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May 10, 2016

By Electronic Filing

Honorable Kathleen Burgess
Secretary
State of New York Public Service Commission
Three Empire State Plaza
Albany, NY 12223

**Re: Case 98-G-1304 – In the Matter of the Reporting Requirements
Applicable to the Gas Industry's Research, Development and
Demonstration Programs, filed in C 28538**

Dear Secretary Burgess:

Attached for filing in the referenced proceeding is Consolidated Edison Company of New York, Inc.'s revised *Program Plan – Gas Research, Development and Demonstration 2016-2018*.

Very truly yours,

/s/ Enver Acevedo



2016

**Gas Research & Development
Report and Project Status Sheets**

Prepared for the Public Service Commission
In compliance with the order issued in Case 28538 in April
1983, and as amended in Case 98-G-1304 in September 1998
by Consolidated Edison Company of New York, Inc.
4 Irving Place, New York, NY 10003

Revised to include Millennium May 2016

FORWARD

This multi-year research and development report has been prepared by Consolidated Edison Company of New York in compliance with the order issued in Case 28538 in April 1983, and as amended in Case 98-G-1304 in September 1998, by the Public Service Commission for review and comment by the Commission staff and other interested parties.

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Introduction

Con Edison continue to maintain a high degree of focus on research and development (R&D), because R&D helps the Company maintain reliability and control customer costs to serve over 1.1 million customers through 4,300 miles of mains. The characteristics of our system, such as very large population, high load density, tremendous infrastructure density, high marginal costs for new infrastructure, the demand for continuation of our renowned reliability, present the Companies with technical issues that are unique in New York State and in the industry. These factors, with increasing focus on customer safety and the customer experience through technology for our service territories' unique demographic, require us to be at the forefront of developing cutting edge power delivery improvements and the development of innovative solutions.

The Companies' research program is focused on obtaining the greatest results for challenges unique to the Companies over various product delivery times. The Companies' portfolio balances short term and strategic, as well as balancing a mix of small and large projects.

The New York City service area is one of the most congested underground networks of service facilities in the world, some of the worst traffic conditions and some of the most stringent local regulatory requirements. All these factors contribute to the high cost of operation and maintenance; for example, excavation costs, especially in Manhattan, are extremely high. The internal Gas RD&D program is the focus of this report.

In 2000, the New York State Public Service Commission approved a surcharge to be collected via the Gas Adjustment Clause (GAC) to support long-term gas distribution research. Funds collected through this GAC are called the Millennium Funds. Research utilizing this funding is 24 or more months in duration, does not pursue utilization or storage advancements and is primarily done collaboratively through the Operations Technology Development (OTD) or the NYSEARCH organizations or can be non-collaborative in accordance with the allocation requirements detailed in the order 99-G-1369.

Goal & Objectives

The gas utility industry is responsible for delivering natural gas in a safe reliable, economic, and environmentally acceptable manner. To fulfill this obligation, continuous improvement in every phase of the Companies' operations is required. Success is dependent, to a great extent, on a sound research, development, and demonstration (R&D) program, with support and cooperation from our customers, the Companies, government, industry, and other gas utilities.

The goal of the Gas RD&D program is the identification, development and demonstration of new technologies required to achieve the overall corporate goal of continuing to provide gas energy in a reliable, economic and safe manner, with minimal environmental impact, and with maximum attention to the efficient use of energy resources by both the customer and the Company. To achieve this goal, the Gas RD&D Program seeks opportunities that seek improvements with the following objectives:

- Reduce risk and enhance public and employee safety
- Increase operational performance and flexibility
- Enhance customer experience and engage our customer

R&D does this by identifying, developing, demonstrating and providing advanced equipment, hardware, software methodologies etc. to Company operations.

Organization

Since its formation in 1970, the RD&D Department has sought to keep pace with the changing demands on the Company's gas distribution systems to ensure that continued progress is made in identifying research that will reduce risk and enhance public and employee safety, increase operational performance and flexibility, and enhance the customer experience.

R&D operates in a transparent environment with a cost-conscious mindset. Our strategy to meet the corporate cultural transformation is:

- We are open, fair, trusted and trusting, internally and externally:
 - Relying on and encouraging the talents of others within the Company
 - Conducting open discussions at our monthly staff meetings and departmental meetings that are held to address specific issues
 - Conducting timely and frequent outreach activities with internal customers and external stakeholders.
- Recognizing the substantial interest that customers and other external stakeholders have in every aspect of our business, we affirmatively and successfully engage with customers and external stakeholders in every aspect of our business:
 - Continually learning more about technological innovations in our industry and others
 - Benchmarking against other industry leaders
 - Seeking out new ideas across a broad spectrum of different industries, academia, policy-makers, governmental agencies and research consortia
- With a cost-conscious mindset, all employees act like business owners
 - Identifying needs of the Company that may have solutions in R&D
 - Developing and deploying advanced technologies and analytical techniques to meet those needs
 - Developing and deploying advanced technologies to improve worker and public safety
 - Developing and deploying advanced technologies to improve Company efficiency
 - Effectively balancing our portfolio to meet both the immediate operational needs and longer-term strategic issues
 - Working to increase value and leveraging of our expenditures

Staffing and Department Organization

Industry group and internal Company Gas RD&D efforts that the Company supports are under the direction of the Gas & Steam RD&D Department. This department, headed by a department manager and supported by a staff of four engineers and scientists, maintains surveillance of new developments in technical areas in which the Company is presently conducting research and also in those areas which might be of future benefit to gas customers. Advancing residential gas detectors

and methane quantification technology are two examples of recently emerging development needs. The Company R&D Department works with the Company's Gas Engineering and Gas Operating departments to determine their needs, develop programs, and initiate RD&D projects to support their objectives.

Program Development and Management

The Company's RD&D Department, guided by corporate goals and objectives and in consultation with other Company organizations, determines technological R&D needs, develops the R&D plan, and establishes programs that implement the plan. Individual projects are funded either solely by the Company or jointly through various arrangements with industry group R&D organizations, other utilities, and manufacturers. With support from engineering and operations personnel, the R&D Department also establishes test sites and demonstration facilities for evaluating new technologies. Once commercial feasibility of a technology is established and demonstrated by adequate field trials, the technology is no longer considered RD&D. The R&D Department monitors initial implementation of new technology to ensure that expected benefits are achieved and potential implementation problems are minimized. It also monitors new technical developments that might be of future benefit to the Company and its customers.

Project Selection and Management

RD&D is a resource to Gas Operations to seek means of resolving existing Company problems provide insights of new technical developments that have potential benefit, or partner with Gas Operations to develop projects which address the Company's goals and objectives and provide potential economic benefit. The projects that are pursued are subject to continual refinement so as to be flexible and able to recognize and address new challenges to Company operations.

The R&D process begins with the assignment of a project manager in R&D and a project leader known as a champion from the Gas Operations organization. Together they develop a project scope. This serves as the basis to develop a funding request which is then approved and funded in accordance with Corporate Policy. The project leader is responsible for the actual implementation of the project's work plans from initiation to preparation of a final report and technology transfer. The project leader is advised by and works closely with the R&D project manager.

Technology Transfer

The Company continues to stress the importance of maximizing return on its investment in research programs. Seminars, workshops, and status reports keep employees informed and engaged with new and emerging technologies. As the program has matured, more individuals throughout the Company have become aware of research and development and the products that are of value to them in achieving corporate goals and objectives.

Research Development and Demonstration Program

The purpose of the Companies gas RD&D program is to develop and demonstrate new processes/methods, technologies, and tools that will improve the natural gas distribution system as well as its operating and business practices through both an internal program and external industry research organizations. R&D is driven by the goal to provide new technology options that don't

presently exist which fill near term operational needs and longer term strategic needs of the corporation. The program strives to provide proactive problem solving opportunities that have the potential for making step-changes or even quantum leaps in the way we do business. The near term operational goal is to demonstrate technologies that have been developed and are ready for deployment into the field. The medium term goal is to develop technologies that fill a need, improve performance, or enhance customer experience and the long range goal is to identify new technologies that presently don't exist. Included within this goal are the following general concepts:

- Assess the impact of emerging technologies on business operations, competitiveness and profitability and deliver more innovative products.
- Anticipate changing technology needs driven by our internal business, by external regulation and by our customer needs. Based on these needs, develop and implement plans to bring new technology options to the company.
- Establish and maintain relationships, with high-value industry, incubators, and other groups and organizations to maintain contacts, gather strategic information and develop new partners for co-funding of research projects.

R&D pursues these goals and initiatives through a wide variety of external and internal programs and activities.

General R&D Support

General and administrative R&D support includes those costs relating to research performed by the Companies that is not specific to a program area. Such efforts have widespread application and benefits throughout the Company and for customers. Other general R&D support includes administrative costs that support research and technical services in all other R&D program areas. R&D has budgeted \$335K in 2016, \$343K in 2017, \$352K in 2018, and \$360K in 2019 for general and administrative support of the gas R&D program.

2015 Project Successes

Significant progress has been made in several areas that will improve the efficiency, reliability and safety of operating and maintaining the Company's gas distribution system. The Gas R&D section teams with the various gas field and engineering organizations to demonstrate and evaluate new technologies that reduce risk and enhance public and employee safety, increase operational performance and flexibility, and enhance the customer experience

Reducing risk and enhancing public and employee safety are of paramount importance in order to provide for the safe distribution of natural gas. In order to reduce these types of risks, projects are undertaken to improve the safety and reliability aspects of Gas Operations. Highlights of projects that were undertaken to reduce risks include the following:

- Protection of plastic gas pipe from electrical arcing and burn-out – The gas distribution system has experienced instances where buried electric infrastructure fails and creates a high heat condition from the resulting arc and that arc impacts a gas distribution main by melting polyethylene piping systems or burning through steel piping systems. This project seeks to replicate the arc event in a lab on demand. This replicable arc would then be used to conduct lab testing to determine an optimal thermal protective barrier for use between

buried electrical cables and gas distribution pipes. Significant progress has been made that enabled creating a repeatable and sustainable arc used as testing basis for candidate shields and work is still ongoing.

- Remote monitoring system for water drip pots - If a gas main has a leak and the main is installed in a wet ground area, water can seep into the gas main. Throughout the gas main distribution network, drip pots are installed to collect water at topographically-established low points where it can be siphoned out. A build-up of water in a gas main can interrupt the flow of gas to our customers. Current practice requires field crews to routinely pump-out drip pots in areas known to accumulate water. Water infiltration may occur at any time resulting from any combination of high water-table, heavy rains, or water main breaks; and there is no telemetry in place to warn of rising water levels in drip pots. The objective of this project is to field test pre-commercial drip pot sensor units at various drip pot locations around the service territory. Efforts are still ongoing and results of this project are expected to improve the quality of our data to deal with emergencies and to maintain the reliability of our gas distribution system by identifying situations that may result in a gas outage or low pressure condition.
- Gas transmission system internal corrosion monitoring - The goal of this project is to utilize permanently mounted ultrasonic wall thickness sensor technology to reduce cost associated with internal corrosion data collection during biennial wall thickness inspections required by Code. Data collection is required on piping adjacent to gate stations feeding the gas transmission system. Access to pipeline areas to be inspected would typically require excavation or manhole entry, coating removal, environmental abatement, pipe surface preparation, data collection using manual ultrasonic testing equipment, recoating and restoration at each location inspected during the biennial inspection cycle. Permanently mounted ultrasonic technologies, if proven reliable, can also be utilized to improve accuracy of internal pipe corrosion data.

