The Narragansett Electric Company

d/b/a National Grid

INVESTIGATION AS TO THE PROPRIETY OF PROPOSED TARIFF CHANGES

Testimony and Schedules of:

Anuraag Bhargava
Daniel J. DeMauro
Mukund Ravipaty
Anthony H. Johnston
Christopher J. Connolly

Book 7 of 17

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nationalgrid

Testimony of
Bhargava, DeMauro, Ravipaty

PRE-FILED JOINT DIRECT TESTIMONY

OF

ANURAAG BHARGAVA

DANIEL J. DEMAURO

AND

MUKUND RAVIPATY

Dated: November 27, 2017

SUMMARY

Anuraag Bhargava is Senior Vice President and U.S. Chief Information Officer responsible for leading National Grid's Information Services (IS) organization in the U.S. Daniel J. DeMauro is Director of U.S. Information Services Regulatory Compliance overseeing National Grid's IS activities in regulatory proceedings for all of its U.S. operating companies, including The Narragansett Electric Company d/b/a National Grid. Mukund Ravipaty is Director, Global Head Security Services, Design, and Architecture overseeing the development of cyber-security strategy and architecture for National Grid (in the U.S. and United Kingdom). In this joint testimony, they support the Company's request for recovery of costs associated with several major IS investments and initiatives that will be placed into service after the end of the Test Year, but before the end of this proceeding, thereby qualifying as post-Test Year adjustments. They also describe National Grid's IS function and the services IS provides to the Company.

Table of Contents

I. Introduction and Qualifications

Q. Mr. Bhargava, please state your full name and business address.

A. My name is Anuraag Bhargava. My business address is 40 Sylvan Road, Waltham, Massachusetts 02451.

Q. By whom are you employed and in what capacity?

A. I am employed by National Grid USA Service Company, Inc. (Service Company), a subsidiary of National Grid USA (National Grid) as Senior Vice President and U.S. Chief Information Officer. My responsibilities include leading and continuously improving the performance of the information systems (IS) organization in the U.S., overseeing internal IS workforce development, and partnering with the business to develop, build, and implement new technologies and IS strategies to support business initiatives and customer needs.

Q. Please describe your educational background and professional experience.

A. In 1992, I received a Bachelor of Science in Mechanical Engineering from G.B. Pant University in Pantnagar, India. In 2000, I received a Master of Business Administration from Carnegie Mellon University in Pittsburgh, Pennsylvania. From 1992-1998, I was a Senior Project Engineer and Department Information Technology Head for Larsen & Tourbro, an engineering and construction firm, where I was responsible for the chemical, petro-chemical, and cryogenics engineering departments. From 1999-2008, I was a Principal in the strategy practice group at A.T. Kearney, Inc., a global management

consulting firm. As a Principal, I provided consulting services related to corporate strategy, information technology, supply chain, engineering, and design to Fortune 500 companies. I was also responsible for leadership, oversight, and restructuring of many of A.T. Kearney Inc.'s operations. From 2008-2011, I was Vice President and Chief Information Officer in several divisions at Electro-Motive Diesel, a diesel locomotive manufacturing corporation. In this role, I was responsible for Electro-Motive Diesel's global supply chain and finance organizations, and led many global corporate strategic initiatives. From 2011-2014, I was the Chief Operating Officer and Board member for PeopleGuard LLC, a subsidiary of LakeEffect Ventures LLC, which provides global security products and services. From 2011-2016, I was Partner and Chief Technology Officer of LakeEffect Ventures LLC, an equity group with worldwide interests in retail, manufacturing, railroads, and mining. In May 2016, I joined National Grid as Senior Vice President and U.S. Chief Information Officer, which is my current role.

Q. Have you previously testified before the Rhode Island Public Utilities Commission (PUC) or any other regulatory commission?

A. I have not testified previously before the PUC. I recently testified in a rate proceeding before the New York State Public Service Commission on behalf of Niagara Mohawk Power Corporation, a subsidiary of National Grid and an affiliate of The Narragansett Electric Company d/b/a National Grid (the Company).

Q. Mr. DeMauro, please state your full name and business address.

A. My name is Daniel J. DeMauro. My business address is 300 Erie Boulevard West, Syracuse, New York 13202.

Q. By whom are you employed and in what capacity?

A. I am employed by the Service Company as Director of U.S. IS Regulatory Compliance. My current responsibilities include oversight of IS activities in regulatory proceedings for all of National Grid's U.S. operating companies, including the Company.

Q. Please describe your educational background and professional experience.

A. In 1983, I graduated from LeMoyne College in Syracuse, New York with a Bachelor of Science in Accounting. In 1986, I joined Niagara Mohawk Power Corporation as an Accountant. In 1991, I became Plant Accounting Manager after holding several other positions in the financial accounting department of Niagara Mohawk Power Corporation, which National Grid acquired in 2002. In 2006, I became Director, Internal Audit U.S. for Service Company. From 2007 through 2015, I held several positions in the accounting department, including Director – Finance Integration, Director – Balance Sheet Integrity, and Accounting Program Director. In these roles, I had direct involvement with a number of accounting processes that supported National Grid's U.S. operating companies, including the Company. These roles include including the oversight of the Fixed Asset Accounting, Cash Accounting, Account Reconciliations, and

Revenue Accounting work teams (Director – Balance Sheet Integrity). I was promoted to my current position in January 2016.

Q. Have you previously testified before the PUC or any other regulatory commission?

A. I have not previously testified before the PUC. I recently testified in a rate proceeding before the Massachusetts Department of Public Utilities on behalf of the Company's affiliates, Massachusetts Electric Company and Nantucket Electric Company, which are subsidiaries of National Grid. Recently, I also testified before the New York Public Service Commission on behalf of Niagara Mohawk Power Corporation.

Q. Mr. Ravipaty, please state your full name and business address.

A. My name is Mukund Ravipaty. My business address is 40 Sylvan Rd, Waltham, Massachusetts 02451.

Q. By whom are you employed and in what capacity?

A. I am employed by the Service Company as Director, Global Head Security Services, Design, and Architecture. My responsibilities include overseeing the development of cyber-security strategy and architecture to ensure that National Grid cyber and security protections are developed to keep pace with the evolving threats and capabilities of hostile individuals, groups, and nations, thereby enabling and supporting resilient business operations and customer service.

Q. Please describe your educational background and professional experience.

A. In 1998, I received a Bachelor of Science degree in Computer Science from Andhra University in India. I am currently pursuing a Master of Business Administration degree at the Massachusetts Institute of Technology Sloan School of Management. I have over 20 years of professional experience focused exclusively on cyber security. Prior to my employment at National Grid, I worked across multiple information security domains in the outsourcing, local government, banking, utilities, telecoms, and new media and Internet sectors.

Q. Have you previously testified before the PUC or any other a regulatory commission?

A. I have not previously testified before the PUC. I recently testified in a rate proceeding before the New York Public Service Commission on behalf of Niagara Mohawk Power Corporation.

Q. Would you please explain the naming conventions that you will be using in your testimony and associated schedules to identify the various entities involved in this proceeding?

A. Yes. This proceeding is a ratemaking proceeding for the electric and gas distribution operations of The Narragansett Electric Company, which constitute the regulated operations that National Grid conducts in Rhode Island. In this testimony, we will refer to the regulated entity as the "Company," when the reference is to both electric and gas distribution operations on a collective basis. When there is a need to refer to the "stand-

alone" or individual electric or gas operations of The Narragansett Electric Company, we will use the terms "Narragansett Electric" or "Narragansett Gas," respectively, as appropriate. When we refer to "National Grid USA," we will use the term "National Grid;" when we refer to "National Grid plc," we will use that specific term.

Q. Are you sponsoring any schedules as part of your testimony in this proceeding?

A. Yes. We are sponsoring the following schedules:

- Schedule ISP-1: Post-Test Year Information System Investments
- Schedule ISP-2: Technology Modernization Investments
- Schedule ISP-3: Cyber Security IS Investments

II. Purpose of Testimony

Q. What is the purpose of your joint testimony?

A. The purpose of our testimony is to support the Company's request for recovery of costs associated with several major IS investments and initiatives that will be placed into service after the end of the test year, which is the twelve-month period ending June 30, 2017 (the Test Year) but before the end of this proceeding, thereby qualifying as post-Test Year adjustments. This testimony also describes National Grid's IS function and the services IS provided to the Company.

III. Information System Services Provided to the Company

Q. What are the IS services provided to the Company?

A. National Grid's IS function provides, maintains, and manages the computer hardware, computer software, cyber security, telecommunications, and other related infrastructure, systems, and services across all of National Grid's service territories. Specifically, the IS function delivers three primary categories of services:

- Development/Delivery Services – identification of new computer and communication technology trends and development of relevant innovative solutions for the business;
- Support and Maintenance Services – ongoing support for business applications and infrastructure; and
- End User Services – products and services, such as desktop and email services, collaboration services, communications media, and printer/fax support.

Q. Please explain the approach to IS service delivery.

A. National Grid's IS service delivery model utilizes external partners, each of which performs a specific IS function. The specialized IS functions are:

- Application Development and Maintenance: This function involves a full range of application services, including development of new applications and day-to-day support of existing applications;
- Internet, Collaboration, and Email: This function provides email, web conferencing, instant messaging, and collaboration tools, such as SharePoint, operated on vendor-owned and hosted infrastructure;

- Networks and Communications: This function manages the Company's computer networks and telecommunication services, including: the Local Area Network Wide Area Network, Wireless Access services, telephony, and video and audio conferencing;
- Data Center and Client Services/Enterprise Services: This function provides data center services (*e.g.*, servers, data storage); management of hardware, software, and storage located in data centers providing security, back-up capability, and disaster recovery services; and client services, such as the provision and support of end user devices (*e.g.*, laptops) and deployment and maintenance of the operating systems and applications that run on those devices; and
- Managed Print: This function manages the support service for a refreshed and standardized fleet of print devices enabling increased security for printing, copying, faxing, and scanning.

Q. Please describe how the IS function identifies the projects and investments necessary to allow the Company to serve its customers.

A. Annually, National Grid identifies investments that will be required during the next three years to meet the needs of the business as it provides service to customers. The IS Business Relationship Managers work closely with functional leadership and the Jurisdictional Presidents for each jurisdiction in which National Grid operates (*i.e.*, Rhode Island, Massachusetts, New York, and Federal) on an ongoing basis to determine the IS needs of the business and the costs and timing for the required investments. The

investments are then prioritized against overall expenditure targets. Project development follows a sanctioning process for all U.S. IS investments.

Q. How are the costs of IS projects and investments assessed to the Company?

A. IS capital projects and investments that are shared across operating companies are implemented and owned by the Service Company and allocated to the Company in the form of an annual rent expense. The calculation of the annual rent expense is described in more detail in the Pre-Filed Direct Testimony of Company witness, Melissa A. Little.

Q. How are the costs of IS capital projects amortized?

A. Service Company assets are recovered based on the use of a weighted average composite service life (comprising the weighted average service lives approved for each National Grid operating company) for each asset type. In general, many of the IS-related assets on Service Company's books are either software intangibles or portable general plant equipment that is being depreciated/amortized and recovered based on that expected life. The actual physical replacement of assets is determined by the responsible functional leadership team, which evaluates whether to maintain, refresh, replace, and/or decommission assets based on variables such as operational risk, cost to be incurred, and the availability of replacement options.

Recovery of hardware and equipment and amortization of software intangible assets is designed to approximate the useful life of the new system, taking into consideration

technological and functional obsolescence and vendor support options. For example, based on experience, National Grid typically amortizes software applications over 84 months, reflecting expected releases of new versions by the vendor. The exception is certain significant systems, such as PowerPlan, which are assigned a ten-year life. Assuming that an asset is not prematurely retired, it would be retired when it is fully recovered. In addition, the amortization expense (and, therefore, the resulting rent expense allocation from Service Company to the Company) would cease at that point. In the rare instance where a software intangible asset is impaired or otherwise prematurely retired before it is fully recovered, the net book value of the asset is written off to expense, and the amortization expense would cease at that point. The write off is charged to the Company using the same allocation percentages as the asset was deployed for the benefit of the Company in the first place.

Q. How do the services provided by the IS organization benefit the Company and its customers?

A. IS services range from critical electric and gas transmission/distribution support systems to standard office desktop applications. These services constitute the technological backbone of the Company's efforts to achieve safe, reliable, efficient, and secure physical and commercial operation of the Company's electric and gas distribution businesses. IS also supports and maintains numerous business applications, such as work management systems that allow for the effective management and operation of the Company. In addition, IS also provides employees with the solutions required to manage and deliver

electric and gas service. National Grid operates these applications on hardware systems that are centrally located and distributed to employees in the form of personal computers and other devices.

IV. Post Test Year Adjustments

Q. What are the IS-related projects that are presented for recovery in this filing?

A. Schedule ISP-1 presents a list of the post-Test Year IS projects with an in-service date between July 1, 2017 and August 31, 2021. Specifically, the schedule lists the projects that will be in service by the end of the Rate Year and each Data Year, along with a description of the projects.

Q. What IS projects were necessary during the period July 1, 2017 to August 31, 2021?

A. The IS projects that will be completed in the post-Test Year period July 1, 2017 through August 31, 2021 are designed to: (i) replace obsolete and unsupported systems and infrastructure; (ii) reduce operational/cyber risks and inefficiencies; (iii) meet evolving customer and business demands; and (iv) facilitate other key utility and market trends. The following sections highlight two areas of IS investments: Cyber Security and Technology Modernization. IS projects in the Test Year included many of the initial phases of Cyber Security projects. The post-Test Year period includes the second phase of Cyber Security and the initial phases of the Technology Modernization projects.

A. Cyber Security

Q. How is National Grid addressing cyber security threats?

A. In 2010, National Grid formally established the Digital Risk and Security organization in the IS organization to protect National Grid's energy networks, IS systems, and confidential company and customer information from cyber security threats. Digital Risk and Security addresses known threats, evaluates emerging threats against National Grid's control environment, and reviews and evolves its program of cyber security initiatives to proactively identify and protect National Grid from emerging threats.

The Cyber Security 1 Program has been developed to enhance National Grid's cyber capabilities, outlining a multi-year investment strategy targeted to better keep pace with the escalating threats. The intention of the Cyber Security 1 Program is to deliver an additional set of safeguards in the National Grid digital environment to address key areas of threat identified as high risk, including:

- **Unauthorized Access/Insider Attack:** This area addresses threats to National Grid's facilities, personnel, systems, and data due to unauthorized access or from a trusted source within the National Grid security perimeter.
- **System Availability/Malfunction:** This area addresses threats to National Grid's systems or data due to system malfunction.
- **Malware/Virus Attack:** This area addresses threats to National Grid's systems or data from an indirect attack through malware or virus infestation.
- **Advanced Persistent Threat/External Attack:** This area addresses threats to National Grid's facilities, personnel, systems, or data through a directed attack by an outside party from outside the security perimeter with the intent of causing damage or destruction.

- **Data Leakage/Loss:** This area addresses threats to National Grid's data confidentiality and integrity to protect against the disclosure of sensitive data to unauthorized personnel either by malicious intent or an inadvertent mistake.

Although several Cyber 1 programs occurred during the Test Year, the following projects comprise the remainder of the Cyber 1 program that will be in-service between July 1, 2017 and August 31, 2019, and, therefore, are included as post-Test Year adjustments:

- **Enterprise Network Security (January 2018)** – Implementation of Network Security capabilities such as: net flow security analysis; forensic packet capture; anti-malware; and an automated and centralized view of all Critical National Infrastructure and Enterprise data, which will provide National Grid with the capability to identify areas of risks in real time and take appropriate action to protect the business from threats. This project will also create a new secure network on which Cyber Security tools and data will be located.

- **Critical National Infrastructure Network Security and Critical National Infrastructure Security Information & Event Management (March 2018)** – Reinforcement and strengthening of security capabilities of current U.S. Critical National Infrastructure environments to mitigate external and internal security threats to National Grid Critical National Infrastructure operations. The Critical National Infrastructure Security Innovation and Event Management will incorporate logs from critical applications in the Critical National Infrastructure environment into the Cyber security operations center and deliver threat correlation, and security analytics capabilities to enhance protection of assets in the Critical National Infrastructure environment.

Q. What cyber security projects is National Grid planning for the Rate Year and Data Years?

A. A description of National Grid's forecast Cyber Security projects for (i) the period between the Test Year and the Rate Year, (ii) the Rate Year, and (iii) the Data Years is provided on Schedule ISP-3.

B. Technology Modernization

Q. Please describe the IS Technology Modernization Program.

A. National Grid's IS portfolio includes many applications and infrastructure components that are obsolete or at or beyond their end of life. There are numerous risks associated with having critical applications and infrastructure at or beyond end of life including, but not limited to, reduced reliability, resiliency, and maintainability; operational inefficiencies due to manual workarounds; data security issues; decreased service levels and vendor support; and potential system failure. Additionally, National Grid's current IS systems and platforms are heavily customized, lack the flexibility to accommodate new business needs, and will not support near term change and regulatory initiatives. Investment in the replacement and upgrade of these applications and infrastructure components will improve the Company's ability to respond to these evolving business and market demands, and improve operation of the electric and gas distribution system in the future so that is run more efficiently, reliably, and safely.

The IS Technology Modernization Program is a multi-year investment program that will: (i) upgrade aged IS infrastructure to address reliability concerns, sustain high operational efficiency and ensure business continuity; (ii) modernize critical applications to improve health and availability, deliver new capabilities, and simplify application landscape; and (iii) update operational technology networks to enable distribution automation, monitoring, and metering. Specifically, the IS Technology Modernization Program will deliver the following benefits:

- With respect to applications, the program will:
  - upgrade applications at end of life to current and supported versions;
  - retire at-risk applications;
  - consolidate core systems to simplify application landscape;
  - develop architecture which allows reuse and easy application "plug-in;"
  - develop new tools to manage applications, like PowerPlan, and automate business process monitoring;
  - roll out agile development practices at scale for effective and timely delivery;
  - reduce cyber risk through upgrades to operating systems and/or applications, and
  - improve customer engagement.

- With respect to infrastructure, the program will:
  - remediate high risk, failure-prone assets to ensure business continuity;
  - improve network capabilities to enable cloud and mobile adoption, improve cyber-security, and ease maintainability;
  - modernize the end user environment to provide new and flexible collaboration capabilities (internally and externally); and
  - adopt strategic data centers to mitigate risk and enable robust, scalable infrastructure solutions.

- With respect to operational technology networks, the program will:
  - improve asset management and operation; and
  - enable operational efficiency through retirement of dated assets as well as enhanced connectivity, monitoring, automation, and improved procurement processes.

Initiatives proposed as part of the IS Technology Modernization Program are also necessary to enable and support the capabilities for the (i) Gas Business Enablement Program, which is discussed in the Joint Pre-Filed Direct Testimony of Company Witnesses, Anthony H. Johnston and Christopher J. Connolly: (ii) Cyber Security; and

(iii) Customer Experience programs, which are discussed in the Pre-Filed Direct Testimony of Company Witness, John F. Isberg.

Q. What projects comprise the IS Technology Modernization Program?

A. The IS Technology Modernization Program projects included in the Company's cost of service as part of the IS post-Test Year adjustment are described in Schedule ISP-2.

Q. Why is it important for the Company to obtain cost recovery of the post-Test Year changes to annual rent expense for IS projects?

A. The recognition of post-Test Year IS investments is both reasonable and appropriate for several reasons. As a threshold requirement, the post-Test Year IS systems additions are known and measurable and are in service (or will be in service) for the benefit of customers within the Rate Year and Data Years, as shown in Schedule ISP-1.
In addition, the cost associated with the designated IS programs is significant, but incurred for the direct and exclusive purpose of serving customers. Moreover, a decision to exclude the post-Test Year change in IS rent expense associated with the post-Test Year Service Company IS investments would cause the Company to experience a very significant shortfall in its rate recovery from the first day that rates take effect. Most of the IS projects requested for inclusion in rates are associated with rent expense periods of five to seven years, which is significantly shorter than the Company's typical utility plant assets. For the period from the end of the Test Year through the end of the Rate Year, $4,266,032 of rent expense will be accumulated on these IS projects. For the

period from the end of the Test Year, June 30, 2017 through the end of Data Year 1, $10,623,847 of rent expense will be accumulated on these IS projects. For the period from the end of the Test Year through the end of Data Year 2, $17,859,814 of rent expense will be accumulated on these IS projects – a significant amount under the circumstances of the case.

If the IS rent expense associated with these investments is not included in rates, the Company would potentially lose more than half of the investment even with a very short period between base distribution rate cases. In the event that recovery of the IS rent expense is denied as a post-Test Year known and measurable expense change, the decision would be tantamount to a disallowance of a substantial portion of the investment without any finding of imprudence. This is a severe outcome in relation to critical systems that are needed to serve customers safely, reliably, efficiently, and with the requisite level of security.

