Q. Please state your name and business address.
A. My name is Troy Devries and my business address is 4 Irving Place, New York, New York 10003.

Q. By whom are you employed and in what capacity?
A. I am employed by Consolidated Edison Company of New York, Inc. (“Con Edison” or the “Company”) as the Director of Research and Development (“R&D”).

Q. Please describe your educational background.

Q. Please describe your work experience.
A. I have been employed by Con Edison since 1990 and have held various engineering and managerial positions in Electric Construction, Emergency Operations, Engineering, and Research and Development.

Q. Please generally describe your current responsibilities.
As the Director of Research and Development, I am responsible for developing products to enhance the safety, productivity, and the operations for Con Edison. I oversee eleven engineers dedicated to R&D project management that undertake R&D to benefit Company electric, gas, and steam business units plus several administrative personnel. I guide their development and manage the overall R&D budget.

Q. Please summarize your testimony.

A. My testimony explains the forecasted level of steam R&D expenditures for the twelve months ending December 31, 2014 (“Rate Year”), which essentially continues spending at the prior rate case allowed expenditure levels. The proposed spending level for Steam R&D for the Rate Year is $725,000, excluding Company labor, for the Rate Year and discusses our research program areas on page 7, past successes on page 16, and several major projects being undertaken in the Rate Year on page 17. My testimony presents details of R&D expenditure levels for the Rate Year and also the two following twelve-month periods – the twelve months ending December 31, 2015 ("Rate Year 2" or "RY 2") and
the twelve months ending December 31, 2016 ("Rate Year 3" or "RY 3").

Q. Is Con Edison projecting R&D expenditures for the Rate Year, RY2, and RY3 above the level of expenditures in the twelve months ending June 30, 2012 ("Historic Year")?

A. Yes. The proposed revenue requirement for the rate year includes $725 thousand for steam R&D projects, which does not include Company labor. This is $147 thousand above Historic Year expenditures.

Q. Was the document Exhibit __ (TD-1), entitled "STEAM RESEARCH AND DEVELOPMENT COSTS" prepared under your direction and supervision?

A. Yes, it was.

MARK FOR IDENTIFICATION AS EXHIBIT __ (TD-1)

Q. Please explain this exhibit.

A. As shown on Exhibit __ (TD-1), planned expenditures, excluding Company labor, for the Rate Year ending December 31, 2014, are estimated to be $725,000, on what appears to be an increase of approximately $147,000 from actual spending in the Historic Year. However, taking into consideration a $150,000 credit
applied during the Rate Year, the planned expenditures for the Rate Year are exactly the same as the Historic Year. This credit was an artifact of the accounting for materials erroneously charged against the R&D project account instead of steam’s account in April 2011, before the Historic Year, and transferred to the correct Steam Operations capital account in July 2011 and August 2011.

Q. Please explain the planned level of expenditures.

A. We are maintaining spending at about the same level as under the current rate plan. That plan, adopted by the Commission in Case 09-S-0794, provided for approximately $836,000, which includes Company labor, (on average) annually for steam R&D. Considering the overall level of the current rate request, we believe that the planned level of expenditures for the Rate Year, that closely reflects the as-adjusted Historic Year level, is the appropriate expenditure level to pursue projects that are necessary for safe and reliable service and otherwise address the challenging needs of the Steam Operations department at this time.
Q. Please explain the reasons for maintaining this level of funding.

A. R&D’s mission is to be an agent of change that drives timely innovation of technological solutions addressing strategic and operational needs. We seek to serve the operational and medium-term (three to five years) research for the steam business unit, as well as address both longer-term (beyond five years) strategic needs and enterprise risk issues of the entire corporation. R&D does this by identifying, developing, demonstrating, and providing such tools as advanced equipment, hardware, software methodologies to Company operations that allow for long-term sustainability.

