

Smart Grid Deployment Project Outline

Table of Contents

Project Description	3
Project Objectives	3
Major Project Components and their functions	4
a) Enhanced Supervisory Control and Data Acquisition (SCADA) System	4
b) Intelligent Underground Automatic Loop.....	5
c) Underground (UG) Distribution Sectionalizing Switches.....	7
d) Overhead Distribution (OH) Sectionalizing Switches.....	8
e) High Tension Monitoring Data Acquisition System (HTMDAS)	9
f) 4kV Grid Modernization.....	10
g) Vault Data Acquisition System.....	12
h) Dynamic Modeling.....	12
Budget.....	15
Cumulative Investment by Element of Expense (through October 2012):.....	16
Technical Performance Parameters and Deliverables	16

Project Description

The Project provides benefits to customers by improving system reliability, reducing carbon emissions, and reducing costs by increasing system efficiency. Indirect benefits include positive economic impacts on the local economy. The Project includes nine sub projects that address three major initiatives: Distribution Automation, Dynamic Modeling and Simulation, and Energy Efficiency. The Project addresses Con Edison's ongoing challenges of maintaining reliability of service and satisfying the increasing demand on resources. By implementing advanced system capabilities like rapid restoration and grid reconfiguration, achieving efficient delivery through system losses reduction, enhancing data visualization, and integrating smart grid technologies, the Project advances new capabilities for the Company's electric system and its customers.

Project Objectives

The major project objectives are:

- Expand distribution automation to advance self-healing grid operations;
- Provide greater visibility and expand automation and control of one of the world's most complex distribution systems;
- Establish cyber-secure and scalable communication platforms;
- Enable interoperability of various system elements through integration into a common operator control system;
- Augment decision support systems with sensor feedback to provide improvements to the predictive models that identify, isolate and rectify system vulnerabilities;
- Expand monitoring and control elements necessary to adapt to dynamic conditions of the service area; and
- Provide for future renewable energy capabilities in the service area.

Customer benefits include:

- Increased reliability
- Lower energy consumption
- Deferral of infrastructure investment costs as well as operation and maintenance costs
- Reduce dependency on fossil fuels
- Reduce carbon footprint

Major Project Components and their functions

Major Project components include:

a) Enhanced Supervisory Control and Data Acquisition (SCADA) System

The enhanced SCADA system will implement cyber-secure control for SCADA-operated smart grid devices that are installed within the scope of the Project. In addition, it will improve system performance and reliability of the overhead autoloop¹ distribution system via implementation of an advanced intelligent communication and logic control system: Intelligent Grid Interface Node (IGIN)². As part of the project, select poor performing autoloops will be targeted for upgrade. The enhancement includes the development of new recloser settings software, the integration of an intelligent radio system with software (onto the existing autoloop infrastructure) and the development of new rules to analyze and automatically respond to system events. The improved design will add an intelligence layer to the radio communication system. Each recloser control and the master radio site that serves the autoloop will have an intelligence manager. The intelligence manager will contain algorithms that make decisions and issue control commands to the reclosers based on the fault scenario. When a fault is detected, the intelligence manager will automatically poll every recloser control on the affected autoloop side and process information such as normal/abnormal voltage and current values, switch positions, and unsolicited flags. In order to expeditiously isolate the fault, the intelligent modules at the recloser controls will format and streamline the fault information to the intelligence manager.

The Project will add seven master radio sites to the existing Data Acquisition System (DAS)³, utilizing licensed wireless 220 MHz frequencies with IGIN technology and upgrading multiple existing 900MHz master radio sites with IGIN technology..

¹ An automatic loop system (“autoloop”) is traditionally a radial or overhead distribution system design where customers are supplied by two feeders through automatic reclosers. Depending on customer load, autoloops can have two, three or five reclosers. By design, an autoloop system automatically isolates the faulted section, minimizing the number of customers interrupted due to an electrical fault. There are 153 overhead distribution autoloops in the Con Edison overhead system.