C. Incremental Staffing Requirements

Q. Are there any additional IS costs included in the Rate and Data Years?

A. Yes. IS is adding 64 full-time equivalent employees at the Service Company in the post-Test Year period. The majority of the new employees will be hired for the Cyber Security and Program Delivery teams to strengthen National Grid's cyber capabilities and deliver the expanded IS Capital Plan, respectively. There are a total of 28 Cyber Security positions that will be added in the following areas: Cyber Security Operations

Center personnel who represent the first line of defense for identifying and responding to cyber threats; Risk and Business Information Security Operations analysts, who work closely with functional teams across National Grid to identify risk and establish appropriate controls to safeguard Company assets; and Project Managers responsible for the implementation of security toolsets that address emerging threats. There are 25 Program Delivery positions that will be added to directly support the delivery of new solutions to the Gas and Electric businesses and the delivery of large capital programs such as the Technology Modernization initiative. These positions include program managers, solution architects, and business analysts. The remaining positions include roles in Commercial Management and Administration to address external partner contracts that are set to expire over the next two years and to further strengthen the Company's oversight of third-party contracts.

Q. Does this conclude your testimony?

A. Yes.

Schedules of
Bhargava, DeMauro, Ravipaty

Index of Schedules

Schedule ISP-1

Schedule __ (ISP-1)

Post-Test Year Information System Investments

The Narragansett Electric Company d/b/a National Grid
PostTest Year Information System Investments for Narragansett Electric and Narragansett Gas

Project	Description	Total Investment	In Service Date	Total		
				Rate Year	Data Year 1	Data Year 2
Regulatory Mandates	This investment is for Regulatory Mandates of a project size that may not be known at the beginning of the fiscal year. The funding will be used to comply with walk-in Mandates and will be used for substitution based on a priority assessment with the business.	$61,869,000	Multiple	$234,247	$661,781	$1,058,026
INVP 3932 Call Center Customer Contact Center/SDC Technology Upgrade Implement Solution	This investment is to upgrade the U.S. Customer Contact Centers and Service Delivery Center (SDC) which are currently operating on core technologies that are no longer supported by their respective vendors. While there may be vendor support by way of third party vendors, the ability to triage all issues is not possible, as any previously undiagnosed issue would not be able to be resolved and many components of our infrastructure no longer have replacement parts available to purchase, as they have been discontinued by the manufacturer. This represents significant risk to the business in the areas of call handli call recording, and the issuance of Regulatory penalties for non-compliance. National Grid also has multiple vendors supporting the technology and is seeking to consolidate support to one vendor with this project. This project will facilitate the replacement and consolidation of these critical systems to support the reliability of key communication channels between National Grid, our customers, and our employees.	$27,725,000	9/1/18	$458,022	$547,356	$501,171
INVP 3737 US CNI GMS SCADA Upgrade & Consolidation	This project is the final step in the strategic evolution of the Critical National Infrastructure (CNI) Gas Management Systems (GMS) SCADA system, supporting the new consolidated control rooms and upgrades to the hardware and operating systems, which are considered to be end of life. Furthermore, the current version of the SCADA application will require an upgrade due to its incompatibility with the new operating systems. The outcome of the proj will ensure continuity in service while meeting the National Grid Gas Control strategic initiative for GMS longevity and up-time performance. Additiona this effort will provide compliance to the National Grid IS Digital Risk & Security (DR&S) policies.	$21,474,909	12/31/19	$0	$200,247	$327,627
Technology Modernization Program	This is a multi-year investment program to modernize and improve the technology infrastructure at National Grid. The program will address a number of risks associated with unsupported applications and aged computer infrastructure and provide the foundational improvements necessary for the Company to deliver strategic initiatives such as: Gas Business Enablement, Customer Experience, and Advanced Analytics. The program consists of several projects in the following areas: - End User software licensing and Desktop tools - RSA Remote Access re-platform and token refresh - Network equipment replacements and bandwidth increases - Video Conferencing enhancements - Data Center improvements - Application and Network Monitoring platforms - Wireless Network enhancements - Cloud Enhancements - Azure Core Service and Secure Cloud Interconnect - Mobility - Mobile Device Management platforms - Technology Innovation Labs - Applications and supporting infrastructure improvements	$20,736,317	Multiple	$268,082	$361,105	$411,460
Cyber 2 Program	This program will deliver new cyber security capabilities to prevent, detect, and react to existing security threats. The projects to be delivered are: -Domain Based Security Phase 1 -Endpoint Scanning (Tanium) -Identity & Access Management: Fine Grain Access Management (Unified Platform) -US CNI Security Enhancements Phase 1 -Cloud Security (Cloud Access Security Broker) -Identity & Access Management: Privileged Access Management -Vstig Scaling Upgrades -Risk Based Authentication - 2FA token alternative (Multi Factor Authentication) -US CNI Intrusion Detection/Prevention Phase 1 (CNI IDS Refresh) -Enterprise Centralized Patch Management -Fundamentals Package -Develop Robust Incident Response -Continuous review of Reference Security Architecture -Virtualized Browser -Perimeter Enhancements -Internal PKI (Public Key) Infrastructure -Identity & Access Management: Role Based Access Management -Removable Media Control - Full Roll out -Data Visualization -Threat Behavior Modeling -Security Research Lab -Network Access Control	$18,609,680	Multiple	$174,672	$346,980	$370,968

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule ISP-1
Page 1 of 23

The Narragansett Electric Company d/b/a National Grid
PostTest Year Information System Investments for Narragansett Electric and Narragansett Gas

Project	Description	Total Investment	In Service Date	Total		
				Rate Year	Data Year 1	Data Year 2
Cyber 1 Program	This program will deliver new cyber security capabilities to prevent, detect, and react to existing security threats. The remaining projects to be delivered are: Enterprise Network Security and CNI Network Security and CNI Security Incident and Event Management (SIEM). These projects will create a Security and Services Network (SSN) to safely store the CNI data and SIEM solutions and tools. Existing security solutions such as: Net Flow Security Analysis , Forensic Packet Capture and Anti-Malware will also be migrated to the SSN in order to hold the CNI and Enterprise together allowing a single lens into all Cyber Security Activity.	$15,826,916	Multiple	$329,142	$301,932	$284,984
INVP 4914 US CNI-EMS Lifecycle Hardware and Software Upgrade	The hardware and software supporting the Energy Management System (EMS) and related networks is 8 years old and unsupported, and is therefore creating risk to National Grid. This investment will deploy hardware and software purchased under investments "INVP 4568-EMS Lifecycle Hardware and Software Upgrade" and "INVP 4570-Tech Services-Network Equipment Lifecycle Replacements" to the electric control rooms in New York and Ne England thereby reducing risk associated to these unsupported and aging assets. Upgrades to the EMS application, requiring new hardware and operating systems, will benefit the business through increased capacity to support new initiatives including the growing distributed generation program.	$14,897,000	8/1/19	$55,141	$255,658	$234,723
INVP 4307 US Win 7 Refresh Ph3	The End User Device Refresh-Windows 7 project is intended to address the migration/transition from XP to Windows 7. The current standard operating system at National Grid is Windows 7, however, there are several legacy applications that rely on Windows XP to operate, which impacts approximately 6000 users. XP is no longer in support and Microsoft has stopped producing security patches, which poses a reliability and security risk. Thus, it is imperative to migrate the remaining applications and users onto Windows 7.	$13,617,457	12/31/17	$278,962	$257,442	$243,280
Regulatory Mandates	This investment is for the identified regulatory mandated projects that scheduled to be completed during the Rate year. The following have been identified as mandated projects of: - INVP 4400 Annual HR & Payroll Mandatory Service Pack Upgrade (HRSP) - FY18 - INVP 4421 - New Arrearage Forgiveness Plan - INVP 4411AB Distributed Generation Portal - INVP 4411C New Electric Connections - INVP 4411D New Gas Connections - INVP 4124 Auto Remote Net Meter - INVP 4479 US Control-Gas Electronic Bulletin Board (EBB) Upgrade	$12,085,230	Multiple	$324,060	$303,882	$286,847
INVP 4708 Business Innovation Projects 2	The Business Innovation project provides a funding base and governance structure that allows the Information Services (IS) organization to improve the IS experience for our employees and customers who will experience improved reliability, use ability, speed and efficiency across all functions. The program will also reduce the risk of system failure which have customer, brand and cost implications.	$11,833,333	Multiple	$31,193	$111,933	$197,330
INVP 4728 Business Innovation Projects 3	The Business Innovation project provides a funding base and governance structure that allows the Information Services (IS) organization to improve the IS experience for our employees and customers who will experience improved reliability, use ability, speed and efficiency across all functions. The program will also reduce the risk of system failure which have customer, brand and cost implications.	$11,833,333	Multiple	$31,193	$111,933	$197,330
INVP 4750 Customer Experience Transformation Tech Program	This program will replace out of support platforms to mitigate existing risks to our customer self-serve billing, payments and other communications porta and set the foundation for the processes and technology changes needed to drive step improvements to the customer experience. Operational efficiencies will be realized through the migration of customers to self-service channels, and through re-engineering of processes and transactions. The program will focus on re-engineering the customer's digital interactions to create a universal and seamless customer experience through multiple service options: Web Mobile, Text, Email, and future emerging channels.	$10,496,000	3/31/19	$35,057	$236,002	$209,099
INVP 4398 Storms/ISched Upgrade	As the primary Work Management and Scheduling tools for the legacy National Grid service territories, 'STORMS' and 'IScheduler' are critical applications in support of both Electric and Gas Operations. The applications have become increasingly unstable, experiencing multiple outages over the past several years. The vendor is no longer in a position to support the applications without upgrades that will bring the applications onto current technology. The project will upgrade the work management system (STORMS) to the latest version of technology including: server hardware, system software and database software, along with bringing both standard and custom application code to the latest version of the technology. The investment will also replace the aged middleware components with new, supported components. As part of the project, the work management scheduling tool (IScheduler) will be replaced with the vendor's latest scheduling tool and integrated with the STORMS product.	$9,503,263	4/23/18	$314,494	$290,545	$274,800
INVP 4570 US CNI Tech Services-Network Equipment Lifecycle Replacements	This Policy-driven investment will procure networking assets needed to replace out of warranty equipment and support infrastructure in the Energy Management System and Outage Management System (EMS/OMS) Data Centers, Communications rooms, Operations Centers, and Support areas across the National Grid service territory in New York and New England that are no longer supported by the hardware and software vendors.	$9,169,203	8/1/19	$54,792	$254,039	$233,237
S005242 M112 Systemic Improvement	This project replaces the existing FERC module with the FERC on SAP HANA solution. The new HANA solution allows for FERC data to be created in parallel with all other data leading to a faster closing process and real time reporting capabilities.	$8,354,545	7/10/17	$127,650	$122,261	$116,977

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule ISP-1
Page 2 of 23

The Narragansett Electric Company d/b/a National Grid
PostTest Year Information System Investments for Narragansett Electric and Narragansett Gas

Project	Description	Total Investment	In Service Date	Total		
				Rate Year	Data Year 1	Data Year 2
INVP 3683X7 Big Data Security Analytics Phase 1 & Phase 2	This project will introduce the new business capability focused on Big Data Security Analytics to enhance and support existing Security Data Analytics. This capability will be integrated with the Cyber Security Operations Center to provide intelligence and further enhance analytical capabilities to respond to threats/attacks in a pro-active manner.The Project will provide National Grid security operational capability to examine large volumes of security related data sets containing a variety of data from multiple sources - including traditional security sources, such as log or audit files, and emerging sources such as images, social data, sensors, etc. - to uncover hidden threats, detect attack patterns and trends, identify suspicious anomalies, and aid in the removal of security threats, in an expeditious and cost effective manner. Real-time analysis will provide prediction and mitigation means for National Grid to discover new threats early and react quickly before they propagate. This capability will be integrated with the Cyber Security Operations Center to provide intelligence and further enhance analytical capabilities to respond to threats/attacks in a pro-active manner. This project consists of two phases.	$8,087,716	3/1/21	$0	$0	$92,720
INVP 4464 Data Visualization	This investment will establish two cloud based self service reporting tools (Tableau and Alteryx). The proposed solution will provide the opportunity for improved decision making through enhanced data mining, decision support, and data visualization capabilities. This will lay the ground work for the migration from current reporting tools which have reached end of life, in addition to providing readily available and proven modern technology.	$8,068,089	9/30/17	$163,493	$150,743	$142,353
Physical Security Replacements	This is annual capital replacement program for Physical Security. Physical Security is responsible for protecting National Grid's personnel and assets, and incorporates a security system as part of the overall security plan. To fulfill this responsibility, it is necessary to ensure that all security related equipment and assets in New England are in good condition. This project replaces assets that are at or near end of life and/or assets that are no longer under vendor warranty.	$6,955,500	Multiple	$111,757	$137,745	$164,482
INVP 4408 Doc Mgmt Systems Replacement Delivery	This investment will provide funding for the purchase and deployment of the Document Management System selected in the commercial RFP event executed in the first half of 2016. Deployment of the new Document Management System will provide a secure and reliable storage solution to serve the needs of the gas and electric business units. The initial partial sanction for this project included funding for the purchase of non-perpetual licenses for a period of one year. Negotiations with the selected vendor "OpenText" has resulted in a lower lifecycle cost the through the purchase of pre-paid perpetual licenses. Purchase of pre-paid perpetual license reduces overall cost of the product by $1.3 million dollars on a nominal basis over a sixteen year period. This partial sanction will provide the necessary funding to proceed with this purchase.	$6,049,256	6/22/18	$128,630	$118,156	$111,632
INVP 3683X13 Domain Based Security Phase 2 (Network Segregation)	This project will implement a Domain-based approach to information assurance for the identification, analysis, and documentation of security issues in the enterprise. Domain Based Security approach helps to analyze information security risks in a business context and provide a clear and direct mapping between the risks and the security controls needed to mitigate those risks. The policy domains will also address the variable risk appetites and requirements for the various business units, enabling National Grid to target the appropriate policies for each unit. Deliver the requirements for security in the organization, taking into account the business that needs to be supported. Security Policy Domains will establish a set of entities, physical and logical, that are subject to a common security policy and also allow each business within National Grid to adopt a risk-based approach to the implementation of information security controls. The approach helps to analyze information security risks in a business context and provide a clear and direct mapping between the risks and the security controls needed to mitigate those risks. The policy domains will also address the variable risk appetites and requirements for the various business units, enabling National Grid to target the appropriate policies for each unit.	$6,000,000	3/1/21	$0	$0	$68,785
Other fiscal plan initiatives	These annual investment plan projects were derived from business need. - INVP 3956 WIFI for Fleet Services Diagnostic Laptops - INVP 4467 STORMS Capital Cost Estimates - INVP 3982 Substation Monitoring-DobleARMS - INVP 4466 Gas Capital Investment Planning Tool - INVP 4480 US Control-Gas System Operating Procedure (SOP) Upgrade - INVP 4390 Plastic Fusion II - INPV 4462 Computapole Enhancements to Support Inspection Types - INVP 4487 Changes to ACIS for PMCC Civil Vendor Billing - INVP 3986 Cascade Electric Application Upgrade Project - INVP 4588 US SAP: Solution Manager Upgrade - INVP 3718 New Medical System	$5,618,031	Multiple	$95,706	$97,278	$90,852

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule ISP-1
Page 3 of 23

The Narragansett Electric Company d/b/a National Grid
PostTest Year Information System Investments for Narragansett Electric and Narragansett Gas

Project	Description	Total Investment	In Service Date	Total		
				Rate Year	Data Year 1	Data Year 2
INVP 4564 US SAP: Enhancement Pack 9 Upgrade	The SAP Enhancement pack upgrade is an investment to provide for the upgrade of the core SAP application every two years (biennially) excluding the upgrade work associated with the annual HR service pack which is accounted for under a separate mandatory annual investment. The project would apply the latest agreed SAP service packs for ECC, SRM, PI, Portal, BPC and SolMan to ensure that the SAP application stays within current vendor support and mitigates the risk of system failure by remaining current every two years on the SAP core application. The investment would only include the upgrade packs (non HR) which are supplied by the SAP and would exclude any discretionary enhancements as part of this upgrade or any upgrades associated with ancillary USFP systems (ex. PowerPlan, uPerform, OpenText, SABRIX). The investment would also not account for any upgrade work which may be required on the BI/BW SAP platform. This biennial patching/upgrade strategy is to ensure that National Grid applies the latest service packs every two year in order to ensure proper system operation and application maintenance support.	$5,328,000	3/31/20	$0	$54,888	$115,262
INVP 4395 US Mobile Device Refresh	This policy-driven project will implement 750 mobile devices previously purchased as part of INVP 4671 – Mobile device refresh FY17 project. In addition, the project will purchase 200 new mobile devices and mounting accessories to continue the effort of eliminating old devices from the field. A majority of mobile devices used in the field are more than 5 years old and these devices impact day to day productivity. These old devices break down frequently and can't be easily repaired due to unavailability of parts and accessories (in some cases manufacturers have stopped supporting the devices). The replacement of old mobile devices with latest tough books will allow field technicians to have the reliable equipment and data required to perform their work in a safe and efficient manner.	$4,492,944	3/31/18	$118,276	$108,959	$102,557
INVP 4843 Virtualized Branches	In coordination with the SD_WAN core infrastructure project, this project will build and deploy the SD-WAN environment at the branch locations. This will support the delivery of WAN automation, application based routing and use of the Internet for network transport.	$3,700,000	3/31/20	$0	$38,116	$80,043
INVP 4489 Active Directory Improvements	Active Directory (AD) is a key service that supports core authentication for all National Grid computers and servers logging onto the corporate network in both the United States (US) and United Kingdom (UK). Therefore, AD provides access to all Information Systems (IS). The scope of this initiative is to implement a refreshed global AD infrastructure and support services. The new AD environment will unify all global applications that use the AD service. It is critical that National Grid can ensure that the AD service is reliable and supports core authentication requireme to all current and proposed applications.	$3,555,000	12/31/18	$44,082	$73,485	$67,373
INVP 4491 ICE Replacement	This investment is required to replace the current Instant Messaging, Collaboration, and Email (ICE) services with a set of similar, or enhanced, services provided by Office 365. Office 365 will provide a more effective collaboration and email service (Microsoft Office 365) to meet the business demand for additional capabilities (e.g.: collaboration with external parties) and provide any enabling infrastructure technology necessary before the ICE service contract expires.	$3,447,722	12/31/18	$55,578	$89,692	$82,543
INVP 4606 Data Visualization Expansion	Building upon the success of the Data Visualization (Tableau) core implementation last year, this investment expands its use with additional data and analytics capabilities. Data Visualization will be extended with the build out of dashboards across more business areas in support of their reporting, data retention and regulatory obligations. In addition to enhanced data access, this investment will provide for more advanced analytics through the use of new tools and longer term storage of information within the environment for audit and trending. The investment will introduce additional dashboards within Finance, Customer and Operations in support of reporting requirements.	$3,435,000	6/30/19	$19,828	$73,162	$67,150
INVP 4707 Business Innovation Projects 1	The Business Innovation project provides a funding base and governance structure that allows the Information Services (IS) organization to improve the IS experience for our employees and customers who will experience improved reliability, use ability, speed and efficiency across all functions. The program will also reduce the risk of system failure which have customer, brand and cost implications.	$3,368,613	3/31/18	$70,378	$64,586	$60,979
INVP 4568 US CNI-EMS Lifecycle Hardware and Software Upgrade	The server and workstation hardware for the Energy Management System (EMS) replacement project was purchased in 2010. The hardware is now near peak operating capacity and may constrain the capacity of the associated databases in EMS. The application vendor ASEA Brown Boveri (ABB), is recommending a hardware refresh for the EMS environments in order to increase the capacity of the databases to accommodate future growth. This Poli driven investment will procure the equipment needed for the project stages for the hardware and software refresh of the current ABB EMS.	$3,144,063	8/1/19	$11,638	$53,957	$49,539
INVP 4706 1327 Interfaces - 523 FTS, 340 RDX, 245 MQSI, 253 JCAPS, 44 PM4D, 7 VB	The primary driver for this project is to mitigate the risks of continuing to be reliant on out of support infrastructure. These risks are : •Increased Security risk as out of support infrastructure will not receive security patches. •In the event of failure National Grid IS will be unable to meet the agreed Service Level Agreements (SLAs) for many key applications once the middleware infrastructure goes out of support. The majority of these applications currently have Gold or Platinum SLA's. •The FTS environment has a single point of failure/no redundancy. •The new technology provides functional benefits which will provide productivity improvements enabling improvements in the efficiency of data and file transfer. The 1327 interfaces (523 FTS, 340 RDX, 245 MQSI, 253 JCAPS, 44 PM4D, 7 VB) included in this scope of work will be divided into sprints that will focus on a specific set of interfaces that touch specific sets of applications. Each sprint will be executed sequentially.	$3,083,333	6/30/19	$17,798	$65,672	$60,276
INVP 4348 US SAP: Infrastructure Landscape	This project will create a permanent set of servers used for project development in support of initiatives pertaining to the SAP portfolio.	$2,999,067	3/31/18	$78,950	$72,731	$68,457

