Electric Distribution System Demand Response

Col Smart

smartco@coned.com

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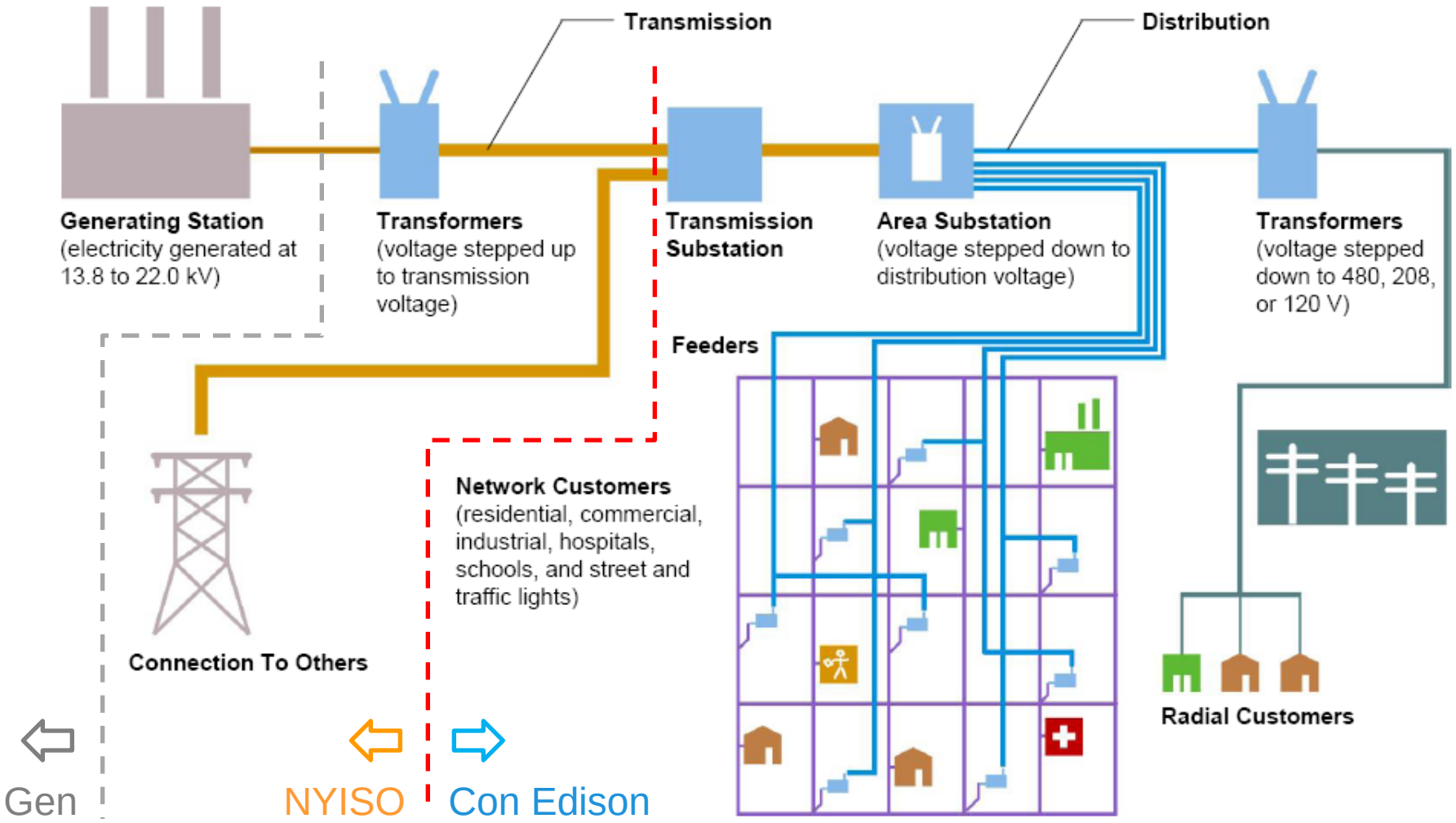
Agenda

- What is Demand Response
- Distribution vs Wholesale
- Contingency vs Peak Shaving
- What is Electric Distribution System Demand Response
- Residential vs Commercial
- Con Edison's Programs
- Operating a Demand Response Program
- Last Thought
- Questions

What is Demand Response?