Projects that improve the way the Company performs its functions serve to increase operational performance and flexibility. Improvements in these areas will serve to mitigate increasing costs associated with operating the gas organization which in turn serves our customers at as low a cost as possible. Highlights of projects that were undertaken to improve performance and flexibility include the following:

- Emergency main stop-off station (EMSOS) - The EMSOS project was undertaken in response to a need find cost effective means to install isolating points on the larger diameter low pressure distribution system. The EMSOS system has application on existing infrastructure where there are limited valves in order to provide a means of isolating the gas main in as expedient a manner during an emergency. The project developed a system that utilizes riser tubes installed on the main in strategic locations. These riser tubes serve as a means to insert an inflatable stopper in the gas main. The riser tubes are in a de-pressurized state and when needed, a completion plug that is in a fitting on the main is removed through no-blow technology. This energizes the riser tube with the gas system pressure and allows the insertion of inflatable stoppers into the gas main to achieve shutdown. The station is installed on energized mains through standard tapping equipment and using existing tapping procedures. This project successfully developed a beta prototype and the project will now be continued to complete commercialization, which will include development of training manuals, operating procedures, and formalizing a third party as the distributor for the complete system.

- Technology deployment and implementation (TDI) Program – The R&D section utilizes research collaboratives such as NYSEARCH to pursue technology development, and enhancements. The last phase of research is deployment and implementation. Many times due to code or regulatory requirements, successful research or technology cannot be instituted. This project seeks to overcome such barriers. Example of recent efforts undertaken includes demonstration of advancements to cured in-place lining process for gas main rehabilitation. Liners represent a potential savings of cost associated with gas main replacement since they do not require the replacement of existing pipe with a new direct buried pipe. They instead utilize the existing pipe as a host pipe for which the new liner is secured to with adhesive. A pipe with a liner installed is still the original pipe since these liners are not structural in nature but can be now considered as no longer being prone to leaks. This option of main replacement offers cost savings over the direct burial option especially as the diameter of the pipe increases. This project seeks opportunities to continue advancing the technology by demonstrating through laboratory testing that pipes with liners are not prone to leaks.

The Company very recently made a commitment to install automated meter intelligence (AMI) network. This network will allow the Company the opportunity to access customer use information on a much granular scale in order to not only perform typical customer functions such as meter reading, but potentially also to provide more specific use data to optimize operation of the system, such as gas pressure. Due to the newness of this decision there have been minimal efforts to achieve results and going forward emphasis will be placed on technology that can potentially be utilized on the AMI network such as residential methane detector communications.

Collaborative RD&D

For projects where the Company shares a common interest with others in the industry, the Company works with various industry organizations to conceptualize and develop new products or advance existing products. These groups include NYSEARCH, a gas research consortium started in New York that now operates nationally and internationally in Canada and is part of the Northeast Gas Association (NGA), Operations Technology Development (OTD) and Sustained Membership Program (SMP) that are part of the Gas Technology Institute, and the American Gas Association (AGA). NYSEARCH and OTD both consist of member gas companies, some which are members of both groups such as The Company. In addition, RD&D employees maintain regular contact with other utilities, gas trade groups, universities, and technology developers as a further source for new ideas. Industry group participation allows for greater economies in developing and implementing new technologies and ensures that these new technologies are available to the industry as a whole. For these reasons, The Company continues its commitment to industry group research and development through the support of GTI's OTD and SMP programs, and NGA's NYSEARCH gas research programs.

R&D has budgeted \$50K per year in 2016 through 2019 for collaborative efforts that are not part of the Millennium budget. R&D has budgeted \$1,963K per year in 2016 through 2019 for Millennium budget funded efforts.

Internal RD&D Program

The Company is actively seeking solutions to problems specific to its service area. In addition to its commitment to industry-wide research, development and demonstration through support of national and state gas research groups, the Company will continue a strong program of research and development within the Company and through outside contractors.

The Company's gas business is primarily in distribution. This has caused the Company to concentrate heavily on the maintenance and improvement of the existing gas distribution system and on improving the conservation and utilization of the Company's gas infrastructure as presently available. The Company system has approximately 1,100 miles of cast iron mains, much of which is 100 years old. While cast iron is naturally resistant to corrosion, our cast iron system, typically in 12-foot sections, has over half million joints, which are potential sources of leakage. The Company also has approximately 1,000 miles of bare or unprotected steel mains and approximately 67,000 bare steel services that are costly to maintain or replace. Areas of research in our current program seek opportunities to address these gas distribution system demographics.

The Company's proposed Gas Research Program for 2016 and beyond continues to emphasize the gas operations areas that bring new technologies to our work force allowing them to work more safely and productively. Spending in the Gas Operations Internal Program area for 2015 was about \$.91 million and in 2016 through 2019 we plan to maintain expenditures at approximately \$1.1 million per year. The Company believes that new technologies are vital to contain the costs of maintaining and replacing a distribution system that is predominantly cast iron and unprotected steel mains and unprotected steel services. Because of the unique subsurface congestion in New York and associated high excavation and restoration costs, traditional methods are too expensive and research efforts conducted by GTI and others may not always address our special needs.

Additional Information

Additional information of the Company's RD&D programs can be obtained directly through:

Richard J Trieste, Jr.
Department Manager
Gas & Steam RD&D Programs
212 460 4830
triester@coned.com

FORM G- 5 and 6
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
RESEARCH AND DEVELOPMENT PROGRAM PLAN EXPENDITURES 2015 - 2019
(\$000)

Description	2015 Actual	2016 Budget	2017 Estimate	2018 Estimate	2019 Estimate	Total Project Authorization	Total Project Spending
Industry Groups G - 5							
OPERATIONS TECHNOLOGY DEVELOPMENT (OTD) PROGRAM (NON-MILL)	\$257	\$25	\$25	\$25	\$25	\$1,450	\$1,595
NYSEARCH-NORTHEAST GAS ASSOCIATION RESEARCH DEVELOPMENT AND DEMO		\$25	\$25	\$25	\$25	\$8,732	\$8,629
Subtotal Industry Groups	\$257	\$50	\$50	\$50	\$50		
Administration G - 6							
SALARIES AND WAGES	\$235	\$276	\$284	\$293	\$302	Annually Funded	
OTHER EXPENSES	\$33	\$32	\$32	\$32	\$32	Annually Funded	
PATENT SEARCHES IN CONNECTION WITH COMPANY R&D TECHNOLOGY APPLICATIONS	\$18	\$26	\$26	\$26	\$26	\$1,846	\$1,853
Subtotal Administration	\$286	\$335	\$343	\$352	\$360		
Gas In-House G - 6							
3D TOOL BOX EVALUATION	\$7	\$10				\$30	\$24
APPROVAL FOR 1.10.e ENHANCED DAMAGE PREVENTION IN NY PHASE 3		\$25	\$50				
DEMONSTRATE 12" CONSPLIT		\$25	\$25	\$50			
DEMONSTRATE TRACKING AND TRACEABILITY TECHNOLOGY FOR PE FUSIONS		\$50	\$50	\$75			
DEMONSTRATE WATERPROOFING TECHNOLOGY FOR GAS OPERATIONS INFRASTRUCTURE		\$25	\$25	\$75			
DEMONSTRATION OF ADVANCEMENTS TO THE CURED-IN-PLACE-LINING PROCESS FOR GAS MAIN REHABILITATION		\$50	\$50			\$210	\$85
DESIGN AND DEVELOPMENT OF GAS DISTRIBUTION LINE FLOOD PROTECTION DEVICE		\$25	\$25	\$25			
DESIGN AND DEVELOPMENT OF GROUND FROST HEAVE PREDICTION MODEL		\$25	\$25	\$25			
DEVELOP 16" PLASTIC PIPE SQUEEZE-OFF MACHINE		\$25	\$25	\$25			
DEVELOP A GAS GIS BASEMAP OF MANHATTAN TOWARD AN AUTOMATED GAS LEAK SURVEY LOGGING SYSTEM	\$15	\$25				\$300	\$248
DEVELOP A METHOD TO RELOCATE PAVED-OVER METALLIC VALVE BOXES	\$37					\$145	\$91
DEVELOP A TOOL TO SEAL A SEVEREDTEE TAP IN AN ELEVATED PRESSURE GAS MAIN		\$50	\$50	\$25			
DEVELOP AN EMERGENCY MAIN STOP-OFF STATION	\$19					\$380	\$380
DEVELOP JACKHAMMER SIDE COMPARTMENT FOR UTILITY TRUCKS		\$25	\$50	\$50			
DEVELOP METHANE SENSORS		\$50	\$50	\$50			
DEVELOP PE REPAIR FITTINGS		\$50	\$145	\$229			
DEVELOP TECHNOLOGY ROADMAP FOR FIELD DATA CAPTURE	\$50	\$50	\$25	\$25		\$50	\$50
DEVELOPMENT OF A NO-DIG CUT & CAP SYSTEM FOR 2" PLASTIC SERVICES	\$9	\$20				\$280	\$177
EMERGENCY MAIN STOP-OFF STATION (EMSOS) PHASE 2 - FIELD DEVELOPMENT AND TESTING		\$75	\$50	\$75			
EVALUATION OF HIGH-TEMP CIPL REHAB OF GAS MAIN IN MGO		\$75	\$50	\$0			
EVALUATION OF LARGE DIAMETER FULL SIZED REMOTE OPERATED VALVE CLOSER UNDER FULL FLOW AND FULL PRESSURE CONDITIONS	(\$4)					\$82	\$75
FIELD EVALUATION OF COMPOSITE REPAIR WRAP FOR GAS TRANSMISSION PIPELINES	\$81					\$80	\$81
GAS LEAK SURVEY FIELD AUTOMATION PILOT PROJECT	\$31					\$125	\$81
GAS OPERATIONS INNOVATION MONITOR - A SUBSCRIPTION SERVICE	\$7	\$8	\$8	\$8		\$135	\$109
GAS PIPE WATER EXTRACTION SYSTEM EVALUATION		\$25	\$50	\$0		\$45	\$0

FORM G- 5 and 6
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Description	2015 Actual	2016 Budget	2017 Estimate	2018 Estimate	2019 Estimate	Total Project Authorization	Total Project Spending
GAS R&D RELATED TRAVEL AND TIME BY NON-R&D COMPANY PERSONNEL	\$1					\$155	\$158
GAS TRANSMISSION SYSTEM INTERNAL CORROSION MONITORING.	\$159					\$150	\$159
GENESIS SPRAY-IN-PLACE-PIPE (SIPP) LINING SYSTEM - SHOP DEMONSTRATION	\$35	\$25	\$25	\$50		\$48	\$35
HEAT SHIELD TESTING FOR CIPL TO REHABILITATE GAS MAINS IN CLOSE PROXIMATY TO STEAM MAINS	\$50					\$97	\$93
HIGH TEMPERATURE LIMIT SWITCH TO DIAPHRAM IMPROVEMENTS FOR THM TURBINE BLEED VALVES	\$74	\$55	\$50	\$25		\$270	\$83
HOUSE PIPE INTEGRITY TEST AUTOMATION				\$50			
MICRO-EXCAVATION FOR CP TEST STATION / VALVE BOX INSTALLATION	\$18	\$25				\$360	\$308
PAVED-OVER VALVE BOX LOCATING AND REINSTATEMENT - FIELD PILOT	\$23	\$25				\$50	\$50
PICARRO LEAK SURVEY PHASE 0	\$21					\$20	\$21
PILOT DEMONSTRATION OF ACOUSTIC LEAK DETECTION SYSTEM FOR TRANSMISSION GAS MAINS		\$25	\$25	\$25		\$225	\$131
PROTECTION OF PLASTIC GAS PIPE FROM ELECTRICAL ARCING AND BURN-OUT	\$15	\$25	\$50			\$495	\$221
REMOTE MONITORING SYSTEM FOR DRIP POT WATER		\$25	\$25	\$25		\$470	\$467
RESEARCH INTERNATIONAL PRACTICES FOR LOCATING PE PIPES BY STEAM PIPES		\$10	\$10				
ROBOTIC CORROSION DETECTION OF FEEDER PIPING		\$50	\$50	\$50			
TECHNOLOGY DEPLOYMENT AND IMPLEMENTATION (TDI) PROGRAM FOR GAS OPERATIONS - PHASE 2	\$1					\$495	\$427
TEST AND EVALUATE RECORDING DYNAMIC CONE PENETROMETER (RDCP)		\$15	\$15	\$26			
TRANSMISSION PRESSURE CIP BLISTERING TESTING	\$33					\$96	\$91
VOICE-ENABLED APPLICATIONS FOR OPERATIONS		\$20	\$10				
GAS METER BARCODING AND COMPUTER INFRASTRUCTURE ENHANCEMENT	\$25					\$50	\$58
GUIDED WAVE TESTING ON INSULATED PIPING AT LNG PLANT	\$14					\$40	\$14
PROOF OF WATERFRONT CONCEPT FOR ACOUSTIC LEAK DETECTION OF TRANSMISSION GAS MAINS	\$38					\$85	\$75
TECHNOLOGY DEPLOYMENT AND IMPLEMENTATION (TDI) PROGRAM		\$50	\$50	\$75			
OFF GRID MINIDOME CCTV	\$73					\$77	\$73
OFF GRID REMOTE SURVEILLANCE	\$77					\$80	\$77
DEMONSTRATION OF NEW SAFETY TOOLS AND EQUIPMENT FOR GAS OPERATIONS		\$25	\$25	\$25		\$50	\$50
In-House Total G - 6	\$909	\$1,088	\$1,088	\$1,088	\$1,088		
Administration & In-House Total G - 6	\$1,195	\$1,423	\$1,431	\$1,440	\$1,448		
Total Program G5 & G6	\$1,452	\$1,473	\$1,481	\$1,490	\$1,498		