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule ISP-1
Page 4 of 23

The Narragansett Electric Company d/b/a National Grid
PostTest Year Information System Investments for Narragansett Electric and Narragansett Gas

Project	Description	Total Investment	In Service Date	Total		
				Rate Year	Data Year 1	Data Year 2
INVP 4217 US SAP: Business Planning	SAP's Business Planning and Consolidation (BPC) platform is a module that supports National Grid's financial processes, such as financial reporting, budgeting and forecasting. It allows for real-time monitoring of financial results and improved strategic decisions. SAP HANA is an in-memory database developed by SAP. BPC on HANA has been used by National Grid since November 2012. Upgrading the platform from version 7.5 to 10.1 will allow National Grid to utilize the current version's enhancements and leverage additional benefits, such as reading and aggregating data for reporting purposes, transforming data, and reporting on greater volumes of data.	$2,645,000	3/31/19	$24,492	$55,750	$51,121
INVP 4680 WAP Density deployment	This project will deploy new wireless access points in high density configurations to improve wireless capacity and coverage at 30 identified U.S. sites. In addition, it will decommission and replace currently unsupported wireless bridge equipment to migrate risks associated with failure of that equipment.	$2,546,133	3/31/18	$67,026	$61,747	$58,118
INVP 3683X11 IT/OT Discovery and Implementation Phase 1	This project will allow National Grid the capabilities to discover Smart/IT/OT computing and other devices across the National Grid environment in a centralized location, allowing the business to gain a full inventory of devices/applications/technologies, determine risks associated with those components, identify relevant controls, and management of devices/applications /technologies through their lifecycle.	$2,540,160	10/1/20	$0	$0	$43,886
INVP 4222 Governance Risk & Compliance (GRC) Optimization/Upgrade	This project updates the Governance, Risk and Compliance (GRC) solution of SAP to the vendor supported version. In addition, the project will update the GRC environments from Service Pack 4 to the latest version, Service Pack 17. These updates will ensure that the module, which provides control / roles segregation and Sarbanes-Oxley Act (SOX) guidelines, will be stable and incorporate the necessary program fixes in the new version. It will also integrate the newest features and improvements released by SAP.	$2,522,000	3/1/19	$26,285	$52,971	$48,558
INVP 4562 US SAP: Business Warehouse (BW) Consolidation to HANA Enterprise Cloud (HEC)	This investment is to provide funding to consolidate National Grid Business Intelligence (BI) / Business Warehouse (BW) to HANA Enterprise Cloud (HEC). This project supports Strategy Alignment by delivering •Reporting Platform Consolidation •Maintenance Cost Reduction •Reporting Infrastructure Enhancement	$2,366,000	3/31/19	$21,909	$49,869	$45,729
INVP 3683X8 Enhanced DLP Gateway and Endpoin	Data Loss Prevention (DLP) will enable National Grid's businesses to detect sensitive data in the organization and then be able to identify, implement, and enforce policies for protecting the data without forcing any modifications to the data. The aim of this project will provide enhancements to the existing DLP gateway solution and introduce DLP capability on corporate endpoint devices (Corporate assets such as laptops and mobile devices). Implementation of such technology provides the business with the ability to manage and reduce risk exposure to key information assets, thus protecting National Grid's reputation and shareholder value.	$2,238,480	3/1/21	$0	$0	$25,662
INVP 4364 Wireless Network	This is a policy driven project to replace end of life equipment, decommission legacy wireless networks, and install or expand the current coverage and capacity of the Wireless Local Area Network (WLAN) at various National Grid sites that have been identified as a priority. The project will also strengthen the stability of the wireless network by providing current supported equipment with additional capacity. In addition this project will renew the outdoor (Yard) wireless network for these prioritize sites by replacing out of support access points at field locations to ensure Wi-Fi vehicle communications rem supportable.	$2,221,820	3/31/18	$46,419	$42,599	$40,220
INVP 4481 US MDS-Energy Accounting System (EAS) migration to Wholesale Settlement Applicatio (WSA)	This policy-driven project will consolidate the existing wholesale settlement processing applications into one application for New York (NY) and New England (NE), in order to improve upon the wholesale settlement market reporting and existing business processes. The expanded Wholesale Settlement Application (WSA) will provide enhanced functionality around wholesale settlement quality control in each load zone within the NY and NE jurisdictions. A consolidated, automated, and vendor supported wholesale settlement platform will reduce the risk of settlement reporting failure and data inconsistencies, making the settlement process more streamlined and efficient. As a result of the migration of Energy Accounting System (EAS) into WSA, the project will also decommission the existing EAS application.	$2,160,000	10/1/18	$44,486	$57,259	$52,445
INVP 4563 US SAP: FERC on Hana (FOH)	This project provides funding structure to support FERC on HANA (FOH) upgrade. Electric and gas utilities of all sizes must comply with the Uniform System of Accounts from the Federal Energy Regulatory Commission (FERC) or the National Association of Utility Regulatory Commissioners (NARUC). As government reemphasizes regulatory oversight, National Grid is facing increasingly stringent compliance requirements. To reduce the challenges of FERC compliance, such that filing reports and responding to data requests, National Grid is using the FERC on HANA SAP tool, which, in order to stay in compliance, has to be upgraded as required.	$2,115,000	3/31/19	$19,584	$44,579	$40,877
INVP 4704Q Customer Bill Redesign	The last major bill redesign at National Grid concluded in 2007 with the rollout of the HP-Exstream software and the new "blue-bar" design. The now 10-year-old "blue bar" bill needs a refresh, and the priorities from contact center engagement need to be addressed. The bill refresh and changes implemented will result in direct benefits to customer satisfaction and effectiveness of customer interactions – both direct and digital channels. New "best practices" will give the company a "current" customer interaction – which occurs millions of times each month. No other form of communication affects the company's customers more. Imaging and eBilling will naturally follow as a set of benefits to this project.	$2,108,147	3/31/19	$22,040	$50,169	$46,003

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule ISP-1
Page 5 of 23

The Narragansett Electric Company d/b/a National Grid
PostTest Year Information System Investments for Narragansett Electric and Narragansett Gas

Project	Description	Total Investment	In Service Date	Total		
				Rate Year	Data Year 1	Data Year 2
INVP 4280 US VSTIG Bandwidth Ph2	The purpose of the Verizon Secured Telecommunications Gateway (VSTIG) network services is to connect National Grid securely to the internet and otl external business partners. Due to the growth of these services, and other demands within the VSTIG environment, an upgrade is now required. The utilization of both VSTIGs (Billerica and Ashburn) are reaching the capacity limits of the network hardware, which, if not addressed, will lead to poor network performance, impact key business processes, and result in the potential loss of gateway services (such as internet access, cloud services and guest wireless internet access). This "phase 2" project builds upon the additional capacity provided by the phase 1 VSTIG upgrade, which will only alleviate the most pressing capacity constraint issues. Phase 2 will enable the network capacity to be increased up to 1gb/s per VSTIG. This capacity will meet the National Grid demands in the short to medium term. It will also be an enabler for other projects that are dependent upon the capacity increase, such as legacy De-Militarized Zone (DMZ) migration, Wide Area Network (WAN) and cloud services.	$2,089,174	3/31/18	$43,648	$40,056	$37,819
INVP 4709 Data Center Consolidation	A number of applications were not able to move in the timescales of Transformation and so the physical legacy Data Centers have had to be retained while remediation work is carried out on these applications (retained apps). Once all retained applications are remediated and moved to the new Data Center, the legacy Data Centers will need to be decommissionedIn addition there is a risk to continuing to run systems in the legacy data centres. A number of mission critical systems remain in the legacy data centers running in aged systems connected to aged network platforms. There is a likelihood that either the compute platform or network could fail and the hardware would not easily be restored. A compute platform failure would impact one system, but a network failure could impact multiple systems. Reliability - Old technology is vulnerable to more DRS threats - removing the old technology will mitigate this risk.	$2,000,000	3/31/19	$18,520	$42,155	$38,655
INVP 3683X4 Security Incident Event Management Phase 4 and Phase 5	The Security Incident and Event Management solution provides National Grid with the capabilities to analyze security event data in real time for internal and external threat management, and to collect, store, analyze, and report on log data for compliance and forensics. It provides the capabilities of gathering, analyzing and presenting information from network and security devices; identity and access management applications; vulnerability management and policy compliance tools; operating systems, database and application logs; and external threat data. his security capability will ensure alignment with best practices for cyber security and will provide CSOC and Network teams with actionable information to allow faster response to security incidents and demonstrate the effectives of controls and evidence in compliance with security regulations. This business capability will ensure key stakeholders have access to timely, useful security information relevant to protecting National Grid assets including CNI and Enterprise systems.	$1,999,450	Multiple	$0	$0	$25,479
INVP 3683X5 Identity & Access Management: Shared Area Access Management	This project is National Grid's continual effort to strengthen its Identity & Access Management (IAM) across its businesses. This multi-phase project will continue to expand on the existing capabilities delivered by the IAM Program as part of the Cyber Security Program. Shared Area Access Management will administer access to various shared file areas that exist across National Grid.	$1,740,000	3/1/21	$0	$0	$19,948
INVP 4761 US Foundation Hosting Renewal	In order to address its growing business environment, National Grid must enhance its SAP and High Performance Analytic Appliance (HANA) application support and hosting services. Currently, the application hosting support is provided by T-Systems out of Houston, Texas and SAP HANA services are provided by SAP HANA Enterprise Cloud (HEC) out of Virginia. This project and Freudenberg Information Technology (FIT) will consolidate these two datacenters under one platform for both primary and Disaster Recovery (DR) in the US. The new service provider FIT was selected through a formal Request For Proposal (RFP) process supported by INVP 3924. FIT will supply Platform as a Service (PaaS) for SAP and HANA applications, and ancillary applications including PowerPlan, Open Text, uPerform and SABRIX. National Grid IS will work with FIT to move the SAP application portfolio to a new datacenter. By moving to the new platform, National Grid will eliminate the need to renegotiate contract extensions with current hosting providers SAP, T-Systems and Wipro as well as having to conduct costly upgrades of the existing SAP infrastructure hosted by T-Systems.	$1,636,250	3/31/18	$34,185	$31,372	$29,620
INVP 4632 US Video Conferencing upgrade for RW	The current video conferencing units at Reservoir Woods are on old technology meaning that they are not able to integrate with the rest of the Video conferencing estate and do not provide a consistent user interface. This project will replace the Video Conference units in Res Woods with the current Video Conferencing platform of CISCO's Call Manager. This upgrade will provide consistent integration with the rest of the Video Conferencing estate. Improvements to the effectiveness of meetings are enabled through video conference services. The current services at Reservoir Woods are inconsistent; users find them difficult to use and performance of the service is unreliable. This restricts the number of people using the service and minimizes the opportunity for the Company in providing service to customers. To improve consistency, this project proposes to upgrade videoconference capability at Reservoir Woods to improve the user interface and ensure flexible, compatible technology is in use to ease ability for future upgrades.	$1,588,097	12/31/17	$41,020	$37,948	$35,733
INVP 4830 Migration of Oracle to Linux	This project will migrate our Oracle Database applications that reside on expensive Unix P-Series hardware, to less expensive Wintel/Linux based hardware. Funding for the Wintel hardware along with the application effort to repurpose from Unix to Linux will be covered from this project.	$1,500,000	8/1/21	$0	$0	$8,477
INVP 4397 Ariba TLS and CI Update	The project will address the upgrade of two Systems Applications Processing (SAP) Enterprise Infrastructure components to mitigate the risk of losing the Ariba connection to National Grid suppliers for the purposes of collaboration, and network activities such as the sending and receiving of purchase orders, as well as other necessary interfaces, such as GridForce. The TLS (Transport Layer Security) provides inbound and outbound communications security over the internet.	$1,462,275	8/28/17	$23,116	$21,983	$20,738

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule ISP-1
Page 6 of 23

The Narragansett Electric Company d/b/a National Grid
PostTest Year Information System Investments for Narragansett Electric and Narragansett Gas

Project	Description	Total Investment	In Service Date	Total		
				Rate Year	Data Year 1	Data Year 2
INVP 4188 Aging System Stabilize	National Grid's Electric and Gas Operations are dependent on several critical applications that are running on older technology and components which are beyond their support life cycle. For example, several Operations applications are dependent on outdated and soon to be non-supported operating systems components and platforms such as Windows 2003. This investment will upgrade, enhance and redesign some of the higher at risk Operations applications and replace outdated components.	$1,459,505	3/31/18	$32,247	$29,594	$27,941
INVP 4461 Unix51 Interface Migration	At National Grid, a majority of the file transfers are facilitated through the UNIX 51 File Transfer Service (FTS) tool. There are over 70 third parties receiving and sending critical data to National Grid via this service. UNIX 51 is running on aged technology and infrastructure without any support. The FTS service (downstate) was developed almost 20 years ago and is running on an unsupported and unpatchable platform. The business critical interfaces that utilize UNIX 51 from the Customer Related Information System (CRIS) and Customer Service System (CSS) systems to numerous third parties are at risk of failure with no viable contingency plan in place. This investment will provide a centralized expandable environment - Comprehensive Integration Services (CIS) - for additional interfaces to be implemented. Migrating UNIX 51 interfaces to the CIS platform will enable decommissioning of the UNIX 51 server. In Phase 1, analysis, tactical work and migration of the initial set of interfaces will be performed. Target completion for Phase 1 is November 2017. This project, Phase 2, will deliver the migration of the remaining set of business critical interfaces from the unsupported UNIX 51 platform onto the selected National Grid strategic middleware platform (CIS). By leveraging the experience, processes and infrastructure setup from Phase 1, the Phase 2 business critical interfaces are expected to be implemented more efficiently.	$1,308,051	9/30/18	$20,782	$26,749	$24,500
INVP 4693 Enterprise Labs	The project is an initiative within IS to construct and equip an Enterprise Laboratory, which will be available as a Proving Ground or Forum to accelerate the speed of innovation and new technology integration into the Enterprise. The E-Lab will be used to perform trials, tests, and showcase technologies for our customers. The Project Team will manage both the procurement and the suppliers' execution of the design, delivery and implementation of the construction and the technological aspects (hardware and software) that is required. The E-Lab will be located at Reservoir Woods on the second floor in the former High Density File (HDF) room W2-873.	$1,247,083	12/31/17	$32,212	$29,799	$28,060
INVP 4662 - Concur Licenses	This project allows National Grid to implement an end-to-end corporate travel booking and expense process. Concur allows setup of customizable audit rules which should reduce review time of expense items. It also will auto-generate notifications out to end users on outstanding expense items which currently is manually triggered. Both the audit rules and automated notifications should cut down on administrative efforts. This is the second phase of the investment, following last year's license agreement which was completed as part of a broader negotiation with SAP, via a discounted pricing model.	$1,232,000	1/31/18	$25,557	$23,439	$22,120
INVP 4289 US Network Improvement	The original IS Transformation Network implementation project delivered a new National Grid Verizon network and migrated almost every site onto a single Wide Area Network (WAN) using a consistent set of designs, hardware, services and delivery method. A small number of sites were not migrated for various reasons such as potential site closure and Long Island Power Authority separation complexities. The sites that were omitted now need to be migrated to the Verizon WAN service because the legacy services are using unsupported network infrastructure and are unable to offer the functionality and reliability required by the business.	$1,215,547	3/31/18	$25,396	$23,306	$22,004
INVP 4837 SD-WAN Core, automation, orchestration tools and pilot sites	This project will build and deploy the SD-WAN core infrastructure and tools in the Network data centers that will be used to support the SD-WAN as it is deployed throughout the branch locations.	$1,200,000	3/31/19	$11,112	$25,293	$23,193
INVP 3486 US MDS-Itron Enterprise Edition (IEE)	This project will deliver a consistent meter reading platform utilizing the Itron Enterprise Edition (IEE) version 8.1 cloud based solution. This solution will support the migration of meter groups in work streams. Initially targeted are approximately 3,000 MV90 interval collection system New York electric meters that need to be upgraded from 2G to 4G, as the 2G technology is being retired by the communication vendor, and 4G is the current standard wireless communication technology. There are also 400 Massachusetts and 170 Rhode Island meters that are in scope for migration. Currently these 3,600 C&I meters are on the existing MV90 platform with a goal to eventually replace the MV90 with IEE 8.1. This project is necessary as all known carriers are retiring the 2G technology and moving to 4G. A technology has been selected that will align with the roadmap for any future AMI initiatives that may be implemented and will avoid near-term replacement costs at the time of such implementation.	$1,193,859	3/31/18	$32,333	$29,672	$28,015
INVP 3430 Mobility - (MDM) Mobile Device	This project will implement an Enterprise Mobility Management (EMM) service that will allow National Grid to secure and manage mobile apps and content across a variety of mobile devices. National Grid has over 4000 corporate owned mobile devices that are used by the workforce to store information and gain access to network applications, such as email. In addition, Time Transformation project (Time entry system) will be integrated between mobile devices and our backend systems (i.e. iphones, ipads, making external and internal apps available to NG via NG site - push and pull) to enable our workforce to work in a more flexible and efficient manner. Due to the growing use of mobile devices, it is more critical than ever that we have a way to manage these devices so that we can comply with Internal corporate policy, distribute applications, and secure the data on these devices through a central EMM platform. This project will establish and deploy a central EMM service capable of on-boarding 4000 mobile devices. Included in this delivery is the implementation of device and security policies, a corporate apps store, mobile device containers and the infrastructure required to support mobile device access to corporate systems and data in a secure fashion.	$1,017,693	12/31/17	$20,848	$19,240	$18,181
	Total Capital Investment	***$392,715,244***				
	Rent Expense allocation to Narragansett Electric and Gas	***$17,859,814***		*$4,266,032*	*$6,357,815*	*$7,235,967*

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule ISP-1
Page 7 of 23

The Narragansett Electric Company d/b/a National Grid
Post-Test Year Information System Investments for Narragansett Electric

Project	Description	Total Investment	In Service Date	Distribution		
				Rate Year	Data Year 1	Data Year 2
Regulatory Mandates	This investment is for Regulatory Mandates of a project size that may not be known at the beginning of the fiscal year. The funding will be used to comply with walk-in Mandates and will be used for substitution based on a priority assessment with the business.	$61,869,000	Multiple	$167,991	$474,598	$758,767
INVP 3932 Call Center Customer Contact Center/SDC Technology Upgrade Implement Solution	This investment is to upgrade the U.S. Customer Contact Centers and Service Delivery Center (SDC) which are currently operating on core technologies that are no longer supported by their respective vendors. While there may be vendor support by way of third party vendors, the ability to triage all issues is not possible, as any previously undiagnosed issue would not be able to be resolved and many components of our infrastructure no longer have replacement parts available to purchase, as they have been discontinued by the manufacturer. This represents significant risk to the business in the areas of call handling, call recording, and the issuance of Regulatory penalties for non-compliance. National Grid also has multiple vendors supporting the technology and is seeking to consolidate support to one vendor with this project. This project will facilitate the replacement and consolidation of these critical systems to support the reliability of key communication channels between National Grid, our customers, and our employees.	$27,725,000	9/1/18	$281,137	$335,972	$307,623
INVP 3737 US CNI GMS SCADA Upgrade & Consolidation	This project is the final step in the strategic evolution of the Critical National Infrastructure (CNI) Gas Management Systems (GMS) SCADA system, supporting the new consolidated control rooms and upgrades to the hardware and operating systems, which are considered to be end of life. Furthermore, the current version of the SCADA application will require an upgrade due to its incompatibility with the new operating systems. The outcome of the project will ensure continuity in service while meeting the National Grid Gas Control strategic initiative for GMS longevity and up-time performance. Additionally, this effort will provide compliance to the National Grid IS Digital Risk & Security (DR&S) policies.	$21,474,909	12/31/19	$0	$0	$0
Technology Modernization Program	This is a multi-year investment program to modernize and improve the technology infrastructure at National Grid. The program will address a number of risks associated with unsupported applications and aged computer infrastructure and provide the foundational improvements necessary for the Company to deliver strategic initiatives such as: Gas Business Enablement, Customer Experience, and Advanced Analytics. The program consists of several projects in the following areas: - End User software licensing and Desktop tools - RSA Remote Access re-platform and token refresh - Network equipment replacements and bandwidth increases - Video Conferencing enhancements - Data Center improvements - Application and Network Monitoring platforms - Wireless Network enhancements - Cloud Enhancements - Azure Core Service and Secure Cloud Interconnect - Mobility - Mobile Device Management platforms - Technology Innovation Labs - Applications and supporting infrastructure improvements	$20,736,317	Multiple	$192,256	$258,967	$295,080
Cyber 2 Program	This program will deliver new cyber security capabilities to prevent, detect, and react to existing security threats. The projects to be delivered are: -Domain Based Security Phase 1 -Endpoint Scanning (Tanium) -Identity & Access Management: Fine Grain Access Management (Unified Platform) -US CNI Security Enhancements Phase 1 -Cloud Security (Cloud Access Security Broker) -Identity & Access Management: Privileged Access Management -Vstig Scaling Upgrades -Risk Based Authentication - 2FA token alternative (Multi Factor Authentication) -US CNI Intrusion Detection/Prevention Phase 1 (CNI IDS Refresh) -Enterprise Centralized Patch Management -Fundamentals Package -Develop Robust Incident Response -Continuous review of Reference Security Architecture -Virtualized Browser -Perimeter Enhancements -Internal PKI (Public Key) Infrastructure -Identity & Access Management: Role Based Access Management -Removable Media Control - Full Roll out -Data Visualization -Threat Behavior Modeling -Security Research Lab -Network Access Control	$18,609,680	Multiple	$125,267	$248,838	$266,041