- Demand response is considered to be a change in electric usage (electric import) by end-use customers from their normal consumption patterns in response to a dynamic need to reduce electric demand.

Distribution vs Wholesale



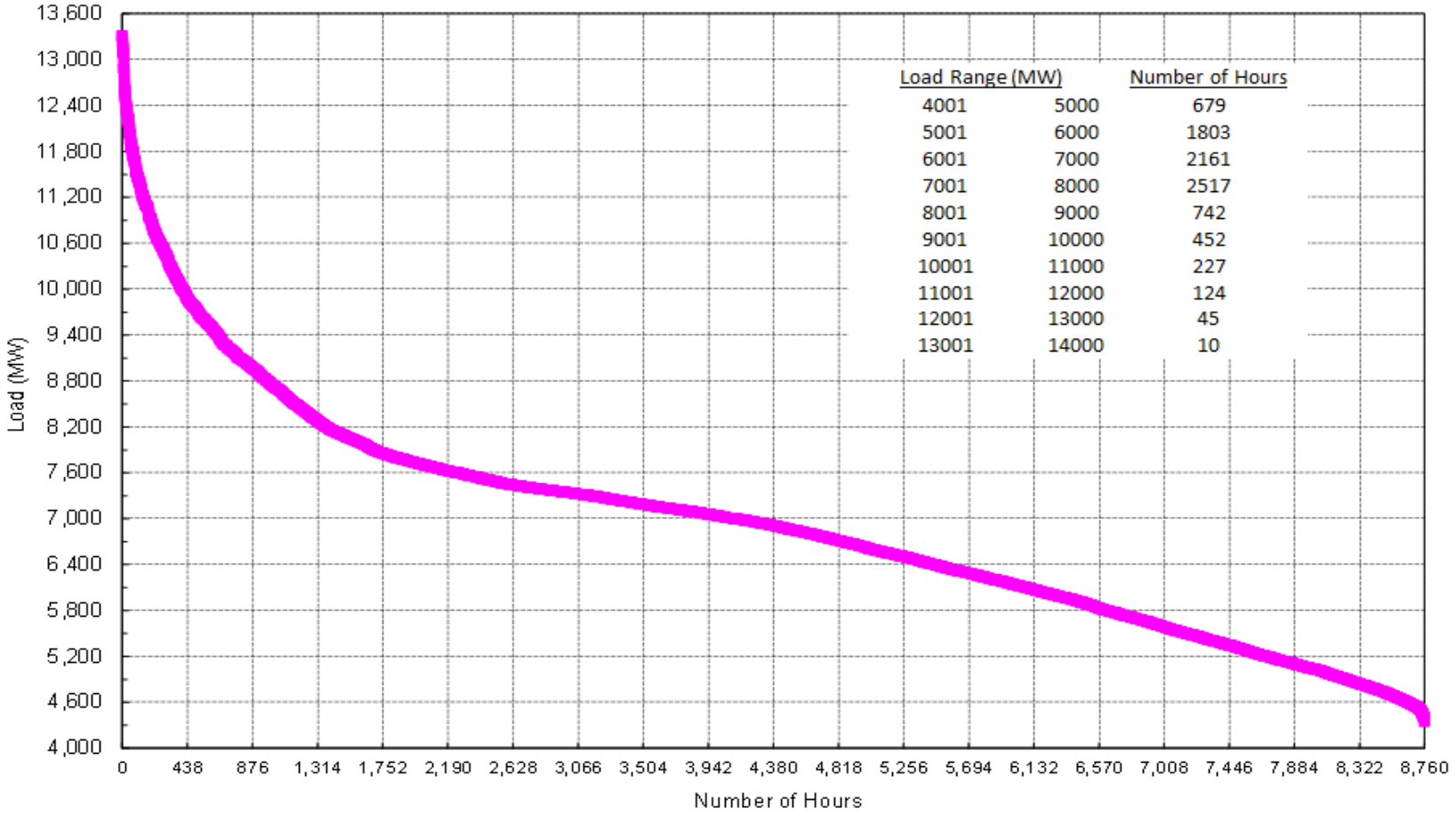
What is Electric Distribution System Demand Response?