MILLENNIUM
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
RESEARCH AND DEVELOPMENT PROGRAM PLAN EXPENDITURES 2015 - 2019
(\$000)

Description	2015 Actual	2016 Budget	2017 Estimate	2018 Estimate	2019 Estimate	Total Project Authorization	Total Project Spending
MILLENNIUM PROGRAM							
Industry Groups							
EPRI FUNDING FOR MGP SITE REMEDIATION AND HEALTH RISK R&D	\$174	\$175	\$180	\$185	\$185	Annually	
NYGAS (NYSEARCH) FUNDING FOR MILLENNIUM GAS RESEARCH AND DEVELOP	\$529	\$500	\$500	\$500	\$500	Annually	
OPERATIONS TECHNOLOGY DEVELOPMENT (OTD), NOT FOR PROFIT PROGRAM	\$889	\$650	\$650	\$650	\$650	Annually	
Sub-Total Industry Groups	\$1,592	\$1,325	\$1,330	\$1,335	\$1,335		
In-House							
DEMONSTRATE RESTRAINT AND LOCKING MECHANISMS FOR MANHOLE COVERS		\$50	\$75	\$50			
EVALUATE POLYUREA COATING ON ER-199 AT HUNTS POINT STATION	\$102					\$105	\$102
PHASE III- STRUCTURAL WEAR TESTS OF COMPOSITE COVERS USING ROADWAY PARAMETERS	\$133	\$35				\$150	\$133
FIELD DEMONSTRATION OF EXPLORER PIPELINE CLEANING TOOL		\$125	\$75	\$75			
FIELD DEMONSTRATION OF THE EXPLORER 20/26 CRACK SENSOR		\$125	\$75	\$75			
FIELD DEMONSTRATION OF TIGRE 20/26 IN-LINE INSPECTION TOOL	\$2					\$170	\$114
FIELD TRIAL / DEMO OF BEM INTERNAL INSPECTION TOOL	\$30	\$25	\$25	\$20		\$145	\$30
IN-LINE INSPECTION OF 8 INCH GAS TRANSMISSION PIPE (M5)		\$28	\$8	\$8			
COMPOSITE PIPE STUDIES, TESTING AND DEMONSTRATIONS FOR REHABILITATION OF DISTRIBUTION GAS MAINS		\$50	\$50	\$50			
DEVELOP, TEST AND DEMO OF NYSEARCH PROJECT TECHNOLOGIES		\$100	\$125	\$125			
DEVELOP, TEST AND DEMO OF OTD PROJECT TECHNOLOGIES		\$100	\$125	\$125			
SMART GRID APPLICATION FOR GAS			\$75	\$100			
GENERAL					\$628		
Sub-Total In-House	\$267	\$638	\$633	\$628	\$628		
Total Millennium	\$1,859	\$1,963	\$1,963	\$1,963	\$1,963		

TITLE Operations Technology Development (OTD) Not For Profit Program (Non Millennium Program)

CSN 92206 **POET** 10064342 **TASK** 0143

PROGRAM AREA Industry Group Industry Group

CONTRACTOR

DURATION 6/6/2008 to 12/2014

ENGINEER Trieste

PROJECT LEAD Nick Inga

AUTHORIZED \$ 1,450,000

EXP. THROUGH 2015 \$ 1,594,547

OBJECTIVE

OTD is a not for profit corporation of gas distribution utilities whose charter is to perform research beneficial to the public they serve. The program provides the gas industry with innovative methods to voluntarily invest in R&D projects aimed at particular Company needs. Participants in these projects are directly involved in program plan, project selection, field tests, and technology transfer. By teaming participants with common interests, funding can be significantly leveraged providing cost-effective solutions to the gas industry's most pressing problems.

BENEFITS

The expected benefits include improved availability, reliability and efficiency of the gas system, and reduced impact of gas distribution and construction operations on the environment, as well as increased customer satisfaction from reduced costs and public interference. Continued support for longer term research programs will ultimately benefit shorter term demonstration projects. OTD will retain all intellectual property associated with each project, but the industry cofunders will be granted a royalty-free license of any patented process or product for internal use. Cofunders will also have access to all reports, data and results generated from all OTD projects.

TECHNICAL STATUS

Three Regulator Vault Projects are undergoing field demonstrations and are in various stages of completion.

TITLE 3D Toolbox Evaluation**CSN** 90209 **POET** 20915358 **TASK** 0001**PROGRAM AREA** Gas Research Operations**CONTRACTOR** Technical Toolboxes Inc.**DURATION** 4/15/2014 to 12/2016 **ENGINEER** Fowles**PROJECT LEAD** Frank Hemerlein**AUTHORIZED** \$ 30,000 **EXP. THROUGH 2015** \$ 24,421**OBJECTIVE**

To perform a comparative evaluation of the 3D Toolbox NDE system, a computerized methodology to perform Non-Destructive Evaluations (NDE) of pipe surface anomalies, automatically quantify metal loss and run the ASME B31 G/RSTRENG calculations for determining the need for corrective action, against the conventional "Pit Gauge" method for the assessment of pipe surface defects/corrosion.

BENEFITS

It is expected that the use of the 3D Toolbox will provide for a much more accurate assessment of pipeline defects, versus using the conventional pit gauge method. Highly accurate defect data will lead to very meaningful RSTRENG calculation results and therefore will allow the Company to make prudent corrective action decisions. In addition, a significant improvement in labor productivity is expected by using the 3D Toolbox.

TECHNICAL STATUS

In 2014 a 3D Toolbox NDE system was obtained, and in 2015 two successful field evaluations of the system were conducted on the Con Edison gas transmission system. Prior to the two field evaluations, a special vendor training session for engineers from Gas Transmission Engineering (GTE) and Corrosion Control was held in order to help maximize their knowledge of the system. Based on the results of the field testing, GTE believes that this system has significant advantages over the conventional pit gauge method of pipe wall defect/corrosion assessment for most applications, and will continue to consider opportunities for further field usage.

TITLE DEVELOP A GAS GIS BASEMAP OF MANHATTAN TOWARD AN AUTOMATED GAS LEAK SURVEY LOGGING SYSTEM

CSN 92095 **POET** 10046626 **TASK** 0021

PROGRAM AREA Gas Research - Traditional

CONTRACTOR

DURATION 12/1/2011 to 12/2012 **ENGINEER** Jaramillo
PROJECT LEAD Alan Boyd
AUTHORIZED \$ 300,000 **EXP. THROUGH 2015** \$ 247,500

OBJECTIVE

Coordination with IR, Gas Operations, Construction Management's Survey Group, GTI and NYSEARCH for similar R&D efforts in the gas industry is an ongoing process. Electric R&D is also reviewed to eliminate redundancy of this effort.

BENEFITS

From GPS-enabled vehicles, Leak Survey crews will be able to view gas lines accurately located relative to landbase maps and vehicle position in real-time. The expected qualitative benefits include not only elimination of time consuming and error-prone manual tasks. But providing 1) an automated system that eliminates potential missed or inaccurate surveys and 2) interfaces with Gas Operations' Mapping toward greatly improving mapping accuracy by providing a basis from which to expand. The results of this demonstration could be by G8S Operations Mapping Group toward full deployment for all other NYC boroughs. It will also serve as an example toward IR's GIS Assessment effort with other operating groups throughout CECONY.

TECHNICAL STATUS

This project conducted several field trials in an attempt to proof the GPS capabilities would overcome the Urban Canyon affect. The technology was not able to overcome the urban canyon affect thus rendering ineffective to conducting Leak Surveys in areas with high buildings and structures. This project was completed with an unsuccessful outcome.

TITLE DEVELOP A METHOD TO RELOCATE PAVED-OVER METALLIC VALVE BOXES**CSN** 92489 **POET** 20233656 **TASK** 0001**PROGRAM AREA** Gas Research - Traditional**CONTRACTOR****DURATION** 8/12/2012 to 0/2000**ENGINEER** Jaramillo**PROJECT LEAD** Frank Mc Brien**AUTHORIZED** \$ 145,000**EXP. THROUGH 2015** \$ 91,499**OBJECTIVE**

To obtain a tagging method that will be long lasting (minimum 5 years) and provide the ability to locate:

1. Both 4" and 12" metallic valve boxes in the roadway.
2. A valve box when buried under 6' of asphalt,
3. A valve box under snow, and
4. A valve box when the cover has been removed by pavement stripping contractor.

BENEFITS

The expected benefit for Gas Operations will be faster turn-over in main valve, corrosion and BOPA fault repairs. In addition to the man-hours spent per fault being greatly reduced, there will also be a reduction in the excavation and restoration costs needed to find each paved-over main valve, buried corrosion IJ, and curb valve box that has this RFID installed in it.

TECHNICAL STATUS

This project was completed in 2015. Test was made to show that the tags can be read through various materials and weather conditions. Manhattan gas operations received 3 reading units, and are planning to utilize this technology in Governor's Island as a means to be able to tag all the gas valves on the island.

TITLE DEVELOP AN EMERGENCY MAIN STOP-OFF STATION**CSN** 92304 **POET** 10064342 **TASK** 0209**PROGRAM AREA** Gas Research - Traditional**CONTRACTOR** Gas Technology Institute**DURATION** 5/4/2007 to 12/2015**ENGINEER** Fowles**PROJECT LEAD** Bob McGrath**AUTHORIZED** \$ 380,000**EXP. THROUGH 2015** \$ 379,917**OBJECTIVE**

To develop and field test "Emergency Main Stop-off Stations" in order to achieve a means of effecting a rapid and reliable stop-off of flow in 16" to 36" low pressure metallic mains.

BENEFITS

Having EMSOS installed at strategic locations on our large diameter low pressure mains will allow field crews to effectively respond to system emergencies by accessing the EMSOS from the street surface and quickly deploying stoppers into the main to stop-off flow without having to excavate or tap the main during the emergency situation. The EMSOS will not only improve our readiness to deal with emergencies and enhance the safety of life and property, but will also minimize methane or "greenhouse" emissions to the atmosphere.

TECHNICAL STATUS

Phase 2 of the project was initiated in July 2011, which included the design and implementation of certain technical enhancements to the existing 16"- 24" prototypes developed in Phase 1, and to develop and test 30" and 36" prototypes. By Dec. 2015, the 16" - 24" enhancements and the development and testing of the 30" & 36" prototypes have been completed. A successful qualification demonstration on a pressurized 20" steel main section was conducted at the Con Edison Learning center in Aug. 2014. This project is currently pending close-out. We plan to initiate *EMSOS Phase 3 –Field Installation and Testing* in 2016.