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule ISP-1
Page 8 of 23

The Narragansett Electric Company d/b/a National Grid
Post-Test Year Information System Investments for Narragansett Electric

Project	Description	Total Investment	In Service Date	Distribution		
				Rate Year	Data Year 1	Data Year 2
Cyber 1 Program	This program will deliver new cyber security capabilities to prevent, detect, and react to existing security threats. The remaining projects to be delivered are: Enterprise Network Security and CNI Network Security and CNI Security Incident and Event Management (SIEM). These projects will create a Security and Services Network (SSN) to safely store the CNI data and SIEM solutions and tools. Existing security solutions such as: Net Flow Security Analysis , Forensic Packet Capture and Anti-Malware will also be migrated to the SSN in order to hold the CNI and Enterprise together allowing a single lens into all Cyber Security Activity.	$15,826,916	Multiple	$236,045	$216,531	$204,377
INVP 4914 US CNI-EMS Lifecycle Hardware and Software Upgrade	The hardware and software supporting the Energy Management System (EMS) and related networks is 8 years old and unsupported, and is therefore creating risk to National Grid. This investment will deploy hardware and software purchased under investments "INVP 4568-EMS Lifecycle Hardware and Software Upgrade" and "INVP 4570-Tech Services-Network Equipment Lifecycle Replacements" to the electric control rooms in New York and New England thereby reducing risk associated to these unsupported and aging assets. Upgrades to the EMS application, requiring new hardware and operating systems, will benefit the business through increased capacity to support new initiatives including the growing distributed generation program.	$14,897,000	8/1/19	$55,141	$255,658	$234,723
INVP 4307 US Win 7 Refresh Ph3	The End User Device Refresh-Windows 7 project is intended to address the migration/transition from XP to Windows 7. The current standard operating system at National Grid is Windows 7, however, there are several legacy applications that rely on Windows XP to operate, which impacts approximately 6000 users. XP is no longer in support and Microsoft has stopped producing security patches, which poses a reliability and security risk. Thus, it is imperative to migrate the remaining applications and users onto Windows 7.	$13,617,457	12/31/17	$200,059	$184,625	$174,469
Regulatory Mandates	This investment is for the identified regulatory mandated projects that scheduled to be completed during the Rate year. The following have been identified as mandated projects of: - INVP 4400 Annual HR & Payroll Mandatory Service Pack Upgrade (HRSP) - FY18 - INVP 4421 - New Arrearage Forgiveness Plan - INVP 4411AB Distributed Generation Portal - INVP 4411C New Electric Connections - INVP 4411D New Gas Connections - INVP 4124 Auto Remote Net Meter - INVP 4479 US Control-Gas Electronic Bulletin Board (EBB) Upgrade	$12,085,230	Multiple	$232,624	$215,365	$203,615
INVP 4708 Business Innovation Projects 2	The Business Innovation project provides a funding base and governance structure that allows the Information Services (IS) organization to improve the IS experience for our employees and customers who will experience improved reliability, use ability, speed and efficiency across all functions. The program will also reduce the risk of system failure which have customer, brand and cost implications.	$11,833,333	Multiple	$22,370	$80,273	$141,516
INVP 4728 Business Innovation Projects 3	The Business Innovation project provides a funding base and governance structure that allows the Information Services (IS) organization to improve the IS experience for our employees and customers who will experience improved reliability, use ability, speed and efficiency across all functions. The program will also reduce the risk of system failure which have customer, brand and cost implications.	$11,833,333	Multiple	$22,370	$80,273	$141,516
INVP 4750 Customer Experience Transformation Tech Program	This program will replace out of support platforms to mitigate existing risks to our customer self-serve billing, payments and other communications portals, and set the foundation for the processes and technology changes needed to drive step improvements to the customer experience. Operational efficiencies will be realized through the migration of customers to self-service channels, and through re-engineering of processes and transactions. The program will focus on re-engineering the customer's digital interactions to create a universal and seamless customer experience through multiple service options: Web, Mobile, Text, Email, and future emerging channels.	$10,496,000	3/31/19	$21,518	$144,860	$128,347
INVP 4398 Storms/ISched Upgrade	As the primary Work Management and Scheduling tools for the legacy National Grid service territories, 'STORMS' and 'IScheduler' are critical applications in support of both Electric and Gas Operations. The applications have become increasingly unstable, experiencing multiple outages over the past several years. The vendor is no longer in a position to support the applications without upgrades that will bring the applications onto current technology. The project will upgrade the work management system (STORMS) to the latest version of technology including: server hardware, system software and database software, along with bringing both standard and custom application code to the latest version of the technology. The investment will also replace the aged middleware components with new, supported components. As part of the project, the work management scheduling tool (IScheduler) will be replaced with the vendor's latest scheduling tool and integrated with the STORMS product.	$9,503,263	4/23/18	$225,138	$207,994	$196,722
INVP 4570 US CNI Tech Services-Network Equipment Lifecycle Replacements	This Policy-driven investment will procure networking assets needed to replace out of warranty equipment and support infrastructure in the Energy Management System and Outage Management System (EMS/OMS) Data Centers, Communications rooms, Operations Centers, and Support areas across the National Grid service territory in New York and New England that are no longer supported by the hardware and software vendors.	$9,169,203	8/1/19	$54,792	$254,039	$233,237

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule ISP-1
Page 9 of 23

The Narragansett Electric Company d/b/a National Grid
Post-Test Year Information System Investments for Narragansett Electric

Project	Description	Total Investment	In Service Date	Distribution		
				Rate Year	Data Year 1	Data Year 2
S005242 M112 Systemic Improvement	This project replaces the existing FERC module with the FERC on SAP HANA solution. The new HANA solution allows for FERC data to be created in parallel with all other data leading to a faster closing process and real time reporting capabilities.	$8,354,545	7/10/17	$91,545	$87,680	$83,890
INVP 3683X7 Big Data Security Analytics Phase 1 & Phase 2	This project will introduce the new business capability focused on Big Data Security Analytics to enhance and support existing Security Data Analytics. This capability will be integrated with the Cyber Security Operations Center to provide intelligence and further enhance analytical capabilities to respond to threats/attacks in a pro-active manner. The Project will provide National Grid security operational capability to examine large volumes of security related data sets containing a variety of data from multiple sources - including traditional security sources, such as log or audit files, and emerging sources such as images, social data, sensors, etc. - to uncover hidden threats, detect attack patterns and trends, identify suspicious anomalies, and aid in the removal of security threats, in an expeditious and cost effective manner. Real-time analysis will provide prediction and mitigation means for National Grid to discover new threats early and react quickly before they propagate. This capability will be integrated with the Cyber Security Operations Center to provide intelligence and further enhance analytical capabilities to respond to threats/attacks in a pro-active manner. This project consists of two phases.	$8,087,716	3/1/21	$0	$0	$66,494
INVP 4464 Data Visualization	This investment will establish two cloud based self service reporting tools (Tableau and Alteryx). The proposed solution will provide the opportunity for improved decision making through enhanced data mining, decision support, and data visualization capabilities. This will lay the ground work for the migration from current reporting tools which have reached end of life, in addition to providing readily available and proven modem technology.	$8,068,089	9/30/17	$117,250	$108,106	$102,089
Physical Security Replacements	This is annual capital replacement program for Physical Security. Physical Security is responsible for protecting National Grid's personnel and assets, and incorporates a security system as part of the overall security plan. To fulfill this responsibility, it is necessary to ensure that all security related equipment and assets in New England are in good condition. This project replaces assets that are at or near end of life and/or assets that are no longer under vendor warranty.	$6,955,500	Multiple	$77,012	$94,531	$112,575
INVP 4408 Doc Mgmt Systems Replacement Delivery	This investment will provide funding for the purchase and deployment of the Document Management System selected in the commercial RFP event executed in the first half of 2016. Deployment of the new Document Management System will provide a secure and reliable storage solution to serve the needs of the gas and electric business units. The initial partial sanction for this project included funding for the purchase of non-perpetual licenses for a period of one year. Negotiations with the selected vendor "OpenText" has resulted in a lower lifecycle cost the through the purchase of pre-paid perpetual licenses. Purchase of pre-paid perpetual license reduces overall cost of the product by $1.3 million dollars on a nominal basis over a sixteen year period. This partial sanction will provide the necessary funding to proceed with this purchase.	$6,049,256	6/22/18	$92,253	$84,741	$80,062
INVP 3683X13 Domain Based Security Phase 2 (Network Segregation)	This project will implement a Domain-based approach to information assurance for the identification, analysis, and documentation of security issues in the enterprise. Domain Based Security approach helps to analyze information security risks in a business context and provide a clear and direct mapping between the risks and the security controls needed to mitigate those risks. The policy domains will also address the variable risk appetites and requirements for the various business units, enabling National Grid to target the appropriate policies for each unit. Deliver the requirements for security in the organization, taking into account the business that needs to be supported. Security Policy Domains will establish a set of entities, physical and logical, that are subject to a common security policy and also allow each business within National Grid to adopt a risk-based approach to the implementation of information security controls. The approach helps to analyze information security risks in a business context and provide a clear and direct mapping between the risks and the security controls needed to mitigate those risks. The policy domains will also address the variable risk appetites and requirements for the various business units, enabling National Grid to target the appropriate policies for each unit.	$6,000,000	3/1/21	$0	$0	$49,330
Other fiscal plan initiatives	These annual investment plan projects were derived from business need. - INVP 3956 WIFI for Fleet Services Diagnostic Laptops - INVP 4467 STORMS Capital Cost Estimates - INVP 3982 Substation Monitoring-DobleARMS - INVP 4466 Gas Capital Investment Planning Tool - INVP 4480 US Control-Gas System Operating Procedure (SOP) Upgrade - INVP 4390 Plastic Fusion II - INPV 4462 Computapole Enhancements to Support Inspection Types - INVP 4487 Changes to ACIS for PMCC Civil Vendor Billing - INVP 3986 Cascade Electric Application Upgrade Project - INVP 4588 US SAP: Solution Manager Upgrade - INVP 3718 New Medical System	$5,618,031	Multiple	$73,258	$73,996	$69,518

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule ISP-1
Page 10 of 23

The Narragansett Electric Company d/b/a National Grid
Post-Test Year Information System Investments for Narragansett Electric

Project	Description	Total Investment	In Service Date	Distribution		
				Rate Year	Data Year 1	Data Year 2
INVP 4564 US SAP: Enhancement Pack 9 Upgrade	The SAP Enhancement pack upgrade is an investment to provide for the upgrade of the core SAP application every two years (biennially) excluding the upgrade work associated with the annual HR service pack which is accounted for under a separate mandatory annual investment. The project would apply the latest agreed SAP service packs for ECC, SRM, PI, Portal, BPC and SolMan to ensure that the SAP application stays within current vendor support and mitigates the risk of system failure by remaining current every two years on the SAP core application. The investment would only include the upgrade packs (non HR) which are supplied by the SAP and would exclude any discretionary enhancements as part of this upgrade or any upgrades associated with ancillary USFP systems (ex. PowerPlan, uPerform, OpenText, SABRIX). The investment would also not account for any upgrade work which may be required on the BI/BW SAP platform. This biennial patching/upgrade strategy is to ensure that National Grid applies the latest service packs every two year in order to ensure proper system operation and application maintenance support.	$5,328,000	3/31/20	$0	$39,363	$82,660
INVP 4395 US Mobile Device Refresh	This policy-driven project will implement 750 mobile devices previously purchased as part of INVP 4671 – Mobile device refresh FY17 project. In addition, the project will purchase 200 new mobile devices and mounting accessories to continue the effort of eliminating old devices from the field. A majority of mobile devices used in the field are more than 5 years old and these devices impact day to day productivity. These old devices break down frequently and can't be easily repaired due to unavailability of parts and accessories (in some cases manufacturers have stopped supporting the devices). The replacement of old mobile devices with latest tough books will allow field technicians to have the reliable equipment and data required to perform their work in a safe and efficient manner.	$4,492,944	3/31/18	$84,822	$78,141	$73,549
INVP 4843 Virtualized Branches	In coordination with the SD_WAN core infrastructure project, this project will build and deploy the SD-WAN environment at the branch locations. This will support the delivery of WAN automation, application based routing and use of the Internet for network transport.	$3,700,000	3/31/20	$0	$27,335	$57,403
INVP 4489 Active Directory Improvements	Active Directory (AD) is a key service that supports core authentication for all National Grid computers and servers logging onto the corporate network in both the United States (US) and United Kingdom (UK). Therefore, AD provides access to all Information Systems (IS). The scope of this initiative is to implement a refreshed global AD infrastructure and support services. The new AD environment will unify all global applications that use the AD service. It is critical that National Grid can ensure that the AD service is reliable and supports core authentication requirements to all current and proposed applications.	$3,555,000	12/31/18	$31,614	$52,700	$48,317
INVP 4491 ICE Replacement	This investment is required to replace the current Instant Messaging, Collaboration, and Email (ICE) services with a set of similar, or enhanced, services provided by Office 365. Office 365 will provide a more effective collaboration and email service (Microsoft Office 365) to meet the business demand for additional capabilities (e.g.: collaboration with external parties) and provide any enabling infrastructure technology necessary before the ICE service contract expires.	$3,447,722	12/31/18	$39,858	$64,323	$59,196
INVP 4606 Data Visualization Expansion	Building upon the success of the Data Visualization (Tableau) core implementation last year, this investment expands its use with additional data and analytics capabilities. Data Visualization will be extended with the build out of dashboards across more business areas in support of their reporting, data retention and regulatory obligations. In addition to enhanced data access, this investment will provide for more advanced analytics through the use of new tools and longer term storage of information within the environment for audit and trending. The investment will introduce additional dashboards within Finance, Customer and Operations in support of reporting requirements.	$3,435,000	6/30/19	$14,219	$52,468	$48,157
INVP 4707 Business Innovation Projects 1	The Business Innovation project provides a funding base and governance structure that allows the Information Services (IS) organization to improve the IS experience for our employees and customers who will experience improved reliability, use ability, speed and efficiency across all functions. The program will also reduce the risk of system failure which have customer, brand and cost implications.	$3,368,613	3/31/18	$50,472	$46,318	$43,731
INVP 4568 US CNI-EMS Lifecycle Hardware and Software Upgrade	The server and workstation hardware for the Energy Management System (EMS) replacement project was purchased in 2010. The hardware is now near peak operating capacity and may constrain the capacity of the associated databases in EMS. The application vendor ASEA Brown Boveri (ABB), is recommending a hardware refresh for the EMS environments in order to increase the capacity of the databases to accommodate future growth. This Policy-driven investment will procure the equipment needed for the project stages for the hardware and software refresh of the current ABB EMS.	$3,144,063	8/1/19	$11,638	$53,957	$49,539

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule ISP-1
Page 11 of 23

The Narragansett Electric Company d/b/a National Grid
Post-Test Year Information System Investments for Narragansett Electric

Project	Description	Total Investment	In Service Date	Distribution		
				Rate Year	Data Year 1	Data Year 2
INVP 4706 1327 Interfaces - 523 FTS, 340 RDX, 245 MQSI, 253 JCAPS, 44 PM4D, 7 VB	The primary driver for this project is to mitigate the risks of continuing to be reliant on out of support infrastructure. These risks are : •Increased Security risk as out of support infrastructure will not receive security patches. •In the event of failure National Grid IS will be unable to meet the agreed Service Level Agreements (SLAs) for many key applications once the middleware infrastructure goes out of support. The majority of these applications currently have Gold or Platinum SLA's. •The FTS environment has a single point of failure/no redundancy. •The new technology provides functional benefits which will provide productivity improvements enabling improvements in the efficiency of data and file transfer. The 1327 interfaces (523 FTS, 340 RDX, 245 MQSI, 253 JCAPS, 44 PM4D, 7 VB) included in this scope of work will be divided into sprints that will focus on a specific set of interfaces that touch specific sets of applications. Each sprint will be executed sequentially.	$3,083,333	6/30/19	$12,764	$47,097	$43,227
INVP 4348 US SAP: Infrastructure Landscape	This project will create a permanent set of servers used for project development in support of initiatives pertaining to the SAP portfolio.	$2,999,067	3/31/18	$56,619	$52,159	$49,094
INVP 4217 US SAP: Business Planning	SAP's Business Planning and Consolidation (BPC) platform is a module that supports National Grid's financial processes, such as financial reporting, budgeting and forecasting. It allows for real-time monitoring of financial results and improved strategic decisions. SAP HANA is an in-memory database developed by SAP. BPC on HANA has been used by National Grid since November 2012. Upgrading the platform from version 7.5 to 10.1 will allow National Grid to utilize the current version's enhancements and leverage additional benefits, such as reading and aggregating data for reporting purposes, transforming data, and reporting on greater volumes of data.	$2,645,000	3/31/19	$17,565	$39,981	$36,662
INVP 4680 WAP Density deployment	This project will deploy new wireless access points in high density configurations to improve wireless capacity and coverage at 30 identified U.S. sites. In addition, it will decommission and replace currently unsupported wireless bridge equipment to migrate risks associated with failure of that equipment.	$2,546,133	3/31/18	$48,068	$44,282	$41,680
INVP 3683X11 IT/OT Discovery and Implementation Phase 1	This project will allow National Grid the capabilities to discover Smart/IT/OT computing and other devices across the National Grid environment in a centralized location, allowing the business to gain a full inventory of devices/applications/technologies, determine risks associated with those components, identify relevant controls, and management of devices/applications /technologies through their lifecycle.	$2,540,160	10/1/20	$0	$0	$31,473
INVP 4222 Governance Risk & Compliance (GRC) Optimization/Upgrade	This project updates the Governance, Risk and Compliance (GRC) solution of SAP to the vendor supported version. In addition, the project will update the GRC environments from Service Pack 4 to the latest version, Service Pack 17. These updates will ensure that the module, which provides control / roles segregation and Sarbanes-Oxley Act (SOX) guidelines, will be stable and incorporate the necessary program fixes in the new version. It will also integrate the newest features and improvements released by SAP.	$2,522,000	3/1/19	$18,850	$37,989	$34,823
INVP 4562 US SAP: Business Warehouse (BW) Consolidation to HANA Enterprise Cloud (HEC)	This investment is to provide funding to consolidate National Grid Business Intelligence (BI) / Business Warehouse (BW) to HANA Enterprise Cloud (HEC). This project supports Strategy Alignment by delivering •Reporting Platform Consolidation •Maintenance Cost Reduction •Reporting Infrastructure Enhancement	$2,366,000	3/31/19	$15,712	$35,764	$32,794
INVP 3683X8 Enhanced DLP Gateway and Endpoint	Data Loss Prevention (DLP) will enable National Grid's businesses to detect sensitive data in the organization and then be able to identify, implement, and enforce policies for protecting the data without forcing any modifications to the data. The aim of this project will provide enhancements to the existing DLP gateway solution and introduce DLP capability on corporate endpoint devices (Corporate assets such as laptops and mobile devices). Implementation of such technology provides the business with the ability to manage and reduce risk exposure to key information assets, thus protecting National Grid's reputation and shareholder value.	$2,238,480	3/1/21	$0	$0	$18,404
INVP 4364 Wireless Network	This is a policy driven project to replace end of life equipment, decommission legacy wireless networks, and install or expand the current coverage and capacity of the Wireless Local Area Network (WLAN) at various National Grid sites that have been identified as a priority. The project will also strengthen the stability of the wireless network by providing current supported equipment with additional capacity. In addition this project will renew the outdoor (Yard) wireless network for these prioritize sites by replacing out of support access points at field locations to ensure Wi-Fi vehicle communications remain supportable.	$2,221,820	3/31/18	$33,289	$30,550	$28,844