Q. Why does Con Edison need to continue to develop and demonstrate new technologies?

A. Our steam system is the largest and one of the oldest steam distribution systems in the country, originally established in 1882. Its high operating temperatures and pressures and delivery system in a very congested underground urban environment make it unique. Its location beneath the streets of New York City also
poses considerable challenges because our steam lines are in close proximity with underground electric lines, gas lines, water lines, telecommunication lines, sewer piping, subway infrastructure, vehicular infrastructure, old trolley tracks, and various auxiliaries that support traffic lighting and street lighting. Also, the combination of oil and natural gas that the Company burns is not common among other steam generators. Other steam generators burn gas or oil, but not both, and coal. Thus, providing safe and reliable steam service for our customers requires our own investment in the tools needed to operate and maintain this unique system reliably and safely.

Q. Please describe the purpose of Con Edison’s Steam R&D program.

A. The purpose of Con Edison’s steam R&D program is to continue developing and demonstrating new processes/methods and cutting-edge technologies that will improve the Company’s steam system operating and business practices. The program is a combination of research undertaken collaboratively with others, as well as projects developed and conducted internally.
The program is continually refined to recognize new challenges to Company operations, to better define our new needs, and to evaluate past successes and/or failures.

Q. Why must the Company itself undertake R&D?

A. The program seeks out projects where results would be useful in our service territory, but that the industry as a whole is either not addressing or not addressing quickly enough.

Q. Please describe the internal program.

A. Our internal R&D program focuses on matters that are unique to the Company’s steam system. We focus on the development of selected products and methods that would improve steam generation efficiency and reduce combustion emissions, and which address the system’s aging distribution infrastructure. For example, manhole structures are not vented and consequently retain high temperatures and humidity that, in addition to collected runoff and salt, corrodes equipment and the very walls of the manhole structure itself. The cost of rebuilding all of these structures would be prohibitive so, instead, we work
to develop other ways to maintain the necessary infrastructure. In the steam generation area, we focus on ways to improve plant efficiency and reduce combustion emissions. Most of our steam generation plants date from the 1950’s and 1960’s. The age of this equipment makes it challenging for the Company to meet emissions standards because the plants burn oil and natural gas and are not be as efficient as newer plants. There are only a handful of other utilities that burn a combination of oil and natural gas fuels so, consequently, there is a limited market for technology developers to create improvements in reducing emissions from these fuels. Therefore, we seek out and attempt to develop solutions on our own or with the few other utilities that share this problem. I discuss below our efforts to work collaboratively on these problems where possible.

Q. Could you please comment further on the specific challenges posed for maintaining a steam system underground in Manhattan?

A. Yes. As I noted above, because New York City wishes to reduce traffic congestion while at the same time
encouraging bicyclists by opening bike lanes thereby reducing lanes available for automotive traffic, New York City prefers that the Company limit opening up streets to access its steam system. The City’s Department of Transportation (“DOT”) has very restrictive requirements for street access. The Company must often work underground during limited time frames, generally at night or on weekends. In addition, due to heightened noise restrictions, the opportunity to work at night has been even more constrained. At the same time, the Company’s workload underground has increased with the need to maintain and, in some cases, replace elements of our steam infrastructure. Thus, it is increasingly difficult for the Company to physically do needed work. These are driving factors for our program’s effort to develop the tools to work underground without always needing to dig an open trench.

Q. Beyond securing access to the system, are there particular difficulties associated with excavation for access to the steam system?
A. Yes. As a general matter, open trench excavation in New York City is costly and causes traffic congestion, combustion emissions (from trenching equipment as well as vehicles), and safety risks to pedestrians and workers. In addition, there is a social cost associated with open trench excavation which is related to loss of pedestrian traffic for the local businesses. For steam excavations, those difficulties are exacerbated because the steam mains are generally deeper in the ground and the excavations require shoring due to their depth. As such, the excavations are more costly, require more time, and pose more safety and environmental risks than other street excavations.

Q. Does Con Edison coordinate steam research projects with outside organizations and steam utilities?

A. There are only a handful of other utilities in the country that have a steam distribution system and none have the distribution capacity or network size of Con Edison’s. There are several campus systems that provide steam or hot water, but these are small and few in number. This means that there are few
potential collaborators. We have found that the best resource is EPRI, but only in the area of steam production. Accordingly, Con Edison has joined four of EPRI’s programs related to steam generation. As Con Edison’s relationship develops through participation at meetings and discussion of common problems with other members, in the EPRI Generation Sector, there will be more opportunities to collaborate with EPRI and its members on steam generation projects. I again emphasize that EPRI’s programs are limited to steam generation. EPRI has no programs that address steam distribution.