² Digitalogic IGIN system will provide remote terminal unit (“RTU”) services at the SCADA controlled smart grid field devices and secure the communications by adding 256 bit encryption. At the communications hub, an IGIN Gateway Controller with redundant backup will add additional security features, such as time-based and signature authentication as well as password protection. IGIN Manager Data concentrators with redundant backup will be located at the Company’s energy control centers. These concentrators feed the backhauled data into the front end processors of the SCADA system allowing monitoring, status reporting and operator control. A redundant IGIN Manager setup will be installed at each of the three Company regional electric control centers.

³ Con Edison’s DAS system has hundreds of remote terminal units (“RTUs”) installed on vacuum recloser switches (“VRS”). The distribution control centers have primary, secondary and tertiary D200s. D200 is similar to a concentrator and interfaces the RTU’s with the Realflex System for SCADA at the energy control centers.

The Project will implement a test lab for the development and testing of the new IGIN-based SCADA system. This lab will have the capability to communicate to locally installed test switches through the 900 MHz system. In addition to providing an essential test platform for the new IGIN system, the lab will provide an environment for training technical and operating resources.

Major objectives of the Enhanced SCADA System project include:

- Add seven master radio sites for communication to overhead and underground SCADA switches.
- Add a redundant IGIN Manager at three distribution control centers.
- Reducing momentary outages on targeted overhead autoloops by developing and installing a logic controller
- Reducing sustained outages on targeted autoloops by installing multiple SCADA-controlled switches and incorporating them into central logic controller.

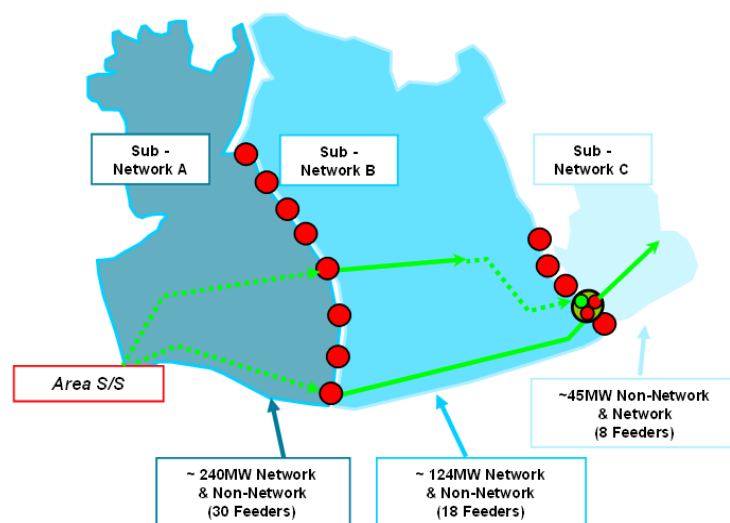
b) Intelligent Underground Automatic Loop

The goals of this sub-project are to reduce the risk of a large network outage, to improve operational flexibility, and to enhance reliability by utilizing the underground automatic loop design in the Flushing network and by providing the capability to segregate the large network into smaller networks. The interactive operation of sectionalizing switches on the underground autoloop will be achieved by equipping the switches with SCADA control and wireless communication. Successful implementation will provide the basis for future applications at other locations to achieve the reduction in size of large networks, reduction in risk of major network outages and improvement in reliability of the underground distribution grid.

This sub project will provide the ability to segment the Flushing network⁴ into three smaller networks (Sub-Networks A, B and C) through the installation of automated underground switches, as shown in Figure #1 below:

⁴ The Flushing Network supplies the northeastern portion of Queens. It is one of the largest underground distribution networks in the Con Edison system with 389 MW of peak demand. It is supplied by twenty-four 27 kV primary distribution feeders and 780 underground network transformers. There are approximately 120,000 customers in the Flushing Network.