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule ISP-1
Page 12 of 23

The Narragansett Electric Company d/b/a National Grid
Post-Test Year Information System Investments for Narragansett Electric

Project	Description	Total Investment	In Service Date	Distribution		
				Rate Year	Data Year 1	Data Year 2
INVP 4481 US MDS-Energy Accounting System (EAS) migration to Wholesale Settlement Application (WSA)	This policy-driven project will consolidate the existing wholesale settlement processing applications into one application for New York (NY) and New England (NE), in order to improve upon the wholesale settlement market reporting and existing business processes. The expanded Wholesale Settlement Application (WSA) will provide enhanced functionality around wholesale settlement quality control in each load zone within the NY and NE jurisdictions. A consolidated, automated, and vendor supported wholesale settlement platform will reduce the risk of settlement reporting failure and data inconsistencies, making the settlement process more streamlined and efficient. As a result of the migration of Energy Accounting System (EAS) into WSA, the project will also decommission the existing EAS application.	$2,160,000	10/1/18	$44,486	$57,259	$52,445
INVP 4563 US SAP: FERC on Hana (FOH)	This project provides funding structure to support FERC on HANA (FOH) upgrade. Electric and gas utilities of all sizes must comply with the Uniform System of Accounts from the Federal Energy Regulatory Commission (FERC) or the National Association of Utility Regulatory Commissioners (NARUC). As government reemphasizes regulatory oversight, National Grid is facing increasingly stringent compliance requirements. To reduce the challenges of FERC compliance, such that filing reports and responding to data requests, National Grid is using the FERC on HANA SAP tool, which, in order to stay in compliance, has to be upgraded as required.	$2,115,000	3/31/19	$14,045	$31,970	$29,315
INVP 4704Q Customer Bill Redesign	The last major bill redesign at National Grid concluded in 2007 with the rollout of the HP-Exstream software and the new “blue-bar” design. The now 10-year-old “blue bar” bill needs a refresh, and the priorities from contact center engagement need to be addressed. The bill refresh and changes implemented will result in direct benefits to customer satisfaction and effectiveness of customer interactions – both direct and digital channels. New “best practices” will give the company a “current” customer interaction – which occurs millions of times each month. No other form of communication affects the company’s customers more. Imaging and eBilling will naturally follow as a set of benefits to this project.	$2,108,147	3/31/19	$13,651	$31,072	$28,492
INVP 4280 US VSTIG Bandwidth Ph2	The purpose of the Verizon Secured Telecommunications Gateway (VSTIG) network services is to connect National Grid securely to the internet and other external business partners. Due to the growth of these services, and other demands within the VSTIG environment, an upgrade is now required. The utilization of both VSTIGs (Billerica and Ashburn) are reaching the capacity limits of the network hardware, which, if not addressed, will lead to poor network performance, impact key business processes, and result in the potential loss of gateway services (such as internet access, cloud services and guest wireless internet access). This “phase 2” project builds upon the additional capacity provided by the phase 1 VSTIG upgrade, which will only alleviate the most pressing capacity constraint issues. Phase 2 will enable the network capacity to be increased up to 1gb/s per VSTIG. This capacity will meet the National Grid demands in the short to medium term. It will also be an enabler for other projects that are dependent upon the capacity increase, such as legacy De-Militarized Zone (DMZ) migration, Wide Area Network (WAN) and cloud services.	$2,089,174	3/31/18	$31,302	$28,726	$27,122
INVP 4709 Data Centre Consolidation efforts	A number of applications were not able to move in the timescales of Transformation and so the physical legacy Data Centers have had to be retained while remediation work is carried out on these applications (retained apps). Once all retained applications are remediated and moved to the new Data Center, the legacy Data Centers will need to be decommissioned. In addition there is a risk to continuing to run systems in the legacy data centres. A number of mission critical systems remain in the legacy data centers running in aged systems connected to aged network platforms. There is a likelihood that either the compute platform or network could fail and the hardware would not easily be restored. A compute platform failure would impact one system, but a network failure could impact multiple systems. Reliability - Old technology is vulnerable to more DRS threats - removing the old technology will mitigate this risk.	$2,000,000	3/31/19	$13,281	$30,232	$27,721
INVP 3683X4 Security Incident Event Management Phase 4 and Phase 5	The Security Incident and Event Management solution provides National Grid with the capabilities to analyze security event data in real time for internal and external threat management, and to collect, store, analyze, and report on log data for compliance and forensics. It provides the capabilities of gathering, analyzing and presenting information from network and security devices; identity and access management applications; vulnerability management and policy compliance tools; operating systems, database and application logs; and external threat data. his security capability will ensure alignment with best practices for cyber security and will provide CSOC and Network teams with actionable information to allow faster response to security incidents and demonstrate the effectives of controls and evidence in compliance with security regulations. This business capability will ensure key stakeholders have access to timely, useful security information relevant to protecting National Grid assets including CNI and Enterprise systems.	$1,999,450	Multiple	$0	$0	$18,272
INVP 3683X5 Identity & Access Management: Shared Area Access Management	This project is National Grid's continual effort to strengthen its Identity & Access Management (IAM) across its businesses. This multi-phase project will continue to expand on the existing capabilities delivered by the IAM Program as part of the Cyber Security Program. Shared Area Access Management will administer access to various shared file areas that exist across National Grid.	$1,740,000	3/1/21	$0	$0	$14,306

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule ISP-1
Page 13 of 23

The Narragansett Electric Company d/b/a National Grid
Post-Test Year Information System Investments for Narragansett Electric

Project	Description	Total Investment	In Service Date	Distribution		
				Rate Year	Data Year 1	Data Year 2
INVP 4761 US Foundation Hosting Renewal	In order to address its growing business environment, National Grid must enhance its SAP and High Performance Analytic Appliance (HANA) application support and hosting services. Currently, the application hosting support is provided by T-Systems out of Houston, Texas and SAP HANA services are provided by SAP HANA Enterprise Cloud (HEC) out of Virginia. This project and Freudenberg Information Technology (FIT) will consolidate these two datacenters under one platform for both primary and Disaster Recovery (DR) in the US. The new service provider FIT was selected through a formal Request For Proposal (RFP) process supported by INVP 3924. FIT will supply Platform as a Service (PaaS) for SAP and HANA applications, and ancillary applications including PowerPlan, Open Text, uPerform and SABRIX. National Grid IS will work with FIT to move the SAP application portfolio to a new datacenter. By moving to the new platform, National Grid will eliminate the need to renegotiate contract extensions with current hosting providers SAP, T-Systems and Wipro as well as having to conduct costly upgrades of the existing SAP infrastructure hosted by T-Systems.	$1,636,250	3/31/18	$24,516	$22,498	$21,242
INVP 4632 US Video Conferencing upgrade for RW	The current video conferencing units at Reservoir Woods are on old technology meaning that they are not able to integrate with the rest of the Video conferencing estate and do not provide a consistent user interface. This project will replace the Video Conference units in Res Woods with the current Video Conferencing platform of CISCO's Call Manager. This upgrade will provide consistent integration with the rest of the Video Conferencing estate. Improvements to the effectiveness of meetings are enabled through video conference services. The current services at Reservoir Woods are inconsistent; users find them difficult to use and performance of the service is unreliable. This restricts the number of people using the service and minimizes the opportunity for the Company in providing service to customers. To improve consistency, this project proposes to upgrade videoconference capability at Reservoir Woods to improve the user interface and ensure flexible, compatible technology is in use to ease ability for future upgrades.	$1,588,097	12/31/17	$29,417	$27,214	$25,626
INVP 4830 Migration of Oracle to Linux	This project will migrate our Oracle Database applications that reside on expensive Unix P-Series hardware, to less expensive Wintel/Linux based hardware. Funding for the Wintel hardware along with the application effort to repurpose from Unix to Linux will be covered from this project.	$1,500,000	8/1/21	$0	$0	$6,080
INVP 4397 Ariba TLS and CI Update	The project will address the upgrade of two Systems Applications Processing (SAP) Enterprise Infrastructure components to mitigate the risk of losing the Ariba connection to National Grid suppliers for the purposes of collaboration, and network activities such as the sending and receiving of purchase orders, as well as other necessary interfaces, such as GridForce. The TLS (Transport Layer Security) provides inbound and outbound communications security over the internet.	$1,462,275	8/28/17	$16,577	$15,765	$14,872
INVP 4188 Aging System Stabilize	National Grid's Electric and Gas Operations are dependent on several critical applications that are running on older technology and components which are beyond their support life cycle. For example, several Operations applications are dependent on outdated and soon to be non-supported operating systems, components and platforms such as Windows 2003. This investment will upgrade, enhance and redesign some of the higher at risk Operations applications and replace outdated components.	$1,459,505	3/31/18	$23,138	$21,234	$20,048
INVP 4461 Unix51 Interface Migration	At National Grid, a majority of the file transfers are facilitated through the UNIX 51 File Transfer Service (FTS) tool. There are over 70 third parties receiving and sending critical data to National Grid via this service. UNIX 51 is running on aged technology and infrastructure without any support. The FTS service (downstate) was developed almost 20 years ago and is running on an unsupported and unpatchable platform. The business critical interfaces that utilize UNIX 51 from the Customer Related Information System (CRIS) and Customer Service System (CSS) systems to numerous third parties are at risk of failure with no viable contingency plan in place. This investment will provide a centralized expandable environment - Comprehensive Integration Services (CIS) - for additional interfaces to be implemented. Migrating UNIX 51 interfaces to the CIS platform will enable decommissioning of the UNIX 51 server. In Phase 1, analysis, tactical work and migration of the initial set of interfaces will be performed. Target completion for Phase 1 is November 2017. This project, Phase 2, will deliver the migration of the remaining set of business critical interfaces from the unsupported UNIX 51 platform onto the selected National Grid strategic middleware platform (CIS). By leveraging the experience, processes and infrastructure setup from Phase 1, the Phase 2 business critical interfaces are expected to be implemented more efficiently.	$1,308,051	9/30/18	$14,904	$19,183	$17,570
INVP 4693 Enterprise Labs	The project is an initiative within IS to construct and equip an Enterprise Laboratory, which will be available as a Proving Ground or Forum to accelerate the speed of innovation and new technology integration into the Enterprise. The E-Lab will be used to perform trials, tests, and showcase technologies for our customers. The Project Team will manage both the procurement and the suppliers' execution of the design, delivery and implementation of the construction and the technological aspects (hardware and software) that is required. The E-Lab will be located at Reservoir Woods on the second floor in the former High Density File (HDF) room W2-873.	$1,247,083	12/31/17	$23,101	$21,370	$20,124
INVP 4662 - Concur Licenses	This project allows National Grid to implement an end-to-end corporate travel booking and expense process. Concur allows setup of customizable audit rules which should reduce review time of expense items. It also will auto-generate notifications out to end users on outstanding expense items which currently is manually triggered. Both the audit rules and automated notifications should cut down on administrative efforts. This is the second phase of the investment, following last year's license agreement which was completed as part of a broader negotiation with SAP, via a discounted pricing model.	$1,232,000	1/31/18	$18,329	$16,810	$15,863

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule ISP-1
Page 14 of 23

The Narragansett Electric Company d/b/a National Grid
Post-Test Year Information System Investments for Narragansett Electric

Project	Description	Total Investment	In Service Date	Distribution		
				Rate Year	Data Year 1	Data Year 2
INVP 4289 US Network Improvement	The original IS Transformation Network implementation project delivered a new National Grid Verizon network and migrated almost every site onto a single Wide Area Network (WAN) using a consistent set of designs, hardware, services and delivery method. A small number of sites were not migrated for various reasons such as potential site closure and Long Island Power Authority separation complexities. The sites that were omitted now need to be migrated to the Verizon WAN service because the legacy services are using unsupported network infrastructure and are unable to offer the functionality and reliability required by the business.	$1,215,547	3/31/18	$18,212	$16,714	$15,780
INVP 4837 SD-WAN Core, automation, orchestration tools and pilot sites	This project will build and deploy the SD-WAN core infrastructure and tools in the Network data centers that will be used to support the SD-WAN as it is deployed throughout the branch locations.	$1,200,000	3/31/19	$7,969	$18,139	$16,633
INVP 3486 US MDS-Itron Enterprise Edition (IEE)	This project will deliver a consistent meter reading platform utilizing the Itron Enterprise Edition (IEE) version 8.1 cloud based solution. This solution will support the migration of meter groups in work streams. Initially targeted are approximately 3,000 MV90 interval collection system New York electric meters that need to be upgraded from 2G to 4G, as the 2G technology is being retired by the communication vendor, and 4G is the current standard wireless communication technology. There are also 400 Massachusetts and 170 Rhode Island meters that are in scope for migration. Currently these 3,600 C&I meters are on the existing MV90 platform with a goal to eventually replace the MV90 with IEE 8.1. This project is necessary as all known carriers are retiring the 2G technology and moving to 4G. A technology has been selected that will align with the roadmap for any future AMI initiatives that may be implemented and will avoid near-term replacement costs at the time of such implementation.	$1,193,859	3/31/18	$32,333	$29,672	$28,015
INVP 3430 Mobility - (MDM) Mobile Device	This project will implement an Enterprise Mobility Management (EMM) service that will allow National Grid to secure and manage mobile apps and content across a variety of mobile devices. National Grid has over 4000 corporate owned mobile devices that are used by the workforce to store information and gain access to network applications, such as email. In addition, Time Transformation project (Time entry system) will be integrated between mobile devices and our backend systems (i.e. iphones, ipads, making external and internal apps available to NG via NG site - push and pull) to enable our workforce to work in a more flexible and efficient manner. Due to the growing use of mobile devices, it is more critical than ever that we have a way to manage these devices so that we can comply with Internal corporate policy, distribute applications, and secure the data on these devices through a central EMM platform. This project will establish and deploy a central EMM service capable of on-boarding 4000 mobile devices. Included in this delivery is the implementation of device and security policies, a corporate apps store, mobile device containers and the infrastructure required to support mobile device access to corporate systems and data in a secure fashion.	$1,017,693	12/31/17	$14,951	$13,798	$13,039
	Total Capital Investment	***$392,715,244***				
	Rent Expense allocation to Narragansett Electric - Distribution Segment	***$12,616,969***		*$3,063,725*	*$4,511,132*	*$5,042,111*

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule ISP-1
Page 15 of 23

The Narragansett Electric Company d/b/a National Grid
Post-Test Year Information System Investments for Narragansett Gas

Project	Description	Total Investment	In Service Date	Gas		
				Rate Year	Data Year 1	Data Year 2
Regulatory Mandates	This investment is for Regulatory Mandates of a project size that may not be known at the beginning of the fiscal year. The funding will be used to comply with walk-in Mandates and will be used for substitution based on a priority assessment with the business.	$61,869,000	Multiple	$66,256	$187,183	$299,259
INVP 3932 Call Center Customer Contact Center/SDC Technology Upgrade Implement Solution	This investment is to upgrade the U.S. Customer Contact Centers and Service Delivery Center (SDC) which are currently operating on core technologies that are no longer supported by their respective vendors. While there may be vendor support by way of third party vendors, the ability to triage all issues is not possible, as any previously undiagnosed issue would not be able to be resolved and many components of our infrastructure no longer have replacement parts available to purchase, as they have been discontinued by the manufacturer. This represents significant risk to the business in the areas of call handli call recording, and the issuance of Regulatory penalties for non-compliance. National Grid also has multiple vendors supporting the technology and is seeking to consolidate support to one vendor with this project. This project will facilitate the replacement and consolidation of these critical systems to support the reliability of key communication channels between National Grid, our customers, and our employees.	$27,725,000	9/1/18	$176,884	$211,384	$193,548
INVP 3737 US CNI GMS SCADA Upgrade & Consolidation	This project is the final step in the strategic evolution of the Critical National Infrastructure (CNI) Gas Management Systems (GMS) SCADA system, supporting the new consolidated control rooms and upgrades to the hardware and operating systems, which are considered to be end of life. Furthermore, the current version of the SCADA application will require an upgrade due to its incompatibility with the new operating systems. The outcome of the proj will ensure continuity in service while meeting the National Grid Gas Control strategic initiative for GMS longevity and up-time performance. Additiona this effort will provide compliance to the National Grid IS Digital Risk & Security (DR&S) policies.	$21,474,909	12/31/19	$0	$200,247	$327,627
Technology Modernization Program	This is a multi-year investment program to modernize and improve the technology infrastructure at National Grid. The program will address a number of risks associated with unsupported applications and aged computer infrastructure and provide the foundational improvements necessary for the Company to deliver strategic initiatives such as: Gas Business Enablement, Customer Experience, and Advanced Analytics. The program consists of several projects in the following areas: - End User software licensing and Desktop tools - RSA Remote Access re-platform and token refresh - Network equipment replacements and bandwidth increases - Video Conferencing enhancements - Data Center improvements - Application and Network Monitoring platforms - Wireless Network enhancements - Cloud Enhancements - Azure Core Service and Secure Cloud Interconnect - Mobility - Mobile Device Management platforms - Technology Innovation Labs - Applications and supporting infrastructure improvements	$20,736,317	Multiple	$75,826	$102,137	$116,380
Cyber 2 Program	This program will deliver new cyber security capabilities to prevent, detect, and react to existing security threats. The projects to be delivered are: -Domain Based Security Phase 1 -Endpoint Scanning (Tanium) -Identity & Access Management: Fine Grain Access Management (Unified Platform) -US CNI Security Enhancements Phase 1 -Cloud Security (Cloud Access Security Broker) -Identity & Access Management: Privileged Access Management -Vstig Scaling Upgrades -Risk Based Authentication - 2FA token alternative (Multi Factor Authentication) -US CNI Intrusion Detection/Prevention Phase 1 (CNI IDS Refresh) -Enterprise Centralized Patch Management -Fundamentals Package -Develop Robust Incident Response -Continuous review of Reference Security Architecture -Virtualized Browser -Perimeter Enhancements -Internal PKI (Public Key) Infrastructure -Identity & Access Management: Role Based Access Management -Removable Media Control - Full Roll out -Data Visualization -Threat Behavior Modeling -Security Research Lab -Network Access Control	$18,609,680	Multiple	$49,405	$98,142	$104,927

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule ISP-1
Page 16 of 23

The Narragansett Electric Company d/b/a National Grid
Post-Test Year Information System Investments for Narragansett Gas

