arguably the most important driver impacting adoption
- **Environmental Regulation/Legislation:** Enactment of stringent clean air and GHG related laws will make alternative fuels such as CNG a viable option to reaching transportation policy goals
- **Government Incentives:** Incentives are a key driver to facilitate adoption, and if priced adequately can be economically beneficial to both the customer and CECONY
- **Technology:** Advancements in CNG and refueling technologies should increase CNG vehicle viability
- **Stakeholder Involvement:** Increased stakeholder (OEMs, government, infrastructure investors, etc.) involvement would boost CNG marketing and adoption

Source: Bridge Strategy

Appendix

There are a number of refueling stations in CECONY's service territory today, but more will be required to meet future demand

CECONY Service Territory CNG Stations

Name	Location	Type of Access
ConEd	Bronx	Public – card key at all times
Bronx Zoo	Bronx	Private access only
Manhattan Beer	Bronx	Private access only
MTA – NYCT West Farms / Coliseum Depot	Bronx	Private – government only
ConEd	New York	Public – card key at all times
ConEd	New York	Public – card key at all times
City of New York – Central Park	New York	Private – government only
ConEd	Queens	Public – card key at all times
ConEd	Rye	Public – card key at all times
Clean Energy – NYS Dept of Transportation	Valhalla	Public – card key at all times
NY Bus Company – College Point	Flushing	Private – government only
City of White Plains – Dept of Public Works	White Plains	PLANNED – not yet accessible

Public access

Source: CECONY

There are approximately 7,700,000 fleet vehicles in the US today

US Fleet Statistics by Industry Segment (as of 1/1/09)

Type of Fleet	Cars	Trucks (GVW 1-5)	Typical Fleets[1,2]
Commercial (incl. utility)	**791,000**	**2,224,000**	**1,594,000[1]**
Government (less police)	**1,299,000**	**1,701,000**	**1,701,000**
Federal	99,000	319,000	319,000
State, County, & Local	1,200,000	1,382,000	1,382,000
Other	**607,000**	**59,000**	**59,000**
Police	432,000	0	0
Taxi (incl. vans)	175,000	0	0
Rental (incl. vans & SUVs)	**1,289,000**	**381,000**	**381,000**
Fleet Total (15+ vehicles)	**3,986,000**	**4,365,000**	**3,735,000**
All Fleets (5 – 15 vehicles)	**896,000**	**1,964,000**	**NA[2]**
Total	**4,882,000**	**6,329,000**	**7,721,000**

1. Excludes 630,000 GVW 5 Trucks (Commercial fleets, typically owner operated
2. Excludes all 1,964,000 fleets with less than 15 vehicles

Source: Automotive Fleet

Brazil Case Study:

NGV History

- Search for alternative fuels was first initiated in 1940s and became more intensive in 1970s when country faced impact of the first oil shock
- With limited oil and gas reserves data available at the time, Brazil started producing biomass fuel in large scale
- Today all gasoline is oxygenated with 25% sugarcane ethanol
- **Natural gas** was first used as fuel in light vehicles in 1996, the result of new law extending use beyond buses to all vehicles
- The NGV industry has now progressed to over 1.6 million vehicles on Brazil's roads, a remarkable number in only nine (9) years (most are aftermarket converted taxicabs or commercial medium duty vehicles)

Government Policy

- In large metropolitan areas like Sao Paulo or Rio de Janeiro, the government is planning programs to displace diesel with natural gas in city buses
- Plans are being developed to resolve issues with technology, price differentials to diesel engines, taxation, and operating and maintenance practices to make natural gas attractive to fleets (a niche expected to grow significantly)
- Plans are underway for "Blue Corridors", routes that will connect Rio and Sao Paulo with Buenos Aires (Argentina), Montevideo (Uruguay), and Santiago (Chile), where natural gas would be available to fuel NGVs to improve export-import transactions

Current Status (6.3% penetration of all vehicles)

- NGV vehicles: 1.6 million
- Fuel stations: 1,769
- Fuel supply:
  - 2005 proven gas reserves of 316 billions cu.m and new discoveries are estimated to be 419 billion cu.m
  - Projected demand for 2010 estimated as 100 million cu.m/day, assuming imports of 30 million cu.m/day from Bolivia
  - NGV consumption represents 13% of total consumption
- Refueling infrastructure:
  - Brazil is a recent arrival in natural gas arena (44% of country's primary energy is from hydro, and known gas reserves are in Amazon region, far from consumer markets)
  - Large gas reserves have now been found close to consumption markets, resulting in natural gas distribution network being constructed in large part of country
  - NGV fueling station requirements have been used to justify construction of pipelines in areas that otherwise were not viable
- Vehicle availability:
  - Big success is "flex-fuel" car (models redesigned to run gasoline, ethanol or mix of both in any proportion, with single fuel tank
  - Technology to make vehicles run with third fuel, natural gas, is available (developed by Bosch and Magnetti-Marelli – tri-fuel)
  - Flex-fuel vehicles are sold at same price as regular gasoline vehicles, but tri-fuels are more expensive

Source: International Association for Natural Gas Vehicles – Brazil Country Profile

Definition of Alternative Fuels

Department of Energy

- The following fuels are defined as alternative fuels by the Energy Policy Act (EPAct) of 1992: **pure methanol, ethanol, and other alcohols; blends of 85% or more of alcohol with gasoline; natural gas and liquid fuels domestically produced from natural gas; liquefied petroleum gas (propane); coal-derived liquid fuels; hydrogen; electricity; pure biodiesel (B100); fuels, other than alcohol, derived from biological materials; and P-Series fuels**. In addition, the U.S. Department of Energy (DOE) is authorized to designate other fuels as alternative fuels, provided that the fuel is substantially nonpetroleum, yields substantial energy security benefits, and offers substantial environmental benefits

Internal Revenue Service

- The Internal Revenue Service (IRS) defines alternative fuels as **liquefied petroleum gas (LPG), compressed natural gas (CNG), liquefied natural gas (LNG), liquefied hydrogen, liquid fuel derived from coal through the Fischer-Tropsch process, liquid hydrocarbons derived from biomass, and P-Series fuels**. Biodiesel, ethanol, and renewable diesel are not considered alternative fuels by the IRS. While the term "hydrocarbons" includes liquids that contain oxygen, hydrogen, and carbon and as such "liquid hydrocarbons derived from biomass" includes ethanol, biodiesel, and renewable diesel, the IRS specifically excluded these fuels from the definition. (Reference 26 U.S. Code 6426)

Beginning 1/1/10, vehicle and engine manufacturers are required to report annual greenhouse gas (GHG) emissions to the U.S. Environmental Protection Agency (EPA). Vehicle and engine manufacturers outside of the light-duty sector are required to report CO2 emissions levels beginning with Model Year 2011 and other GHG emissions in subsequent model years. This includes heavy trucks, motorcycles, and non-road engines and equipment. Reporting requirement also applies to suppliers of fossil fuels or industrial GHGs and facilities that emit at least 25,000 metric tons of CO2 equivalent per year

Source: US Department of Energy

Details of federal alternative fuel incentives and programs applicable to both CNG vehicles and EVs

Both CNG and EV

Clean Fuels Grant Program

- The Clean Fuels Grant Program assists designated ozone and carbon monoxide air quality nonattainment and maintenance areas in achieving or maintaining the National Ambient Air Quality Standards through grant funding. The program accelerates the deployment of advanced bus technologies by supporting the use of low-emission vehicles in transit fleets. The program assists transit agencies in purchasing low-emission buses and related equipment, constructing alternative fuel stations, modifying garage facilities to accommodate clean fuel vehicles, and assisting with the use of biodiesel

Vehicle Incremental Cost Allocation

- All federal agencies are required to allocate the incremental cost of purchasing alternative fuel vehicles across the entire fleet of vehicles distributed

Alternative Fuel Infrastructure Tax Credit

- A tax credit for cost of installing alternative fueling equipment placed into service after 12/31/05. Credit amount is up to 30% of cost, not to exceed $30,000, for equipment placed into service before 1/1/09. Credit amount is up to 50% not to exceed $50,000, for equipment placed into service on or after 1/1/09. Fueling station owners who install qualified equipment at multiple sites are allowed to use the credit towards each location. Consumers who purchase residential fueling equipment may receive a tax credit of up to $1,000, which increases to $2,000 for equipment placed into service after 12/31/08. Credit expires 12/31/10

Congestion Mitigation and Air Quality (CMAQ) Improvement Program

- The CMAQ Improvement Program provides funding to state departments of transportation (DOTs), municipal planning organizations (MPOs), and transit agencies for projects and programs in air quality non-attainment and maintenance areas that reduce transportation-related emissions. Eligible activities include transit improvements, travel demand management strategies, traffic flow improvements, purchasing idle reduction equipment

Voluntary Airport Low Emission (VALE) Program

- The goal of the VALE program is to reduce ground level emissions at commercial service airports located in designated ozone and carbon monoxide air quality nonattainment and maintenance areas. The VALE program provides funding through the Airport Improvement Program and the Passenger Facility Charges program for the purchase of low-emission vehicles, development of fueling and recharging stations

Improved Energy Technology Loans

- The U.S. Department of Energy (DOE) provides loan guarantees through the Loan Guarantee Program (Program) to eligible projects that reduce air pollution and greenhouse gases, and support early commercial use of advanced technologies, including biofuels and alternative fuel vehicles. The Program is not intended for research and development projects. DOE may issue loan guarantees for up to 100% of the amount of the loan for an eligible project. For loan guarantees of over 80%, the loan must be issued and funded by the Treasury Department's Federal Financing Bank

Vehicle Acquisition and Fuel Use Requirements for Federal Fleets

- Under the Energy Policy Act (EPAct) of 1992, 75% of new light-duty vehicles acquired by certain federal fleets must be alternative fuel vehicles (AFVs). As amended in 1/08, Section 301 of EPAct of 1992 defines AFVs to include hybrid electric vehicles, fuel cell vehicles, and advanced lean burn vehicles. Federal fleets are also required to use alternative fuels in dual-fuel vehicles unless the U.S. Department of Energy (DOE) determines an agency qualifies for a waiver; grounds for a waiver include the lack of alternative fuel availability and cost restrictions. Additionally, Executive Order 13423, issued in January 2007, requires federal agencies with 20 vehicles or more in their U.S. fleet to decrease petroleum consumption by 2% per year, relative to their Fiscal Year (FY) 2005 baseline, through FY 2015. Agencies must also continue to increase their alternative fuel use by 10% per year, relative to the previous year

Vehicle Acquisition and Fuel Use Requirements for State and Alternative Fuel Provider Fleets

- Under the Energy Policy Act (EPAct) of 1992, certain state government and alternative fuel provider fleets are required to acquire alternative fuel vehicles (AFVs). Compliance is required by fleets that operate, lease, or control 50 or more light-duty vehicles within the U.S. Of those 50 vehicles, at least 20 must be used primarily within a single Metropolitan Statistical Area/Consolidated Metropolitan Statistical Area. Those same 20 vehicles must also be capable of being centrally fueled. Covered fleets earn credits for each vehicle purchased, and credits earned in excess of their requirements can be banked or traded with other fleets. On March 20, 2007, the U.S. Department of Energy (DOE) issued a final rule on Alternative Compliance, which allows fleets the option to choose a petroleum reduction path in lieu of acquiring AFVs

Air Pollution Control Program

- The Air Pollution Control Program assists state, local, and tribal agencies in planning, developing, establishing, improving, and maintaining adequate programs for prevention and control of air pollution or implementation of national air quality standards. Plans may emphasize alternative fuels, vehicle maintenance, and transportation choices to reduce vehicle miles traveled. Eligible applicants may receive federal funding for up to 60% of project costs to implement their plans

Source: US Department of Energy

Details of federal alternative fuel incentives and programs applicable to CNG vehicles and EVs (continued)

CNG

Qualified Alternative Fuel Motor Vehicle (QAFMV) Tax Credit

- Tax credit is available toward the purchase of QAFMVs, either new, OEM vehicles or vehicles repowered by an aftermarket conversion company to operate on an alternative fuel. Vehicle must be placed in service as an alternative fuel vehicle on or after January 1, 2006

Alternative Fuel Tax Exemption

- Alternative fuels used in a manner that the Internal Revenue Service (IRS) deems as nontaxable are exempt from federal fuel taxes. Common nontaxable uses in a motor vehicle are: on a farm for farming purposes; in certain intercity and local buses; in a school bus; exclusive use by a nonprofit educational organization; and exclusive use by a state, or political subdivision of a state

EV

Heavy-Duty Hybrid Electric Vehicle (HEV) Tax Credit

- Tax credit of up to $18,000 is available for the purchase of qualified heavy-duty HEVs with a gross vehicle weight rating of more than 8,500 pounds

Light-Duty Hybrid Electric Vehicle (HEV) Tax Credit

- Tax credit for qualified light-duty HEVs and advanced lean burn technology vehicles placed in service after December 31, 2005

Qualified Plug-In Electric Drive Motor Vehicle Tax Credit

- Tax credit for purchase of new qualified plug-in electric drive motor vehicle with at least 4 kW hours of capacity, uses external source of energy to recharge battery, has a gross vehicle weight rating of up to 14,000 pounds, and meets specified emission standards. Minimum credit amount is $2,500, and the credit may be up to $7,500, based on each vehicle's traction battery capacity and the gross vehicle weight rating
- Credit applies to vehicles acquired after 12/31/09. Through 12/31/11, qualified plug-in electric vehicle conversions are also eligible for a tax credit for 10% of the conversion cost, not to exceed $4,000. Additionally, a tax credit of up to 10% of the cost of qualified low-speed electric vehicles, electric motorcycles, and three-wheeled electric vehicles, not to exceed $2,500, is available through 12/31/11

Source: US Department of Energy

Details of New York State alternative fuel incentives and programs applicable to both CNG vehicles and EVs

Both CNG and EV

Alternative Fueling Infrastructure Tax Credit

- A state tax credit is available for the installation of alternative fuel vehicle fueling infrastructure located in the state. The tax credit is equal to 50% of the cost of the infrastructure. This includes infrastructure for storing or dispensing an alternative fuel into the fuel tank of a motor vehicle powered by that fuel, as well as infrastructure used for charging electric vehicles. Eligible alternative fuels include natural gas, liquefied petroleum gas, hydrogen, electricity, and any other fuel that is a least 85% ethanol or other alcohol. This credit does not apply after December 31, 2010

Alternative Fuel Bus and Infrastructure Funding

- The Clean Fueled Bus Program, administered by NYSERDA, provides funds to state and local transit agencies, municipalities, and schools for up to 100% of the incremental cost of purchasing new alternative fuel buses and associated infrastructure. Eligible infrastructure projects include construction and installation of equipment to fuel or recharge alternative fuel buses including, but not limited to, battery charging stations and natural gas fueling stations and depots. To be considered for funding, the project must be necessary to introduce or expand a fleet of alternative fuel buses and include only cost items directly associated with making the facility capable of dispensing the fuel. Funding for this program is provided by the Clean Water/Clean Air Bond Act

Alternative Fuel Vehicle (AFV) and Fueling Infrastructure Funding

- The New York State Clean Cities Challenge, administered by NYSERDA, awards funds to members of New York's Clean Cities Coalitions that acquire AFVs or install AFV fueling or recharging infrastructure. Funds are awarded on a competitive basis, and can be used to cost-share up to 75% of the proposed project, including the incremental cost of purchasing AFVs, the cost of installing fueling and recharging equipment, and the incremental costs associated with bulk alternative fuel purchases. Consideration will be given to projects that result in new fueling or charging facilities, benefit more than one fleet, provide a high level of visibility and innovation, and/or comprise unique public/private partnerships

Alternative Fuel Vehicle (AFV) Technical Assistance

- The New York State Clean Cities Sharing Network (Network), which provides technical, policy, and program information about AFVs, is managed by NYSERDA. Membership is open to all organizations, businesses, and individuals interested in AFVs and members are notified about upcoming funding opportunities and events. The Network publishes information about tax incentives, fueling stations, case studies, and contact information for the Clean Cities program and other industry leaders. The Network also organizes and sponsors technical workshops

Alternative Fuel Vehicle (AFV) and Fueling Infrastructure Technical Assistance

- NYSERDA’s Flexible Technical (Flex-Tech) Assistance Program provides assistance to fleet managers who want to evaluate the feasibility and cost of adding AFVs and fueling facilities to their operations. Low-cost training for vehicle mechanics is also available through certified institutions

Alternative Fuel Vehicle Support

The Alternative Fueled Vehicles Program (Program) was developed within the New York State Office of General Services (OGS) to:

- Assist New York State agencies, authorities, state universities and community colleges in acquiring and utilizing alternative fueled vehicles;
- Satisfy federal and state requirements for purchasing such vehicles; and
- Develop a comprehensive, conveniently accessible statewide network of fueling stations to support the vehicles.

Alternative Fuel and Advanced Technology Vehicle Funding - New York City

- The New York City Private Fleet Alternative Fuel/Electric Vehicle Program, administered by NYSERDA in cooperation with New York City Department of Transportation, helps private companies and non-profit organizations operating vehicles in New York City to acquire alternative fuel and advanced technology vehicles. Funds are awarded on a competitive basis for up to 50% of the incremental cost of purchasing new light-duty natural gas vehicles (NGVs) or electric vehicles (EVs), and up to 80% of the incremental cost for purchasing new or converting medium- and heavy-duty NGVs (dedicated and bi-fuel), EVs, or hybrid electric vehicles. In addition, up to 50% of the costs for alternative fueling or EV charging station equipment and installation may be eligible

Source: US Department of Energy

Details of New York State alternative fuel incentives and programs applicable to both CNG vehicles and EVs (continued)

Both CNG and EV

Alternative Fuel Product Development Funding

- The New York State Energy Research and Development Authority's (NYSERDA) Transportation Research Program sponsors a wide variety of product development efforts aimed at improving efficiency and increasing the use of alternative fuels. Program Opportunity Notices are issued periodically to solicit proposals for cost-share development efforts leading to the manufacture and sale of innovative products that provide energy, environmental and economic development benefits

Alternative Fuel Infrastructure Feasibility Study

- The New York State Clean Cities Challenge, administered by NYSERDA, awards funds to members of New York's Clean Cities Coalitions that acquire AFVs or install AFV fueling or recharging infrastructure. Funds are awarded on a competitive basis, and can be used to cost-share up to 75% of the proposed project, including the incremental cost of purchasing AFVs, the cost of installing fueling and recharging equipment, and the incremental costs associated with bulk alternative fuel purchases. Consideration will be given to projects that result in new fueling or charging facilities, benefit more than one fleet, provide a high level of visibility and innovation, and/or comprise unique public/private partnerships

Alternative Fuel Tax Exemption and Rate Reduction

- E85, compressed natural gas, and hydrogen fuel that is used exclusively to operate the engine of a motor vehicle is exempt from state sales and use taxes. Additionally, cities and counties are authorized to reduce the sales and use tax imposed on B20 to 85% of the diesel fuel tax rate. This exemption and rate reduction expires September 1, 2011

Alternative Fuel Vehicle (AFV) Acquisition Requirements

- State agencies and other affected entities must procure increasing percentages of AFVs as part of their annual vehicle acquisition plans; hybrid electric vehicles qualify under these requirements. By 2010, 100% of all new light-duty vehicles must be AFVs, with the exception of designated specialty, police, or emergency vehicles. State agencies and other affected entities that operate medium- and heavy-duty vehicles must implement strategies to reduce petroleum consumption and emissions by using alternative fuels and improving vehicle fleet fuel efficiency. State agencies and other affected entities may substitute the use of 450 gallons of B100 for the acquisition of one AFV. Alternatively, the use of 2,250 gallons of B20 or use of 9,000 gallons of B5 may also be substituted in place of purchasing one AFV. No more than 50% of a given state agency fleet's AFV purchase requirement may be met by substituting B100, B20, or B5

Source: US Department of Energy

Details of New York State alternative fuel incentives and programs applicable to CNG vehicles and EVs (continued)

CNG	EV
Compressed Natural Gas (CNG) Taxi Funding – New York City • The New York City Clean Fuel Taxi Program provides funding towards the purchase of new CNG taxis cabs or the conversion of gasoline powered taxi cabs to operate on CNG **Fuel Exclusivity Contract Regulation** • Motor fuel franchise dealers are permitted to obtain alternative fuels from a supplier other than a franchise distributor. Any provision of a franchise which prohibits or discourages a dealer from purchasing or selling E85, biodiesel blends of at least 2% (B2), hydrogen, and compressed natural gas from a firm or individual other than the distributor is null and void as it pertains to that particular alternative fuel if the distributor does not supply or offer to supply the dealer with the alternative fuel. Distributors who violate the law by entering into exclusivity contracts will be subject to a fine of $1000. If the distributor does offer renewable fuels, they are allowed to require the station to use their brands **Natural Gas Vehicle (NGV) and Infrastructure Rebates and Technical Assistance – Utilities/Private Incentives** • National Grid offers a NGV incentive program that provides rebates for NGVs on a case-by-case basis and special rates for compressed natural gas (CNG) fueling. National Grid will also help secure CNG fueling station financing, and provide technical assistance and other services to NGV fleets on a case-by-case basis. Financial awards are made depending on the fleet size, amount of fuel used, and vehicle type	NA

Source: US Department of Energy

Appendix F:
Gas Supply Outlook

GLRP Assessment

April 30, 2010

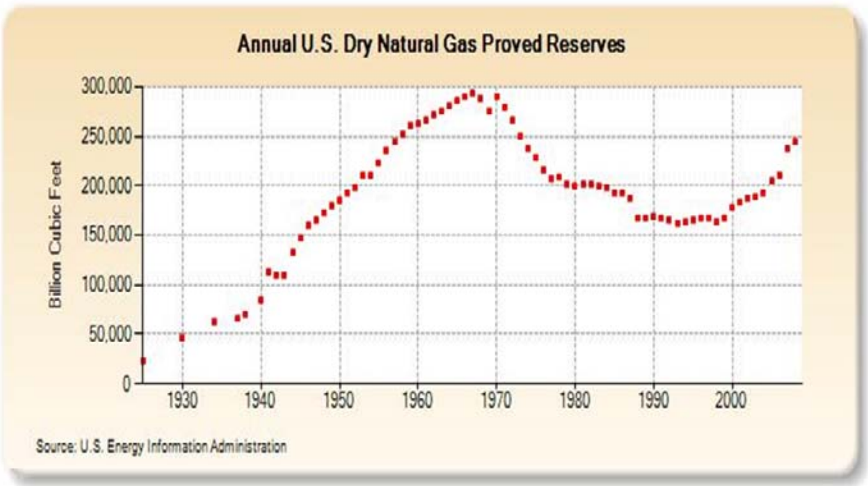
Outline

There are three parts to Con Edison's Gas Supply Outlook:

- **Availability of reserves and supplies**
- **Gas Deliverability to Con Edison's System**
- **Gas Price Forecast**

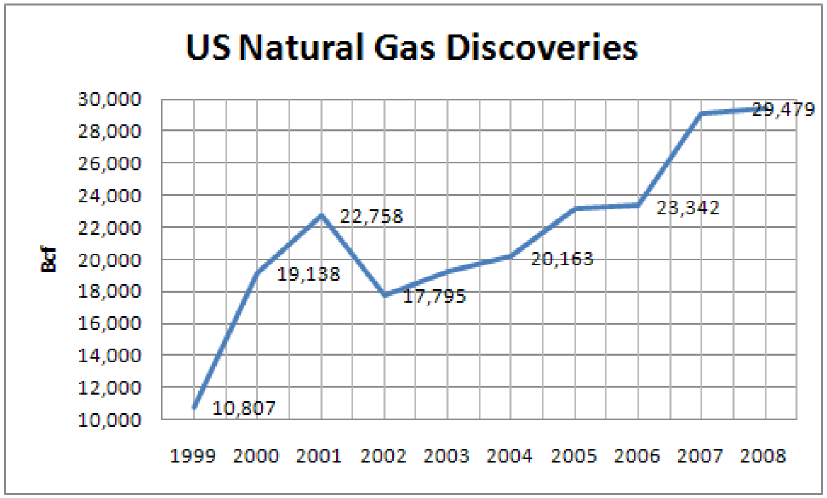
Availability of Gas Reserves and Supplies

After having declined during the 1970s and 1980s and remaining flat through the 1990s – US proved natural gas reserves have been on a highly positive trend over the past 10 years



<u>Total US Proved Reserves</u>

- Proved reserves peaked in the late 1960s at almost 300 Tcf
- Weak prices and declining gas fields in the Gulf Coast region resulted in declines in reserves to 164 Tcf in 1998
- But, higher prices, horizontal drilling and shale gas plays resulted in reserves growing to 245 Tcf in 2008 … nearly a 50% increase over 1998.



Source: EIA

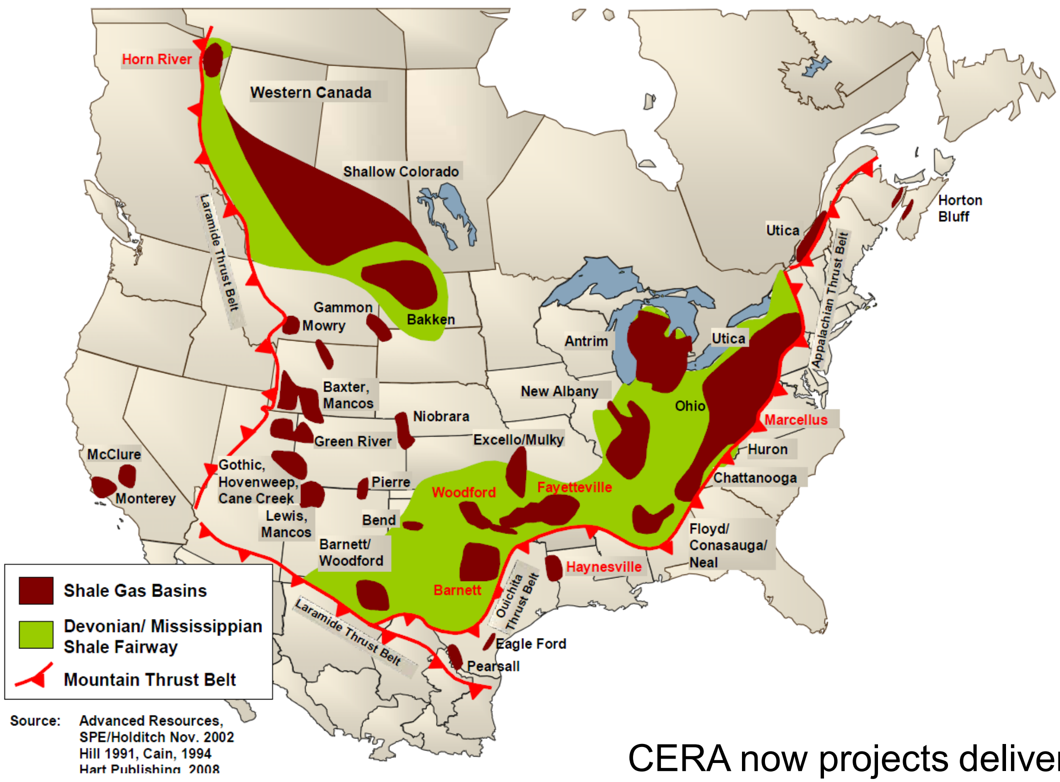
<u>Annual US Natural Gas Discoveries</u>

- From 1999 to 2008, the rate of annual natural gas discoveries has nearly tripled.
- 66% of the increase in discoveries from 2002 to 2008 was from shale gas discoveries
- Shale gas will continue to account for a majority of foreseeable additions to proved reserves

conEdison ON IT

Shale gas developments are occurring over much of North America, but the major shale plays are the story of the day with emphasis on the Marcellus and Haynesville Shale plays and emerging stories developing in Western Canada with the Horn River and Colorado shale gas basins.

North American Shale Gas Plays



Major Shale Plays

	Proved Reserves (Tcf) 6/30/2008 (1)	Estimated Recoverable Reserves (Tcf) (2)
Barnett	21.4	44.0
Woodford	3.5	11.0
Fayetteville	3.8	42.0
Haynesville	1.0	251.0
Marcellus	0.1	392.0
Total	29.8	740.0

CERA now projects deliverability of Marcellus shale gas alone to grow to 6 Bcf per day by 2018. This is more than half of the total Northeast Region requirements of 9 Bcf per day

1. Source: EIA
2. California Energy Commission Staff Paper, "Shale-Deposited Natural Gas: A Review of Potential" by Leon D. **Brathwaite, May 14, 2009**

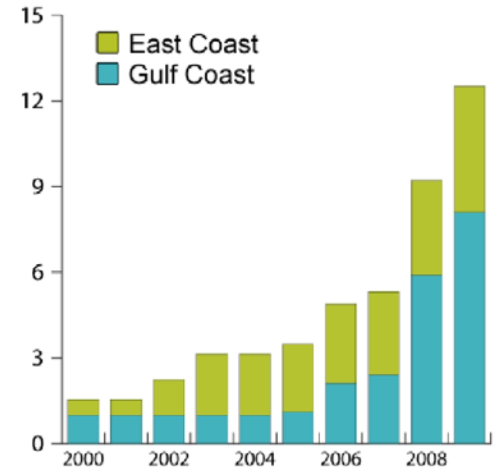
While we are still early in the development of the shale plays and there is not much data history, well economics being cited should provide ample incentives for continued development even at a gas price of $5 per Dth.

Shale Basin Economics for Premier Acreage Per XTO Energy			
Play	**Well Cost $ Millions**	**Gross EUR (Est Ultimate Recovery) BCFE**	**ROR with Gas price @ $5.00 / Dth**
Barnett	2.8	3.3	**47%**
Fayetteville	2.7	2.2	**36%**
Woodford	5.0	3.8	**32%**
Haynesville	8.0	6.5	**36%**
Marcellus	3.5	3.0	**70%**
Source: Tudor, Pickering, Holt & Co Citation of Data Provided by XTO			

Exxon/ Mobil's pending purchase of XTO Energy for $41 billion is considered by industry analysts to be yet another indication of the value of the shale plays.

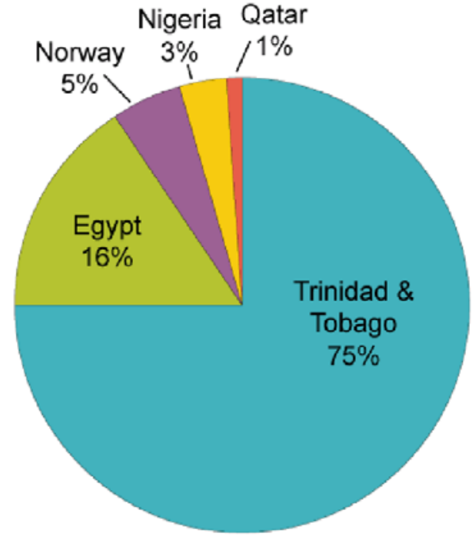
LNG: Due to an earlier prospective supply-demand gap, LNG terminal developers have increased US receiving capacity by more than six times from ~2 Bcf per day to ~13 Bcf per day since 2000 resulting in substantial excess capacity.

U.S. Capacity to Receive LNG Imports, 2000-2009 (Billion Cubic Feet per Day)



Source: U.S. Energy Information Administration, Office of Oil and Gas

Sources of LNG to the United States, 2008 (Percent)

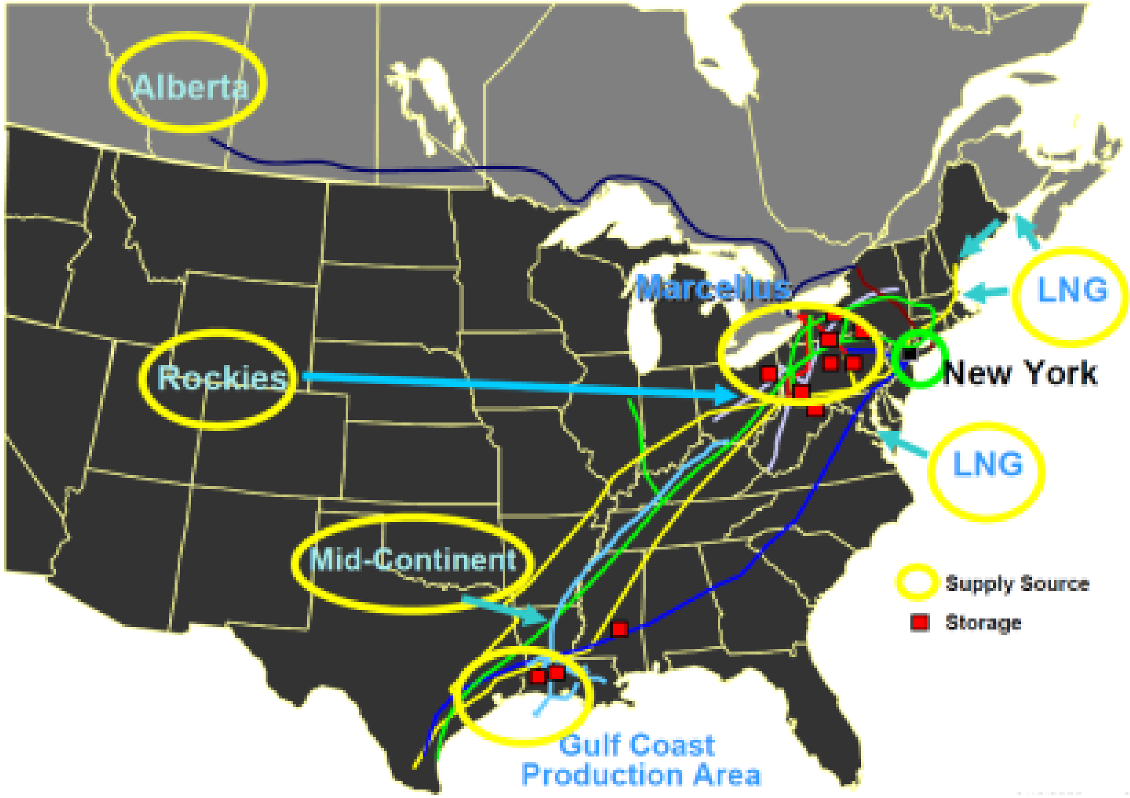


Source: U.S. Energy Information Administration, Office of Oil and Gas, based on data from the Office of Fossil Energy, U.S. Department of Energy.

LNG stands as a competitive source of gas supply with recent prices as low as $2.30 per Mcf in Boston. Future prospects for competitively priced LNG continue to be good with declining prices of Russian gas going to European markets and LNG supplies with no other home being dumped in the US - “the market of last resort!.”

Con Edison is developing an increasingly diversified gas supply portfolio in terms of regions and sources.

Con Edison's Gas Supply Sources



Major Regions

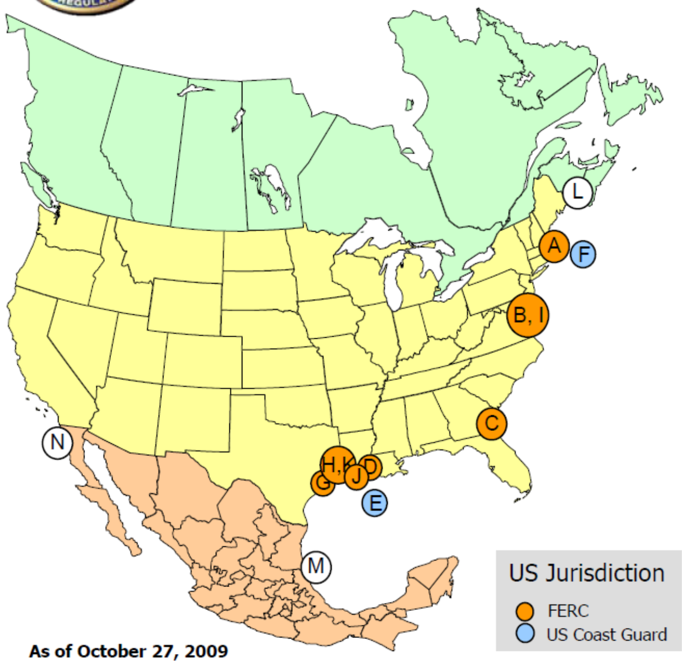
- Traditional Sources
  - Gulf Coast Production Area – mostly off the coasts of Texas, Louisiana and Mississippi
  - Canadian Gas – mostly from Western Canada in Alberta
- Newly Developing Sources
  - Marcellus Shale Play in Pennsylvania, southern New York State, and West Virginia
  - Mid-Continent Area – mostly shale plays in Texas, Louisiana, Arkansas and Oklahoma
  - Rockies Gas (via the new REX pipeline)
  - Gulf and east coast LNG facilities

Source: Con Edison Energy Management

Con Edison has indirect access to competitive LNG supplies coming to the US. There is already access to Gulf Coast LNG gas which can be secured as part of supplies from that region. Also, new LNG terminals in the Boston, Maryland and New Brunswick areas will provide new sources of supply.

North American LNG Terminals

Existing



U.S.

A. Everett, MA : 1.035 Bcfd (SUEZ LNG - DOMAC)
B. Cove Point, MD : 1.0 Bcfd (Dominion - Cove Point LNG)
C. Elba Island, GA : 1.2 Bcfd (El Paso - Southern LNG)
D. Lake Charles, LA : 2.1 Bcfd (Southern Union - Trunkline LNG)
E. Gulf of Mexico: 0.5 Bcfd, (Gulf Gateway Energy Bridge - Excelerate Energy)
F. Offshore Boston: 0.8 Bcfd, (Northeast Gateway- Excelerate Energy)
G. Freeport, TX: 1.5 Bcfd, (Cheniere/Freeport LNG Dev.)
H. Sabine, LA: 2.6 Bcfd (Sabine Pass Cheniere LNG)
I. Cove Point, MD : 0.8 Bcfd (Dominion – Expansion)*
J. Hackberry, LA: 1.8 Bcfd (Cameron LNG - Sempra Energy)
K. Sabine, LA: 1.4 Bcfd (Sabine Pass Cheniere LNG – Expansion)*

Canada

L. St. Johns, NB: 1.0 Bcfd, (Canaport - Irvin Oil)

Mexico

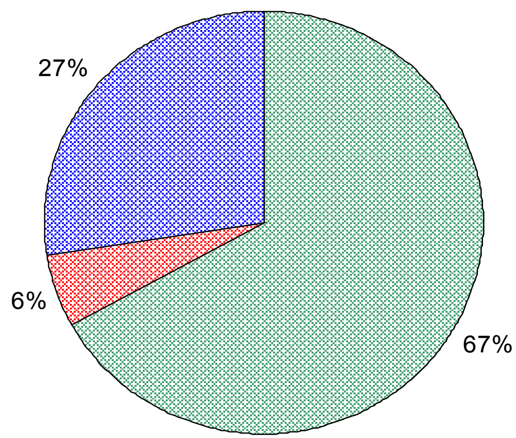
M. Altamira, Tamaulipas: 0.7 Bcfd, (Shell/Total/Mitsui)
N. Baja California, MX: 1.0 Bcfd, (Sempra)

Note: There is an existing import terminal in Peñuelas, PR. It does not appear on this map since it can not serve or affect deliveries in the Lower 48 U.S. states.

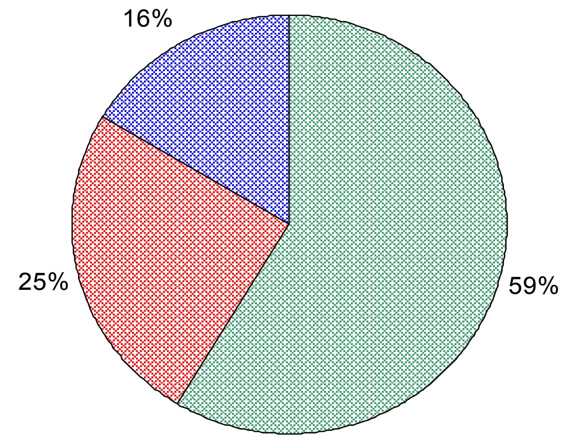
Office of Energy Projects

Source: EIA

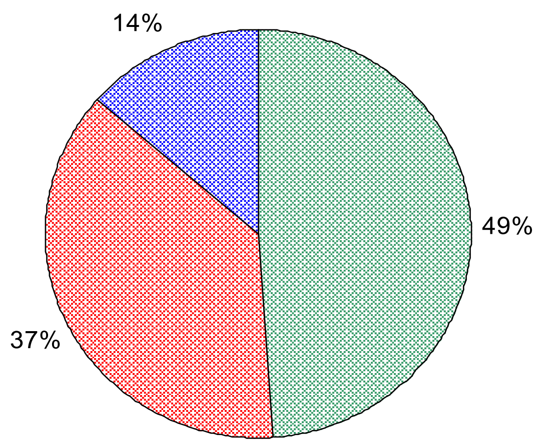
Increasing supplies from Marcellus and access to Rockies gas and east coast LNG are displacing traditional Canadian and Gulf Coast gas



Pre-Millennium Pipeline (2007)



Post-Millennium Pipeline (2009)



New Build (2013-14)

Gulf Coast | Northeast | Canada

Gulf Coast supply includes traditional Gulf Coast gas, LNG from Gulf Coast terminals, and shale gas from the midcontinent plays

Northeast supply includes Appalachian, Marcellus, Rockies and East Coast LNG.

New Build (2013-14) includes the new interconnection with Texas Eastern via the NYC gate station

Source: Con Edison Energy Management

Potential for Renewable Gas (Work in Progress)

- There are three potential waste water treatment facilities that could supply gas to Con Edison or to on-site generation facilities. Rough estimates of potential annual gas supply (developed by the NYC Department of Environmental Protection) for each facility\are:
  - Bowery Bay in Astoria, Queens: 310 million cubic feet (mmcf) of gas per year that is vented
  - Ward's Island / Randall's Island: 256 mmcf of gas per year that is vented plus another 215 mmcf per year that is flared
  - Hunts Point, Bronx: 125 mmcf of gas per year that is flared

- The food processing facilities at the Hunts Point Food Distribution Center in the Bronx are a potential source of gas for Con Edison
  - This food center is comprised of parcels of land that is owned by NYC and leased to over twenty tenants, including the New York City Terminal Market (Produce Market) and the Fulton Fish Market.
  - An anaerobic digester system could be developed to produce biogas from food waste which can either be used as gas supply to Con Edison or to generate electricity
  - A feasibility study was done in 2005 that showed the physical concept of an AD plant to be feasible, but the economics were marginal.
  - The study was not specific about how much gas would be produced but did estimate that enough gas could be produced to generate 3.1 million KWHs of electricity per year.
  - Assuming a heat rate of 10,000 BTUs per KWH, this would translate into 31 Mdt of gas (~30 million cubic feet) per year

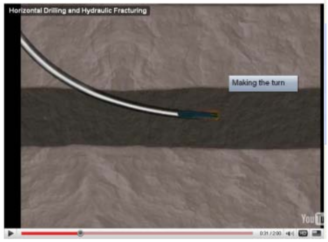
- Renewable gas prospects in New York State
  - The NYS Energy Plan provides draft estimates of statewide potential biogas production:
    - Waste Water Treatment Plants have estimated state-wide potential to produce 6.7 Bcf of Anaerobic Digester Gas (ADG) per year
    - The state's 128 food and beverage manufacturing plants can produce an estimated 3.8 Bcf per year.
    - New York's farms are estimated to have the capacity to produce 9 Bcf per year
  - At less than 20 Bcf per year potential for the entire state of New York, renewable gas prospects for Con Edison are not significant

<u>Shale Gas Development Risk</u>: While the prospects for shale gas growth are substantial, environmental concerns related to the hydraulic fracturing drilling process ("hydrofracking") may limit the extent to which shale gas opportunities can be captured.

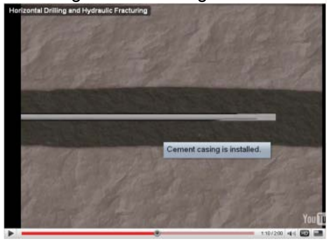
- Hydrofracking fluid contains hydrochloric acid (HCL) and other toxic chemicals to improve its performance in holding open fractures and lubricating wellbores. Spills have created a great deal of concern and increased environmental regulation oversight due to contamination of water tables and groundwater supplies.
- There have been a number of cases of fines and ordered shutdowns of drilling sites
- There are two parallel bills in the US House and Senate: the Fracturing Responsibility and Awareness of Chemicals Act (the FRAC Act). Both would give the EPA authority over the hydraulic fracturing process under an extension of the Safe Drinking Water Act
- The result will be increased cost of development and the prospect for increasing limitations on where wells can be drilled, possibly limiting shale gas growth prospects.
- The hydrofracking drilling process is illustrated below

<u>The hydrofracking process</u>:
Vertical wellbore

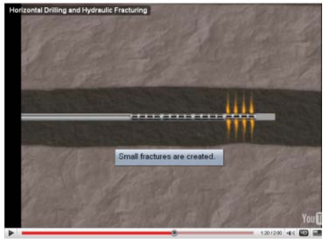
Making the turn to continue wellbore horizontally



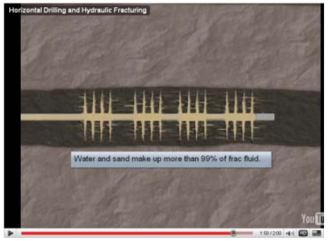
Installing cement casing



Creating a series of small fractures



Pumping in sandy water to prop open fractures and allow natural gas to flow into wellbore



Summary

Barring major unforeseen market or regulatory events, there will be adequate available reserves and supplies to meet Con Edison's requirements over the planning horizon

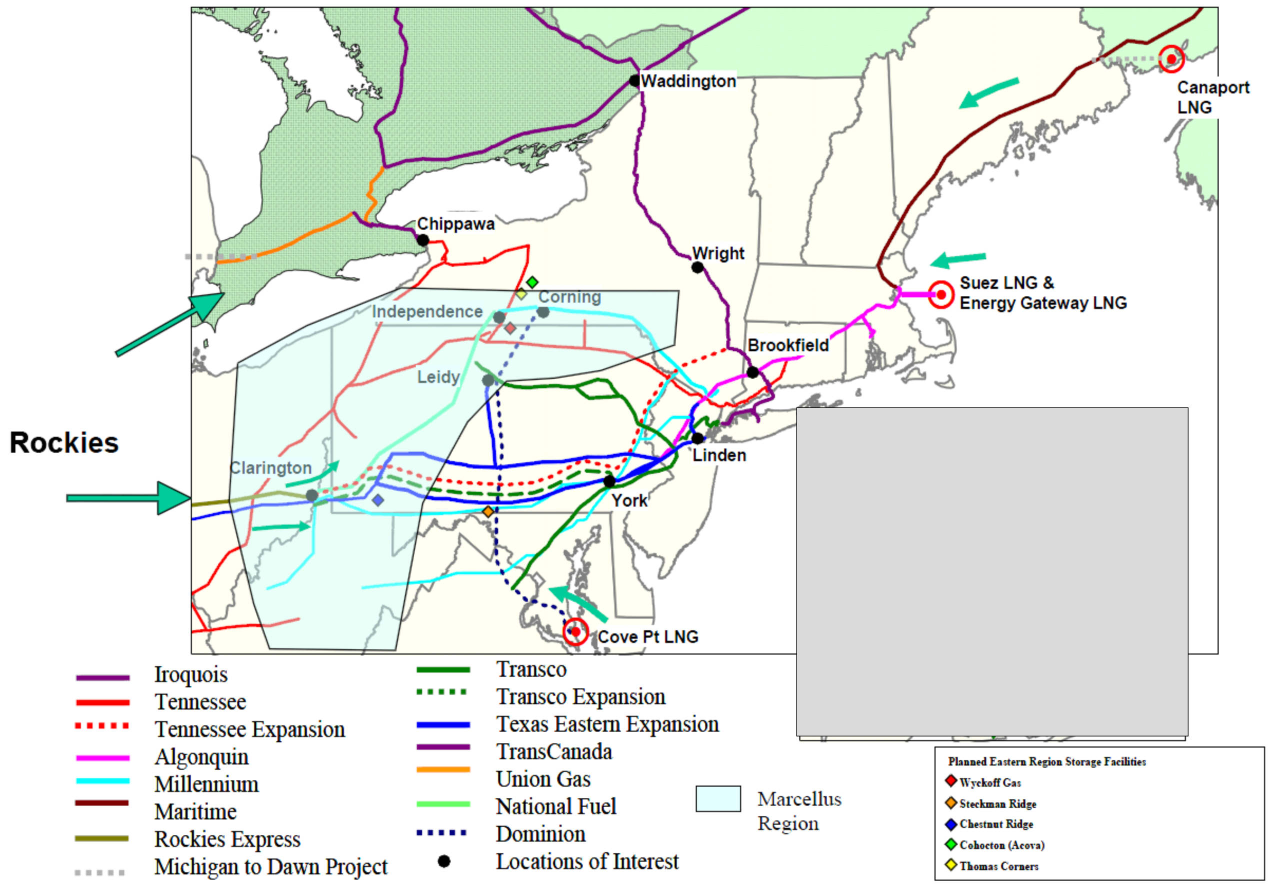
- While supplies from the Gulf Coast Production Area and Canada are declining, all other supply regions are increasing, including Marcellus shale gas, Mid-Continent shale gas, Rockies gas (which is also largely shale gas), LNG, and emerging shale gas development in Western Canada
- The Marcellus Shale Play, in particular, promises the prospects for substantial growth in regional supply possibilities at a lower delivery basis
- Shale gas well economics should support continued aggressive development
- Prospects for supplies of renewable gas to Con Edison's customers are slim
- There are risks related to increased environmental regulation of shale gas drilling (hydrofracking), which could constrain growth of shale gas opportunities, but – at this stage – those risks do not appear to be significant enough to forestall significant growth in these development opportunities

Gas Deliverability to Con Edison’s System

The Need for New Pipeline Capacity

- **Con Edison recognizes the need for the addition of pipeline capacity to meet growing demand for natural gas in its service territory**
- **This will also mean the need for additional supply through multiple points of delivery into our system**
- **Adding to this need is the fact that Con Edison is moving to increase the reliability of its system to reduce the number of customers who might lose gas service in the case of the loss of a pipeline interconnection**

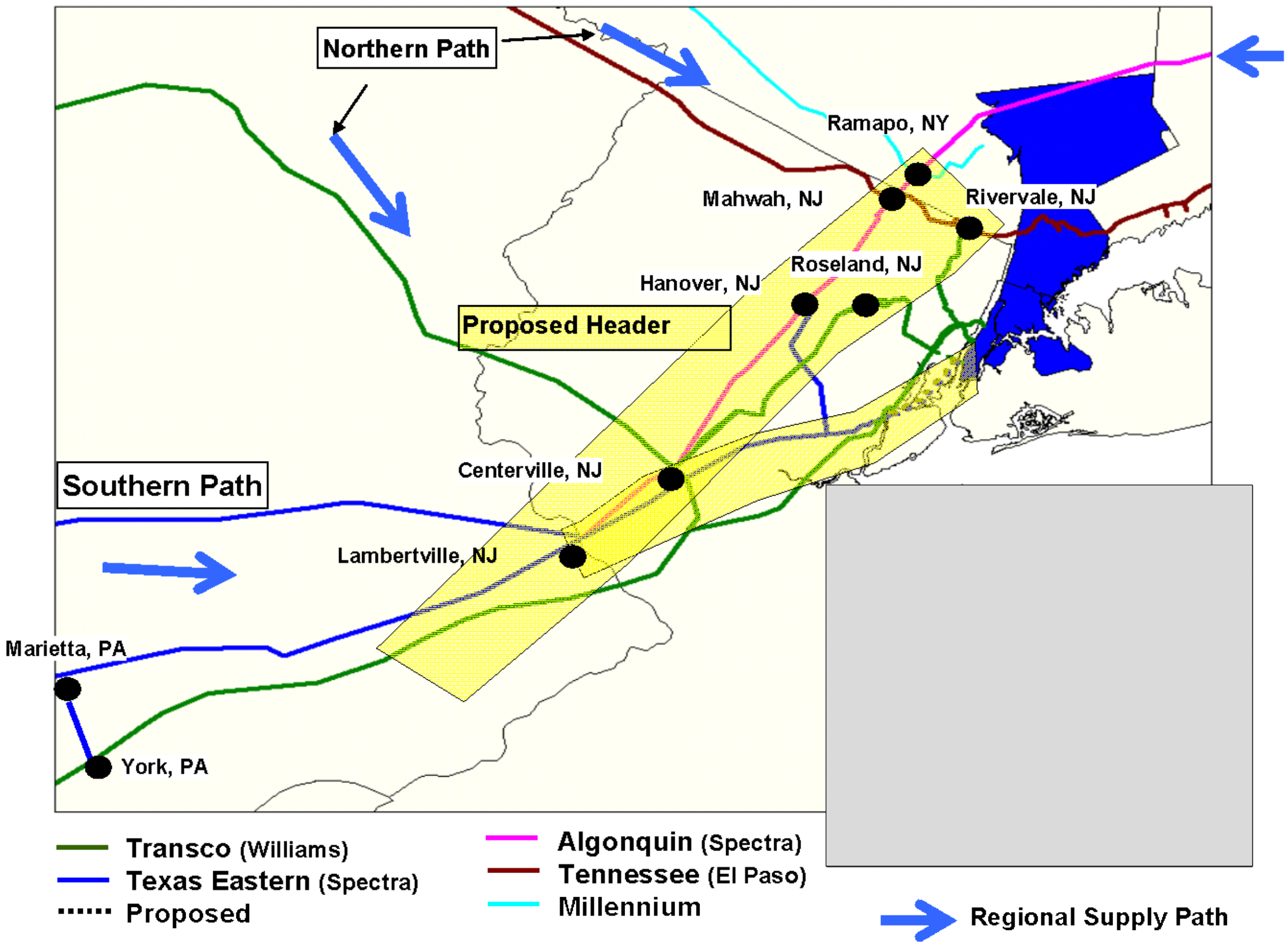
While Northeast pipeline capacity is constrained, there are a number of prospective pipeline expansion projects that will provide Con Edison increased access to supplies from Marcellus, the Rockies, East Coast LNG facilities and Eastern Canada.



Economics to the pipelines will be a key determining factor in which of these pipeline projects will actually go forward. Con Edison will likely have to make some up-front commitments for firm capacity to assure development of projects beneficial to it, as was the case with the Spectra agreement.