Q. Please describe any additional collaborative R&D efforts the Company undertakes.

A. Con Edison is an active member of the International District Energy Association (“IDEA”), which is an organization that strives to serve the district heating industry by creating network opportunities, information exchange, and providing educational training. We recently attempted to initiate a collaborative research funding mechanism through the Association, but the majority of the members are small
(campus-type facilities) and the availability of R&D funding among the other members is limited. Recently, we have been able to share information with Copenhagen Energy, a large district heating company serving Copenhagen, Denmark, on pipeline integrity, failure analysis, water hammer prevention, and remote monitoring in an effort to address some problems in these areas. While we have some hope of working with international steam systems, none of those systems operate under pressures or temperatures comparable to the high pressures and temperatures in our system.

Q. Please explain why, with these various collaborative efforts, the Company needs an internal R&D program for steam.

A. First, as noted, while we continue to try to develop collaborative efforts, our success here has been limited due to the absence of steam systems comparable to Con Edison’s. Even if the initiatives with EPRI and IDEA develop, or we are successful in developing other collaborative partners, such as Copenhagen Energy, and the collaborative research provides valuable new perspectives and ideas, these efforts
cannot and will not substitute for an internal program focused on our specific needs. The potential R&D from the collaborative efforts could not replicate the experience and practical job knowledge that has been gained by our R&D staff working with operating personnel because the types of projects that would aid our unique system, as I described above, simply would never be viewed as applicable to other steam district companies.

Q. Please explain how Con Edison’s R&D portfolio is established and managed.

A. The process of selecting R&D projects depends heavily on the experience of the Company’s professional staff both in R&D and within the Company’s steam business unit. The goal is to match the needs of the Company’s operations to opportunities for solutions using advanced technology. In all cases, the first step is to determine whether the project meets the New York State Public Service Commission’s definition of R&D. An analysis of candidate projects is then made, with potential advantages being reviewed against financial resources required for successful development. The
probability of achieving success in a reasonable time is also considered. Finally, the benefits of conducting the project are detailed. This general approach facilitates a comparison of various candidate technologies and aids in project selection and prioritization.

Q. How often is the portfolio reviewed?

A. On an annual basis an analysis of candidate projects, both those already authorized and new conceptual ideas, is developed and prioritized in conjunction with our operating organizations. We seek to work on projects that have combinations of attributes for cost, probability for success, and potential benefit in providing service to customers that make projects attractive candidates. Electric and Gas R&D activities, the programs and budgets for which are concurrently being developed, are reviewed to avoid possible duplications and identify potential synergies. Emphasis is placed on projects that show near and mid-term benefits, as well as long-term programmatic issues that directly impact the Company.
This list is then reviewed with senior management against available financial resources.

Q. How does the Company consider the benefits of the projects?

A. A review of the benefits of candidate projects is an integral part of the review process and project selection. A cost-benefit analysis is prepared for each individual project when seeking funding authorization. These analyses range from qualitative reviews for small projects to detailed quantitative cost benefit analyses for larger projects.

Q. Have there been successful R&D projects through the years?

A. Yes. The Company has a long history of successful R&D project completions.

Q. Are all R&D projects successful?

A. No. Because of the nature of R&D, some projects do not result in a successful product. To address that challenge, most projects are conducted in phases to reduce the risk that would be otherwise associated with over-committing in advance to work that reveals itself to be unfruitful at some point during the
course of the project. However, the Company can never be sure of the final outcome for any project.

Q. Please describe some recent successful projects conducted under the current program.

A. There have been a number of recent successful Steam R&D projects:

1. Working with NASA Jet Propulsion Laboratory ("NASA JPL"), we successfully completed a Phase I, proof-of-concept study using high temperature sensors to detect condensate build-up in a steam main. This success has led to a Phase II project whereby the system components will be designed and a field-ready prototype will be demonstrated in one of our steam manholes.