Figure 1: Flushing Sub-Networks



The Flushing network will have the ability to be divided into three sub networks, each with a second contingency design⁵. The program will install 22 automated underground sectionalizing switches with SCADA control on 22 primary feeders to isolate Sub-Network A and Sub-Network B. An additional eight automated underground sectionalizing switches with SCADA control will be installed on eight primary feeders to isolate Sub-Network B and Sub-Network C. Two of these eight switches will be new multi-way automated sectionalizing switches with SCADA controls and will be installed on four new feeders supplying load to Sub-Network B and Sub-Network C to create two underground autoloops. Four new breakers positions will be established at Corona #1 substation to supply these four feeders. The new positions, as well as the existing breaker positions, will have microprocessor relays installed to enable incipient faults detection on these feeders. This allows the opportunity to detect and make preemptive repair to transient faults

⁵ Con Edison's Second Contingency Design configures underground distribution networks to provide uninterrupted service to customer loads when two of the primary feeders supplying the network are out of service during peak load conditions.

prior to them failing and tripping the feeder out of service. Under this project Con Edison will be implementing the autoloop design in the underground network distribution system for the first time since it pioneered the technology for the overhead distribution system.

Major objectives of the Intelligent Underground Autoloop project include:

- Set-up a laboratory environment to develop and test a multi- way 27 kV vacuum switch and time synchronized operation of switches that will allow for sub-network isolation.
- Install four new breakers to establish two underground autoloops.
- Upgrade 24 feeder breakers with microprocessor relays at North Corona Substation.
- Allow for manual operation of underground switches to manually segregate sub networks and manually operate the loops.
- Allow for remote operation of underground switches to remotely segregate sub networks and remotely operate the loops
- Allow for remote synchronized operation of underground switches to automatically segregate the sub networks and automatically operate the loops.
- Perform primary cable and secondary cable and transformer reinforcement to support the sub- network isolation.

c) Underground (UG) Distribution Sectionalizing Switches

This component involves the installation of an estimated 150 underground sectionalizing switches on targeted network feeders in the Con Edison underground distribution networks. Most of the switch locations will be selected based on individual Network Reliability Index (NRI)⁶ rankings. A majority of these switches will utilize different communication options such as Fiber Optic, 900 MHz or 220 MHz based wireless system, public carrier based wireless system and some of these switches may be manually operated. However, because these communication technologies are new and the validation process may not be fully completed prior to the project completion date; the company may elect to utilize the switches for their manual operation only to preserve the reliability of its distribution system.

The goal of this sub project is to work towards creating a smart distribution grid by enabling rapid isolation of faulted segments of primary feeders and re-energizing the healthy portion of the feeder.

Major objectives of the underground switch installation include:

⁶ Con Edison's Network Reliability Improvement (NRI) tool measures the risk of network shut down. NRI value of 0.001 for a network means that the network will be in an NRI state once in a thousand years (1/0.001=1000). For a given network, when the NRI state is reached, it indicates the potential for cascading feeder failures resulting from overload conditions of the adjacent feeders, transformers and secondary grid. This makes it difficult or impossible to feed that portion of the network and corrective actions must be taken to avoid such a situation. Refer to Attachment 1 for details.

- Through switch operation, reduce the amount of load shifted to other distribution feeders due to partial restoration of the healthy portion of the feeder. This will reduce the failure rate for adjacent feeders that pick up the load of the faulted feeder section.
- Improving feeder restoration time by isolating faulted segments of primary feeders. This allows the healthy portion to be re-energized quickly, thereby reducing the amount of load shifted to other distribution feeders and reducing the failure rates for adjacent feeders that pick up the load of the faulted feeder section.
- Reduces the stress on the secondary distribution grid, and the probability of cascading failure events is also diminished.

Ultimately, the addition of underground sectionalizing switches with or without SCADA control will create a more flexible, interactive and optimized distribution system.

d) Overhead Distribution (OH) Sectionalizing Switches

This component will improve Con Edison's overhead distribution systems reliability [namely System Average Interruption Frequency Index (SAIFI)] by creating a more adaptive, integrated/flexible, interactive, and optimized distribution system through the installation of automatic and manual sectionalizing switches. This includes installation of approximately 490 switches on the overhead distribution system. The majority of these switches will be SCADA controlled for remote operation and control and will utilize the Company's SCADA system or utilizing the IGIN technology if validation of this technology is completed prior to the project completion date.

Major objectives of the new switches include:

- Installation of approximately 490 switches
- Improve reliability by significantly reducing the number of customers that experience outages due to permanent faults on the main feeder run or on the branches (spurs) of a feeder that are not fuse-protected.
- Provide a cost-effective method of reducing the frequency of customer interruptions as measured by SAIFI and also provide for sensitive detection and isolation of downed conductors, reducing public and utility worker safety risk.
- The manual switches also reduce customer outage durations as measured by CAIDI during major overhead system emergencies, such as storms.