TITLE DEVELOPMENT OF A TECHNOLOGY ROADMAP FOR FIELD DATA CAPTURE AND MANAGEMENT**CSN** 99955 **POET** 21369387 **TASK** 0001**PROGRAM AREA** Gas Research - Traditional**CONTRACTOR** GasOps iQ, Inc.**DURATION** 4/1/2015 to 12/2015 **ENGINEER** Aromando**PROJECT LEAD** Michael DeVirgilio**AUTHORIZED** \$ 50,000 **EXP. THROUGH 2015** \$ 50,000**OBJECTIVE**

Regulations require that operators of natural gas distribution systems implement a Distribution Integrity Management Program (DIMP). This requires that operators know everything about their distribution systems and that they maintain complete records of all work performed, including repair methods, pipe material, and history of the pipes and fittings in question. In summary, DIMP requires that every record must be complete, traceable, and verifiable. The objective of this study is to develop a strategic technology roadmap for the acquisition of field data and justify the means with a strong business case in Gas Operations. This will be performed through the following approach: stakeholders will be identified early in the process in various departments of the organization to establish business needs. Their input to the data acquisition process will be used to develop a current state operating model that takes into account what the stakeholders currently practice and determines whether their methods are effective. A gap analysis will then be performed based on this preliminary research to identify deficiencies in the data acquisition process and to determine areas of operational improvement where the company complies with regulatory requirements. Once this analysis is complete, a business case will be developed to justify and develop a plan to enhance the existing process through the selection of potential technologies.

BENEFITS

By improving the process of capturing field data so that it is traceable and verifiable, the data quality is improved, especially for archiving purposes and regulatory compliance. A complete history of the system's records will especially be useful for any future studies for system and dispatch improvement and potentially reduce the time required during investigations if possible gas incidents occur.

TECHNICAL STATUS

Meetings were held between the vendor and with Gas Work Management to compile the necessary data, and fully understand the methods employed for capturing specific field data. For the purposes of this study, the work focused on the necessary fields that describe attributes for a work order gas leak ticket, such as pipeline diameter and length, material, and description of work performed on that section of pipe. A gap analysis was completed within the time frame. The results were documented into a final field report for Gas Work Management and Information Resources personnel (who support Gas Operations) and subsequently presented to management of both groups. This project is complete.

TITLE DEVELOP A NO-DIG GAS SERVICE CUT & CAP SYSTEM**CSN** 92124 **POET** 10064342 **TASK** 0082**PROGRAM AREA** Gas Research - Traditional**CONTRACTOR** ULC Robotics**DURATION** 3/10/2005 to 12/2017**ENGINEER** Fowles**PROJECT LEAD** Thierry Desrosiers**AUTHORIZED** \$ 280,000**EXP. THROUGH 2015** \$ 176,727**OBJECTIVE**

Develop a system that can access a low pressure service pipe from the head of the service in the building, and stop-off and physically cut the pipe near the tee at the main. This would avoid having to make an excavation over the main/service connection in the street.

BENEFITS

Reduction in O&M costs. Reduced disruption to traffic, the environment and the general public.
Enhanced worker safety. Elimination of street opening permit fees.

TECHNICAL STATUS

In 2014, the focus of the project became the development and testing of a complete system for 2" plastic services. Consideration was given to the development of 2" electrofusion plug, but due to anticipated high costs and significant technical challenges it was decided to focus our efforts on the development and testing of a 2" Cured-In-Place plug. The development of the prototype 2" CIP plug is nearing completion and shop testing of the plug is expected to be conducted in spring 2016.

TITLE EVALUATION OF LARGE DIAMETER FULL SIZED REMOTE OPERATED VALVE CLOSER UNDER FULL FLOW AND FULL PRESSURE CONDITIONS**CSN** 92083 **POET** 10064342 **TASK** 0056**PROGRAM AREA** Gas Research - Traditional**CONTRACTOR** Control Associates**DURATION** 10/10/2009 to 8/2013**ENGINEER** Aromando**PROJECT LEAD** Lenny Toscano**AUTHORIZED** \$ 82,000**EXP. THROUGH 2015** \$ 75,322**OBJECTIVE**

The objective will be to simulate full-closure operation of a 36-inch valve while under full flow and full pressure conditions during a catastrophic failure on a gas transmission main in a laboratory setting. Expected results will indicate the required torque to achieve full shutdown of the valve.

BENEFITS

Recognition of potential flaws in remote operated valve (ROV) operation will provide Gas Engineering information for improving the integrity and safety of the Gas Transmission system. This will also provide information on how the emergency response rate of remote operated valves and the associated contingency plans may also be improved.

TECHNICAL STATUS

Legal issues were settled in 2011 between Con Edison and the vendor. Once these issues were resolved, testing began 1Q12 and completed by 4Q12. Twenty-seven test runs were performed on the 36" test valve. Overall, the test assembly completed the closed cycle against the required pressure (for up to 350 psi) and flow conditions (designed for 30 MMSCFH at 0.6 specific gravity) both during AC power and during battery back-up. Data also showed the amount of torque required to fully shut down the valve during a pipeline failure. With Van Nest Shop's assistance, Gas Transmission Engineering designed and fabricated a torque actuator that could handle the torque forces seen during a pipeline failure. Additionally, some of the funding was used for performing hydrostatic seat tests for the same valve after these flow tests were completed in order to recertify for service. However, the valve experienced enough seating damage during the initial tests that it could no longer be recertified. A final technical report was provided to Con Edison detailing results of the valve closure tests; the project was formally closed out by 3Q15.

TITLE FIELD EVALUATION OF COMPOSITE REPAIR WRAP FOR GAS TRANSMISSION PIPELINES**CSN** 99879 **POET** 21697008 **TASK** 0001**PROGRAM AREA** Gas Research - Traditional**CONTRACTOR** Precision Pipeline Solutions (PPS)**DURATION** 10/1/2015 to 12/2016**ENGINEER** Aromando**PROJECT LEAD** Peter Cavazzini**AUTHORIZED** \$ 80,000**EXP. THROUGH 2015** \$ 81,301**OBJECTIVE**

Steel pipelines may exhibit non-leaking defects such as gouging, pitting, and corrosion. If left ignored, these defects have the potential to weaken the structural integrity of the pipeline which may in turn potentially cause gas main rupture. This can lead to possible damage to the surrounding area and to the public and lead to customer disruptions downstream from the rupture. Repairs may consist of either cutting out the defective section for replacement which requires a main shut-down or installing a split sleeve around the area of the pipe with the defects with the gas main live. Both repair options would require significant excavation around the affected pipe and extensive coordination with stakeholders such as Gas Control / System Operations, Central Field Services, Construction Management, and Gas Transmission Engineering. As such, both options can be quite costly, time-consuming, and labor-intensive.

15 linear feet of 24-in. steel gas transmission pipe located at Fisher and Tibbetts Avenues in White Plains will be repaired and reinforced with a composite material consisting of vinyl ester and fiberglass material that is a commercially available product called Clock Spring™. The performance of this material was tested at the Gas Research Institute (GRI), now known as the Gas Technology Institute and later approved by pipeline regulators as an acceptable form of permanent pipe repair. The installation of Clock Spring™ will be performed with the gas main live. This could be performed and completed in one week or less.

BENEFITS

An external composite sleeve that has proven its ability as a permanent repair method for pipelines has the benefits of decreasing O&M costs associated main replacements or split-sleeve installations. Similar to the split-sleeve installation, Clock Spring™ can be performed with the gas main live. The composite sleeve has also proven its longevity through gas industry research and therefore this technology has the potential to ensure that the repaired pipe operates for as long as possible.

TECHNICAL STATUS

Field scoping of the work began with the contractor and with Gas Engineering, Research and Development, and Corporate Environmental Health and Safety departments in 3Q15. Vendor contract and procurement were completed in 4Q15. Application and installation of the Clock Spring™ composite wrap were completed immediately afterwards. Monitoring of this section of gas transmission main will continue for a duration of six to twelve months.

TITLE Gas Leak Survey Field Automation Pilot Project

CSN 13100 **POET** 20353229 **TASK** 0001

PROGRAM AREA Gas Research - Traditional

CONTRACTOR

DURATION 1/14/2013 to 10/2013

ENGINEER Jaramillo

PROJECT LEAD Alan Boyd

AUTHORIZED \$ 125,000

EXP. THROUGH 2015 \$ 80,851

OBJECTIVE

Objectives of the project was two-fold:

1. Test the feasibility of using smartphones and tablets to record driving and walking gas leak surveys on top of highly accurate landbase maps of Manhattan; and
2. Build a SQL Server database structure and populate it with the driving and walking gas leak survey data.

This project is for determining whether current technology can accurately record required gas leak data from the field into an enterprise database. Phase 1 will not produce, nor will it result in, a final production-ready to use software application. However, if the results of the pilot project indicate that accurate survey records can be produced, then the next step would be a separate follow-on Phase 2 project to create and deploy a final, production-ready, field-usable software application for use by Can Edison's gas leak survey crews. Phase 2 is outside the scope of this proposed Phase 1 pilot project.

BENEFITS

From a smart device in vehicles, Leak SUNey crews will be able to view gas lines accurately located relative to landbase maps and vehicle position in real-time. The expected qualitative benefits include not only eliminnaan of time consuming and error-prone manual tasks, but providing 1) an automated system that eliminates potential missed or inaccurate surveys and 2) interfaces with Gas Operations Mapping Group toward greatly improving mapping accuracy by providing a basis from which to expand. The results of this demonstration in Manhattan could be used by Gas Operations' Mapping Group toward full deployment for all other NYC boroughs and Westchester County.

TECHNICAL STATUS

Gas Leak crews currently drive gas mains or walk leak sureys of Business District seNices then manually record gas leaks on hard copy maps and paper fonnns. Gas Leak Technicians fill out a Leak Location and Time Report. The data manually recorded on this fonn is sent back to the office by telephone every day. The data is then manually input to a Microsoft Access database and then imported to an Excel spreadsheet from which reports are output. An automated method that tracks vehicles using GPS on a landbased map is needed. In 2015 this project produced a SQL Database used to run reports from data

that was previously saved in Excel database, and which would be used to create reports using the new software described in the project to capture Leak Survey information. As part of the project, in 2015, the project delivered a walking app to be used with apple products to capture leak survey information. R&D and Leak Survey will analyze and evaluate the continuation of this project. The next phase of this project is to develop a mobile app which can be used when Leak Survey conducts their mobile surveys of the gas system.

TITLE GAS OPERATIONS INNOVATION MONITOR - A SUBSCRIPTION SERVICE**CSN** 92244 **POET** 10064342 **TASK** 0170**PROGRAM AREA** Gas Research Operations**CONTRACTOR** Gas Operations Innovation Alliance**DURATION** 8/19/2005 to 12/2018 **ENGINEER** Fowles**PROJECT LEAD** Nick Inga**AUTHORIZED** \$ 135,000 **EXP. THROUGH 2015** \$ 108,929**OBJECTIVE**

To obtain the ability to maintain an increased awareness of new and innovative products and services that could potentially benefit Con Edison in the near future by continued participation in a technical gas industry subscription service offered by the Gas Operations Innovation Alliance.

BENEFITS

The Company will receive monthly technical publications (called *Technology Market Watch*) containing around 6 articles on new and innovative products or processes recently commercialized or nearing commercialization that may benefit the Company. In addition, quarterly publications (called *Innovation Insights*) providing an in-depth analysis of a selected priority topic pertinent to the gas industry will be issued. It is expected that this technical service will compliment the efforts of gas industry R&D organizations such as GTI/OTD and NGA/NYSEARCH.

TECHNICAL STATUS

In Jan. 2016, R&D renewed our annual subscription for three additional years (2016, 2017 and 2018). The Company continues to receive the monthly publications and quarterly in-depth reviews on new and innovative topics related to the gas industry. R&D continues to share these publications with Gas Operations and continues to seek out promising technologies for further investigation.