Source: Con Edison Energy Management

Con Edison is proposing a new pipeline header system that will provide connectivity to numerous pipeline paths available from west to east through either northern (along New York State/Pennsylvania border) or southern (along southern Pennsylvania border) pipeline delivery paths



Source: Con Edison Energy Management

This proposed "header system" will result in a number of benefits to Con Edison

- **Reduce high basis costs caused by congestion due to existing pipeline capacity constraints**
- **Create additional options and flexibility in selecting gas from various pipelines thereby reducing our fixed cost commitment for incremental capacity**
- **Provide an opportunity for supply diversity to source gas from both northern and southern paths of gas supply. It would provide access to developing regional supply opportunities, such as Marcellus Shale in Pennsylvania/New York area, LNG, deliveries from Rockies/Mid-continent or Canadian supply sources**
- **Provides enhanced reliability for the gas system through both the lateral and the header**
- **The approach will provide us with increased flexibility to take advantage of supply opportunities through a phased approach to meeting our demand growth**

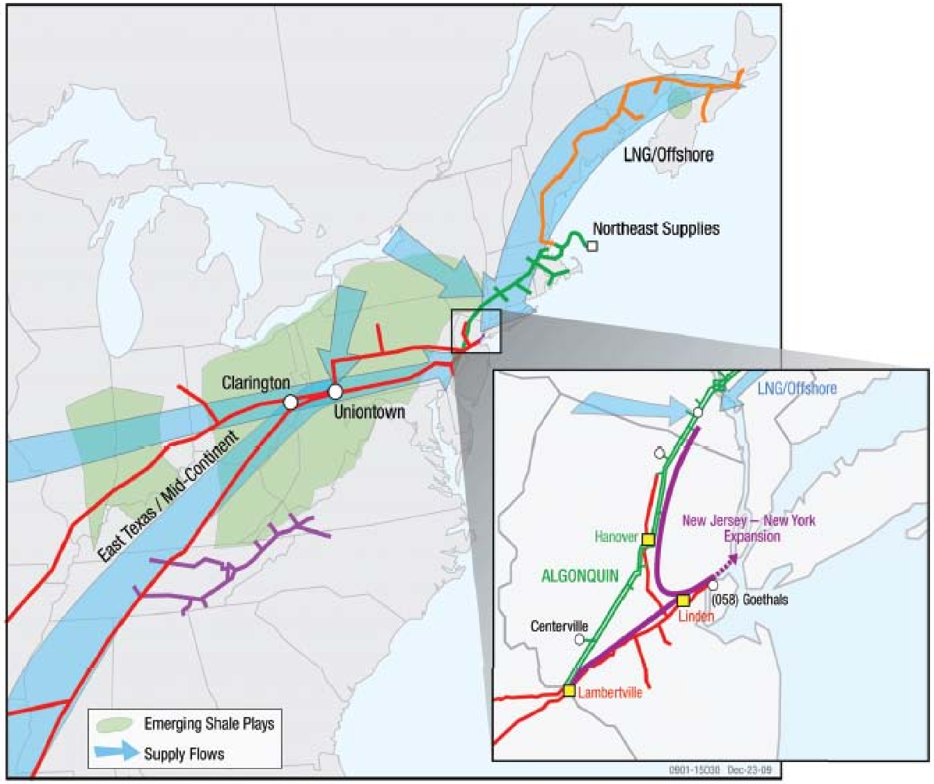
Spectra (Texas Eastern) project signed in late December, 2009 will bring important new natural gas supplies to Con Edison's system via a NYC gate station

New Jersey - New York expansion project

- Deliver new, critically needed natural gas supplies to the New Jersey and New York areas, including Manhattan
- Transport up to 800 Mdt/day of new natural gas supplies to the region
- Shipper commitment provides sufficient market support to proceed with project
- Targeted to be in-service in the fourth quarter of 2013

Project Benefits

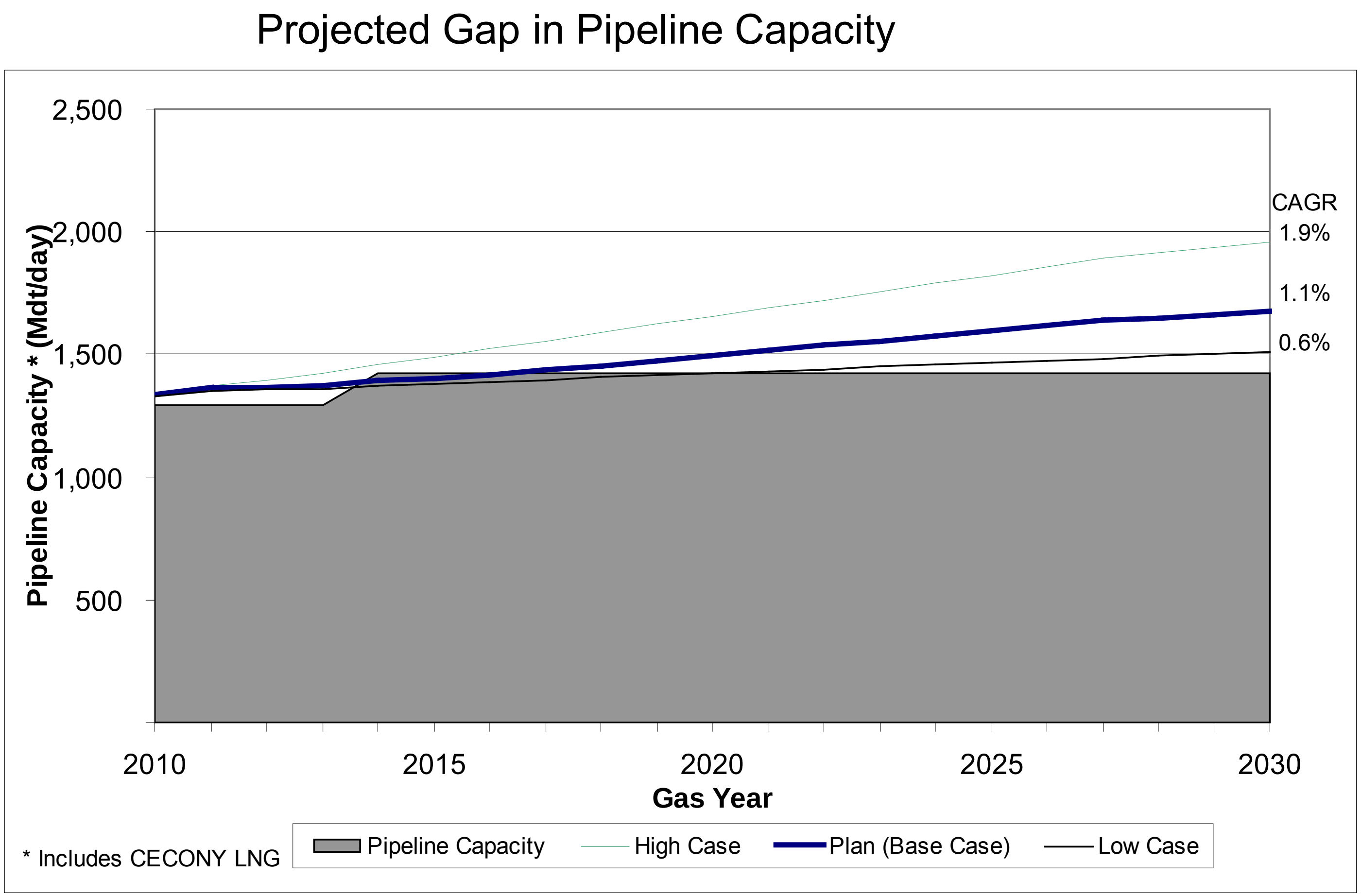
- Helps meet growing energy needs and strengthens reliability of Con Edison's gas system
- Provides access to new supply sources and increases the diversity of Con Edison's pipeline supplier diversity
- Improves air quality in New Jersey and New York and helps achieve goals of NYC and NYS long-term energy and environmental plans



The existing system - with the addition of the Spectra (Texas Eastern) interconnection at NYC in 2013 – can accommodate additional delivery capacity at its major gate stations to meet some growth and contingency needs.

Source: Con Edison Energy Management

But, at some level of incremental demand growth, reliability requirements will dictate the need for additional pipeline capacity. Our continuing gas supply and capacity planning process continues to monitor the best approaches to meet the future gaps.



Source: Con Edison Energy Management

Summary

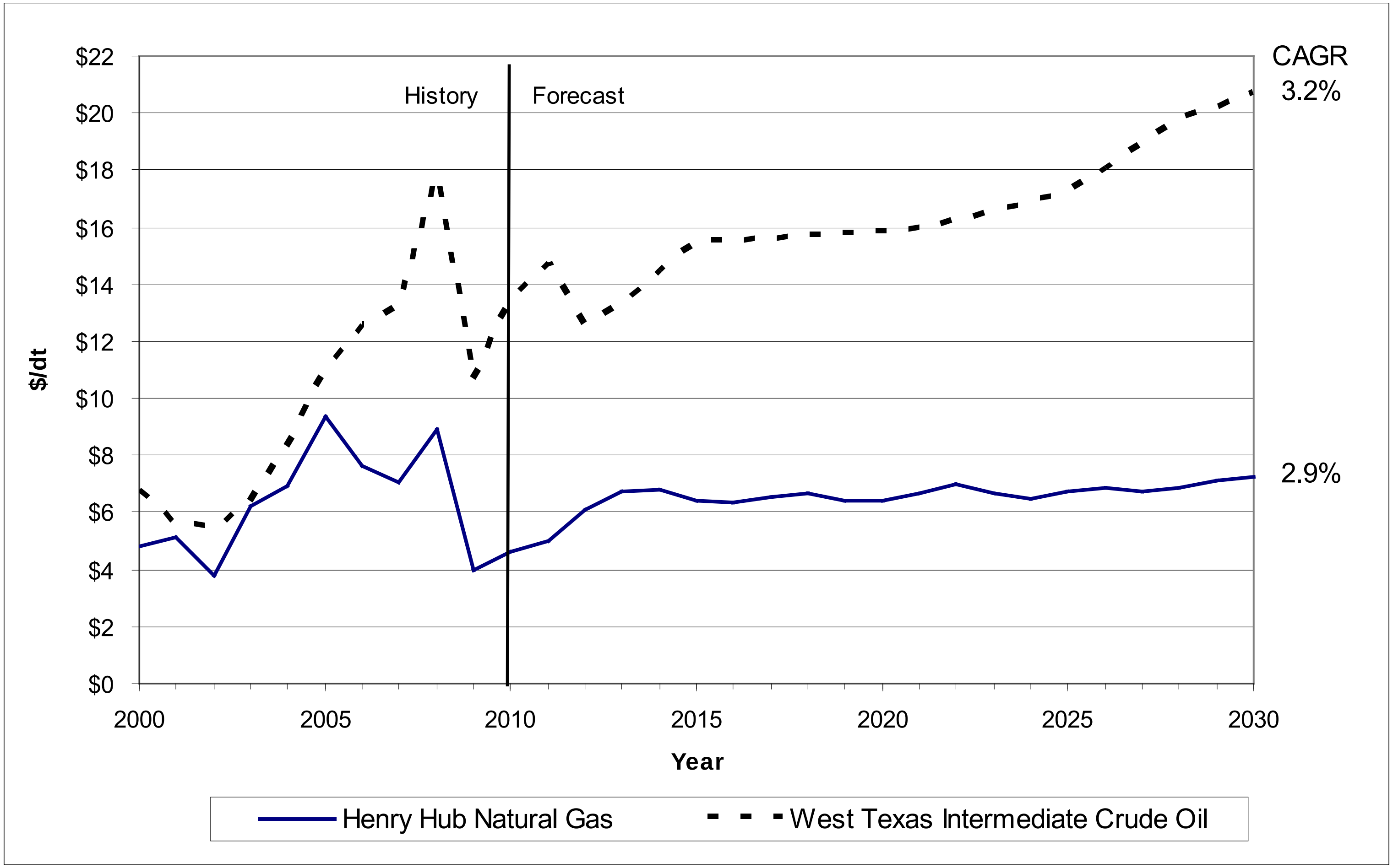
While there has been pipeline delivery congestion in the Northeast region, the outlook for delivery capacity of new supplies to Con Edison's system to meet projected demand growth is positive

- Con Edison's existing system, with the addition of the Texas Eastern interconnection, will be able to handle some level of demand growth depending where in the system it occurs
- At some point of demand growth, additional pipeline capacity will be needed most likely on the east side of the system to accommodate both supply and reliability requirements
- There are a number of proposed and in-process pipeline expansion projects that will relieve much of the congestion
- Economics to the pipeline developers will dictate whether the proposed projects go forward, but it is expected that supply and demand for pipeline capacity will be balanced over the long term
- In most cases, Con Edison will have to make some form of up-front commitments to assure development of projects that are beneficial to it

Gas Price Forecast

Because of recent developments, wholesale natural gas prices at the Henry Hub are no longer expected to track at their historical relationships of 60-90% of West Texas Intermediate Crude (WTI) prices. Natural gas prices are projected to track WTI prices more in the range of 35-50% going forward

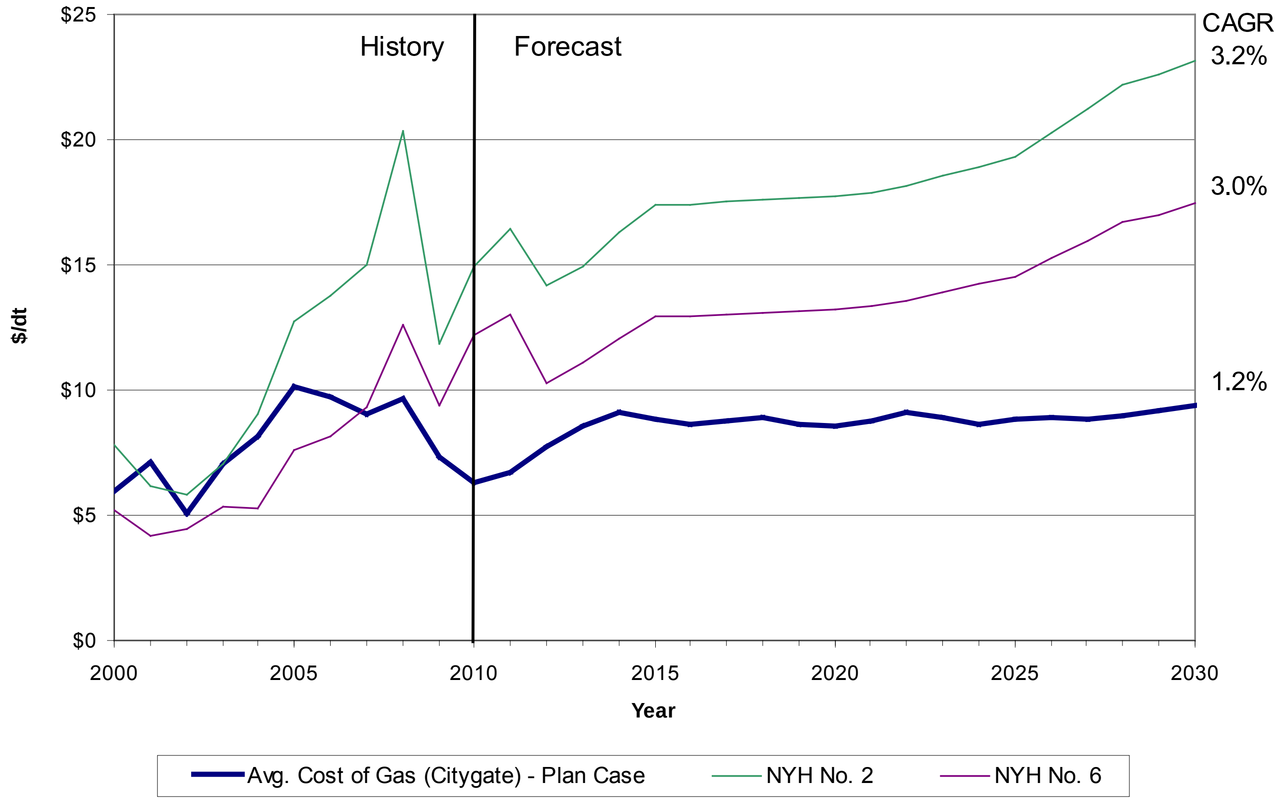
Wholesale Spot Price Comparison - Gulf Coast



Source: Various sources o Con Edison Energy Management. All prices are in constant 2009 dollars per dt

Con Edison's Citygate cost of gas for firm customers is projected throughout the planning horizon to continue to hold a comfortable competitive price advantage relative to No.6 and No. 2 fuel oil

Con Edison's Citygate Cost of Gas for Firm Customers Versus #2 & #6 Oil

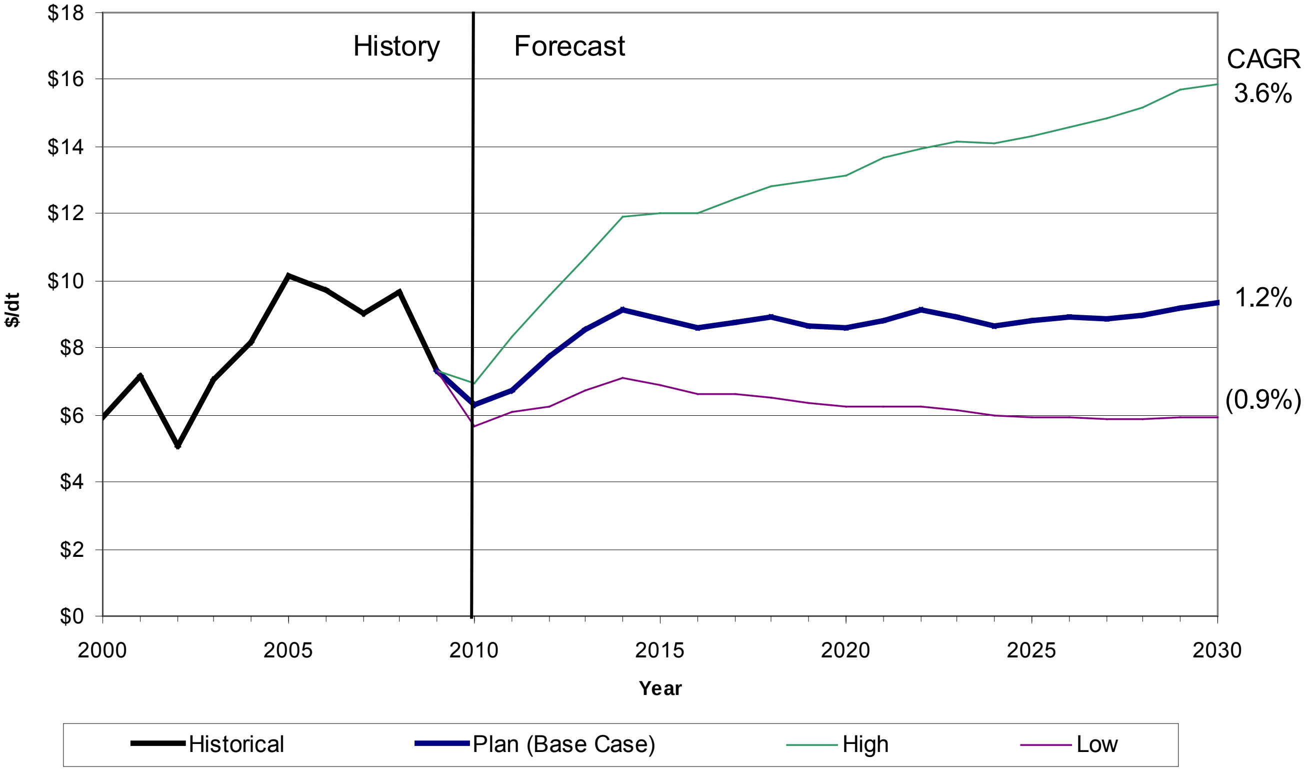


*Comparison of Con Edison's Citygate average cost of gas for firm gas customers versus No. 2 and No. 6 New York Harbor (NYH) oil prices. Gas cost includes pipeline and storage fixed capacity charges.

SOURCE: Historical Annual Prices for NYH No.2 and No.6 – US Energy Information Administration and Henry Hub Average of Monthly NYMEX Settlement; Con Edison Energy Management, historical and forecasted citygate average cost of gas for firm customers. All prices are in constant 2009 dollars per dt

Con Edison's plan case suggests that the Citygate average cost of gas for firm customers will remain on average within $7-9 per dt over the planning horizon (in constant 2009 dollars),

Citygate Average Cost of Gas for Firm Customers



*Includes pipeline and storage fixed capacity charges

Source: Con Edison Energy Management, historical and forecasted citygate average cost of gas for firm customers. All prices are in constant 2009 dollars per dt.

Appendix G

Overview of System Design Criteria

The purposes of System Design Criteria

- Maintain the reliability of supply mains in the event of an outage to a gate station or critical regulating station
- Maintain the reliability of transmission system.
- Reduce the potential of incoming gas leaks each year
- Maintain the system at optimal Operating Pressures while satisfying design basis conditions as described below

Elements of Distribution System Design Criteria

The system design criteria for the distribution system are comprised of the following elements:

- Operating pressure limits, which specify minimum set pressure at regulator station outlet, maximum pressure at extremity points, optimal pressure range at regulator station outlet, minimum pressure to any destination regulating station, maximum pressure variation for low pressure systems, and operating pressure guidelines for high pressure systems, and specified Maximum Allowable Operating Pressures (MAOP)
- Gas main design, which specifies the type material to be used for different situations and when polyethylene can be used versus when cathodically protected, steel main must be used.
- Gas service design, which specifies when polyethylene can be used versus when cathodically protected, steel main must be used, and the rule to connect to the highest pressure main where more than one is available
- System reinforcements, which requires the system to be reinforced if it cannot meet the established pressure criteria on a design day (0 degree F).
- Cathodic Protection, which requires all new steel mains and services to be cathodically protected and any unprotected, coated steel main that is exposed to get a “hot spot” anode installed
- Valve installation, which specifies requirements for the frequency and location of valves
- Regulating stations, which specifies where regulating stations can be used in lieu of piping installation or replacement, allowable pressures, requirements for smart controls, and requirements for review of capacity using the latest pressure data from the coldest day (validation)
- Tunnels, which specifies requirements for egress, distancing mains from electric transmission cables, anchoring to prevent flotation in the case of flooding, materials to be used, and a variety of other requirement related to worker safety and security

Elements of Transmission System Design Criteria

The system design criteria for the transmission system are comprised of the following elements:

- Operating Pressures, which specifies maximum pressures gate station outlets and minimum pressure for different types of destination, e.g., regulator stations and electric and steam generating stations
- Main design, which specifies pipe and fittings, SMYS limits to operation, requirement for line inspections, use of steel plates to protect mains, and the requirement to supply only a distribution system or a generating or steam plant
- The Use of Gas Heaters, which requires that gate stations deliver gas at least 50 degrees F to the Con Edison system
- Cathodic Protection, which requires that all new steel mains be cathodically protected
- Requirements for transmission valve installation
- Installation and location of Remote Operated Valves (ROVs)

System Replacement Criteria

- Transmission Pipe, Pressure limits relative to SMYS for older pipe, prioritization of gas main replacement, and criteria for replacing or downgrading mains
- Gas Service Replacement, which specifies criteria for selecting services that need replacement

Future Gas System Design Criteria

- Operating pressures, which specifies requirement for all supply mains to be able to supply local distribution mains in the event of loss of one source of supply, i.e., must be able to withstand a contingency such as the loss of a gate station with no loss of customers and requirement for areas of the Low Pressure Distribution systems to be reinforced prior to the extremity points reaching 4" wc during a design hour
- Transmission system, which will specify the requirement for any new pipe or replacement pipe to be sized to accommodate the loss of a gate station supply and to be capable of being inspected using in-line inspection (ILI) tools in accordance with State and Federal codes for mains greater than 20% SMYS, and the requirement for the transmission system to be able to withstand the loss of one gate station on design hour throughout the system except in the case of radial systems.
- ROV Installation, which will specify
    1. The requirement for remote operated valves (ROVs) with differential pressure transducers to detect valve closure and system breaks via SCADA to limit the loss of regulator stations to no more than one high pressure and one low pressure regulating station
    2. And the requirement that closure of any 2 consecutive ROV's will not negatively impact supply mains or the distribution system on an average winter day (20 degrees F)

Appendix H

New Technology Development Outlook

GLRP Assessment

April 30, 2010

Outline

There are four parts to Con Edison's Business Solution Development (R&D) Outlook:

- **The Importance of Developing New Business Solutions**
- **Con Edison's R&D Process**
- **Recently Completed and Nearly Completed R&D Projects**
- **The Current R&D Project Portfolio**

The Importance of Developing New Business Solutions

R&D is particularly important to Con Edison because of the unique set of challenges presented by doing business in New York City.

- In addition to facing all the normal challenges to gas local distribution companies, including third party damage, gas interchangeability issues, graphitic corrosion, and a host of environmental, health and safety issues, Con Edison also faces a unique mix of additional challenges
- Con Edison's average customer density per city block is substantially more than other utilities, resulting in higher cost of more customer shut-offs in order to maintain a section of main
- Utility congestion under the streets is also the highest of any gas utility in this country making the cost and complexity of maintaining our systems higher than most other gas utilities. This congestion includes:
  - Underground electric lines
  - Steam lines
  - Water lines
  - Telecommunication lines
  - Sewer piping
  - Subway infrastructure
  - Vehicular infrastructure
  - Old trolley tracks and yolks
  - Various auxiliaries that support traffic lighting, street lighting, and fire department pull boxes
- New York City codes further complicate matters by not allowing us to install plastic pipe within 35 feet of a steam main.
  - Working with steel mains and steel services is much more expensive in terms of the material, the installation, and its maintenance
- NYC's Department of Transportation (DOT) has very restrictive requirements for street access with limited timeframes available for maintenance work (usually at night), which is further complicated by night time noise restrictions
- Hence, the importance of developing new technologies, processes and methodologies (business solutions) that require less trenching and support easier location of and access to the sections of main that we need to inspect and repair

Con Edison's R&D Process

Con Edison has a well established research, development and demonstration program (R&D) that identifies, prioritizes, secures funding for, and manages R&D projects

The objective of the R&D program is to match the needs of Company operations with opportunities for new business solutions in the form of technologies, processes and methodologies to accomplish the following objectives:

- Reduce or minimize operations and maintenance costs with new business solutions
- Maintain or enhance the reliability of gas service to customers
- Enhance the safety and well being of our employees, customers, and the overall public
- Enhance environmental excellence

Con Edison's R&D group has a well established approach to identifying potential R&D projects

- The R&D group works closely with Gas Operations employees to identify areas in which there is a need for new technologies, processes, and methodologies.
  - Meetings are conducted with every department and area organization to explore new ideas, establish priorities, and discuss the status of existing projects.
  - The R&D group conducts "road shows" where they present select projects to first-line operations managers to educate them on newly emerging products and methods and to solicit ideas for further improvement on their operations.
  - They also conduct periodic brainstorming sessions and technology fairs to discuss problems with various gas departments, solicit ideas for new projects, and showcase new technologies.
  - This results in a highly customer-driven process, where the customer is the Gas Operations function

- The R&D group also maintains regular contact with other utilities, gas trade groups, universities and technology developers as a further source for new ideas, including:
  - Gas Technology Institute ("GTI")
  - NYSEARCH
  - Operations Technology Development ("OTD")
  - Sustained Membership Program ("SMP")
  - American Gas Association ("AGA")
  - American Gas Foundation ("AGF")
  - Northeast Gas Association
  - Water Research Foundation (formerly "AWWARF")
  - Various utilities including National Grid, Gaz de France and Tokyo Gas
  - Federal government organizations such as DOT – Pipeline and Hazardous Materials Safety Administration ("DOT PHMSA")) and the Department of Energy (DOE)
  - International Gas Research Committee
  - National and international private organizations

The evaluation of potential projects and prioritization of selected projects is also a well established process that is collaborative between the R&D group and Gas Operations

- Once a potential new business solution is identified, a user/ sponsor within the Gas Department is assigned to assist in preparing a cost/benefit justification for the appropriate R&D project.
- In all cases, an analysis of candidate projects is made, viewing potential advantages and cost required to develop an appropriate level of investment.
- A number of factors are considered in the evaluation of a candidate project, including
  - Potential benefits
  - Estimated cost
  - Probability of success
  - Likelihood of commercialization and deployment
- Emphasis is placed on those projects with the possibility of near-term and mid-term benefits, but long-term development initiatives (greater than five years) are also addressed where the potential benefits warrant. This approach facilitates a consistent comparison of the various candidate projects for project selection and prioritization

R&D projects are managed and staffed either internally or in collaboration with external organizations

- Internal to Con Edison: R&D projects that are internally staffed and managed within Con Edison
  - Once a project is selected and launched internally, the user/ sponsor Gas Department provides support as the project progresses through its development phases through to field demonstration.
  - The phases of solution development are:
    1. Research
    2. Early development (proof of concept, breadboard development, lab testing)
    3. Advanced development (prototype development, lab testing)
    4. Demonstration and field testing
    5. Commercialization
    6. Technology transfer to user groups
  - The user/ sponsor organization then adopts the solution if it is successfully developed, demonstrated, and commercialized.

- Collaborative: R&D projects that are conducted in collaboration with other organizations such as those mentioned on Page 7
  - These projects follow a similar process to that described above in the prioritization, funding and management of projects, although the collaboration partner develops the cost/ benefit analysis, provides the majority of the staffing, and manages the project.
  - The R&D group – in conjunction with the user/ sponsor – monitors the project progress, acts in an advisory role to the collaboration partner in addressing issues as they emerge, and participates in the work as appropriate.

Recently Completed and Nearly Completed R&D Projects

We have recently completed or are in the process of completing a number of highly productive R&D initiatives.

- Each initiative is classified in terms of where it stands in the process of adoption and deployment
- Stages of adoption are:
  1. Demonstration
  2. Commercialization
  3. Early (partial) deployment
  4. Full deployment

Recently Completed & Nearly Completed R&D Projects

PROJECT	ANTICIPATED BENEFITS	TRENCHLESS TECHNOLOGY	STAGE OF ADOPTION
Large cast iron joint sealing robot ("CISBOT") for 16" to 36" Cast Iron mains	Device that goes in the pipe and can seal up to 40 cast iron joints from one small excavation	Yes	Demonstration
EXPLORER II robot for 6" & 8" and TIGRE robot for 20" to 26" live gas condition assessment for unpiggable lines	Performs condition assessment of unpiggable piping with minimal trenching.	Yes	Demonstration
Non-Interruptible Meter Changeout (NIMCO) DBS - Large Diameter Tool Development	Enables customer meter change-outs without interruptions and without methane emissions	No	Demonstration
Ultra Violet ("UV") light train to rapidly cure Cured In Place Linings ("CIPLs)	Allows for complete curing of a liner that has been used to rehabilitate a gas main in 8 hours and reduces outage time for the customers by more than 50%. This trenchless technology process developed through OTD can be used in high customer density areas where previously only open trenching with 24 hour customer shut offs were required	Yes	Demonstration
Thermal Spray Coating	Provide the best coating performance so far for outdoor piping applications. This coating process developed by GTI will greatly reduce the frequency of recoating outdoor equipment subjected to corrosion, such as meter stations	No	Demonstration
Special tools for the no-blow deployment of plugs, stoppers and standpipes in 3", 4", 6", 8" and 12" diameter metallic low pressure mains	Allow the worker to safely replace service tees or valves without release of methane to the atmosphere. This will improve worker and pedestrian safety as well as reduce greenhouse gas by reducing methane emissions	No	Demonstration
New needle bars for bar holing, a new, more improved excavation technology	Improves efficiency and safety	No	Demonstration
Live gas main inspection and repair device (GRISLEE)	Used for condition assessment and repairs of steel gas mains	Yes	Commercialization
4", 6" & 8" modified **ConSplit** machines, which are pipe-splitting technology that allow for pulling a new larger plastic or steel service through an existing main by splitting/ breaking the existing main	Reduced cost of not having to trench, remove and replace cast iron main	Yes	Early deployment
New mule lifting device	Reduces soft tissue injuries	No	Early deployment
New State-of-the-Art Intrinsically-Safe phones	Improves safety	No	Early deployment
GreenPatch environmentally-friendly asphalt paving material	Environmentally friendly asphalt paving material that makes it safer to handle because it eliminates toxins in playground and street repairs. It also reduces the possibility of dispersing toxins into ground water	No	Early deployment
No-dig anode installation method	Prevents main corrosion on an existing steel main or service without the need for excavation. This method has demonstrated cost savings due to reduction in excavations as well as preventing corrosion.	Yes	Early deployment
Application of high temperature epoxy spray	Enables rehabilitation of mains near steam mains and avoids replacement of the main and associated excavation costs	Yes	Early deployment
GasFindIR Infrared Camera Evaluation for detection and location of natural gas leaks (plumes)	Improve emergency response	No	Early deployment

The Current R&D Project Portfolio

The R&D portfolio is focused on addressing key cost, system integrity, reliability, and safety issues

- In this section, we present the current R&D project portfolio. Projects are classified into the following categories:
  - Pipe Materials, Repair & Rehabilitation
  - Pipe and Leak Location
  - Excavation & Site Restoration
  - Pipeline Integrity Management & Automation
  - Operations Infrastructure Support
  - Environmental Science and Forensic Chemistry
  - Safety
- The most advanced & valuable technologies are in the first three areas above, especially the trenchless-related technologies, but all project expenditures add key value to the safety, reliability and integrity management of Con Edison's gas T&D system
- Each project is classified in terms of where it stands in the development process. Solution development stages are:
  1. Research
  2. Early development (proof of concept, breadboard development, lab testing)
  3. Advanced development (prototype development, lab testing)
  4. Demonstration (field testing)
  5. Commercialization
  6. Adoption

Current R&D Projects

Pipe Materials, Repair & Rehabilitation

PROJECT	ANTICIPATED BENEFITS	TRENCHLESS TECHNOLOGY?	STAGE OF DEVELOPMENT
Evaluation of Effects Of Pipe Bursting (ConSplit) on Surroundings	Rquired to assure the value of the ConSplit technology	Yes	Research
Evaluation of Cured In Place Lining ("CIPL") For High Temperature Applications in Sewer Pipes	Reduces the cost to replace mains near steam mains	Yes	Research
Pipe Depth Locator	Reduce third party contractor damage	No	Early development
Automating Leak Pinpointing	Improve emergency response, reduce erroneous excavations, reduce unaccounted for losses, reduce methane emissions	No	Early development
Butt Fusion Integrity	Reduces the cost to repair plastic mains	No	Advanced development
Develop A No-Dig Gas Service Cut & Cap System	Reduces the cost of excavations to perform a gas service cut out	Yes	Advanced development
Harris Cast Iron Joint/Pipe Locator	Reduce erroneous excavations	No	Advanced development
Evaluate Cured In Place Liners for Retaining Undermined Cast Iron Main	Reduces cost by eliminating the need to remove and replace cast iron mains	Yes	Demonstration
UUC Interference Project Cost Reduction	Reduces cost of "interference projects" associated with NYC projects	Yes	Demonstration
GPS-Based Excavation Encroachment Notification	Reduce third party contractor damage	No	Demonstration
Field Applied Pipeline Coatings	Reduces the cost to repair mains	No	Commercialization
Variable Length Sleeve	Reduces the cost to repair or replace mains	No	Commercialization
Technology Deployment and Implementation (TDI) Program for Gas Operations	Cost calculator that explains the beneficial economics of trenchless technologies and helps to pick the best one to use for any particular job.	No	Commercialization
Development of a Live Inspection & Repair System for 4" Steel Gas Mains (GRISLEE)	Reduces the cost to inspect & replace mains	Yes	Commercialization
Hand-held Acoustic Pipe Detector	Reduce third party contractor damage and reduce erroneous excavations	No	Commercialization
Metallic Joint Locator (MJL) Development	Reduce erroneous excavations	No	Commercialization

Current R&D Projects

Excavation & Site Restoration

PROJECT	ANTICIPATED BENEFITS	TRENCHLESS TECHNOLOGY?	STAGE OF DEVELOPMENT
Jackhammer Evaluation: Addressing Noise Abatement Issues	Reduces jackhammer noise. May enable night work.	No	Research
Non-Destructive Testing (NDT) of Electric Feeder Lines	Reduces injury related to tapping into dielectric cable.	No	Advanced development
Development of service terminator device, which allows plugging the meter set above ground to terminate service	Eliminates the need to dig a trench and plug the service line where it connects to the main when terminating a service	Yes	Advanced development
Rock Drill Lift Assist	Reduces soft tissue injuries	No	Early development
Pavement Breaker Lift Assist	Reduces soft tissue injuries	No	Commercialization

Pipeline Integrity Management & Automation

PROJECT	ANTICIPATED BENEFITS	TRENCHLESS TECHNOLOGY?	STAGE OF DEVELOPMENT
Graphitic Corrosion	Condition assessment tool that can be used to determine graphitic corrosion in cast iron mains.	Maybe	Research
Distribution Integrity Management Risk Model	Provides a model to evaluate integrity management risk for distribution systems.	No	Advanced development
Corrosion Rate Monitoring in Cased Gas Transmission Pipeline Segments	Provides corrosion rate information in cased piping.	No	Advanced development
Evaluation of Conditions Causing Loosening of 2 Inch Compression Ccouplings	Determines cause of coupling leaks in Queens.	No	Advanced development
READ device (PCB and PFT field analyzer)	Leak detection device that helps pinpoint gas leaks and minimizes erroneous digs	No	Advanced development
TransKor Remote Inspection Testing	Condition assessment tool that can be used above ground without contact with pipe.	Yes	Demonstration

Operations Infrastructure Support

PROJECT	ANTICIPATED BENEFITS	TRENCHLESS TECHNOLOGY?	STAGE OF DEVELOPMENT
Continued Research on Gas Interchangeability & Quality	Provides information on effect of LNG and renewable (biogas) gas on existing infrastructure.	No	Research
Mitigation of Water Accumulation in Underground Regulator Vaults	Eliminates need to dewater regulator vaults.	No	Early development
Applying Thermoelectric Generators for Regulator Vault Instrumentation Power	Provides power to instrumentation in regulator vaults without installing electric cable.	No	Early development
Consequential Simulator For Gas Operations	Safety tool that trains operators on the consequences of their actions.	No	Early development
Gas Regulator Vent Line Protector	Prevents flooding of house regulator event during abnormal flooding conditions.	No	Advanced development
Protection of Plastic Gas Pipe From Electrical Arcing & Burning	Evaluates cost effective shielding materials for gas mains against electric arcing.	No	Advanced development
Emergency Main Shut-Off System (“EMSOS”) for low-pressure metallic main that can be used in lieu of installing shut-off valves	EMSOS stations will be placed in strategic locations in the distribution system where construction is ongoing, and will provide for isolation during emergencies.	No	Advanced development
Tool for External Classification of Pipe Contents	Reduces injury related to tapping into dielectric cable.	No	Advanced development
Regulator Vault Corrosion and Coating Rehabilitation with Thermal Spray	Reduces maintenance of equipment in regulator vaults.	No	Demonstration
Demonstration of the Sullair light weight jackhammers	Improves efficiency and ergonomics	No	Demonstration
Remote Monitoring System For Drip Pot Water	Monitors and alerts operator when drip pots are at a specific water level.	No	Commercialization

Current R&D Projects

Environmental Science and Forensic Chemistry

PROJECT	ANTICIPATED BENEFITS	TRENCHLESS TECHNOLOGY?	STAGE OF DEVELOPMENT
Improve Uncertainties Surrounding Key Distribution Greenhouse Gas Sources, including Field Measurement Program	Determines a more accurate emission factor for methane credits.	No	Research
Arrow Board - Alternate Power	Provides an electric generation/storage system that will allow for less truck idling.	No	Research

Safety

PROJECT	ANTICIPATED BENEFITS	TRENCHLESS TECHNOLOGY?	STAGE OF DEVELOPMENT
RD&D of Non-Conductive Materials For Barholing	Provides for worker safety when barholing in vicinity of electric cables.	No	Advanced development
Field Testing of Various Safety Related Tools & Equipment	Various safety benefits.	No	Demonstration
Further Development of No-Blow Equipment & Methods	Provides worker safety and reduces methane emissions.	No	Research

Appendix I

Regulatory and Environmental

GLRP Assessment

December 2009

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  - RGGI
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  - Emerging EPA and New York State Department of Environmental Conservation Rules

Regulations on environmental change are shaping policy initiatives for New York City, with implications for CECONY

Overview

- CECONY has a long-standing commitment to protect the environment and the safety of our employees and the public
- As good stewards of the environment, our focus includes environmental sustainability
- To that end, we will ensure that our gas long range plans will contribute to reducing the environmental impact of our transmission and distribution operations, help our customers manage their energy consumption, and reduce the carbon footprint from our day-to-day business activities
- We will address identified opportunities, in which there is a clear business imperative, with programs and investments that are consistent with the different technologies that are required to measurably reduce national CO2 emissions
- Our initiatives will include several themes, from energy efficiency and energy security to clean energy, and will smooth the integration of intermittent distributed energy and renewables as appropriate to meet our environmental objectives

This document describes current State, City, Federal and Regional plans and opportunities focused on addressing future / potential regulatory and environmental challenges expected to impact CECOY's business

Source: State Energy Plan, New York City Energy Plan (PlaNYC)

The New York State Plan is designed to meet five policy objectives

New York State Energy Plan Overview

- The State has developed an energy plan that analyzes a broad range of matters relating to its energy systems, including the reliability of delivery networks for natural gas, and the interrelated effects of gas production and use on the State's economy, environment, and transportation system
- The plan also addresses the impact of energy production and use on public health, particularly for the State's most vulnerable populations
- The plan sets forth a vision for an innovative Clean Energy Economy that is geared towards stimulating investment, creating jobs, and meeting the energy needs of residents and businesses over its 10-year planning horizon
- The plan's strategies and recommendations have been designed to meet five policy objectives

New York State Plan Policy Objectives

- **Maintain Reliability**: Assure that New York has reliable energy and transportation systems
- **Reduce GHG Emissions**: Support energy and transportation systems that enable the State to significantly reduce GHG emissions, both to do the State's part in responding to the dangers posed by climate change and to position the State to compete in a national and global carbon-constrained economy
- **Stabilize Energy Costs and Improve Economic Competitiveness**: Address affordability concerns of residents and businesses caused by rising energy bills, and improve the State's economic competitiveness
- **Reduce Public Health and Environmental Risks**: Reduce health and environmental risks associated with the production and use of energy across all sectors
- **Improve energy independence**: Improve the State's energy independence and diversity by developing in-state supplies of clean energy

Source: New York State Energy Plan

Furthermore, five main strategies are outlined in the Energy Plan which are intended to simultaneously achieve the policy objectives

New York State Energy Plan Strategies

- Produce, deliver, and use energy more efficiently
- Support development of in-state energy supplies
- Invest in energy and transportation infrastructure
- Stimulate innovation in a Clean Energy Economy
- Engage others in achieving the State's policy objectives

Four out of the five strategies are most applicable to CECONY's gas distribution business

Source: New York State Energy Plan

The plan has identified energy efficiency as the priority resource for meeting its multiple objectives

New York State Energy Plan Strategies

- **Produce, deliver, and use energy more efficiently**
- Support development of in-state energy supplies
- Invest in energy and transportation infrastructure
- Stimulate innovation in a Clean Energy Economy

Produce, deliver, and use energy more efficiently

Key Highlights

- Invest in end-use energy efficiency (EE) across all sources of energy and across all energy-using sectors
- Improve coordination of all end-use EE programs making sure that they reach low income customers
- Reduce demand for natural gas through EE improvements to reduce strain on natural gas infrastructure
- Significant efficiency potential exists with regard to #2 oil. A third of New York households (2.3 million) use #2 oil for heating
- Residential and commercial gas demand is expected to increase over the next several years at annual rates of 0.12% and 1.25%, respectively, primarily from economic growth and increased customers (including conversions from oil to gas)
- Overall trend of gas use per residence is expected to decline as appliances and equipment that use natural gas become more efficient in response to federal regulation
- The PSC established targets for a comprehensive gas efficiency program which, combined with reductions from other sources, is expected to result in ~15% reduction (3.8 billion ft^3) in estimated gas use by 2020, independent of any fluctuations in use from fuel switching or other economic factors

While the potential for reducing natural gas use through EE programs is significant, efficiency programs in other energy sectors could affect overall demand for natural gas

Source: New York State Energy Plan

Focusing energy investments on in-state opportunities can reduce the amount of dollars New York exports to pay for energy resources

New York State Energy Plan Strategies

- Produce, deliver, and use energy more efficiently
- **Support development of in-state energy supplies**
- Invest in energy and transportation infrastructure
- Stimulate innovation in a Clean Energy Economy

Support development of in-state energy supplies

Key Highlights

- Accelerating the strategic development of New York's energy resources, both in the renewable energy and natural gas areas, will play a key role in achieving the policy objectives
- Biomass has been the leading in-state renewable resource consumed in the residential, commercial and industrial sectors as measured by primary energy input
- By converting wastes into usable gas, farms and other similar entities can use the gas onsite by producing electricity for farm operations or can deliver gas to the gas pipeline system
- The State recommends programs to increase the proportion of renewable generation to 30% demand by 2015, encourage deployment of DG, and development of Marcellus Shale natural gas formation with environmental safeguards that are protective of water supplies and natural resources.

Using in-state energy resources will increase reliability and security of energy systems, reduce energy costs, help address climate change, public health and environmental benefits

Note: On Wednesday, 12/30/09, the Environmental Protection Agency commented in a New York State Department of Environment document that New York regulators have much more work to do on proposed regulations that have already held up gas drilling in the state's part of the massive Marcellus Shale formation for more than a year

Source: New York State Energy Plan

Infrastructure investments are necessary to support the State's transition to a clean energy economy

New York State Energy Plan Strategies

- Produce, deliver, and use energy more efficiently
- Support development of in-state energy supplies
- **Invest in energy and transportation infrastructure**
- Stimulate innovation in a Clean Energy Economy

Enhanced pipeline delivery capacity is needed downstate to maintain reliability while allowing for conversions or repowering of power plants from oil to gas and growing core demand

Invest in energy and transportation infrastructure

Key Highlights

- New York's aggregate gas demand is expected to increase over the 10-year planning period covered in the State Plan, driven largely by growth in residential and commercial sectors
- The state has determined that the capacity of interstate pipelines to transport sufficient natural gas to meet peak day demand is a concern
- The State contends pipeline capacity constraints in downstate area are of concern and LDCs who provide service to the area need to add delivery capacity into their service territories. This would directly benefit both natural gas and electric ratepayers
- The State recommends identifying strategies, actions and infrastructure needs to reduce GHG emissions by 80% below 1990 levels by 2050

New York State Energy Plan Strategies

- Produce, deliver, and use energy more efficiently
- Support development of in-state energy supplies
- Invest in energy and transportation infrastructure
- **Stimulate innovation in a Clean Energy Economy**

Stimulate innovation in a Clean Energy Economy

Key Highlights

- Foster collaboration among major stakeholders to accelerate the commercialization of emerging clean energy technologies. Leverage NY states clean energy programs to increase local demand for clean energy technologies

Source: New York State Energy Plan

Several themes emerge from the State plan which present CECONY Gas Operations with opportunities to enhance and grow its business

Major Themes	Opportunities
Energy Efficiency	• Promote the use of gas DG / CHP resources at consumer sites, particularly for commercial buildings (including district DG), to increase building efficiency • Explore actively marketing conversions of #2 oil to gas in areas where it makes economical sense • Reduce demand for natural gas through EE improvements, such as increase in efficiency of domestic heating equipment, weatherization, promotion of energy star home construction etc., to reduce strain on natural gas infrastructure
System Reliability	• Explore adding delivery capacity to relieve capacity constraints, increase reliability and reduce any potential for volatility of spot market gas prices and the delivered price of natural gas into the market
Energy Security	• Diversify gas supply in order to reduce exposure to supply disruptions (source from in-state suppliers) and explore associated impact on gas transmission system including potential for new transmission lines or reinforcing existing lines to
Clean Energy	• Reduce GHG emissions from vehicles by exploring the use of CNG as viable alternative vehicle fuel • Explore the use of New York's landfills and biomass as sources for renewable energy development and support NY based entities that advance innovative gas energy solutions that improve New York's economy and environment

CECONY has many opportunities stemming from the strategies outlined in the State plan, to implement solutions appropriately in line with efforts at reducing the environmental impact of the gas transmission and distribution operations, and also to help customers reduce their energy consumption and reduce the carbon footprint of day-to-day business activities

Source: New York State Energy Plan

The New York City Plan's (PlaNYC's) strategies and recommendations have been designed to meet four policy objectives

New York City Plan (PlaNYC) Policy Objectives

- **Improve Energy Planning**: Centralize energy planning through a single organization empowered to develop a broad vision for energy planning in the city that considers supply and demand together as part of an integrated strategy
- **Reduce New York City's Energy Consumption**: Evaluate how to maximize energy efficiency with a focus on buildings rather than on industry and automobiles, the typical focus of nationwide energy efficiency efforts
- **Expand the City's Clean Power Supply**: Build 2,000 to 3,000 MW of new electric capacity by as early as 2015 to compensate for loss of power from accelerating the retirement of New York City's oldest, most polluting power plants to address environmental justice issues Electric supply must also increase to make prices more competitive with the region. These measures will increase gas load
- **Modernize the Electricity Delivery Infrastructure**: ***Minimum impact on gas distribution***

PlaNYC sets forth a vision to provide cleaner, more reliable and affordable energy by upgrading the city's energy infrastructure

Source: PlaNYC

In support of its plan and need to increase clean energy, the City has outlined fourteen key initiatives focused on each policy objective

New York City Plan Policy Objectives

- Improve Energy Planning
  1. **Establish a New York City Energy Planning Board Reduce New York City's Energy Consumption**
- Reduce New York City's Energy Consumption
  2. **Reduce energy consumption by City government**
  3. **Strengthen energy and building codes for New York City**
  4. **Create an energy efficiency authority for New York City**
  5. Prioritize five key areas for targeted incentives
  6. Expand peak load management
  7. Launch an energy awareness and training campaign
- Expand the City's Clean Power Supply
  8. **Facilitate repowering and construct power plants and dedicated transmission lines**
  9. **Expand Clean Distributed Generation ("Clean DG")**
  10. **Support expansion of natural gas infrastructure**
  11. **Foster the market for renewable energy**
- Modernize the Electricity Delivery Infrastructure
  12. Accelerate reliability improvements to the city's grid
  13. Facilitate grid repairs through improved coordination and joint bidding
  14. Support ConEd's efforts to modernize grid

Most applicable to CECONY Gas Operations

Source: PlaNYC

The City will work with the State and utilities to centralize planning for the city's supply and demand initiatives

New York City Energy Plan Initiatives

- **Establish a New York City Energy Planning Board Reduce New York City's Energy Consumption**
- Reduce energy consumption by City government
- Strengthen energy and building codes for New York City
- Create an energy efficiency authority for New York City
- Facilitate repowering and construct power plants and dedicated transmission lines
- Expand Clean Distributed Generation ("Clean DG")
- Support expansion of natural gas infrastructure
- Foster the market for renewable energy

Establish a New York City Energy Planning Board Reduce New York City's Energy Consumption

Key Highlights

- Functions
  - Primary function will be to review and approve energy plans that include supply and demand strategies
  - The City has asked the State to pass a new energy planning law to establish the New York City Planning Board
  - The Board should address the following: peak demand capacity and reduction targets, supply targets, energy consumption, costs to ratepayers, environmental impacts and GHG emissions
  - Board would recommend ratepayer charges to PSC for fulfillment of its plan
- Board Structure
  - To ensure a range of perspectives and technical experience, the proposed Board would include representatives from the City, the State, and the utilities
  - ConEd would be expected to create its own plans for gas demand and supply

The City has deemed that there is a clear need for a more comprehensive, coordinated, and aggressive planning effort, focused on the specific needs of New York City

Source: PlaNYC

The City will commit 10% of its annual energy bill to fund energy-saving investments in City operations

New York City Energy Plan Initiatives

- Establish a New York City Energy Planning Board Reduce New York City's Energy Consumption
- **Reduce energy consumption by City government**
- Strengthen energy and building codes for New York City
- Create an energy efficiency authority for New York City
- Facilitate repowering and construct power plants and dedicated transmission lines
- Expand Clean Distributed Generation ("Clean DG")
- Support expansion of natural gas infrastructure
- Foster the market for renewable energy

Reduce energy consumption by City government

Key Highlights

- The City's government spends $800 million a year on electricity, natural gas, and heating oil, and consumes 6.5% of the city's energy
- The measures will include creating systems and tools to manage the energy use of City buildings centrally; conducting routine energy audits and tune-ups, retrofit City buildings, and improve maintenance to save heating bills
- With aggressive management and funding, the City is committed to reducing its government's energy consumption and CO2 emissions by 30% within 10 years

In addition to a number of investments made recently to reduce consumption, including some retrofits to city-owned buildings, an amendment is to be proposed to the City Charter requiring that New York invest, each year, 10% of its energy expenses in energy saving measures including creating systems and tools to manage energy use of City buildings centrally, conduct audits, tune-ups, and retrofit City buildings and improve maintenance to save heating bills

Source: PlaNYC

The City will strengthen energy and building codes to support energy efficiency strategies and other environmental goals

New York City Energy Plan Initiatives

- Establish a New York City Energy Planning Board Reduce New York City's Energy Consumption
- Reduce energy consumption by City government
- **Strengthen energy and building codes for New York City**
- Create an energy efficiency authority for New York City
- Facilitate repowering and construct power plants and dedicated transmission lines
- Expand Clean Distributed Generation ("Clean DG")
- Support expansion of natural gas infrastructure
- Foster the market for renewable energy

Strengthen energy and building codes for New York City

Key Highlights

- New York City is completing its first major revisions to building codes in nearly 40 years with adoption in 2007 followed by regular reviews and updates on a three year cycle
- New code consists of a number of green elements, including rebates for some green building features, requirements for cool (white) roofs and energy code certification, as well as more stringent ventilation standards
- Further "greening of the code" will be made a central focus of the next revision cycle, with an emphasis on implementing the city's energy efficiency strategies
- Enforcement of several codes, including City building and fire codes, and State energy conservation construction code will be strengthened and sustainability considerations more fully integrated, striking an appropriate balance between reducing implementation barriers while preserving safety standards

The next three years are viewed as an opportunity to amend other codes influencing the city's energy efficiency, such as the State Energy Conservation Construction Code and New York City's Fire Code. While the State code is required to be amended every three years, the process is often delayed and its provisions are not adequately enforced

Source: PlaNYC

The City will create the New York City Energy Efficiency Authority responsible for reaching the city's demand reduction targets

New York City Energy Plan Initiatives

- Establish a New York City Energy Planning Board Reduce New York City's Energy Consumption
- Reduce energy consumption by City government
- Strengthen energy and building codes for New York City
- **Create an energy efficiency authority for New York City**
- Facilitate repowering and construct power plants and dedicated transmission lines
- Expand Clean Distributed Generation ("Clean DG")
- Support expansion of natural gas infrastructure
- Foster the market for renewable energy

Create an energy efficiency authority for New York City

Key Highlights

- There are currently a number of programs that target demand reduction and energy efficiency in New York City, including NYPA and NYSERDA at State level, and ConEd at local level
- The existing programs are not always coordinated and City has not had opportunity to play more active role in coordinating or shaping programs, beyond participating in PSC proceedings
- To achieve unprecedented reductions in energy consumption, the City is proposing to create the New York City Energy Efficiency Authority to direct all NYC efficiency and demand reduction efforts
- Efforts will be funded through rate-payer based surcharges to enable City to develop a unified effort well-tailored to unique circumstances
- The new Authority will be charged with developing and managing programs and establishing the incentive structures required to reach the city's demand reduction targets as set by the New York City Energy Planning Board

The City, NYSERDA, ConEd, and Keyspan will serve on the new Authority's board, allowing the Authority to marshal coordinated action among these entities and utilize their resources, with the Authority's first task being to undertake: targeting five key areas for energy efficiency; expanding peak load management programs; and undertaking an energy awareness and training campaign

Source: PlaNYC

The City will facilitate construction of 2,000 to 3,000 MW of electric supply capacity by repowering old plants and constructing new ones

New York City Energy Plan Initiatives

- Establish a New York City Energy Planning Board Reduce New York City's Energy Consumption
- Reduce energy consumption by City government
- Strengthen energy and building codes for New York City
- Create an energy efficiency authority for New York City
- **Facilitate repowering and construct power plants and dedicated transmission lines**
- Expand Clean Distributed Generation ("Clean DG")
- Support expansion of natural gas infrastructure
- Foster the market for renewable energy

Facilitate repowering and construct power plants and dedicated transmission lines