- Demand response is considered to be a change in electric usage (electric import) by end-use customers from their normal consumption patterns in response to a dynamic need by the electric distribution system operator to reduce electric demand, generally in a specific location.
- Currently, the electric distribution system does not generate a dynamic price signal on the relationship between distribution system loading (ability to supply) and the need for electricity by customers (demand). More to come on this.

Contingency vs. Peak Shaving

- Contingency
  - Designed to be available to respond to unexpected changes in engineering conditions on the electric distribution system. Due to the design of the Con Edison electric distribution system these conditions are monitored and responded to, generally, on a network by network basis. The contingency programs require the ability for relatively quick response.
- Peak Shaving
  - Designed to respond to expected high demand resulting from a forecasted period of extreme heat. Con Edison's peak shaving programs are triggered when the day-ahead forecast is for 96% or higher of the forecasted summer peak. As these are forecasted events the response does not necessarily need to be as quick as that required for a contingency program.

CECONY Service Area
2013 Load Duration Curve

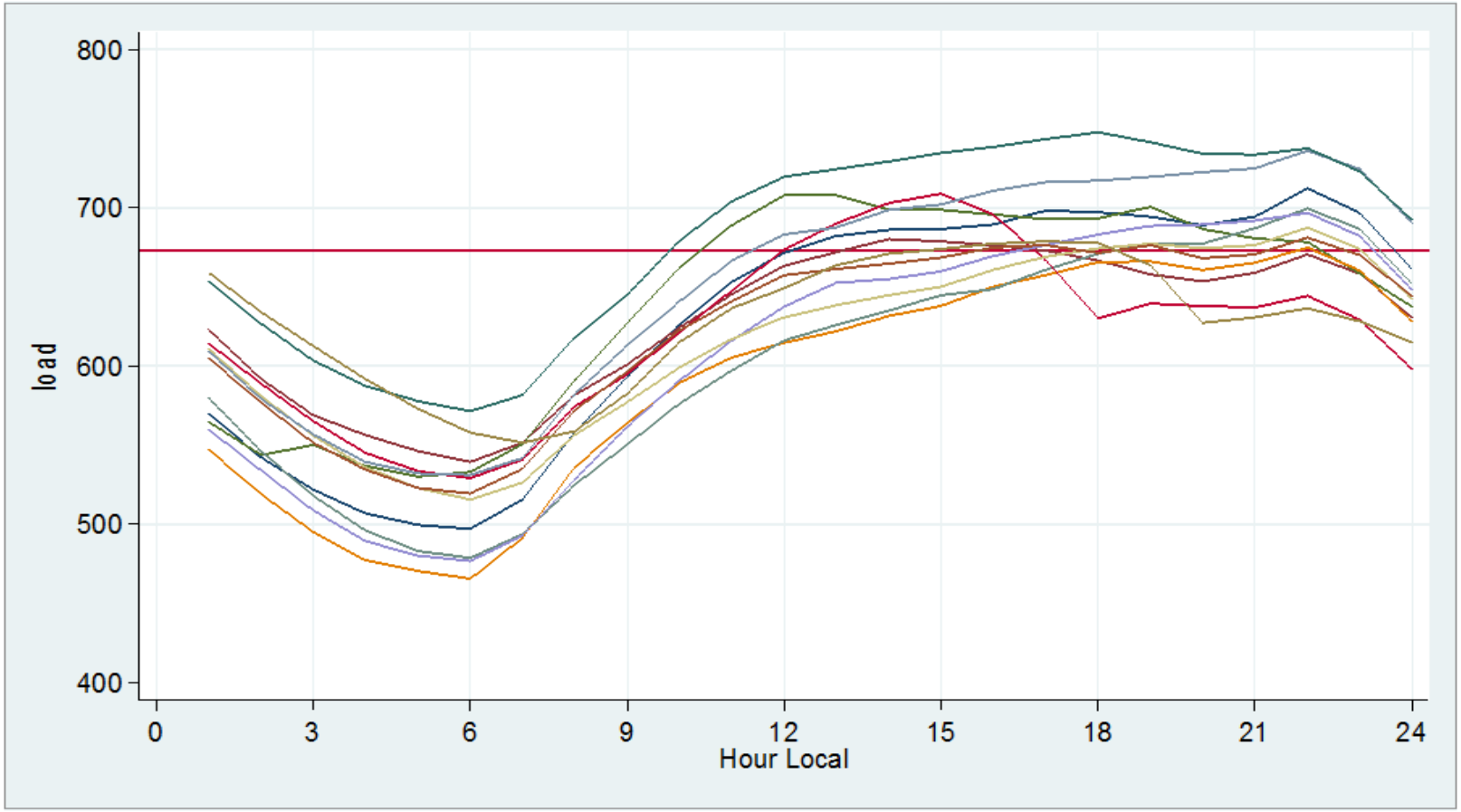


Load Range (MW)		Number of Hours
4001	5000	679
5001	6000	1803