TITLE Gas Transmission System Internal Corrosion Monitoring

CSN 90353 **POET** 21065437 **TASK** 0001

PROGRAM AREA Gas Research - Traditional

CONTRACTOR Rohrback Cosasco System, Inc.

DURATION 8/15/2014 to 12/2016

ENGINEER Aromando

PROJECT LEAD Vincent Pastore

AUTHORIZED \$ 150,000

EXP. THROUGH 2015 \$158,596

OBJECTIVE

The intent of this project is to utilize permanently mounted ultrasonic wall thickness sensor technology to reduce cost associated with internal corrosion data collection during biennial wall thickness inspections required by federal requirements. Data collection is required on piping adjacent to gate stations feeding the gas transmission system. Access to pipeline areas to be inspected would typically require excavation or manhole entry, coating removal, environmental abatement, pipe surface preparation, data collection using manual ultrasonic testing equipment, recoating and restoration at each location inspected during the biennial inspection cycle. Permanently mounted ultrasonic technologies, if proven reliable, can also be utilized in:

1. Improving accuracy of collected data - Inaccurate wall loss data collection that is not repeatable and comparable could potentially lead to liquid corrosion constituent entry into the gas transmission system
2. Many more applications to improve the integrity, safety, reliability and operation of the gas transmission system.

The goals will be the following:

1. Obtain pipe wall measurements from the wall mounted sensor system that will specifically monitor for internal corrosion that will be long lasting (minimum of five years)
2. Require accurate results at five (5) installation locations (aboveground, buried and manhole)
3. Determine if the sensors can withstand various installation environments (wet; partially submerged; submerged)
4. Determine that the wiring and data collection at the junction boxes can withstand various installation environments (wet; partially submerged; submerged)
5. Verify accuracy and repeatability of data collection
6. Demonstrate the durability, accuracy and ease of use of data collection equipment

The project will monitor for the potential threat of internal corrosion by collecting wall loss data via the installation of Ultrasonic Wall Thickness Monitoring Sensors within four (4) Remote Operated Valve (ROV) manholes and one (1) below grade location, all located downstream of gas transmission main gate

stations. The sensors will be in a circumferential configuration that will collect data from three positions: three o'clock, six o'clock, and twelve o'clock. The project includes the installation of sensors, associated wiring, supports and junction/testing boxes and purchase of data readers/recorders and software. Following project completion, data will be collected and recorded at said locations twice a year. Data will be analyzed and compared to data collected through other monitoring program components to determine a course of action to address an indication of potential internal corrosion.

BENEFITS

The expected benefit for Gas Operations will be to perform faster inspections that do not require substantial cost and resources. In addition to the man-hours spent for each inspection being greatly reduced, there will also be a reduction in excavation (if required), coating abatement and restoration costs, and increased reliability and accuracy of collected data.

TECHNICAL STATUS

The corrosion probe sensors were installed in April 2015 at each of the test locations. Subsequently, inspections at each of the test locations were performed on a monthly basis and will continue on in 2016 until year's end in 4Q16. Wall thickness data was obtained at each location during each inspection. Towards the end of 2015, the probes appeared to show wall thickness data that were out of range prompting Gas Engineering to recalibrate the sensors as per consultation with the vendor and to allow for continued monthly recording of data until year's end in 2016.

TITLE Genesis Spray-in-Place-Pipe (SIPP) Lining System - Shop Demonstration

CSN 99975 **POET** 21164233 **TASK** 0001

PROGRAM AREA Gas Research - Traditional

CONTRACTOR PIM Corp., Genesis Pipe Rehabilitation

DURATION 10/10/2014 to 12/2016 **ENGINEER** Fowles

PROJECT LEAD Shawn Mackey

AUTHORIZED \$ 48,000 **EXP. THROUGH 2015** \$ 34,676

OBJECTIVE

The objective is to find a spray lining product to line existing gas mains that can withstand elevated ground temperatures resultant from the heat from steam mains in close proximity. This project will begin to evaluate the technical viability of an internal pipe spray lining process used in the water and sewer industry called the "Genesis Spray-in-Place-Pipe (SIPP) Lining System". The project's proposed approach will be to first construct a piping "Test Loop" consisting of 24" steel pipe with four elbows, a compression coupling and several holes made in the pipe to simulate corrosion damage. Once constructed, the test loop will be internally cleaned, visually inspected with a camera, and then internally spray-lined with the "InstaCote IC202" polyurea material to a specified thickness using the Genesis SIPP process. (sentence removed) . After the spray-lining is completed, another camera inspection will be performed to visually inspect and evaluate the lining application. We are also planning to conduct a 90 psig pressure test on the post-lined test loop if it is determined that all of the holes have been sealed. (last sentence removed)

BENEFITS

This project will provide technical insight into the performance and potential applicability of the Genesis SIPP Lining System for gas distribution piping in need of replacement or repair. Utilizing a trenchless pipeline rehabilitation technology, such as the Genesis SIPP Lining System, typically results in a 40% to 50% reduction in costs when compared to conventional direct burial of new steel pipe. In addition, the impact on the environment and general public will be reduced due to the trenchless nature of the Genesis SIPP process.

TECHNICAL STATUS

A shop demonstration on the 24" steel pipe "test loop" as described in the "OBJECTIVE" above was conducted in April 2015. The demonstration, which included the internal cleaning, video camera inspection and the internal spray lining using the "InstaCote IC202" polyuria material and the Genesis SIPP process was successfully conducted. However, the liner material experienced cracking after cold tap water was introduced into the pipe for the pressure test. This is believed to have occurred due to allowing insufficient polyuria material curing time prior to introducing the water. The next phase of the project is expected to include the pursuit of certain equipment modifications for Company applications, and testing considerations for its ability to flex under traffic loadings/environmental conditions.

TITLE Heat Shield Testing for CIPL to Rehabilitate Gas Mains in Close Proximity to Steam Mains

CSN 90337 **POET** 20985845 **TASK** 0001

PROGRAM AREA Gas Research - Traditional

CONTRACTOR Progressive Pipeline Mgt. with subcontract to Cornell University

DURATION 6/13/2014 to 1/2015 **ENGINEER** Jaramillo

PROJECT LEAD Shawn Mackey

AUTHORIZED \$ 97,000 **EXP. THROUGH 2015** \$ 92,614

OBJECTIVE

The intent of this project is to find a solution that will allow CIPL to be utilized within the area of heat influence from a steam main. This project will install insulation (heat shield) between the original carrier gas distribution pipe and the CIPL to protect the liner from the heat of the 400oF steam main. This project will study the possibility of utilizing the heat shield concept by testing various types of heat-shield materials. Two test set ups will be used: 1) flat plates to test various heat shield materials, then 2) the best insulator will be wrapped within a 24" diameter pipe and tested for its sustained temperature protection. The first test consists of three samples chosen by Cornell University and approved by the Company for testing. This test consists of a flat steel plate with a heat shield material & carbon fiber covering. These three different sample specimens tested / heated to 400°F and monitored over a specific period of time. Once the best material is chosen it will be re-tested on a full scale test performed at PPM's facility. Cornell University's principal investigator will monitor these tests and will prepare a final report of the findings. The combination of heat shield and carbon fiber materials may then be utilized at Duffy Square. The new product combination can then be used at any other location where rehabilitation of a gas main is needed in close proximity with steam mains.

BENEFITS

- a. Time & costs associated with trenching and restoration are minimized with CIPL because rehabilitating a section of pipeline by this trenchless technology is far quicker than open trench replacement with a cost savings of 40% on average over conventional trenching.
- b. Disruption to the surrounding neighborhood and vehicular traffic is minimized when compared to open trenching due to the trenchless aspect of using CIPL.
- c. Requirements for New York City Street opening permits offer greater access to the work site by only needing access to two small pits rather than permits required to open trench the street.

TECHNICAL STATUS

This project was able to demonstrate that the Heat Shield would protect the Cured In Place liner even if the steel main is exposed to temperatures of up to 400°F. Based on the lab results and the Cornell report, this is a valid method to rehabilitate steel and cast iron mains in the vicinity of steam mains. The next phase of this project is to find a location in the field near a steam main to install and monitor the technology.

TITLE High Temperature Limit Switch and Diaphragm Improvements for THM Turbine Bleed Valves

CSN 90388 **POET** 21076391 **TASK** 0001

PROGRAM AREA Gas Research Operations

CONTRACTOR Innoveering

DURATION 8/26/2014 to 12/2016

ENGINEER Fowles

PROJECT LEAD Howard Goldberg

AUTHORIZED \$ 270,000

EXP. THROUGH 2015 \$ 83,124

OBJECTIVE

Find and implement a solution to the failing LNG plant turbine bleed valve limit switch and diaphragm in order to improve the reliability of the turbine which is used to drive a nitrogen compressor as part of the natural gas liquefaction process train.

BENEFITS

Improvement in the reliability of the bleed valves and as such will reduce the risk of a bleed valve failure and associated down time of the turbine. This should also significantly reduce the venting of the compressed nitrogen for the liquefaction operations, as well as reduce the potential of other compressor equipment of being damaged.

TECHNICAL STATUS

In phase 1, prototypes were developed of both an improved high temp limit switch and a metallic piston replacement kit for the elastomeric diaphragm, and successful high temp lab testing of a retrofitted bleed valve was performed. In phase 2, being initiated in Jan 2016, we are planning to complete the development and testing of the improved high temp limit switch and metallic piston replacement for the diaphragm.

TITLE MICRO-EXCAVATION FOR CP TEST STATION / VALVE BOX INSTALLATION**CSN** 92397 **POET** 10064342 **TASK** 0281**PROGRAM AREA** Gas Research - Traditional**CONTRACTOR** ULC Robotics**DURATION** 10/15/2010 to 12/2016**ENGINEER** Fowles**PROJECT LEAD** James Lucente**AUTHORIZED** \$ 360,000**EXP. THROUGH 2015** \$ 308,479**OBJECTIVE**

To develop and test a methodology for effectively locating, exposing and reinstating paved-over valve box test stations, and to install new valve box test stations without the need to make expensive excavations.

BENEFITS

A successful outcome of this project should result in a reduction in excavations on city streets and sidewalks. In addition to a reduction in excavation costs, fewer excavations mean less noise and dust created by jackhammers and a reduced impact on the environment and general public. On the jobsite, no barricades, temporarily restored openings or traffic plates will be left behind to disrupt traffic. In addition, follow-up paving crews will not be needed.

TECHNICAL STATUS

The project was officially kicked-off in April 2011. The final design of the "Mock Roadway" was completed in Sept. 2011, and the construction of the Mock Roadway itself was completed in January 2012. In 2014, special facility locating methods and paved-over valve box test station locating, raising and restoration techniques were developed, tested and refined. Project 92284 - *Paved-over Valve Box Locating & Reinstatement – Field Pilot* was spun-off from this project. During 2013 – 2015, the methodology to install a new valve box test station was developed and tested, and we expect to complete this part of the project with a qualification demonstration during 2016.

TITLE Paved-over Valve Box Locating & Reinstatement - Field Pilot

CSN 92284 **POET** 20566057 **TASK** 0001

PROGRAM AREA Gas Research - Traditional

CONTRACTOR ULC Robotics

DURATION 7/24/2013 to 12/2015

ENGINEER Fowles

PROJECT LEAD Richard Mejia

AUTHORIZED \$ 50,000

EXP. THROUGH 2015 \$ 49,999

OBJECTIVE

Under a prior R&D project, a process was developed to accurately locate paved over valve box/test stations and reinstate them to grade without the need for a conventional excavation. This project consists of a 20 day field pilot project to primarily generate the necessary data so that an appropriate "unit cost" for this process can be determined. As part of the field pilot, ULC Robotics will be expected to develop efficiency improvements for the process, including method/procedural improvements and/or improvements/modifications to the locating and reinstatement equipment.