2. Working with the Cooper Union and Laird Technologies, we successfully developed and tested prototypes of thermoelectric devices that use thermal energy from the steam main and convert it to electric power. These devices are now being field tested at customer premises and will supply power to new steam consumption meters avoiding the cost of installing permanent
TROY DEVRIES – STEAM

electrical power supplies to these meters. It is also hoped that these devices will be used to provide power to future monitoring sensors and data transmitters that will be installed in the manholes, thus eliminating the need to install separate power cables from external sources.

3. Working with a consultant, the SPT Group, we recently developed a prototype engineering model to predict conditions that could lead to a water hammer event. If we can verify this model in the field, for which a significant effort is required, we hope to expand the use of the model to cover the whole system.

Q. Please describe the ongoing steam R&D projects.

A. There are a number of ongoing Steam R&D projects that focus on various issues affecting Steam Operations. For example, in connection with mitigating one of our largest risks, we are focused on solutions for steam main condensate detection and monitoring. In this area, we continue to work with a well respected consultant, NASA JPL, to design and build a prototype sensor that can detect and monitor steam condensate as
it forms in the steam main, so that an operator can react to a potential water hammer condition before it arises. The sensor will be designed to withstand the extreme environment of the manhole structure, which sees temperatures of 300 degrees Fahrenheit and 100 percent relative humidity. Phase I, which was a proof-of-concept effort, has been successfully completed and system design and field testing of prototype components are underway in Phase II.

Q. Please explain the concern for condensate in the mains.

A. Condensate forms in steam mains as the steam cools below its dry saturated temperature. The system is designed to remove a calculated amount of condensate as it is generated through steam traps, devices that automatically remove condensate from a steam main. If off-design conditions occur such as excessive flooding external to the main, and/or malfunctioning traps, then enough condensate may accumulate in the steam main to develop a potential water hammer condition. Detection and monitoring the condensate accumulation
in the steam main may help mitigate potential water hammer conditions.

Q. Please explain the term “water hammer.”
A. Water hammer refers to a phenomenon that can occur under certain conditions in a steam distribution main, when there is an excess of condensate at a certain sub-cooled temperature that envelopes a steam bubble causing the bubble to collapse and creating an internal pressure surge that can rupture the steam main.

Q. Please continue.
A. In connection with steam manhole water monitoring, we have been working with a consultant, LC Pegasus, to develop a conductance sensor that will detect and monitor water collecting in a manhole and transmit an alarm back to the operator before the water builds up in the manhole and engulfs the piping and equipment to create higher-than-design condensate formation in the steam main. This device is expected to be more reliable and require less maintenance than the float-type device that is currently installed.

Q. Please continue to describe other ongoing projects.
A. Other projects being undertaken during the Rate Year include:

1. We are developing a new robot called Steam Main Assessment and Repair Technology ("SMART") that can inspect and weld pipe from inside the pipe to repair wall loss from corrosion or to seal against steam leaks. This device would reduce the amount of trenching normally associated with this type of work. I described above the reasons for reducing the need for open trenching in New York City.

2. We are conducting integrity tests on a composite cover (Logicover™) that incorporates sensors and communication hardware in it. The tilt sensors in the cover will detect removal of or tampering with the cover and the cover’s composite material may offer other advantages such as lighter weight and reduced heat transfer.

3. We are investigating alternative manhole vent stack designs that would make these stacks lighter, less expensive, and “smarter,” i.e., designed with integrated sensors to indicate if
the stacks have tilted over or have been hit by a
vehicle. Lighter stacks would make it easier for
our employees to install, and the sensors would
alert us if the stack is no longer covering the
manhole and causing a safety hazard for
pedestrian and vehicular traffic.

4. We are investigating new designs and materials
for cooling chambers, enclosed vessels that
contain the steam condensate discharged from
steam traps and cool it down before discharge to
New York City sewers. Our goal is to reduce the
costs of maintaining and replacing these cooling
chamber units.