6001	7000	2161
7001	8000	2517
8001	9000	742
9001	10000	452
10001	11000	227
11001	12000	124
12001	13000	45
13001	14000	10

CSRP Call Windows

11:00 AM - 3:00 PM	2:00 PM - 6:00 PM	4:00 PM - 8:00 PM	7:00 PM - 11:00 PM
BATTERY PARK CITY	BAY RIDGE	COOPER SQUARE	BRIGHTON BEACH
BEEKMAN	CANAL	FOX HILLS	CENTRAL BRONX
BORDEN	CHELSEA	FRESH KILLS	CENTRAL PARK
BOROUGH HALL	EMPIRE	OCEAN PARKWAY	CROWN HEIGHTS
BOWLING GREEN	FASHION	RICHMOND HILL	FLATBUSH
CITY HALL	HERALD SQUARE	SUNNYSIDE	FLUSHING
COLUMBUS CIRCLE	HUDSON	TRIBORO	FORDHAM
CORTLANDT	LONG ISLAND CITY	WAINWRIGHT	HARLEM
FREEDOM	PARK SLOPE	WEST BRONX	JACKSON HEIGHTS
FULTON	ROCKEFELLER CENTER	WILLIAMSBURG	JAMAICA
GRAND CENTRAL	ROOSEVELT	WILLOWBROOK	MASPETH
GREELEY SQUARE		WOODROW	NORTHEAST BRONX
GREENWICH			PROSPECT PARK
HUNTER			RANDALL'S ISLAND
KIPS BAY			REGO PARK
LENOX HILL			RIDGEWOOD
LINCOLN SQUARE			RIVERDALE
MADISON SQUARE			SHEEPSHEAD BAY
PARK PLACE			SOUTHEAST BRONX
PENNSYLVANIA			WASHINGTON HEIGHTS
PLAZA			YORKVILLE
SHERIDAN SQUARE			
SUTTON			
TIMES SQUARE			
TURTLE BAY			

Electric Networks – One Network, Different Days



Residential vs. Commercial

- Different approaches are required for different customer segments – small vs big (in the context of consumption levels) is only the first divide.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VIDEO GAME AWARDS
DISCOVER CARD
CUP NOODLES
NISSIN FOODS
Budweiser
ERNST & YOUNG
ONE WAY
BUBBA GUMP SHRIMP CO.
TV on your phone?