Project	Description	Total Investment	In Service Date	Gas		
				Rate Year	Data Year 1	Data Year 2
Cyber 1 Program	This program will deliver new cyber security capabilities to prevent, detect, and react to existing security threats. The remaining projects to be delivered are: Enterprise Network Security and CNI Network Security and CNI Security Incident and Event Management (SIEM). These projects will create a Security and Services Network (SSN) to safely store the CNI data and SIEM solutions and tools. Existing security solutions such as: Net Flow Security Analysis , Forensic Packet Capture and Anti-Malware will also be migrated to the SSN in order to hold the CNI and Enterprise together allowing a single lens into all Cyber Security Activity.	$15,826,916	Multiple	$93,097	$85,400	$80,607
INVP 4914 US CNI-EMS Lifecycle Hardware and Software Upgrade	The hardware and software supporting the Energy Management System (EMS) and related networks is 8 years old and unsupported, and is therefore creating risk to National Grid. This investment will deploy hardware and software purchased under investments "INVP 4568-EMS Lifecycle Hardware and Software Upgrade" and "INVP 4570-Tech Services-Network Equipment Lifecycle Replacements" to the electric control rooms in New York and Ne England thereby reducing risk associated to these unsupported and aging assets. Upgrades to the EMS application, requiring new hardware and operating systems, will benefit the business through increased capacity to support new initiatives including the growing distributed generation program.	$14,897,000	8/1/19	$0	$0	$0
INVP 4307 US Win 7 Refresh Ph3	The End User Device Refresh-Windows 7 project is intended to address the migration/transition from XP to Windows 7. The current standard operating system at National Grid is Windows 7, however, there are several legacy applications that rely on Windows XP to operate, which impacts approximately 6000 users. XP is no longer in support and Microsoft has stopped producing security patches, which poses a reliability and security risk. Thus, it is imperative to migrate the remaining applications and users onto Windows 7.	$13,617,457	12/31/17	$78,903	$72,817	$68,811
Regulatory Mandates	This investment is for the identified regulatory mandated projects that scheduled to be completed during the Rate year. The following have been identified as mandated projects of: - INVP 4400 Annual HR & Payroll Mandatory Service Pack Upgrade (HRSP) - FY18 - INVP 4421 - New Arrearage Forgiveness Plan - INVP 4411AB Distributed Generation Portal - INVP 4411C New Electric Connections - INVP 4411D New Gas Connections - INVP 4124 Auto Remote Net Meter - INVP 4479 US Control-Gas Electronic Bulletin Board (EBB) Upgrade	$12,085,230	Multiple	$91,436	$88,517	$83,233
INVP 4708 Business Innovation Projects 2	The Business Innovation project provides a funding base and governance structure that allows the Information Services (IS) organization to improve the IS experience for our employees and customers who will experience improved reliability, use ability, speed and efficiency across all functions. The program will also reduce the risk of system failure which have customer, brand and cost implications.	$11,833,333	Multiple	$8,823	$31,660	$55,814
INVP 4728 Business Innovation Projects 3	The Business Innovation project provides a funding base and governance structure that allows the Information Services (IS) organization to improve the IS experience for our employees and customers who will experience improved reliability, use ability, speed and efficiency across all functions. The program will also reduce the risk of system failure which have customer, brand and cost implications.	$11,833,333	Multiple	$8,823	$31,660	$55,814
INVP 4750 Customer Experience Transformation Tech Program	This program will replace out of support platforms to mitigate existing risks to our customer self-serve billing, payments and other communications port and set the foundation for the processes and technology changes needed to drive step improvements to the customer experience. Operational efficiencies will be realized through the migration of customers to self-service channels, and through re-engineering of processes and transactions. The program will focus on re-engineering the customer's digital interactions to create a universal and seamless customer experience through multiple service options: Web Mobile, Text, Email, and future emerging channels.	$10,496,000	3/31/19	$13,539	$91,142	$80,752
INVP 4398 Storms/ISched Upgrade	As the primary Work Management and Scheduling tools for the legacy National Grid service territories, 'STORMS' and 'IScheduler' are critical applications in support of both Electric and Gas Operations. The applications have become increasingly unstable, experiencing multiple outages over the past several years. The vendor is no longer in a position to support the applications without upgrades that will bring the applications onto current technology. The project will upgrade the work management system (STORMS) to the latest version of technology including: server hardware, system software and database software, along with bringing both standard and custom application code to the latest version of the technology. The investment will also replace the aged middleware components with new, supported components. As part of the project, the work management scheduling tool (IScheduler) will be replaced with the vendor's latest scheduling tool and integrated with the STORMS product.	$9,503,263	4/23/18	$89,356	$82,552	$78,078
INVP 4570 US CNI Tech Services-Network Equipment Lifecycle Replacements	This Policy-driven investment will procure networking assets needed to replace out of warranty equipment and support infrastructure in the Energy Management System and Outage Management System (EMS/OMS) Data Centers, Communications rooms, Operations Centers, and Support areas across the National Grid service territory in New York and New England that are no longer supported by the hardware and software vendors.	$9,169,203	8/1/19	$0	$0	$0

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule ISP-1
Page 17 of 23

The Narragansett Electric Company d/b/a National Grid
Post-Test Year Information System Investments for Narragansett Gas

Project	Description	Total Investment	In Service Date	Gas		
				Rate Year	Data Year 1	Data Year 2
S005242 M112 Systemic Improvement	This project replaces the existing FERC module with the FERC on SAP HANA solution. The new HANA solution allows for FERC data to be created in parallel with all other data leading to a faster closing process and real time reporting capabilities.	$8,354,545	7/10/17	$36,105	$34,581	$33,087
INVP 3683X7 Big Data Security Analytics Phase 1 & Phase 2	This project will introduce the new business capability focused on Big Data Security Analytics to enhance and support existing Security Data Analytics. This capability will be integrated with the Cyber Security Operations Center to provide intelligence and further enhance analytical capabilities to respond to threats/attacks in a pro-active manner.The Project will provide National Grid security operational capability to examine large volumes of security related data sets containing a variety of data from multiple sources - including traditional security sources, such as log or audit files, and emerging sources such as images, social data, sensors, etc. - to uncover hidden threats, detect attack patterns and trends, identify suspicious anomalies, and aid in the removal of security threats, in an expeditious and cost effective manner. Real-time analysis will provide prediction and mitigation means for National Grid to discover new threats early and react quickly before they propagate. This capability will be integrated with the Cyber Security Operations Center to provide intelligence and further enhance analytical capabilities to respond to threats/attacks in a pro-active manner. This project consists of two phases.	$8,087,716	3/1/21	$0	$0	$26,225
INVP 4464 Data Visualization	This investment will establish two cloud based self service reporting tools (Tableau and Alteryx). The proposed solution will provide the opportunity for improved decision making through enhanced data mining, decision support, and data visualization capabilities. This will lay the ground work for the migration from current reporting tools which have reached end of life, in addition to providing readily available and proven modern technology.	$8,068,089	9/30/17	$46,244	$42,637	$40,264
Physical Security Replacements	This is annual capital replacement program for Physical Security. Physical Security is responsible for protecting National Grid's personnel and assets, and incorporates a security system as part of the overall security plan. To fulfill this responsibility, it is necessary to ensure that all security related equipment and assets in New England are in good condition. This project replaces assets that are at or near end of life and/or assets that are no longer under vendor warranty.	$6,955,500	Multiple	$34,745	$43,214	$51,907
INVP 4408 Doc Mgmt Systems Replacement Delivery	This investment will provide funding for the purchase and deployment of the Document Management System selected in the commercial RFP event executed in the first half of 2016. Deployment of the new Document Management System will provide a secure and reliable storage solution to serve the needs of the gas and electric business units. The initial partial sanction for this project included funding for the purchase of non-perpetual licenses for a period of one year. Negotiations with the selected vendor "OpenText" has resulted in a lower lifecycle cost the through the purchase of pre-paid perpetual licenses. Purchase of pre-paid perpetual license reduces overall cost of the product by $1.3 million dollars on a nominal basis over a sixteen year period. This partial sanction will provide the necessary funding to proceed with this purchase.	$6,049,256	6/22/18	$36,377	$33,415	$31,570
INVP 3683X13 Domain Based Security Phase 2 (Network Segregation)	This project will implement a Domain-based approach to information assurance for the identification, analysis, and documentation of security issues in the enterprise. Domain Based Security approach helps to analyze information security risks in a business context and provide a clear and direct mapping between the risks and the security controls needed to mitigate those risks. The policy domains will also address the variable risk appetites and requirements for the various business units, enabling National Grid to target the appropriate policies for each unit. Deliver the requirements for security in the organization, taking into account the business that needs to be supported. Security Policy Domains will establish a set of entities, physical and logical, that are subject to a common security policy and also allow each business within National Grid to adopt a risk-based approach to the implementation of information security controls. The approach helps to analyze information security risks in a business context and provide a clear and direct mapping between the risks and the security controls needed to mitigate those risks. The policy domains will also address the variable risk appetites and requirements for the various business units, enabling National Grid to target the appropriate policies for each unit.	$6,000,000	3/1/21	$0	$0	$19,456
Other fiscal plan initiatives	These annual investment plan projects were derived from business need. - INVP 3956 WIFI for Fleet Services Diagnostic Laptops - INVP 4467 STORMS Capital Cost Estimates - INVP 3982 Substation Monitoring-DobleARMS - INVP 4466 Gas Capital Investment Planning Tool - INVP 4480 US Control-Gas System Operating Procedure (SOP) Upgrade - INVP 4390 Plastic Fusion II - INPV 4462 Computapole Enhancements to Support Inspection Types - INVP 4487 Changes to ACIS for PMCC Civil Vendor Billing - INVP 3986 Cascade Electric Application Upgrade Project - INVP 4588 US SAP: Solution Manager Upgrade - INVP 3718 New Medical System	$5,618,031	Multiple	$22,448	$23,281	$21,334

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule ISP-1
Page 18 of 23

The Narragansett Electric Company d/b/a National Grid
Post-Test Year Information System Investments for Narragansett Gas

Project	Description	Total Investment	In Service Date	Gas		
				Rate Year	Data Year 1	Data Year 2
INVP 4564 US SAP: Enhancement Pack 9 Upgrade	The SAP Enhancement pack upgrade is an investment to provide for the upgrade of the core SAP application every two years (biennially) excluding the upgrade work associated with the annual HR service pack which is accounted for under a separate mandatory annual investment. The project would apply the latest agreed SAP service packs for ECC, SRM, PI, Portal, BPC and SolMan to ensure that the SAP application stays within current vendor support and mitigates the risk of system failure by remaining current every two years on the SAP core application. The investment would only include the upgrade packs (non HR) which are supplied by the SAP and would exclude any discretionary enhancements as part of this upgrade or any upgrades associated with ancillary USFP systems (ex. PowerPlan, uPerform, OpenText, SABRIX). The investment would also not account for any upgrade work which may be required on the BI/BW SAP platform. This biennial patching/upgrade strategy is to ensure that National Grid applies the latest service packs every two year in order to ensure proper system operation and application maintenance support.	$5,328,000	3/31/20	$0	$15,525	$32,601
INVP 4395 US Mobile Device Refresh	This policy-driven project will implement 750 mobile devices previously purchased as part of INVP 4671 – Mobile device refresh FY17 project. In addition, the project will purchase 200 new mobile devices and mounting accessories to continue the effort of eliminating old devices from the field. A majority of mobile devices used in the field are more than 5 years old and these devices impact day to day productivity. These old devices break down frequently and can't be easily repaired due to unavailability of parts and accessories (in some cases manufacturers have stopped supporting the devices). The replacement of old mobile devices with latest tough books will allow field technicians to have the reliable equipment and data required to perform their work in a safe and efficient manner.	$4,492,944	3/31/18	$33,454	$30,819	$29,008
INVP 4843 Virtualized Branches	In coordination with the SD_WAN core infrastructure project, this project will build and deploy the SD-WAN environment at the branch locations. This will support the delivery of WAN automation, application based routing and use of the Internet for network transport.	$3,700,000	3/31/20	$0	$10,781	$22,640
INVP 4489 Active Directory Improvements	Active Directory (AD) is a key service that supports core authentication for all National Grid computers and servers logging onto the corporate network in both the United States (US) and United Kingdom (UK). Therefore, AD provides access to all Information Systems (IS). The scope of this initiative is to implement a refreshed global AD infrastructure and support services. The new AD environment will unify all global applications that use the AD service. It is critical that National Grid can ensure that the AD service is reliable and supports core authentication requireme to all current and proposed applications.	$3,555,000	12/31/18	$12,468	$20,785	$19,056
INVP 4491 ICE Replacement	This investment is required to replace the current Instant Messaging, Collaboration, and Email (ICE) services with a set of similar, or enhanced, services provided by Office 365. Office 365 will provide a more effective collaboration and email service (Microsoft Office 365) to meet the business demand for additional capabilities (e.g.: collaboration with external parties) and provide any enabling infrastructure technology necessary before the ICE service contract expires.	$3,447,722	12/31/18	$15,720	$25,369	$23,347
INVP 4606 Data Visualization Expansion	Building upon the success of the Data Visualization (Tableau) core implementation last year, this investment expands its use with additional data and analytics capabilities. Data Visualization will be extended with the build out of dashboards across more business areas in support of their reporting, data retention and regulatory obligations. In addition to enhanced data access, this investment will provide for more advanced analytics through the use of new tools and longer term storage of information within the environment for audit and trending. The investment will introduce additional dashboards within Finance, Customer and Operations in support of reporting requirements.	$3,435,000	6/30/19	$5,608	$20,694	$18,993
INVP 4707 Business Innovation Projects 1	The Business Innovation project provides a funding base and governance structure that allows the Information Services (IS) organization to improve the IS experience for our employees and customers who will experience improved reliability, use ability, speed and efficiency across all functions. The program will also reduce the risk of system failure which have customer, brand and cost implications.	$3,368,613	3/31/18	$19,906	$18,268	$17,248
INVP 4568 US CNI-EMS Lifecycle Hardware and Software Upgrade	The server and workstation hardware for the Energy Management System (EMS) replacement project was purchased in 2010. The hardware is now near peak operating capacity and may constrain the capacity of the associated databases in EMS. The application vendor ASEA Brown Boveri (ABB), is recommending a hardware refresh for the EMS environments in order to increase the capacity of the databases to accommodate future growth. This Poli driven investment will procure the equipment needed for the project stages for the hardware and software refresh of the current ABB EMS.	$3,144,063	8/1/19	$0	$0	$0

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule ISP-1
Page 19 of 23

The Narragansett Electric Company d/b/a National Grid
Post-Test Year Information System Investments for Narragansett Gas

Project	Description	Total Investment	In Service Date	Gas		
				Rate Year	Data Year 1	Data Year 2
INVP 4706 1327 Interfaces - 523 FTS, 340 RDX, 245 MQSI, 253 JCAPS, 44 PM4D, 7 VB	The primary driver for this project is to mitigate the risks of continuing to be reliant on out of support infrastructure. These risks are : •Increased Security risk as out of support infrastructure will not receive security patches. •In the event of failure National Grid IS will be unable to meet the agreed Service Level Agreements (SLAs) for many key applications once the middleware infrastructure goes out of support. The majority of these applications currently have Gold or Platinum SLA's. •The FTS environment has a single point of failure/no redundancy. •The new technology provides functional benefits which will provide productivity improvements enabling improvements in the efficiency of data and file transfer. The 1327 interfaces (523 FTS, 340 RDX, 245 MQSI, 253 JCAPS, 44 PM4D, 7 VB) included in this scope of work will be divided into sprints that will focus on a specific set of interfaces that touch specific sets of applications. Each sprint will be executed sequentially.	$3,083,333	6/30/19	$5,034	$18,575	$17,049
INVP 4348 US SAP: Infrastructure Landscape	This project will create a permanent set of servers used for project development in support of initiatives pertaining to the SAP portfolio.	$2,999,067	3/31/18	$22,331	$20,572	$19,363
INVP 4217 US SAP: Business Planning	SAP's Business Planning and Consolidation (BPC) platform is a module that supports National Grid's financial processes, such as financial reporting, budgeting and forecasting. It allows for real-time monitoring of financial results and improved strategic decisions. SAP HANA is an in-memory database developed by SAP. BPC on HANA has been used by National Grid since November 2012. Upgrading the platform from version 7.5 to 10.1 will allow National Grid to utilize the current version's enhancements and leverage additional benefits, such as reading and aggregating data for reporting purposes, transforming data, and reporting on greater volumes of data.	$2,645,000	3/31/19	$6,928	$15,769	$14,459
INVP 4680 WAP Density deployment	This project will deploy new wireless access points in high density configurations to improve wireless capacity and coverage at 30 identified U.S. sites. In addition, it will decommission and replace currently unsupported wireless bridge equipment to migrate risks associated with failure of that equipment.	$2,546,133	3/31/18	$18,958	$17,465	$16,439
INVP 3683X11 IT/OT Discovery and Implementation Phase 1	This project will allow National Grid the capabilities to discover Smart/IT/OT computing and other devices across the National Grid environment in a centralized location, allowing the business to gain a full inventory of devices/applications/technologies, determine risks associated with those components, identify relevant controls, and management of devices/applications /technologies through their lifecycle.	$2,540,160	10/1/20	$0	$0	$12,413
INVP 4222 Governance Risk & Compliance (GRC) Optimization/Upgrade	This project updates the Governance, Risk and Compliance (GRC) solution of SAP to the vendor supported version. In addition, the project will update the GRC environments from Service Pack 4 to the latest version, Service Pack 17. These updates will ensure that the module, which provides control / roles segregation and Sarbanes-Oxley Act (SOX) guidelines, will be stable and incorporate the necessary program fixes in the new version. It will also integrate the newest features and improvements released by SAP.	$2,522,000	3/1/19	$7,435	$14,983	$13,734
INVP 4562 US SAP: Business Warehouse (BW) Consolidation to HANA Enterprise Cloud (HEC)	This investment is to provide funding to consolidate National Grid Business Intelligence (BI) / Business Warehouse (BW) to HANA Enterprise Cloud (HEC). This project supports Strategy Alignment by delivering •Reporting Platform Consolidation •Maintenance Cost Reduction •Reporting Infrastructure Enhancement	$2,366,000	3/31/19	$6,197	$14,105	$12,934
INVP 3683X8 Enhanced DLP Gateway and Endpoin	Data Loss Prevention (DLP) will enable National Grid's businesses to detect sensitive data in the organization and then be able to identify, implement, and enforce policies for protecting the data without forcing any modifications to the data. The aim of this project will provide enhancements to the existing DLP gateway solution and introduce DLP capability on corporate endpoint devices (Corporate assets such as laptops and mobile devices). Implementation of such technology provides the business with the ability to manage and reduce risk exposure to key information assets, thus protecting National Grid's reputation and shareholder value.	$2,238,480	3/1/21	$0	$0	$7,259
INVP 4364 Wireless Network	This is a policy driven project to replace end of life equipment, decommission legacy wireless networks, and install or expand the current coverage and capacity of the Wireless Local Area Network (WLAN) at various National Grid sites that have been identified as a priority. The project will also strengthen the stability of the wireless network by providing current supported equipment with additional capacity. In addition this project will renew the outdoor (Yard) wireless network for these prioritize sites by replacing out of support access points at field locations to ensure Wi-Fi vehicle communications rem supportable.	$2,221,820	3/31/18	$13,129	$12,049	$11,376

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule ISP-1
Page 20 of 23

The Narragansett Electric Company d/b/a National Grid
Post-Test Year Information System Investments for Narragansett Gas

				Gas		
Project	**Description**	**Total Investment**	**In Service Date**	**Rate Year**	**Data Year 1**	**Data Year 2**
INVP 4481 US MDS-Energy Accounting System (EAS) migration to Wholesale Settlement Application (WSA)	This policy-driven project will consolidate the existing wholesale settlement processing applications into one application for New York (NY) and New England (NE), in order to improve upon the wholesale settlement market reporting and existing business processes. The expanded Wholesale Settlement Application (WSA) will provide enhanced functionality around wholesale settlement quality control in each load zone within the NY and NE jurisdictions. A consolidated, automated, and vendor supported wholesale settlement platform will reduce the risk of settlement reporting failure and data inconsistencies, making the settlement process more streamlined and efficient. As a result of the migration of Energy Accounting System (EAS) into WSA, the project will also decommission the existing EAS application.	$2,160,000	10/1/18	$0	$0	$0
INVP 4563 US SAP: FERC on Hana (FOH)	This project provides funding structure to support FERC on HANA (FOH) upgrade. Electric and gas utilities of all sizes must comply with the Uniform System of Accounts from the Federal Energy Regulatory Commission (FERC) or the National Association of Utility Regulatory Commissioners (NARUC). As government reemphasizes regulatory oversight, National Grid is facing increasingly stringent compliance requirements. To reduce the challenges of FERC compliance, such that filing reports and responding to data requests, National Grid is using the FERC on HANA SAP tool, which, in order to stay in compliance, has to be upgraded as required.	$2,115,000	3/31/19	$5,539	$12,609	$11,562
INVP 4704Q Customer Bill Redesign	The last major bill redesign at National Grid concluded in 2007 with the rollout of the HP-Exstream software and the new "blue-bar" design. The now 10-year-old "blue bar" bill needs a refresh, and the priorities from contact center engagement need to be addressed. The bill refresh and changes implemented will result in direct benefits to customer satisfaction and effectiveness of customer interactions – both direct and digital channels. New "best practices" will give the company a "current" customer interaction – which occurs millions of times each month. No other form of communication affects the company's customers more. Imaging and eBilling will naturally follow as a set of benefits to this project.	$2,108,147	3/31/19	$8,390	$19,097	$17,511
INVP 4280 US VSTIG Bandwidth Ph2	The purpose of the Verizon Secured Telecommunications Gateway (VSTIG) network services is to connect National Grid securely to the internet and oth external business partners. Due to the growth of these services, and other demands within the VSTIG environment, an upgrade is now required. The utilization of both VSTIGs (Billerica and Ashburn) are reaching the capacity limits of the network hardware, which, if not addressed, will lead to poor network performance, impact key business processes, and result in the potential loss of gateway services (such as internet access, cloud services and guest wireless internet access). This "phase 2" project builds upon the additional capacity provided by the phase 1 VSTIG upgrade, which will only alleviate the most pressing capacity constraint issues. Phase 2 will enable the network capacity to be increased up to 1gb/s per VSTIG. This capacity will meet the National Grid demands in the short to medium term. It will also be an enabler for other projects that are dependent upon the capacity increase, such as legacy De-Militarized Zone (DMZ) migration, Wide Area Network (WAN) and cloud services.	$2,089,174	3/31/18	$12,346	$11,330	$10,697
INVP 4709 Data Centre Consolidation efforts	A number of applications were not able to move in the timescales of Transformation and so the physical legacy Data Centers have had to be retained while remediation work is carried out on these applications (retained apps). Once all retained applications are remediated and moved to the new Data Center, the legacy Data Centers will need to be decommissionedIn addition there is a risk to continuing to run systems in the legacy data centres. A number of mission critical systems remain in the legacy data centers running in aged systems connected to aged network platforms. There is a likelihood that either the compute platform or network could fail and the hardware would not easily be restored. A compute platform failure would impact one system, but a network failure could impact multiple systems. Reliability - Old technology is vulnerable to more DRS threats - removing the old technology will mitigate this risk.	$2,000,000	3/31/19	$5,238	$11,923	$10,933
INVP 3683X4 Security Incident Event Management Phase 4 and Phase 5	The Security Incident and Event Management solution provides National Grid with the capabilities to analyze security event data in real time for internal and external threat management, and to collect, store, analyze, and report on log data for compliance and forensics. It provides the capabilities of gathering, analyzing and presenting information from network and security devices; identity and access management applications; vulnerability management and policy compliance tools; operating systems, database and application logs; and external threat data. his security capability will ensure alignment with best practices for cyber security and will provide CSOC and Network teams with actionable information to allow faster response to security incidents and demonstrate the effectives of controls and evidence in compliance with security regulations. This business capability will ensure key stakeholders have access to timely, useful security information relevant to protecting National Grid assets including CNI and Enterprise systems.	$1,999,450	Multiple	$0	$0	$7,207
INVP 3683X5 Identity & Access Management: Shared Area Access Management	This project is National Grid's continual effort to strengthen its Identity & Access Management (IAM) across its businesses. This multi-phase project will continue to expand on the existing capabilities delivered by the IAM Program as part of the Cyber Security Program. Shared Area Access Management will administer access to various shared file areas that exist across National Grid.	$1,740,000	3/1/21	$0	$0	$5,642