Key Highlights

- Achieving clean and reliable energy will require upgrading, expanding, and replacing much of New York City's current energy supply
- Between now and 2015, the City will pursue three strategies to increase supply from cleaner power plants to make prices more competitive
  - The City will maximize existing power plant sites, either by building additional generation facilities within existing sites or modernizing the plant's technology (repowering) to increase efficiency by up to 40% and significantly reduce GHG emissions
  - The City may build new plants on new sites (this will cost less or the same as repowering, but land is limited)
  - The third strategy is to build power plants outside the city limits but dedicated to providing electricity to the New York City grid

All three strategies are expected to provide a cleaner energy supply that is also cheaper to run

Source: PlaNYC

The City will increase the amount of clean Distributed Generation by 800MW by 2030

New York City Energy Plan Initiatives

- Establish a New York City Energy Planning Board Reduce New York City's Energy Consumption
- Reduce energy consumption by City government
- Strengthen energy and building codes for New York City
- Create an energy efficiency authority for New York City
- Facilitate repowering and construct power plants and dedicated transmission lines
- **Expand Clean Distributed Generation ("Clean DG")**
- Support expansion of natural gas infrastructure
- Foster the market for renewable energy

Expand Clean Distributed Generation ("Clean DG")

Key Highlights

- Distributed generation currently contributes 180 MW to New York City's energy supply
- Clean DG, using natural gas is an efficient form of energy production because the energy travels over a relatively short distance to its destination, retaining up to 8% more energy
- Clean DG in the form of Combined Heat and Power (CHP) can be produced on a building level or developed as a "mini-grid" for multiple buildings within a small area (district energy) to produce twice as much energy for the same amount of fuel used by older conventional power plants and result in substantial cost savings
- The City will work with ConEd and relevant agencies to reduce the financial, technical, and procedural barriers related to inter-connection to achieve, at least 800 MW of Clean DG by 2030
- ConEd is analyzing economic / technical feasibility for a district energy project in the Hudson Yards area as a viable alternative to extending existing steam infrastructure used for heating in Manhattan below 96th Street to reach Hudson Yards area

Because DG technology is not always compatible with New York City's existing grid, ConEd sometimes limits the amount of DG that can be connected. The City would like ConEd to study new technologies that would increase the amount of Clean DG that can be safely connected to the grid

Source: PlaNYC

The City will support critical expansions of natural gas infrastructure

New York City Energy Plan Initiatives

- Establish a New York City Energy Planning Board Reduce New York City's Energy Consumption
- Reduce energy consumption by City government
- Strengthen energy and building codes for New York City
- Create an energy efficiency authority for New York City
- Facilitate repowering and construct power plants and dedicated transmission lines
- Expand Clean Distributed Generation ("Clean DG")
- **Support expansion of natural gas infrastructure**
- Foster the market for renewable energy

Support expansion of natural gas infrastructure

Key Highlights

- New power plants and expanded Clean DG will both require the use of natural gas, the cleanest-burning fossil fuel, already fueling 80% of New York City's power plants and more than 25% of all energy used in buildings
- On the coldest and hottest days of the year, New York City's demand exceeds the capacity of the four long pipelines currently carrying natural gas into the city extending from the Gulf of Mexico and the Canadian border, by up to 1.2 billion cubic feet
- The City has been able to ensure reliable heating and power by keeping enough gas in storage to cover the gap but as demand continues to rise, it will become more difficult to meet the need
- Given how critical new natural gas infrastructure is to New York City's long-term energy security, the City will support the development of new infrastructure projects that are designed to be sensitive to environmental and community needs
- Identify infrastructure requirements for switch to natural gas for space heating by liquid fuel (#4 and #6 oil) customers

The City is supporting applications to FERC and other relevant authorities for additions to natural gas infrastructure to address delivery constraints that could leave New York City vulnerable to any disruptions along pipelines or unexpected temperature swings

Source: PlaNYC

The City will provide incentives and reduce barriers to renewable energy and pilot emerging technologies

New York City Energy Plan Initiatives

- Establish a New York City Energy Planning Board Reduce New York City's Energy Consumption
- Reduce energy consumption by City government
- Strengthen energy and building codes for New York City
- Create an energy efficiency authority for New York City
- Facilitate repowering and construct power plants and dedicated transmission lines
- Expand Clean Distributed Generation ("Clean DG")
- Support expansion of natural gas infrastructure
- **Foster the market for renewable energy**

Foster the market for renewable energy

Key Highlights

- The City projects that biomass can provide a plentiful source of energy, producing as much as 450 MW, the equivalent of a medium sized power plant
- If handled improperly, however, biomass could add significantly to New York City's GHG emissions through the production of methane, which is 21 times as potent a GHG as CO_2
- The City will work to maximize the safe, cost-effective extraction of useful energy from its organic waste streams and minimize the methane and CO_2 emissions associated with waste
- The City will also explore the feasibility of generating more energy from its landfill gas, and review the standards regarding methane capture and flaring
- The City has committed to a greenhouse gas reduction target of 30%

Over the next three years, the City will end all methane emissions from sewage processing, and will work to expand the use of digester gas for energy production

Source: PlaNYC

Several themes emerge from PlaNYC which present CECONY with opportunities to enhance and grow its business

Major Themes	**Opportunities**
Energy Efficiency	• Promote energy efficiency by helping to manage the energy use of City buildings centrally; conducting routine energy audits and tune-ups, retrofit City buildings, and improve maintenance to save heating bills • Promote the use of gas DG / CHP resources at consumer sites, particularly for commercial buildings (including district DG), to increase building efficiency
System Reliability	• Explore impact on distribution system of critical required expansions to the City's natural gas infrastructure that are sensitive to community and environmental needs (e.g. new power plants, expanded DG, and switch to natural gas for space heating by liquid fuel customers (replacing #4 and #6 oil with gas has potential to double load in western corridor of Manhattan))
Clean Energy	• Reduce GHG emissions from vehicles by exploring the use of CNG as viable alternative vehicle fuel • Explore the feasibility of generating more energy from gas related renewable energy, including any constraints regarding the scrubbing of the gas to attain desired quality • Plan for potential repowering / construction of power plants and dedicated transmission lines, and explore impact on gas transmission system including new load requirements to ensure firm customers are not adversely impacted • Actively support the City's efforts to phase out residual oil (#4 and #6 oil) by 2030

The phasing out of the residual oil (#4 and #6 oil) is likely to have the biggest impact on CECONY's gas distribution in recent times and will require a carefully orchestrated implementation plan and associated infrastructure reinforcement

Source: PlaNYC

Two main Federal plans have been proposed, a House plan passed on 6/26/09 (Waxman-Markey) …

Overview of Waxman-Markey (American Clean Energy and Security Act of 2009)

- It is intended to be a comprehensive clean energy bill
- Contains five distinct titles: clean energy, energy efficiency, reducing global warming, transitioning to a clean energy economy, and agriculture and forestry related offsets
- The bill covers seven GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydro fluorocarbons (HFCs), per fluorocarbons (PFCs), sulfur hexafluoride (SF_6), and nitrogen trifluoride (NF_3)
- Entities covered by the proposal include distributors of natural gas to residential, commercial and small industrial users (i.e., local gas distribution companies)
- The bill establishes emission caps that would reduce aggregate GHG emissions for all covered entities to 3% below their 2005 levels in 2012, 17% below 2005 levels in 2020, 42% below 2005 levels in 2030, and 83% below 2005 levels in 2050
- Bill utilizes value of emission allowances to offset cost impact to consumers and workers to aid businesses in transitioning to clean energy technologies
- Consumers are protected from higher prices with allowances to natural gas distribution companies with a clear mandate that the value of the allowances be used for the benefit of consumers. Low and moderate income households will also receive a refundable tax credit or rebate
- The bill provides that states could enact more stringent climate regulations with the exception of cap-and-trade programs. Holders of allowances issued by RGGI before 12/31/11 can exchange these state allowances for federal allowances

Source: Pew Center

… and a Senate plan introduced on 9/30/09 (Kerry-Boxer)

Overview of Kerry-Boxer (Clean Energy Jobs and American Power Act)

- The goal of the bill is "to create clean energy jobs, promote energy independence, reduce global warming pollution, and transition to a clean energy economy"
- The core of the bill creates a "Pollution Reduction and Investment" program aimed at setting up an economy-wide, market-based program for reducing GHGs and covers the same seven GHGs covered by the Waxman-Markey bill as well as similar entities including local gas distribution companies
- The provisions center around four urgent national priorities:
  - Putting America back in control of our energy future. Focuses on coal, natural gas, nuclear energy and energy efficiency
  - Reasserting American economic leadership and competitiveness. Focuses on turning clean energy into an American economic advantage, developing and training key workers, support for industries, and protecting consumers
  - Protecting our families from pollution. Focuses on pollution reduction and investment, state adaptation, wildlife
  - Ensuring our national security. Focuses on moving America toward energy independence, preventing runaway climate change, proactively addressing adaptation needs
- This bill sets a more stringent 20 percent reduction target for sources covered under the cap from 2005 levels in 2020 compared to the 17 percent reduction in the House bill. The other targets are the same: a 3 percent reduction from 2005 levels in 2012; 42 percent reduction in 2030; and an 83 percent reduction in 2050
- In addition to establishing the GHG Pollution Reduction and Investment program described above, the Kerry-Boxer bill supports the expansion of electricity generation using natural gas and RD&D for advanced, low-emitting natural gas end uses, such as natural gas use coupled with carbon capture and storage

1. The bill includes the concerns, advice, and perspectives of six Senate Committees: **Energy** and Natural Resources, Finance, Agriculture, Commerce, Foreign Relations, and Environmental and Public Works

Source: Pew Center

The Regional Greenhouse Gas Initiative (RGGI) is the first mandatory, market-based effort in the United States to reduce GHG emissions

Overview of RGGI

- Ten[1] Northeastern and Mid-Atlantic states signed RGGI and capped CO2 emissions from power plants at their 2000-2004 four year average (188 million tons) from 2009 until the start of 2015, then reduce emissions by an additional 10% (2.5% per year) by 2019
- RGGI is implementing a cap-and-trade system for CO2 emissions from power plants. Emission permit auctioning began in September 2008, and the first three-year compliance period began on January 1, 2009. Proceeds will be used to promote energy conservation and renewable energy. The system affects fossil fuel power plants with 25 MW or greater generating capacity ("compliance entities")
- The states are committed to invest 25% of revenue from carbon credits to energy efficiency and strategic energy schemes (the revenue is received by auctioning credits from the state budget to compliance entities)
- Expected benefits of RGGI
  - **Reduce CO2 emissions.** The cap on emissions of CO2 from power plants in the RGGI region will be 10 percent lower by end of 2018 than at the start of the RGGI program in 2009. Since electric power plants pump out more than one-fourth of the CO2 emitted each year in the northeastern/mid-Atlantic region, RGGI is a key aspect of participating states' strategies to combat climate change
  - **Support a green economy.** Revenues from CO2 allowance auctions will be used to boost investment for energy efficiency and renewables, while creating green jobs and accelerating regional shift to a clean-energy economy (at an estimated ROI greater than 2:1). Clean-technology innovation and deployment will increase energy independence, keep wealth in local economies and create green-collar jobs. RGGI will provide a market signal that the cost of emitting carbon must now be incorporated into energy pricing
  - **Promote energy independence.** Americans are showing readiness to cut back on energy use. Under RGGI, states should be able to invest 50% more per capita in helping consumers use energy efficiently. Because the cheapest power plant is the one that never gets built, the resulting efficiencies will help keep electric rates down
  - **Provide a model for a national program to reduce CO2 emissions.** RGGI demonstrates that a national program to reduce CO2 emissions can benefit both the environment and the economy. Innovative aspects of RGGI design are already being incorporated into congressional cap-and-trade proposals and may influence the future direction of the European Union Emissions Trading Scheme for CO2 (EUETS) and other programs under development

1. Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island and Vermont Pennsylvania, which is a major coal producer and manufacturing state, participates as an observer

In December of 2009, a new political accord was struck by world leaders at the U.N. Climate Change Conference in Copenhagen

Overview of Copenhagen

- The accord provides for explicit emission pledges by all the major economies, including, for the first time, China and other major developing countries, but charts no clear path toward a treaty with binding commitments
- The basic terms of the Copenhagen Accord were brokered directly by President Obama and a handful of key developing country leaders on the final day of the conference, capping two weeks of harsh rhetoric and pitched procedural battles that made the prospect of any agreement highly uncertain
- Key elements of the Copenhagen Accord include:
  - An aspirational goal of limiting global temperature increase to 2 degrees Celsius. Also calls for a review of the accord by 2015, including a consideration of strengthening the long-term goal "in relation to temperature rises of 1.5 degrees Celsius."
  - A process for countries to enter their specific mitigation pledges by January 31, 2010 – Annex I (developed) countries "commit to implement" economy-wide emissions targets for 2020, and non-Annex I (developing) countries "will implement mitigation actions." (Least developed and small island countries "may undertake actions voluntarily and on the basis of support.")
  - Broad terms for the reporting and verification of countries' actions
  - A collective commitment by developed countries for $30 billion in "new and additional" resources in 2010-2012 to help developing countries reduce emissions, preserve forests, and adapt to climate change
  - A goal of mobilizing $100 billion a year in public and private finance by 2020 to address developing country needs
  - The US set a provisional target to reduce GHG emissions by 14 to 20 percent by 2020, compared to 2005 levels

The reduced GHGs sought by Federal, RGGI and Copenhagen plans, may speed the move to more GHG friendly fuels such as natural gas and renewables

Plans	Summary Description of GHG Targets	Some Potential Future Implications on CECONY's Business
Waxman-Markey	• Establishes emission caps that would reduce aggregate GHG emissions for all covered entities to 3% below their 2005 levels in 2012, 17% below 2005 levels in 2020, 42% below 2005 levels in 2030, and 83% below 2005 levels in 2050	• Likely hasten the move to more environmentally friendly fuels such as natural gas and renewables, potentially impacting electricity generation, oil to gas conversions, transportation, etc. • More stringent targets may impact the use of low sulfur oil, adding to increased demand for gas • May have implications on portfolio / mix of firm gas versus interruptible gas customers • Potential significant implication on gas system strengthening requirements
Kerry-Boxer	• Sets more stringent 20% reduction target for sources covered under the cap from 2005 levels in 2020 compared to 17% reduction in House bill. Other targets are the same: 3% reduction from 2005 levels in 2012; 42% reduction in 2030; and an 83% reduction in 2050	
RGGI	• Caps CO2 emissions from power plants at 2000-2004 four year average (188 million tons) from 2009 until the start of 2015, then reduce emissions by an additional 10% (2.5% per year) by 2019	
Copenhagen	• US set provisional target to reduce GHG emissions by 14 to 20 percent by 2020, compared to 2005 levels	

The above plans all represent the “cap” part of the “cap and trade” program. Regulated companies such as CECONY would be allowed to purchase carbon offsets to meet a portion of their required emissions reductions, meaning they could fund clean-energy projects elsewhere instead of cutting their own emissions. This could lower the cost of complying with the plans

There are six key emerging EPA and New York State Department of Environmental Conservation (DEC) rules that could impact CECONY

Emerging EPA and Regulations

- Clean Air Interstate Rule (CAIR)[1] – Replacement Rule
  - CAIR was vacated by the courts on 7/11/08, but the mandate to "close" CAIR has been held off for two years. The EPA is in process of gathering information from stakeholders
  - As part of the replacement rule, the EPA is planning on including plant performance standards, and cap-and-trade provisions
- Nickel MACT
  - Courts vacated CAMR (mercury rule). EPA will go back to prior regulatory scheme for metals. New emission standard for nickel sets limits for oil- and coal-fired units, but not gas-fired units. Standards will be based on best 12% of plants nationwide. Possibly three years to enactment
- NYS NOX RACT (Reasonably Available Control Technology)
  - The DEC has held public outreach sessions related to lower emission limits for NOX for regulated entities
  - DEC has promised to begin public comment period "within a few weeks" for almost two years now. Proposal is still on agenda
- NYS Part 251
  - Proposed rules set new CO2 performance standard that could not be met by most plants in state (on regulatory agenda, and a draft circulated to stakeholders, but no proposed rule as of yet)
- Clean Air Act (CAA) Section 185 Fees
  - Because NY is still in ozone non-attainment, sources will need to pay a fee ($8K+) for every ton of NOX emitted over 80% of 2007 baseline
  - EPA is writing guidelines for states to use in modifying their SIP, and will send them shortly. DEC must revise New York State SIP (State Implementation Plan) to incorporate the fee methodology
- NYS Global Warming Legislation
  - State Assembly bill A. 7572 mandates return to 1990 GHG levels, provides no mechanism for control (referred to State Senate Environmental committee)

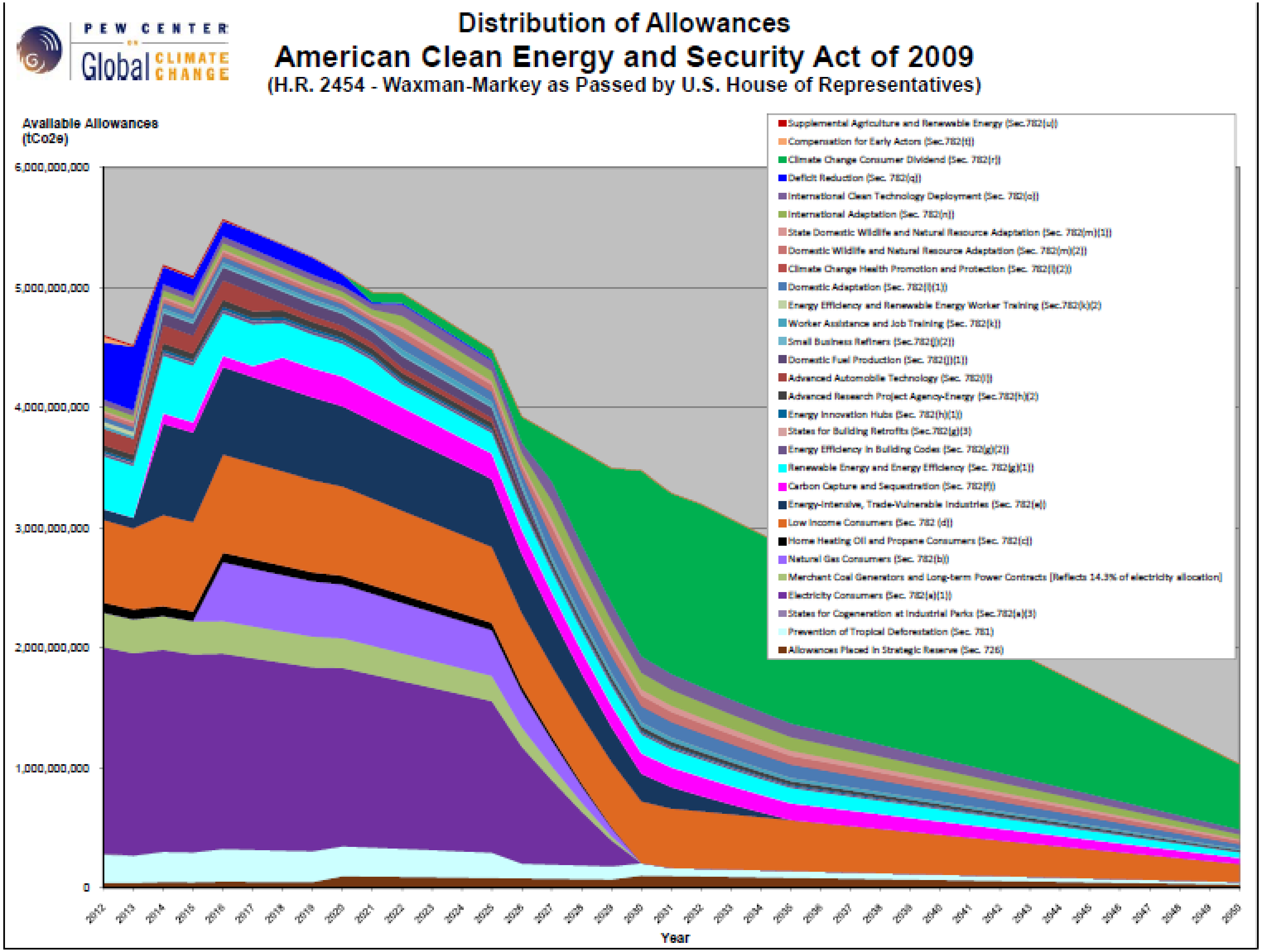
1. CAIR will permanently cap emissions of sulfur dioxide (SO2) and nitrogen oxides (NOx) in eastern US. CAIR achieves large reductions of SO2 and/or NOx emissions across 28 eastern states and the District of Columbia. When fully implemented, CAIR will reduce SO2 emissions in these states by over 70 percent and NOx emissions by over 60 percent from 2003 levels. This will result in $85 to $100 billion in health benefits and nearly $2 billion in visibility benefits per year by 2015 and will substantially reduce premature mortality in the eastern US. Benefits will continue to grow each year with further implementation

There are a number of potential programs can enhance CECONY's gas business as a result of the implications of the State and City plans

Themes	Implications	Potential Programs / Assessments
Energy Efficiency	• Both the State and City are supporting DG and would are expecting CECONY to pursue a DG strategy • The State's plan has energy efficiency at its core. CECONY needs to determine how the company can support energy efficiency from a gas perspective • The State mandate to switch #2 high sulfur customers to #2 low sulfur can be exploited by CECONY to promote switching to natural gas where it makes economic sense	• A comprehensive DG program for CECONY should be evaluated for potential implementation • A comprehensive gas related energy efficiency program should be assessed • An assessment of the implications for switching #2 oil customers in CECONY's service territory to natural gas should be conducted
System Reliability	• Significant infrastructure costs are expected in support of the City's mandate to expand the City's natural gas infrastructure to maintain system reliability	• A comprehensive infrastructure reinforcement program should be developed to include age as well as the mandated infrastructure expansion
Energy Security	• Significant infrastructure costs are expected in support of the State's mandates to enhance delivery capacity	• A comprehensive infrastructure enhancement program should be developed to support the enhanced delivery capacity requirements
Clean Energy	• Both the State and City are supporting the use of alternative vehicle fuels to reduce GHG emissions • CECONY does not have many significant renewable gas sources in its service territory but has to prepare for the possibility that other entities may introduce renewable gas into the gas system • The City mandated switch from #4 and #6 oil to natural gas will impact many large customers in CECONY's territory with significant impact on gas demand	• A comprehensive CNG assessment and resulting program for CECONY should be evaluated for potential implementation • CECONY needs to assess and understand the "scrubbing" requirements of renewable gas to meet its quality threshold • A comprehensive program for switching #4 and #6 oil customers in CECONY's service territory to natural gas should be evaluated for implementation

Source: New York State and City Energy Plan

Appendix



Source: Pew Center

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A

Advanced Metering Infrastructure (AMI)

System which deploys end-use devices designed to communicate with the utility and with a robust meter data management system.

Alternate Fuel Vehicle (AFV)

An alternative fuel vehicle is a vehicle capable of operating on any one of the following alternative fuels: "methanol, denatured ethanol, mixtures containing up to 85% methanol or denatured ethanol, natural gas, propane (liquefied petroleum gas), biodiesel, hydrogen, and electricity."

Assets

Items of value owned by or owed to a business. Utility assets include: Utility Plant, Other Property and Investments, Current and Accrued Assets, and Deferred Debits.

B

Biogas

Methane produced by the decomposition or processing of organic matter

C

Capital optimization

A process that allows us to attain objectives by helping us evaluate projects system wide, and make reductions across operating units through standardized analytical methods and guidelines.

Cast iron pipe

Pipe made of pouring molten iron into molds.

Cast iron joint sealing robot (CISBOT)

Live main sealing technology that is capable of sealing joints on cast iron mains, between 6 and 12 inches in diameter. It can seal up to 25 joints, 125 feet in either direction, from one launching pit.

Cathodic protection

A corrosion control system in which the metal to be protected is made to serve as a cathode, either by the deliberate establishment of a galvanic cell or by impressed current.

City gate

Point at which a distribution gas company receives gas from a pipeline company.

Coated pipe

Pipe that has been covered with a corrosion resistant coating or compound (such as asphalt or tar) to prevent corrosion from soil conditions.

Code MuRRE (Multiple Resource Response Event)

An alert to field personnel for situations that require an escalated response to gas events

Combined Heat and Power (CHP)

Combined Heat and Power (CHP) or cogeneration is a system that involves the recovery of waste heat from power generation to form useful energy like useable steam. Combined heat and power is also the production of electricity and thermal energy in a single integrated structure.

Common trench

A trench containing two or more utilities.

Compressed Natural Gas (CNG)

Natural gas in high-pressure surface containers that is highly compressed (though not to the point of liquefaction). CNG is used extensively as a transportation fuel for automobiles, trucks and buses in some parts of Italy, New Zealand, and in Western Canada, and has recently begun to penetrate some regions of the United States. Small amounts of natural gas are also transported overland in high-pressure containers.

ConSplit

A trenchless technology used to replace and up-size steel and other ductile pipes with plastic pipe.

Corrosion

Destruction of a metal by chemical or electrochemical reaction with its environment.

Coupling

A sleeve-type fitting used to connect two pipes of similar or different materials, providing insulation or continuity.

Cubic Foot (CF)

The most common unit of measurement of gas volume. It is the amount of gas required to fill a volume of one cubic foot under stated conditions of temperature, pressure, and water vapor.

Cured in Place Lining (CIPL)

Cured-in-place lining is a “trenchless” pipe rehabilitation method that can seal existing pipe leaks and prevent future leakage due to corrosion, joint failure, or third-party damage.

Customer Service System (CSS)

Con Edison customer billing and account system.

D

Delivery rate

Represents the cost of transporting gas from the point of supply to the Con Edison system and then to the customer. It constitutes to a percentage of an average customer bill. This rate covers costs to build and maintain our transmission and distribution assets as well as to maintain and operate the customer billing and other operations platforms to service customers.

Demand Side Management (DSM)

The term for all activities or programs undertaken by a Load-Serving Entity or its customers to influence the amount or timing of electricity they use.

Distributed Generation (DG)

Electricity generating apparatus sited with a customer as opposed to a centralized station. DG is designed to serve some or all of the electricity needs of a customer by leveraging fuel sources ranging from natural gas, to waste water, to renewable fuels such as solar and wind.

Distribution system

Gas pipelines other than the transmission system including services up to building walls and all known underground gas piping beyond the outlet of the customers’ meters, but excluding customers’ piping in industrial complexes.

E

Emergency response

A response of an unplanned event that is capable of disrupting operations, threatens life and or creates major damage.

Energy Efficiency (EE)

Actions or technologies that provide reductions in energy consumption at the customer level, while maintaining equal or greater quality of service.

Energy Efficiency Portfolio Standard (EEPS)

In May 2007, the EEPS proceeding was initiated by the New York State Public Service Commission (PSC) as part of the overall effort to reduce New York‘s electricity use by 15 percent from forecasted 2015 levels. Subsequently, the PSC established and approved efficiency targets for the State‘s investor-owned electric utilities and NYSERDA.

Enterprise Risk Management (ERM)

A process, by which the Company identifies, monitors and mitigates risks. Our risk management program has three primary objectives: 1) systematic risk mitigation; 2) proper allocation of resources; and 3) enhanced communication and transparency.

Energy Service Companies (ESCOs)

Energy suppliers that sell electricity and/or natural gas to business and residential customers.

F

Firm

Service offered to customers (regardless of Class of Service) under schedules or contracts which anticipate no interruptions.

Flat billing

The application of applying a fixed monthly charge to recover all the costs related to serving gas cooking customers. That would mean that there will be no need to meter the gas usage for these customers.

G

Gas pipes

Pipes used to carry gas from one point to another. As contrasted with service pipes, they carry gas in large volume for general or collective use.

Gate station

A location where gas changes ownership, from one party to another, neither of which is the ultimate consumer.

Green House Gas (GHG)

Gases in the atmosphere that absorb and emit radiation within the thermal infrared range. The main greenhouse gases in the Earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide and ozone.

H

Hedging

Any method of minimizing the risk of price change. Since the movement of cash prices is usually in the same direction and about in the same degree as the movement of the present prices of futures contracts, any loss (or gain) resulting from carrying the actual merchandise is approximately offset by a corresponding gain (or loss) when the contract is liquidated.

Henry Hub

A pipeline interchange, located in Vermilion Parish, Louisiana, which serves as the delivery point of natural gas futures contracts.

Hydrofracturing

A process used to extract natural gas from previously impermeable shale. Also known as Hydraulic fracturing the process utilizes millions of gallons of water, sand, and chemicals injected at high pressure into horizontally drilled wells, some as far as 10,000 feet below the surface. The pressure causes the shale to 'crack'. These cracks or fissures are held open by the sand particles and chemical propants, which then allow the natural gas to escape from the shale and to the well.

I

Incoming leaks

Gas leaks reported to the company.

Infrastructure

The network of distribution piping to which customers' service pipes are attached. Generally, large pipes are laid in principal streets with smaller laterals extending along side streets and connected at their ends to form a grid

Interference

Occurs when an existing facility must be located, identified, removed and reinstalled at a new location in order to accommodate and/or provide space for a new City or other municipal facility.

Interruptible

Low priority service offered to customers under schedules or contracts which anticipate and permit interruption on short notice, generally in peak-load seasons, by reason of the claim of firm service customers and higher priority users. Gas is available at any time of the year if the supply is sufficient and the supply system is adequate.

Interstate

With respect to natural gas companies, the transporting and sale of gas for resale across state lines.

Intrastate

With respect to natural gas companies, the transporting and sale of gas for resale within the boundaries of a state.

K

Key Performance Indicators (KPI)

Set of indicators used to ensure safe and reliable performance which is a benefit to Con Edison's customers and to align management employee salaries to the Company's performance. The periodic monitoring of these indicators helps the Company make mid-course corrections, as necessary.

L

Leak

An unintended hole, crack, break, or the like, through which gas escapes.

Liquefied natural gas (LNG)

Natural gas which has been liquefied by reducing its temperature to minus 260 degrees Fahrenheit at atmospheric pressure. It remains a liquid at -116 degrees Fahrenheit and 673 psig. In volume, it occupies 1/600 of that of the vapor at standard conditions

M

Main Replacement Program (MRP)

A program that uses a computer model to prioritize main requiring replacement based on factors such as leak history, soil condition, age and material of pipe.

Manhole

An opening into a vault, or other equipment through which a person can enter to service equipment; can be sealed with a removable plate or door

Maximum allowable operating pressure (MAOP)

The maximum pressure at which a pipeline or segment of a pipeline may be operated.

Megawatt (MW)

Unit of power equal to one million watts.

Meter

An instrument for measuring and indicating or recording the volume of gas that has passed through it.

Methane (CH_4)

The chief constituent of natural gas. Pure methane has a heating value of 1012 Btu per cubic foot..

N

Natural gas

A naturally occurring mixture of hydrocarbon and nonhydrocarbon gases found in porous geologic formations beneath the earth's surface, often in association with petroleum. The principal constituent is methane.

Natural Gas Vehicle (NGV)

A vehicle that is equipped to operate using natural gas.

NOx RACT

New York State's air regulation Part 227-2, .Reasonably Available Control Technology (RACT) for Oxides of Nitrogen (NOx) applies to large and small boilers (furnaces) and internal combustion engines. NOx is one of the gaseous air pollutants that results from the combustion of fossil fuels, such as oil or natural gas.

NYISO

The New York Independent System Operator (NYISO) is at the heart of New York State's electric system, operating the high-voltage transmission network, administering and monitoring the wholesale electricity markets, and planning for the state's energy future. The NYISO is responsible for the reliable operation of New York's nearly 11,000 miles of high-voltage transmission and the dispatch of over 500 electric power generators. In addition, the NYISO administers bulk power markets that trade over $11 billion in electricity and related products annually.

NYPA

The New York Power Authority (NYPA) is America's largest state power organization. They provide some of the lowest-cost electricity in New York State, operating 17 generating facilities and more than 1,400 circuit-miles of transmission lines.

NYSDEC

The New York State Department of Environmental Conservation (DEC) was created on July 1, 1970 to combine in a single agency all state programs designed to protect and enhance the environment.

NYSERDA

New York State Energy Research and Development Authority is a public benefit corporation created in 1975. Currently, NYSERDA is primarily funded by New York State rate payers through the System Benefits Charge (SBC). These funds are allocated towards energy efficiency, programs, research and development initiatives, low-income energy programs, and other activities. In addition, NYSERDA is involved in energy efficiency through the energy efficiency portfolio standard proceedings, and through a Request for Proposals process, is the central procurement administrator for renewable energy sources in New York State.

O

OSHA incidence rate

"The main performance metric in the area of employee safety is the OSHA incidence rate. The incidence rate is a normalizing indicator that captures the number of recordable injuries/illnesses per standard unit of 100 full-time equivalent employees (each working 2,000 hours per year). It is dependant upon the number of recordable injuries/illnesses experienced and the number of productive hours worked, which includes all straight time, compensable overtime, training hours, and restricted duty hours for both weekly and management employees.

The formula for calculating the incidence rate is: Number of Recordable Incidences x 100 x 2000 / Total Number of Productive Hours Worked."

P

Peak day

The one day (24 hours) of maximum system deliveries of gas during a year. Peak day data is used to, among other things; determine the allocation of certain costs between classes of service.

Peak demand

The highest rate at which gas is delivered to or by a system, expressed in cubic feet or therms or multiples thereof, for a designated period of time.

Pipeline capacity

The maximum quantity of gas that can be moved through a pipeline system at any given time based on existing service conditions such as available horsepower, pipeline diameter(s), maintenance schedules, regional demand for natural gas, etc

Pressure control

Maintenance of pressure, in all or part of a system, at a predetermined level or within a selected range.

Propane

A gas, the molecule of which is composed of three carbon and eight hydrogen atoms. Propane is present in most natural gas and is the first product refined from crude petroleum. It has many industrial uses and may be used for heating and lighting. Contains approximately 2,500 Btu per cubic foot.

R

Regulator

A device that maintains the pressure in a fluid flow line, less than its inlet pressure within a constant band of pressures, regardless of the rate of flow in the line or the change in upstream pressure.

Renewable Portfolio Standard (RPS)

A mandate, or goal, set to require or promote the use of renewable resources for electric generation. The Standard generally states that a certain percentage of a retail electric provider's overall or new generating capacity or energy sales must be derived from renewable resources, with the percentage increasing gradually over time. An RPS most commonly refers to electric sales measured in megawatt hours, as opposed to electric capacity measured in megawatts. Most Standards also contain a secondary market in tradable renewable credits, allowing the electricity providers to use the least-cost method to achieve the set goals.

Risk Priority Number (RPN)

Quantifies the relative priority of risks across the Company. For each identified enterprise risk an assessment is performed of the severity, likelihood and controllability through assigning a value from 2 - 10 for each component. These component factors are then multiplied to produce a risk priority number.

S

Shale gas

Shale gas is an emerging type of unconventional natural gas deposit. The gas is distributed throughout the low permeability shale formations rather than accumulating in a more permeable reservoir.

SMYS

Specified minimum yield strength.

Storage

Storage facilities or a portion of storage facilities, which are leased to others for the purposes of storing gas

T

Tariff

A gas company schedule detailing the terms, conditions and rate information applicable to various types of natural gas service. This document is filed with and approved by the Federal Energy Regulatory Commission (FERC) or a state regulatory body.

Therm

A unit of heating value equivalent to 100,000 British thermal units (Btu).

Time-based pricing

Electric rates designed to encourage customers to reduce electricity use during peak hours. Customers are charged for electricity depending on when they use it.

Transmission pipelines

Pipes installed for the purpose of transmitting gas from a source or sources of supply to one or more distribution centers, to one or more large volume customers, or a pipeline installed to interconnect sources of supply. In typical cases, transmission lines differ from gas mains in that they operate at higher pressures, are longer, and the distance between connections is greater.

Transmission system

Gas pipelines operated at pressures over 125 psig.

Trenchless technology

No-dig techniques used for underground pipeline and utility construction, for replacement, rehabilitation, renovation, repair, inspection, leak detection, etc., with minimum excavation from the ground surface.

U

Unprotected steel

Pipe that has not been covered with a corrosion resistant coating or compound (such as asphalt or tar) to prevent corrosion from soil conditions.

V

Valve

A mechanical device for controlling the flow of fluids and gases; types such as gate, ball, globe, needle, and plug valves are used.

Volatility

The term volatility indicates how much and how quickly the value of an investment, market, or market sector changes.

Z

Zero-degree day

It is the basis used by Con Edison for planning and designing the transmission and distribution system.

Company Name: Con Edison
Case Description: 2016 - Con Edison Electric and Gas Rate Filings
Case: 16-E-0060; 16-G-0061

Response to DPS Interrogatories – Set DPS-1
Date of Response: 03/17/2016
Responding Witness: Gas Infrastructure & Operations Panel

Question No. : 9 Supp

Provide a copy of all strategic operating plans that describe the company's current or prospective corporate goals and objectives.

Response

Attached (DPS-1-9-Att 5) please find the Company's latest Gas Long Range Plan.

Gas Long Range Plan

March 2016

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1. EXECUTIVE SUMMARY

1.1 Background

For over 190 years, Consolidated Edison, Inc. *(Con Edison* or *the company*) has had the privilege of providing power, light, and heat to the people of New York City (NYC) and Westchester County through our natural gas delivery system. The vision for the company's gas organization is to be industry best-in-class in safety, quality, compliance, and customer experience. Our strategic mission is to deliver natural gas safely, reliably and cost-effectively while enhancing the customer experience, to respect the environment, to create a culture of safety and compliance, and to support the development of our employees. This vision and mission are the basis for this Gas Long Range Plan (GLRP), which provides our gas system plan through the year 2035.

The GLRP incudes cost projections to manage risk and maintain the safety and reliability of the gas system. System inspections, gas leak detection, emergency response to gas leaks, and replacement of gas distribution and transmission piping identified for replacement are key components to maintaining a safe gas system. Also critical to gas system safety are detailed operating, maintenance, and system design procedures, and strict compliance to those procedures.

In past years, Con Edison developed infrastructure plans for its gas distribution and transmission systems. The purpose of those infrastructure plans was to determine the work needed to build sufficient system capacity to meet customer energy requirements, based on stringent design criteria aimed to produce a very safe and reliable system. In 2010, we issued our original GLRP, which extended the transmission and distribution system infrastructure plans by adding other elements of our business, such as demand and supply drivers and customer and workforce implications, to present a single comprehensive plan for the business unit. In 2012, Con Edison developed an Integrated Long Range Plan (ILRP) that applied a common, integrated framework to our infrastructure planning processes for electric, steam, and gas, with the intent of capturing opportunities to limit growing delivery costs and identify cross-commodity solutions to meet customer energy needs. Our GLRP was also updated in 2012, and now again in 2016, to incorporate changes in technology, the economy, and both environmental and governmental policy. The key elements for the 2016 GLRP are:

- Managing System Risk
- Balancing Demand, Supply, and Environmental Profile
- Improving Infrastructure Planning and Design
- Enhancing the Customer Experience
- Focusing on Cost Management

1.2 Key Elements of the Plan

1.2.1 Managing System Risk

Learnings from both company and industry gas incidents have resulted in an urgency by both gas utilities and regulators to accelerate the replacement of cast iron and unprotected steel gas distribution piping. Utilities with older gas systems in the Northeast, like Con Edison, have large inventories of this piping in their systems. We also foresee future legislation involving gas transmission piping that may require rehabilitation or replacement of older transmission piping.

The company has a comprehensive strategy to manage risk in our gas system that involves the following components:

- **Prevention**: Minimizing leaks in the gas system by prioritized replacement of identified distribution and transmission piping. The company plans to replace all 12-inch-and-under diameter cast iron and unprotected steel gas distribution piping during the next 20 years. In addition, the company also has long-range plans, beyond the scope of this 20-year GLRP, to assess and rehabilitate or replace all cast iron and unprotected steel gas distribution piping larger than 12 inches in diameter as necessary, as well as all vintage gas transmission piping. Each piping replacement and rehabilitation program is very capital-intensive, but necessary to assure the safe operation of the gas system.
- **Detection**: Reducing the risks associated with gas leaks by employing leak detection methods continuously in our system and by seeking out improved leak detection technologies. Our operating procedures include a methane leak survey of all gas distribution mains, gas service lines, and transmission mains per federal and state requirements. In addition to these mandated leak surveys, the company has conducted monthly leak surveys of all gas distribution mains since November 2014. Con Edison is also pursuing the use of new technologies to improve gas leak detection of our system, such as residential methane detector technologies. Our vision is that residential methane detection will improve public safety, just as residential smoke and carbon monoxide detectors have.
- **Response**: Rapid emergency response to gas leak calls and making each situation safe as quickly as possible, to prevent a leak from becoming a safety issue. Our plan includes the use of our Code MuRRE (Multiple Resource Response Event) process, which provides a heightened response to specific high-hazard conditions by both company forces and the fire department. This process assists with getting more boots on the ground quickly to minimize the risks of these reported leaks.
- **Compliance**: Enhanced quality control and assurance programs. The company has an increased focus on quality control and assurance to assist with achieving a compliance culture that is best-in-class. The company formed a new organization in 2015 with increased resources focused on training, qualifications, work quality, field inspections and the use of improved technologies to monitor and assure these practices.

1.2.2 Balancing Demand, Supply and Environmental Profile

In April of 2011, New York City enacted clean heat regulations, which limited the use of No. 4 and No. 6 oil for heating buildings. To comply with the rules, heavy oil users can turn to Con Edison for clean burning natural gas service. These regulations, coupled with natural gas prices likely being favorable as compared to oil for the next 20 years, will increase our peak hour demand system-wide and will require a significant investment in capital infrastructure. The investments will include a continuation of oil-to-gas conversion work in New York City, as well as the expansion of gas service installations and conversions in Westchester. This initiative will allow customers to reduce their carbon emissions footprint and improve air quality in their communities.

We also need to plan for adequate supply and pipeline capacity to reliably operate our natural gas system. Furthermore, we face the logistical challenges that come with managing a significant number of natural gas service requests and effectively coordinating the infrastructure work needed to meet the demand. We must complete the work in a way that is customer-friendly, minimizes disruptions to the community, is cost-effective, and enhances safety.

1.2.2.1 Forecasting Demand

One of the most important steps in our expanded planning process is to develop forecasts for gas demand. We make assumptions about economic trends, environmental and regulatory requirements, and the competitiveness of natural gas prices to develop forecasts of customer demand. To develop the infrastructure projects and programs in this plan, we used demand forecasts and identified signposts that we will monitor and use to update our plan in the future as appropriate. The forecasted peak demand compound annual growth rate (CAGR) over the first five years of this plan is forecasted at 2.3 percent.

This is due mostly to oil-to-gas conversions, and is also influenced by large new construction and distributed generation forecasts.

Looking further out, our forecast for firm peak demand CAGR over this 20-year plan is 1.3 percent. Over the next twenty years, natural gas will remain an integral part of our community's energy mix. We expect demand for natural gas to grow because it is a cost-effective, environmentally-responsible fuel for particular energy applications, such as heating, power generation, and transportation. Motivated by economic and environmental considerations, we anticipate that consumers will consider natural gas as a favorable heating fuel and power generation source, and will evaluate the economics of gas-fired distributed generation.

1.2.2.2 Meeting Supply Needs

Demand for natural gas applications is highly dependent on the commodity's availability and its price relative to competing fuels and their price volatility. Recent North American unconventional gas discoveries, including Marcellus shale production in the Northeast United States, suggest that natural gas prices will likely remain competitive during the planning period. Through our supply diversification, gas procurement, and hedging strategies, we obtain adequate supplies of natural gas, while reducing the near-term commodity price volatility that our full-service customers experience. Reliable gas supply and service also depend upon adequate pipeline capacity and storage contracts to deliver gas to our city-gates.

To meet these challenges, we have growth strategies and marketing campaigns in place to bring customers onto our gas system as efficiently as possible. In addition, we support projects that give us access to new sources of low-cost natural gas supply.

1.2.2.3 Protecting the Environment

Con Edison is committed to environmental responsibility. Nearly all methane emissions caused by the gas distribution industry are due to unintended fugitive leaks. The company has been a member of the Environmental Protection Agency's (EPA) Natural Gas STAR Program since its inception in 1993 and has achieved estimated cumulative reductions in released methane of 5.1 million mcf[1] primarily through the repair or replacement of leaking pipe and the use of automated systems to reduce pressure.

Our Research and Development organization is currently participating in the development of an exciting technology that will be used to quantify actual methane emissions from Type 3[2] leaks. The company is working with the Environmental Defense Fund and other parties on a pilot project to quantify which non-hazardous leaks make the greatest contribution to greenhouse gas emissions from our system. The largest methane emitters will either be repaired or eliminated through capital replacements. This technology may not only help Con Edison to reduce methane emissions, but also help to promote the improvement of detection technology.

1.2.3 Improving Infrastructure Planning and Design

Our gas system consists of more than 4,300 miles of pipe transporting more than 300 million dekatherms (MMDth) of natural gas annually. These pipes run alongside other underground facilities (such as electric, telephone and cable television ducts and water, steam, and sewer pipes) and their location makes infrastructure repair and replacement projects logistically challenging and expensive. A key element of our GLRP is our infrastructure plan, which details our efforts in this area.

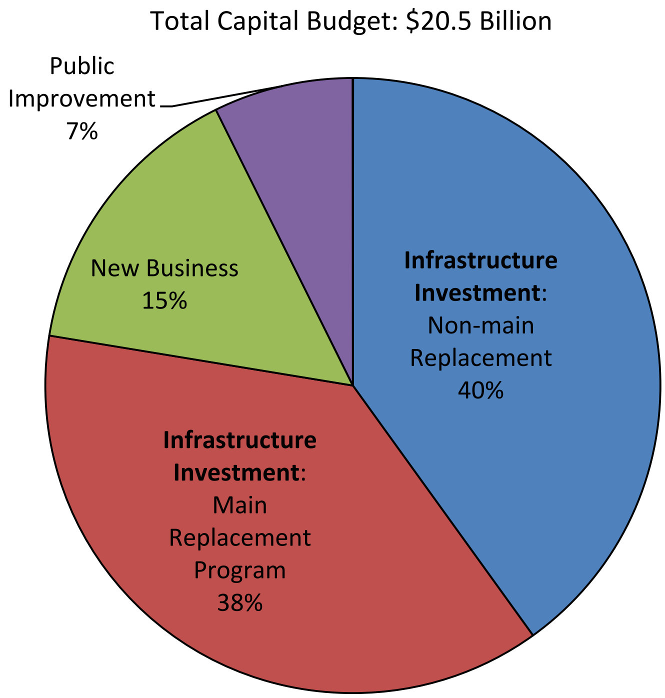
[1] Methane emissions are measured in thousand cubic feet (mcf).

[2] A Type 3 leak is not immediately hazardous at the time of detection and can be reasonably expected to remain that way. However, Type 3 leaks shall be reevaluated during the next required leakage survey or annually, whichever is less.

1.2.3.1 Infrastructure Plan Overview

The programs outlined in our infrastructure plan help Con Edison manage a large, complex, logistically challenging, underground gas transmission and distribution infrastructure designed to the rigorous reliability and safety standards that our customers have come to expect. The cost of the programs total $20.5 billion over this 20-year plan. All capital figures in this long-range plan are expressed in nominal dollars and include an inflation assumption of 2.5 percent (post five-year business plan) to reflect future price level changes. Our current infrastructure initiatives represent three broad activities as shown below in Figure 2-1.

Figure 2-1: Gas Infrastructure Plan (2016–2035 Capital Budget)



Infrastructure Investment: Expenditures in this category are designed to reduce risk, maintain system integrity, accommodate gas demand and maintain pressures and system reliability. The programs in this category represent two types of investments:

- **Main replacement program**: Replacement of 12-inch-and-under cast iron and unprotected steel gas distribution mains. This program is a necessary effort that minimizes risk from aging infrastructure.
- **Non-main replacement infrastructure investment**: Replacement or rehabilitation of all mains, services, and components in our gas distribution and transmission systems not covered under the main replacement program. These investments will further reduce system risk, and will also serve to reinforce or upgrade the system to accommodate new loads.

Infrastructure managed under this category includes pipes, regulator stations, valve, etc. Over the planning period, this activity will represent 78 percent of our investments.

New Business: Expenditures in this category represent the cost of installing new services or mains for connecting new customers to our system, which includes new construction, existing customers with increased load, and oil-to-gas conversions. Over the 2016–2035 planning period, this activity is expected to represent 15 percent of our investments.

Public Improvement: When a municipality decides to perform work under its streets, the presence of existing facilities such as sewer, water, telephone, electric, and gas can complicate both new installations and maintenance work. When gas facilities are in conflict with municipal activity, Con Edison has a legal obligation to remove or otherwise protect its facilities to accommodate that work at our—and therefore our customers'—expense. Due to the nature of the work, we have little control over the amount or timing of the required public improvement investments. However, we apply the same capital expenditure management to this part of the plan as for our infrastructure maintenance and new business work. Over the planning period, we forecast that this activity will represent 7 percent of our investments.

1.2.3.2 Key Gas Infrastructure Plan Initiatives

Our gas distribution system was primarily installed between 1880 and 1970. The original installations were predominately cast iron and unprotected bare steel. Over time, cast iron and unprotected steel pipes have become vulnerable to leaks because of steel corrosion, joint leaks, and main breaks associated with small-diameter cast iron, which can adversely affect our system's integrity. Since 1971, new and replacement pipes have been mostly polyethylene plastic or cathodically-protected steel, which are much less susceptible to leakage. The plastic piping used today is the best available technology for new pipe. It eliminates corrosion issues and is resilient. As of January 2015, approximately 27 percent of the pipes in our system were cast iron, 25 percent were unprotected steel, 42 percent were plastic, and 6 percent were protected steel.

The projected cost of our gas distribution main replacement program in the 20-year plan is $7.7 billion, which is approximately 38 percent of the total $20.5 billion infrastructure plan. This distribution main replacement is, by far, our largest infrastructure initiative. The program's objective is to replace all remaining cast iron and unprotected steel pipes of a diameter 12-inches-or-less, with plastic pipes or protected steel pipes over a 20-year period starting in 2017. In order to accomplish this, we will need to significantly increase our current replacement levels of unprotected steel and cast iron piping. This smaller-diameter category of piping is the most prone to cast iron breaks and corrosion leaks based on industry and company risk analysis. In 2015, 70 miles of this piping was replaced. This GLRP includes ramping-up to 100 miles of replacement a year by 2021, which will allow for completion by 2036.

In addition to the main replacement program, which targets our smaller-diameter distribution pipes, our Distribution Supply Main Projects involve replacement or rehabilitation of cast iron and unprotected steel pipes in our backbone system. These backbone supply mains are typically larger than 12 inches in diameter, and carry a lower risk than cast iron and unprotected steel pipes of 12 inch diameter and below. Where possible, we intend to rehabilitate pipe by using trenchless technologies to prevent future leaks, reduce the costs of pipe replacement, and minimize digging and disruption. We expect that industry experience and research and development advances will improve liner technologies significantly over the next decade, and that these liners will become a cost-effective long-term solution within the course of this GLRP. We expect to spend nearly $1.8 billion, or 9 percent of our capital budget, on supply main work during this 20-year plan. The supply main replacement/rehabilitation program will also extend beyond the twenty year plan.

Gas Transmission Projects are also a major portion of the infrastructure plan, and focus on the replacement of vintage transmission mains. Approximately 14 percent, or $2.9 billion of the overall $20.5 billion, is targeted for vintage transmission pipe replacement. The work during this 20-year plan includes replacement of approximately 18 miles of the oldest, least ductile piping in the system, which runs through the Bronx and Westchester. The infrastructure plan also includes transmission projects to connect additional gas supplies to our service territory via replacement of existing gate stations with larger capacity gate stations and the installation of additional gate stations. This work is needed to assure adequate gas supplies to meet demand requirements, ensure competitive pricing for our gas supplies, and maintain reliability during contingencies, such as the loss of a gate station.

1.2.4 Enhancing the Customer Experience

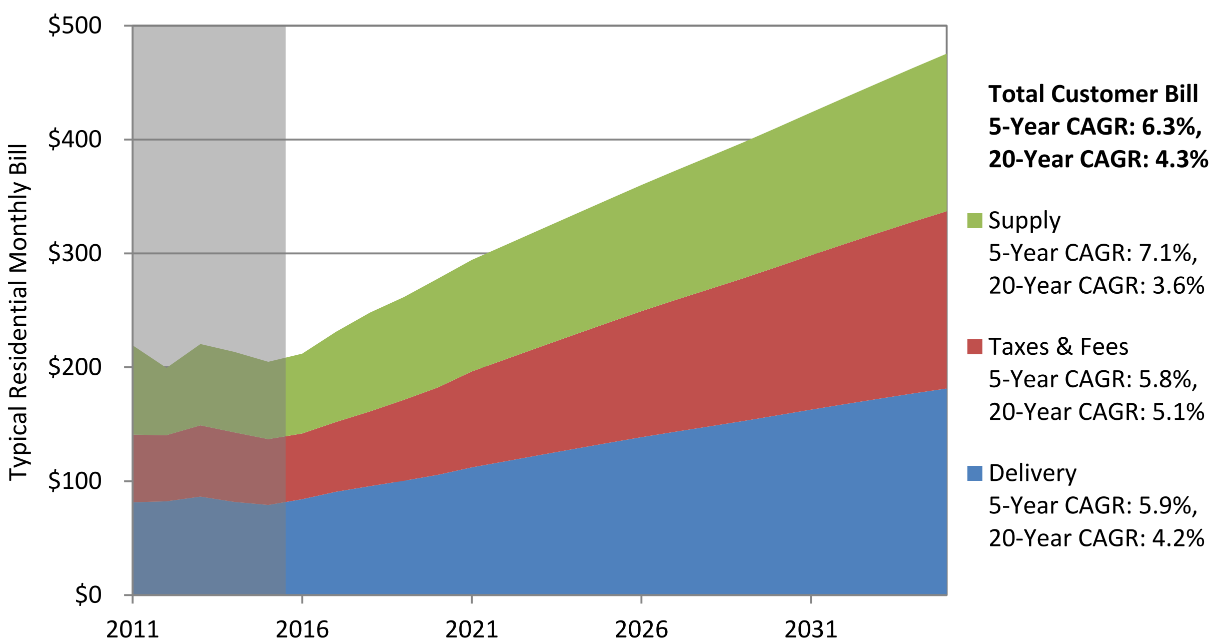
We will continue to seek new opportunities to minimize our customers' gas energy costs. Our projections of customer bill impact indicate an increase in bills over the 20-year plan of approximately 2 percent greater than inflation. This is predominately related to the increase in our planned replacement of gas distribution and gas transmission piping described in our Gas Infrastructure Plan Overview. Minimizing customers' gas energy costs will be accomplished by better project designs, more efficient management of gas infrastructure, increased system usage, lower gas commodity costs and the leveraging of technology. We are committed to cost reduction efforts such as maximizing trenchless technologies, growing the number of qualified employees and contractors, adding work and cost management tools to better track unit costs and performance indicators, and by establishing and maintaining performance cost goals.

The Con Edison customer bill encompasses three sections: delivery, supply, and taxes and fees.

- The *delivery* portion comprises about 41 percent of the current bill and represents the costs associated with transporting natural gas from Con Edison's point-of-supply to the customer.
- The *taxes and fees* portion makes up about 33 percent of the current bill, and is composed of sales taxes, Con Edison's property and income tax, and fees imposed by the state associated with energy efficiency and renewable portfolio programs.
- The *supply* portion is about 26 percent of the current bill, and includes the commodity cost of the gas supply and the transportation costs of delivering natural gas to Con Edison before redistribution to customers.