In addition to benefits afforded by the automated switches, Con Edison will install few manual switches to reduce the length of segments, minimizing customer exposure to outages and increasing flexibility of grid reconfiguration.

e) High Tension Monitoring Data Acquisition System (HTMDAS)

High Tension Monitoring Data Acquisition System (HTMDAS) is a remote communication system that will be deployed to collect real-time power quality data at approximately 940 existing High Tension (HT) locations in the Con Edison distribution system as well as future HT installations. The combined HT load of 805 MW represents 7% of the peak underground distribution network load. HT services mostly supply large commercial customers with critical load, such as NYC Subway transit facilities.

The new HTMDAS system will provide real-time billing and load flow data on approximately 940 HT customer locations. In addition to improving the billing accuracy, the data will significantly increase the accuracy of the load flow modeling of distribution network feeders. Currently, the Company does not have a system to monitor the HT customer load in real time. The new HTMDAS system will enhance the reliability and operation of the distribution network by providing this information. HTMDAS data will improve load forecasting, support remote metering of HT customers, and provide critical load data during contingency situations.

Real-time monitoring of HT load will significantly improve the accuracy of the distribution network load flow analysis. The real-time data acquisition, which is a principle factor of the program, will advance the efficiency of HT data collection by providing more accurate information at a faster rate with continuous availability.

Major objectives of HTMDAS are:

- The replacement of existing meters with Smart Kv2c meters
- Developing a communication infrastructure for all high tension installations
- Develop device and user management application
- Perform rigorous testing to ensure that this new technology meets our reporting and operational requirements
- Incorporate data obtained from HTMDAS to improve the company's PVL (Poly Voltage Load-flow) analysis. Historical data will be used for trend analysis, load flow analysis, internal and external studies.

The ability to reconfigure the loading on the HT customer feeders while maintaining adequate service to the HT customer for short periods of time could potentially defer system reinforcement capital investments. Better understanding the customers load cycle and needs through monitoring will enable the Company to make such decisions. The information received will be invaluable for performing historical analysis in order to better understand the potential risk of deferring or eliminating system reinforcement and the implications of de-energizing HT feeders during contingencies.

f) Remote Monitoring System (RMS)

This component involves the installation of approximately 6,900 Remote Monitoring System (RMS) 3rd generation transmitters and 8,100 pressure, temperature and oil (PTO) sensors at various underground network transformer vault locations in Manhattan, Bronx, Westchester, Brooklyn and Queens.

The objective for the upgrade of the current RMS transmitters to the 3rd generation transmitters is to ensure an interactive system by maintaining or improving the reporting rate of its RMS system and allowing for the addition of the PTO sensor, which provides additional critical information on the health of the underground transformer to the system operators and engineers.

The RMS data from the underground transformers will be used for operational response and system planning. The real-time temperature data available through the new PTO sensors will aid in staging transformer cooling resources. In addition, the oil and pressure values will enable condition-based preventive maintenance of the network transformers.

For instance, monitoring transformer pressure will help remove defective units from the system more quickly and prevent a potentially more violent failure or one that would result in taking the primary feeder out of service. If the oil level goes below minimum, the equipment will be in danger of failing and the Company must take action as required. For system planning, the sensors will enable accurate modeling of temperature rise in network transformers under both normal and contingency operations.

When the Company detects an anomaly in a network transformer that could lead to a failure due to the installation of monitoring equipment from this program the unit will be de-energized and replaced. Based on the number of transformers in which anomalies were previously detected via RMSPTO an estimated eighty (80) transformers will require replacement. The actual number that will be replaced shall be contingent on the number of anomalies detected.

Major objectives include:

- Installation of approximately 6,900 RMS 3rd generation transmitters
- Installation of approximately 8,100 PTO sensors
- Through the upgrade of RMS transmitters and the addition of PTO sensors, critical information on the health of the underground transformer will be provided to the system operators and engineers.

g) 4kV Grid Modernization

The 4kV grid modernization component provides an approach for improving the operation, efficiency, and analysis of Con Edison's 4kV distribution grids. This sub project includes installation of distribution capacitors for power factor correction, Load Tap Changer

(LTC) controller upgrades to digital SCADA ready equipment, software implementation for voltage control of 4kV unit station transformers, single grid implementation of a power quality and battery cubicle monitoring system, and the development of accurate load flow models to complete load flow and reliability analysis.