Con Edison's Electric Distribution Demand Response Programs - Contingency

Program	Acronym	Purpose	Incentive
Distribution Load Relief Program (NYC and Westchester County)	**DLRP**	Activated by Con Edison in response to system critical situations (Condition Yellow or voltage reduction). Events last for 4 or more hours. Premium paid for customers who pre-commit load.	Customers in the Summer Reservation Payment program receive a reservation payment of $15.00 or $6.00 per kW-month pledged and performed, depending on location, and performance payments equal to $1.00 per kWh reduced. Reservation Payment customers who pledge an enrollment amount equal or greater than the enrollment in their first year can receive a Three Year Incentive bonus of $5 per kW per month at the end of the third year if all performance criteria is met. Customers in the Voluntary program are paid only a performance payment equal to $3.00 per kWh reduced.
Direct Load Control (NYC and Westchester County)	**DLC**	Activated by Con Edison in system critical situations (condition yellow or voltage reduction). Con Edison residential, religious and small business (demand less than 100 kW) customers with central air-conditioning. Allows Con Edison to remotely adjust thermostat settings.	Customers will receive a free programmable thermostat and an incentive payment of $25 for residential customers per unique address, and $50 for small commercial customers per unique building site.

Con Edison's Electric Distribution Demand Response Programs – Peak Shaving

Program	Acronym	Purpose	Incentive
Commercial System Relief Program (NYC only)	**CSRP**	Event activated when day-ahead forecast is 96% or greater of forecasted summer system peak to relieve system peak load. Premium paid for customers who pre-commit load. A Customer must provide least 50 kW of load reduction or 50 kW of load delivery. An Aggregator must provide at least 100 kW of load reduction or 100 kW of load delivery.	Customers in the Summer Reservation Payment Program receive a reservation payment of $10 per kW per month pledged and performed for months with fewer than 5 events and $15 per kW per month during and after a month with 5 or more events. Performance payment equal to $1.00 per kWh for each kW reduced during an event. Reservation Payment customers who pledge an enrollment amount equal or greater than the enrollment in their first year can receive a Three Year Incentive bonus of $10 per kW per month at the end of the third year if all performance criteria is met. Customers in the Voluntary program receive a performance payment equal to $3.00 for each kWh reduced
Direct Load Control (NYC and Westchester County)	**DLC**	Event activated when day-ahead forecast is 96% or greater of forecasted summer system peak to relieve system peak load. Con Edison residential, religious and small business (demand less than 100 kW) customers with central air-conditioning. Allows Con Edison to remotely adjust thermostat settings.	Customers will receive a free programmable thermostat and an incentive payment of $25 for residential customers per unique address, and $50 for small commercial customers per unique building site.
Residential Smart Appliance Program (NYC only) [Pilot program] Three year pilot program concluded in 2012.	**RSAP**	Event activated when day-ahead forecast is 96% or greater of forecasted summer system peak to relieve system peak load. Con Edison will have ability to turn off window or wall A/Cs when an event is called. Available to Con Edison customers with a minimum of two window or wall A/C units, an AMR meter.	Participants receive a free home energy management system with installation and participation in 80% of all event hour's results in an incentive payment of $10 for each wall or window A/C unit enrolled and $10 for the combination of other enrolled appliances.