While only the delivery portion of the customer bill is directly under Con Edison's control, we work to mitigate increases to the bill through investments in transmission infrastructure that would give us access to lower cost sources of supply and by advocating for our customers to lower their taxes and fees. We forecast a 6.3 percent annual increase in the customer bill over the next five years and an average annual increase of 4.3 percent (approximately 2 percent greater than inflation) in the customer bill through 2035. This is due to near-term increases in supply costs, as well as modest increases forecasted in both the delivery and taxes and fees portions of the bill. See Figure 2-2.

Figure 2-2: Total Bill Impact for Residential Heating Customer[3]



[3] An average residential customer is projected to consume 135 therms of gas monthly.

As the energy landscape is changing, new methods of collecting customer usage data are emerging. An example is our AMI (Advanced Meter Infrastructure) "smart meter" initiative that will transform Con Edison's relationship with our customers by providing them with a two-way communication device for monitoring energy usage and helping them become better consumers. This also ties in with New York State's REV (Reforming the Energy Vision) initiative, which encourages programs that provide incentives for customers to actively participate in energy markets, control energy use, and take control of their monthly bill.

We are committed to having the right systems and resources in place to enhance the customer experience and to address key issues including cost, quality of service, and the ease of doing business with us. We will employ new media to offer customers an increased level of control over their gas use through energy management tools.

1.2.5 Focusing on Cost Management

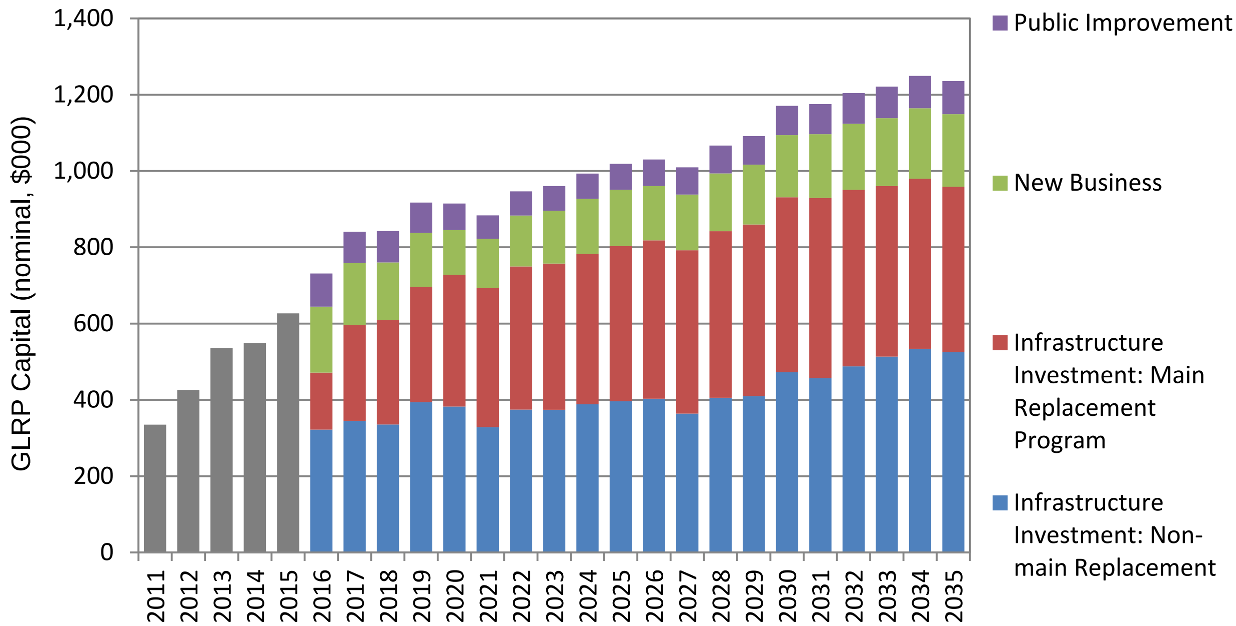
The Gas Organization's costs primarily involve construction, operation, and maintenance of the transmission and distribution infrastructure. Heightened awareness of our system risk, influenced by learnings from natural gas industry events both in our service territory and across the country, has increased the volume of incoming leak calls we receive, as well as the costs associated with responding to and repairing these leaks. We have also recognized a need to accelerate certain capital-intensive programs, such as our main replacement program, which will involve a significant increase in capital expenditures.

1.2.5.1 Capital Expenditure Patterns and Forecast

We anticipate capital expenditures to increase at an annualized rate of 3.5 percent during the 20-year planning horizon. See Figure 2-3. The main contributor to this spending growth is the acceleration and enhancement of our risk management programs, such as our distribution main replacement program, described in section 3.2.1. In 2015, we replaced 70 miles across our service territory, and by 2021, we will be ramping-up this amount to reach 100 miles per year. Within the next 20 years, 33 percent of the gas transmission system (30 miles) will also be replaced to improve safety and reliability. Further driving this expenditure growth is the increased main replacement in Manhattan, which will increase significantly from historical levels. Due to permit restrictions, density of utilities in the street and various other factors, replacing pipe in Manhattan can be up to six times more expensive than in the other boroughs. To save on our own project costs and avoid street disruption, we plan to coordinate and integrate our street work with concurrent Con Edison or NYC projects. Acceleration of near-term expenditures results in an annualized capital growth of 7.8 percent over the years 2015 through 2020. However, after 2020, our expenditures level off, and the forecasted annualized capital growth rate slows to a rate of 2.0 percent from 2020 through 2035.

To aid in managing work projects and the capital expenditures that fund them, Gas Operations identified the need for an integrated system to optimize its ability to plan and manage all types of work. Changes in technology, the economy, and both environmental and governmental policy present challenges for Gas Operations, and justify the need to implement a Work and Asset Management System. This system will permit Gas Operations to standardize work processes, improve work scheduling and prioritization, and provide a single repository for all work and asset data related to Con Edison's gas facilities. This will be a seven-year capital expenditure scheduled to commence in 2016.

Figure 2-3: Capital Expenditure History and Forecast ($000)



1.2.5.2 Operations and Maintenance Cost Patterns

The company's operations and maintenance (O&M) costs are also a critical component of our cost structure. These costs include our regular infrastructure maintenance programs, such as leak detection, leak repairs, system monitoring operations, inspections, and emergency response. In addition, increased capital-intensive infrastructure renewal programs drive incremental O&M expenditures associated with facilitating and transferring existing services to new mains.

The company has made a considerable effort to raise and maintain public awareness related to identifying and reporting gas odors. In wake of the upstate New York Horseheads incident in 2011, the Public Service Commission (PSC) issued an order to enhance gas safety public awareness. In response to this order, and to the more recent incidents in East Harlem and East Village, we have mounted an aggressive effort on many fronts to encourage the public to call if they suspect a gas odor. This has resulted in a significant increase in the company's gas leak calls, which have subsequently led to increases in our emergency response, leak repair, and other O&M activities, as explained in section 3.3.1. In addition, the company has increased the number of proactive leak detection surveys. These changes have been the main drivers for the increase in O&M costs that we have experienced over the past few years. We anticipate that leak calls will remain at these higher levels for the near future, which we project, will result in a higher level of O&M expenditures over the next five years (2016 – 2020). We also forecast an $11 million O&M expenditure increase in 2017, which will be associated with changes to our Service Line Inspection Program in order to comply with recent changes in the New York State code Part 255, regarding the definition of a service line.

Currently, approximately 95 percent of all system main leaks are associated with cast iron or unprotected steel mains. Therefore, we anticipate a sharp decline in our system leak rates in the later years of the plan as a result of our to our 20-year main replacement program, which will eliminate 12-inch-and-under cast iron and unprotected steel mains at an aggressive rate. This decline in leaks will result in a significant long-term decline in our O&M budget.

We are currently developing capabilities to perform ongoing strategic workforce planning that will help us proactively direct our workforce to manage the increased volume of work that these initiatives create.

1.2.5.3 Optimizing Cost

Our cost management objectives are to minimize expenses through a combined strategy of improved processes and operations, effective human resource management, the use of advanced technology, and by encouraging a culture of safety and regulatory compliance.

To carry out our 20-year plan, we will need to develop new skill sets and implement the appropriate training to support the growth of our employees; improve upon our management and organizational processes; enhance our cultural values to be one of safety and compliance; and develop new systems to take advantage of emerging technologies that will enable the company's initiatives. This will involve concentrating on four areas:

- **Job Skills and Organization:** Evolving the skill sets of our employees to meet the needs of tomorrow by implementing the proper hands-on training and to recruit and secure the talent we need by strategic workforce planning.
- **Information Technology:** Implement new projects to enable Gas Operations to streamline its work flows and improve efficiency.
- **Culture:** Developing a compliance culture that is best-in-class with tools to measure and check compliance.
- **Management Systems**: Implement new management systems or realign existing systems to meet changing organizational needs and to maintain clear accountabilities for estimating accuracy, tracking of results, analyzing variances, and implementing corrective actions as required.

1.3 Summary

This GLRP describes our intent to serve our customers cost-effectively with safe and reliable natural gas. It provides a strategic framework for implementing our plans, to manage demand and supply, invest in our infrastructure, provide environmental stewardship, and to serve our customers at a reasonable cost. Over the planning horizon, some uncertainties will be resolved, and other uncertainties will surface. It is because of this uncertainty that we must plan ahead.

In the process of developing a plan, we express desired outcomes, identify unknowns, and enhance our corporate ability to address contingencies and to adjust to new and unforeseen developments when they inevitably arise.

We developed this long range plan to reflect our most current thinking, approaches and roadmap towards the vision we plan to achieve over the next 20 years. During the planning period, we will measure our performance, manage our costs, and reduce the risks on our system. We have described the various uncertainties and identified key signposts, and we expect to update the plan as material changes occur in our operating environment. To accomplish our goals, we will collaborate with our customers, legislators, regulators, community leaders and others in order to communicate and implement our plan successfully.

This plan is consistent with the company's mission to provide safe, reliable, and cost-effective energy to our customers, demonstrate respect for the environment, and create an atmosphere that encourages safety and development of our employees. We will do so by managing demand and supply and by protecting our environment. We will integrate our system design to meet the needs of our customers and improve our system through optimal replacement and maintenance of our infrastructure. We will provide our customers with cost-effective, safe and reliable service, and train our workforce to serve them into the future. It is in these ways that we expect to successfully carry out our objectives and implement our long range gas plan.

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2. INTRODUCTION

This section provides an overview of the vision, mission, and long range (20-year) plan objectives for Con Edison's Gas Operations. It further reviews the unique requirements of our service territory, and describes the salient technical points of our transmission and distribution system.

2.1 Vision and Mission

The Con Edison Gas Operations vision statement is as follows:

"We will be industry best-in-class in safety, quality, compliance and customer experience."

The company's NYC and Westchester County service territory is a densely-populated, largely urban environment that is also host to one of the world's largest commercial hubs. Con Edison Gas Operations serves a wide range of residential, small business, large commercial, and energy generation customers in this territory who use natural gas for a variety of applications.

Individual homes and multifamily dwellings depend on natural gas provided by Con Edison for their space heating, water heating, and cooking needs. Con Edison has approximately 650,000 residential cooking gas customers and 290,000 residential heating customers. Our customers include the largest cooperative housing development in the world and the largest public housing authority in North America.

Commercial enterprises, such as Fortune 500 companies, and commercial buildings require natural gas for heating, combined heat and power generation (distributed generation), and as a fuel for transportation. Con Edison serves approximately 80,000 commercial heating customers and an additional 70,000 commercial non-heating customers. Our approximately 650 large-volume, dual-fuel, interruptible customers include in-city electric and steam generation plants. The reliability of gas service is critical to these generation plants and to the electric and steam customers in our service area, as the majority of NYC's in-city electric power generation and steam capacity is dependent on natural gas as a primary or backup fuel.

Given the density of our urban service territory, it is our highest priority to ensure the safe and reliable operation of our gas system and to use the lessons learned from gas industry episodes and incidents in the Con Edison system to continuously reduce risk. Given the harshness of recent winters in the Northeastern United States and the criticality of the area as a commercial hub, reliable gas delivery ranks high among customer expectations in our high-density service territory. System reliability is a priority because gas outages have the potential to affect many customers at any given time, and restoration of service requires a meticulous process that requires customer premise piping to be inspected and integrity tested prior to restoring gas service.

Con Edison Gas Operations is also dedicated to being a responsible steward of the environment. We support the reduction of energy consumption with energy efficiency programs and are committed to helping our community achieve a cleaner energy mix. Natural gas is the most efficient energy source for heating purposes, and the cleanest fossil fuel available to fulfill our area's energy needs. Con Edison environmental commitments include meeting the natural gas demand that supports the environmental goals of New York State (NYS) and NYC, and minimizing our own methane gas emissions.

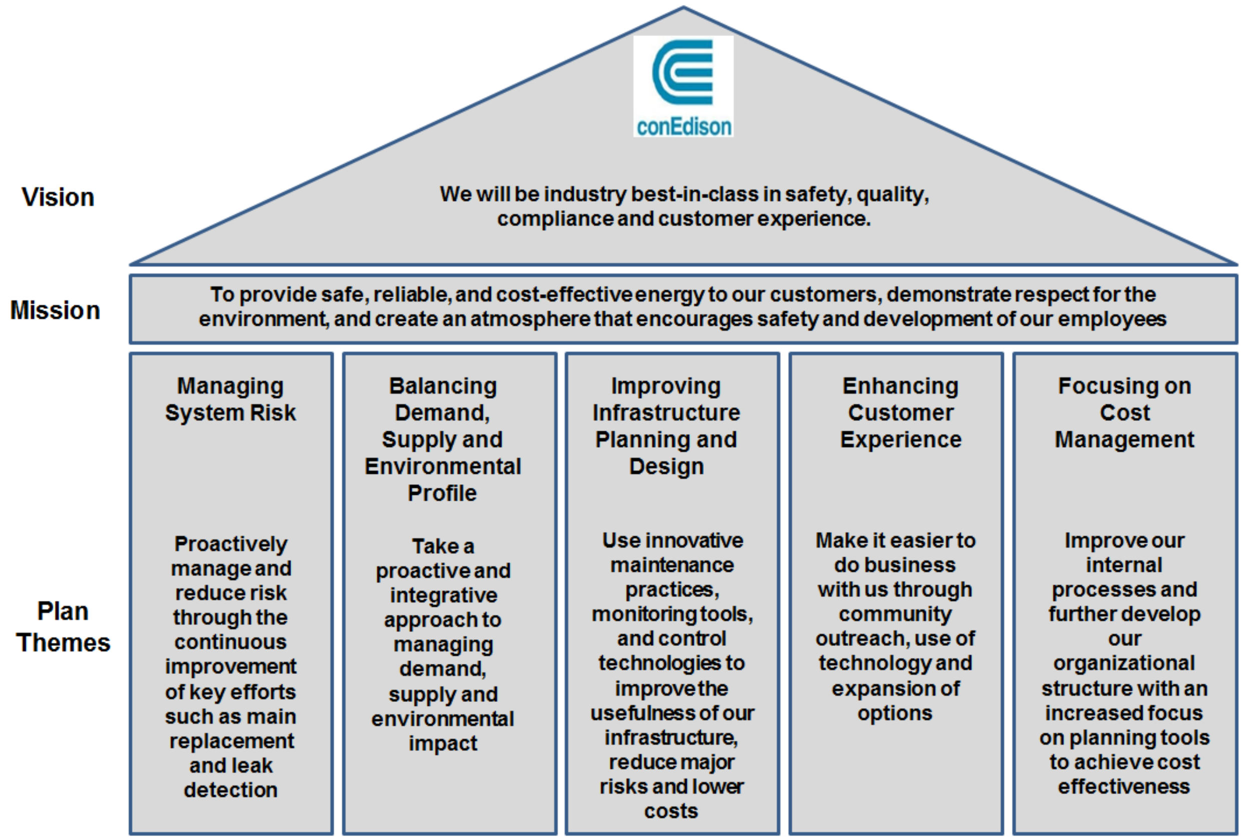
We also believe that the needs of NYC and Westchester County will continue to grow and change and we pledge to meet the needs of both existing and future customers. While appliance and building codes and standards will continuously improve the efficiency of gas-fired applications and reduce per-capita gas consumption, we believe overall gas demand will increase based on the need to reduce environmental impacts and use optimal fuels.

Con Edison has defined a strategic mission to align near-term objectives with our longer-term vision. Our mission to *deliver natural gas safely, reliably, and cost-effectively while enhancing the customer experience* serves as a touchstone for our planning and decision-making processes. We will respect the environment, create a culture of safety and compliance, and support the development of our employees.

We will also continue to upgrade and expand our natural gas infrastructure to meet the future needs of our customers.

We have developed five themes to guide the development of the Gas Long Range Plan. The plan themes reflect our mission and individually describe areas of Con Edison strategy by which individual programs and investments are developed. Figure 2-1 illustrates how the objectives support the Con Edison vision and mission.

Figure 2-1: Con Edison Gas Vision, Mission, and Plan Themes



2.2 Background on the Con Edison Gas System

2.2.1 Service Territory

As depicted in Figure 2-2 below, Con Edison's gas service territory is comprised of 460 square miles with approximately 5 million residents. The territory includes Manhattan, the Bronx, northern Queens, and almost all of Westchester County. As of August 2015, Con Edison served approximately 1.1 million firm customers and 650 large-volume interruptible customers, several of which are in-city gas-fired power generation plants.

Figure 2-2: Con Edison Gas Service Territory

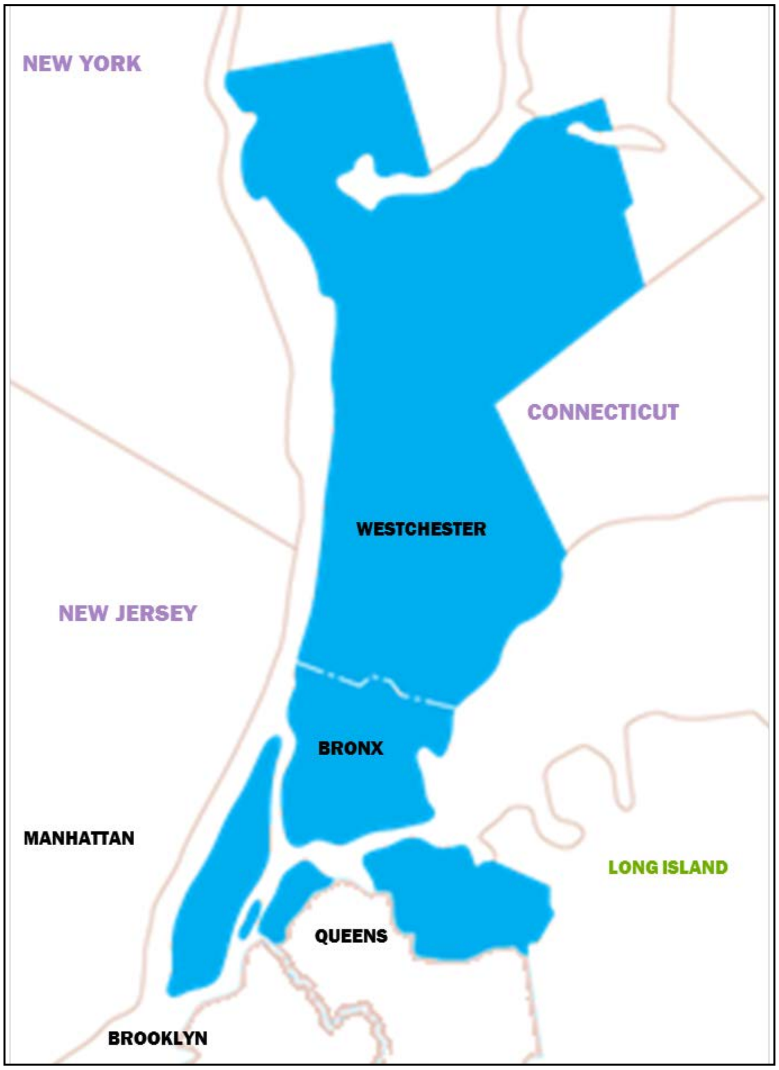


Table 2-1: Service Territory Statistics

Region	Square Miles of Gas Service Area	Number of Customers[4]
Bronx	42	304,799
Manhattan	28	332,887
Queens	43	207,517
Westchester County	347	233,083
Total	460	1,078,286

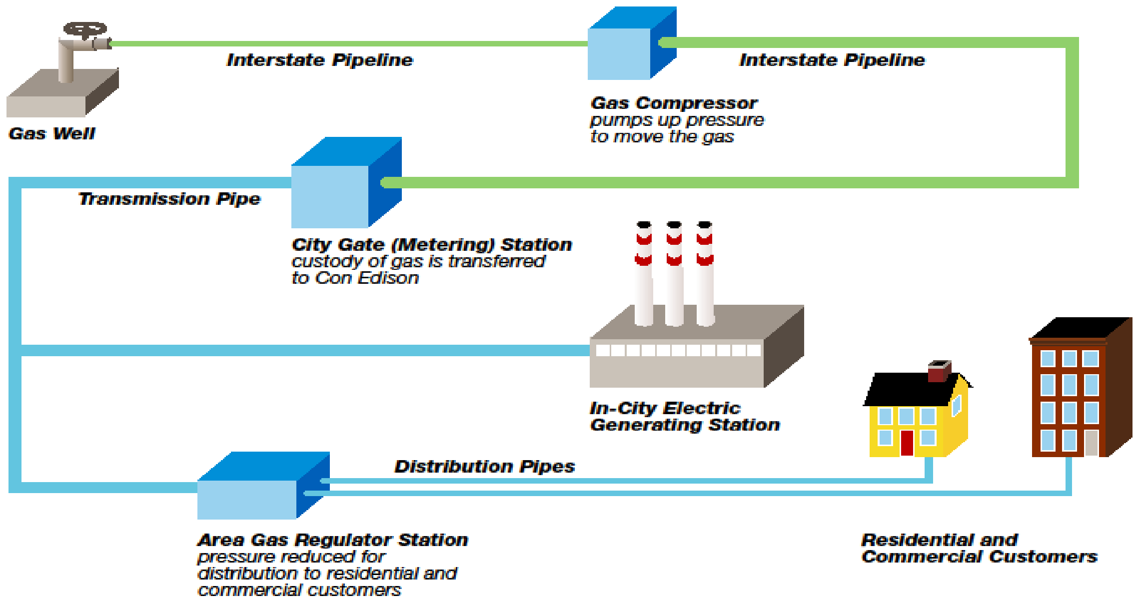
[4] The number of customers is determined based on the number of active Gas Accounts.

2.2.2 Con Edison Gas System

As illustrated in Figure 2-3 below, Con Edison manages a large, complex, logistically challenging, underground gas transmission and distribution infrastructure designed to rigorous reliability and safety standards.

Our gas system consists of more than 4,300 miles of main transporting more than 300 million dekatherms of natural gas annually. Gas is transported from interstate transmission pipelines, through gate stations, into Con Edison-owned transmission pipelines and then through key regulator stations into backbone systems and finally, into our distribution network to supply our customers.

Figure 2-3: Illustration of Con Edison Gas System



We have gas mains and facilities installed under almost every street and/or sidewalk in our service community, and we are constantly working to maintain or improve our infrastructure. Examples of this work are shown below in Figure 2-4.

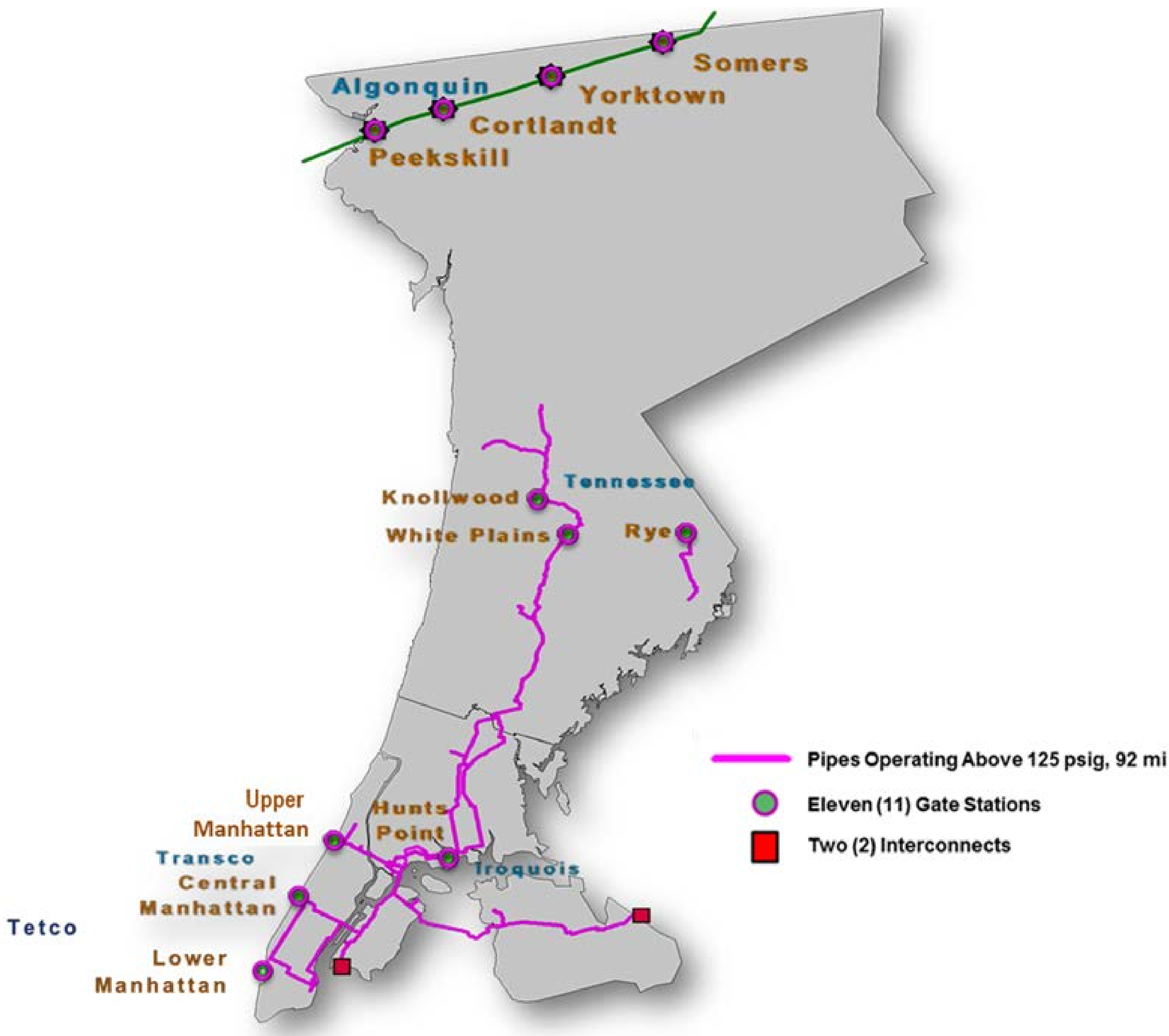
Figure 2-4: Installation of Con Edison Gas Main and Regulator Station

2.2.2.1 Gas Transmission

Con Edison's gas transmission system is comprised of 92 miles of 6 inch to 36 inch diameter cathodically-protected steel mains, operating at pressures ranging from 125 psig[5] to 350 psig, in Manhattan, Queens, the Bronx and Westchester County. The majority of these mains were installed between 1947 and 1973.

Of these 92 miles of transmission main, 46.5 miles operate at a maximum allowable operating pressure (MAOP) of 350 psig in Manhattan, Queens, and the Bronx. The remaining 45.5 miles operate at a MAOP of 245 psig in the Bronx and Westchester. Con Edison's transmission system is currently supplied by seven gate stations and the distribution system is directly supplied by four additional gate stations at the locations shown in Figure 2-5 below. The Hunts Point Station in the Bronx is the demarcation point between the 245 and 350 psig transmission systems. Gas flows seasonally through the two pressure systems by way of a regulator station during the heating season and a compressor station during the summer.

Figure 2-5: Con Edison Gas Transmission System



[5] Pound-force per square inch gauge

The seven gate stations supplying the gas transmission system are from four pipeline companies—two Transco stations in Manhattan, three Tennessee stations in Westchester, one Iroquois station in the Bronx, and one Texas Eastern (Tetco) station in Manhattan. We have an additional four gate stations in northern Westchester that supply our high-pressure distribution system from Spectra Energy Algonquin Pipeline.

Con Edison's transmission system is also part of a larger regional network called the New York Facilities (NYF) System. The NYF System is jointly operated and maintained by National Grid and Con Edison. Con Edison is connected to National Grid at two bi-directional metering station interconnects—one at Newtown Creek at the Brooklyn/Queens border and one at Lake Success at the Long Island/ Queens border.

2.2.2.2 Gas Distribution

Con Edison's gas distribution system consists of 4,239 miles of main, operating at pressures less than 99 psig in Manhattan, the Bronx, Queens and Westchester.

Key regulator stations and backbone systems, called supply mains, are critical facilities that transport gas from transmission to distribution systems. Most of these supply mains are large diameter and are located under major roadways.

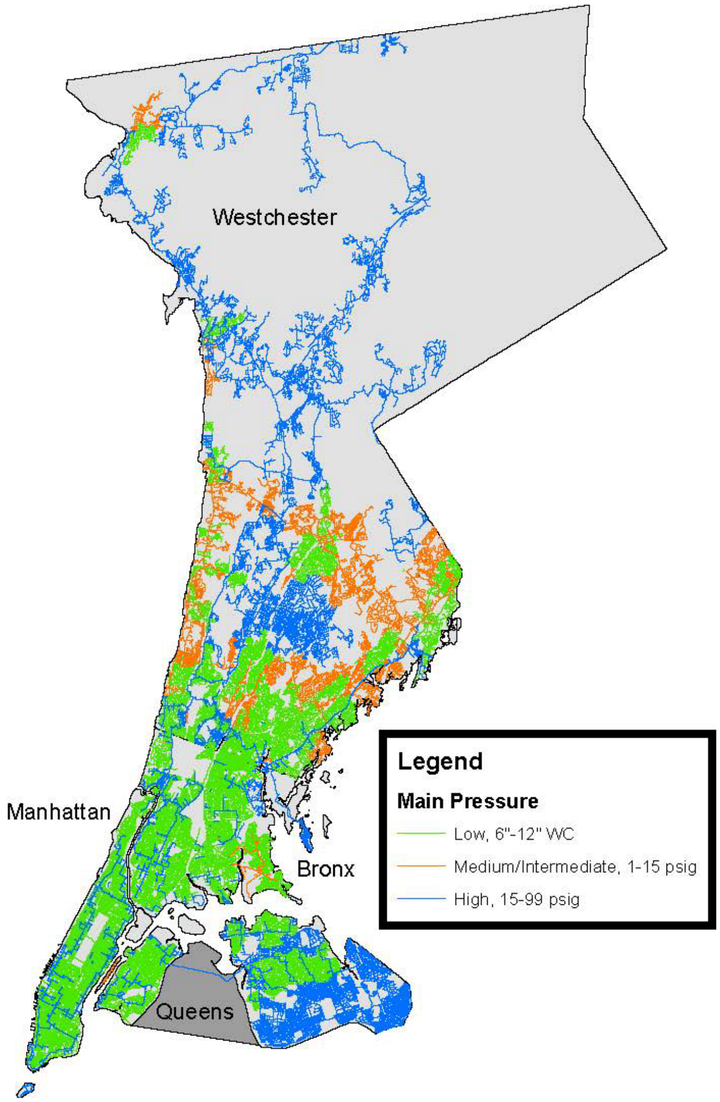
The remaining miles of the distribution system consist of smaller diameter mains, operating at a variety of pressures:

- 33 percent of the system is high-pressure (HP) operating between 15–99 psig.
- 11 percent of the system is medium pressure (MP) operating between 1–15 psig.
- 56 percent of the system is low pressure (LP) operating between 4–12 inches of water column (inWC).

As noted above, a large portion of the distribution system consists of low-pressure mains that support smaller residential heating and non-heating loads. This configuration of the distribution system limits the type of growth the system can accommodate without significant enhancement or reinforcement.

Emanating from the distribution mains, 370,000 steel, plastic, and copper services connect the distribution system to customer premises. See Figure 2-6 below.

Figure 2-6: Con Edison Gas Distribution System



The distribution system was primarily installed using cast iron, unprotected steel or coated steel mains. Since 1971, as mains and services are replaced or added, the pipe being installed is composed of polyethylene plastic or cathodically-protected steel to increase its longevity and reduce corrosion and leaks. Today, approximately 27 percent of the mains are cast iron, 25 percent are unprotected steel, 42 percent are plastic, and 6 percent are protected steel. Approximately 67 percent of the services are plastic.

2.2.2.3 Design Specifications

Con Edison's gas transmission and distribution systems are designed to meet the requirements of the gas safety code: NYS Codes, Rules and regulations Part 255. In addition to Part 255, Con Edison's gas transmission and distribution systems are subject to a variety of federal, state, and city regulations, along with standards published by professional organizations.

The Con Edison system is designed to meet the load requirements of all firm customers[6] 24 hours per day, 365 days per year, based on the forecasted peak hourly load.

The purpose of these design criteria is to govern key reliability, safety, and system integrity conditions:

- Maintain the reliability of supply mains in the event of an outage to a gate station or critical regulating station.
- Maintain the reliability of the transmission system.
- Reduce the potential of incoming gas leaks each year.
- Maintain the system at optimal operating pressures while satisfying detailed design basis conditions.

2.2.2.4 Reliability

Con Edison's gas customers have come to expect a high level of gas system availability, and our goal is to consistently meet that expectation. We have lowered operating pressures in our high-pressure systems in Queens and Westchester. This reduced pressure allows for increased reliability for increasing capacity and adds to public and employee safety. Over the past ten years, gas system availability (time of uninterrupted gas service out of total system time) has been greater than 99.999 percent.

During the recent Superstorm Sandy, the dependability of our gas system was tested. Although it had a much greater impact on Con Edison's electric system, Superstorm Sandy also identified some significant vulnerabilities where gas system reliability could be enhanced to withstand future storms. We identified five key system components that contained storm vulnerabilities, and have designed gas "storm hardening" programs and projects to address these vulnerabilities.

The five system components targeted by the storm hardening work are:

- flood-prone piping
- tunnel facilities
- the liquefied natural gas (LNG) plant
- regulator stations/remote operated valves
- service vent lines

Flood-prone pipe replacement involves replacing 12-inch-and-less low-pressure cast iron and unprotected steel pipe in flood-prone areas, which is taken to mean all land included in the Federal Emergency Management Agency (FEMA) 100-Year Flood Zone. Hardening work for the other four components has included enhancing the structures that protect the entrances to our tunnel head-houses and house critical LNG plant controls, installing new devices to protect our high-pressure service vent lines, and waterproofing critical components of our regulator stations and remotely-operated valves to reduce the risk of water intrusion. For these components, we look to harden all facilities within the 100-Year Flood Zone plus three feet of flooding along the horizontal plane ("FEMA 100 Year Flood Zone + 3 feet"). Construction work for these storm hardening projects and programs began during our 2014-2016 rate case. Our storm hardening designs have also been incorporated into our system design criteria, and so will continue to be prevalent in programs and projects located within flood-prone areas going forward.

For 2017, the company has created a new capital program to address system reliability called the *Gas System Vulnerability Elimination Program*. This is a program to proactively identify vulnerable areas of our infrastructure, where the failure of a single component could result in a large-scale outage. During the next rate case period, capital replacement and reinforcement projects will be initiated to mitigate

[6] For off-peak firm and other non-firm customers, Con Edison's obligations are less stringent, allowing interruptions at higher temperatures or for other reasons.

targeted system vulnerabilities. To continue high-reliability performance, the company will strive to maintain and exceed its high performance levels in system reliability and customer restoration.

2.3 Performance, Cost, and Risk Management

One of the company's greatest management challenges is to assure a safe gas system and balance the often competing priorities of risk reduction, cost control, and performance. Our strategic priorities and specific initiatives are designed to improve one or more of these attributes and make informed trade-offs. For example, the desirable result of reducing risk through programs such as our main replacement program will result in increased capital expenditures. Increasing our gas system performance through measures such as faster emergency response, improving system reliability, and reducing our environmental impact can also have large cost implications on both the capital and operations and maintenance budgets. In response, the company develops strategies to mitigate the cost increases otherwise associated with these strategic priorities. For example, in order to balance performance improvement and risk management with capital cost impacts, we use a formalized optimization process described in section 6.1.4. We make all business decisions related to operation, maintenance, and investment in the gas system in the context of their impact on the system's performance, cost, and risk metrics.

2.4 Summary

This section provided an overview of Con Edison, our customers, and our service area. The section also described our plan objectives and plan development process.

The remainder of this GLRP addresses each element of the plan in further detail.

Section 3 outlines the initiatives we are undertaking to manage system risk. Specifically, we discuss our plan to manage the risk of a gas distribution event through enhanced quality assurance and control, prevention, detection, and response mitigation strategies.

Section 4 provides an outlook for gas supply over the planning period, and our strategic priorities for ensuring that adequate supply reaches our service territory.

Section 5 discusses the natural gas demand and customer growth aspects of the plan. It provides details on anticipated customer needs and the impacts that economic growth, environmental regulation and technology development will have on our gas usage forecasts.

Section 6 describes our infrastructure plan, in particular, the programs and initiatives we undertake to maintain our system and to take on new customers. It further provides details on our capital plan estimates during the plan horizon as well as steps we've undertaken to manage our capital investments.

Section 7 describes what Con Edison is doing to enhance the customer experience. Efforts are underway to engage customers using the platforms they are most comfortable with and to adapt our plans to meet the changing expectations of our customer base.

Section 8 describes cost management practices that affect our workforce, including skill needs and the business continuity planning necessary to manage and maintain a complex gas system in a consistently safe, reliable and cost-effective manner.

Section 9 is a summary that recounts the internal and external challenges that face a public utility like Con Edison, the cost-reduction opportunities that we are pursuing and some of the signposts we are watching to anticipate change and prepare for it.

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3. MANAGE SYSTEM RISK

We are committed to delivering our gas service safely, with high reliability and resilience. To execute on this commitment and support the company's corporate strategy objective of strengthening its core utility businesses, Con Edison has a comprehensive strategy in place to manage system risk. In this section, we will focus specifically on how we manage the risk of a gas distribution event through enhanced quality assurance and control, prevention, detection, and response mitigation strategies. In order to help manage this risk, we promote a company culture which has a strong focus on both public and employee safety.

Con Edison uses learnings from both industry and company incidents to manage risk and minimize the risk of such future incidents. Recent events, such as the unfortunate Horseheads, East Harlem and East Village incidents have created a heightened public awareness of risks associated with natural gas systems. This awareness has affected our internal procedures and programs, and has also led us to expend considerable efforts to raise and maintain public awareness. We have encouraged the public to call if they suspect a gas odor with our "Smell Gas, Act Fast" campaign, and this has resulted in a significant increase in the number of gas odor calls, which have subsequently led to increases in our emergency response, leak repair and other O&M activities. Con Edison continues to maintain a high emergency response performance in light of these increased leak calls.

The increase in leak call volume has resulted in an associated increase in our Operations and Maintenance (O&M) costs since 2013, which includes emergency response, leak repairs, system monitoring operations, and our regular infrastructure maintenance and inspection programs. We anticipate that leak call volumes will remain high, and have planned a five-year O&M cost forecast that will allow us to maintain our high response, while enhancing operational performance. Throughout the later years of the plan, we will begin to see a decline in our system leak rates, as a result of our 20-year main replacement program. This decline in leaks will lead to a significant long-term decline in our O&M budget.

Given the complexity of our gas system, there are numerous inherent operational, financial, and safety risks that could potentially impact our customers, the communities we serve, our employees, and the public at large. The company evaluates its risks and seeks to mitigate them whenever possible to improve its performance. As a result, these risks drive many O&M programs and capital investments, and are considered within the project prioritization process when planning operating and capital budgets.

3.1 Enterprise Risk Management

The company has always placed a high priority on identifying and mitigating risk and has implemented a formal Enterprise Risk Management (ERM) process to monitor this activity. Con Edison's ERM program, initiated in 2005, is the subject of ongoing refinement to improve its usefulness. Through a collaborative process of risk assessment, ERM has become embedded into the planning and budgeting functions of all operating groups. As part of the annual ERM cycle, each group identifies operational and administrative risks, and assesses their severity, likelihood, and controllability. These assessments are reviewed and adjusted through the active participation of senior management.

ERM is a process to identify, analyze, integrate, evaluate, manage, monitor, and communicate risks across the company. Our risk management program has three primary objectives:

- **Systematic risk mitigation**: Continually evaluate the likelihood, severity, and control mechanisms of risk categories and ensure proper risk mitigation and preparedness. Promote a culture of comprehensive risk assessment and prevention throughout Con Edison.
- **Proper allocation of resources**: Integrate ERM into the development and evaluation of business cases. Ensure that annual budgeting and longer-term program development allocate appropriate funding for risk mitigation.

- **Enhanced communication and transparency**: Allow for greater transparency and collaboration by actively involving all levels and functions of the organization, up to and including the CEO and Board members. Establish clear accountability by assigning specific officers to each risk.

As shown in Table 3-1 below, ERM allows Con Edison to translate a broad concept such as "risk" into quantifiable measures of severity, likelihood, and controllability.

- **Severity**: Estimate of the potential impact of the event on public perception, safety, or finances
- **Likelihood**: Estimate of the likelihood that an event will occur within a set timeframe based on past experience and current probability
- **Controllability**: Estimate of the likelihood that existing detection or control mechanisms could predict or prevent the event

For each identified risk, these three components are assigned a value from 2 to 10. These component factors are then multiplied to produce a Risk Priority Number (RPN). The RPN quantifies the relative priority of risks across the company. This value is a key input into our Capital Optimization process described in section 6.1.4.

Table 3-1: Risk Assessment Factors

ERM RISK ASSESSMENT FACTORS
CEI
YEAR 2015

The following table should be used as a guide for assessing risk within the context of an enterprise risk management system. Consider the most probable realistic worst-case scenario.

Severity Factor

Estimate the severity of the event using the five-point scale and use the highest score of the three perspectives:

	Factor	Public Perception Perspective	Safety Perspective	Financial Perspective (After taxes and insurance)
Insignificant	**2**	No effect	First Aid	up to $3M
Moderate	**4**	Minor impact	Medical	$3 to $15M
Significant	**6**	Marginal impact	Restricting	$15 to $50M
Severe	**8**	Significant public perception impact	Disabling	$50 to $250M
Catastrophic	**10**	Major public perception impact	Fatality	>$250M

Likelihood Factor

Estimate the frequency of occurrence of the triggering event based on past experience as well as considering the current probablity of the event occuring:

	Factor	Description
Rarely	**2**	One incident in 10 years
Unlikely	**4**	One incident in 5 years
Likely	**6**	One incident in 3 years
Frequent	**8**	One incident in 1 years
Certain	**10**	Greater than one incident per year

Controllability Factor

Determine the likelihood that existing detection or control mechanisms would predict or prevent the triggering event:

	Factor	Description
Almost Certain	**2**	Excellent detection and control over the triggering event
High Probability	**4**	Highly predictable detection and control over the triggering event
Moderate	**6**	Detection and control are reasonably achievable
Low	**8**	Detection and control are very limited
Impossible	**10**	No ability to detect or control the triggering event

The outputs of the ERM process are detailed mitigation plans for each key risk. Illustrative examples of risks are set forth in Table 3-2 below.

Table 3-2: Illustrative Gas Operations Risks

Event	Illustrative Mitigation Programs
Gas distribution system events (e.g., explosion/fire caused by damages, inside/outside leaks, etc.)	• Monthly leak surveys of the entire main system • Safety inspections of key assets • Maintain low inventory of leaks pending repair • Install corrosion-resistant plastic mains and services • Operate at lower pressures than historical past practices • Timely response to gas odor complaints • Accelerate annual main replacement program • Increase leak-qualified workforce • Continuous cast iron frost patrols from January through April • Leaking service replacement program
Gas transmission system events (e.g., explosion/fire caused by damages, inside/outside leaks, etc.)	• Patrols of transmission system (minimum weekly) to proactively identify excavators who fail to follow utility mark out protocols • Monitoring of excavation activities within 25 feet of transmission mains • Installation and maintenance of remotely-operated valves • Notification protocols with local fire departments for transmission leaks
Workforce Management: Inability to meet mandated replacement programs, accommodate growing demand, and respond to increasing odor complaints	• Increased employee hiring • Employee development and training streamlined into cohorts • Increased contractor onboarding • Yard expansion plan in place for each operating region
Cyber Security: Cyber infiltration of corporate networks resulting in the inability to control, monitor, and account for gas deliveries and maintain system pressures	• Enhanced Cyber Attack Response Plan • Deploy "Tipping Point" technology (intrusion prevention/detection) on corporate networks • Segmentation of network/systems using firewall technologies • Two-levels of authentication for backup • Regular drills

Other Gas Operations risks tracked within ERM include:

- Water main breaks that might impact our low-pressure gas system and cause an extensive customer outage
- Loss of gas supply into the service territory for an extended period of time
- The physical security of a company facility being compromised by a terrorist attack or act of sabotage

3.2 Prevention

Prevention is the most integral part of our comprehensive approach to manage system risk. For example, to prevent a distribution event, there are programs in place to mitigate primary failure causes that compromise the integrity of our mains resulting in a leak condition. Due to the large inventory of cast iron and unprotected steel in our service territory, our gas distribution system generates a large volume of leaks. Leak repairs constitute a major component of our overall O&M costs, totaling approximately $50 million per year.

3.2.1 Main Replacement Program

The major proactive program to reduce the risks associated with leaks on our gas system is the replacement of cast iron and unprotected steel distribution mains with polyethylene pipe or cathodically protected steel pipe. Wrought iron pipe replacement is also addressed in this program, and is included in the cast iron category. This program permits us to improve public and employee safety by reducing the potential risk of loss of life, injury, and/or property damage.

In addition to the safety benefits, main replacement has the added benefits of reducing:

- financial expenditures necessary to respond to and repair gas leaks
- negative public reaction/loss of public confidence
- insurance deductibles and increases in insurance premiums

Since 2010, the company has accelerated its main replacement program in order to strengthen our focus on safety. Beginning in 2017, replacement of main will become a stronger focus in our capital expenditure program with a significant emphasis on reducing the risk posed by cast iron and unprotected steel distribution mains. Our main replacement program will target:

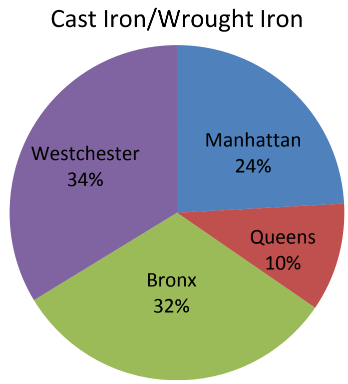
- cast iron distribution mains when interference or encroachment criteria is met, as is our current practice
- all cast iron gas mains[7] 12-inch-and-under by the year 2036 (within 20 years), which expands upon our current program that targets the replacement of 8 inch and under mains
- all unprotected steel gas mains 12-inch-and-under by the year 2036 (within 20 years), which expands upon our current program that targets the replacement of 8 inch and under mains

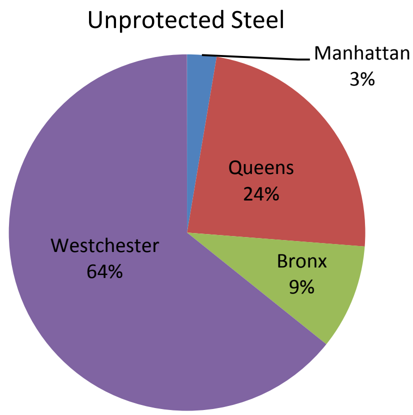
Con Edison's enhanced main replacement program will utilize a replacement prioritization model that allows us to optimize risk reduction (see the next section). We will also incorporate the replacement of these mains within geographic areas on a risk prioritized basis. These and other planning efforts will form an integrated capital program to address our aging system.

Approximately 1870 miles of main will be replaced during our 20-year main replacement program. This total includes all 12-inch-and-under cast iron and unprotected steel inventory projected to be remaining in the system as of January 1, 2017. This inventory is made up of roughly equal percentages of both cast iron (including wrought iron) and unprotected steel mains, and is distributed throughout the system as illustrated in Figure 3-1.

[7] The cast iron main replacement program category also encompasses wrought iron mains up to 12-inches in diameter.

Figure 3-1: Distribution of 12-inch-and-under Inventory Targeted in the 20-year Main Replacement Program[8]





Prior to this revision of our GLRP, the gas distribution main replacement program targeted replacement of all 8-inch-and-under diameter cast iron and unprotected steel distribution gas mains. Based on recent analysis and benchmarking, we have expanded our main replacement prioritization program to include up to 12-inch cast iron and unprotected steel. This revision permits us to further reduce the risk of an incident impacting public or employee safety due to natural gas leaks from cast iron or unprotected steel mains.

Due to their greater thickness, cast iron and unprotected steel mains larger than 12-inches in diameter are less susceptible to the cast iron breaks and corrosion leaks that are associated with many natural gas incidents. These larger distribution mains will be addressed concurrently through our supply main programs, explained in section 6.3.2. These programs include both rehabilitation and replacement of larger diameter cast iron and unprotected steel mains, and are anticipated to be completed beyond the scope of this 20-year GLRP.

3.2.1.1 Main Replacement Prioritization Model

We currently optimize the removal of cast iron and unprotected steel mains by targeting mains that are predicted to contribute most to the likelihood of a gas distribution event. In order to do this, the company has historically used a main replacement prioritization model. This model prioritizes unprotected steel and cast iron main segments by calculating a relative condition and risk score for each pipe segment. These scores are generated by analyzing main condition parameters (e.g., diameter and age), previous

[8] The inventory for the 20-year main replacement program is subject to change depending upon 2016 main replacement program results.

failure history, the physical area surrounding the main (e.g., adjacent main failures), as well as certain risk factors (e.g., ease of gas ingress).

We are continuously working to better understand correlations between leaks and additional condition and consequence factors. To enhance our main replacement prioritization model, we have recently added additional condition factors (such as concentration of vintage services) and consequence factors (such as population density). We will also further integrate the Distribution Integrity Management Program (DIMP) requirements with our main replacement prioritization software model. The DIMP program calculates a separate risk score for each geographic area, using a Frequency of Failure factor, and four Consequence of Failure factors (population density, hazardous leaks, mechanical fitting failures, and cast iron breaks). Going forward, we plan to further utilize these DIMP risk scores by integrating them into the main prioritization model score assigned to each pipe segment.

3.2.1.2 Geographic Main Replacement Approach

Beginning in 2017, we will begin using our main replacement prioritization model to target geographic areas that contain high concentrations of prioritized main, which will supplement the traditional model output of prioritized high-risk main segments. This will improve the way that the results from the model are translated into tangible construction projects. Prioritized geographic areas will be selected for construction with a target to complete each geographic replacement project within a one-year construction season.

This geographic replacement approach will significantly change the way that mains are prioritized and replaced. Prioritization will be predominately determined based on “area” scores instead of individual segment scores. This approach will concentrate annual replacement across our service territory to the areas that will result in the greatest risk reduction, and will also allow for bundling of other work streams within the selected areas. Other work activities that can be integrated into these area replacement projects include:

- installation of isolation valves
- new business (NB) services
- oil-to-gas service conversions (OTG)
- winter load relief (WLR)
- regulator station installations
- replacement/rehabilitation of large-diameter cast iron and unprotected steel

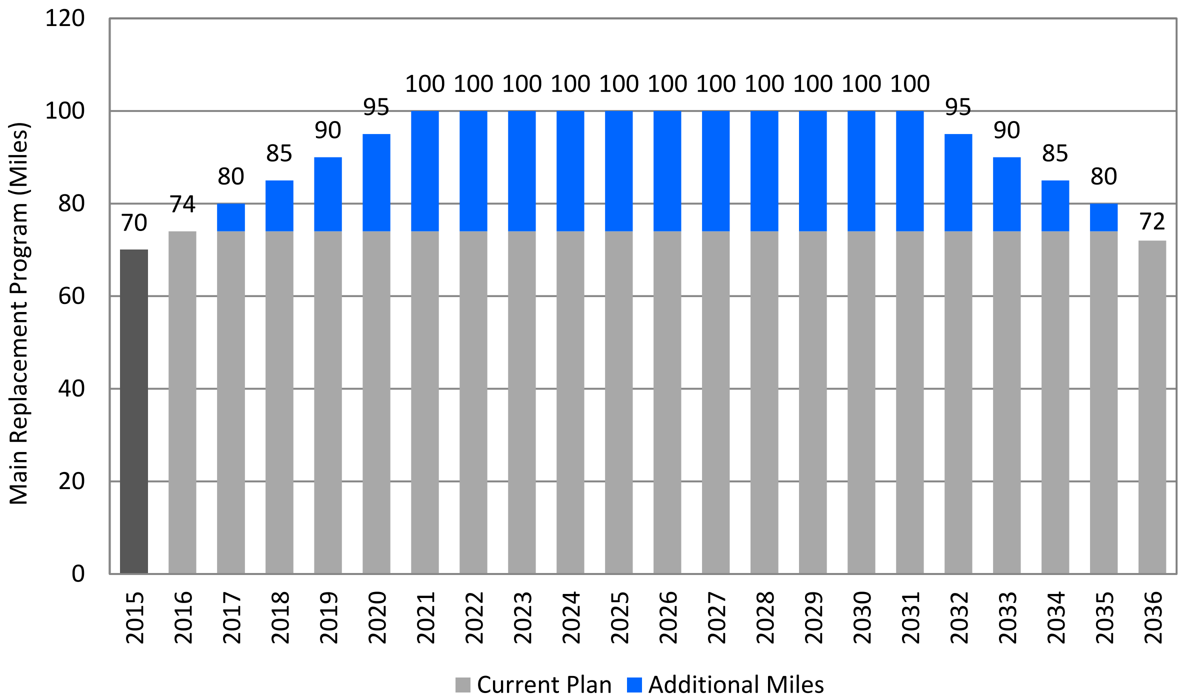
Additionally, the future impact to communities will be minimized by addressing all gas main and service concerns during one construction period. Geographic replacement is key to the development of our 20-year plan to replace all cast iron and unprotected steel distribution gas mains 12-inch-and-under.

3.2.1.3 Accelerating the Rate of Main Replacement

Original plans for our main replacement program included a projected timeline of 34 years to eliminate all 12-inch-and-under cast iron and unprotected steel. In order to reach our 20-year target for the replacement of 12-inch-and-under cast iron and unprotected steel, the annual mileage goal of the main replacement program will be increased significantly. As shown in Figure 3-2 below, we replaced 70 miles of cast iron and unprotected steel pipe in 2015, and plan to replace a minimum of 74 miles in 2016. The company will propose to ramp-up to 80 miles in 2017, and then to increase the annual replacement mileage by 5 miles every year, until reaching 100 miles by 2021, as illustrated in Figure 3-2. This will permit the completion of the 20-year program in 2036 (beginning in 2017) to eliminate approximately 1,900 miles of 12-inch-and-under cast iron and unprotected steel. The majority of replacement in this 20-year program will be geographic area projects. The remainder of the replacement mileage will be selected based on emergent issues, public improvement interference, and isolated high-risk main segments highlighted and prioritized by the main replacement prioritization model.

Incorporated into this yearly replacement mileage will be an annual target of four miles of flood-prone pipe replacement until all cast iron and unprotected steel inventory 12-inch-and-less is replaced within the FEMA 100 Year Flood Zone. As of June 2015, we had 49 miles of flood-prone pipe in our system. Prioritizing the replacement of this pipe will help to harden our gas distribution system against the impacts of a future storm, as explained in section 2.2.2.4.