The capacitors installed under this project will be a combination of fixed and switchable pole-mounted capacitors. The software application will enable remote automated grid voltage control and maintain each grids 4kV unit substation transformer bus voltage within a set bandwidth. The application also allows for voltage reduction (VR) at the grid level. The load flow models will enable reliability analysis, improve system visualization, and integrate various operating information to optimize the performance of these systems. The 4kV grid models will provide dynamic load flow analysis (KW & KVAR). The Power Quality and Battery Monitoring System will collect data for power quality analysis, measure battery parameters, and provide early detection of battery failures through alarms. The availability of remote battery condition monitoring will reduce the frequency of manual inspections and associated maintenance costs.

In addition to efficiency improvements and increased asset utilization, this sub project will provide a foundation for incorporating new smart grid technologies and intelligent electronic devices. The grid design will be optimized to reduce losses, energy consumption and carbon footprint.

Major objectives of the 4kV Grid Modernization project include:

- Electrical loss reduction and power factor improvement through the installation of over 400 fixed and VAR controlled switchable capacitor banks.
- Optimize distribution grid performance using Volt VAR Control remote automated unit station secondary bus voltage regulation.
- Enhance power system sensing, measurement, and analysis by deploying PQ & Battery Monitoring technology at 17 unit stations.
- Improve control methods on unit station load tap changing transformers by replacing over 100 existing electromechanical controllers with digital SCADA controllers
- Develop 4kV grid models that include single phase unbalanced and three phase balanced loads.

The SCADA consolidation project, as the name suggests, aims to centralize currently independent SCADA systems in our distribution control rooms under one platform: the GE XA/21 Distribution Management system. We have successfully completed the first phase of this project under which two SCADA systems were migrated into XA/21. Under the second phase of this project, we plan to match and subsequently enhance the functionality of the existing DAS (Distribution Automation System/RealFlex) currently used to monitor and control overhead electric distribution assets across our service territory. The XA/21 system's modular software and open system architecture provide unmatched performance and overall reliability while facilitating continued compliance with industry requirements.

The major objectives of the second phase include:

- Build database for all existing devices in the RealFlex system
- Build device screens for all existing devices in the RealFlex system
- Perform point-to-point testing for every device to certify operations from the new screens

The project has been augmented to include the purchase and installation of approximately 30 wireless modems to implement a secure backup communication channel to 4kV Unit Substations.

h) Vault Data Acquisition System

This project is the Vault Data Acquisition System in Staten Island. The intent of this project is to provide a two way communications between the underground transformer and distribution control center. The overall system consists of data collection and control of vault equipment, a wireless, cyber secured, private radio system between the vaults and the local control center servers. The data collection will be via sensors located within both the network protector and on the transformer as well as a communicating microprocessor network protector relay that will provide the control of the network protector (NWP). The secured two way radio communication between the vaults and the control centers will be via a repeater system that will consist of approximately 220 pole mounted radios located throughout Staten Island.

Major objectives of the Vault Data Acquisition System project include:

- Establish two-way cyber secure communication between approximately 180 network protectors in Staten Island and the regional control center.
- Install approximately 220 pole top repeaters and establish seven fully redundant master radio sites.
- Develop and deploy HMI control applications for data monitoring and control.
- Establish fully redundant Disaster Recovery site.

i) Dynamic Modeling

The Dynamic Modeling component of the Project will integrate data from diverse systems to generate, predict and visualize information. This will enable interoperability and enhanced visualization of information and automation, and will also provide the Company with the ability to optimize secondary distribution grid performance. The system will calculate dynamic load flows under

contingency operations and assist the operators to adapt in advance to mitigate outages and secondary event risks to the greatest extent possible.