Residential Demand Response
Direct Load Control (DLC) Program

Residential Central Air Conditioning Free Programmable Thermostat

Eligibility:

- Central A/C
- Residence/Small Business

Con Edison Benefit:

- 39 MW of Callable Demand Response
- 28,000 customers

Customer Benefit:

- FREE Smart Thermostat ($300 Installed)
- $25 Incentive for Residential Customers or $50 Incentive for Small Business Customers
- Control (Smartphone/Computer)
- Energy Savings
- Ability to Override Con Edison Control

coolNYC
A Con Edison program in partnership with ThinkEco

modlet®

- **mod**ern electric out**let**
- Energy efficiency intelligence to wall outlets
- Customers can save energy and manage use

smartAC

- Remote thermostat
- With the modlet, smartens window air conditioners
- Allows for participation in sponsored demand response events

Operating a Demand Response Program

- Program Design
  - System needs vs Customer acceptance vs Economics
  - Economic analysis is an early but complicated step
- Program Promotion and Education
  - Simple is best
  - Don’t mention “Demand Response”!
- Program Enrollment
  - Multiple pathways
  - Key criteria
  - Validation protocols
- Pre-event Testing
  - Validate communication
  - Validate expected performance

Operating a Demand Response Program Continued

- Event Management
  - Initiation
  - Monitoring
  - Curtailment
- Customer Performance
  - What didn't they do? The art of the baseline
  - Performance Payment
- Systems and Communications
  - Various Systems
  - Multiple Communication / Control Pathways
  - Constant Monitoring
- Reporting
  - State
  - Federal
  - Stakeholders

Operating a Demand Response Program Evaluation and Evolution

- Evaluation
  - What happened?
  - What worked?
  - What did not work?
  - Why did it happen?
  - How can you either maintain the same outcome or influence a different outcome?
- Evolution
  - What is changing?
  - What are the new opportunities?
  - How are stakeholders aligned?
- Warning
  - How much change is too much change?

Last Thought - Know Your System

Hour	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**
2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**
3	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**
4	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**
5	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**
6	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**
7	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**
8	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**
9	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**
10	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.4%**
11	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	1.7%	0.1%	0.0%	0.0%	0.0%	0.0%	**2.9%**
12	0.0%	0.0%	0.0%	0.0%	0.0%	1.9%	3.1%	1.5%	0.0%	0.0%	0.0%	0.0%	**6.5%**
13	0.0%	0.0%	0.0%	0.0%	0.0%	**2.9%**	**4.7%**	**4.5%**	**0.3%**	0.0%	0.0%	0.0%	**12.4%**
14	0.0%	0.0%	0.0%	0.0%	0.0%	**3.4%**	**5.9%**	**5.9%**	**0.5%**	0.0%	0.0%	0.0%	**15.6%**
15	0.0%	0.0%	0.0%	0.0%	0.0%	**3.6%**	**7.1%**	**6.3%**	**0.5%**	0.0%	0.0%	0.0%	**17.5%**
16	0.0%	0.0%	0.0%	0.0%	0.0%	**3.5%**	**7.6%**	**7.5%**	**0.5%**	0.0%	0.0%	0.0%	**19.1%**
17	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**3.0%**	**5.9%**	**5.6%**	**0.4%**	**0.0%**	**0.0%**	**0.0%**	**14.9%**
18	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**1.3%**	**3.0%**	**2.2%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**6.5%**
19	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.4%**	**1.3%**	**0.4%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**2.1%**
20	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**1.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**1.0%**
21	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**1.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**1.0%**
22	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**
23	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**
24	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**
Total	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**21.3%**	**42.5%**	**34.1%**	**2.2%**	**0.0%**	**0.0%**	**0.0%**	**100.0%**

Program Details

www.coned.com/dr

NYS PSC case numbers

09-E-0115

14-E-0423

QUESTIONS?

National Grid Questions

National Grid Questions on Consolidated Edison's Distribution Demand Response Programs

*For **each** of the ConEd programs please address the following questions*

Pricing:

How was ConEd's reservation payment rate determined (and performance payments, incentive payments and bonus payments)?

A complex economic model has been developed by Con Edison which integrates various costs and benefits to establish program values and economics. The methodology developed was filed with the Commission under case number 09-E-0115 (now moved to case number 14-E-0423).

Confirm ConEd's reservation payments and any NYISO ICAP payments are additive?