Figure 3-2: Main Replacement Program Annual Mileage Forecast



3.2.2 Transmission Main Replacement Programs

The company selects transmission main projects that support its efforts to provide safe and reliable gas service to its customers at reasonable rates. To meet this objective, Con Edison will employ a risk-based approach to identify and replace vintage segments of the gas transmission system. This will include the elimination of transmission piping with the following characteristics:

- Operating at ≥ 30 percent SMYS
- Original pressure test for the main does not meet the present-day standards. Some of our main was originally tested with air at a pressure of approximately 1.2 times the MAOP. Present requirements require use of water as the testing medium at 1.5 times the MAOP.
- Material has been evaluated for facture toughness and has been found to have fracture toughness below that of newly-installed gas piping, and therefore, a lower degree of ductility. These mains may also have associated fittings that may affect the safe operation and overall reliably of the section of main.

Within the next 20 years, the company plans to replace approximately 30 miles (33 percent) of what are deemed to be the riskiest mains in the gas transmission system that meet these criteria. Replacement of vintage gas transmission piping is also a major portion of the infrastructure plan. $2.9 billion of the overall $20.5 billion budget (approximately 14 percent) is targeted for vintage transmission pipe replacement. Beyond the scope of this GLRP, we also have plans to complete the replacement of all vintage transmission main.

We will also be replacing mains that will allow us to eventually meet the company's future transmission system design criterion, which calls for the system, with the exception of radial systems, to withstand the loss of one gate station during a peak hourly load (without causing customer outages).

The replacement of these mains gives the company the opportunity to increase capacity for future growth at a minimal incremental cost, by replacing the existing mains with larger diameter mains. All new replacement transmission piping will be made of material that permits the pipe to operate below 20 percent SMYS. This will reduce the risk associated with these pipes, as well as provide long-term savings of costs associated with maintaining aging transmission infrastructure. The new pipes fall below the regulatory threshold and definition of being transmission pipe, and will be identified as distribution piping operating above 125 psig.

3.2.3 Security

Our security programs address physical and cyber vulnerabilities to enhance safety and reliability for our customers and employees.

3.2.3.1 Cyber Security

Cybersecurity is a priority at Con Edison. As there is increasingly more interconnectivity between elements of the gas system, Con Edison is vigilant in defending against the potential for a remote attacker to compromise customer accounts, gain access to protected information, affect physical equipment, and threaten system reliability. Con Edison has a Cybersecurity team within its Information Technology department responsible for deploying preventative cyber security control technologies and for continuous monitoring of networks. Con Edison also has a first-in-the-industry Cyber Action Team. It is dedicated to responding to and investigating security threats as part of each department's Cyber Incident Response Plan, as well as for helping to create controls that prevent such incidents going forward. This combination of proactive and reactive measures helps to protect the security and reliability of Con Edison's Gas System.

3.2.3.2 Physical Security

Included in the Gas Capital Budget are specific projects that address potential security vulnerabilities at critical Gas Operations facilities. These projects include the installation and/or upgrade of physical security components in order to secure and mitigate threats to critical Gas Operations facilities. Mitigation measures will be designed to deter, delay, detect, assess and respond to potential threats. These physical security measures may include closed circuit cameras providing live feed of the sites, digital video recording of the live feeds, lighting to provide 24/7 camera coverage, intrusion detection, continuous physical perimeter barrier, electronic access control, and/or security signage.

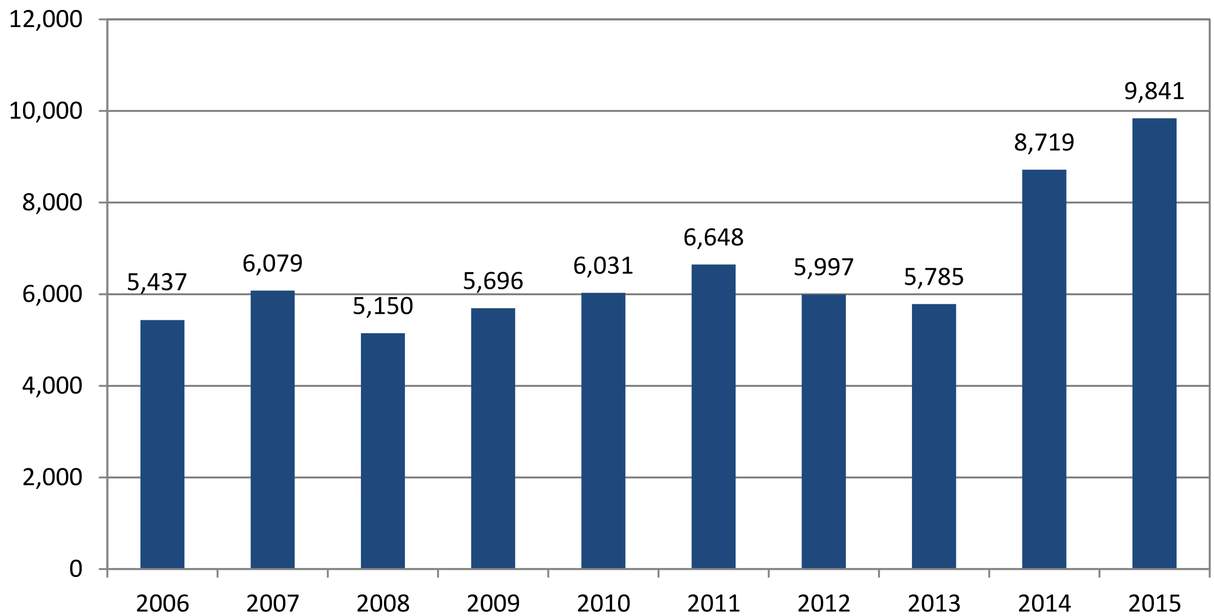
3.3 Gas Leak Detection

Detection of gas leaks is critical to our comprehensive approach to risk management. Through detection programs, we can determine where vulnerabilities on our system exist, decide upon the appropriate method of response and remediation, and eliminate a potential hazard more quickly.

3.3.1 Leak Management

Increased public awareness stemming from recent gas incidents and enhanced outreach and education efforts has resulted in a significant increase in the gas odor calls the company receives. In 2013, our Gas Emergency Response Center received of approximately 26,000 calls. In 2014, we received over 41,000 emergency response calls. In 2015, the number of incoming calls climbed to over 56,000. This number of incoming odor calls has directly led to an increase in the number of confirmed outside leaks, as illustrated in Figure 3-3.

Figure 3-3: Incoming Outside Leaks (2006-2015)



These emergency response calls originate from the public, Con Edison workers and contractor crews. Call volumes from each of these sources increased significantly in 2015. For example, the number of calls the company received from fire departments (New York City and Westchester County) as part of the campaign to have customers "call 911" when they smell gas combined with the fire department response protocol change to notify Con Edison of every leak call received has increased enormously, from 2,717 calls in 2013, 5,605 calls in 2014, to 20,807 calls in 2015. Con Edison continues to maintain a high emergency response performance despite these increased leak calls.

In order to manage these incoming leaks, Con Edison performs an extensive number of leak repairs annually and has been able to successfully reduce the backlog of leaks consistently over the past 15 years. In 1988, the gas leak backlog peaked at over 15,000 leaks. Since then, the backlog has been greatly reduced.

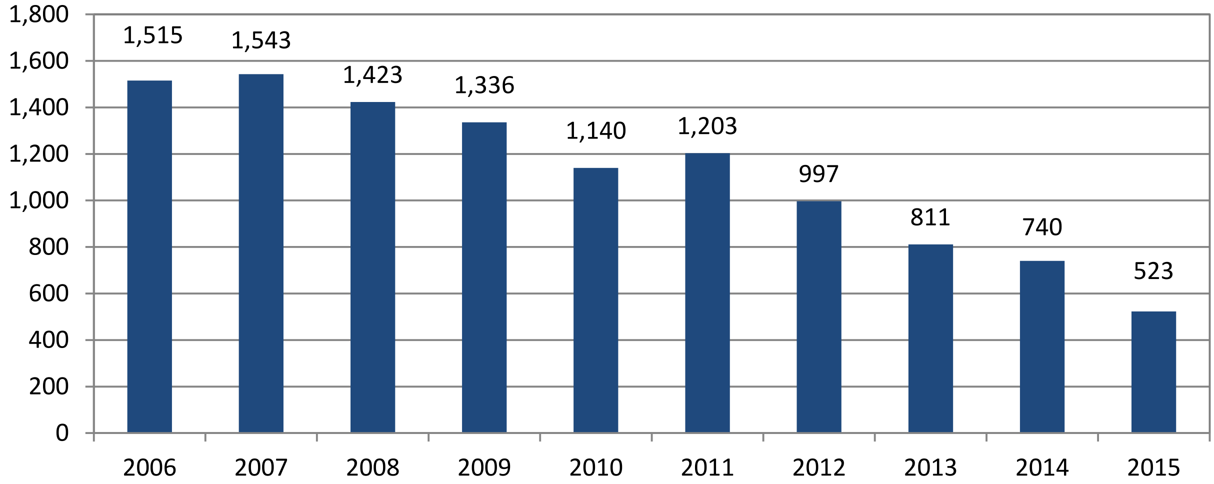
Despite the dramatic increase of leak calls over the past few years, we have consistently decreased our number of outstanding leaks annually. At year-end 2015, the leak backlog was 523, as shown in Figure 3-4 below. The vast majority of the leaks in the leak backlog are non-hazardous Type 3[9] leaks. For example, only seven of the 523 leaks in the 2015 year-end inventory were Type 1[10] (4) or Type 2[11] (3) leaks. Gas leak repairs are a major component of our O&M expenses. Con Edison's goal with the NYS Public Service Commission (PSC), as per our 2014–2016 rate case agreement, is to achieve a leak backlog of less than 750 leaks at year-end 2016.

[9] A Type 3 leak is not immediately hazardous at the time of detection and can be reasonably expected to remain that way. However, Type 3 leaks shall be reevaluated during the next required leakage survey or annually, whichever is less.

[10] A Type 2 gas leak is non-hazardous at the time of detection, but requires a scheduled repair based on the potential for becoming a hazard.

[11] A Type 1 leak requires continuous attention until the leak is made safe, and daily inspection until permanent repairs are completed.

Figure 3-4: Outside Leak Backlogs (2006-2015)



3.3.1.1 Traditional Leak Survey

As explained in section 2.2.2.2, over 50 percent of our distribution mains are composed of either cast iron or unprotected steel. These pipes are vulnerable to corrosion or leakage due to a variety of factors including age, soil condition, weather, etc. Corrosion adversely affects the integrity of the system by causing leaks. Leaks give rise to a host of safety and reliability issues including reduced efficiency through gas losses along the system, possible pressure drops causing outages, and flammable gas in the atmosphere. To manage the safety and reliability risks posed by a loss of system integrity, Con Edison has an extensive leak management program to detect, monitor, prevent, and prioritize leaks for repair.

Historically, the company has performed methane leak surveys on all 4,239 miles of its gas distribution mains annually and on all 92 miles of the gas transmission mains three times per year. Gas services in our business districts are surveyed once per year and gas services in non-business districts are surveyed every three years. The company also performs special cast iron surveys during extreme weather conditions, special surveys as needed, such as pre-paving and pre-parade routes, and it conducts visual inspections of above-ground gas service piping for atmospheric corrosion. Additionally, in June 2014, we began testing the capability of additional outside mobile leak surveys. Our survey frequency was ramped up throughout the year, and by November of 2014, we reached our current level of continuous leak surveys, where all gas distribution mains are now surveyed on a monthly basis. All methane leak detection surveys are conducted by Con Edison technicians or contractors who are dedicated to this task.

Another program that serves to proactively reduce leaks in the system is the main replacement program described in section 3.2.1, which replaces 12-inch-and-under diameter cast iron and unprotected steel mains.

3.3.1.2 Picarro Surveyor Technology

In our ongoing pursuit to further increase public safety by identifying outside leaks on our gas system, Con Edison has been working with Picarro Inc. to test their mobile leak survey equipment in our service area. Picarro is a leading provider of solutions to measure trace gases and stable isotopes such as methane. The Picarro Surveyor system is comprised of detection equipment that utilizes Cavity Ring Down Spectroscopy (CRDS). Based on stated claims, the equipment's sensitivity and the use of propriety algorithms incorporating real-time atmospheric and meteorological conditions, allow the system to detect methane leaks much farther from the source when compared to traditional leak survey equipment.

Continuing through 2016, the Leak Survey section of Gas Technical Operations will work with Con Edison's Research and Development group to further test and deploy the Picarro technology in targeted areas, with the goal of creating a standard for its continued use. Testing the system first before advancing deployment will provide an opportunity to gain experience with this new technology, understand its capabilities to identify leaks on our gas infrastructure and understand the impact it will have on our operations.

We plan to purchase the Picarro survey equipment in 2017. Based on experience gained in 2016, protocols for its continued use will be developed and include a focus on leak-prone piping that is targeted for replacement. Initially, we anticipate the technology will be used to survey areas where we will be performing geographic bundling of pipe replacement, areas that require special surveys (events, parade routes, etc.), and to pinpoint hard-to-find leaks. Our efforts to incorporate this state-of-the-art leak detection technology may further improve our ability to identify and mitigate outside leaks on our gas system, thus improving public safety.

3.3.2 Methane Detection Technology

Recent industry events have brought to light the need to embrace technology in order to improve public safety. The use of residential methane detectors is a way to address this need. Over the past two years, the company has led a concerted effort to promote industry improvements and the widespread adoption of residential methane detectors by consumers as a means of enhancing the safe delivery of natural gas to our customers.

The current governing standard for residential methane detectors, written by Underwriters Laboratory (UL), prescribes alarm limits at 25 percent of the lower explosive limit (LEL) of natural gas. However, federal and New York State codes for the distribution of natural gas mandate odor threshold limits of 20 percent and 10 percent of LEL, respectively. This means that consumers using a residential methane detector would smell gas well before an alarm would activate. This disparity with the UL standard could create negative consumer sentiment and could also potentially provide less time for consumers to respond to an alarm in the event of a natural gas emergency. Therefore, part of our effort will be to work with industry stakeholders, research collaboratives, and the American Gas Association to develop a second UL performance standard that will mandate a lower (10 percent LEL) alarm level. We will also recommend for this second standard to include a “fit for purpose” aspect, which will address application matters such as placement, actions in event of alarm, warnings, packing labels, etc.

We are currently supporting a residential methane detector test project that is being performed by the Operations Technology Development (OTD) group, in conjunction with the Gas Technology Institute (GTI). Based upon the results of this program, we will deploy approximately 300 of the top-rated methane detector units throughout our system as a part of a residential methane detector pilot program. The pilot program will evaluate performance of the units through four seasons as well as confirm that the units do not provide false positive alarms when exposed to normal household chemicals. This pilot program will also help us to promote the benefits of the technology and the need to promulgate regulations for widespread use to customers and New York City and State regulators. We will look to foster regulations for methane detectors that are similar to the current NYC Department of Buildings carbon monoxide detector requirements in new and existing buildings (i.e., hard-wired into new buildings and surface mounted into existing older buildings). These goals have received recent support from Bill A09027, proposed to the NYS Assembly in January, 2016.

3.3.3 Service Line Inspection Program

On April 2, 2015, the New York State Public Service Commission issued an amendment to Part 255 that revised the service line definition to align with the federal definition. This essentially expanded the prior service line definition, which limited operator responsibility for jurisdictional piping to the first fitting inside the building wall, to include jurisdictional responsibility to the outlet of the meter, regardless of who owns the piping within the building. The specific implementation requirements related to this revision have been stayed pending further commission action. The proposed change in language to Part 255—the definition of service line—will have a great impact on the company. All of the company’s operations, practices, and procedures have been geared to the definition of service line reflected in the PSC’s regulations prior to the amendment. Changes to the company’s process, procedures, and performance of leak surveys and corrosion inspections for inside pipe extending to the outlet of the customer's meter will take significant time and additional resources to practically and effectively implement.

The company has more than one million inside meter sets, with approximately 900,000 inside building sets, located in more readily-accessible building areas (e.g., basements), and approximately 200,000 inside building sets in apartments (room sets) that are much less-readily accessible. The company estimates the incremental cost of a leak survey and atmospheric corrosion inspection program that comprises all interior gas piping, excluding all room sets, would be approximate $11 million annually. This increase in our operations and maintenance costs is forecasted to begin in 2017. This expenditure level assumes an inside leak survey and corrosion inspection program, where the company would address accessible inside piping associated with approximately 900,000 inside meters during a nine-year inspection cycle, pending the results of a currently ongoing study of room sets.

This study is supported by Northeast Gas Association (NGA) membership under contract with the Gas Technology Institute and includes developing a comprehensive New York State-specific inside piping assessment data set to support evaluation of an appropriate DIMP-based reassessment frequency. The study will also focus on presumed unique low-risk installations referred to as "room sets." If detailed assessment confirms the low-risk nature of these installations, a special permit may be pursued limiting the need for future inspections. The study commenced in January 2016 and will be completed by June 2017.

The company and National Grid have been working with the Plumbing Foundation for the City of New York (Plumbing Foundation) on proposed legislation that would mandate that owners of residential buildings containing three or more units and commercial buildings have licensed plumbers perform safety inspections of indoor gas piping up to utilization equipment. These inspections would become part of the NYC Department of Buildings code and would be performed on a five-year cycle in conjunction with other mandated safety inspections (e.g., fire protection systems). The Plumbing Foundation has provided proposed legislative language to a City of New York council member and a late-February 2016 release for public comment is anticipated. Additional work is being done to provide licensed plumbers with training and qualification to be equivalent to the gas operator qualification program that is required by for gas distribution companies by Part 255. Efforts are also being made to include the plumbers as part of a federal Department of Transportation compliant drug and alcohol program.

3.3.4 Public Awareness

Following the 2014 East Harlem incident, there were multiple accounts that people smelled gas in the preceding days, but no one reported it. In an effort to understand why people failed to report the smell of gas, Con Edison immediately initiated market research, focus groups, and phone surveys. The research found that, despite outreach efforts, people did not call for different reasons. Some people assumed that another person would report the leak, while others did not recognize the situation as an emergency. Apartment dwellers also mentioned the informal practice of reporting problems directly to their building's superintendent or landlord, and expressed concern that departing from this practice could jeopardize their relationship with building management. In addition, the research found that people are more likely to call when they know that reports can be made anonymously. Other information provided to Con Edison by municipal emergency responders indicates that some people do not call to avoid having their gas service interrupted for repairs or building code compliance issues.

As a result of this study, we reevaluated our Public Awareness Program and initiated a "Smell Gas, Act Fast" campaign, revamping the public awareness campaign messaging to reinforce calling 911 or 1-800-75-CONED when a gas smell is detected. The new campaign messages also emphasize that gas leaks can be reported anonymously. Con Edison has always accepted calls made anonymously. The NGA's Gas Pipeline Safety Study that was conducted in May of 2014 measured the effectiveness of Con Edison's outreach and education efforts. This study found that the majority of customers surveyed are "very" or "somewhat familiar" with the smell of natural gas and said they could identify a gas leak by smell.

Con Edison's Public Awareness Program (PAP) identifies specific program objectives, message types, and contents to enhance public, environmental, and safety protection through increased public awareness and knowledge. Con Edison's Public Awareness program has identified, and targets each of the four stakeholder groups in the following sections.

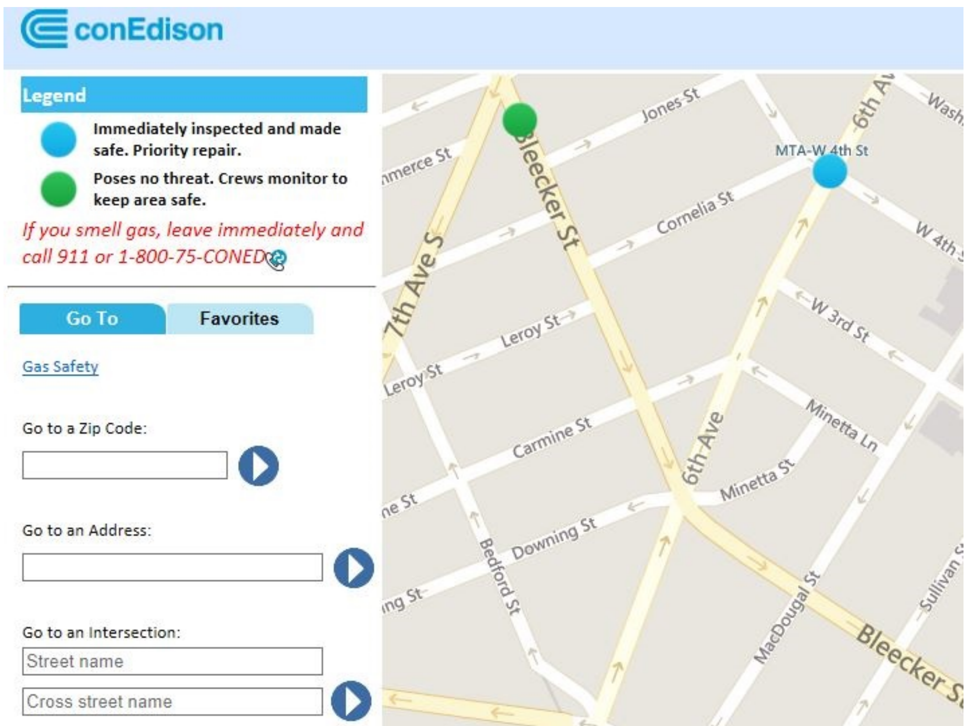
3.3.4.1 Affected Public

This stakeholder group includes distribution customers, transmission customers, residents along the distribution and/or transmission systems, places of public assembly, and school districts. Con Edison's baseline requirement for this group is satisfied through a bilingual newsletter issued two times per year. Supplemental programs for the affected public include a combination of multilingual bill insert newsletters and brochures, bilingual "peel and sniff" bill inserts, community and youth outreach efforts, digital outreach, social media, and paid media advertisements.

Con Edison reaches an estimated nine million people in the public at-large by consistently spreading the word about gas safety and the urgency of reporting gas leaks through a variety of outreach efforts in New York City and Westchester County.

Additionally, in 2014, Con Edison launched an interactive online gas leak map, shown below in Figure 3-5, that provides the location of current leaks on the system, along with data indicating the severity of the leaks. The map, which is updated every 24 hours, provides greater transparency with respect to gas leak information and reinforces the need to report the smell of gas.

Figure 3-5: Interactive Gas Leak Map



3.3.4.2 Emergency Officials

This group includes fire departments, police departments, and emergency management agencies. Con Edison meets its baseline requirement to this stakeholder group by annually mailing a letter to approximately 120 emergency officials that includes:

- an offer of free in-person gas hazards awareness training
- information on excavation safety
- a link to the Pipeline and Hazardous Materials Safety Administration's pipeline mapping system
- copies of the Con Edison gas hazards DVD (on responding to natural gas emergencies)
- a natural gas safety brochure ("What you need to know")

Supplemental programs for emergency officials include training sessions and/or drill exercises and tests, videos, and the Code MuRRE protocol, which will summon additional company resources to incidents that require an escalated response.

3.3.4.3 Public Officials

This stakeholder group includes government officials, city and county managers, building code enforcement departments, permitting departments, and public works officials. Con Edison meets its baseline requirement to this group by emailing a letter to over 300 public officials every three years highlighting important gas safety information that should be shared with constituents.

In addition, Con Edison offers an *Energy 101* supplemental program annually to our public official stakeholders as part of our Public Liaison Program. This program provides a better understanding about the electric, gas, and steam systems in our service territory and any special projects that may be ongoing.

3.3.4.4 Excavators

These stakeholders consist of construction companies, landscapers, and any trade or business that is involved with excavation or demolition. Con Edison meets its baseline requirement to this group by mailing a quint-fold poster with a detachable visor card containing natural gas safe-digging information to almost 30,000 excavators annually. Additionally, supplemental programs offer seminars and training on public awareness and safety issues, sponsorship of the annual Northeast Gas Association campaign, and face-to-face meetings with municipalities that have high instances of contractor damage. The company has a member on the board for each of the One Call Centers and sponsors various One Call Center programs such Excavation Safety Seminars, 811 national campaigns, and statewide calendars. The company hosts and chairs the New York City Damage Prevention Committee and is a secretary for Hudson Valley Damage Prevention Council.

3.4 Incident Response

A prompt response is crucial in preventing reported leaks from becoming distribution or transmission events. The programs the company has in place are focused on making the situation safe as quickly as possible.

3.4.1 Leak Response

Con Edison's commitment to public safety is evidenced by the investments the company makes in reliability, environmental performance, risk mitigation and, most importantly, leak management programs. Despite these measures, incidents ranging in severity from gas leaks to explosions have occurred throughout the gas industry. Con Edison has an emergency response system designed to act quickly and efficiently during an incident to minimize its severity.

During 2015, Con Edison responded to 56,135 emergency calls, of which 88 percent were responded to in less than 30 minutes, and 99 percent had a less than 45 minute response.

Despite the response challenges in NYC's highly congested and densely-populated urban area, Con Edison continues to exceed our mandated response targets to safeguard the public. Increased public awareness of the importance of gas safety has resulted in a significant and sustained increase in gas odor calls. We are committed to maintaining our high performance in emergency response despite the dramatic increase in odor calls. Further, through risk mitigation programs, we also seek to improve the processes utilized during an emergency to protect life and property. For example, Con Edison monitors both "response time" as well as "made safe" time for each reported gas leak emergency. A leak is considered "made safe" when positive physical action is taken and the threat to life and property is eliminated. In 2015, 76 percent of leaks were made safe within 75 minutes.

When warranted, we also continue to initiate Code MuRRE, which is an alert to field personnel for high hazard conditions requiring a heightened response by both company and fire department personnel. Getting more “boots on the ground” in the form of qualified personnel who are capable of taking proactive measures—such as obtaining gas readings and evacuating and ventilating structures—is critical to protecting life and property. In 2015, over 4,000 Code MuRREs were initiated, resulting in an expedited response to reported gas leak emergencies, further ensuring the safety of the public.

In addition to responding to significant leak conditions, the local fire departments are also called to assist on contractor damage investigations. These are high-hazard events and the additional support can reduce the time needed to make situations safe. This multi-resource response provides additional support to company forces and municipal responders during emergency events. We also link coincident gas and electric events for multi-commodity response. This strategy focuses on mitigating the historic causes of distribution events.

3.4.2 Installation of Isolation Valves

During an incident or emergency, isolation valves in a gas distribution system allow for affected areas to be isolated in a timely manner, minimizing the danger to first responders and the public, and reducing the delay in recovery operations. Because much of our system is cast iron, and installation of these mains in the late 1800’s and early 1900’s did not include isolation valves, much of our low-pressure system cannot be isolated without excavating to the main to cut and physically block the flow of gas.

Starting in 2016, Con Edison will proactively install isolation valves at locations that will permit area isolation of critical customers in the case of an emergency. Over 520 critical customers will be targeted, requiring the installation of approximately 1,200 valves for quicker area isolation. These customers include, but are not limited to: hospitals, nursing homes, daycare centers, and customers utilizing life-sustaining equipment. The installation of these valves will permit faster isolation during a potential gas event, and will also mitigate the possible impacts to critical customers. In addition to this initiative, isolation valves will also be installed during the normal course of our cast iron and unprotected steel mains replacement programs, which will continue at an accelerated level. We will review and update the Gas Operations Critical Customer list on an annual basis and propose new locations as necessary.

We are also exploring a new technology known as Emergency Mains Stop-Off Station (EMSOS). EMSOS is a cost-effective trenchless means of installing isolation points on the larger-diameter low-pressure gas distribution system without the need of a main cut-out and the associated large excavations required to install a valve. Our Research and Development organization recently completed a study on this technology, and is now supporting its commercialization.

3.4.3 Remote Operated Valves

In order to minimize potential impacts to the gas transmission and distribution systems, maintain supply to firm gas customers, and protect the public at large, we install remote operated valves (“ROV”s) at strategic locations on the gas transmission system. The ROV Program involves installing new ROVs, or converting existing transmission valves to operate as ROVs. ROVs are installed to achieve rapid isolation of:

- a compromised section of the transmission system to minimize affected areas
- the transmission system at river and tunnel crossings and at the outlet of gate stations
- intersecting transmission or supply mains at tee or branch locations, thereby minimizing affected areas
- mains feeding electric and steam generating facilities from our gas transmission system

Prioritization of new ROV installations is based on the total number of customers that would be negatively impacted by an emergency isolation within the existing ROV configuration. ROV locations are designed so that:

- loss of regulator stations will impact no more than one high-pressure and one low-pressure regulator station

- closure of any two ROVs will not negatively impact supply mains or the distribution system on an average winter day (20°F)

The ROV Program includes the installation of at least one retrofit or new ROV per year.

3.5 Quality Control / Quality Assurance

Quality Control and Assurance are essential to delivering safe, reliable, and resilient gas service. The company is focused on improving the quality of our workmanship and safety of our system by putting the right controls in place, providing our people with the proper tools and training, and monitoring the health of our equipment using advanced analytics. In order to promote an organizational culture of risk management, and streamline the increased workload that comes with enhancing this culture, Con Edison formed a new Gas Compliance and Quality Assessment Organization in 2015, containing the following three functional groups:

- **Quality Assurance:** Conducts reviews of processes and controls within Gas Operations to identify areas for improved compliance, efficiency, and recordkeeping
- **Quality Control:** Supports Gas Operations by conducting field inspections to promote continuous improvement
- **Training & Employee Development:** Assists in the development of Gas employee skills by coordinating and tracking training requirements, and assisting with the development of new employees as they join Gas Operations and progress through their career path

A fourth section focused on **Regulatory Strategy and Compliance** will also be created in 2016 that will focus on planning, intake, and interpretation of new and changed regulations, and will provide guidance on compliance-related matters to Gas Operations employees.

Recent improvements to improve quality and assure full compliance with procedures are detailed below.

3.5.1 Plastic Fusion Procedure Alterations

Con Edison has amended its plastic fusion procedures to require pipe and fitting surfaces to be cleaned using alcohol for all methods of heat fusion, regardless of whether any contaminant is visible on the fusion surfaces. This procedural change exceeds the current ASTM[12] standard and eliminates operator discretion with respect to determining whether the pipe surfaces are visibly contaminated.

To drive standardization in the industry, the company will sponsor an Operations Technology Development (research collaborative group) study by the Gas Technology Institute, a leading gas research, development and training organization, to evaluate solvent cleaning and polyethylene joining procedures. The goal of the study, which will begin in 2016, is to gain knowledge of the issues related to the use of liquid cleaning solvents, develop a data-driven consensus on solvent cleaning best practices, and to optimize the surface preparation process for plastic fusion. The study is anticipated to take approximately 18 months. Con Edison plans to adopt the applicable guidelines and best practices that result from the study.

We also revised our heat fusion joining procedure to include additional language specifically stating that heat fusion joints shall be inspected after they have cooled and solidified to verify that the beads are uniform around the circumference of the joint. We have previously trained our employees to inspect to this standard, but we elaborated on this detail in our procedure.

[12] ASTM International is an international standards organization that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services.

4. NATURAL GAS SUPPLY OUTLOOK

The demand for natural gas for any end-use purpose is sensitive to the availability and price of natural gas. The purpose of this section is to provide an outlook for gas supply over the planning period. This section covers three key aspects of gas supply:

- The availability of natural gas resources (domestic and global)
- The wholesale competiveness of natural gas compared to other fuels
- The deliverability of natural gas to the New York City area

4.1 Natural Gas Resource Availability

4.1.1 Historical Reserves and Discoveries

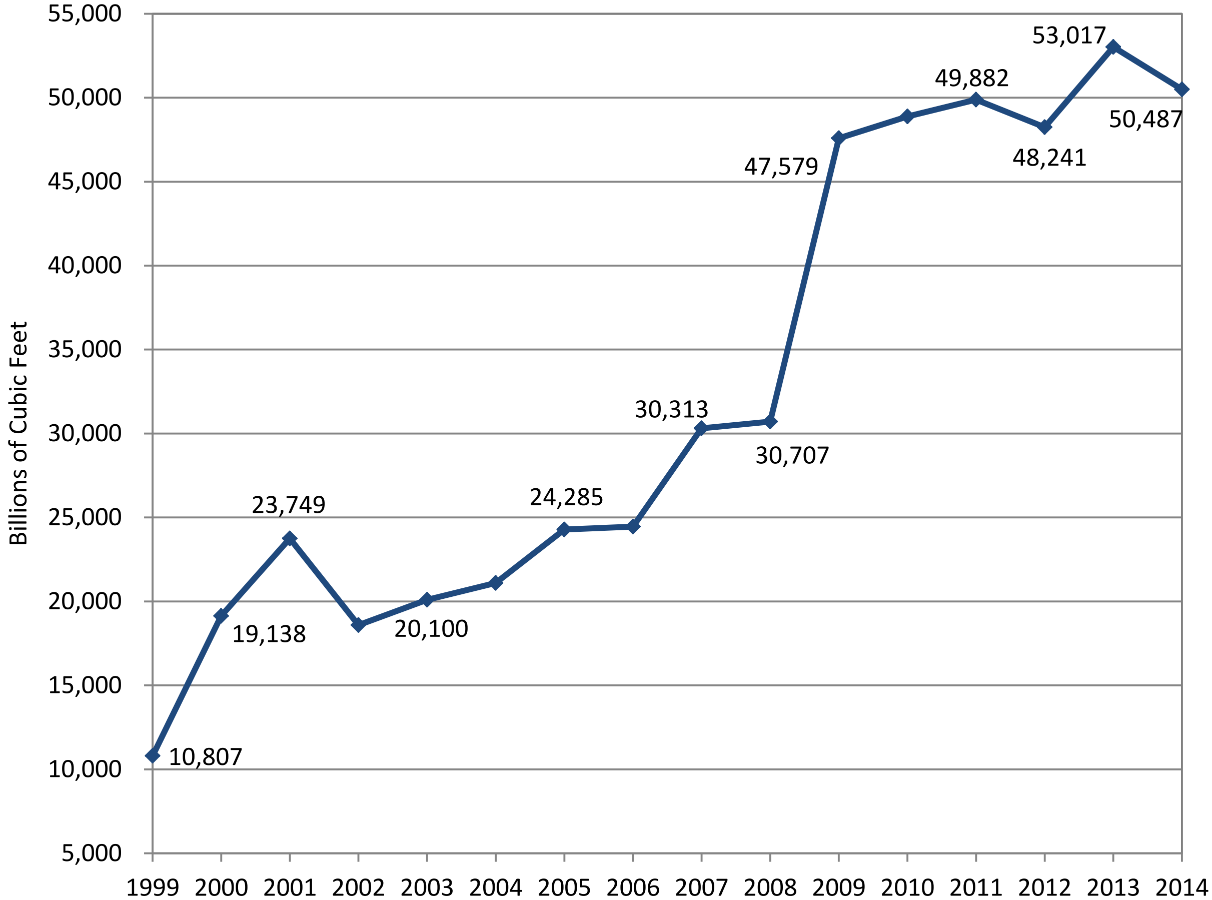
Natural gas reserves in the United States reached a peak in the late 1960s at almost 300 trillion cubic feet and began to decline over the next 30 years to 164 trillion cubic feet in 1998 due to depleting gas fields. At the same time, historically low prices did not encourage the exploration of harder-to-access gas. The recent discovery of natural gas in shale formations, supported by the development of horizontal drilling and stronger prices, has resulted in proved reserves[13] rising to nearly 389 trillion cubic feet in 2014, a 137 percent increase over the reserves known in 1998.

The rate of annual natural gas discoveries[14] has also more than quadrupled over the last decade, as shown in Figure 4-1, with over 75 percent of the increase in discoveries from 2002 to 2014 coming from unconventional (including tight sands and shale) gas discoveries. Shale gas reserves increased from nearly 132 billion cubic feet in 2011 to almost 200 billion cubic feet in 2014, now comprising 51.4 percent of all proven U.S. gas reserves.

[13] Proved reserves of natural gas as of December 31 of the report year are the estimated quantities that analysis of geological and engineering data demonstrate with reasonable certainty to be recoverable in future years from known reservoirs under existing economic and operating conditions. Volumes of natural gas placed in underground storage are not to be considered proved reserves.

[14] Natural Gas Discoveries are defined by the U.S. Energy Information Administration (EIA) as net proved reserve additions of natural gas from discoveries of new fields, identification of new reservoirs in fields discovered in prior years, and extensions (reserve additions that result from the extension of previously-discovered reservoirs).

Figure 4-1: US Natural Gas Discoveries (1999-2014)



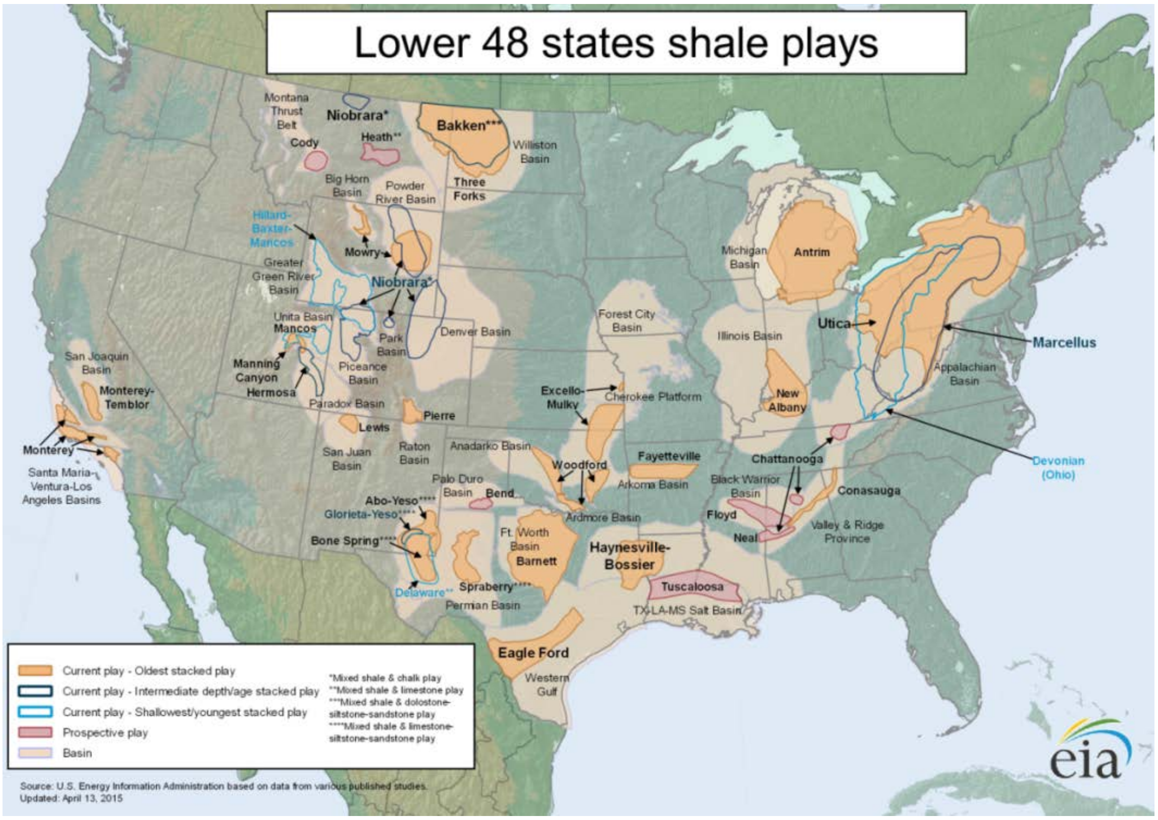
Source: U.S. Energy Information Administration (EIA)

4.1.2 Projected Natural Gas Supplies

4.1.2.1 Shale Gas

Shale gas is an emerging type of unconventional natural gas deposit. The gas is distributed throughout low-permeability shale formations rather than accumulating in a more permeable reservoir. The occurrence of gas in this manner requires special production techniques that involve horizontal drilling into the gas-bearing formation, followed by hydraulic fracturing of the rock (exerting pressure in the gas well so high that it causes brittle rock to fracture (also known as hydraulic fracturing) to release the gas from the rock. Shale gas developments are occurring over much of North America as shown in Figure 4-2.

Figure 4-2: North American Shale Gas Plays



The major shale opportunities are in the Marcellus (located in West Virginia, Pennsylvania, and New York) and Haynesville Shale (Gulf region) plays (a geographic region with gas fields). Promising shale plays are also emerging in Western Canada with the Horn River play, and in the Western U.S. in the Colorado shale gas basin.

The Marcellus shale is a significant emerging regional resource for New York City and for Con Edison. Wood Mackenzie, a commodity research and consultancy group, now projects deliverability of gas from the Marcellus shale to grow to 15.3 billion cubic feet per day by 2020, which is 70 percent higher than the total Mid-Atlantic Region (New York, New Jersey, and Pennsylvania) requirements of 9 billion cubic feet per day. The New York State Energy Plan also has a stated objective of leveraging in-state Marcellus gas for energy, security and economic development reasons.

The development of shale gas is currently very economic, but production is sensitive to the price of natural gas. The development of the shale plays is in the early stages and there is not much historical data available. There have been improvements in drilling productivity and additional low-cost supplies have emerged. Current well economics, aided by associated gas found in reserves that are developed for the production of oil, provide ample incentives for continued development even at gas prices under $3 per Dt. The breakeven cost for production is likely to stay low until the need for higher cost supplies arise.

While the prospects for shale gas growth are substantial, the use of hydraulic fracturing has caused some environmental concerns. These concerns stem from the injection of large amounts of water into the gas well, concerns about the chemical composition of the injected fluids, fears that the fractured rock will expose local water wells to non-potable waters, and cases where unacceptable levels of radiation were released. Environmental regulations related to hydraulic fracturing could limit the extent to which shale gas opportunities can be captured. Current concerns, reflected in proposed state regulations and potential federal legislation, will likely result in increased cost of well development and place some restrictions on where wells can be drilled, thereby limiting shale gas growth prospects.

4.2 Natural Gas Price and Volatility Expectations

Compared to previous decades, the first decade of this millennium saw a notable increase in natural gas price volatility, driven to some extent by market speculation. Given the improvements in resource availability in the past five years, wellhead gas prices are not expected to rise dramatically over the 20-year planning period. However before the necessary infrastructure is constructed, gas prices will likely continue to experience short-term volatility comparable to historical patterns.[15]

4.2.1 Wholesale Spot Prices for Oil vs. Natural Gas

Changes in U.S. supply developments in the past three years have resulted in natural gas prices at the Henry Hub (a point in the Gulf that is the pricing point for natural gas futures on the New York Mercantile Exchange) no longer tracking at its historical relationships of 60–90 percent of West Texas Intermediate Crude (WTI) prices[16]. Natural gas prices are projected to exhibit a much lower relationship to oil prices (in the range of 30–50 percent) as a result of evolving gas supply developments and expected gas-on-gas competition. Propane, the other significant heating fuel alternative in our service territory, generally follows the pricing trends of crude oil, and so is also forecasted to price higher than natural gas. Given these forecasts, we expect that natural gas will remain a competitive energy source for customers and provide sufficient economic incentive for producers to develop technology and wells for continued unconventional extraction.

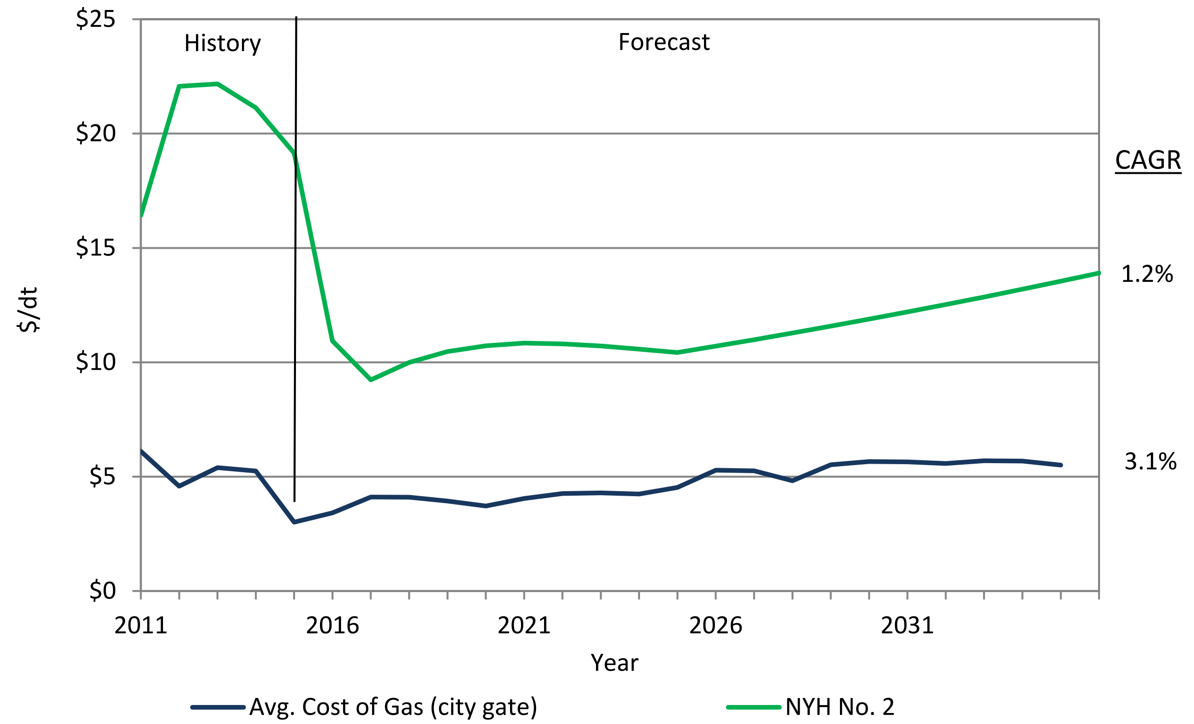
4.2.2 City Gate Prices

As shown in Figure 4-3, since 2011, Con Edison's city gate cost of gas for firm customers has held, and is projected to continue to hold a competitive advantage for natural gas on an average annual basis relative to No. 2 fuel oil New York Harbor (NYH) prices. This cost, which represents the total cost of the gas supply delivered to our system (including the cost of pipeline and storage capacity), will remain, on average, within $4–5 per Dt (in constant 2015 dollars), and will increase at a CAGR of 3.1 percent over the planning period.

[15] Volatility could be restrained by changes, such as increased gas storage, more long-term pipeline contracts, or government regulation.

[16] West Texas Intermediate (WTI) is a grade of crude oil used as a benchmark in oil pricing. It is the underlying commodity of the New York Mercantile Exchange's oil futures contracts.

Figure 4-3: Con Edison's City Gate Cost of Gas for Firm Customers Versus No. 2 & No. 6 Oil)[17]



Source: Historical Annual Prices for NYH No.2 - US Energy Information Administration and Henry Hub Average of Monthly NYMEX Settlement; Con Edison Energy Management, historical and forecasted city gate average cost of gas for firm customers. All prices are in constant 2015 dollars per Dt.

4.3 Deliverability of Natural Gas to the New York City Area

Con Edison recognizes the importance of having adequate pipeline capacity and storage contracts to deliver gas to our city gates and reliably operate our gas system. A substantial portion of our planning activity is dedicated to this important business requirement.

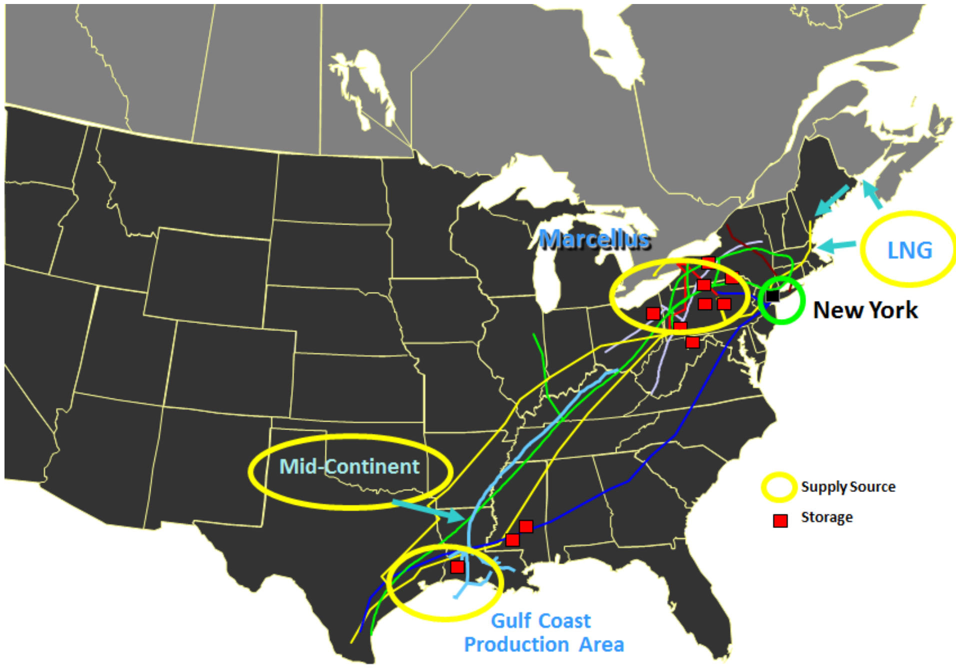
4.3.1 Diversification of Con Edison's Natural Gas Supply

Con Edison has a diversified gas supply portfolio that will become increasingly diversified over the planning horizon in terms of regions and sources. Con Edison's traditional sources include the Gulf Coast production area (mostly onshore and offshore Texas, Louisiana, and Mississippi) and Canadian gas (mostly from Western Canada in Alberta). In recent years, our sources have grown to also include gas from Eastern Canada and the Northeast (mostly Pennsylvania). In addition, Con Edison has access to storage fields in both the Gulf Coast and the Northeast, where gas is injected during off-peak periods and withdrawn during high-load periods to meet customer needs.

The map in Figure 4-4 shows these existing and developing sources of natural gas for Con Edison.

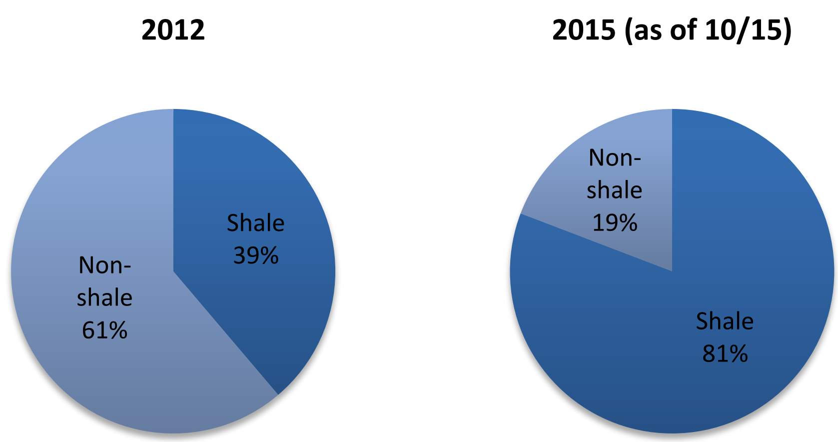
[17] Comparison of Con Edison's city gate average cost of gas for firm gas customers versus No. 2 New York Harbor (NYH) oil prices based on NYMEX crude futures. Gas costs are based on historical bills, including pipeline and storage fixed-capacity charges.

Figure 4-4: Con Edison's Gas Supply Sources



In 2012, Con Edison began to introduce gas from shale suppliers to the system. Before this, gas supply had been primarily from the Gulf Coast. As shown in Figure 4-5, the mix of our resource supply portfolio between shale and non-shale supply has changed dramatically over the past four years. This shift has been driven by technology advances, which have permitted increasing low-cost production of shale gas in close proximity to our service territory.

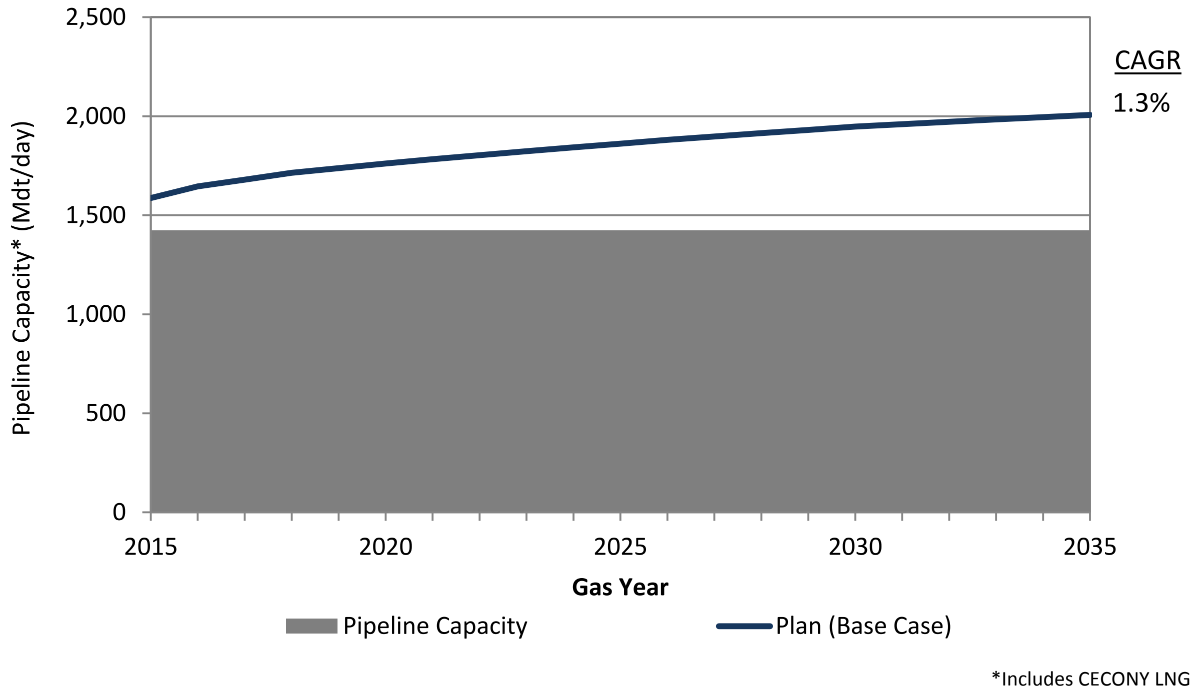
Figure 4-5: Composition of Con Edison's Gas Supply (Shale Gas vs. Non-shale)



4.3.2 New Pipeline Capacity

In order to meet growing gas demand, the Company has developed, and will continue to develop, major enhancements to its natural gas transmission-level facilities. Whenever necessary, we will enter into firm agreements o increase pipeline capacity to our city gates. As shown in Figure 4-6, our projected demand growth over the course of the plan indicates a need for new pipeline capacity to the NYC region.

Figure 4-6: Projected Gap in Pipeline Capacity



There are two means for meeting our demand:

- Procure additional capacity from existing capacity holders
- Become a shipper on new pipeline projects to the NYC city gates

Due to the limited availability of unsubscribed capacity on existing pipelines, and the long lead time of new pipeline projects to the city gate, Con Edison has started to explore and evaluate potential pipeline projects that come to the NYC and Westchester County region.

The company is looking to select pipeline projects that would increase the reliability of our system, increase our flexibility, provide access to an abundant source of supply, are feasible to complete, and provide delivered gas that is economic compared to existing alternatives. New pipeline projects to the NYC area would also benefit other stakeholders in the region by increasing the amount of pipeline capacity available to utilities, marketers, and power generators.