BENEFITS

This new process should allow this job function to be performed without incurring the cost of conventional roadway excavation, restoration and street opening permits. In addition, it will minimize the disruption to traffic, the environment and to the general public. No barricades, traffic plates, temporarily restored openings or roadway debris will be left behind at the jobsite thereby avoiding the need for follow-up paving and clean-up crews returning to the jobsite. By conducting this pilot project, we plan to refine and improve this new process which should result in the lowest unit pricing and maximum productivity gain. At the end of the field pilot, the Company expects to be in a favorable position for negotiating a term order contract with ULC Robotics for performing this process as a service on the unit cost pricing developed under this pilot project.

TECHNICAL STATUS

At the end of 2015 this project was successfully completed. Along with making process improvements, appropriate "work items" along with proposed "unit costs" were created for developing a contract to locate and reinstate paved over valve box/test stations.

TITLE Picarro Leak Survey Phase 0**CSN** 99921 **POET** 21484918 **TASK** 0001**PROGRAM AREA** Gas Research - Traditional**CONTRACTOR****DURATION** 5/28/2015 to 10/2015**ENGINEER** Jaramillo**PROJECT LEAD** Alan Boyd**AUTHORIZED** \$ 20,000**EXP. THROUGH 2015** \$ 20,533**OBJECTIVE**

The intent of this Phase 0 technology demonstration is to obtain actual field data generated by the technology in order to understand the Picarro operational parameters and verification and quantification of the effectiveness of the Picarro Surveyor versus the DPIR-IS method.

BENEFITS

An increase in accuracy and efficiency within the Leak Survey process, will lead to the company being able to respond to critical leaks faster making the system safer to the public. In addition, leak surveys will be conducted faster with minimal equipment, thus reducing the total number of crews, lowering O&M cost in the process.

TECHNICAL STATUS

Gas Leak Survey crews currently drive gas mains or walk leak surveys, then manually record gas leaks on hard copy maps and paper forms. Gas Leak Survey Technicians then fill out a Leak Survey Location and Time Reports. The data recorded on these forms is then relayed to the office by phone every day after each daily survey. The data is then manually inputted into a Microsoft Access database and then imported to an Excel spreadsheet from which reports are created to track status of leak survey. An advanced leak detection system that automates the tracking and recording process with the same or better level of leak detection capability is required since the gas distribution system is being leak surveyed monthly. Phase 0 of this project was completed and it proved to be a successful way to detect gas leaks. In the second part of the project, Picarro was able to provide a new mechanism to differ sewer gas from natural gas, thus refining the leak survey. In addition, Picarro also introduced a new technology to overcome the Urban Canyon affect thus capturing accurate GPS data. Leak Survey will look to lease this technology in 2016.

TITLE PROTECTION OF PLASTIC GAS PIPE FROM ELECTRICAL ARCING AND BURN-OUT

CSN 92286 **POET** 10064342 **TASK** 0194

PROGRAM AREA Gas Research Operations

CONTRACTOR EPRI

DURATION 8/21/2001 to 12/2016

ENGINEER Fowles

PROJECT LEAD Afief Era

AUTHORIZED \$ 495,000

EXP. THROUGH 2015 \$ 221,488

OBJECTIVE

Identify and test the most promising, cost effective flame and arc resistant materials and/or plastic pipe protection methods for the application of protecting our plastic gas facilities from the detrimental effects of underground secondary electric cable arcing and burn-out.

BENEFITS

Maintain the integrity of our gas distribution system. Reduce the risk of gas related incidents. Improve safety and environmental performance.

TECHNICAL STATUS

In 2014, EPRI was successful at developing a test methodology whereby a sustained arcing condition of significant duration was created in the lab utilizing the same secondary cable used by Con Edison (Phase 1). In 2015, 12 promising candidate thermal barriers were identified for subsequent testing. Prior to Phase 2 arc-testing of the barriers, an interim testing step consisting of "Heating Element" and "Molten Copper" resistance testing was conducted in order to help make a preliminary determination of the best candidate thermal barriers. As of Feb. 2016, the data from this interim testing is under evaluation.

TITLE TECHNOLOGY DEPLOYMENT AND IMPLEMENTATION (TDI) PROGRAM FOR GAS OPERATIONS - PHASE 2**CSN** 92009 **POET** 10064342 **TASK** 0010**PROGRAM AREA** Gas Research - Traditional**CONTRACTOR****DURATION** 4/14/2009 to 12/2013**ENGINEER** Jaramillo**PROJECT LEAD** Tony Mancino**AUTHORIZED** \$ 495,000**EXP. THROUGH 2015** \$ 426,994**OBJECTIVE**

The objective of this program is to advance technology that has completed basic research but requires additional research activities to achieve full deployment and implementation such as cured-in-place liners that have technically been demonstrated to meet requirements of application but have not attained regulatory approval for application.

BENEFITS

The benefits of this program will manifest in improved frequency and innovativeness of application of the various trenchless technologies demonstrated as time in the program goes on. This will impact the Gas Capital Budget by reducing overall rehabilitation expenses. The areas within the budget to be focused on will be New Business, System Reinforcement, GD3 and GD4 work (replacement of leaking services and mains, respectively).

TECHNICAL STATUS

Complete

TITLE Transmission Pressura CIP Liner Blistering Testing

CSN 92321 **POET** 10064342 **TASK** 0221

PROGRAM AREA Gas Research - Traditional

CONTRACTOR

DURATION 7/7/2010 to 12/2015

ENGINEER Jaramillo

PROJECT LEAD Tony Leto

AUTHORIZED \$ 96,000

EXP. THROUGH 2015 \$ 91,407

OBJECTIVE

To perform initial permeation testing on Karl Weiss' HPL-450 liner. This testing will include the determination of the equilibrium time for natural gas to achieve saturation through the entire thickness of a liner as would exist under field conditions. This modification is for an additional \$15,000 needed to change to the liner size and its preparation costs. Originally 8" was going to be tested; however 12" was the only size readily available at this pressure rating.

BENEFITS

The deliverable of this project will be a report detailing the testing results of the permeation testing of the Karl Weiss HPL-450 liner. This will include the time to achieve saturation of the liner at 350 psig at 70 degrees F and a proposal for full scale testing. The information from this first phase is needed to determine the time to hold the full scale setup prior to depressurization cycles for a second phase if within reason.

TECHNICAL STATUS

GTI had been contracted to build and execute the first phase of this project. They reported in December 2011 that the time to saturation is within 1 week's time confirming that Karl Weiss' prior testing to evaluate blistering after 8 weeks saturation was reasonable. With the oversight of Gas Engineering, GTI will now evaluate (2Q12) the level of blistering when the lined sections from this test are depressurized within 1/2 hour's time to simulate a real-life worst-case field scenario. If not catastrophic, GTI will quote on HPL full-scale testing for part 2 of this project to manage gaps and elbows to be done in late 2012/early 2013. As of 2015, this project has been completed. The lab test and report shows that liners will blister and show disbondment when used in a 350 psig system.

TITLE Gas Meter Barcoding and Computer Infrastructure Enhancement**CSN** 90220 **POET** 20935646 **TASK** 0001**PROGRAM AREA** Gas Research Operations**CONTRACTOR****DURATION** 4/25/2014 to 5/2015**ENGINEER** Trieste**PROJECT LEAD** Kevin Kelly**AUTHORIZED** \$ 50,000**EXP. THROUGH 2015** \$ 57,632**OBJECTIVE**

The objective of this project is to create a mobile application for GasAdams that can utilize barcode information. It is also to demonstrate the new "ToughPads" and vehicle docks for the "ToughPad", and evaluate if the process to create an immediate electronic file of the meter removal and setting process will improve accuracy of meter information and productivity. If the project is successful Gas Operations will expand use of the new technology. Future deployment of the technology will be based upon an realized cost savings determined from this project.

BENEFITS

Gas Operations installs, removed and exchanges 44,000 gas meters every year. A study completed in 2013 conservatively estimates that this initiative will save 6 minutes per meter. At an hourly labor-rate of \$130 per hour this translates to \$572,000 per year in savings. Additional cost savings and enhanced productivity will be realized as a result of the increased capabilities of the newer hardware and reduced downstream errors in the automation process.

TECHNICAL STATUS

The objective of this project was to create a mobile application for GasAdams that can utilize barcode information. It was also to demonstrate the new "ToughPads" and vehicle docks for the "ToughPad," and evaluate if the process to create an immediate electronic file of the meter removal and setting process to improve accuracy of meter information and productivity. If the project was successful Gas Operations plan was to potentially expand use of the new technology. Future deployment of the technology would be based upon any realized cost savings determined from this project. The project was completed and accomplished the original goal of determining if the Toughpad technology would improve the information workflow of gas operations meter installations. This project was successful in identifying that the original Motion Tablet did not meet the needs of gas operations. The Panasonic Toughpad proved to meet all of the criteria necessary for the processing of meter installations. A new Ergonomic vehicle stand was identified and field trialed which will help our employees work in a more comfortable less strenuous body position. The Toughpads have the potential to be expanded in use to fuse tracking, Leak History Drawing and Gas Main Installation drawings, the tools needed to provide instantaneous and accurate information back to the various database systems used to manage the meter setting process.

The project was completed and accomplished the original goal of determining if the Toughpad technology would improve the information workflow of meter installations. This project was successful in identifying that the technology currently utilized, Motion Tablet, did not meet the needs of Gas Operations. This project demonstrated the Panasonic Toughpad met all of the criteria necessary for the processing of meter installations. The need for a new ergonomic vehicle stand was also identified and field trialed, which will help our employees work in a more comfortable less strenuous body position. The Panasonic Toughpads have the potential to be expanded in use to track fuses, draw leak history reports and prepare gas main installation drawings.

TITLE Guided Wave Testing on Insulated Piping at LNG Plant**CSN** 99912 **POET** 21532270 **TASK** 0001**PROGRAM AREA** Gas Research Operations**CONTRACTOR** GE Inspection Services**DURATION** 6/30/2015 to 12/2016**ENGINEER** Fowles**PROJECT LEAD** Howard Goldberg**AUTHORIZED** \$ 40,000**EXP. THROUGH 2015** \$ 14,200**OBJECTIVE**

The objective of this project is to conduct an evaluation of Ultrasonic Guided Wave (UGW) inspection technology on segments of the insulated gas piping between the Regeneration Skid and Compressor Building in order to determine its technical feasibility and cost-effectiveness when compared to the traditional inspection methods currently used, which include the removal of all the insulation and performing a visual and ultrasonic inspection. UGW inspection technology utilizes directional ultrasonic pulses of energy to screen piping segments for potential areas of concern, including internal or external corrosion, circumferential cracks, girth weld anomalies, and the location of welds and fittings. Our plan is to partner with GE Inspection Services in conducting a test of UGW inspection technology on segments of the 4" and 6" insulated gas piping. (the following section has been removed)

BENEFITS

It is anticipated that this project will show that UGW inspection technology will provide for a technically viable and a more cost effective condition assessment of this insulated gas piping at the LNG plant, when compared to the traditional inspection method of complete insulation removal, visual inspection, taking manual pipe wall thickness measurements, and reinstallation of new insulation (removed "see Cost/Benefit calculation sheet"). In addition, use of UGW technology would improve safety since scaffolding will no longer be needed for the piping at high elevations.

TECHNICAL STATUS

In August 2015 an UGW inspection was successfully performed on selected segments of 2", 4" and 6" diameter insulated piping between the Regen Skid and Compressor Building at the LNG plant. A report of the test results was issued by the contractor and is under evaluation.