Yes. Different programs for different purposes.

What is the frequency (e.g. monthly) of the payment/credit made to participants?

Payments are made monthly for customers in the Reservation Payment Option in the commercial programs. The residential programs have one time or once a year payments depending on the specific programs.

Are payments made directly to participants or does ConEd apply a bill credit?

For customers in the commercial demand response programs payments are made directly either to the customer or the demand response aggregator representing the customer. Voluntary customers in the commercial programs receive a bill credit at the end of the season. For a small set of government customers arrangements have been made for credits on their Con Edison bill. For residential programs any payments are made directly to the customers.

National Grid Questions Continued

Are there any performance penalties and if so what are they?

Both the contingency and peak shaving commercial demand response programs have a penalty of derating for under performance. This is where the capacity payment paid is reduced to the level of performance experienced during a test or event if it is less than the level committed. In addition, the peak shaving program has penalties as following;

If the average kW of Load Relief provided for Planned Events in the current month is lower than the prior month's average kW of Load Relief for Planned Events or the contracted kW, whichever is lower, the Direct Participant or Aggregator will be subject to a Penalty. The penalty is equal to the Reservation Payment rate times the difference between the prior month's average kW or the contracted kW, whichever is lower, and the current (lower) average kW performed. If the current average kW performed is negative, 0 kW will be set as the current month's average kW performance.

If a Direct Participant or Aggregator fails to arrange for the furnishing and installation of the metering and telecommunications service for an account, as required under section F of the tariff, a penalty will be assessed for the kW enrolled for that account. Such penalty, assessed no more than once per year, will be equal to the Reservation Payment rate per kW times the kW of contracted Load Relief. In August Con Edison filed a request to remove this penalty (this is one item on January 8, 2015 Consent Agenda).

National Grid Questions Continued

Are the M&V protocols the same for all programs?
M&V is the same for the two commercial programs but different approaches are used for the residential programs.

Why do you offer two different CBL methods to determine load reduction?
We assume the question refers to the “Average Day” and “Weather Adjusted” CBLs used for the commercial demand response programs. Generally, there may be customer performance which can be expected to be consistent irrespective of the weather conditions. For example, the curtailment of production at a manufacturing facility is a very consistent level of import reduction. However this may not be the case for a commercial office space customer using a pure curtailment strategy which includes an increase in temperature setting for the HVAC. The former customer may be more properly measured via the average day CBL whereas the latter may choose the weather adjusted CBL.

What criteria did you use to determine the Tier 1 and Tier 2 Network designations?
We use our network reliability index (NRI) and pay a premium to the networks which score lower on this index as, in theory at least, these networks may be considered have a lower reliability. One exception, is the three networks served by the Brooklyn Queens Demand Management Program, which have been included in the Tier 2 listing even if their NRI is high as we look to provide relief at the sub-transmission level.

National Grid Questions Continued

Participation:

Does ConEd allow loads served by NYPA and ESCOs to participate in its DR programs?
Yes. (Commercial programs).

Does ConEd allow for 3RD Party aggregators to participate in all programs?
Yes (Commercial programs.)

What percentage of ConEd program participants also participate in the NYISO program?
There is a high incident of overlap. Exact percentage is not available at this time.

Does the NYISO and ConEd test participant's separately for eligibility?
Con Edison has no responsibility for the administration of the NYISO programs and NYISO has no responsibility for the administration of Con Edison's programs.

How many participants are enrolled (how many direct participants versus aggregators)?
To be provided separately.

National Grid Questions Continued

Implementation:

Are there any total kw limits or other caps on these programs?

Not for the commercial programs. There are budget caps for the residential programs.

Are there any system restrictions on participation (e.g. too much DR on a feeder or no need for DR on a feeder)?

Not at this time.

How many times has ConEd activated the program in the past year? What do you estimate the average annual activations will be?