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule ISP-1
Page 21 of 23

The Narragansett Electric Company d/b/a National Grid
Post-Test Year Information System Investments for Narragansett Gas

Project	Description	Total Investment	In Service Date	Gas		
				Rate Year	Data Year 1	Data Year 2
INVP 4761 US Foundation Hosting Renewal	In order to address its growing business environment, National Grid must enhance its SAP and High Performance Analytic Appliance (HANA) application support and hosting services. Currently, the application hosting support is provided by T-Systems out of Houston, Texas and SAP HANA services are provided by SAP HANA Enterprise Cloud (HEC) out of Virginia. This project and Freudenberg Information Technology (FIT) will consolidate these two datacenters under one platform for both primary and Disaster Recovery (DR) in the US. The new service provider FIT was selected through a formal Request For Proposal (RFP) process supported by INVP 3924. FIT will supply Platform as a Service (PaaS) for SAP and HANA applications, and ancillary applications including PowerPlan, Open Text, uPerform and SABRIX. National Grid IS will work with FIT to move the SAP application portfolio to a new datacenter. By moving to the new platform, National Grid will eliminate the need to renegotiate contract extensions with current hosting providers SAP, T-Systems and Wipro as well as having to conduct costly upgrades of the existing SAP infrastructure hosted by T-Systems.	$1,636,250	3/31/18	$9,669	$8,873	$8,378
INVP 4632 US Video Conferencing upgrade for RW	The current video conferencing units at Reservoir Woods are on old technology meaning that they are not able to integrate with the rest of the Video conferencing estate and do not provide a consistent user interface. This project will replace the Video Conference units in Res Woods with the current Video Conferencing platform of CISCO's Call Manager. This upgrade will provide consistent integration with the rest of the Video Conferencing estate. Improvements to the effectiveness of meetings are enabled through video conference services. The current services at Reservoir Woods are inconsistent; users find them difficult to use and performance of the service is unreliable. This restricts the number of people using the service and minimizes the opportunity for the Company in providing service to customers. To improve consistency, this project proposes to upgrade videoconference capability at Reservoir Woods to improve the user interface and ensure flexible, compatible technology is in use to ease ability for future upgrades.	$1,588,097	12/31/17	$11,602	$10,733	$10,107
INVP 4830 Migration of Oracle to Linux	This project will migrate our Oracle Database applications that reside on expensive Unix P-Series hardware, to less expensive Wintel/Linux based hardware. Funding for the Wintel hardware along with the application effort to repurpose from Unix to Linux will be covered from this project.	$1,500,000	8/1/21	$0	$0	$2,398
INVP 4397 Ariba TLS and CI Update	The project will address the upgrade of two Systems Applications Processing (SAP) Enterprise Infrastructure components to mitigate the risk of losing the Ariba connection to National Grid suppliers for the purposes of collaboration, and network activities such as the sending and receiving of purchase orders, as well as other necessary interfaces, such as GridForce. The TLS (Transport Layer Security) provides inbound and outbound communications security over the internet.	$1,462,275	8/28/17	$6,538	$6,218	$5,866
INVP 4188 Aging System Stabilize	National Grid's Electric and Gas Operations are dependent on several critical applications that are running on older technology and components which are beyond their support life cycle. For example, several Operations applications are dependent on outdated and soon to be non-supported operating systems components and platforms such as Windows 2003. This investment will upgrade, enhance and redesign some of the higher at risk Operations applications and replace outdated components.	$1,459,505	3/31/18	$9,109	$8,360	$7,893
INVP 4461 Unix51 Interface Migration	At National Grid, a majority of the file transfers are facilitated through the UNIX 51 File Transfer Service (FTS) tool. There are over 70 third parties receiving and sending critical data to National Grid via this service. UNIX 51 is running on aged technology and infrastructure without any support. The FTS service (downstate) was developed almost 20 years ago and is running on an unsupported and unpatchable platform. The business critical interfaces that utilize UNIX 51 from the Customer Related Information System (CRIS) and Customer Service System (CSS) systems to numerous third parties are at risk of failure with no viable contingency plan in place. This investment will provide a centralized expandable environment - Comprehensive Integration Services (CIS) - for additional interfaces to be implemented. Migrating UNIX 51 interfaces to the CIS platform will enable decommissioning of the UNIX 51 server. In Phase 1, analysis, tactical work and migration of the initial set of interfaces will be performed. Target completion for Phase 1 is November 2017. This project, Phase 2, will deliver the migration of the remaining set of business critical interfaces from the unsupported UNIX 51 platform onto the selected National Grid strategic middleware platform (CIS). By leveraging the experience, processes and infrastructure setup from Phase 1, the Phase 2 business critical interfaces are expected to be implemented more efficiently.	$1,308,051	9/30/18	$5,878	$7,566	$6,930
INVP 4693 Enterprise Labs	The project is an initiative within IS to construct and equip an Enterprise Laboratory, which will be available as a Proving Ground or Forum to accelerate the speed of innovation and new technology integration into the Enterprise. The E-Lab will be used to perform trials, tests, and showcase technologies for our customers. The Project Team will manage both the procurement and the suppliers' execution of the design, delivery and implementation of the construction and the technological aspects (hardware and software) that is required. The E-Lab will be located at Reservoir Woods on the second floor in the former High Density File (HDF) room W2-873.	$1,247,083	12/31/17	$9,111	$8,429	$7,937

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule ISP-1
Page 22 of 23

The Narragansett Electric Company d/b/a National Grid
Post-Test Year Information System Investments for Narragansett Gas

Project	Description	Total Investment	In Service Date	Gas		
				Rate Year	Data Year 1	Data Year 2
INVP 4662 - Concur Licenses	This project allows National Grid to implement an end-to-end corporate travel booking and expense process. Concur allows setup of customizable audit rules which should reduce review time of expense items. It also will auto-generate notifications out to end users on outstanding expense items which currently is manually triggered. Both the audit rules and automated notifications should cut down on administrative efforts. This is the second phase of the investment, following last year's license agreement which was completed as part of a broader negotiation with SAP, via a discounted pricing model.	$1,232,000	1/31/18	$7,229	$6,630	$6,257
INVP 4289 US Network Improvement	The original IS Transformation Network implementation project delivered a new National Grid Verizon network and migrated almost every site onto a single Wide Area Network (WAN) using a consistent set of designs, hardware, services and delivery method. A small number of sites were not migrated for various reasons such as potential site closure and Long Island Power Authority separation complexities. The sites that were omitted now need to be migrated to the Verizon WAN service because the legacy services are using unsupported network infrastructure and are unable to offer the functionality and reliability required by the business.	$1,215,547	3/31/18	$7,183	$6,592	$6,224
INVP 4837 SD-WAN Core, automation, orchestration tools and pilot sites	This project will build and deploy the SD-WAN core infrastructure and tools in the Network data centers that will be used to support the SD-WAN as it is deployed throughout the branch locations.	$1,200,000	3/31/19	$3,143	$7,154	$6,560
INVP 3486 US MDS-Itron Enterprise Edition (IEE)	This project will deliver a consistent meter reading platform utilizing the Itron Enterprise Edition (IEE) version 8.1 cloud based solution. This solution will support the migration of meter groups in work streams. Initially targeted are approximately 3,000 MV90 interval collection system New York electric meters that need to be upgraded from 2G to 4G, as the 2G technology is being retired by the communication vendor, and 4G is the current standard wireless communication technology. There are also 400 Massachusetts and 170 Rhode Island meters that are in scope for migration. Currently these 3,600 C&I meters are on the existing MV90 platform with a goal to eventually replace the MV90 with IEE 8.1. This project is necessary as all known carriers are retiring the 2G technology and moving to 4G. A technology has been selected that will align with the roadmap for any future AMI initiatives that may be implemented and will avoid near-term replacement costs at the time of such implementation.	$1,193,859	3/31/18	$0	$0	$0
INVP 3430 Mobility - (MDM) Mobile Device	This project will implement an Enterprise Mobility Management (EMM) service that will allow National Grid to secure and manage mobile apps and content across a variety of mobile devices. National Grid has over 4000 corporate owned mobile devices that are used by the workforce to store information and gain access to network applications, such as email. In addition, Time Transformation project (Time entry system) will be integrated between mobile devices and our backend systems (i.e. iphones, ipads, making external and internal apps available to NG via NG site - push and pull) to enable our workforce to work in a more flexible and efficient manner. Due to the growing use of mobile devices, it is more critical than ever that we have a way to manage these devices so that we can comply with Internal corporate policy, distribute applications, and secure the data on these devices through a central EMM platform. This project will establish and deploy a central EMM service capable of on-boarding 4000 mobile devices. Included in this delivery is the implementation of device and security policies, a corporate apps store, mobile device containers and the infrastructure required to support mobile device access to corporate systems and data in a secure fashion.	$1,017,693	12/31/17	$5,897	$5,442	$5,143
	Total Capital Investment	***$392,715,244***				
	Rent Expense allocation to Narragansett Electric - Gas Segment	***$5,242,846***		*$1,202,307*	*$1,846,683*	*$2,193,855*

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule ISP-1
Page 23 of 23

Schedule __ (ISP-2)

Technology Modernization Investments

TECHNOLOGY MODERNIZATION INVESTMENTS

Project/INVP #	In Service Date(s)	Description of Project/Customer Benefits
US Win7 Refresh Phase 3 - INVP 4307	December 2017	The End User Device Refresh-Windows 7 project will transition the remaining users from XP to the current standard operating system of Windows 7. Currently, there are approximately 6000 users that rely on XP due to legacy applications. XP is no longer in support and Microsoft has stopped producing security patches, thus posing reliability and security risks to the company. This project will remediate the legacy applications to work on Windows 7 and upgrade the users laptops to Windows 7
Office 365 (ICE Replacement) - INVP 4491	December 2018	This investment is required to replace the current instant messaging, collaboration, and email (ICE) services with a set of similar, or enhanced, services provided by Office 365. The current ICE platform cannot support the business demand due to limitations in the current functionality and the inability of the current service to be upgraded.
WAP Density Deployment - INVP 4680	March 2018	This project will deploy new wireless access points in high density configurations to improve wireless capacity and coverage at 30 identified U.S. sites. In addition, it will decommission and replace currently unsupported wireless bridge equipment to migrate risks associated with failure of that equipment.

Project/INVP #	In Service Date(s)	Description of Project/Customer Benefits
Wireless Network - INVP 4364	March 2018	This project will replace end of life equipment, decommission legacy wireless networks, and install or expand the current coverage and capacity of the Wireless Local Area Network (WLAN) at various National Grid sites that have been identified as a priority. The project will also strengthen the stability of the wireless network by providing current supported equipment with additional capacity. In addition this project will renew the outdoor (Yard) wireless network for these prioritized sites by replacing out of support access points at field locations to ensure Wi-Fi vehicle communications remain supportable.
US VSTIG Bandwidth Ph2 - INVP 4280	March 2018	The purpose of the Verizon Secured Telecommunications Gateway (VSTIG) network services is to connect National Grid securely to the internet and other external business partners. Due to the growth of these services, and other demands within the VSTIG environment, an upgrade is now required. The utilization of National Grid's two VSTIGs are reaching the capacity limits of the network hardware, which, if not addressed, will lead to poor network performance, impact key business processes, and result in the potential loss of gateway services (such as internet access, cloud services and guest wireless internet access). This "phase 2" project builds upon the additional capacity provided by the phase 1 VSTIG upgrade, which will only alleviate the most pressing capacity constraint issues. Phase 2 will enable the network capacity to be increased up to 1gb/s per VSTIG. This capacity will meet the National Grid demands in the short to medium term. It will also be an enabler for other projects that are dependent upon the capacity increase, such as legacy De-Militarized Zone (DMZ) migration, Wide Area Network (WAN), and cloud services.

Project/INVP #	In Service Date(s)	Description of Project/Customer Benefits
US Video Conferencing upgrade for Reservoir Woods office - INVP 4632	December 2017	The current video conferencing units at Reservoir Woods (Waltham) are on aged technology that does not provide a consistent user interface. This project will replace the Video Conference units in Reservoir Woods with the current Video Conferencing platform of CISCO's Call Manager. This upgrade will provide consistent integration with the rest of the Video Conferencing estate.
Unix51 Interface Migration - INVP 4461	September 2018	At National Grid, a majority of the file transfers are facilitated through the UNIX 51 File Transfer Service (FTS) tool. There are over 70 third parties receiving and sending critical data to National Grid via this service. UNIX 51 is running on aged technology and infrastructure without any support. The business critical interfaces that utilize UNIX 51 from the Customer Related Information System (CRIS) and Customer Service System (CSS) systems to numerous third parties are at risk of failure with no viable contingency plan in place. This investment will provide a centralized expandable environment - Comprehensive Integration Services (CIS) - for additional interfaces to be implemented.
Enterprise Labs - INVP 4693	December 2017	The project is an initiative to construct and equip an Enterprise Laboratory, which will be available as a Proving Ground to accelerate the speed of innovation and new technology integration into the Enterprise. The E-Lab will be used to perform trials, tests, and showcase technologies for our customers.

Project/INVP #	In Service Date(s)	Description of Project/Customer Benefits
US Network Improvement - INVP 4289	March 2018	This project will migrate four of the existing legacy network sites onto the new Verizon service. This will provide business users on-site with a supportable, more reliable service with greater availability and lower outage times. This will allow us to leverage Verizon's capacity management process which is tightly aligned with National Grid's problem, incident, and change management processes. This in turn should allow us to proactively identify network bottlenecks leading to greater availability and lower outage times.
Mobility (MDM) Mobile Device - INVP 3430	December 2017	This project will implement an Enterprise Mobility Management (EMM) service that will allow National Grid to secure and manage mobile apps and content across a variety of mobile devices. National Grid has over 4000 mobile devices that are used by the workforce to store information and gain access to network applications, such as email. In addition, Time Transformation project (Time entry system) will be integrated between mobile devices and our backend systems (*i.e.*, iPhone, iPad, making external and internal apps available to NG via NG site - push and pull) to enable our workforce to work in a more flexible and efficient manner. Due to the growing use of mobile devices, it is more critical than ever that we have a way to manage these devices so that we can comply with internal corporate policy, distribute applications, and secure the data on these devices through a central EMM platform.

Project/INVP #	In Service Date(s)	Description of Project/Customer Benefits
Hicksville Data Center Improvement (Forward Proxy Upgrade) - INVP 4676	March 2018	Replace end of life proxy appliances with new appliances that support higher throughput capacity. All internet proxy services will be migrated to the new infrastructure and the old hardware decommissioned. If capacity is reached, there will be performance issues that affect services and applications that utilize the Internet.
Call Manager Upgrade - INVP 4577	December 2017	This project will refresh the Cisco Call Manager hardware and software used for managing the Internet Protocol (IP) telephony estate – call distribution and voice mail. This project will also consolidate the call manager from two clusters to one cluster and provide monthly Run-the-Business savings under an updated financial model.
Legacy DMZ Firewalls - INVP 4688	March 2018	New firewalls will be purchased to support the legacy internet gateway at the Metrotech and Henry Clay Boulevard data centers.
Log Logic - INVP 4674	March 2018	This project will replace the Logging services in the VSTIG which are at the end of their useful life and, are currently being supported by Verizon on a best endeavors basis only. The Log Logic service will be replaced by the new Cisco Hyperflex service.
VSTIG Hardware Refresh - INVP 4274	March 2018	Within the VSTIG (Verizon Secure Telecommunications Gateway) solution, the Reverse Proxy (Bluecoat) servers have reached end of life and are no longer supported by Verizon as of February 2017. From that point, any support provided would be on a best endeavors basis only meaning contractual service level agreements (SLAs) cannot be guaranteed. This project will procure, install, and transition the replacement Bluecoat reverse proxy servers which will be fully supported for five years and provide an increase in bandwidth to the existing servers.

Project/INVP #	In Service Date(s)	Description of Project/Customer Benefits
Refresh of network equipment at Verizon supported Sites (transformed sites-core infrastructure sites) - INVP 4645	December 2017	This project is a replacement of aged, unsupported network infrastructure across Verizon Supported sites (Non Reservoir-Woods sites ONLY).
PPMI - INVP 4392	December 2017	This project will improve the IS Project and Portfolio management (PPM) capability in the US with the introduction of the Microsoft Project Online tool to manage Projects, Portfolios, Programs and provide status reporting via a centralized view.
Network Tx-NB/MTC - INVP 4687	December 2017	This project will replace aged network infrastructure at the Metrotech and Northborough sites. This infrastructure is largely unsupported project today. Once completed, the new equipment will be brought under Verizon Support Contract.
NG Labs - INVP 4705	March 2018	This project will equip ngLabs with the necessary hardware and software to serve as proving ground for technology innovation and proof of concept projects. The mission is to bring current and emergent tech in house, execute technology scouting, and partner with the business to create products and solutions to address their needs.

Project/INVP #	In Service Date(s)	Description of Project/Customer Benefits
SharePoint 2007 Decommission - INVP 3667	December 2019	This project will migrate the SharePoint 2007 sites and applications onto a new service as the current service is no longer able to meet service level and functional requirements. Failure of the aged and out of support infrastructure would result in many business processes and teams being unable to access shared data held on the service.
Mobile Application Development Platform (MADP) – INVP 3996	March 2019	This platform will contain the frameworks and tools needed for the development and deployment of custom mobile applications.
Service Now – Release 3 – INVP 4261	March 2018	This is a continual project to improve the Service Management Integration (SMI) processes, including the extension of channels available for contacting help desk and resolving issues.
WAN Bandwidth Upgrades - INVP 4267	March 2018	This is to rollout and deploy additional Wireless Access Points and increase the bandwidth of WAN at selected US sites.
RAS/VPN Re-Platform/Mobile - NVP 4269	March 2018	The original Juniper Remote Access SSL VPN (RAS) deployed by Verizon is now five years old and doesn't support some of the latest mobile capability or integrate easily with other technologies that have been implemented (Cisco ISE). This Project proposes to replace the existing RAS VPN solution with a more modern platform that has improved mobile VPN capability and improved integration with National Grid technologies.

Project/INVP #	In Service Date(s)	Description of Project/Customer Benefits
RSA Re-platform - INVP 4270	March 2018	The existing Managed One Time Password service (MTOP) has been eliminated by Verizon and National Grid is one of the last customers on the service. This project will migrate this service to the current RSA product which provides one time passwords via RSA token or a smartphone app, but also includes a risk based authentication engine that can increase of decrease the password requirements based on your location, device, and access required.
4279 - Citrix Infrastructure Upgrade (Xenapp and NetScaler) - INVP 4729	March 2018	Upgrade/rationalization of Global Citrix infrastructure
Wireless LAN Management Tools – INVP 4284	March 2019	This project is to develop a service level for WLAN and implement the tools required to measure the use, understand capacity/utilization, support connectivity issues and troubleshooting, and help plan for additional growth of the service.