5. Finally, we are working with EPRI to investigate
the feasibility of regenerating the selective
catalytic reduction ("SCR") catalysts which are
used to control NOx emissions from our ERPP
units. Regeneration of the catalysts instead of
replacing with new catalysts could result in
millions of dollars saved over the life of the
units.
Q. What are some of the new R&D projects to be pursued in the Rate Year?

A. In addition to continuation of the ongoing steam R&D projects described in my testimony, during the Rate Year R&D will focus on technologies that may help reduce operator error, improve safety, pinpoint steam leaks, and possibly store energy from steam. These initiatives include:

1. Developing and demonstrating of a consequential training simulator to train steam operations personnel to perform typical operation tasks in a safe and proper manner and to provide them with instantaneous and corrective feedback when they make erroneous decisions or do not follow procedures correctly. This project will build upon the success accomplished with the simulators designed for both Electric and Gas Operations. This project will begin in the Rate Year and will finish in Rate Year 2.

2. Investigating state-of-the-art technologies that could be used to more accurately pinpoint steam leaks and reduce the costs of excavations usually
associated with leak pinpointing operations.

Based on the research conducted so far, as well as that which has been conducted in the water and gas industries, we have concluded that there needs to be further development of the current technologies to reach our goal of reducing excavations during leak pinpointing operations. As the potential benefits are great, we will seek out and develop leak pinpointing technologies that have potential solutions for us.

3. Investigating the feasibility of developing an advanced cost-effective thermal storage system for steam. This is a long-term research initiative that we are working on with the City College of New York.

In addition to projects that incur expenditures and that are shown on Exhibit __ (TD-1), we use Company labor to investigate other potential solutions that are not yet projects, which may improve the efficiency of steam usage and may reduce condensate waste. We have sponsored several consultants who have received New York State Energy Research and Development
Authority ("NYSERDA") grants to: (1) study the feasibility of using liquid air storage in conjunction with our steam plants, and (2) to test the device for its use as a direct mixing chamber that could eliminate a steam-to-water heat exchanger and associated electric pump in building hot water systems. This device appears to have some cost saving potential for our steam customers in the way of steam efficiency, reduction in electric power for water pumps, and reduction in water/sewer charges associated with quenching steam condensate prior to over boarding to the sewers. Also, we are investigating more efficient steam chillers to reduce the cost of air conditioning for our steam customers, and in an effort to improve the attractiveness of steam usage, we are looking at the feasibility of supplying Con Edison steam to fuel cells to reduce the cost of current fuel cell designs that integrate steam generation as part of the design process.

Q. Is R&D funding currently subject to any reconciliation mechanism?
A. Yes, under the current 2009 Steam Rate Plan, Steam R&D funding is subject to a downward-only reconciliation mechanism.

Q. Is the Company proposing that R&D expenditures continue to be subject to reconciliation during the Rate Year?

A. No.

Q. Please explain why.

A. The Company does not believe that there is a reasonable basis for subjecting this individual element of Company expense to reconciliation and certainly not to downward-only reconciliation.

Q. Didn’t the Company propose, along with other signatory parties, downward-only reconciliation for R&D expenses as part of the Joint Proposal made to the Commission in the prior gas rate case?

A. Yes. The Company agreed to this provision as part of the give and take of the rate settlement process. However, downward-only reconciliation is particularly unreasonable when setting rates for a single year.

Q. Please explain why.
A. R&D’s estimate of expenditures is subject to variation as a result of unanticipated events and opportunities during the course of the Rate Year. A downward-only reconciliation mechanism fails to recognize that there is a reasonable likelihood that actual R&D expenses in any one year can be higher than forecasted and that it is in customers’ interest for the Company to make such expenditures to take advantage of R&D opportunities. The current mechanism, which is applicable to a multi-year period, provides some recognition of the annual variability of such expenditures by permitting the Company to accommodate the uncertainties inherent in undertaking and managing R&D projects. A one-year, downward-only reconciliation would fail to address his annual variability in a reasonable manner.

Q. Does this conclude your testimony?

A. Yes, it does.