2014 and 2013 may be considered somewhat anomalies. Summer 2014 was extremely mild and as a consequence Con Edison did not call any events. Only performance tests were conducted.

During the summer of 2013 New York experienced an extremely long heat wave where the Con Edison peak shaving program was called for five continuous days (Monday through Friday). The contingency program was called six times in 2013.

What are the main drivers for activating DR?

The peak shaving programs are activated in response to forecasted system peak as the result of extreme heat events. The contingency programs are activated based on engineering conditions within a specific network (load pocket).

National Grid Questions Continued

How much advance notice do participant's get?
Commercial peak shaving customers get a minimum of 21 hours notice and contingency customers generally get 2 hours notice. There is no notification for the residential program.

How are DR reductions considered in ConEd's system planning?
This is a complex process for which we can provide further information.

How do you notify customers (automated system, operator calls)?
Directly enrolled customers and demand response aggregators participating in our commercial demand response programs are notified by an automated system which sends and records receipt of both an email and phone message. The automated notifications do require human intervention to initiate the notification process. The program triggers are not linked directly to the notification process. For residential programs the actual devices are controlled.

National Grid Questions Continued

Program Costs:

What was ConEd's total annual payout to its program participants last year?
Approximately $10 million.

About how many FTE's are needed to run ConEd's program?
Eight FTEs for direct operation of the commercial and residential programs. Somewhere in order of another four FTEs within Con Edison support the programs in various roles (research and analysis, financial management, marketing, tariff support, legal, general management).

Does ConEd collect any administration fees and if yes from who?
All costs of program operations are collected from customers.

Does ConEd administer this system in house or is the administration (enrollments, communications, payment calculations) contracted out?
The majority of the program operations for the commercial programs take place in house but with consulting support for measurement and verification and technology support. For the residential programs extensive works is conducted by third party contractors.

What additional systems did ConEd need to facilitate these programs (technical enhancements or organization structure changes)?
Advanced meter management systems and customer interfaces have been required for the commercial programs and the company is currently completing deployment of a Demand Response Management System. For the residential programs the majority of the systems functionality (control, verification) is provided by the third party contractors, however, with the expansion of the Direct Load Control program, the Company is looking to expand the Demand Response Management System to support the residential programs.

National Grid Questions Continued

Which entity pays for the communication and metering equipment?
Under the commercial programs customers with peak demand over 500 kW have the metering and communications provided by Con Edison under the Mandatory Hourly Pricing (MHP) program. Customers who are not in the MHP program take responsibility for the metering and communications costs. For residential customers, Con Edison provides or incents the required equipment.

How is ConEd recovering payments and program costs (base rates, retail surcharge, deferral)?
Costs are collected from the Monthly Adjustment Charge (MAC) which is a bill surcharge.

Is recovery from all delivery customers?
Generally all customers are charged with a few exceptions.

What are the costs to marketing the program to new participants?
This differs for each program. While Con Edison is increasing the promotion of its commercial demand response programs, a great deal of the marketing and customer acquisition is conducted via the demand response aggregators. Con Edison spent approximately $300,000 last year marketing the commercial demand response programs. The residential programs also spent approximately $300,000 on program marketing in 2014.

What are the costs to retain customers year to year on the program?
We do not have this cost.

Over the life of the program, has ConEd experienced variations in participation and why?
Yes the participation in Con Edison's programs has varied over time. Most recently the company has experience growth in participation in the commercial programs as program incentives have been increased, penalties have been reduced, hours and times of participation altered and engagement with stakeholders have increased.

National Grid Questions Continued

Program Benefits:

How does ConEd quantify the value/benefit of reduction events or the program in general?

Please see the answer to the first question under Pricing.

Do you see similar benefits/applicability to upstate customers compared to downstate?

Con Edison believes that the economics will be different for different operating areas. Certainly the nature of the need, operating impact, and programs economics are different within different areas of Con Edison's own area of operation. Our network system produces a different economic outcome to those for our radial system.


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