The sub project will provide a dynamic distribution model using the Poly Voltage Load flow (PVL)⁷ software for near real-time system analysis and a planning model to prioritize secondary grid reinforcements. The sub project will provide a visualization platform to integrate real-time information from multiple distribution assets. The modeling platform will combine near real time data for load flows from the feeders (PI at the Area Substation), underground distribution transformers (RMS), customer load profiles [model validation project and future advanced metering infrastructure (AMI)], high tension customers (HTMDAS), and distributed generation (DG). In addition, load flow and outage status information from underground sectionalizing switches will be integrated.

Near real-time load flows from strategic locations in the secondary grid through smart meters will enable dynamic load flow modeling and visualization. The distributed demand models will enhance the accuracy of the load flow by placing demand at customer service points. This improved load flow will provide superior information for engineers to use in designing system reinforcement jobs for both load relief and system reliability. The optimization resulting from utilizing this new model will provide enhanced “near real-time operational models”. By designing known system conditions such as known open mains into the model, and re-running under contingency conditions, the Company will better be able to stage field forces for cooling and operational techniques that can be used to safeguard the system during emergencies. In this respect it becomes a valuable predictive tool that the Company can use to adapt to ever-changing system conditions in a manner beneficial to the customer. The flexibility provided by these distributed demand models as a planning and operational tool makes the model indispensable for the distribution engineer designing for system planning purposes and also for the trouble analysis engineer who is supporting control center operations.

The major project objectives are:

- Install 1,350 smart meters in the Borden Network and the needed communication infrastructure to support these smart meters
- Create a usable database for in-house applications to access near real time smart meter information for use in system modeling, load forecasting, visualization, and simulation
- Determine and implement needed integration of smart meter data into in-house applications

⁷ Poly Voltage Load Flow (PVL) is a balanced, 3-phase load flow software application for the distribution system. PVL utilizes models of distribution system components extracted from mapping systems to simulate the actual network (including substations, feeders, secondary mains, transformers, switches, etc.). This load flow program is the core planning and design tool used by the Con Edison regional and customer engineering sections to forecast system deficiencies and develop reinforcement designs. The primary load flow is a power flow analysis tool for simulating three phase electric distribution systems. The data model can include single or multiple voltage levels, from transmission levels of 345 kV down to secondary levels of 208 Volts.

Distribution Simulator

The Distribution Simulator program will be completed in multiple phases. In Phase 1 of the project, all the requirements will be scoped to determine the full scope of a Distribution Simulator to mimic the underground distribution system, perform system analysis and develop the analytical skills required to operate and manage the electric distribution system. This requirements analysis will review the computational platforms, graphic interfaces and supporting software currently in place and those planned (e.g. enhanced modeling, load flow models, and versatile work stations). In addition, Phase 1 will encompass the numerous IT systems that may need to be modified, and create a development timeline and engineering scope cost estimate. Phase 2 will implement the selected computational platforms to develop the simulator. The training simulator environment for Control Center Operators will provide them with state-of-the-art distribution operations experience in a condensed time-frame and in a controlled manner.

Major objectives of the Distribution Simulator include:

- Create an application based simulator to mimic the underground distribution system such that operators and engineering can train for various contingencies.
- Create a task based 3-D simulator to allow the various control center operators to train on core functions of their positions.

PI Data Historian

The PI data historian project seeks to implement a centralized data historian for all electric distribution SCADA data. The implementation will consist of two production sites and a development site capable of storing up to eight years worth of electric distribution data from the SCADA systems. The system will be integrated into the existing corporate infrastructure and will provide a single point of access for electric distribution data for all users.

The centralized data historian will improve the efficiency and effectiveness of electric distribution operations monitoring and analysis by providing users with customizable tools and access to near real-time data from a single source for both network and non-network data.

The major objectives of the project include:

- Installation and deployment of High Availability PI system: 2 production systems and 1 development system.
- Interface with overhead distribution GE XA/21 system for non-network data.

- Interface with underground distribution GE XA/21 system for network data.
- Provide training to targeted users.