Marketers and producers who subscribe to pipeline capacity also offer delivered services that can be made available to meet peak demands. Increased pipeline capacity to the region would increase the amount of delivered services that are potentially available and, all else being equal, can serve to reduce or at least maintain current gas prices for all stakeholders.

The construction and operation of pipelines entails impacts and risks that must be minimized. In a densely developed area such as the New York metropolitan region, reconciling new pipeline construction with existing conditions is an extremely delicate undertaking. Con Edison believes that pipelines can be built and operated safely. However, the risks and consequences of unlikely events should be considered in the siting process.[18] Co-location of critical infrastructure projects, such as electric and gas distribution facilities is equally important to evaluate.

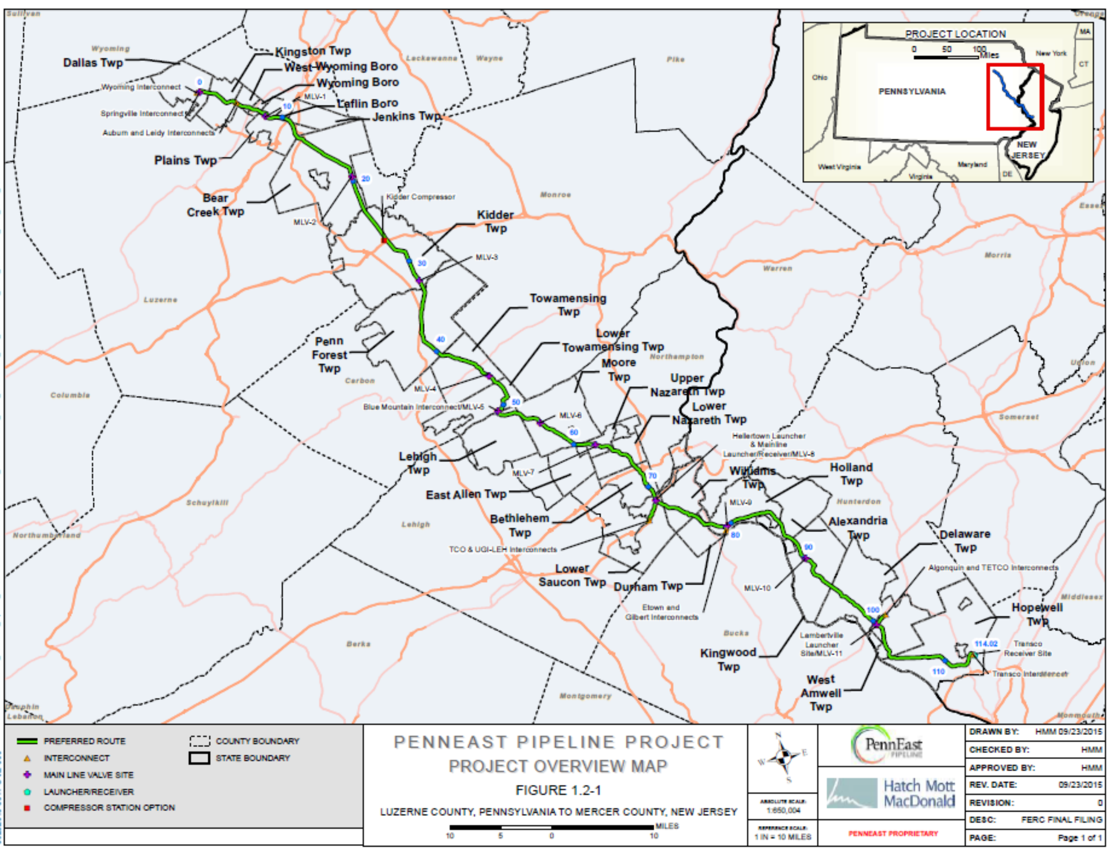
The abundant, low-cost supply of natural gas in the Marcellus shale has changed the flows of gas in the Northeast supply region. New pricing paradigms have been created that support the need for additional pipeline expansion to export Marcellus shale gas to other regions.

While existing Northeast pipeline capacity is constrained in general, there are a number of prospective pipeline expansion projects that will provide Con Edison increased access to supplies from the Marcellus supply region. The timing and volume of future pipeline expansion projects will be highly-dependent on shipper commitments to long-term contracts and constructability. The economics of expansions to the pipelines will be a key determining factor in which of these pipeline projects will actually go forward. The potential need for future capacity to meet demand is further discussed in section 5.5.1.3.

4.3.2.1 PennEast Pipeline

This as-filed $1.131 billion project is being jointly financed by AGL Resources, NJR Pipeline, PSEG Power, South Jersey Industries, Spectra Energy and UGI Energy Services. It was pre-filed at the FERC in early October 2014 and the full FERC application was made on September 25, 2015. The proposal is for the construction of a 1 billion cubic feet/day, 114-mile long 36-inch diameter pipeline designed to bring lower-cost Marcellus shale gas in Eastern Pennsylvania (Luzerne County) southeasterly to an interconnection with Transco in Mercer County, NJ. The proposed pipeline path is illustrated in Figure 4-7.

Figure 4-7: PennEast Project - Upstream Pipeline Connectivity



Source: PennEast Pipeline

[18] Siting is the process of determining the optimal location for a pipeline after all impact factors are taken into consideration.

As a result of an open season (a solicitation for interest) held in August 2015, PennEast has signed precedent agreements with 13 shippers for the entire 1 billion cubic feet/day capacity. Con Edison is a Foundation Shipper taking capacity of 100,000 Dt/day. At the northwest end of the project, it will be receiving gas from the Auburn, Springville and Wyoming gathering systems as well as Transco's Leidy line. For deliveries, there will be interstate pipeline interconnections with Columbia Gas, Texas Eastern and Algonquin Gas, as well as Transco's Trenton-Woodbury lateral in order to facilitate flexible deliveries with Con Edison. Service is expected to begin in late 2017.

4.3.2.2 Mountain Valley Pipeline (MVP)

The MVP is an approximately 300-mile long, 42-inch diameter pipeline, with an estimated total project cost of $3-$3.5 billion. With the rapid development and vast supply of natural gas in the Appalachian region, the strategic design of the MVP will extend from the Equitrans transmission system in Wetzel County, West Virginia, to Transcontinental Gas Pipeline Company's (Transco) Zone 5 compressor station 165 in Pittsylvania County, Virginia. The MVP is expected to provide at least two million dekatherms per day of firm transmission capacity and has secured commitments at 20-year terms for this amount, which will support communities along the route, as well as the growing demand markets of the Mid-Atlantic and Southeast regions of the United States. The project is being co-financed by EQT Midstream Partners, Con Edison, NextEra Energy, WGL Holdings, Vega Energy Partners, and RGC Resources.

Con Edison entered a 20-year transportation agreement to deliver 250,000 dekatherms per day of firm capacity on MVP and 250,000 dekatherms per day on the Equitrans system. These capacity agreements enable customers to achieve significant future savings through access to low-cost, reliable supply.

Mountain Valley Pipeline, LLC filed a certificate application with the Federal Energy Regulatory Commission (FERC) in October 2015, and subject to approval by the FERC, the MVP is targeting to be fully in-service during the fourth quarter of 2018.

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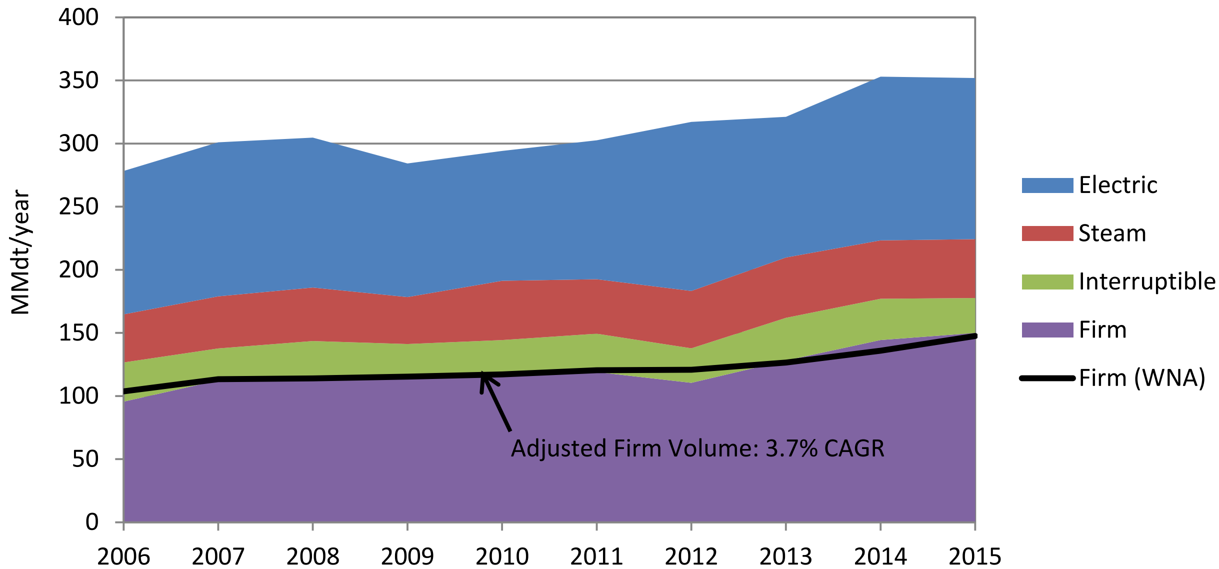
5. DEMAND, SUPPLY, AND ENVIRONMENTAL PROFILE

Con Edison has approximately 1.1 million residential, commercial, distributed, steam and electric generation natural gas customers. Traditionally, growth in firm gas volumes from residential and commercial uses has been dependent upon the economic and environmental benefits of natural gas versus other sources of fuel. As seen in Figure 5-1 below, Con Edison's adjusted[19] volume from firm gas demand has grown at a 3.7 percent Compound Annual Growth Rate (CAGR) between 2005 and 2015.

Figure 5-1: Historical Volume[20]

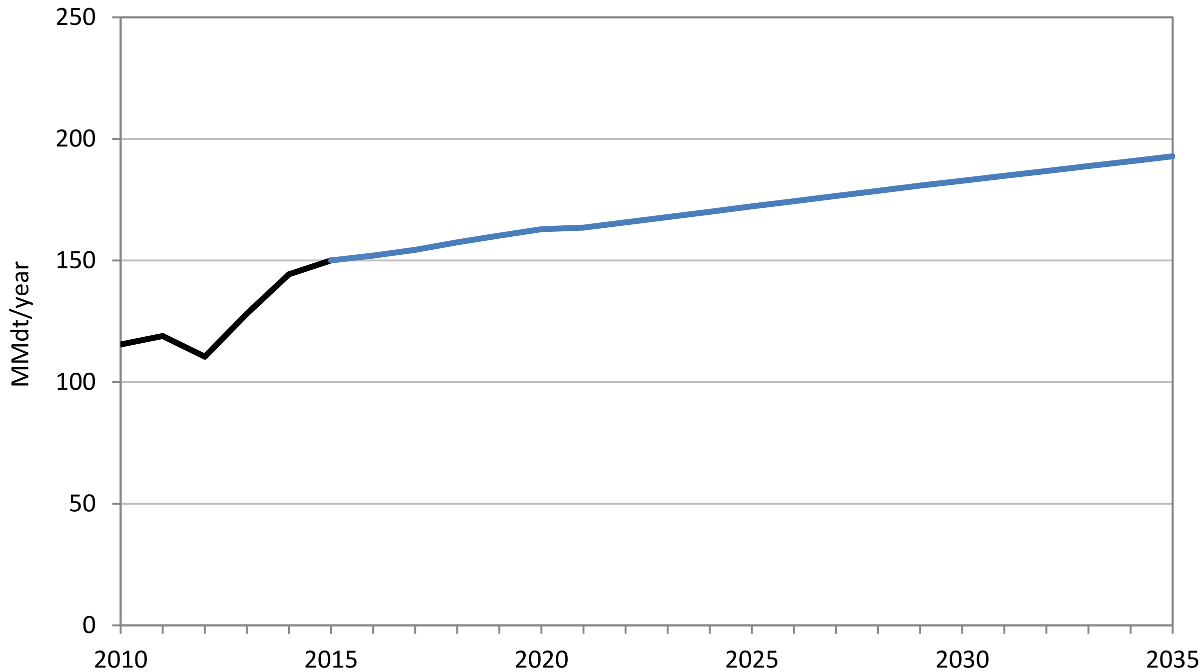


Based on environmental compliance considerations and the economics of gas versus other fuels that lead to customer growth, the near-term average annual growth rate for firm natural gas is estimated to be 2.0% per year from 2015 through 2020 and about 1.3% per year from 2015 through 2035. This forecast is illustrated in Figure 5-2.

[19] Adjustments made for variations, principally for weather

[20] Actual 2015 interruptible data used through October. Proxy data was used November–December 2015.

Figure 5-2: Forecasted Volume (Firm)



This section provides additional detail on anticipated customer needs from economic growth, environmental regulation, and technology developments underlying our gas usage forecasts. We will review expected gas usage trends in three major categories:

- **End-user Residential, Commercial, and Industrial**: explores the evolving needs of our primarily residential and commercial customer base
- **Distributed Generation**: explores a growing interest in on-site generation as a heat and power alternative
- **Transportation**: explores the renewed interest in natural gas vehicles in our service territory

5.1 End-user Oil-to-gas Conversions

Customers have a number of choices to meet their heating needs. Within our service territory, customers primarily choose among four options: heating oil, natural gas, propane, or steam. Electric heating is much less prevalent in our service territory than in other areas of the country due to relatively high electricity prices in the Northeast. Propane tends to be used in the northernmost areas of our service territory.

In 2007, New York City's Mayor Michael Bloomberg launched PlanNYC 2030. The purpose of this plan was to "prepare the city for one million more residents, strengthen our economy, combat climate change, and enhance the quality of life for all New Yorkers."[21] One of the findings was that 1 percent of buildings in New York City (approximately 10,000[22]) produced 86 percent of the city's soot pollution, more than all

[21] PlaNYC website - http://www.nyc.gov/html/planyc2030/html/about/about.shtml

[22] Source: NYC Department of Buildings

the cars and trucks in New York City combined[23]. The buildings that were identified are unique in that they burn No.4 or No. 6 heating oil ("heavy fuel oil").

In April 2011, after two years of stakeholder engagement, Mayor Bloomberg adopted new clean heat regulations to improve air quality. The new regulations targeted heavy fuel oil and required the following:

- No new permits for No. 6 or No. 4 boilers would be issued, (unless emissions were as clean as No. 2 oil).
- No certificate of operation was to be renewed after July 1, 2012 for boilers burning No. 6 oil (unless emissions were as clean as No. 4 oil).
- All boilers were to use the cleanest fuels (No. 2 oil, natural gas, or equivalent) upon retirement or by 2030, whichever is sooner.

Since the launch of this regulation, many oil users in New York City have chosen to convert to natural gas service. Modest growth is expected over the next four years in the heavy heating oil market. In order to provide service for these interested customers, we are faced with the challenge of meeting natural gas demand and infrastructure needs. We also need to have adequate supply and pipeline capacity to operate our natural gas system reliably. Furthermore, we face logistical challenges in managing a significant number of natural gas service requests and effectively coordinating the work. We must complete the work in a way that minimizes disruptions to the community, is cost-effective, and does not contribute to higher overall firm delivery rates for existing customers.

5.1.1 Oil-to-gas Conversion in New York City

5.1.1.1 Recent History and Progress

Con Edison has had tremendous success with converting No. 4 and No. 6 heating oil customers in the New York City portion of its service territory to natural gas for heating purposes. Since the promulgation of rules by the City of New York in April 2011, Con Edison has completed over 3,200 conversions, or approximately 46 percent of the total heavy heating oil population identified in Con Edison's NYC gas service territory in 2011. We estimate that we have removed nearly 400 tons of fine particulate matter (defined as 2.5 microns or less) from the air through these conversions.

The company applied for a tariff amendment as part of its "Area Growth Program" in 2013 and the New York State Public Service Commission approved the tariff in November 2013. Simply, it allows for the aggregation of customers in a defined geographic zone with the intent of completing all construction at the same time (minimizing disruptions to the neighborhoods) and aligning capital expenditures with revenue so that we can offer customers a zero capital connection cost. The program is expected to end in 2020, at which time every heavy heating oil customer will have been offered a connection opportunity through the program, and we expect to have converted approximately 70 percent of the available population by that time.

5.1.1.2 NYC OTG Conversion Forecast

Over the next 15 years, we anticipate converting an additional 2,000 No. 4 and No. 6 heating oil customers in the New York City portions of our service area. In 2015, we converted more than 500 large No. 2 heating oil customers in New York City and project a similar conversion rate in the short-term forecast. The recent drop in oil prices may dampen near-term conversion forecasts, as oil prices fell to a seven-year low in 2015. However, a projected rebound in oil prices paired with stability in long-term natural gas price forecasts (Figure 4-3), and new construction being almost exclusively natural gas-only, provides a basis for optimism that the number of oil-to-gas conversions will continue to grow.

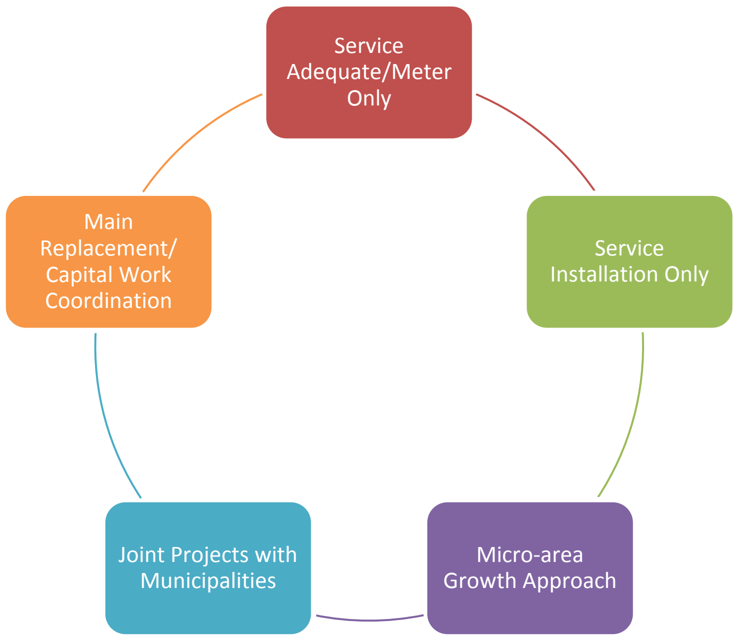
[23] NYC.government press release April 21, 2011: *Mayor Bloomberg Presents an Update to PlaNYC: A Greener, Greater New York*

5.1.2 Oil-to-gas Conversion in Westchester County

In Westchester County alone, there are 225,000 Con Edison gas customers. However, only 60 percent of those customers are using gas for heating. Con Edison is seeking to increase the use of natural gas in Westchester County through oil-to-gas conversions and by changing the usage profile of existing natural gas customers from a winter-peaking commodity to a more consistent year-round profile by encouraging customers to use natural gas for air conditioning, emergency generation, recreational use (outdoor food preparation, pool heating, etc.) and heating.

The gas expansion approach has five main areas of focus, shown in Figure 5-3 and is described below:

Figure 5-3: Gas Expansion Areas of Focus



- **Service Adequate/Meter Only:** This involves increasing marketing efforts for residential gas non-heating customers whose gas service is sized to support the gas heating demand and who are eligible for the rebate program to offset conversion costs. This program requires only a meter replacement/upgrade to facilitate the gas heating footprint and enables customers to convert with minimal external disruptions/excavations.
- **Service Installation Only:** This area of focus involves increasing marketing in areas where the existing gas infrastructure in the area is adequate to accommodate the conversion of residential non-heating gas customers who have an existing unprotected steel gas service, to residential heating customers. This effort will improve the reliability of the existing gas system by eliminating unprotected steel gas services while facilitating lower cost gas conversions. This program requires a service replacement and a meter replacement/upgrade to facilitate the gas heating footprint but enables customers to convert with minimal external disruptions/excavations.
- **Micro-area Growth** (Lower 5 municipalities)**:** Here, we will target specific municipalities to facilitate conversions. This program will focus on the marketing of gas heat to multi-family and commercial customers and includes associated system reinforcement to facilitate conversions through main extensions and reinforcements, as well as the installation of new regulator stations where necessary.
- **Joint Projects with Municipalities:** This will entail partnering with the municipalities and determining if their proposed plans align with either future expansion potential for areas that are

not yet served and/or areas that need reinforcement to facilitate future conversion to natural gas for heat.

- **Main Replacement Program/Capital Work Coordination:** This involves internal coordination with main replacement program work so that the sizing of the gas main accommodates this large growth potential. As of 2015, nearly 2,100 of the 4,300 miles of gas main in the Con Edison gas system are within Westchester County. Of the 2,100 miles, 46 percent are planned for replacement over the next 20 years. Our plan is to ensure that the mains are appropriately-sized during replacement to facilitate growth in the future.

Our plan initially supports infrastructure build-out to capture approximately 50 percent of the total projected non-gas heating multi-family/commercial customers in each specific municipality. Importantly, our area and phase plan is designed to maintain flexibility to respond to unexpected events—including seeing more or less demand than we expect.

In order to guard against building for customers who ultimately choose not to take gas service for heating, we will develop a plan to require commitments from customers before we confirm the connection price for a particular area before we build. Our approach can be simply described as:

- plan to 50 percent of potential large non-gas heating customer conversions
- build to actual commitments of all pending load up to planned capacity

This program will initially target the five Westchester municipalities with the highest volume of large commercial/multi-family non-gas heating customers:

- Mount Vernon
- New Rochelle
- Port Chester
- White Plains
- Yonkers

We anticipate that each municipality will need a new regulator station and significant main reinforcement and/or extensions. With the area growth model in place, these areas will be marketed in order to drive enough revenue to substantiate the build-out for these customers.

For example, in 2016, we plan to market to nearly 600 multi-family/commercial customers in the City of White Plains, with a heightened focus on targeting the No. 4 and No. 6 oil customers in the city. Based on the conversion commitments we receive, significant main reinforcement and service work will be performed in White Plains over the subsequent years.

We anticipate the program to take multiple consecutive years in each municipality. Based on reinforcement and customer commitment, schedules would be subject to be either accelerated or extended in order to effectively build out the system and maximize the growth potential in each geographic area.

5.1.3 Marketing Strategy

Proactive marketing will be critical to our growth program for two reasons:

- to manage growth of the natural gas system in a cost-effective manner for both the company and our customers
- to help New York City achieve its clean heat goals

Our marketing strategy consists of mailings, town hall meetings, door-to-door canvassing, and presentations to real estate and building management organizations to educate customers on the benefits of natural gas.

We will employ targeted marketing to cluster customers in geographic proximity to convert to natural gas at the same time, minimizing disruption to the community. We can also work with local community boards to gather groups of potential customers to a common meeting. Here, we are able to explain to customers the benefits of clustering and converting as a group at the same time.

The cost of connecting to Con Edison's natural gas system varies based on a combination of the size of the building, type of customer, expected revenue, and distance from Con Edison's existing gas distribution mains, as defined in our PSC-approved tariff. Clustering of customers often helps customers to pass our revenue test, and can serve to minimize their connection cost.

5.1.4 Dedicated Resources to Meet Growing Demand

Con Edison is dedicating resources to meet the challenges associated with oil conversions. We have created a department called the *Gas Customer Conversion Group* with responsibility for executing the company's conversion activities.

The Gas Customer Conversion Group is comprised of a number of sections:

- **Gas Customer Solutions**: serves as a single point-of-contact for the customer; responsible for the sales, marketing, and call center functions
- **Planning**: makes recommendations or gas service determinations for customers, and ensures that new business processes are aligned with engineering recommendations
- **Conversion Operations**: manages installations for conversion customers
- **Analytics**: analyzes the financial aspects of a conversion; tracks conversion metrics, trends, and quantity
- **Strategic Support**: coordinates with internal departments and external stakeholders, such as New York City agencies, the Public Service Commission, and the Real Estate Board of New York

The group has created a website (http://www.conEd.com/gasconversions) for customer interaction, communication, and education. It also provides a link for potential customers to apply for natural gas service.

5.2 Distributed Generation

Distributed generation (DG) is the installation of an electric generating system on customer premises that reduces the need to purchase energy from traditional energy providers, either the local utility or an Energy Service Companies (ESCO). Where customers were once simply an energy user receiving electricity flow one-way from traditional generation sources, the installation of DG has changed their role into both an electric generation source and a consumer, resulting in two-way energy flow for the grid in some cases.

There are numerous types of DG installations throughout the Con Edison service territory, but the two primary technologies are combined heat and power (CHP) systems, fueled by natural gas, and solar photovoltaic (PV) generation. Natural gas-fueled CHP technologies also offer the customer the extra benefit of using the heat byproduct of electricity generation to create steam or hot water for facility heating, and it can be used to replace existing fuel oil-fired boilers. In most cases, customers do not choose DG to allow them to disconnect from the grid; they choose it instead to offset or supplement some of the energy currently purchased.

Customers can choose to use their DG for emergency use only, to offset thermal energy requirements, for peak shaving, for total energy offset, or to produce surplus energy to sell back to the grid. Most of the current DG installations in Con Edison's territory are used only for backup/standby power, though more than 130 MW of customer-owned gas-fueled DG is interconnected to the electric distribution system, operating continuously.

5.2.1 A Brief History of Gas-Fired Distributed Generation at Con Edison

The adoption of gas-fired DG is not new to Con Edison or its customers, who have been installing these systems since the 1980s. There are currently over 100 CHP project requests pending development, representing over 85 MW of capacity. Approximately 75 percent of all Con Edison Electric CHP customers are located within Con Edison's gas-service territory.

Gas-fired CHP technologies can meet the needs of a wide range of users in the residential, commercial, and industrial sectors, but it is best-suited to customers with large and consistent thermal and electric loads throughout the year (e.g., hospitals). The need to defer electric transmission and distribution (T&D) investments (such as substation construction) is also likely to be another source of gas-fired DG growth. More than half of the potential gas usage from CHP systems would be in Manhattan, with several large projects scattered around the remaining divisions.

5.2.2 Gas-fired Distributed Generation Forecast

The Con Edison Electric Long Range Plan developed preliminary forecasts for DG adoption, including technical and market potential[24] in the service territory. Technical potential measures what is possible, taking into account the physical availability of recourses, but does not project actual adoption as it does not include any evaluation of cost. We use a preliminary estimate of technical potential as an upper-bound and then make estimates about the cost of various technologies and fuel sources to arrive at an estimate of market potential, or what we could actually see in our service territory, based on historical adoption rates.

There are signs that the trend of gas-fired DG growth will continue. See Figure 5-4 below. Based on expected projects, historic adoption rates, market trends—including increased interest in fuel cells[25], and the stable spark spread[26]—we predict that CHP will make up more than 150 MW of new grid-connected DG by 2035.

Using this forecast, Gas Operations can better plan their investments in infrastructure required to serve or accommodate these gas-fired DG assets. In particular, New York State's Reforming the Energy Vision[27] (REV) proceeding is looking to leverage the electricity output of DG to offset the need for building additional substation and local distribution system equipment, while simultaneously growing the market for DG Installers to create jobs throughout the state. The use of CHP and Fuel Cell technologies to achieve the REV goals means a corresponding rise in the forecast for future gas availability and an increased need for high-pressure gas distribution infrastructure. In addition to REV, there are several other ongoing and future programs that will positively affect the gas outlook going forward.

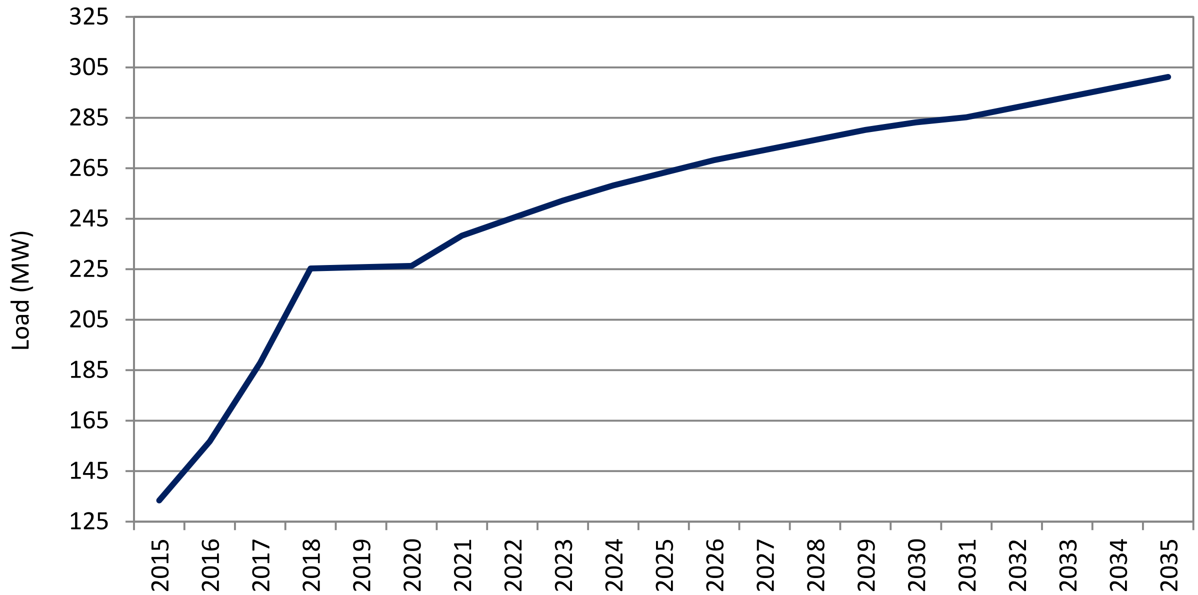
[24] For additional detail about the ELRP technical and market potential forecasts, please refer to the Con Edison Electric Long Range Plan, Section 3.

[25] A fuel cell is a device that converts the chemical energy from a fuel into electricity through a chemical reaction of positively charged hydrogen ions with oxygen or another oxidizing agent.

[26] The stable spark spread is the difference between the cost of electricity and the cost to produce it with a natural gas generator. It is used to demonstrate the profitability of gas-fired generation.

[27] Reforming the Energy Vision (REV) is Governor Cuomo's comprehensive energy strategy for New York to help consumers make better and more informed energy choices, enable the development of new energy products and services, protect the environment and create new jobs and economic opportunity throughout New York State.

Figure 5-4: Projected CHP Distributed Generation Capacity in Con Edison Electric Territory



5.2.3 NYSERDA Incentive Programs

The New York State Energy Research and Development Authority (NYSERDA) promotes energy efficiency and the use of renewable energy sources in order to develop a less-polluting and more reliable and affordable energy system for all New Yorkers. To that end, NYSERDA administers several incentive programs, funded by surcharges on the utility bill, to help establish a thriving market for clean energy technologies and energy efficient products.

For CHP technologies, NYSERDA has two main programs that currently have multi-million dollar funding—the CHP Acceleration Program for systems with electric generation sized at 1.3 MW and smaller, and the CHP Performance Program for systems sized 1.3 MW and larger.

NYSERDA's fuel cell programs have been less funded, and historically more focused on introducing the technology to consumers rather than widespread customer adoption. Both CHP and fuel cells typically require either a high-pressure gas line or booster to supply their steady fuel needs during operation. In addition to helping fund the cost of the systems themselves, NYSERDA's Flex Tech program performs cost-shared technical services and energy evaluations to help customers understand the energy efficiency opportunities provided by these technologies and to make better energy choices to reduce consumption and costs.

5.3 Natural Gas Vehicles

Economic and environmental issues have coincided to create a burgeoning interest in alternative fuel vehicles in North America. Key concerns are:

- **Economic concerns**: Affordability and availability of oil as a continued transportation fuel in 20–30 years
- **Environmental concerns**: The transportation sector has dominated the growth in US carbon dioxide emissions since 1990, accounting for 69 percent of the total increase in US energy-related carbon dioxide emissions, and petroleum is by far the largest source of carbon dioxide emissions in the transportation sector

- **Public health concerns**: Air quality concerns from burning oil and its effect on public health, such as respiratory diseases

Compressed natural gas (CNG) can be used as an alternative transport fuel in vehicles that have been converted to operate as natural gas vehicles (NGVs). This offers an ideal solution to many environmental and economic concerns:

- Natural gas is an abundant domestic resource, particularly with large reserves of unconventional shale gas
- NGVs will result in increased utilization of the nation's current gas infrastructure
- Natural gas is the cleanest fossil fuel available
- Use of NGVs vs. conventional vehicles results in lower vehicle emissions

Despite its many benefits in aligning the nation's political and economic interests, NGV growth has lagged behind other alternative fuel vehicle technologies. Electric vehicles (EVs) have dominated the national alternative fuel dialog due to a variety of reasons, including powerful support from automakers and electric and coal lobbies. However, EVs also face some important limitations including limited vehicle range, inadequate battery storage technology (size and capacity), and lack of a charging infrastructure. These limitations affect the applicability of electric vehicles in medium and heavy-duty vehicles or long-haul segments. Natural gas vehicles, on the other hand, are well-suited to serve these segments.

Fleets today represent a significant CNG market, with the most vehicle sales in government and transit bus market segments. To spur CNG growth, federal, state, and local governments provide a significant number of incentives across several different dimensions. We believe that the use of CNG will grow among fleets in Con Edison's service territory over the next 20 years.

Con Edison's fleet currently contains approximately 300 CNG fueled vehicles including Class 1 passenger sedans, Class 2 cargo vans and even Class 4 step vans. We have been servicing both company and non-company NGVs for over 35 years. The company currently owns eight CNG stations that are located throughout its service territory in Brooklyn, Queens, Manhattan, the Bronx and Westchester. Five of the eight stations are currently open to the public.

Gas consumed by natural gas vehicles and discharged via CNG fueling stations represents firm gas demand for Con Edison. This assumes that current levels of incentives continue to exist and current mandated environmental regulations will be met.

Among the many signposts that Con Edison is watching are potential environmental and/or energy efficiency mandates to be posed by New York State or the federal government. Enactment of stringent air, carbon-related laws or federal renewable portfolio standards could promote compressed natural gas as a viable option for reaching transportation policy goals or change the economics of certain distributed generation technologies—particularly those powered by natural gas—and thus alter adoption patterns.

5.4 Gas Energy Efficiency

5.4.1 Energy Efficiency Plan

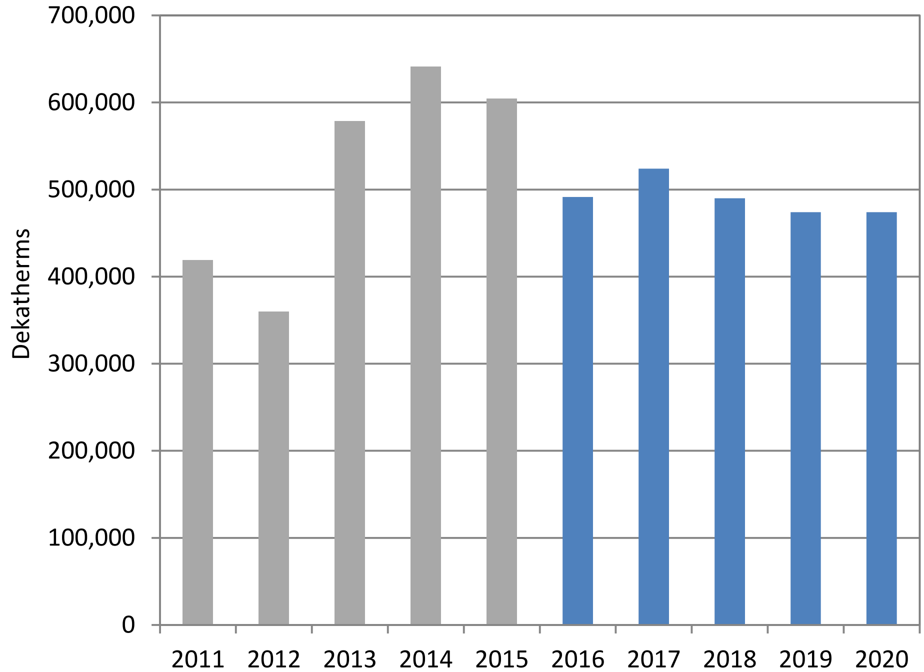
Con Edison's energy efficiency plan is to work with customers proactively to manage their energy needs and costs, cooperating with regulatory and other agencies to develop, offer, and continually refine a suite of programs that drive efficient end-use behavior and technologies that permanently reduce per-unit energy use.

Because of our direct relationship with our gas customers, we believe we are well-positioned to directly partner with customers to reduce energy usage. Energy Efficiency Portfolio Standard (EEPS) programs have gained momentum and have effectively established relationships and awareness at the community and customer level. Looking ahead, the company will build upon this momentum and improve gas programs in a way that streamlines the customer experience in order to cost-effectively increase savings while achieving energy savings goals and associated emissions reduction.

Moving forward, the company's proposed Energy Efficiency Transition Implementation Plan (ETIP) will offer a framework for a more integrated approach to customer-oriented demand side management (DSM) offerings, including gas programs. Improving programs in 2016 and beyond in anticipation of—and in response to—customer demand will be a priority.

Based on acquisition rates from recent years and program targets for subsequent years, we believe Con Edison and NYSERDA programs in the Con Edison service territory will be able to achieve savings of approximately 1.5 million dekatherms through 2018, as shown below in Figure 5-5.

Figure 5-5: Con Edison and NYSERDA Incremental Achievements



Con Edison's projected savings over the 2016–2020 period are based on targets set forth by the PSC in the ETIP. The included programs span across all customer segments in the Con Edison territory, such as commercial, multifamily and residential customer groups. As REV evolves, subsequent updates to the ETIP will include changes to the portfolio to better align with REV objectives, thus potentially modifying goals.

5.4.2 Demand Management Platform

We are currently developing a Demand Management Platform. The system will streamline and integrate customer relationship management, data tracking and reporting, and analytics. This will greatly enhance our ability to understand program participation and market dynamics and to market our programs effectively to the public. The Platform will be the system of record for all demand management programs, and will consist of a robust business intelligence component, as well as a customer relationship component. The system is scheduled for full implementation by the fourth quarter of 2016.

5.4.3 Uncertainties May Affect Outcomes

The company realizes the uncertainty that is inherent to initiatives that are highly-dependent on customer behavior as well as regulatory and economic factors. This plan is designed to balance a long-term vision with the flexibility required to meet changing demand. As such, the company has identified the market, regulatory, and legislative conditions that need to be monitored on an ongoing basis to continually refine the plan. Customers may not respond as expected and planned results may not be achievable at the expected cost levels projected for post-2015 gas program goals. Codes and standards may emerge as expected or may far under- or over-achieve targeted levels of efficiency. From a regulatory and legislative standpoint, there may be a change in targets, in the role of NYSERDA, or in future State or Federal legislation.

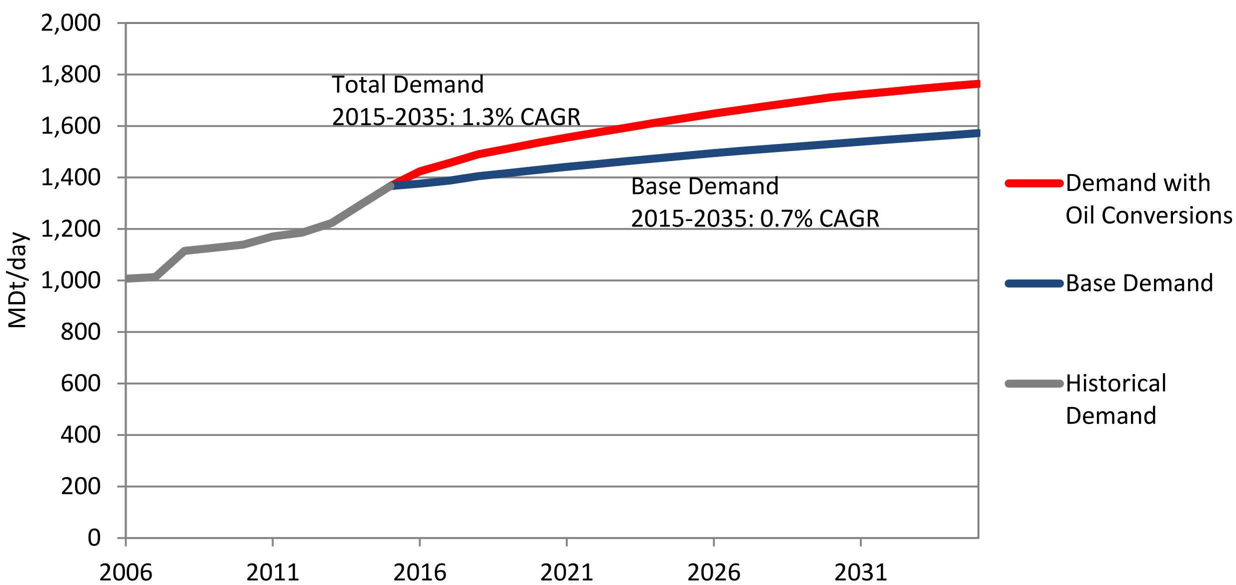
5.5 Meeting Natural Gas Demand

The natural gas peak demand forecast drives the timing and magnitude of the required investment in transmission and distribution infrastructure. Con Edison currently develops a 20-year peak demand forecast to ensure that our transmission and distribution infrastructure is adequate to support the economic growth of NYC and Westchester County.

A standard forecast consists of two components: a volumetric forecast and a peak demand forecast. The volumetric forecast is a projection of annual gas consumption by both firm and interruptible customers, measured in millions of dekatherms (MMDth). The peak demand forecast is a projection of the maximum gas requirements that Con Edison's firm gas customers demand at a single point in time, measured in thousands of dekatherms per day (MDth/day). Forecasting peak demand drives infrastructure investment because we must build to that demand, even if it is a relatively infrequent occurrence, to provide reliable gas service when it is most needed. For the Con Edison natural gas system, firm gas peak demand occurs in the winter when customers have a high demand for reliable gas service for heating purposes.

Economic conditions, along with environmental energy policy and regulation influence customer fuel choices and usage. Con Edison's gas system will experience growth due to conversion of fuels from liquid fuel to natural gas. Innovations and price changes in end-use technology (e.g., higher efficiency boilers, building management systems, natural gas vehicles) also affect customer energy use. To facilitate the development of the Gas Long Range Plan, we developed a base case for peak demand. This case is the basis for all initiatives and assumptions discussed in the plan. The case incorporates modest energy efficiency gains, an increased oil-to-gas conversion rate through the end of 2015 followed by moderate conversion rates for the remaining years, and historical rates of growth for gas-fired distributed generation and natural gas vehicles. The 20-year gas peak demand forecast is depicted graphically in Figure 5-6. We expect a 1.3 percent compound annual growth rate in peak demand over the planning period. A significant volume of conversions is expected in the next five years, with a 2.3 percent compound annual growth rate over that period.

Figure 5-6: Daily Firm Peak Demand Forecasts (MDt/day)



For the next five years, the company expects the peak demand to grow by 12.2 percent cumulatively, or 167,000 Dt/day. The peak positive components considered in this projection—listed in descending order

—are: No. 4 and No. 6 oil-to-gas conversions, large new construction, DG/steam lost business, large No. 2 oil-to-gas conversions, net transfers, and small residential. The forecast is also affected by peak negative components, including Con Edison and NYSERDA energy efficiency programs and natural conservation.

Historically, peak demand growth has depended on the rate of economic growth. Following this same logic, growth, not including oil conversions, would be 0.7 percent over the next twenty years, as shown in the chart above.

5.5.1 Logistics

New York City is one of the most densely populated, urban environments in the world. In such a congested area, we are faced with many oil conversion customers in the same vicinity potentially requesting conversions to natural gas at different times. If this random conversion process were allowed to occur, it would require digging up the streets multiple times, causing ongoing disruption to the community and adding to the connection costs of many of the new customers. We plan to minimize these situations through customer aggregation and work coordination strategies.

As mentioned earlier, we expect to have completed a significant number of oil conversions in the near term. We forecast that approximately 67 percent (4,700) of the total heavy heating oil population identified in Con Edison's NYC gas service territory in 2011 will have converted by 2020. The timeline of these conversions is largely dependent upon the boiler age distribution in our service territory. Once the boiler requires replacement, these oil customers will not be allowed to renew their No. 4 or No. 6 oil burning certification and must choose a cleaner-burning fuel alternative. A rapid number of conversions complicates matters because there will be many jobs scheduled for construction in a short period of time.

To accommodate the new demand on our system, we will be reinforcing both our transmission and distribution gas systems by installing regulator stations, replacing mains, installing new mains, and connecting services to customers. The infrastructure itself is costly, and in some instances, one infrastructure solution is more cost-effective than another while achieving the same level of reliability. Wherever possible, we will pursue the least-cost solution for high reliability.

Expanding and reinforcing our system to meet new demand will require significant investment. System expansion and reinforcement requires a significant amount of trenching in the streets, resulting in high costs for excavation, construction, and restoration.

In the next 20 years, we plan to spend over $3.1 billion on all growth programs, of which $350 million is to continue our efforts to convert the heavy oil users in NYC to natural gas. Going forward, we anticipate significant investments to support all oil-to-gas conversions, expanding our heating footprint, and all other new business opportunities. Described below are examples of gas transmission and gas distribution projects needed to support the growth in demand associated with this 20-year plan for the gas system.

5.5.1.1 Transmission System Reinforcement Projects

- Astoria to 3rd Ward of Queens Oil-to-gas Transmission Main Reinforcement: In 2008, a new 36-inch, 350 psig MAOP transmission main was installed in our Astoria Tunnel, which feeds gas from our Hunts Point regulator station in the Bronx to the 1st Ward of Queens. As a part of planned transmission system reinforcement, and to support future growth from oil-to-gas conversions, the transmission main, which runs east from the Astoria Tunnel, will be replaced with a larger main, in order to increase gas supply capacity to the 3rd Ward of Queens.
- This reinforcement project requires installation of approximately 13,000 feet of 36-inch, 350 psig transmission main that will replace an existing 20-inch, 350 psig transmission main. The replacement will also involve reestablishing a number of main connections to feed various Con Edison regulator stations and commercial and industrial customers. This is a multi-year project that is scheduled to begin in 2017, and will be phased-in over a number of years. Annual footage installation amounts will be reevaluated on an annual basis utilizing the latest 20-year gas forecast.

The replacement of the, 20-inch, 350 psig main, will ensure adequate pressure to the firm gas customers in the 3rd Ward of Queens. The new 36-inch main will operate at less than 20 percent specified minimum yield strength (SMYS), meaning that this section of main will no longer meet the Federal DOT definition of transmission lines and will therefore operate as a distribution main, operating at greater than 125 psig. The new gas main will be constructed of piping with both higher-yield strength and increased ductility than the existing transmission main.

5.5.1.2 Distribution System Reinforcement Projects

A large portion of our distribution system consists of low-pressure mains, which are adequate for our current customer needs, but will require reinforcement to accept our growing load. There are three ways that we reinforce the system for increased demand:

- Install new district regulators, where possible. Where there is a higher pressure main nearby, we can install a regulator and associated main ties/extensions to provide an additional supply to the low-pressure system in the area.
- Replace smaller-diameter mains with larger-diameter mains to add capacity.
- Install new main extensions to supply new customers.

Each year, we complete a combination of each of these types of distribution reinforcement work designed to accommodate demand, taking into consideration all anticipated load growth. For example, in 2015 we installed eight new regulator stations, reinforced two existing regulator stations, and installed and replaced over 16 miles of pipe in order to meet the demands of the current load growth and prepare the system for expected growth.

5.5.1.3 New Gas Supply to Infrastructure

We also recognize that we must have adequate supply to meet growing demand. To this end, we support projects that give us access to new sources of low cost natural gas supply. Within the next ten years, up to two new pipeline supply points are planned to enter our service territory.

Con Edison is evaluating potential new transmission supply sources that will increase reliability in the system and mitigate risks of severe disruptions in Queens and Westchester.

The addition of these proposed supply points will also allow Con Edison to source natural gas from a number of areas, providing diversity and flexibility in purchases.

5.6 Environmental Concerns

Con Edison is fully-committed to improving the environmental elements associated with our gas system infrastructure. The aggressive main replacement program that we are undertaking will not only improve safety by reducing the risk associated with gas leaks, but will also reduce fugitive methane emissions. We are dedicated to working with new technologies to better quantify gas leaks so that leak repairs can be prioritized to effectively reduce methane emissions. We are also being proactive by participating in collaborative climate change studies that will help us anticipate and plan for environmental trends potentially impacting our system.

5.6.1 Environmental Performance

The company is committed to environmental responsibility. We have been a member of the EPA's Natural Gas STAR Program since its inception in 1993. The Natural Gas STAR Program is a flexible, voluntary partnership that encourages natural gas companies to adopt proven, cost-effective technologies and practices to improve operational efficiency and reduce methane emissions. Nearly all distribution sector methane emissions are due to unintended fugitive leaks.

According to the latest available EPA report, between 1993 and 2013, Con Edison has achieved cumulative methane reductions of over 5 billion cubic feet (Bcf), primarily through the rehabilitation of leaking pipe and the use of automated systems to reduce pressure. In 2013 alone, the company achieved 141,337 Mcf of methane reductions, largely through the identification and rehabilitation of leaking pipe.

Methane is considered a potent greenhouse gas (GHG)—25 times more powerful than carbon dioxide in trapping heat in the atmosphere over a 100-year period. Table 5-1 below illustrates the magnitude of Con Edison's methane reductions in some commonly used carbon dioxide and greenhouse gas equivalents.

Table 5-1: Con Edison's Methane Emissions Reductions

	Con Edison's Methane Emissions Reductions (Mcf)	Metric Ton CO2 Equivalent	Equivalent CO2 Emissions from Electricity Use In Homes
2013	141,337	67,755	9,320
Cumulative Since 1993	5,138,043	2,463,121	338,808

Source: EPA Natural Gas STAR Program

Since 2011, Con Edison has also reported total GHG emissions from the company's natural gas distribution system to the EPA under Subpart W of the Mandatory Greenhouse Gas Reporting program. Table 5-2 summarizes the emissions reported under this program.

Table 5-2: Con Edison's Gas Distribution System Emissions Reported to EPA

Reporting Year	2011	2012	2013	2014
Carbon Dioxide (metric tons)	2,626	1,973	1,653	993
Methane (metric tons)	12,799	12,605	10,678[28]	10,337
Carbon Dioxide Equivalent (CO2e, metric tons)	322,590	317,095	268,611	259,415

Another indicator of our environmental performance is the number of reportable liquid spills within Gas Operations. These liquid spills average approximately half a gallon quantity each, and are generally vehicle-based. In 2015, Gas Operations had six reportable spills. Gas remains committed to improvement in this area.

Our Research and Development organization is currently participating in an exciting new technology development that will be used to quantify actual methane emissions from Type 3[29] leaks. This technology could be used to characterize the emissions of methane into categories such as small, medium, and large, which would then be used to prioritize repairs of the greatest emitters. The company is working with the Environmental Defense Fund and other parties on a pilot project to identify the leaks that contribute the most to greenhouse gases and repair or replace such leaks on a prioritized basis. We are also participating in a parallel effort with industry research collaboratives to advance development of this

[28] The irregular drop between 2012 and 2013 was due to a change in the company reporting method for gas service count.

[29] A Type 3 leak is not immediately hazardous at the time of detection and can be reasonably expected to remain that way. However, Type 3 leaks shall be reevaluated during the next required leakage survey or annually, whichever is less.

technology, with the goal of creating a commercially-available product. The company is also planning to lease in 2016, then purchase in 2017 similar leakage survey technology in order to test, analyze and begin to implement the technology into our detection efforts.

5.6.2 Climate Change

In 2009, a climate change study was conducted for NYSEARCH member utilities that investigated the effect of climate change during the periods 2005–2025 and the potential impacts that it would have on local gas distribution company infrastructures. A few of the findings were as follows:

- Hotter summers may lead to more demand for power generation, which would increase demand for natural gas. This could increase the demand for gas not only in our service vicinity, but across the country, creating capacity issues in transmission lines.
- The increased frequency of rain may cause flooding. As part of the company's post-Sandy Storm Hardening initiatives described in section 2.2.2.4 of this plan, the company is working towards making the gas system more resilient to future storms and the rising of sea level.

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6. GAS INFRASTRUCTURE PLAN

In this section, we describe the system design strategies that Con Edison uses to efficiently manage our planned capital infrastructure investments. Further, the investment projections for the plan period and the expected benefits of our planned investments are outlined, along with some details of the programs within the gas capital infrastructure plan.

This section also highlights our robust research and development (R&D) efforts to enhance our equipment, practices, design and infrastructure management approaches with new materials and innovative technologies.

6.1 Developing the Gas Infrastructure Plan

Con Edison employs a variety of methods and tools to monitor, analyze, and optimize the performance of our gas system, and to develop our infrastructure plan. These tools and methods include:

- Defining system design criteria to meet regulatory requirements and internally-specified performance standards
- Employing tailored system design approaches
- Integrating the demand forecast in conjunction with system design criteria to meet reliability, system integrity, and safety standards
- Optimizing capital spend to achieve targeted system capacity, reliability and integrity requirements
- Monitoring and managing system performance

Customer demand drives our reliability and reinforcement needs. Our system design criteria are developed to meet safety and operational performance levels. All infrastructure projects are put through a rigorous review to evaluate alternatives that will result in the most cost-effective capital funding.

6.1.1 Defining System Design Criteria

The Con Edison system is designed to deliver gas service safely and reliably. It also must be flexible enough to accommodate new customers or increased load from existing customers. Our mission is to always look at the long-range solution and incorporate that view in addressing today's needs.

Con Edison's gas transmission and distribution systems are designed to meet the requirements of the gas safety code: NYS Codes, Rules and Regulations Part 255. In addition to Part 255, Con Edison's gas transmission and distribution systems are subject to a variety of federal, state, and city regulations, along with standards published by professional organizations.

The purpose of our design criteria is to ensure key safety, reliability, and system integrity conditions:

- Maintain the reliability of supply mains in the event of an outage of a critical regulating station
- Maintain the reliability of the transmission system
- Reduce incoming gas leaks
- Maintain the system at optimal operating pressures while satisfying detailed design basis conditions

The company's design criteria includes specifications for operating pressures, pipeline material, main replacement versus repair, design of regulator stations, tunnels, and service connections, as well as contingency procedures.

6.1.2 Employing Tailored System Design Approaches

Our design specifications also have built-in flexibility. They offer design alternatives and provide criteria for choosing among those alternatives.

For example, given the anticipated increase in gas conversion load, wherever economically justified, we connect new services to the highest pressure main available on the street to enable us to scale up quickly (and without the extra costs of additional excavation and a new connection) if a customer's load increases.

When replacing mains, we strategically replace small-diameter mains with larger-diameter mains, in order to enable our system to accommodate larger gas loads. Such tailoring of our system for future new business is especially important given that anticipated new loads (heating oil to natural gas conversions, distributed generation, etc.) are often larger than our current average customer size. Alternatives like district regulating stations or larger-diameter mains also will help reduce the capital costs required for us to support new customer demands.

6.1.3 Integrating the Demand Forecast

Con Edison has had a solid approach to forecasting demand for many years, but as part of this planning process, we have expanded the analysis and have increased the involvement of a number of corporate organizations to better integrate planning efforts that are taking place around the company. As explained in section 5.5, our demand forecast is made up of a number of component parts, including traditional growth and oil-to-gas conversion demand growth.

6.1.4 Optimizing Capital Investments

Con Edison has developed and implemented a capital budgeting process to evaluate projects and programs on an enterprise-wide basis, and to optimize expenditure decisions within operating units through the use of standardized analytical methods and guidelines. The process has been in place since 2010 at Con Edison of New York, and was developed through an initiative facilitated by the Business Improvement Services organization, in conjunction with the company's senior management team.