TITLE Proof of wavefront concept for acoustic leak detection of transmission gas mains

CSN 92697 **POET** 20705484 **TASK** 0001

PROGRAM AREA Gas Research Operations

CONTRACTOR Joining Technologies

DURATION 11/4/2013 to 5/2014 **ENGINEER** Jaramillo

PROJECT LEAD Tom Brunelle

AUTHORIZED \$ 85,000 **EXP. THROUGH 2015** \$ 75,000

OBJECTIVE

This proposal is for the effort to design, construct and test an apparatus that can produce, as close as possible, the pressure waveform to determine a gas main rupture. The purpose of this effort is to provide a means to calibrate and verify the operation of sensors to be developed in future tasks. A secondary use may be to verify the level of immunity to false positive indications.

The results have shown that using a shock tube is a viable approach to producing the clean wave front necessary for accurate product verification and test. It is also a simple structure to introduce concurrent broadband noise for testing.

Since shock tubes traditionally produce faster rise times than we are seeking to simulate we need to perform analyses and tests to optimize the tube dimensions to suit our needs. We have identified two possible approaches, each with their own advantages and disadvantages.

BENEFITS

A successful project will determine the ability to use sound waves as a means to identify a rupture on a gas main in addition to identifying its location. This will give the ability to create a tool which can be created, manufactured, and installed along ConEd's transmission lines as a means to respond rapidly in case of a main rupture.

TECHNICAL STATUS

In 2015, Joining Technologies was able to prove that a rupture on a pipe will create a wave that can be detected. The project produced a report which detailed the studies done on a pipe that was not buried. In 2016, the project will look to conduct the same experiment, but to simulate the results on a buried pipe.

TITLE Off Grid Minidome CCTV**CSN** 99902 **POET** 21633924 **TASK** 0001**PROGRAM AREA** Gas and Steam Research Supply**CONTRACTOR****DURATION** 8/4/2015 to 8/2016**ENGINEER** Lee**PROJECT LEAD** Artie Claudio**AUTHORIZED** \$ 76,500**EXP. THROUGH 2015** \$ 73,395**OBJECTIVE**

The purpose of this project is to determine if the Xtralis Off Grid Minidome CCTV can support some of the remote critical facilities, especially at gas gate stations and other remote company locations. The gas gate stations receive gas from suppliers and feeds downstream systems. Almost all gate stations are located in various remote areas, many of which have limited to no network connectivity. Running fiber for network connectivity is too costly and infeasible for some locations. Additionally, Gas Operations have limited resources to support all gas locations, including remote gate stations. The Xtralis Minidome CCTV system is a combination NVR/Pan, Tilt, Zoom, (PTZ), Camera built into a quickly deployable system that only requires local power for operation. It gives Corporate Security a quick option to address multiple security needs and eyes on target in locations where no cameras are currently in place. The SOC will also monitor the remote system during weather conditions, such as storm or snowy conditions, to determine if the system will be self sufficient and not require continual maintenance by Gas Operations or other company personnel.

BENEFITS

Many of the gas gate stations have very basic security defenses and almost all gate stations do not have a near or real time alerting. Security incidents are only realized when personnel visiting the site reports. Deployment of current intrusion detection systems are too costly since it may require trenching and running fiber. Additionally, the gate stations are located in remote sites that experience harsh weather conditions and therefore requires a self sustaining system with minimal maintenance. If successful, the deployment of the Off Grid Minidome CCTV will provide real time alerting of security incidents to the SOC. Capital costs are low since it integrates with Verizon wirelessly, eliminating the need for long cable runs.

TECHNICAL STATUS

One of Corporate Security's responsibilities is to conduct on site surveys and recommendations regarding physical security applications at Con Edison facilities, including critical, electric and gas operational facilities. These physical security applications are integrated into Corporate Security's Security Operations Center (SOC) for remote alert and event monitoring. Some of these facilities are remote where wire based network connectivity is unavailable or too costly. The Xtralis Minidome CCTV system is a

combination NVR/Pan, Tilt, Zoom, (PTZ), Camera built into a quickly deployable system that only requires local power for operation. The system can be recorded locally on the integrated NVR, in addition the user has the ability to record the video while live monitoring of the system. It gives Corporate Security a quick option to address multiple security needs and eyes on target in locations where no cameras are currently in place. The built in NVR will integrate with Verizon ISP to allow video to be transmitted back to the SOC, and Investigators in the field. If successful, this kit will support some of the physical security requirements of remote facilities.

To date, we have deployed 2 Minidomes at two locations. The device has proven to be easy to mount and setup. It provides a quick setup and monitoring option for many applications.

In 2016, we will be deploying other minidomes at various locations to evaluate operability and ease of deployment.

We are also looking to test these devices within the Honeywell test lab for acceptance by the internal IT/IR department and possible integrations with Honeywell.

TITLE Off Grid Remote Surveillance**CSN** 99907 **POET** 21573693 **TASK** 0001**PROGRAM AREA** Gas and Steam Research Supply**CONTRACTOR****DURATION** 7/23/2015 to 8/2016**ENGINEER** Lee**PROJECT LEAD** Artie Claudio**AUTHORIZED** \$ 80,000**EXP. THROUGH 2015** \$ 76,500**OBJECTIVE**

The purpose of this project is to determine if the Xtralis Off Grid Remote Surveillance System can support some of the remote critical facilities, especially at gas gate stations. The gas gate stations receive gas from suppliers and feeds downstream systems. Almost all gate stations are located in various remote areas, many of which have limited to no network connectivity. Running fiber for network connectivity is too costly and infeasible for some locations. Additionally, Gas Operations have limited resources to support all gas locations, including remote gate stations. The Off Grid Remote Surveillance System is a self contained system that may support most of the technical security needs for the gate stations. This system will be deployed at one or two gate stations that have no network connectivity. The system will be configured to send alerts back to the SOC for monitoring. The SOC will monitor and review the alerts to determine if they are true alerts and will notify Gas Operations accordingly. The SOC will also monitor the remote system during weather conditions, such as storm or snowy conditions, to determine if the system will be self sufficient and not require continual maintenance by Gas Operations personnel.

BENEFITS

Many of the gas gate stations have very basic security defenses and almost all gate stations do not have a near or real time alerting. Security incidents are only realized when personnel visiting the site reports. Deployment of current intrusion detection systems are too costly since it may require trenching and running fiber. Additionally, the gate stations are located in remote sites that experience harsh weather conditions and therefore requires a self sustaining system with minimal maintenance. If successful, the deployment of the Off Grid Surveillance System will provide real time alerting of security incidents to the SOC. Capital costs are low since it integrates with Verizon wirelessly, eliminating the need for long cable runs.

TECHNICAL STATUS

One of Corporate Security's responsibilities is to conduct on site surveys and recommendations regarding physical security applications at Con Edison facilities, including critical, electric and gas operational facilities. These physical security applications are integrated into Corporate Security's Security Operations Center (SOC) for remote alert and event monitoring. Some of these facilities are remote where wire based network connectivity is unavailable or too costly. Additionally, pulling cable for power may be

costly especially if the cameras and video recorders are mounted on remote poles. The Xtralis Off Grid Remote Surveillance Kit is a complete package that utilizes solar and wind energy to power all the devices. The kit also contains a preconfigured NVR that will integrate with Verizon ISP to allow alerts and video to be transmitted back to a remote monitoring station. If successful, this kit will support some of the physical security requirements of remote facilities, especially at Gas Gate Stations which are located in various remote locations that currently have limited to no corporate network connectivity.

To date, we have deployed the 2 trailers kits at Con Edison's locations. At one of the locations, the device was active and running on solar and wind power for approximately 1.5 months, when the weather turned and the device was not getting enough self generated power. Recently due to this weather impact we provided permanant power to the trailer and it has been up and operational since.

During this time the device was effective in that both positive and negative alarms were generated. Positive in that the alarm came in alerting the presence of unknown personnel. Other alerts proved to be negative as they were generated by an object in the camera view.

At the second location, initially we had to contact Verizon to boost the signal to the area for a firm connection once this was resolved the trailer performed well. This device similarly power became an issue and there is a plan in place to provide permanant power to this trailer. During the time it was operational no issues and no alarms.

Currently deactivated until power is setup. Once the weather changes we would look to experiment with the power source to test self sustainability.

Both of these location are considered residential areas, we will see how this becomes a factor or not. Currently they are monitored through an external ISP at the Con Edison Security Operations Center. Independent PCs are setup to monitor and record at the SOC. These devices can be displayed for monitoring on the SOC large display wall. Additionally these devices can be viewed through smart devices, currently Con Edison uses iPhone devices for which there is an available App for remote smart device monitoring. We have been able to remote view, remote record and remote video retrieval for follow up purposes.

So far these devices appear to be a viable option for these types of remote locations that do not have connectivity back into the Con Edison Network.

TITLE EPRI FUNDING FOR MGP SITE REMEDIATION AND HEALTH RISK R&D**PROGRAM AREA** Gas Research Millenium Fund**CONTRACTOR** Electric Power Research Institute (EPRI)**DURATION** On Going**ENGINEER** Trieste**ANNUALLY AUTHORIZED****PROJECT LEAD****OBJECTIVE**

The objective of this project is to develop, test, and demonstrate innovative methods for characterizing and remediating MGP sites, along with an updated assessment of human health risks.

BENEFITS

If successful, this project could result in the development of new and innovative methods for characterizing and remediating MGP sites thus demonstrating the Company's commitment to environmental excellence.

TECHNICAL STATUS

EPRI staff and administrative expenses are approved by the EPRI Board of Directors; individual R&D projects are reviewed, guided and approved within the EPRI committee structure. There are several manufactured gas plant (MGP) sites in the Company's service territory where past practices have resulted in soil and ground water contamination. The anticipated high cost of site remediation reflects the difficulty of delineating the contamination at these sites, the difficulty of removing and disposing of contaminants, and the currently available methods for remediating soil and ground water contamination. Research continues in this project.

TITLE NYSEARCH Program

PROGRAM AREA Gas Research Millenium Fund

CONTRACTOR Various

DURATION On Going

ENGINEER

Trieste

ANNUALLY AUTHORIZED

PROJECT LEAD

Nick Inga

OBJECTIVE

NYSEARCH is a not for profit organization that performs research beneficial to the gas industry through funding provided by program participants. NYSEARCH provides the gas industry a means of developing innovative methods that each Company can choose to fund to meet Company specific needs. Participants in these R&D projects are directly involved in program planning, project selection, field testing, and final technology transfer. The process to team member Company's with common interests allows the leveraging of funding to provide cost-effective solutions to the gas industry's most pressing problems.

BENEFITS

The expected benefits include improved availability, reliability, safety and efficiency of the gas system, and reduced impact of operations on the environment, as well as increased customer satisfaction from reduced costs and reduced public interference resultant from the development of innovative processes. Continued support for longer term research programs will ultimately benefit shorter term demonstration projects. NYSEARCH will retain all intellectual property associated with each project, and the industry co-funders will be granted a royalty-free license of any patented process or product developed for Company use. Any income NYSEARCH receives from successful technology development is used to offset administrative costs, which are applied to each project under development.

TECHNICAL STATUS

The projects conducted by the NYSEARCH Program are conceptualized to address various problems determined by industry needs and NGA Board. The Sr VP of gas Engineering sit son this Board. Millennium project research performed under this RADPAR funds projects that are 24 months or more from commercial deployment. This appropriation funds the NYSEARCH projects approved for pursuit by the VP of gas Engineering and costs specific to any associated field testing activities. Research continues under this program.