Budget

The budget breakdown by project element is included in the table below:

Project and Project Components	Budget (millions)
Enhanced SCADA System	\$24
Intelligent Underground Automatic Loop	\$65
Overhead Distribution Sectionalizing Switches	\$26
Underground Distribution Sectionalizing Switches	\$36
Remote Monitoring System Upgrade	\$51
High Tension Monitoring and Data Acquisition System	\$5
4kV Grid Modernization	\$20
Dynamic Modeling	\$10
Distribution Simulator	\$3
Vault Data Acquisition System	\$7
PI Historian	\$4
Total	\$251

Cumulative Investment by Element of Expense (through October 2012):

Project	Labor	Fringe Benefits	Equipment	Supplies	Contractual	Other	Indirects	Total
1. Underground Sectionalizing Switches	\$ 5,062,870.11	\$ 3,057,495.10	\$ 8,844,496.38	\$ 4,619,850.43	\$ 5,104,411.73	\$ 314,456.16	\$ 738,497.14	\$ 27,742,077.04
2. Overhead Distribution Sectionalizing Switches	\$ 6,259,850.03	\$ 3,539,710.62	\$ 9,565,283.56	\$ 1,804,836.45	\$ 2,140,186.67	\$ (33,559.89)	\$ 586,144.21	\$ 23,862,451.65
3. SCADA	\$ 1,137,501.45	\$ 683,543.71	\$ 9,082,481.74	\$ 281,298.75	\$ 2,583,694.19	\$ 70,731.69	\$ 376,482.29	\$ 14,215,733.82
4. Remote Monitoring Program	\$ 9,867,934.73	\$ 5,127,726.01	\$ 13,657,118.18	\$ 11,399,751.15	\$ 1,347,682.28	\$ (99,153.88)	\$ 1,146,138.01	\$ 42,447,196.48
5. Dynamic Secondary Network Modeling & Visualization	\$ 1,263,318.10	\$ 818,090.82	\$ 2,007,359.05	\$ 77,101.77	\$ 3,632,689.10	\$ 29,570.10	\$ 266,421.94	\$ 8,094,550.88
6. High Tension Monitoring	\$ 582,653.79	\$ 295,963.36	\$ 460,901.57	\$ 237,360.53	\$ 160,463.56	\$ (3,741.83)	\$ 67,649.79	\$ 1,801,250.77
7. Vault Data Acquisition System	\$ 697,908.54	\$ 441,965.59	\$ 3,507,349.61	\$ 252,571.57	\$ 95,093.87	\$ 55,701.22	\$ 150,886.52	\$ 5,201,476.92
8. 4KV Grid Modernization	\$ 5,313,229.07	\$ 3,002,875.55	\$ 3,310,268.31	\$ 1,424,252.17	\$ 2,153,726.75	\$ 31,801.06	\$ 409,138.84	\$ 15,645,291.76
9. Intelligent Underground Automatic Loop	\$ 9,240,641.86	\$ 5,473,270.57	\$ 7,951,522.80	\$ 11,802,584.60	\$ 16,013,249.20	\$ 299,963.15	\$ 1,411,354.23	\$ 52,192,586.41
Total Con Edison Project Costs (Prime Recipient)	\$ 39,425,907.68	\$ 22,440,641.33	\$ 58,386,781.20	\$ 31,899,607.42	\$ 33,231,197.35	\$ 665,767.78	\$ 5,152,712.97	\$ 191,202,615.73

Technical Performance Parameters and Deliverables

The table below outlines the technical deliverables and performance metrics that are reported on a cumulative basis to the Department of Energy each quarter. Attachment 1 includes the third quarter metrics report for 2012 and Attachment 2 includes the semi annual impact report for 2012.