Capital Optimization is the first step of the capital budgeting process and aligns and ranks all capital project and program requests with the corporate strategic drivers, risks, and benefits. Proposed capital projects or programs are grouped under one of three categories—regulatory mandated, operationally required, and strategic. The company has adopted a strategic alignment methodology to evaluate projects and programs so that funds are allocated to reduce operating risks and meet strategic objectives efficiently. This methodology takes into account the portfolio's cost, benefits, and weighted strategic value, allowing for analysis of all projects and programs as an integrated portfolio.

Our Business Finance organization performs the optimization analysis, applying the constraints outlined in the Budget Guideline Memos (unless otherwise directed), and provides the strategic value and ranking of the projects and programs within the portfolio to the respective portfolio Optimization Teams. These teams consist of subject matter experts selected for their respective expertise to vet the results of the optimization. Several iterations may occur until the Optimization Teams recommend the portfolio to the respective Governance Committee for final approval. The final recommended portfolio is then input into the next step of the budget process.

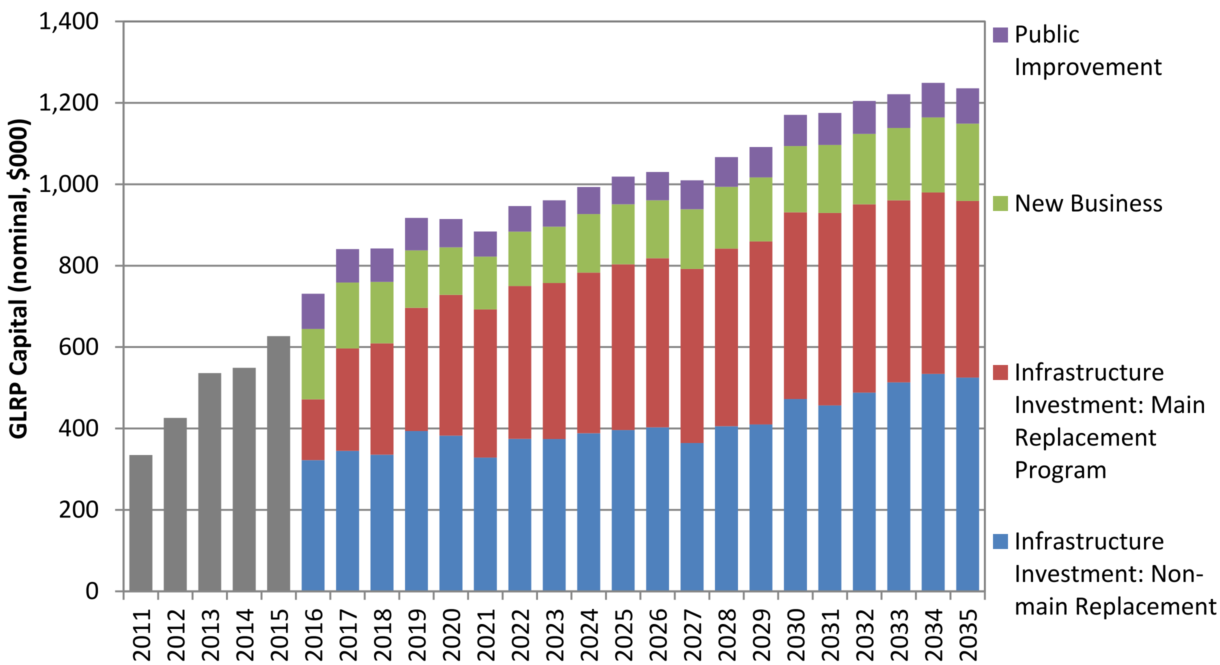
6.1.5 Monitoring and Managing System Performance

We constantly monitor the performance of our gas transmission and distribution infrastructure through the tracking of key performance indicators in our monthly Gas Operations Performance Trends report. This is a detailed 80-page report that provides the latest results and historical trends such as incoming leaks, leak backlogs, time- and cost-per-unit worked, units of work accomplished, and actual costs versus budget. We review this report monthly, and where we see variances from plan, adjust project schedules and priorities to accommodate immediate needs and risks.

In addition to the indicators listed above, the PSC also requires the company to monitor specific metrics that represent our customer service and reliability performance. As a result of the current rate case agreement with the PSC, specific goals and performance measures for Con Edison were developed and are monitored on an ongoing basis, and penalties are incurred if these thresholds are not met. The PSC may change the thresholds for each rate case period. The PSC Performance Measures for the current rate case period include company targets for customer satisfaction rate, annual system gas leak backlog, response time for gas leak calls, and total damages to company gas facilities.

6.2 Gas Infrastructure Plan Overview

Figure 6-1: Gas Capital Expenditure Forecast ($000)



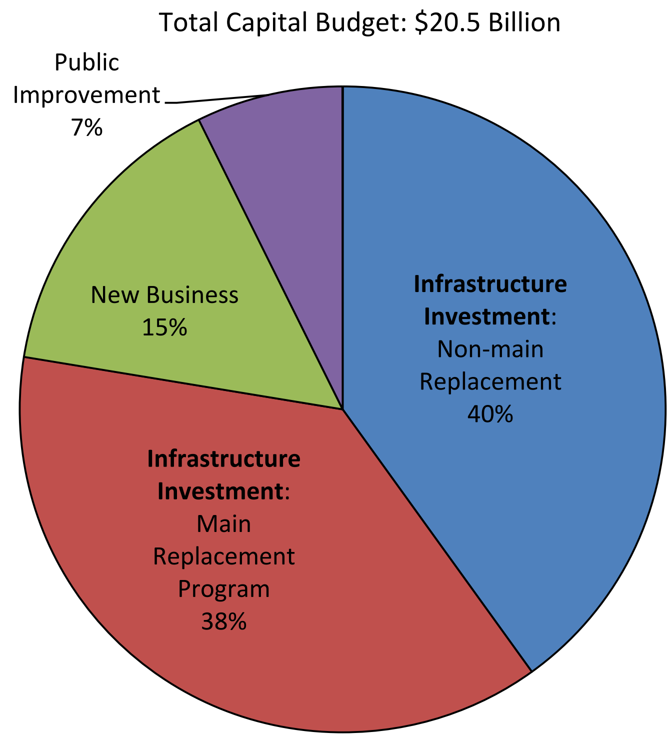
Our tools and methods described above were used to create the company's overall 20-year capital investment profile, presented in Figure 6-1 above. At our current investment trajectory, we will be investing approximately $1 billion annually or $20.5 billion during the planning period. All capital figures in this long range plan are expressed in nominal dollars and include an inflation assumption of 2.5 percent (post five-year business plan) to reflect future price level changes. The annualized growth rate of capital investment is 3.5 percent per year from 2015–2035. The drivers of these investments can be grouped into the following:

- **Infrastructure Investment:** Expenditures in this category are designed to reduce risk, maintain system integrity, accommodate gas demand and maintain pressures and system reliability. The programs in this category represent two types of investments:
  - **Main replacement program**: Replacement of 12-inch-and-under cast iron and unprotected steel gas distribution mains. This program is a necessary effort that minimizes risk from aging infrastructure.
  - **Non-main Replacement Infrastructure Investment:** Replacement or rehabilitation of all mains, services, and components in our gas distribution and transmission systems not covered under the main replacement program. These investments will further reduce system risk, and will also serve to reinforce or upgrade the system to accommodate new loads.

- Infrastructure managed under this category includes pipes, regulator stations, valves, etc. Over the planning period, this activity will represent 78 percent of our investments, as shown in Figure 6-2 below.
- **New Business:** Expenditures in this category represent the cost of installing new services or mains for connecting new customers to our system, which includes new construction, existing customers with increased load, and oil-to-gas conversions. Over the 2016–2035 planning period**,** this activity is expected to represent 15 percent of our investments.
- **Public Improvement**: When a municipality decides to perform work under its streets, the presence of existing facilities such as sewer, water, telephone, electric, and gas can complicate both new installations and maintenance work. When gas facilities are in conflict with municipal activity, Con Edison has a legal obligation to remove or otherwise protect its facilities to accommodate that work at our—and therefore our customers'—expense. Due to the nature of the work, we have little control over the amount or timing of public improvement investments required. However, we apply the same capital expenditure management to this part of the plan as for our infrastructure maintenance and new business work. Over the planning period, we forecast that this activity will represent 7 percent of our investments.

The programs outlined in our infrastructure plan will help the company to manage our complex, logistically challenging, underground gas transmission and distribution infrastructure designed to the rigorous reliability and safety standards that our customers have come to expect.

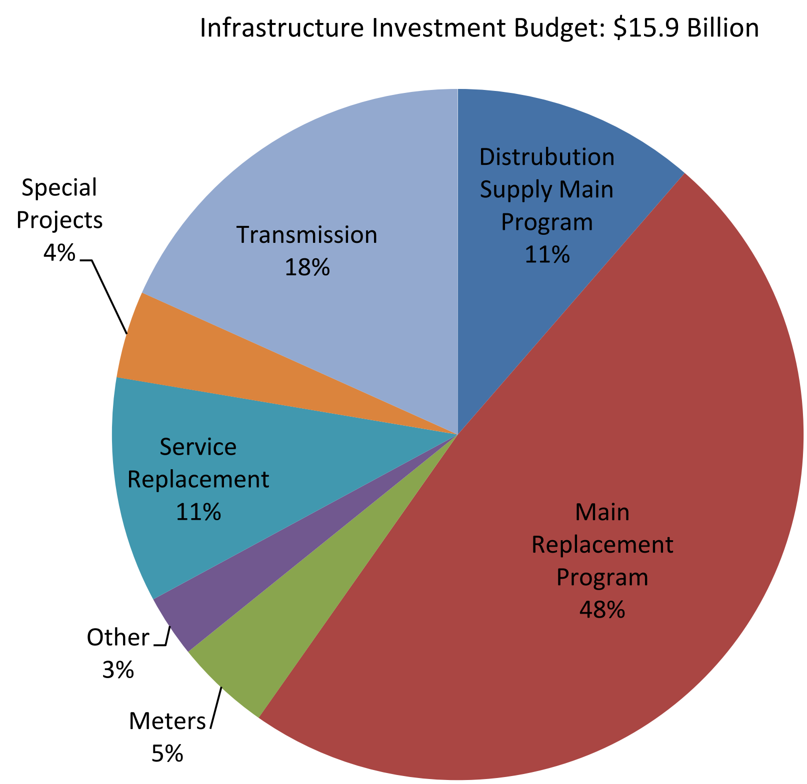
Figure 6-2: 20-year Gas Infrastructure Plan Breakdown



6.3 Infrastructure Investments

As stated above, programs and projects in this category target ongoing infrastructure replacement of pipes and components along with new facilities that reduce risk, maintain system pressures for system reliability, to reduce leaks, to maintain the system's integrity and safety, and to accommodate new loads. Figure 6-3 shows the various programs that make up our infrastructure investments.

Figure 6-3: 20-year Gas Infrastructure Investment Breakdown



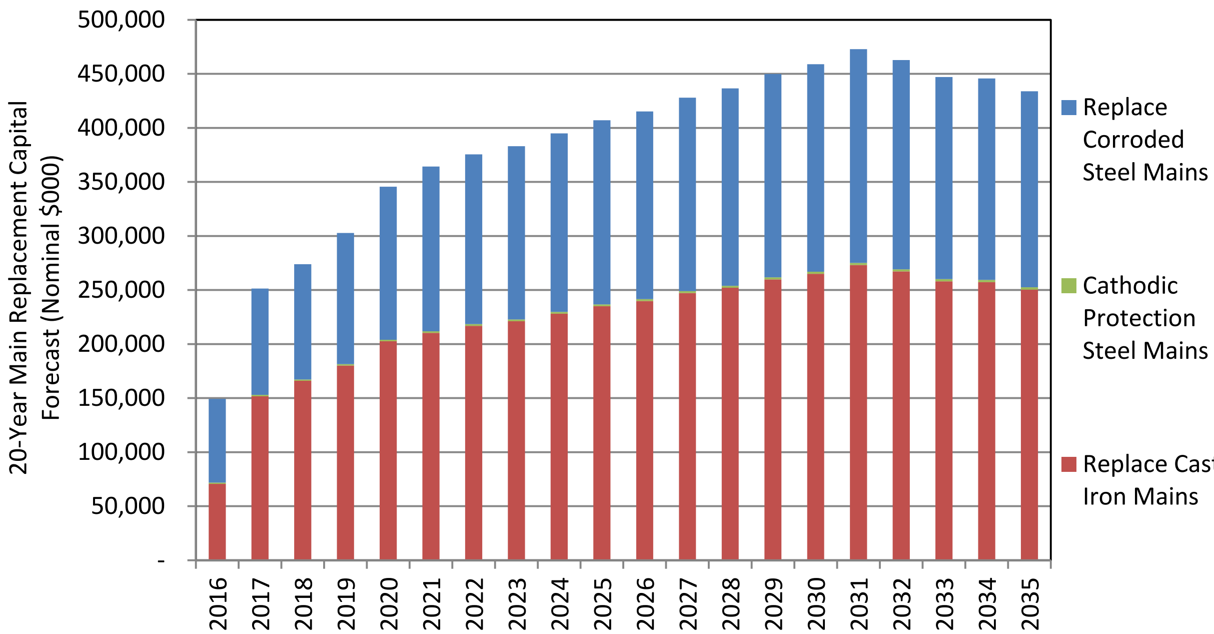
6.3.1 Main Replacement Program

The main replacement program is the largest component of our infrastructure maintenance plan and comprises 48 percent of the $15.9 billion infrastructure investment at $7.7 billion over the 20-year plan. It involves replacement of cast iron and unprotected steel distribution mains with plastic or cathodically-protected steel pipe to reduce leaks and maintain system integrity.

The level of main replacement is generally mandated by our regulators during each rate case agreement. Replacement is prioritized using a statistical computer program that considers main conditions (material, age, and size), and main risk (ease of gas ingress and consequence). As described in section 3.2.1, this replacement program has been accelerated to achieve the replacement of all 12-inch-and-under cast iron and unprotected steel mains within the next 20 years. This acceleration will result in a significant increase from historical capital expenditures for this program.

As shown in Figure 6-4 below, the capital spending for main replacement will ramp up over the next five years, from a forecasted budget of $149.3 million in 2016, to $364.2 million in 2021. The increase is driven by increased levels of replacement in Manhattan and the overall annual increase in replacement mileage. Once the planned replacement level reaches 100 miles per year in 2021, the budget will undergo a more gradual annual increase, reaching a peak of $472.9 million in 2031. Our budget will begin to decline slowly as this program is completed, ending at a forecasted annual budget of $433.9 million in 2035.

Figure 6-4: 20-Year Main Replacement Program Capital Forecast



Along with the challenge to replace our 12-inch-and-under cast iron and unprotected steel infrastructure over the next 20 years is an equal challenge to assemble the company and contractor resources needed to complete this effort. These needs will be largely addressed by new contractors that will need to build up their internally-trained and qualified employees over time. In the short-term, the unit cost of the replacement program will likely increase as the annual replacement level increases and the resources become fully qualified and efficient. This is reflected the capital budget forecast shown above.

Investments to reduce system risk will reduce operations and maintenance expenditures over the long run. For example, replacing cast iron and unprotected steel pipes 12-inch diameter and less will reduce the operations and maintenance costs incurred annually to repair leaks on these mains.

We continue to seek opportunities to utilize trenchless technology measures on replacements where such methods are appropriate and prove to be the most cost-effective approach. Our main replacement work has been completed generally by contractors or by company forces with area contractor support. While the increased use of trenchless technology, where appropriate, helps mitigate the excessive cost of trenching and restoration associated with traditional direct bury installation methods, we will also transition to a geographic replacement approach in specific areas selected based on their relative risk and solicit competitive bid packages accordingly.

In addition to the replacement of 12-inch-and-under cast iron and unprotected steel mains, our replacement program also includes a small amount of funding for the installation of cathodic protection, such as test stations and anodes, on existing steel mains. This program allows the lifespan of existing steel mains to be extended during the course of the replacement program.

6.3.2 Distribution Supply Main Projects

Supply mains represent the backbone systems that transport gas from the transmission mains to the distribution system. The cast iron and unprotected steel portions of these supply mains pose a potential safety and operational risk if not properly maintained. To proactively address this issue, these supply mains are identified and prioritized for replacement or rehabilitation based on an evaluation of their leak history together with the results of the main replacement prioritization model. These projects replace sections of pipe with larger diameter mains where appropriate, to reduce the risk of a significant customer outage during the coldest winter days resulting from loss of supply to local networks or downstream regulator stations. Con Edison will spend nearly $1.8 billion, or 11 percent of its infrastructure budget, in the 2016–2035 period to complete these projects.

One of our newer initiatives for cast iron piping greater than 12-inch diameter is to utilize cured-in-place lining that would be designed to prevent joint leakage and breaks. Although liner technology exists today, more research and development work can further improve the technology to achieve the most reliable product that can be used as a longer-term solution. The expectation is that liner technology will continue to develop over the next decade. This technology is and will continue to be very cost-effective compared to replacement of these large-diameter cast iron pipes. Larger-diameter cast iron pipes are a much lower risk than cast iron pipes of 12-inch diameter and below, since they have higher thickness and beam strength compared to smaller-diameter piping, and are therefore much more resilient to breaks. Also, leaks at joints can be addressed with other technologies that exist today, such as CISBOT[30] and external joint sealing at a much lower cost than pipe replacement. Our plan for unprotected steel piping greater than 12-inch diameter will also utilize trenchless technologies that can offer more cost-effective long-term reliability.

We also have a number of other programs which address additional risks and vulnerabilities in the supply main system, including the Winter Load Relief Program, and the System Vulnerabilities Program, each described below.

6.3.2.1 Winter Load Relief

Winter Load Relief is an ongoing annual program that involves the installation and replacement of gas mains for system reinforcement in areas where pressures are forecasted to drop below design criteria during a peak hour, based on expected demand growth for the following heating season. Without this program, the system low points and downstream regulator inlet pressures could fall below design criteria and possibly result in customer outages on the coldest winter days. Because of the capital investments associated with this reinforcement ($439.7 million to be spent over 20 years), we seek to maximize system benefits by evaluating alternative solutions including upsizing mains, installing regulator stations and upgrading mains to higher operating pressures.

6.3.2.2 System Vulnerabilities

In many cases, the failure of a single component on our gas system could result in a large-scale outage during winter peak heating system. Beginning in 2017, we will be implementing a new program that will proactively address these vulnerabilities through system reinforcement projects. Parts of the system where a single failure would have the largest impact will be targeted first. Network analysis modeling studies will be performed annually in order to determine the prioritization of planned projects, and identify emergent vulnerabilities.

6.3.3 Transmission Projects

During this GLRP, our transmission projects are focused on replacing segments of the gas transmission system that operate greater than 20 percent of the SMYS and are constructed of lower ductility pipe than currently used in our new transmission mains. The objectives of these investments, which are budgeted at nearly $2.9 billion over the next 20 years, are to improve reliability, increase gas supply take-away capacity, and reduce the risk of pipe failure. The projects will maximize supply flexibility and deliverability and help us meet electric load-generating requirements. This category also includes the installation of

[30] CISBOT is a robot that seals cast iron pipe joints in live gas mains. Working inside live 16” to 36” low-pressure gas mains, CISBOT can seal up to 40 joints through one small access pit.

remotely-operated valves (ROVs) to rapidly isolate desired sections of the system in the event of damage or for planned repair purposes.

6.3.3.1 Bronx Tunnel to White Plains Transmission Projects

Over the next 15 years, an 18-mile section of the oldest transmission main in our system, a 24-inch steel main stretching from Hunts Point in the Bronx, across the Bronx River, and north to White Plains, will be replaced with new 36-inch steel through a series of three capital projects: the Bronx River Tunnel to Bronx-Westchester Border project, the Westchester-Bronx Border to White Plains project, and Bronx River Tunnel and Easement project.

This 24-inch transmission main is constructed of lower strength steel joined with mechanical couplings. The new main will replace the lower ductility pipe with transmission pipe that is made of steel that is stronger and more resilient.

The work will also require the installation of ROVs as required to meet the Con Edison design criteria. The installation will also require the replacement or reconnection of supply to existing regulator stations. The existing 24-inch transmission main in the Bronx River Tunnel will be replaced by either the installation of a new 36-inch main within the tunnel or by horizontal directionally drilling (HDD) with a new 36-inch main alongside the tunnel.

This replacement will provide many significant enhancements:

- It will permit future elimination of the 245 psi maximum allowable operating pressure system.
- A continuous, 36-inch 350 psig system from White Plains to Hunts Point connected to the existing 36-inch transmission piping from Hunts Point to Astoria, Queens, will enhance operation of the transmission system allowing for flexibility of economic dispatch of various sources of gas.
- It will permit future elimination of the Hunts Point Compressor Station and expenses associated with the facility.
- A 36-inch, 350 psig system from White Plains to Hunts Point will provide contingency in the event of the loss of a gate station should the supply of gas from a pipeline be interrupted. The larger diameter main is crucial to withstanding the loss of the White Plains Gate Station and to withstand the isolation of a section of transmission main along the southern route of this line.
- The 36-inch will operate at less than 20 percent SMYS, therefore supplying safe and reliable gas service to the firm gas customer.
- The new facility will have much greater fracture toughness/greater ductility and will provide a safer delivery of natural gas.
- It will increase take-away capacity at our White Plains Gate Station (i.e., support additional supplies for oil-to-gas conversions).
- It will provide for the elimination of potential corrosion issues associated with current field-coated mains.

6.3.4 Service Replacement

There are three main service programs in our infrastructure plan. The first involves the replacement of vintage unprotected steel services performed in conjunction with main replacement projects. As our level of main replacement increases, this associated program will also increase. Our second service program will replace the approximately 400 services in our systems, which do not currently contain outdoor shut-off valves, in order to meet the requirements of the New York City Fuel Gas Code.

The third service program in our plan replaces leaking services installed before 1972, which have been identified as being the source of an active leak. For pre-1972 steel gas services, replacement is the most prudent means to clear a gas leak and make the condition safe. Approximately 25 percent of the incoming outside leaks received result in a service replacement. Over $1.7 billion will be spent in the next 20 years to fund these service activities.

6.3.5 Other

This category includes programs such as the physical security enhancements projects, described in section 3.2.3, and the installation of isolation valves, described in in section 3.4.2. Also included in this budget category are programs that are managed by the company's Pressure Control department. This department is responsible for the maintenance and operation of our more than 300 regulator stations, which require capital maintenance and equipment replacement projects.

Projects that involve replacement and rehabilitation of our LNG facility are also included in this category. The LNG facility requires new equipment and refurbishment whenever parts become obsolete or equipment life-cycle expires. Some of the larger projects that will be performed at the LNG plant throughout the plan are the upgrade of two vaporizers, and the rebuild of two gas turbines.

Our tunnel facilities also require regular refurbishment and equipment replacement. While the tunnels house the company's electric, gas, and steam facilities, Gas Operations is responsible for the operation and maintenance of all company tunnels. Capital projects planned for the tunnel facilities include replacement of radio communications, electrical services, facility supports, and walkway passages. All are included in this "other" portion of the gas capital budget.

Overall, we plan to spend $461 million on isolation valves, Pressure Control programs, LNG projects, and tunnels projects throughout the plan.

6.3.6 Special Projects

In addition to distribution and transmission main replacement work and service replacements, we have various other special projects included in the infrastructure investment category of our GLRP. Included in this category are projects such as the implementation of the Gas Work and Asset Management System, detailed further in section 8.2.1, which will require an investment of $152 million over the planning period. In total, Con Edison will be investing nearly $650 million for the duration of this plan to fund special projects.

6.4 New Business

New Business investments include the installation of new gas mains and/or services to provide gas service to new customers or to existing customers with increased load. Most jobs are small, requiring a single service and in some cases, a short main extension. As discussed in section 5, recent trends have led to a large increase in the number of oil-to-gas service conversions in our territory. As a result, New Business has become a more significant part of the budget in recent years.

New Business also includes reinforcement investments, including system reinforcements, new district regulators, upgrades to supply mains, and pipe replacements with larger sizes required to accommodate growth and maintain adequate delivery pressures.

Beyond 2015, it is anticipated that we will continue to construct at least two new distribution regulator stations per year to accommodate demand across the distribution system. In addition to these regulator stations, we will need to construct associated pipes and services to serve new customers. We will also need to perform necessary infrastructure upgrades and reinforcements associated with new customer growth. This expected investment is required to support incremental growth in No. 2, 4 and 6 oil conversions, distributed generation, and natural gas vehicles in addition to traditional new business (new construction, and existing customers with increased load). Overall, we plan to spend $3.1 billion on new business work throughout the course of the plan.

6.5 Public Improvement

In a city as congested as New York, Con Edison's gas infrastructure must share the space under the city's streets with other utility facilities, such as telephone and cable TV owned by private companies, and also with sewer and water systems owned by municipalities. When a municipality decides to perform work under its streets, the work is often complicated by the presence of our facilities. Under these circumstances, the company has the legal obligation to remove or otherwise protect its facilities to accommodate the municipal activity.

When a city or a municipal entity plans to perform work within these streets and is prevented from completing the proposed plan due to other facilities being in the way, the term *interference* is used. Interference can be direct or indirect. Direct interference occurs when the existing facility needs to be moved to accommodate and provide space for the new facility, resulting in a capital expense. An indirect interference occurs when an existing gas main is placed in the angle of repose[31] due to third party excavation. This is resolved through a short main replacement, resulting in either an O&M or capital expenditure depending upon the extent of the affected main length.

If the City of New York or a municipality performs work, such as installing new or upgrading water mains, sewers, catch basins, curbs, and sidewalks and so forth around a Con Edison gas main or service, then Con Edison must bear the cost to move or replace its facilities affected by the city's or municipalities' proposed construction activity. Often the facilities replaced have many years of useful life left. We have little control over the amount or timing of public improvement investments required. However, we do apply the same capital expenditure management to this part of the plan as for our infrastructure maintenance and new business work.

During the years 2011–2015, we spent approximately $70–84 million annually in public improvement projects. Gas infrastructure relocations have significantly increased in the past several years and are anticipated to continue at higher than historical levels.

As with all of our work, we endeavor to realize productivity and technology-related gains wherever we can. We work to coordinate main replacement with public improvement projects. This is especially critical in Manhattan where there is an extensive infrastructure impact due to many ongoing and planned New York City municipal projects. Historically, these have included the NYC Water Tunnel and Second Avenue Subway projects, along with numerous other public improvement ventures. These can be considered one-time opportunities to install the correct size facilities required to accommodate anticipated load growth. We also collaborate with the other entities involved to benefit from common project elements (for example, a common trench) to reduce costs and disruption. Throughout the course of the plan, we forecast expenditures of $1.5 billion for public improvement projects.

6.6 Research and Development

The Con Edison Research and Development (R&D) organization strives to be an agent of change that drives innovative technological solutions—addressing both short-term operations issues and long-term strategic objectives. They review technology developments in all industries, participate in utility industry groups, and perform benchmarking in an effort to leverage best practices and opportunities to improve operations.

[31] The maximum angle from horizontal at which a given material will rest on a given surface without sliding or rolling. For trenches, this is the natural collapse line of any excavation that is not supported.

R&D administers projects through internal staff and through two external gas industry research and development consortia (NYSEARCH[32] & OTD[33]). Between these two organizations, R&D is currently participating in over 62 projects that address various areas important to the company, such as plastic pipe leak repair, methane quantification, leak detection and pinpointing, third-party damage, trenchless technologies, repair technologies, facility locating, corrosion mitigation, gas interchangeability, pipeline integrity, and environmental, health, and safety.

The company has a well-established program that identifies, prioritizes, secures funding, and manages research, development and demonstration projects. Internal R&D is particularly important to the company because no other gas utility faces the same level of customer density and underground utility congestion. The company's average customer density per city block is substantially higher than that of most other utilities, resulting in a higher average cost of maintaining a section of main. Utility congestion under the streets of our territory is also the highest of any gas utility in this country, making the cost and complexity of maintaining our systems higher than other gas utilities.

6.6.1 R&D Program Objective

The objective of the company's R&D program is to match the needs of company operations with opportunities for new business solutions in the form of technologies, processes and methodologies to accomplish the following objectives:

- Reduce risk and enhance public and employee safety
- Increase operational performance and flexibility
- Enhance customer experience and engage our customer
- Create new cost efficiencies in our everyday work

The R&D group works with Gas Operations employees to identify areas where there is a need for new technologies, processes, and methodologies. R&D also conducts periodic brainstorming sessions and seminars to discuss problems with various gas departments, solicit ideas for new projects, and showcase new technologies. This results in a highly customer-driven process, where the customer is the Gas Operations organization.

6.6.2 R&D Sponsorship

Once a potential new business solution is identified, a user/sponsor is obtained within Gas Operations to assist in preparing a cost/benefit justification for the appropriate R&D project. The analysis of candidate projects considers potential advantages compared to the financial and human resources required for successful development, to arrive at the right amount of investment.

R&D projects are staffed and managed either internally, where the user/sponsor Gas Department provides support as the project progresses through its development phases through to field demonstration, or as a collaboration with outside organizations where another group shares in the staffing and management and helps fund the project.

[32] NYSEARCH is a collaborative research, development and demonstration (RD&D) organization dedicated to serving its gas utility member companies. Members of NYSEARCH voluntarily participate in projects and programs to target RD&D areas that directly address their unique challenges and opportunities. The NYSEARCH Committee is a voluntary sub-organization within the Northeast Gas Association.

[33] Operations Technology Development (OTD) is a not-for-profit established in May 2003 to facilitate collaborative research on issues relating to gas operations and infrastructure with a focus on reducing operating costs, enhancing safety, and increasing the operating efficiency of natural gas distribution systems. OTD's membership has grown to 23 members, representing utilities throughout the United States and Canada.

6.6.3 Increased Adoption of New Technologies

The R&D group has completed or is in the process of completing a number of successful internal and collaborative R&D projects that are in various stages of adoption by the Gas Operations areas, such as the Residential Methane Detector test project discussed in section 3.3.2. Some of the most impressive recent successes have involved trenchless technologies that collectively allow the Company to repair or rehabilitate gas mains without the need to excavate and create an open trench. These technologies not only reduce the need to excavate, but they also reduce traffic congestion and combustion emissions from trenching equipment and utility vehicles; they improve safety for pedestrians and workers; and they reduce noise that would be associated with traditional excavation activities.

Illustrative examples of recent trenchless technology successes include:

- Development of a no-dig anode installation method to install a 17 lb. anode that prevents main corrosion on an existing steel main or service without the need for excavation. This method demonstrated cost savings due to the reduction in excavations, and resulted in corrosion prevention, which will reduce future leak repairs.
- Completion of the longevity testing of field-aged cured-in-place linings used to rehabilitate piping by lining steel or cast iron mains. CIPLs serve as an economical option for replacing steel or cast iron gas mains. The results of these tests demonstrated that the current lining product will provide over 100 years of service.

Other recent successful R&D projects include:

- In conjunction with R&D, Gas Operations successfully performed a live main insertion project in Queens. The process inserts a smaller high-pressure main into an existing low-pressure main, leaving existing customers on low-pressure until work to transfer those customers to high-pressure can proceed on a scheduled basis. This results in only one interruption of gas to the customer instead of the current process that interrupts the customer twice.
- R&D partnered with National Grid to develop and test a cast iron joint sealing robot (CISBOT) that seals leaking cast iron joints on 20-inch to 36-inch cast iron mains. The robot has been tested in Westchester and successfully sealed over 200 feet of cast iron main on Route 9A from one excavation.

Gas Operations has historically incorporated successful R&D projects into our work processes and project designs. For example, trenchless technologies like the CISBOT, and ConSplit[34] are routinely evaluated as alternatives to main replacement. We are committed to continually incorporating new technologies into our work.

[34] ConSplit™ is a pipeline splitting technique in which a tool is launched into an existing pipe at an entry pit and pulled through the pipeline to an exit pit. The old pipe is split open and expanded out into the soil, allowing a polyethylene pipe to be pulled into the enlarged hole immediately behind the ConSplit tool.

7. ENHANCING CUSTOMER EXPERIENCE

7.1 Overview

Over the past five years, low commodity costs, increasing supply, customer demand, environmental regulations and an expectation of reliability have prompted consumers to adopt gas for heating purposes in record numbers. Despite recent drops in the price of oil, Con Edison believes that interest in natural gas will continue to rise. We expect customers to continue to use gas, not only for residential/commercial heating and food preparation, but also for air conditioning, emergency backup, and distributed generation. While environmental regulations, low commodity prices and reliability are certainly components in the customer decision-making process, we cannot forget the end user's impression of the company.

Enhancing the customer experience is mission critical for the Gas Organization and for Con Edison as a whole. Efforts are underway to engage customers using the platforms they are most comfortable with—including mobile applications and social media. We not only need to have a safe, reliable system and to make the appropriate investments in infrastructure improvements and expansion, but we also need to adapt our own plans to meet the changing expectations of our customer base.

7.2 Customer Perspectives

The gas we provide affects the lives of our customers every day—and their feedback is invaluable to us.

Customers interact with us across multiple platforms—through online applications for service, inquiries to our customer call centers, social media (such as Facebook and Twitter), emergency calls routed to the Fire Department or the Gas Emergency Response Center, and through stakeholder engagement meetings. Customers inquire about gas service installations, restorations after emergency shut-offs, billing inquiries and gas service availability.

In addition to direct contact from customers, we maintain an active dialog with community-based organizations, civic leaders, advocacy groups, concerned citizens and public officials throughout the year in various forums. Our Public Affairs staff interacts with homeowners, renters, small business owners, and community leaders on numerous occasions, including community and employer meetings, environmental fairs, and senior events. We conduct at least one annual conference for community-based and social service organizations, and we interact with countless numbers of elected officials and community boards. This type of interaction is expected to continue throughout the course of our long range plan.

To benchmark our performance and ensure that we are aware of relevant concerns, we participate in J.D. Power and Associates surveys of residential and business customers for gas and electric utilities. In addition, we conduct surveys on customer satisfaction, and monitor our information and education programs to identify their effectiveness as well. We actively use the feedback we receive from each of these areas about customer concerns, information requirements, and expectations. Con Edison also has an online community that we pulse regularly to provide us with feedback on various issues and topics. Participation in the online community is voluntary.

7.2.1 Customer Research Enhances Plan Development

Success in defining and executing this plan is dependent upon a strong partnership with our customers. Gathering feedback on key issues directly from our customer base has allowed us to build on our daily interactions with them, and to better understand customers' energy needs and priorities. What we have learned has helped to refine the objectives of this plan and has confirmed our belief that customers value reliability, prefer that we are proactive with our investment programs rather than reactive, and understand that there are significant costs associated with maintaining a complex system that meets their expectations.

In addition to the customer surveys indicated above, our Gas Conversions group meets with the real estate community and has surveyed the members of the Real Estate Board of New York.

Customers have indicated the following:

- Customers see gas as a long-term (permanent) option for heating purposes and will continue to convert at boiler end-of-life.
- Despite increased awareness of gas safety, customers have not abandoned conversion projects.
- Lack of coordination of infrastructure work/delays in restoration is a source of frustration for them.
- Customers want access to information.

7.3 Enhancing the Customer Relationship

One of our key strategic objectives is the continuous improvement of our relationship with our customers. In order to achieve this, we need systems and processes that are effective and that satisfy customer needs. For example, we plan to use new media, as appropriate, to expand our communication and customer service programs. We will also use new technology, including improvements to our internal systems, to make it easier for customers to do business with us and foster more interactive communication and collaboration that can eliminate the need for a customer to have to take the time to contact us.

Consistent with our environmental goals and the expectations and concerns of some customers, we will also search for effective ways to increase awareness of energy efficiency via energy management tools, incentives, and education.

7.3.1 Digital Customer Experience

The Digital Customer Experience (DCX) programs that we have planned will deliver an improved online experience for customers through a redesign of the customer interface, that will include the www.coned.com external website, the mobile website, the "My Account" portal and the mobile app. This will include purchase and implementation of new technology-supporting enhanced digital interactions, development of a new web and mobile customer experience, and the implementation of tools to support multi-channel communication preferences such as chat, text, and email.

The company seeks to provide this best-in-class user experience by providing customers with better and more coordinated information across multiple channels. This will be achieved through a transformation of current digital offerings, new technology, improved analytics, and a new digital operating model. The DCX program will also enable efforts such as REV[35] and AMI[36], contributing to customer engagement opportunities.

In 2015, a project team was formed, and a planning phase was completed. In 2016, a Web Experience Management (WEM) platform will be installed, a secure and streamlined customer authentication process will be put into place, a redesign of public web pages will be released with simple and intuitive navigation and social media integration with customer feedback survey tools will become available.

[35] REV (Reforming the Energy Vision) is New York State's effort to dramatically change how energy is generated and consumed in the state. It is intended to spur the energy industry to evolve beyond the traditional electric grid structure.

[35] AMI (Advanced Metering Infrastructure) With AMI, customers will have access to new energy management tools that provide them with detailed information about their energy use, and Con Edison will be able to automatically detect when customers lose power, leading to faster restoration times.

In 2017, a redesign of *My Account* will be released along with a new mobile site and mobile app experiences. New usage analysis tools will offer high-bill alerts, anticipated bill amounts, and suggestions for lowering bills. Live chat and communication preference management will provide customers with greater freedom to access the company in the manner they desire.

In 2018, energy efficiency and steam customers will see revamped portions of their sites, and mobile apps will be further enhanced. Continuous improvement and refreshed strategy will be ongoing throughout these periods and beyond.

7.4 Impact on the Customer Bill

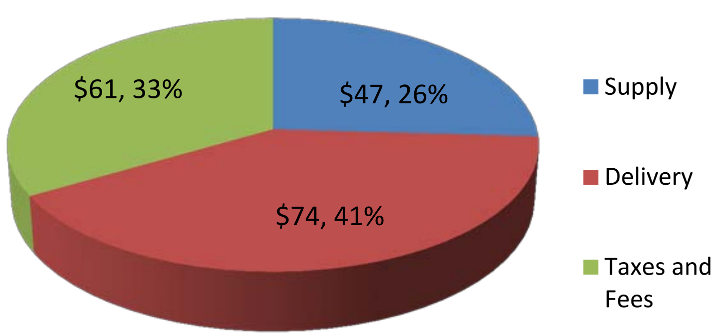
All of the programs discussed in the previous section will help us to enhance the customer experience over the planning horizon. Much of this plan has illustrated our infrastructure investment projects and programs. These programs will minimize risk and provide the high reliability and safety our customers have come to expect. The infrastructure plan that supports these projects and programs leads to the following projections for the customer bill.

We strive to minimize customer bills and have outlined in this document several programs and initiatives designed to monitor our infrastructure costs as well as to work directly with customers to manage their energy usage. While we will continue to make every effort to keep our transmission and distribution rates down, it is important to convey that market and policy forces outside of our control will impact our customers' bill. In particular, the composition, availability, and affordability of the gas supply may experience changes over the 20-year planning horizon.

The customer bill reflects Con Edison's tariff charges for delivery, supply, taxes, and regulatory fees. See Figure 7-1. As the operator of delivery systems, we collect all components of the bill in a single customer payment and remit payments as required to appropriate parties. In June 2015, delivery charges represented approximately 41 percent of the heating customer's residential gas bill; the remaining 59 percent are attributable to costs of supply and costs of taxes and fees imposed by various suppliers and government agencies.

As a proxy for our gas customers' bill, we look at a typical New York City residential apartment building customer with constant monthly consumption of approximately 135 therms over the planning period.

Figure 7-1: June 2015 Residential Customer Bill



7.4.1 Delivery Charges

The delivery rate represents the cost of transporting energy from the point-of-supply to the Con Edison system, and ultimately to the customer. This rate covers costs to build and maintain our transmission and distribution assets, and also to maintain and operate customer billing and other operations that serve customers. As a regulated utility, we recover our costs of providing service through our rates. As we invest in our system, we recuperate the costs of those investments over time through accounting expenses, and earn a return on our capital.

The delivery rate represents Con Edison's "cost of service", including:

- Capital expenditures to provide service, upgrade the infrastructure, and to ensure safety and reliability
- Operating and maintenance expenditures to maintain the infrastructure and to respond to emergencies
- General and administrative expenses required to run Con Edison's business

From 2010–2015, Con Edison's delivery charges declined approximately 12 percent for residential heating customers.

7.4.2 Taxes and Fees

Customers typically pay a Supply Gross Receipts Tax (GRT), a Delivery GRT, and a Sales Tax on their bill. In June 2015, these taxes represented approximately 8 percent of the residential customer's gas bill. Also included are taxes paid by Con Edison, such as income and property taxes, which represent 66 percent of the taxes and fees or 21 percent of the customer's total as of the June 2015 residential heating bill. In total, taxes make up approximately 30 percent of the customer's total gas bill.

The customer bill also includes fees collected for external entities. The System Benefits Charge and Renewable Portfolio Standard surcharge are mandated fees that finance energy efficiency and renewable portfolio programs operated by NYSERDA. The System Benefits Charge funds programs have been determined by the Public Service Commission to be inadequately addressed by New York's competitive energy markets. In addition, there is an 18a Assessment, which is a fee imposed by the New York State Legislature for the support of the State's General Fund. This fee will be phased out by March 2017. There are also supply taxes imposed on each customer, which are based on a sales tax rate applied against purchased supply and a general receipts tax applied against Con Edison total revenues. These fees comprise approximately 3 percent of the customer's bill.

7.4.3 Supply Charges

Supply costs are also a major component of our customers' bills. Although Con Edison does not own significant sources of supply, we procure energy for our full-service customers and those procurement costs are part of their bill.

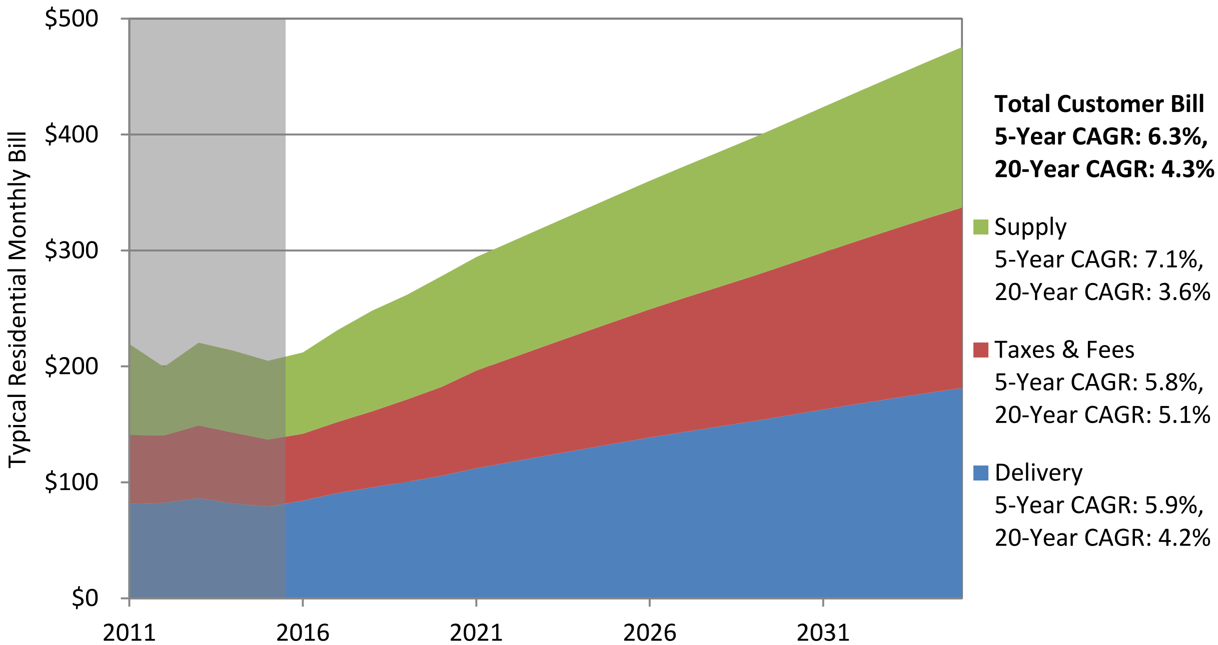
As much as practical, our supply comes from the least-cost options available and is typically a composite of short- and long-term firm supply contracts, and spot market purchases made by the company. To mitigate increases on the supply portion of the bill we invest, or support investment, in transmission projects that would give us access to lower cost sources of supply. Supply charges include the actual cost of the commodity (i.e., the cost of the natural gas itself) and related charges for the cost of storage and delivering the gas to Con Edison for redelivery to customers. In June 2015, this represented 26 percent of the average residential heating bill.

As mentioned above, Con Edison procures gas for some residential and commercial customers from various gas suppliers. We then pass on the actual cost of the gas to the customer without any additional markup. The company charges a nominal fee, known as the Merchant Function Charge (MFC), as its charge for competitive functions that have been unbundled from base rates, and may be avoided by any customer purchasing gas transportation service only[37]. The MFC currently is comprised of:

- Supply-related charges, primarily procurement
- Credit and collections-related charges
- Gas-in-storage working capital
- Gas Cost Factor (GCF)-related uncollectibles

Figure 7-2 below depicts what might comprise the customer bill over the planning period.

Figure 7-2: Customer Bill Forecast[38]



The Gas Long Range Plan projects a customer bill CAGR of 4.3 percent over the planning horizon or 1.8 percent above inflation. The bill projection includes the requested capital project and program investments in the current rate case.

Near-term gas customer bill growth is driven nearly equally by each portion of the bill. Supply costs are increasing as prices rebound from recent low levels. These low levels have been caused by a gas oversupply due to pipeline constraints that have prevented Marcellus shale production from leaving this region. Those pipeline constraints will be alleviated in 2016–2017 when new projects become operational, increasing pipeline capacity, and leading to more demand for Marcellus shale and higher prices.

Additionally, there is upward pressure on the taxes and fees and delivery portions of the bill. Delivery increases are a function of increased capital expenditures to manage system risk via accelerated main replacement while decreases in fees (e.g., phase-out of 18-a assessment) are offset by increases in income and property tax as our rate base grows.

[37] Full-service customers acquire their gas from Con Edison. Transportation customers acquire their gas from third party marketers.

[38] An average residential customer is estimated to consume 135 therms of gas monthly. The 2015 data is based off of a calculated bill, not historic.

7.4.4 Property Tax Implications

Beyond the cost projections set forth in this study, there are additional opportunities to lower the tax component of customer bills.

Con Edison has consistently advocated on behalf of customers that New York's state and local governments need to reform utility taxation because of the regressive nature of utility taxes. Con Edison's energy services in NYC and Westchester County are subject to a plethora of taxes, assessments that function like taxes and fees, which are in turn, built into utility bills. Property taxes are the principal source of the company's tax payments, but the Con Edison tax burden stretches beyond just property taxes. Federal and state income taxes, state and local gross receipt taxes, sales and use taxes, surcharges on utility company purchases, and various other "assessments" all add to our customers' bills.

Property taxes are used to finance local governments and public schools. The funds raised via the property tax levy are often the major revenue source for municipalities, and as a result, there is always pressure on governments to either raise property taxes or cut services.

Con Edison has been, and remains very concerned about the high property taxes in our service territory and their impact on customer bills. We have voiced and demonstrated our concern through the pursuit of litigation and legislative relief for decades. The company has periodic meetings with the NYC Department of Finance and NYC's Legal Department to discuss property tax issues, both to try to settle past litigation and to discuss legislative initiatives. We are currently working with the staff of the Public Service Commission and other gas utility companies in New York State (NYS) to have replacement small-diameter cast iron and unprotected steel mains exempt from property taxes. Our proposal is to have the existing assessment on the retired pipe continue, and treat the new pipe replacement as a repair, and therefore not assessable for property tax purposes. Our strategy to control property taxes consists of legislative initiatives, litigation initiatives, and compliance initiatives.

Our principal legislative strategies are to:

- Champion a bill to make rate base the basis for utility property tax assessment.
- Support legislation to remove utility property from local assessments and instead centralize the assessment process by having NYS assess all of the property.
- Pursue the elimination of a law known as the "Pegging Law" that unfairly taxes certain of our utility property in Westchester County.

The litigation strategy related to gas is to challenge in the courts the property tax assessments by the Office of Real Property Services on the company's gas special franchise property.

Our principal compliance initiative is to continue and expand our efforts in pursuit of:

- Economic obsolescence
- Functional obsolescence
- To identify property that could be moved from taxable to non-taxable status

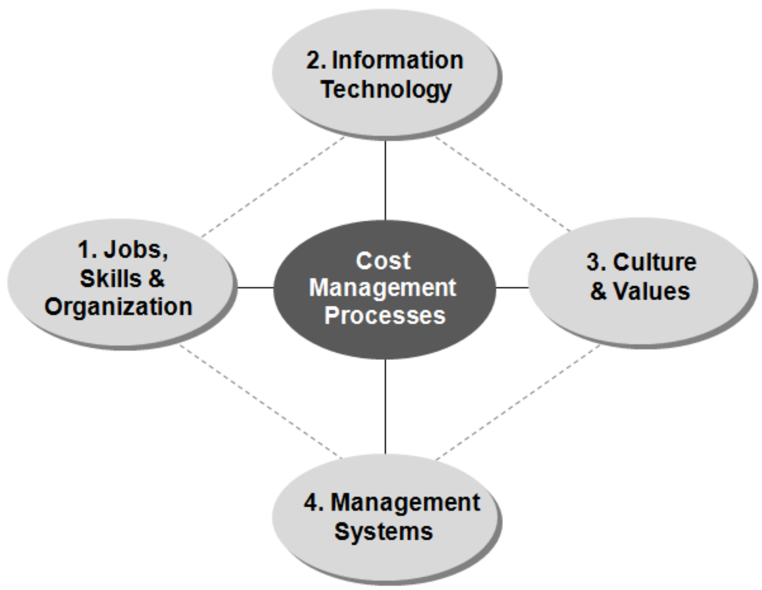
8. CONTINUED FOCUS ON COST MANAGEMENT

Our plan is focused on assuring that our gas service remains reasonably priced for our customers. We continuously review our cost management processes to ensure we maintain this focus and provide our employees with the skills and tools necessary to effectively track and manage costs. During the course of this plan, we will continue to improve our cost management practices in the following four key areas (see Figure 8-1):

- jobs, skills and organization
- information technology
- culture and values
- management systems.

This will entail the integration of planning, management, and review processes to incorporate financial and field operations and align these priorities with cost management. This will involve efforts such as putting an organizational structure into place that balances consistency in all policies and practices, and the alignment of activities and priorities with our stakeholder partnerships.

Figure 8-1: Four Point Implementation Program for Cost Management Improvement



8.1 Jobs, Skills and Organization

8.1.1 Skill Evolution

Our workforce of 2036 will look very different from today's workforce. In looking out over the next 20 years, our staff—at all levels—will need stronger analytical skills. This is because each of the plan themes outlined in this report will require significantly-enhanced analytical work. The integrated management of new demand and supply resources will require a new, more complex level of planning and dispatching.

Tailoring our gas system design will require the quantitative evaluation of several options to address customer demand, reliability and safety constraints. Improving our infrastructure and the increasing monitoring and control of the system will require the processing and analysis of large volumes of data—from load and pressure flow analysis to condition-based maintenance. Managing the customer experience will be transformed by the availability of new information and data and the exponential increase in customer service requirements to explain and make the data easily understood and actionable by customers. Jobs throughout the organization will become more complex and we expect that new jobs will be created to meet the great demand for analytical skills.

We are currently developing capabilities to perform ongoing strategic workforce planning, which will help us proactively anticipate and manage our staffing into the immediate and longer-term future. This involves identifying key skill gaps three-to-five years out, and developing and updating an ongoing strategy to fill those gaps through hiring, internal development, or a combination of both. One approach we are exploring is in building strategic partnerships with local high schools, community colleges, and universities.

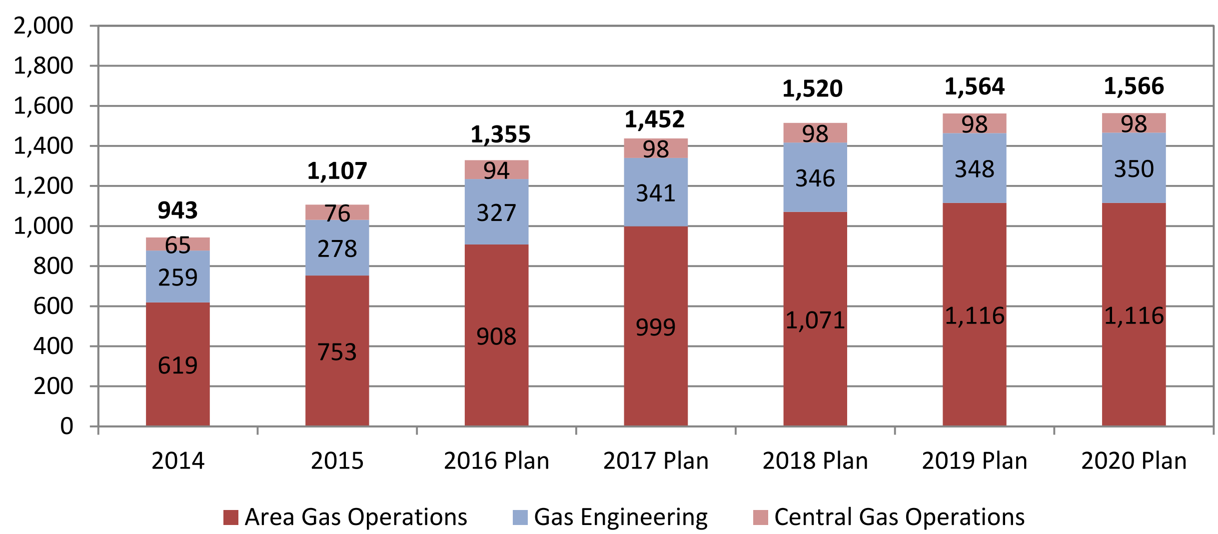
We expect to manage the longer-term implications of skill gaps by carefully monitoring the relationship among industry trends, Con Edison strategic direction, and internal capabilities. This will ensure we are well-positioned for the future, attracting talented people and providing them with the necessary training, development, benefits, job satisfaction, and career growth, thereby minimizing turnover. Going forward, this skill gap analysis will be a standard activity in our workforce planning initiatives.