TITLE Operations Technology Development (OTD) Not For Profit Program

PROGRAM AREA Gas Millennium Fund

CONTRACTOR Gas Technology Institute (GTI)

DURATION On Going

ENGINEER

Trieste

ANNUALLY AUTHORIZED

PROJECT LEAD

Nicholas Inga

OBJECTIVE

OTD is a not for profit corporation of gas distribution utilities whose charter is to perform research beneficial to the public each serves. This program provides the gas industry a means of developing innovative methods that each member Company can choose to fund to meet Company specific needs. Participants in these R&D projects are directly involved in program planning, project selection, field testing, and final technology transfer. The process employed by OTD to team member Company's with common interests allows the leveraging of funding providing cost-effective solutions to the gas industry's most pressing problems. OTD will periodically issue project proposals to each member Company (members currently are Alagasco, APGA, Atmos Energy, Avista, Enbridge, Intermountain Gas, LA ROC, NYSEG/RGE, National Grid, National Fuel, NICOR, NiSource, NW Natural, ONG, PECO, Peoples/Integritys, PNG, Questar, SoCal Gas, PG&E, SW Gas, TECO, and Washington Gas) who then have the option to participate in the specific R&D project and at a Company specified funding level. Included in these project proposals are details of the value of the project to the participating members, targeted deliverables, structure of the final report, and funding structure. These proposals will be reviewed by R&D and Gas Operations to determine the projects that meet current needs and determine the desired funding level for the proposals selected for development. All project co-funders will provide specific project guidance into the preparation of RFP's, proposal reviews, contractor selection and provide input into the progress of the project through technical progress review meetings. The project specific funding will be deducted from the OTD annual program fee, which serves as the source for funding of all OTD projects. The minimum OTD fee is determined by the number of customer meters of the program participants. In the case of the Company, the current OTD program fee is \$550,000 based on 1.1 million customers. Project funding provides for program fees and field demonstrations in Con Ed franchise by Gas Operations, as appropriate.

BENEFITS

The expected benefits include improved availability, reliability, safety and efficiency of the gas system, and reduced impact of operations on the environment, as well as increased customer satisfaction from reduced costs and reduced public interference resultant from the development of innovative processes. Continued support for longer term research programs will ultimately benefit shorter term demonstration projects. OTD will retain all intellectual property associated with each project, and the industry co-funders will be granted a royalty-free license of any patented process or product developed for Company

use. Members have access to all reports, data and results generated from all OTD projects including projects that the Company did not participate.

TECHNICAL STATUS

The projects conducted by this OTD Program are conceptualized to address various problems determined by the OTD Board Members' priority ranking of critical gas industry needs. The Vice President of Gas Engineering currently serves on this Board. Millennium project research performed under this RADPAR funds projects that are 24 months or more from commercial deployment. This appropriation funds the OTD program and costs specific to any associated field testing activities. Research is ongoing under this program.

TITLE EVALUATE POLYUREA COATING ON ER-199 AT HUNTS POINT STATION**CSN** 99895 **POET** 21646317 **TASK** 0001**PROGRAM AREA** Gas Research Millenium Fund**CONTRACTOR** Precision Pipeline Services (PPS)**DURATION** 9/8/2015 **to** 9/2016 **ENGINEER** Aromando**PROJECT LEAD** Leonard Toscano**AUTHORIZED** \$ 105,000.00 **EXP. THROUGH 2015** \$101,730.67**OBJECTIVE**

Con Edison will provide operational support and contractor access to ER-199 for PPS. PPS will perform surface-prep work on each of the two 8-inch steel pipes via abrasive blasting for a profile ranging between 2 to 4 mils. Once surface-prep work is complete, PPS will proceed with the polyurea application labeled as Nukote HTD to a recommended thickness of 40 mils. An outer layer will then be applied as a seal coat to maintain the yellow color and to protect the polyurea coating against UV degradation and color fade. Anticipated timeframe to begin the work is estimated to be during the latter half of September or early October.

BENEFITS

Polyurea coating has high impact resistance and quick application and curing times. The product could also be applied on the pipe itself without the need to shut down that segment, thus potentially eliminating any negative impact to the gas loads downstream.

TECHNICAL STATUS

This project is part of Phase 2 of an ongoing research effort with Operations Technology Development (OTD) 2.10.b "In Service Field Evaluation of Polyurea Coatings Systems" being performed by the Gas Technology Institute (GTI). OTD Phase 1 objective was to test and evaluate the feasibility of polyurea coatings in GTI's laboratories for gas distribution piping applications such as vaults, on bridge crossings, and outdoor meter sets. Various tests, such as corrosion resistance, ultraviolet (UV) resistance, impact resistance, abrasion resistance and cathodic disbondment were conducted on polyurea coating samples with promising results. The objective for Phase 2 is to perform field trials of the polyurea coating evaluated in the lab. Phase 2 field trials are currently in progress

TITLE PHASE III- STRUCTURAL WEAR TESTS OF COMPOSITE COVERS USING ROADWAY PARAMETERS**CSN** 96352 **POET** 20876526 **TASK** 0001**PROGRAM AREA** Gas Research Millenium Fund**CONTRACTOR** Columbia University – Carleton Laboratories**DURATION** 3/21/2014 to 4/2015 **ENGINEER** Josephine Aromando**PROJECT LEAD** Leonard Toscano, Dowlatram Somrah**AUTHORIZED** \$ 150,000.00 **EXP. THROUGH 2015** \$ 133,000.00**OBJECTIVE**

The project looks to determine whether the service life of composite covers is as long or is longer than those typically experienced by cast iron or steel covers. The expected service life for metallic covers is in the order of magnitude of fifty years. However, since composite covers are lighter and it is unknown what their behavior exhibits when under repeated long-term traffic loading, this project investigates these unknowns through wear testing and characterization testing performed by Columbia University. Phase I and II work involved the characterization of three competing vendors' composite manhole covers to establish baseline parameters. Multiple tests were performed to achieve this data, such as wear testing using Hamburg tracking wheels, aging tests, hardness tests, friction coefficient tests, fatigue tests, and static tests. Phase II also included blister tests and pin-on-disk wear tests which evaluated the extent of the bonding behavior of the material. Previous co-sponsors were Distribution Engineering and Civil-Mechanical Engineering for Phases I and II. Phase III was co-sponsored by Civil-Mechanical Engineering and Gas Transmission Engineering, a new sponsor that recognized the value of the study as composite covers pertain to their potential use at gas regulator stations. Thus, Phase III is a culmination of all testing performed up to this point and was a conclusion of the work for which Columbia University will provide guidelines and data for composite cover use in roadways. Con Edison will take the results to determine how best to approach the formulation of standards for composite covers. Distribution Engineering has previously funded 75% of the entire study including this third phase; Gas Transmission Engineering has agreed to fund the remaining 25% of the study for this final phase of this 3 year project.

BENEFITS

The use of composites as a material for manhole covers prevents any possibility of stray voltage from occurring when used over electric distribution manholes because of the non-conductive nature of composites. Additionally, composite materials act as insulators by retarding the rate of heat transfer from the steam manhole to the outdoor ambient environment, thus reducing the potential incidents that could occur due to pedestrians and animals coming into accidental contact with the cover.

TECHNICAL STATUS

All work was complete by 3Q15 and presented to Con Edison by 4Q15. There is some follow-on research work that Civil-Mechanical Engineering envisions pursuing with additional thermal investigations and composite behavior during long-term exposures to elevated temperatures. This will be pursued at a future date once scope of work is fully defined with Columbia University and once funding is secured. At this time, the conclusion of Phase III work confirms the conclusion of the entire wear testing program for the three covers that were evaluated. This project is complete.

TITLE FIELD DEMONSTRATION OF EXPLORER 20/26 IN-LINE INSPECTION TOOL**CSN** 92249 **POET** 20428011 **TASK** 0001**PROGRAM AREA** Gas Research Millenium Fund**CONTRACTOR** Various**DURATION** 4/8/2013 to 12/2015**ENGINEER** Fowles**PROJECT LEAD** Toczyłowski L.**AUTHORIZED** \$ 170,000.00**EXP. THROUGH 2015** \$ 114,177.49**OBJECTIVE**

The objective of this project is to conduct a field demonstration of Explorer 20/26 in-line inspection (ILI) system, an untethered, remote controlled state-of-the-art unpiggable pipeline inspection device for 20" to 26" diameter gas mains developed through the NYSEARCH Robotics Program, in a section of live 24" diameter transmission main at Con Edison as part of the final stage of the Explorer 20/26 ILI tool development and testing effort. The results of this and other live field tests will be a first step towards determining the requirements, costs, applicability and performance, as well as any additional enhancements that may be needed to the Explorer system in order to make ILI a technically viable and cost-effective alternative to ECDA for transmission main condition assessment.

BENEFITS

A field demonstration of the EXPLORER 20/26 ILI system should provide a number of important benefits to Con Edison. These benefits include:

1. It will help to determine all of the requirements necessary to perform an In-line inspection using EXPLORER 20/26;
2. It will help reveal the costs associated with a EXPLORER 20/26 ILI process;
3. It should provide valuable pipe wall condition data for the X-3 line;
4. It will allow for a comparative analysis between the EXPLORER 20/26 ILI pipe wall data and the ECDA Survey data, along with a comparison of their associated costs;
5. It could demonstrate that the EXPLORER 20/26 ILI process is a technically viable, reliable and effective method for the condition assessment of 20" to 26" transmission pipelines;
6. It could help identify any needed enhancements that would make the EXPLORER 20/26 system better suited for inspecting Can Edison's transmission mains; and
7. It will provide experience and lend support towards potential future in-line inspections of larger diameter pipelines (30' and 36") with "EXPLORER 30/36" currently under development by Invodane Engineering.

TECHNICAL STATUS

In 2013, R&D in conjunction with NGA/NYSEARCH and Gas Operations, conducted a successful field demonstration of the “Explorer 20/26” ILI system on a section of energized, 200 psig 24” transmission main located in the Bronx. The Bronx field demo consisted of the ILI device being launched into the live main and inspecting approximately 660 ft. of pipe for corrosion, mechanical damage and other anomalies. A report of the inspection results was provided by the ILI contractor (Invodane). In addition, a successful shop demonstration was conducted of the Explorer 20/26 “Rescue Tool” which was developed to retrieve the Explorer ILI device in case of mechanical breakdown or loss of power or communications. This project is complete and pending close-out.

TITLE Field Trial / DEMO BEM Internal Inspection Tool

CSN 92163 **POET** 10064342 **TASK** 0114

PROGRAM AREA Gas Research Millenium Fund

CONTRACTOR Rock Solid Group Pty Ltd (Australia)

DURATION 4/23/2010 to 12/2016 **ENGINEER** Fowles

PROJECT LEAD STAUSS F.

AUTHORIZED \$ 145,000.00 **EXP. THROUGH 2015** \$ 30,237.47

OBJECTIVE

The project objective is to conduct a field test of an inspection technology called Broadband Electromagnetic (BEM) to determine the practicality of the process and the effectiveness of the technology for detecting areas of graphitic corrosion on a section of small diameter cast iron main. The plan is to first identify a suitable 60 ft. section of cast iron main with known areas of graphitic corrosion, and then conduct an internal inspection of the out-of-service main section using a BEM in-line inspection device on a tether. Test results from the BEM inspection will be directly compared to the condition of the actual cast iron main section (via validation excavations) to determine the performance level of BEM technology in detecting graphitic corrosion.

BENEFITS

The results of this project should provide some valuable information regarding the ability and effectiveness of BEM technology to detect areas of graphitic corrosion and/or cracks on a 6" or 8" cast iron main. If the results of the field test are favorable and show promise, serious consideration will be given to further develop the BEM inspection system for live small diameter mains. Follow-on R&D work could be initiated that involves adapting the small diameter BEM smart pig to an established live mains robotic transport platform (such as those used by "Explorer" or "CISBOT"), whereby a live inspection could be performed for up to 200 ft. in each direction (400 ft. total) from one central entry point. We don't believe that it would be practical nor cost-effective to require that a suspect main section be temporarily taken out of service to perform an inspection with the BEM process.

TECHNICAL STATUS

In 2015 a suitable 6" cast iron abandoned main section was identified for the field test. A subsequent video camera inspection indicated that the main contained a considerable amount of debris and needed to be cleaned. In Sept. 2015 the development and fabrication of a 6" BEM in-line inspection device was completed and we are planning to use it in the field test. In Jan. 2016 the 6" main section was cleaned using a series of industrial vacuuming and grit blasting operations. The 6" BEM in-line inspection is tentatively scheduled for spring 2016.