Project Objective: Improving Electric Power System Reliability	
Project Technical Deliverables	Performance Metrics
Distribution Automation - Intelligent Underground Automatic Loop – Flushing Network	
<ul style="list-style-type: none"> • Installation of 27 kV underground distribution Auto Loop • Installation of 30 underground sectionalizing switches in Flushing network 	<ul style="list-style-type: none"> • Average Feeder Restoration Times during peak summer performance period • Ability to isolate and segregate faulted portion of the network and prevent cascading events
Distribution Automation - Underground Distribution Sectionalizing Switches	
<ul style="list-style-type: none"> • Installation of approximately 150 underground sectionalizing switches targeted on 13kV, 27 kV distribution feeders in worst performing networks in Brooklyn/Queens, Manhattan and Bronx 	<ul style="list-style-type: none"> • Average Feeder Restoration Times during peak summer performance period • Number of underground distribution feeders with partial restoration capability
Distribution Automation - Overhead Distribution Sectionalizing Switches	
<ul style="list-style-type: none"> • Installation of approximately 500 remotely and manually operated overhead switches on 4 kV, 13 kV, 27 kV and 33 kV distribution feeders 	<ul style="list-style-type: none"> • Non Network SAIFI • Number of overhead circuits automated • Ability to minimize customer impact on targeted circuits
Distribution Automation – Enhanced SCADA System	
<ul style="list-style-type: none"> • Upgrade select overhead autoloops • Replace 300 Form 6 Controls • Establish 14 master radio sites • Install SCADA Intelligence Manager • Intelligent & Cyber Secure SCADA system • Increase capacity of SCADA system for field switches • Add capability to monitor and control underground switches 	<ul style="list-style-type: none"> • Reduction in momentary outages on autoloops by developing and installing a logic controller which operates over the licensed frequency wireless system • Reduction in sustained outages on enhanced autoloops by installing multiple SCADA-controlled switches and incorporating them into the logic controller • Implementing advanced computational intelligence for automated restoration
Distribution Automation – Remote Monitoring System (RMS)	

<ul style="list-style-type: none"> • Upgrade approximately 6900 3rd generation RMS transmitters. • Install approximately 8100 Pressure, Temperature & Oil (PTO) sensor on underground network distribution transformers • Upgrade approximately 75 distribution transformers 	<ul style="list-style-type: none"> • Improved accuracy of network distribution load flow models • Implement condition based monitoring and reduce the manual inspection cycles • Proactively remove at risk units from service thereby improving public and worker safety
Distribution Automation – High Tension Monitoring and Data Acquisition System	
<ul style="list-style-type: none"> • Install approximately 940 high tension customer monitoring units • Implement real-time high tension. monitoring data acquisition system (HTMDAS) 	<ul style="list-style-type: none"> • Improved accuracy of network distribution load flow models. • Implement condition based monitoring and reduce manual inspection cycles. • Reduction in outage to critical customers. • Enable increased participation by critical customers.
Project Objective: Optimizing Asset Utilization	
Project Technical Deliverables	Performance Metrics
System Efficiency – 4kV Grid Modernization	
<ul style="list-style-type: none"> • Install approximately 440 distribution capacitors in the 4kV distribution grid • Implement central unit station LTC control software • Develop 4 kV grid models • Install 17 remote battery monitoring devices 	<ul style="list-style-type: none"> • Increase in system capacity (MW) • Reduction in 4 kV system losses (MWhr) • Implement condition based monitoring and reduce the manual inspection cycles • Increased Phase Balancing
Project Objective: Anticipating and Responding to System Disturbances	
Project Technical Deliverables	Performance Metrics
Dynamic Modeling	
<ul style="list-style-type: none"> • Implement approximately 18 distributed demand load flow models for underground network secondary distribution grid • Install approximately 1800 smart meters for distributed demand model load flow validation 	<ul style="list-style-type: none"> • Improved accuracy of underground network secondary distribution grid load flows • Network CAIDI • Reduction in number of underground network secondary grid events
Distribution Simulator	

<ul style="list-style-type: none"> • Create a distribution simulator to mimic contingencies and disturbances • Create a task based simulator to train control center operators on core functions 	<ul style="list-style-type: none"> • Reduce the severity of system contingencies and disturbances
<p>PI Historian</p>	
<ul style="list-style-type: none"> • Create a centralized data historian for all electric distribution SCADA data. 	<ul style="list-style-type: none"> • Improve the efficiency and effectiveness of electric distribution operations monitoring and analysis.
<p>Project Objective: Accommodating all types of distributed generation, clean power, and storage options</p>	
<p>Project Technical Deliverables</p>	<p>Performance Metrics</p>
<p>Vault Data Acquisition System</p>	
<ul style="list-style-type: none"> • Install two way communication and control on approximately 180 underground network distribution transformers in Staten Island 	<ul style="list-style-type: none"> • Reducing electric system power costs.