8.1.2 Strategic Workforce Planning

As mentioned above, we are working on plans to ensure that we fill future workforce gaps. As Figure 8-2 shows, the projected headcount over the next five years indicates growth in the Gas Operations organization due to a steadily increasing workload. This Gas Operations workload increase is driven by a commitment to public safety through two major work categories:

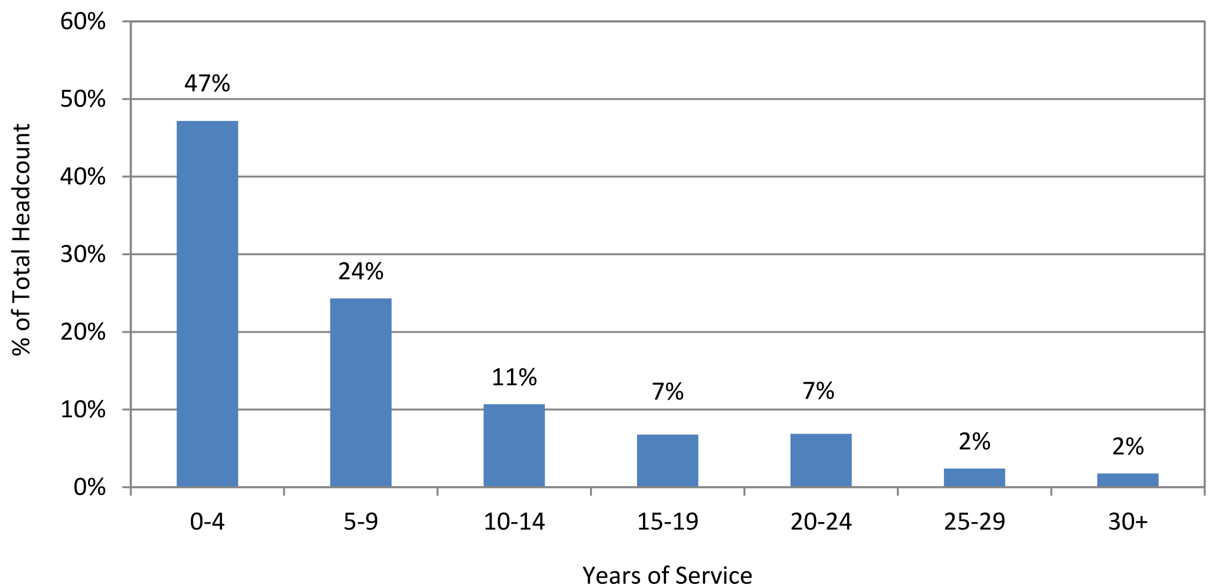
- **Acceleration of main replacement work:** Gas Operations will be accelerating the rate of small-diameter cast iron and unprotected steel main replacements from 65 to 100 miles per year by 2021, as a proactive measure to reduce risk, enhance public safety and improve system reliability. This will permit the company to complete the replacement of all cast iron and bare steel 12-inch-and-smaller diameter mains in 20 years.
- **Doubling of the leak call volume:** Leak response and public safety is a top priority for Gas Operations. Gas Operations will continue with the monthly gas system surveys and customer outreach efforts we are currently undertaking, which to date, have led to a doubling of the number of leak calls and leak repair work compared to prior years.

Figure 8-2: Con Edison Gas Operations Headcount Five-Year Resource Plan



Increases in hiring have altered our workforce demographics drastically. As Figure 8-3 below indicates, 71 percent of our workforce has been employed at Con Edison for less than ten years, and 47 percent for less than five years. This demonstrates that a large number of new employees requiring comprehensive training are coming into the organization. Training objectives must address the steep learning curve required to enable new employees to quickly develop functional knowledge and be effective on the job. Field personnel, for example, participate in apprenticeship programs coupled with formal hands-on training to provide the necessary skill sets to qualify them for promotions and increasing responsibilities.

Figure 8-3: Con Edison Gas Operations Headcount by Years of Service, as of October 2015



Based on the demographics of our workforce, and the structure of our retirement plan, we expect that about 11 percent of our employees working today will retire between 2016 and 2020. We will use systematic knowledge management transfer practices to ensure that we do not lose critical organizational capabilities as this workforce retires. We will focus on the following strategies:

- Employ a cohort training structure to provide employees with a clear path for developing the skills and qualifications needed to perform required tasks.
- Hire a larger percentage of qualified external candidates into the company at the mid-level Mechanic B title. These mechanics start with more experience and skills than typical entry-level hires, which reduces the amount of time needed to perform fully operator-qualified duties.

In another effort to meet the increased operational needs of Gas Operations, the company is working with local schools, local labor unions, and other qualified organizations to create workforce development programs that can be used to train future utility workers. These programs will enhance our candidate pool and empower potential mechanics with skills that will assist them in accelerating through their career path at Con Edison. The company also pursues specialized recruitment opportunities, such as veteran recruitment, and recruitment of women into non-traditional roles.

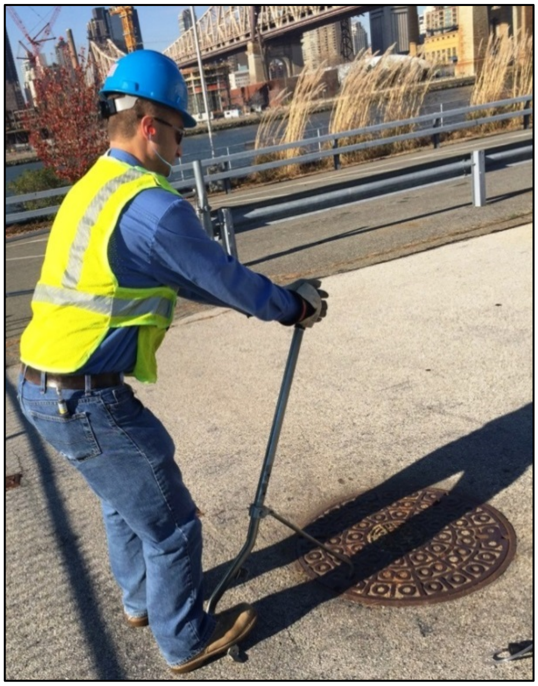
8.1.3 Highest Commitment to Employee Training

Training is one of the most significant investments we can make. The Con Edison Learning Center is a corporate education facility where we train and test employees in the skills they need to safely and productively perform their work. The Learning Center includes classrooms and hands-on labs for real-life learning (See Figure 8-4). Instructors are a combination of former field, office, and line personnel. The courses available at The Learning Center fall into two general categories: Skills and Leadership.

8.1.3.1 Skills Training

Training employees in hands-on skills for new positions is a high priority at The Learning Center. However, the type of employee we are training today and our organizational needs differ from the past. We have shifted our focus from providing veteran employees with new skills for different jobs to providing new employees with enhanced skills for more complex jobs. All of our newly-hired employees require basic training and then skill-enhancement training as they move through their career paths. We also provide refresher training for existing employees. This increase in training demand has compelled us to look at new instructional methods such as e-learning, simulation training, and self-study courses.

Figure 8-4: Con Edison Employee Training at The Learning Center



8.1.3.2 Leadership Training

It has also become increasingly important to look toward recruiting the company's future leaders. We have therefore adapted our training curriculum to provide leadership and analytical skills as well as career advice to develop and prepare employees to manage the Con Edison of tomorrow. An additional priority of both The Learning Center and our Talent Management organization is to develop employees with a greater sense of business acumen. This involves classroom discussions with such topics as ethics, open communications, lessons learned from incidents and audits, and continuous improvement.

8.2 Information Technology

8.2.1 Work and Asset Management System

Starting in 2016, a project team will deploy an integrated Work and Asset Management solution for Gas Operations that will allow for standardization of work processes, better work scheduling and prioritization, and provide a single repository for all work and asset data related to Con Edison's gas facilities.

This project will yield strategic benefits that support both corporate and Gas Operations' goals and objectives. Some examples are:

- an integrated view of financial and operational data resulting in more effective risk mitigation strategies
- increased transparency
- more effective trending and analysis
- improved operational efficiencies
- an enhanced customer experience through more accurate and timely information around work flow and job status

In addition, while the business has always operated within a stringent regulatory environment, the advent (and ongoing) implementation of stricter integrity management regulations has given rise to a new set of requirements that the existing operating model, supporting systems, and processes will be challenged to maintain.

The new system will enhance our ability to comply with increasingly stringent regulations around pipeline safety and recordkeeping. It will also improve Gas Operation's ability to meet new regulations for material/component traceability. Furthermore, it will allow for tighter management of public safety concerns on asset inspection and surveillance programs. Finally, it will permit the prioritization of work through condition-based analysis that balances safety, resources and cost effectiveness.

8.3 Safety Culture

It is important for each employee or contractor to focus on the safety of each task before, during, and after completion. All work requirements and tasks will be mapped to worker's knowledge, skills, and abilities. Job safety is promoted in all company training materials and instruction.

We have a number of programs and initiatives in place to achieve an injury-free workplace. The main performance metric in the area of employee safety is the OSHA incidence rate.[39] The incidence rate is a normalizing indicator that captures the number of recordable injuries/illnesses per standard unit of 100 full-time equivalent employees (each working 2,000 hours per year). It is dependent upon the number of recordable injuries/illnesses experienced and the number of productive hours worked, which includes all straight time, compensable overtime, training hours, and restricted-duty hours for both weekly and management employees.

Con Edison's current safety performance, as measured by the incidence rate, is at the midpoint of its industry peers. We finished 2015 on-target, with a company-wide incidence rate of 1.40 (or approximately one injury and illness per 100 workers). The company-wide OSHA rate goal for 2016 is also 1.40. We still believe there is a significant opportunity for improvement however, and have therefore established the reduction of this company-wide rate as a key objective for all operating groups.

Our Environment, Health and Safety group is working closely with all operating groups to make sure that we achieve our safety goals, including providing appropriate tools and resources to ensure compliance with safety rules, performing comprehensive job planning and briefings, documenting site safety observations— and more broadly—to promoting a culture of personal accountability. As we continuously improve our culture to embrace learning from our experiences and achieving personal and organizational bests, we will seek to maintain or improve that performance over the planning horizon.

[39] The formula for calculating the incidence rate is: Number of Recordable Incidences x 100 x 2000 / Total Number of Productive Hours Worked.

8.3.1 Promoting a Culture of Compliance

Con Edison operates in a regulatory environment governed by federal and state rules. As such, our organization is designed to focus on compliance at every level of the organization. In order to ingrain this culture, we promote a self-correcting environment, where all employees are encouraged to have a questioning attitude, be open to internal findings, and embrace feedback. We also ensure that specifications and regulations are made readily-available to all field and office employees. This permits our organization's employees to have all of the information that they need to perform their jobs in our regulatory environment, and to align with our Enterprise Risk Management process, which has enhanced communication and transparency as one of its goals.

As our GLRP plays out, the newly-established Gas Compliance and Quality Assessment Organization, described in section 3.5 will be at the forefront of our efforts to maintain a compliance culture.

8.4 Management Systems

The roles and responsibilities of all employees will be more clearly defined across our organization with an emphasis on creating a deliverable- and action-oriented culture. As the dynamics of our workload changes, we will implement new management systems as needed to maintain clear accountabilities for estimating accuracy, tracking of results, analyzing variances, and implementing corrective actions.

8.4.1 Centralize Construction Management

In 2015, the company created a centralized Construction Management Gas department, under the Central Operations construction organization, responsible for overseeing planned gas capital construction work completed by contractors.

Before this reorganization, both the Gas Operations organization and the Central Operations Construction Management department provided gas contractor supervision in their respective territories. Faced with the challenge of dramatically-increasing levels of capital gas work over the past five years, the company came to recognize that efficiencies could be gained through the creation of a gas-specific construction management organization. Centralization will enable the company to meet the growing gas workload as well as to standardize processes across the service territories. As the infrastructure investments plan explains, the increase in the level of capital work, driven primarily by the main replacement program, is expected to be sustained over the course of the 20-year plan. The centralized Gas Construction Management group will be crucial in streamlining the implementation of the new geographic approach to our main replacement program. This group will also support other gas capital programs, including commercial and residential service work, distribution supply main projects, and the isolation valve installation program.

8.4.2 Standardize Project Management

The company has made several significant changes to centralize and improve the management of major capital programs and projects within Gas Operations. This initiative will result in projects and programs being managed in a more effective and efficient manner.

In 2015, Gas Operations reorganized the department's project management (PM) efforts into a more centralized PM model. This includes the assignment of PM duties to a dedicated project management group rather than to engineers and operations staff. This model provides management support for large capital projects. Its fundamental function is to provide improved cost and schedule management through industry-leading PM principles and techniques. We are also in the process of revising our project management processes and procedures, which includes the implementation of a new Enterprise Project Management System.

Before these improvements were implemented, project management largely fell to engineers and operations staff. As the number of major capital projects and programs has increased, the ability of engineers and operations staff to productively and efficiently perform their core responsibilities, while simultaneously managing several major projects, became more challenging.

A strong PM structure will improve overall coordination and execution of projects. This reorganization will help foster a results-driven environment that promotes striving for operational excellence, delivering a quality service/product, and ensuring that project and program activity scope are in compliance with regulatory requirements.

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9. PLAN SUMMARY

9.1 Introduction

This Gas Long Range Plan describes some of the many challenges and opportunities that face Con Edison Gas Operations over the next 20 years, provides a roadmap of what we intend to do, and shares our strategy for accomplishing our goals and objectives. In this final section, we summarize what has been discussed and provide some signposts that we will heed to meet our objectives.

A *signpost* on the highway informs drivers of what lies ahead, whether it be a sharp curve, dangerous intersection or simply what city they are entering. Likewise, based on the information outlined in this plan and a careful analysis of the learnings from what has transpired in the past, this section discusses some of the realities that are foreseen for the future of the gas business at Con Edison and outlines some initiatives toward possible courses of action.

9.2 Vision and Objectives

Section 2 introduced us to the Con Edison Gas Operations vision and mission statements and five themes that will govern the plan. See Figure 2-1. The themes are:

- Managing System Risk
- Balancing Demand, Supply, and Environmental Profile
- Improving Infrastructure Planning and Design
- Enhancing the Customer Experience
- Focusing on Cost Management

The plan themes carry out our mission and individually describe areas of Con Edison strategy by which individual programs and investments are developed.

Background information on the Con Edison gas distribution and transmission systems was also provided in this section. One can see just how incredibly complex this system is and why it is necessary to have a detailed plan in place to help guide our decision-making process.

Risk reduction, performance, and cost control are key objectives of the plan and were introduced in this section. These are often competing priorities and the challenge is to balance them so that all can be accomplished successfully to some measure. Subsequent sections of this plan took a more in-depth look at those areas.

A signpost we need to follow is that we need to adapt our planning, design, and operational practices to meet internal challenges. As in the past, we will continue to build and maintain the necessary gas delivery infrastructure. To achieve excellence in this pursuit, we will utilize innovative approaches as compared to what were standard practices in the past. We will employ improved planning processes that leverage quantitative measures to optimize our project and program investment portfolio, and continuously prioritize and incorporate feedback into that process. We will continue to reevaluate our traditional design standards to find lesser-cost solutions to meeting our customers' growing and changing needs, and furthermore, our designs will need to provide greater flexibility than ever before.

9.3 Risk Management

Managing risk is a major objective of the Gas Long Range Plan and the initiatives we are undertaking were discussed in-depth in section 3. Specifically, we discussed our plan to manage the risk of a gas distribution event through enhanced quality control/assurance, prevention, detection, and response mitigation strategies.

The company has several programs in place, such as the main replacement program, that reduce risk by replacing aging infrastructure on a prioritized basis using a prioritization model and the results of our Distribution Integrity Management Program. This section also detailed how by strategically approaching the task, the replacement of these mains gives the company the opportunity to upsize capacity for future growth at a minimal cost increase.

Also discussed in the section was the Gas Compliance and Quality Assessment Organization, which plays a key role in the company's risk management efforts. The organization will create a Regulatory Strategy and Compliance unit in 2016 that will focus on new or changed regulations and mandates that may be issued.

9.4 Natural Gas Supply Outlook

Section 4 provided an outlook of the gas supply over the 20-year planning period, and Con Edison's strategic priorities for ensuring that an adequate supply reaches our service territory. It discussed the three aspects of gas supply, which are:

- The availability of natural gas resources (domestic and global)
- The wholesale competiveness of natural gas compared to other fuels
- The deliverability of natural gas to the New York City area

This plan assumes growing demand for natural gas based on a gas supply outlook with abundant natural gas resources—including shale—a relatively low natural gas price, and the relative affordability of natural gas compared to alternate energy sources. The section also details the steps that Con Edison has taken to assure adequate sourcing to meet demand through diversity of supply and additional capacity.

Key supply signposts would include considerations that might restrict gas supplies, drive prices significantly higher than the predicted range, or conditions that might alter the price/availability of competing fuels. Shale deposits are abundant, but the industry's ability to tap that supply is dependent on the outcomes in city, state, and federal legislation/regulations regarding hydraulic fracturing. Rules that would adversely impact well development economics or restrict large areas of gas fields from exploration will reduce resource availability. Con Edison will closely monitor any rule changes associated with hydraulic fracturing of shale.

9.5 Natural Gas Demand and Customer Growth Factors

In section 5, we discussed the natural gas demand and environmental aspects of the plan. It provided background on the unprecedented amount of oil-to-gas conversions that have been taking place, how distributed generation is likely to play a larger role, and the impacts that economic growth, environmental regulation and technology development will have on our gas usage forecasts.

Also covered was Con Edison's energy efficiency plan, which will offer, and continually refine, a suite of programs that drive efficient end-use behavior and technologies that permanently reduce per-unit energy use.

Finally, the section discussed our environmental performance and the progress the company has made toward reducing overall gas emissions and how we are employing exciting new technology and are collaborating with the Environmental Defense Fund and other parties to quickly respond to those threats that have the greatest impact on the environment.

There are many uncertainties surrounding demand and customer growth but Con Edison is cognizant of several signposts that it will need to monitor closely in order to ensure that demand can be met:

- The state of the economy with regard to any unusual spikes in the costs of our labor or commodity inputs
- Any abrupt change in oil-to-gas adaptation patterns
- Change in our customer mix (i.e., firm versus interruptible business)
- Cost of competing fuels
- The increased efficiency of natural gas end-use technologies or advancement in substitute technologies
- Wide adaptation of technological innovations, such as distributed generation and alternative energy sources
- Unexpected non-response by customers to initiatives making planned results not achievable at the expected cost levels projected

9.6 Capital Investments

Section 6 was dedicated to a discussion of the gas infrastructure plan—how the plan is developed, monitored and maintained. The programs and initiatives Con Edison undertakes to manage our system and to take on new customers were outlined. It also provided details on the company's capital plan estimates during the current planning period, some of the projects being funded, and the steps that are being undertaken to optimize our capital investments. This section also contained information about Con Edison's Research and Development department and many of the R&D efforts that are underway.

Our signpost for this section is that we need to continue to invest in infrastructure. As uses of, and needs for natural gas change over the next 20 years, so too will the need to make the necessary gas infrastructure investments in order to maintain our commitment to assure the safety and reliability of our gas system while balancing affordability for our customers.

9.7 Enhancing the Customer Experience

Con Edison recognizes the importance of our customers in every aspect of our operations and section 7 detailed what the company is doing to improve upon how we interact with our customer base. The section described how enhancing the customer experience is mission critical for the Gas Organization and for Con Edison as a whole and the efforts that are underway to engage customers using the platforms they are most comfortable with—including mobile applications and social media.

The customer bill was broken down into sections and the various charges were explained in detail. The section also contained information on Con Edison's advocacy efforts to reduce the tax burden and the effect that taxes have on the customer bill.

As our customer's needs and usage patterns change over the next 20 years, so too will the ways in which we interact with them. Adoption of digital media through smart phones, tablets and social networks offers additional opportunities for Con Edison to interact with customers. Continuous customer feedback helps us understand emerging issues within our stakeholder groups, as well as identify gaps that may exist between stakeholder expectations and company actions.

Our signposts for this section are that customers want communication channels to be open and easy to use and that we need to be aware of social trends and use the methods that our customers use to communicate. Continual dialog with our customers, whether via outreach or customer research, will ensure that we remain aware of our customers' priorities. In addition, we will need to provide our customers with tools to better manage their gas usage. To carry out these objectives, we will take advantage of innovative technologies and provide our employees with the necessary skill sets.

9.8 Cost Management and Containment

The Gas Long Range Plan wrapped up with a discussion of the company's Cost Management Process in section 8. We saw that the four components of the process are:

- jobs, skills & organization
- information technology
- culture & values
- management systems

These four areas play crucial roles in Con Edison's operations and make up the foundation upon which the company conducts its business.

A signpost for Con Edison is to reduce our overall cost structure. To accomplish this, we need to continually reevaluate and enhance our operational and cost management practices. In short, we will plan for change, implement design and operational practices that support those changes, and meet the ever-shifting needs of our customers, while providing safe, reliable service in a cost-effective manner.

Another signpost is to continue improving our internal processes and educating our employees to ensure our people have the skills needed to perform the Con Edison jobs of the future. Our work is becoming more analytical, and our challenge will be to train our employees to meet new skill demands. Through strategic workforce planning, we will monitor and identify potential skill gaps and address them through resources such as training (e.g., The Learning Center), systematic knowledge management, career management, and targeted hiring.

9.9 Conclusion

This Gas Long Range Plan provides us with a roadmap for our gas system for the next 20 years. This plan guides us toward a responsible energy future for our customers, using a safe, reliable energy resource that is both environmentally responsible and affordably-priced. Building that future will require that we meet the challenges described in this plan by maintaining the gas infrastructure necessary for the transmission and distribution of gas, and expanding it in an efficient way to meet new demand.

This comprehensive plan is a holistic way to effectively integrate our gas system infrastructure plans with the non-infrastructure-related elements of our business, such as demand, supply, and environmental drivers. The plan considers ongoing improved management of existing infrastructure and a tailored approach to design, that includes alternatives and innovative technologies. The plan also provides a framework that links short-term projects and long-term actions to our goals and objectives.

To develop the forecasts for gas demand and a supply outlook, we made assumptions regarding potential environmental and regulatory requirements, economic trends, and included possible technological advances to develop forecasts for prospective customer need. Our plan was developed under considerable uncertainty (i.e., technological, regulatory, and economic) and, as a result, we identified signposts that we will monitor and use to adapt our plan as changes occur. This long range plan is intended to be a living document, with assumptions that will be refined in future versions.

This plan is consistent with the company's mission to provide safe, reliable energy to our customers, demonstrate respect for the environment, and create an atmosphere that encourages safety and development of our employees. We will accomplish this mission by maintaining a safe gas system, managing demand and supply, and protecting our environment. We will integrate our system design to meet the needs of customers in specific areas and improve our infrastructure through increased use and optimal replacement and maintenance of our assets. We will extend the life of our system if feasible, and optimize capital investments. We will provide our customers with cost-effective, safe, and reliable service, and train our workforce to be positioned to serve today and in the future. It is in these ways that we expect to successfully carry out our objectives and implement our long-range gas plan.

Appendix A - Glossary

The following terms are found throughout this document. For clarification, explanations are provided for your reference.

Term	Explanation
49 CFR Part 192	Federal code that prescribes minimum safety requirements for pipeline facilities and the transportation of gas.
assets	Items of value owned by or owed to a business. Utility assets include: Utility Plant, Other Property and Investments, Current and Accrued Assets, and Deferred Debits.
capital optimization	A process that allows the company to attain objectives by evaluating projects system wide, and make reductions across operating units through standardized analytical methods and guidelines.
cast iron pipe	Pipe made by pouring molten iron into molds. This pipe has had historic use as a pressure pipe for water, gas and sewerage. It has relatively good corrosion characteristics but is less ductile than the piping used today.
city gate	Point at which a distribution gas company receives gas from a pipeline company.
coated steel	Steel pipe that has been covered with a corrosion-resistant coating or compound (such as asphalt or tar) to prevent corrosion from soil conditions.
Code MuRRE (Multiple Resource Response Event)	An alert to field personnel for situations that require an escalated response to a reported gas leak or event.
Combined Heat and Power (CHP)	Also known as cogeneration. A system that involves the recovery of waste heat from power generation to form useful energy like useable steam. Combined heat and power is also the production of electricity and thermal energy in a single integrated structure.
common trench	A trench containing two or more utilities.
Compressed natural gas (CNG)	Natural gas in high-pressure surface containers that is highly compressed (though not to the point of liquefaction). CNG is used extensively as a transportation fuel for automobiles, trucks and buses in some parts of Italy, New Zealand, and in Western Canada, and has recently begun to penetrate some regions of the United States. Small amounts of natural gas are also transported overland in high-pressure containers.
ConSplit	A trenchless technology used to replace and up-size steel pipes with plastic pipe.
corrosion	Destruction of a metal by chemical or electrochemical reaction with its environment.
coupling	A sleeve-type fitting used to connect two pipes of similar or different materials, providing insulation or continuity.
cubic feet (CF)	The most common unit of measurement of gas volume. It is the amount of gas required to fill a volume of one cubic foot under stated conditions of temperature, pressure, and water vapor.
cured-in-place lining (CIPL)	A “trenchless” pipe rehabilitation method that can seal existing pipe leaks and prevent future leakage due to corrosion, joint failure, or third-party damage.

Term	Explanation
dekatherm (Dth)	Measurement unit for heat: 10 therms, 1,000,000 BTU. The typical measurement of the “burn ability” or heating value of natural gas and the unit at which most natural gas is purchased.
delivery rate	Portion of the customer bill which is set to recover the Company’s revenue requirement, which represents annual delivery revenues required to cover operating expenses and earn a return on the Company’s net investment to provide service.
demand side management (DSM)	The term for all activities or programs undertaken by a Load-Serving Entity or its customers to influence the amount or timing of energy they use.
distributed generation (DG)	Electricity generating apparatus sited with a customer as opposed to a centralized station. DG is designed to serve some or all of the electricity needs of a customer by leveraging fuel sources ranging from natural gas, to waste water, to renewable fuels such as solar and wind.
Distribution Integrity Management Program (DIMP)	A federally-mandated program that sets standards for integrity management programs for distribution pipeline operators.
distribution system	Gas distribution mains and services
emergency response	A response to a gas leak or other unplanned event that is capable of disrupting operations, threatens life, and/or creates major damage.
energy efficiency (EE)	Actions or technologies that provide reductions in energy consumption at the customer level, while maintaining equal or greater quality of service.
Energy Efficiency Portfolio Standard (EEPS)	In May 2007, the EEPS proceeding was initiated by the New York State Public Service Commission (PSC) as part of the overall effort to reduce New York‘s electricity use by 15 percent from forecasted 2015 levels. Subsequently, the PSC established and approved efficiency targets for the State‘s investor-owned electric utilities and NYSERDA.
Energy Service Companies (ESCOs)	Energy suppliers that sell electricity and/or natural gas to business and residential customers.
Enterprise Risk Management (ERM)	A process, by which the company identifies, monitors and mitigates risks. Our risk management program has three primary objectives: 1) systematic risk mitigation; 2) proper allocation of resources; and 3) enhanced communication and transparency.
firm customer	Service offered to customers (regardless of Class of Service) under schedules or contracts that anticipate no interruptions.
gate station	A location where gas changes ownership, from one party to another, neither of which is the ultimate consumer.
greenhouse gas (GHG)	Gases in the atmosphere that absorb and emit radiation within the thermal infrared range. The main greenhouse gases in the Earth’s atmosphere are water vapor, carbon dioxide, methane, nitrous oxide and ozone.
hedging	Any method of minimizing the risk of price changes. Since the movement of cash prices is usually in the same direction and about in the same degree as the movement of the present prices of futures contracts, any loss (or gain) resulting from carrying the actual merchandise is approximately offset by a corresponding gain (or loss) when the contract is liquidated.

Term	Explanation
Henry Hub	A pipeline interchange, located in Vermilion Parish, Louisiana, which serves as the delivery point of natural gas futures contracts.
hydraulic fracturing	Also known as *hyrofracking* or simply *fracking*. A process used to extract natural gas from previously impermeable shale. The process utilizes millions of gallons of water, sand, and chemicals injected at high-pressure into horizontally drilled wells, some as far as 10,000 feet below the surface. The pressure causes the shale to 'crack'. These cracks or fissures are held open by the sand particles and chemical properties, which then allow the natural gas to escape from the shale to the well.
incoming leaks	Gas leaks reported to or by the company.
infrastructure	The network of transmission and distribution piping systems. Generally, large distribution gas mains are laid in principal streets with smaller laterals extending along side streets and connected at their ends to form a grid.
interference	Occurs when an existing facility must be located, identified, removed and reinstalled at a new location in order to accommodate and/or provide space for a new city, or other municipal facility.
interruptible customer	Low-priority service offered to customers under schedules or contracts that anticipate and permit interruption on short notice, generally in peak-load seasons, by reason of the claim of firm service customers and higher priority users. Gas is available at any time of the year if the supply is sufficient and the supply system is adequate.
interstate	With respect to natural gas companies, the transporting and sale of gas for resale across state lines.
leak	An unintended hole, crack, break, or the like, through which gas escapes a pipe or fitting.
liquefied natural gas (LNG)	Natural gas that has been liquefied by reducing its temperature to minus 260 degrees Fahrenheit at atmospheric pressure. It remains a liquid at minus 116 degrees Fahrenheit and 673 psig. In volume, it occupies 1/600 of that of the vapor at standard conditions.
main replacement prioritization model	Software used by the company to prioritize cast iron and unprotected steel main segments by calculating a relative condition and risk score for each pipe segment, using factors such as main condition parameters, previous failure history, the physical area surrounding the main, and certain risk factors.
main replacement program	The replacement program that uses the main replacement prioritization computer model to prioritize mains requiring replacement based on factors such as leak history, soil condition, age and material of pipe.
maximum allowable operating pressure (MAOP)	The maximum pressure at which a pipeline or segment of a pipeline may be operated.
megawatt (MW)	Unit of power equal to one million watts.
meter	An instrument for measuring and indicating or recording the volume of gas that has passed through it.
methane (CH_4)	The chief constituent of natural gas. Pure methane has a heating value of 1012 Btu per cubic foot.

Term	Explanation
natural gas	A naturally-occurring mixture of hydrocarbon and non-hydrocarbon gases found in porous geologic formations beneath the earth's surface, often in association with petroleum. The principal constituent is methane.
natural gas vehicle (NGV)	A vehicle that is equipped to operate using natural gas as fuel.
NYSERDA	New York State Energy Research and Development Authority is a public benefit corporation created in 1975. Currently, NYSERDA is primarily funded by New York State rate payers through the System Benefits Charge (SBC). These funds are allocated towards energy efficiency, programs, research and development initiatives, low-income energy programs, and other activities. In addition, NYSERDA is involved in energy efficiency through the energy efficiency portfolio standard proceedings, and through a Request for Proposals process, is the central procurement administrator for renewable energy sources in New York State.
OSHA incidence rate	The main performance metric in the area of employee safety. The incidence rate is a normalizing indicator that captures the number of recordable injuries/illnesses per standard unit of 100 full-time equivalent employees (each working 2,000 hours per year). It is dependent upon the number of recordable injuries/illnesses experienced and the number of productive hours worked, which includes all straight time, compensable overtime, training hours, and restricted duty hours for both weekly and management employees. The formula for calculating the incidence rate is: Number of Recordable Incidences x 100 x 2000 / Total Number of Productive Hours Worked.
Part 255	New York State code which prescribes minimum safety requirements for the design, fabrication, installation, inspection, testing and operation and maintenance of gas transmission and distribution systems, including gas gathering lines, gas pipelines, gas compressor stations, gas metering and regulating stations, gas mains, service lines, gas storage equipment of the closed pipe type fabricated or forged from pipe or fabricated from pipe and fittings, and gas storage lines not covered by 49 CFR 192.
peak hour	The one hour of maximum system deliveries of gas during a year. Peak hour data is used to, among other things; as the basis for load requirement during system design.
peak demand	The highest rate at which gas is delivered to or by a system, expressed in cubic feet or therms or multiples thereof, for a designated period of time.
photovoltaic (PV) system	A system that employs solar panels composed of a number of solar cells to supply usable solar power.
pipeline capacity	The maximum quantity of gas that can be moved through a pipeline system at any given time based on existing service conditions such as available horsepower, pipeline diameter(s), maintenance schedules, regional demand for natural gas, etc.
Pressure Control	Organization within Con Edison which is responsible for the maintenance and operation of the Company’s gas pressure reduction equipment.
propane	A gas, the molecule of which is composed of three carbon and eight hydrogen atoms. Propane is present in most natural gas and is the first product refined from crude petroleum. It has many industrial uses and may be used for heating and lighting. Contains approximately 2,500 Btu per cubic foot.

Term	Explanation
psig	Pound-force per square inch gauge, a unit of pressure relative to atmospheric pressure at sea level.
Public Service Commission (PSC)	Public Service Commission. The New York Public Service Commission is the New York state government agency that regulates and oversees the electric, gas, water, and telecommunication industries in New York as part of the Department of Public Service.
regulator station	A device that maintains a gas pressure in the downstream piping less than its inlet pressure, regardless of the rate of flow in the line or the change in upstream pressure.
Risk Priority Number (RPN)	Quantifies the relative priority of risks across the company. For each identified enterprise risk an assessment is performed of the severity, likelihood and controllability through assigning a value from 2 - 10 for each component. These component factors are then multiplied to produce a risk priority number.
service line	A distribution line that transports gas from a common source of supply to a customer. A service line ends at the outlet of the customer meter or at the connection to a customer's piping, whichever is further downstream, or at the connection to customer piping if there is no meter.
shale gas	An emerging type of unconventional natural gas deposit. The gas is distributed throughout the low permeability shale formations rather than accumulating in a more permeable reservoir.
signpost	An indicator that provides a clue of some obstacle or feature that lies ahead. In this plan, those indicators are derived from learnings of what has occurred in the past combined with reasonable forecasts of events foreseen for the future of the gas business.
SMYS	Specified minimum yield strength.
storage	Storage facilities or a portion of storage facilities that are leased to others for the purposes of storing gas.
tariff	A gas company schedule detailing the terms, conditions and rate information applicable to various types of natural gas service. This document is filed with and approved by the Federal Energy Regulatory Commission (FERC) or a state regulatory body.
therm	A unit of heating value equivalent to 100,000 British thermal units (Btu).
transmission pipeline	A gas pipeline that operates at a hoop stress of 20 percent or more of SMYS (Federal definition). In the Con Edison gas system, all pipelines which operate at pressures over 125 psig are treated as transmission pipelines, regardless of SMYS.
trenchless technologies	No-dig techniques used for underground pipeline and utility construction for replacement, rehabilitation, renovation, repair, inspection, leak detection, etc., with minimum excavation from the ground surface.
unprotected steel	Pipe that has not been cathodically protected to prevent corrosion from soil conditions.
valve	A mechanical device for controlling the flow of fluids and gases; types such as gate, ball, globe, needle, and plug valves are used.

Term	Explanation
volatility	A term indicating how much and how quickly the value of an investment, market, or market sector changes.

E N D O F D O C U M E N T

Company Name: Con Edison
Case Description: 2016 - Con Edison Electric and Gas Rate Filings
Case: 16-E-0060; 16-G-0061

Response to DPS Interrogatories – Set DPS-5
Date of Response: 03/03/2016
Responding Witness: Gas Infrastructure & Operations Panel

Question No. : 254

Subject: Leak Prone Pipe

1. Provide the number of miles/units replaced in each of the last five years for the following projects/programs as shown in Exhibit_GIOP-1, page 2 of 217:

   a. Corroded Steel Mains

   b. Cast Iron Mains

   c. Cathodic Protection Steel Mains

   d. Services Associated with Main Work

   e. Services without curb valves

   f. Leaking Services

2. Provide a copy of the most recent Gas Distribution System Annual Report to the U.S. Department of Transportation.

Response

1. See table below providing the number of miles/units replaced in each of the last five years for the following projects/programs requested.
   (Please Note: The company does not individually track the miles/units for the Cathodic Protection Steel Mains program.)

	Corroded Steel Mains (miles)	Cast Iron Mains (miles)	Services Associated with Main Work (count of services)	Services without curb valves (count of services)	Leaking Services (count of services)
2011	20.52	9.58	2,865	324	1,862
2012	17.41	18.57	2,598	181	1,705
2013	17.73	17.59	2,942	147	1,779
2014	27.48	23.43	3,412	142	2,412
2015	29.63	24.09	3,429	171	2,384

2. See attachment DPS-5-254-Att 1.

NOTICE: This report is required by 49 CFR Part 191. Failure to report can result in a civil penalty not to exceed 100,000 for each violation for each day that such violation persists except that the maximum civil penalty shall not exceed $1,000,000 as provided in 49 USC 60122.	OMB NO: 2137-0522 EXPIRATION DATE: 10/31/2016

U.S Department of Transportation
Pipeline and Hazardous Materials Safety Administration

Initial Date Submitted:	03/10/2015
Form Type:	INITIAL
Date Submitted:	

ANNUAL REPORT FOR CALENDAR YEAR 2014 GAS DISTRIBUTION SYSTEM

PART A - OPERATOR INFORMATION	**(DOT use only)**	**20153850-24332**

1. Name of Operator	CONSOLIDATED EDISON CO OF NEW YORK
2. LOCATION OF OFFICE (WHERE ADDITIONAL INFORMATION MAY BE OBTAINED)	
2a. Street Address	1615 Bronxdale Avenue
2b. City and County	New York
2c. State	NY
2d. Zip Code	10462
3. OPERATOR'S 5 DIGIT IDENTIFICATION NUMBER	2704
4. HEADQUARTERS NAME & ADDRESS	
4a. Street Address	4 IRVING PLACE
4b. City and County	NEW YORK,US
4c. State	NY
4d. Zip Code	10003
5. STATE IN WHICH SYSTEM OPERATES	NY

PART B - SYSTEM DESCRIPTION

1.GENERAL

	STEEL				PLASTIC	CAST/ WROUGHT IRON	DUCTILE IRON	COPPER	OTHER	SYSTEM TOTAL
	UNPROTECTED		CATHODICALLY PROTECTED							
	BARE	COATED	BARE	COATED						
MILES OF MAIN	947	118	0	283	1788	1147	0	0	0	4283
NO. OF SERVICES	67968	866	0	36238	246636	0	0	17492	139	369339

2.MILES OF MAINS IN SYSTEM AT END OF YEAR

MATERIAL	UNKNOWN	2" OR LESS	OVER 2" THRU 4"	OVER 4" THRU 8"	OVER 8" THRU 12"	OVER 12"	SYSTEM TOTALS
STEEL	0	166	328	563	154	137	1,348.00
DUCTILE IRON	0	0	0	0	0	0	0.00
COPPER	0	0	0	0	0	0	0.00
CAST/WROUGHT IRON	0	7	186	658	157	139	1,147.00
PLASTIC PVC	0	0	0	0	0	0	0.00
PLASTIC PE	0	654	339	683	109	3	1,788.00
PLASTIC ABS	0	0	0	0	0	0	0.00
PLASTIC OTHER	0	0	0	0	0	0	0.00
OTHER	0	0	0	0	0	0	0.00
TOTAL	0.00	827.00	853.00	1,904.00	420.00	279.00	4,283.00

3.NUMBER OF SERVICES IN SYSTEM AT END OF YEAR | **AVERAGE SERVICE LENGTH: 44.8**

MATERIAL	UNKNOWN	1" OR LESS	OVER 1" THRU 2"	OVER 2" THRU 4"	OVER 4" THRU 8"	OVER 8"	SYSTEM TOTALS
STEEL	0	27892	65389	10350	1306	135	105072
DUCTILE IRON	0	0	0	0	0	0	0
COPPER	0	12027	5448	12	5	0	17492
CAST/WROUGHT IRON	0	0	0	0	0	0	0
PLASTIC PVC	0	0	0	0	0	0	0
PLASTIC PE	0	108460	123839	11781	2453	103	246636
PLASTIC ABS	0	0	0	0	0	0	0
PLASTIC OTHER	0	0	0	0	0	0	0
OTHER	0	18	116	5	0	0	139
TOTAL	0	148397	194792	22148	3764	238	369339

4.MILES OF MAIN AND NUMBER OF SERVICES BY DECADE OF INSTALLATION

	UNKNOWN	PRE-1940	1940-1949	1950-1959	1960-1969	1970-1979	1980-1989	1990-1999	2000-2009	2010-2019	TOTAL
MILES OF MAIN	0	1520	131	250	251	296	353	583	546	353	4283
NUMBER OF SERVICES	0	34194	10206	15504	14091	53406	65137	76215	71417	29169	369339

PART C - TOTAL LEAKS AND HAZARDOUS LEAKS ELIMINATED/REPAIRED DURING THE YEAR

CAUSE OF LEAK	MAINS		SERVICES	
	TOTAL	HAZARDOUS	TOTAL	HAZARDOUS
CORROSION	2604	1166	2789	1632
NATURAL FORCES	221	177	13	9
EXCAVATION DAMAGE	31	31	157	157
OTHER OUTSIDE FORCE DAMAGE	0	0	3	2
MATERIAL OR WELDS	41	10	32	15
EQUIPMENT	580	299	1098	494
INCORRECT OPERATIONS	9	5	7	2
OTHER	2894	1663	482	334

NUMBER OF KNOWN SYSTEM LEAKS AT END OF YEAR SCHEDULED FOR REPAIR : **36**

PART D - EXCAVATION DAMAGE

NUMBER OF EXCAVATION DAMAGES: 188

NUMBER OF EXCAVATION TICKETS : 213612

PART E-EXCESS FLOW VALUE(EFV) DATA

NUMBER OF EFV'S INSTALLED THIS CALENDER YEAR ON SINGLE FAMILY RESIDENTIAL SERVICES: 865

ESTIMATED NUMBER OF EFV'S IN SYSTEM AT THE END OF YEAR: 18368

PART F - LEAKS ON FEDERAL LAND

TOTAL NUMBER OF LEAKS ON FEDERAL LAND REPAIRED OR SCHEDULED TO REPAIR: 0

PART G-PERCENT OF UNACCOUNTED FOR GAS

UNACCOUUNTED FOR GAS AS A PERCENT OF TOTAL INPUT FOR THE 12 MONTHS ENDING JUNE 30 OF THE REPORTING YEAR.

INPUT FOR YEAR ENDING 6/30: 3.6%

PART H - ADDITIONAL INFORMATION

COATED AND CATHODICALLY PROTECTED PARTIAL STEEL SERVICES ARE COUNTED IN STEEL CATEGORIES.

PART I - PREPARER AND AUTHORIZED SIGNATURE

Amit Parikh,Senior Engineer
(Preparer's Name and Title)

(718)839-1776
(Area Code and Telephone Number)

parikha@coned.com
(Preparer's email address)

(Area Code and Facsimile Number)

Company Name: Con Edison
Case Description: 2016 - Con Edison Electric and Gas Rate Filings
Case: 16-E-0060; 16-G-0061

Response to DPS Interrogatories – Set DPS-5
Date of Response: 04/05/2016
Responding Witness: Gas Infrastructure & Operations Panel

Question No. : 254 Supp

Subject: Leak Prone Pipe

1. Provide the number of miles/units replaced in each of the last five years for the following projects/programs as shown in Exhibit_GIOP-1, page 2 of 217:

    a. Corroded Steel Mains

    b. Cast Iron Mains

    c. Cathodic Protection Steel Mains

    d. Services Associated with Main Work

    e. Services without curb valves

    f. Leaking Services

2. Provide a copy of the most recent Gas Distribution System Annual Report to the U.S. Department of Transportation.

Response

Supplemental response to 1.d:
*Due to an error in calculating the units replaced in the services associated with main work program, the unit data has been revised. The data for the original response to interrogatory DPS-5-254 was calculated incorrectly and the revised calculation is indicated in the table below.

Services Associated with Main Work (count of services)	
2011	2194*
2012	2126*
2013	1936*
2014	2490*
2015	2198*

Company Name: Con Edison
Case Description: 2016 - Con Edison Electric and Gas Rate Filings
Case: 16-E-0060; 16-G-0061

Response to DPS Interrogatories – Set DPS-5
Date of Response: 03/07/2016
Responding Witness: Gas Infrastructure & Operations Panel

Question No. : 257

Subject: Gas Safety: Leak Prone Pipe

Provide the following information:

1. Provide a breakdown of the remaining inventory of leak prone pipe (mains and services) by material type and diameter, as of December 31st 2015.

2. Provide a breakdown of the remaining inventory of leak prone pipe (mains and services) in flood prone areas by material type and diameter, as of December 31st 2015

Response

Response to Question 1:

Please see the table below for a breakdown of the remaining leak prone pipe main inventory as of December 31, 2015.

Pipe Diameter	CI / WI (miles)	Steel (miles)	Total
<= 4"	178.26	425.48	603.74
6"	478.10	312.30	790.4
8	156.81	139.89	296.70
10	21.08	18.96	40.04
12	135.13	72.10	207.23
Total	969.38	968.73	1938.11

Please see the table below for a breakdown of the remaining leak prone pipe service inventory as of December 31, 2015.

Pipe Diameter	CI / WI (miles)	Steel (miles)
<= 1"	N/A	182.04
1.25"	N/A	22.11
1.5	N/A	191.58
2	N/A	213.33
3	N/A	30.82
4”	N/A	15.09
6”	N/A	5.85
8”	N/A	2.04
10”	N/A	0.01
12”	N/A	0.12
Total	N/A	662.99

Response to Question 2:

Please see the table below for a breakdown of the remaining leak prone pipe main inventory in flood prone areas as of December 31, 2015.

Pipe Diameter	CI / WI (miles)	Steel (miles)	Total
<=4"	4.43	5.28	9.71
6"	11.67	8.44	20.11
8	4.57	3.13	7.7
10	1.17	0.19	1.36
12	5.89	1.92	7.81
Total	27.73	18.96	46.69

Please see the table below for a breakdown of the remaining leak prone pipe service inventory in flood prone areas as of June 2015.
(Please Note: This analysis requires real world extracts of our service assets. The Company's latest real world extract of services was completed in June of 2015.)

Pipe Diameter	CI / WI (miles)	Steel (miles)
<= 1"	N/A	4.54
1.25"	N/A	0.43
1.5"	N/A	4.07
2"	N/A	5.71
3"	N/A	1.89
4"	N/A	1.73
6"	N/A	0.63
8"	N/A	0.20
12"	N/A	0.08
Total	N/A	19.28

Company Name: Con Edison
Case Description: 2016 - Con Edison Electric and Gas Rate Filings
Case: 16-E-0060; 16-G-0061

Response to DPS Interrogatories – Set DPS-11
Date of Response: 03/25/2016
Responding Witness: Gas Infrastructure & Operations Panel

Question No. : 387

Subject: Mains and Services Replacement Program

1. Provide the average cost to replace a gas service line of unprotected steel and/or cast-iron, broken down by labor and material.

2. Provide a breakdown of the estimated cost of $45.4 million in 2017, $49.3 million in 2018, and $52.1 million in 2019, to replace approximately 2,500-2,800 leak prone services annually by labor and material, as shown on page 49 of GIOP direct testimony.

3. Provide a breakdown of the estimated cost of $251.3 million in 2017, $274 million in 2018, and $302.8 million in 2019, to replace 70, 75, and 80 miles of leak prone pipes (LPP) respectively, as shown on page 34 of GIOP direct testimony by labor and material.

4. Provide the forecasted cost to replace the remaining ten miles of 12-inch and under of unprotected steel and cast iron pipes, to be replaced under other programs, for each forecast year 2016 through 2019, broken down by labor and material.

5. Please identify which project category the ten miles of 12-inch and under replacement of unprotected steel and cast iron pipe project is listed on GIOP – Exhibit 1.

6. Provide the total mileage of LPP replaced, per material type, in each of the operating service territories (i.e. boroughs) during the calendar years 2010 through 2015, and the associated costs.

7. Provide the total number of leak prone services replaced, by material type, in each of the operating service territories (i.e. boroughs) during the calendar years 2010 through 2015, and the associated costs.

Response

1. Please see the table below

Element of Expense	
CAPITAL OVERHEAD	$ 3,604
CONTRACT SERVICES	$ 6,007
LABOR	$ 1,562
MATERIAL AND SUPPLIES AND HANDLING	$ 721
OTHER	$ 120
Grand Total	**$ 12,015**

2. Please refer to the "Request by Elements of Expense" breakdown for the Services Associated with Main Work Program on page 48 of Exhibit__GIOP-1.

3. The three programs that make up the estimated costs as outlined in this question are Replace Corroded Steel Mains, Replace Cast Iron Mains, and Cathodic Protection Steel Mains.
Please refer to the "Request by Elements of Expense" breakdown for the Replace Corroded Steel Mains Program on page 9 of Exhibit__GIOP-1
Please refer to the "Request by Elements of Expense" breakdown for the Replace Cast Iron Mains Program on page 12 of Exhibit__GIOP-1
Please refer to the "Request by Elements of Expense" breakdown for the Cathodic Protection Steel Mains Program on page 14 of Exhibit__GIOP-1

4. The remaining ten miles of 12-inch and under unprotected steel and cast iron replacement will be achieved as a secondary benefit through various other programs. These other programs are related to public improvement, new business, oil-to-gas conversions, and system reinforcement work. This type of work is unplanned and emerging and can be related to city infrastructure projects, encroachment conditions, new business and oil to gas requests, and developing system reinforcement. Therefore, the forecasted cost is based on the respective other programs and the labor and cost cannot be broken down by the ten miles of replacement. Please note the public improvement / interference program is not part of the Gas Infrastructure and Operations Panel Testimony and Exhibit.

5. In accordance with Exhibit_GIOP-1 the following program/project categories are related to the additional replacement of ten miles of 12-inch and under unprotected steel and cast iron main replacement.
The categories are:
Projects related to *Distribution Supply Main Program*,
Projects related to *Growth Related Programs and Projects*,
Projects related to Public Improvement / Interference work - Please note the public improvement / interference program is not part of the Gas Infrastructure and Operations Panel Testimony and Exhibit.

6. Please see the table below

Year	Cast Iron LPP							
	Manhattan		Bronx		Westchester		Queens	
	Associated Cost ($000)	Miles Replaced	Associated Cost ($000)	Miles Replaced	Associated Cost ($000)	Miles Replaced	Associated Cost ($000)	Miles Replaced
2010		6.45		6.85		4.84		4.20
2011		5.45		8.42		6.12		4.21
2012		5.21		6.80		13.48		4.72
2013		4.91		8.13		12.21		4.01
2014	$42,038	3.66	$30,439	10.19	$27,950	14.85	$12,680	3.75
2015	$ 56,552	4.87	$29,892	10.24	$44,755	18.67	$12,126	2.67

Year	Unprotected Steel LPP							
	Manhattan		Bronx		Westchester		Queens	
	Associated Cost ($000)	Miles Replaced	Associated Cost ($000)	Miles Replaced	Associated Cost ($000)	Miles Replaced	Associated Cost ($000)	Miles Replaced
2010		.45		1.96		11.14		15.48
2011		.25		2.21		13.97		17.23
2012		.66		1.23		14.46		10.77
2013		.50		2.39		14.76		5.57
2014	$1,636	.18	$3,578	1.29	$24,245	22.80	$24,245	7.86
2015	$5,200	.48	$6,835	1.86	$38,678	21.01	$24,556	10.87

These costs are incorporated into various programs, some of which fund multiple activities in addition to leak prone main replacements. The associated costs for leak prone pipe replacements were not separately tracked prior to 2014.

7. Please see the table below

	2010	**2011**	**2012**	**2013**	**2014**	**2015**
Manhattan	114	107	96	146	201	150
Queens	1,425	1,626	1,059	754	1,123	977
Bronx	669	526	506	456	645	593
Westchester	1,854	2,176	1,934	2,124	2,616	2,675

The associated costs for these service replacements are not separately tracked. These costs are incorporated into various programs, which track multiple activities in addition to leak prone service replacements.

Company Name: Con Edison
Case Description: 2016 - Con Edison Electric and Gas Rate Filings
Case: 16-E-0060; 16-G-0061

Response to DPS Interrogatories – Set DPS-14
Date of Response: 04/04/2016
Responding Witness: Gas Infrastructure & Operations Panel

Question No. : 429

Subject: Leak Prone Pipe

1. Provide the workpapers supporting the capital expenditure forecast for the main replacement and service replacement programs.

2. Provide the estimated number of leak prone main and services the Company will replace, by type (Corroded Steel and Cast Iron) and by area (Westchester, Manhattan, etc.), for the calendar years 2017, 2018 and 2019.

3. Provide the unit cost, for the past three calendar years, to replace leaking services, services associated with main work, cast iron main, and corroded steel main for Westchester, Manhattan, Bronx, and Queens.

4. For the "Services Associated with Main Replacement" program, reconcile the difference between the amounts shown on Exhibit_GIOP-1, page 38 of 217 and the amounts shown by the Company's response to part 2 of DPS-237.

Response

1. & 2.) Please see the table below for data supporting the capital expenditure forecast and the estimated units as requested. Please note the program "services without curb valves" only pertains to the Queens division.

			2017	2018	2019
Manhattan	Replace Corroded Steel Mains	Expenses	$9,457,000	$10,348,000	$12,664,000
		Units	5,682	6,081	7,247
		Unit Cost	$1,664	$1,702	$1,747
	Replace Cast Iron Mains	Expenses	$70,266,000	$76,907,000	$84,465,000
		Units	44,925	48,134	51,343
		Unit Cost	$1,564	$1,598	$1,645
	Services Associated with Main Work	Expenses	$6,894,000	$7,490,000	$8,038,000
		Units	87	93	98

		Unit Cost	$79,241	$80,538	$82,020
Queens	Replace Corroded Steel Mains	Expenses	$23,963,000	$26,221,000	$28,443,000
		Units	42,673	45,721	48,769
		Unit Cost	$562	$574	$583
	Replace Cast Iron Mains	Expenses	$8,720,000	$9,550,000	$10,375,000
		Units	18,974	20,329	21,685
		Unit Cost	$460	$470	$478
	Services Without Curb Valves	Expenses	$1,110,000	$1,134,000	$1,132,000
		Units	95	95	95
		Unit Cost	$11,686	$11,934	$11,913
	Services Associated with Main Work	Expenses	$7,788,000	$8,482,000	$8,727,000
		Units	514	549	570
		Unit Cost	$15,152	$15,450	$15,311
Bronx	Replace Corroded Steel Mains	Expenses	$12,625,000	$13,810,000	$15,051,000
		Units	17,847	19,122	20,397
		Unit Cost	$707	$722	$738
	Replace Cast Iron Mains	Expenses	$40,490,000	$44,236,000	$49,027,000
		Units	58,371	62,541	66,710
		Unit Cost	$694	$707	$735
	Services Associated with Main Work	Expenses	$13,711,000	$14,860,000	$15,720,000
		Units	468	502	524
		Unit Cost	$29,297	$29,602	$30,000
Westchester	Replace Corroded Steel Mains	Expenses	$52,274,000	$56,306,000	$65,133,000
		Units	119,737	128,291	136,844
		Unit Cost	$437	$439	$476
	Replace Cast Iron Mains	Expenses	$32,263,000	$35,288,000	$36,283,000
		Units	60,506	64,828	69,151
		Unit Cost	$533	$544	$525
	Services Associated with Main Work	Expenses	$16,998,000	$18,422,000	$19,589,000
		Units	1,569	1,674	1,746
		Unit Cost	$10,834	$11,005	$11,219

3.) Please see the tables below for a summary of the unit costs requested. Please note that unit costs for services associated with main work were not tracked prior to 2015.

Westchester	2013	2014	2015
Leaking Services	$13,631	$15,507	$18,559
Replace Corroded Steel Mains	$317	$254	$310

Replace Cast Iron Mains	$293	$322	$385
Services Associated with Main Work	Not Tracked	Not Tracked	$10,369

Manhattan	2013	2014	2015
Leaking Services	$37,271	$30,984	$42,039
Replace Corroded Steel Mains	$2,513	$1,177	$2,031
Replace Cast Iron Mains	$897	$1,311	$1,439
Services Associated with Main Work	Not Tracked	Not Tracked	$75,500

Bronx	2013	2014	2015
Leaking Services	$23,232	$23,734	$30,131
Replace Corroded Steel Mains	$873	$623	$626
Replace Cast Iron Mains	$698	$443	$642
Services Associated with Main Work	Not Tracked	Not Tracked	$27,907

Queens	2013	2014	2015
Leaking Services	$19,926	$16,933	$24,116
Replace Corroded Steel Mains	$376	$589	$413
Replace Cast Iron Mains	$589	$497	$748
Services Associated with Main Work	Not Tracked	Not Tracked	$14,481

4.) The historical expenditures reported for Services Associated with Main Replacement program in DPS-237 mistakenly included historical expenditures for system reinforcement main replacement work, as well as service work. These programs were historically tracked together.