Project/INVP #	In Service Date(s)	Description of Project/Customer Benefits
Legacy DMZ migration to vSTIG - INVP 4362	December 2018	Our internet gateway services are currently comprised of the new strategic service vSTIG and a legacy DMZ service. The internet gateway connects National Grid securely to the internet and other external business partners. The legacy services are currently supporting a significant number of business critical systems and network traffic flows. The hardware and software that make up the legacy network services are experiencing operational issues that are impacting users. This legacy hardware no longer meets the required specifications and cannot be easily restored in the event of a failure, and National Grid does not have a contracted repair Service Level Agreement (SLA) for this equipment from our Network Service Provider. To resolve these issues, this project will migrate all legacy service to the new vStig service.
Data Centre Migration and Capacity Increase Melville - INVP 4377	March 2019	This project will migrate equipment from the Melville Data Center to the company's primary data centers and increase capacity in support of the legacy applications that will remain.

Project/INVP #	In Service Date(s)	Description of Project/Customer Benefits
Active Directory Improvements - INVP 4489	December 2018	Active Directory (AD) is a key service that supports core authentication for all National Grid computers and servers logging onto the corporate network in both the United States (US) and United Kingdom (UK). Therefore, AD provides access to all Information Systems (IS). The scope of this initiative is to implement a refreshed global AD infrastructure and support services. The new AD environment will unify all global applications that use the AD service. It is critical that National Grid can ensure that the AD service is reliable and supports core authentication requirements to all current and proposed applications.
Application Performance Management (APM) - INVP 4490	December 2018 December 2020	This project will implement an Application Performance Management tool to capture and report on application issues.

Project/INVP #	In Service Date(s)	Description of Project/Customer Benefits
Monitoring and Alerting - INVP 4493	March 2018 March 2019 March 2020 March 2021	Build a centralized Application Performance Monitoring platform to collect, present and store data from an end user experience to achieve the following: *Step-change reduction in incident MTTR (Mean Time To Recover): •Earlier detection of performance issues •Fewer false alarms (P1/P2) by having empirical evidence of scale of problem (#users impacted, impact of slowdowns) •Real-time dashboards shared with customer will build transparency showing good performance as well as the true scale of slowdowns/outages
US SAP: Business Warehouse (BW) Consolidation to HANA Enterprise Cloud (HEC) - INVP 4562	March 2019	This investment is to consolidate National Grid Business Intelligence (BI)/Business Warehouse (BW) to HANA Enterprise Cloud (HEC). This will: Consolidate the reporting solutions onto a single platform to reduce costs, including infrastructure hosting and application support costs. Simplify the reporting solution for the business users. Increase cross functional reporting capabilities.

Project/INVP #	In Service Date(s)	Description of Project/Customer Benefits
US SAP: Enhancement Pack 9 Upgrade - INVP 4564	March 2020	The Upgrade Project will apply the latest SAP service packs for Enterprise Central Component (ECC), Supplier Relationship Management (SRM), Process Integration (PI), Portal, Business Planning and Consolidation (BPC), and Solution Manager to ensure that the SAP application stays within current vendor support and mitigates the risk of system failure by remaining current every two years on the SAP core application.
Data Visualization Expansion - INVP 4606	June 2019	This investment will expand the use of the Tableau, reporting platform across more use cases and business areas. Tableau provides data visualizations and analytics that aid management in the development of strategic and operational Plans.
1327 Interfaces - INVP 4706	June 2019	This project will migrate legacy interfaces to new supported middleware services that support file transfers (SAP PI and Oracle Fusion), The current technology is unsupported and is at risk since security patches are no and longer being provided.
Business Innovation Projects 4707 4708 4728	March 2018 March 2019 March 2020 March 2021	The Business Innovation Program will deliver a series projects that include: Big Data Analytics, Process, and Workflow automation with Robotics, CSS system upgrade pilot, and Mobile device capability enhancements. Additionally, application rationalization will be covered under the scope of this investment.

Project/INVP #	In Service Date(s)	Description of Project/Customer Benefits
Data Center Consolidation - INVP 4709	March 2019	This project will consolidate legacy data centers as remediation work is carried out on legacy applications (retained apps). Once all retained applications are remediated and moved to the new data center, the legacy data centers will be decommissioned.
Data Security - INVP 4710	March 2019 March 2020 March 2021	This project is based around a move to protect data through information rights management and advanced cyber protection both for end points and cloud services. The project will be delivered using Microsoft Secure Productive Enterprise Plan E5, a SAAS based subscription product.
EMM Licenses - INVP 4713	December 2018	The Enterprise Mobile Management System (EMM) project will secure corporate data and information stored on mobile devices, mainly by ensuring that policies are enforced on the device. This project will procure the necessary licenses to manage these mobile devices
EMM Phase2 – INVP 4714	March 2018	Rollout of EMM to all corporate mobile devices across the US (about 6000 users).
MWORK and Netmotion Risk Avoidance – INVP 4725	December 2018	Netmotion will be the strategic direction for the MWork application. It is used when mobile field workers move in and out of wireless coverage areas and roam between networks, the product maintains and secures their data connections in order to maximize worker productivity. This project will implement a new solution for MWork that replaces the current Birdstep product with Netmotion.

Project/INVP #	In Service Date(s)	Description of Project/Customer Benefits
Virtual Desktop – DaaS - INVP 4727	December 2019	This project will implement a cloud based desktop as a service (DaaS) offering,
VSTIG Hardware Refresh - IDS Card Replacement - INVP 4749	March 2018	Refresh of the IDS cards in VSTIG to support connectivity up to 10Gb. In addition this project will increase of the MPLS port speed to the VSTIG from 1Gb to 1.5Gb and modify various VSTIG networks (VRFs) to support pent up network bandwidth demand.
MTC and Syracuse Boardrooms & Auditoriums - INVP 4759	March 2018	This project will upgrade and install new Video Conference units.
Mainframe DR Machine - INVP 4760	March 2018	This project will upgrade and improve the performance and capacity profile of National Grid's Mainframe Disaster Recovery platform. This investment will help to avoid potential adverse impact to systems operating on the mainframe.

Project/INVP #	In Service Date(s)	Description of Project/Customer Benefits
US Foundation Hosting Renewal - INVP 4671	March 2018	To address its growing business environment, National Grid must enhance its SAP and HANA application hosting services. Currently the application hosting support is provided by T-Systems out of Houston, Texas and SAP HANA services are provided by SAP HANA Enterprise Cloud (HEC) out of Virginia. This project and the new vendor will consolidate these two datacenters under one platform for both primary and Disaster Recovery (DR) in the US. The service provider will supply Platform as a Service (PaaS) for SAP and HANA applications, and ancillary applications including PowerPlan, Open Text, uPerform, and SABRIX. National Grid IS will work with the provider to move the SAP application portfolio to a new datacenter. The new provider was selected through a formal Request For Proposal (RFP) process supported by INVP 3924.
Dev Test to Cloud - INVP 4478	September 2018	The project will move Development and Test environments from physical to cloud based infrastructure
DR Priority 2 Apps Remediation - INVP 4824	December 2019	Implement the supporting technology tools that National Grid and our suppliers can utilize to design and deploy Disaster Recovery services for Priority 2 Applications.

Project/INVP #	In Service Date(s)	Description of Project/Customer Benefits
DR Priority 3 Apps Remediation – INVP 4825	December 2020	Implement the supporting technology tools that National Grid and our suppliers can utilize to design and deploy Disaster Recovery services for Priority 3 Applications.
EMM Single Sign on - INVP 4826	December 2018	This project will implement VMWare's Workspace One to support single sign on to mobile apps. This will eliminate the need to login more than once to access National Grid mobile apps which are expected to grow significantly in the next few years.
Hicksville Fiber - INVP 4828	March 2019	This project will replace the aged multi-mode fiber optic plant that supports the Hicksville campus with an optimally routed single mode fiber optic cable plant. The project will also include the associated replacement of the Hicksville LAN switches' multimode fiber interfaces (GBICs) with single mode fiber interfaces as part of the migration to the new fiber facilities.
Migration of Oracle to Linux – INVP 4830	August 2021	This project will migrate Oracle Database applications that reside on expensive Unix P-Series hardware, to less expensive Wintel/Linux based hardware.
Network Transformation Continuation-Risk Avoidance - INVP 4834	March 2020	This project will replace aged networking equipment including telephone PBXs.

Project/INVP #	In Service Date(s)	Description of Project/Customer Benefits
Network Transformation Continuation-Substations – INVP 4835	December 2020	National Grid's Transformation project with Verizon included only the office locations and did not include the substations that require card key access and therefore these sites were left on the legacy network. This project is to refresh the network equipment and migrate these sites over to the standard network environment to ensure operational reliability and management under the standard support model.
Network Transformation Continuation-Substations and Security Sites – INVP 4836	December 2020	National Grid's Transformation project with Verizon included only the office locations and did not include the Security sites that require card key access and therefore these sites were left on the legacy network. This project is to refresh the network equipment and migrate these sites over to the standard network environment to ensure operational reliability and management under the standard support model.
SD-WAN Core, automation, orchestration tools and pilot sites – INVP 4837	March 2019	This project will build and deploy the SD-WAN core infrastructure and tools in the Network data centers which in turn will be used to support the deployment of the SD-WAN to the branch locations.
VC - Metrotech Auditorium – INVP 4840	September 2018	Currently there are not adequate video conferencing facilities in the Metrotech auditorium. This project will upgrade and install new Video Conference units.

Project/INVP #	In Service Date(s)	Description of Project/Customer Benefits
VC - Syracuse A39/40 – INVP 4841	June 2019	Install new video conferencing equipment in various rooms throughout the Syracuse Office Complex. Focus on deployment at standard conference rooms given recent deployments of video conferencing at large rooms in Syracuse (auditorium and boardroom).
Virtualized Branches – INVP 4843	March 2020	In coordination with the SD_WAN core infrastructure project, this project will build and deploy the SD-WAN environment at the branch locations. This will support the delivery of WAN automation, application based routing and use of the Internet for network transport.
Cloud Orchestration, Self-service and Broker -INVP 4981	March 2019	This project will provide the capability for users to provision Cloud storage and launch applications without going through an external cloud service provider. Cloud orchestration will arrange or coordinate the ability to automate tasks.
Lincoln Control Room Telephony Replacement	March 2020	Replacement of aged telephony equipment in the Lincoln CNI control room.

Schedule __ (ISP-3)

Cyber Security IS Investments

CYBER SECURITY IS INVESTMENTS

Cyber Security 1 Program Investments

Project/INVP #	In Service Date	Description of Project/Customer Benefits
Enterprise Network Security – INVP 3614D1	January 2018	The Enterprise Network Security (ENS) project has been mobilized to enhance National Grid's ability to detect security threats and determine the nature of incidents as, or potentially before, they occur. The project will deliver best of breed security solutions that: provide end-to-end visibility of the network, govern the secure provisioning of network access resources, and implement malware protection to stop advanced targeted attacks across the Web and E-mail servers. Additionally, the project scope was expanded to deliver a secure network segment to segregate the security solutions and Critical National Infrastructure (CNI) data onto its own network
CNI Network Security – INVP 3614B7	March 2018	The US CNI Secure Communication will identify and implement the most appropriate encryption solution to secure the communication channel between the Supervisory Control and Data Acquisition (SCADA) systems and Remote Terminal Units (RTUs) allowing US CNI management to enforce the communication standards detailed within National Grid's security policies. .
CNI Security Information and Event Management (SIEM) – INVP 3614E4	March 2018	The US CNI Security project provides the US Cyber Security Operations Support team with the capability to perform holistic analysis of the CNI Network and infrastructure. The project will deliver enhanced Security Information and Event Management capabilities to support the detection, investigation and remediation of Cyber

Project/INVP #	In Service Date	Description of Project/Customer Benefits
		Security threats impacting US CNI environments.

Cyber Security 2 Program Investments

Project/INVP #	In Service Date	Description of Project/Customer Benefits
Develop Robust Incident Response - INVP 3683	December 2017	This project will deliver Security services that will ensure contingency and remedial action in response to attempted cyber intrusions. The capabilities implemented will further improve our ability to protect our systems and operations, predict and detect attacks, and respond effectively to events and incidents. This project will be vital in achieving an end state of a risk-based, intelligence led organization that can respond to threats in a proactive manner.
Cloud Security (Cloud Access Security Broker) - INVP 3683B	December 2017	This project will provide the capability to monitor the use of Cloud services and seamlessly enforce security, compliance, and governance policies. Specifically, this solution will provide the capability to: manage user authentication to cloud data, monitor cloud activity, and detect compromised user accounts and insider threats.
CSP 2: US CNI Intrusion Detection / Prevention Phase 1 - INVP 3683X1	December 2018	This project will implement an Intrusion Detection Solution (IDS) to enhance the security protection to cyber assets supporting National Grid US CNI environments. The IDS will provide the capability to monitor the host, network, and/or application for malicious activity and signal if an attack or unauthorized activity is occurring. The solution will also provide the US CNI businesses with the capability to detect abnormal patterns that deviate from normal behavior and use known patterns of unauthorized behavior to predict and detect similar attacks.

CSP 2: IT/OT Discovery and Implementation Phase 1 - INVP 3683 X11	October 2018	This project will assess in further detail, the cyber risks within National Grid's Information Technology/Operational Technology (IT/OT) environments. The project will inventory the growing operational technology estate and analyze the associated risks and issues. Once the full inventory of devices/applications/technologies is established, the Cyber Security team will be better able to determine the risks associated with those components, identify relevant controls, and manage these devices through their lifecycle.
CSP 2: vStig Scaling Upgrades – INVP 3683X12	March 2019	This project will provide the necessary security updates to National Grid's perimeter network environment, Verizon Strategic Internet Gateway (vSTIG). The updates will include enhancements to existing security capabilities that protect against outside malicious cyber threats that are targeted towards the perimeter network.
CSP 2: Domain Based Security Phase 2 - INVP 3683X13	March 2021	This project will leverage the risk assessments and policies, delivered in Domain Based Security Phase 1, to implement specific information security controls (such as network segregation) for each business function.
CSP 2: Domain Based Security Phase 1 - INVP 3683X13	March 2019	This project will implement a Domain-based approach to information assurance for the identification, analysis, and documentation of security issues in the enterprise. The first phase of the project will focus on conducting risk-assessments on the different business lines and developing more personalized, business specific policies based on the risk appetite and tolerance of the particular business function.
CSP 2: Security Research Lab - INVP 3683X14	March 2020	This project will implement a National Grid Security Research Lab to perform testing and research on new cyber technologies. The project will enable applied research focused on cyber threats and countermeasures such as: secure multi-level information sharing, resilient command and control network architectures, and reverse engineering. This project will also ensure new technologies introduced into the National Grid environment do not introduce new

		vulnerabilities, as well as ensuring they provide actionable information to address emerging threats.
Threat Behavior Modeling – INVP 3683X15	March 2020	This project will introduce user behavior analytics which will provide National Grid with the capability to find unknown and hidden threats using data science, machine learning, behavior base lining, peer group analytics, and advanced correlation. This capability will improve the ability to proactively identify potential attacks.
Data Visualization – INVP 3683X16	March 2020	This project will provide National Grid the capability to model and report on enterprise network activity, in a manner that is designed for use by both C-level executives and threat analysts to assess and communicate the enterprise network activity.
Risk Based Authentication – 2FA token alternative – INVP 3683X2	March 2018	This project will introduce the capability to perform risk-based authentication through the use of a token-less software authenticator solution. This new method will perform authentication based on a risk profile associated with a given transaction, thus ensuring users are who they say they are and are only accessing systems and information associated with their profile.
CSP 2: Security Incident Event Management (SIEM) Phase 4 - INVP 3683X4	March 2021	This project will build on the existing SIEM infrastructure implemented as part of the Cyber Security 1 Program. The initiative will focus on identification and prioritization of additional application, system, and device logs from across National Grid into the Cyber Security Operations Center (CSOC) to contribute to the holistic, single-pane of glass view of the company's networks. SIEM 4 will deliver integration/onboarding of a subset of the identified cyber assets, with SIEM 5 delivering the remainder. The project will ensure alignment with cyber security best practices and provide the CSOC and Network teams with actionable information to allow faster response to security incidents.
CSP 2:	December	This project will build on the previous SIEM phases by

Security Incident Event Management Phase 5 – INVP 3683X4	2020	onboarding the next set of identified application, system, and device logs. The project will provide the capability to perform enhanced monitoring of: user and privileged account activity, directory services updates and other system configuration changes, as well as provide log auditing and review and incident response. The project will ensure alignment with cyber security best practices and provide the CSOC and Network teams with actionable information to allow faster response to security incidents.
CSP 2: Identity & Access Management (IAM): Shared Area Access Management – INVP 3683X5	March 2021	This project will extend the IAM solution to administer access to the various shared files areas that exist across National Grid.
CSP 2: Role Base Access Management (RBAC) – INVP 3683X5	March 2020	The Role Based Access Management (RBAC) project will reduce the complexity and cost of security administration in large networked applications by grouping access into functional roles. RBAC will facilitate the management of user access by managing access based on a user's role, rather than on an individual, user-by-user basis
CSP 2: Identity & Access Management: Fine Grained Access Management – INVP 3683X5	March 2019	The Fine Grained Access Management project will deliver the capability to perform a more detailed application-based level of authorization by taking into account the protected resources and its configured policies. This will allow for better controls around user access by creating policies that define which user roles can access software components and distribute policies to integrated applications.
CSP 2: Identity & Access Management: Privileged Access	March 2019	This project will deliver a Privileged Access Management (PAM) solution will provide the capability to temporarily provision and de-provision privileged access to users and provide a detailed audit trail of privileged user actions. Thus, improving the security, auditing, and compliance on

Management – INVP 3683X5		privileged user accounts
CSP 2: US CNI Security Enhancements Phase 1- INVP 3683X6	March 2019	This project is part of continual effort to enhance the security and resilience controls within the CNI infrastructure; thus minimizing the potential loss of an operations service.
Big Data Security Analytics - Phase 2 - INVP 3683X7	March 2021	This project will further enhance the Security Data Analytics capabilities delivered the Big Data Security Analytics Phase 1 project.
CSP 2: Big Data Security Analytics Phase 1 - INVP 3683X7	March 2021	This project will implement the capability to conduct Big Data Security Analytics. This initiative will provide the capability to examine large volumes of security related data from various sources – including traditional security sources such as log or audit files, images, social data, sensors, etc. This project will provide real-time analysis, providing prediction and mitigation means to uncover hidden threats, detect attack patterns and trends, identify suspicious anomalies, and aid in the removal of security threats.
CSP 2: Enhanced DLP Gateway and Endpoint – INVP 3683X8	March 2021	Data Loss Prevention (DLP) will enable National Grid's businesses to detect sensitive data in the organization and then be able to identify, implement, and enforce policies for protecting the data without forcing any modifications to the data. Implementation of such technology provides the business with the ability to manage and reduce the risk of information loss.
CSP 2: Endpoint Scanning	March 2019	This project will deliver the enhanced capability of conducting security management for National Grid owned Endpoint Devices (laptops, desktops, and servers). The solution provides the ability to proactively scan the devices

(Tanium)		for: secure configurations, security patches, and the presence of malware.
CSP 2: Removable Media Control - Full Roll out	October 2019	Roll out of technology that enforces removable media policy on devices connected to enterprise laptops. Unknown or unapproved removable media would be forced to comply with policy, either through reformatting or meeting appropriate encryption standards. Compliant devices would be encrypted in order to protect the data that is stored within the device. The initiative will also scan removable media devices once connected to ensure they have not been compromised in any way
CSP 2: Enterprise Centralized Patch Management	December 2018	This project will implement a centralized patch management solution that provides the capability to: find and implement newly available patches, check systems and computers for vulnerabilities and deploy patches, and test new patches before deployment to the wider network.
CSP 2: Fundamentals Package	December 2018	Implement a number of cyber security "basic" initiatives to increase resilience and raise cyber awareness. Initiatives include: blocking and filtering of undesirable sites, cleaning up proxy categories and creating easy access routes for employees to security policies and information.
CSP 2: Continuous review of Reference Security Architecture	August 2019	This project is part of a continual review of Security Architecture best practices that are leveraged throughout a projects lifecycle. This effort will also ensure Security standards continue to evolve along with emerging cyber threats.
CSP 2:	December	This project will deploy micro-virtual machine software to

Virtualized Browser	2018	aged laptops/desktops that are out of support and may be vulnerable to attack. The introduction of a micro virtual machine will allow vulnerable operations, such as web browsing and downloading attachments to be isolated to a virtual session, thus preventing malicious activity from compromising the device.
GPS Project	March 2021	This project will assess the vulnerabilities associated with GPS technology on the operational technology (OT) environment. This initiative will identify at risk technologies and take remedial action to address them.
CSP 2: Perimeter Enhancements	October 2018	This project will enhance perimeter security through advanced content filtering, traffic routing and Distributed Denial of Service preventative measures; thus preventing the entry and proliferation of known malicious activity (botnets, ransomware, etc.) throughout the enterprise.
CSP 2: Network Access Control	September 2019	This solution will provide the capability for more granular control over whether a device/user is allowed to connect to the network, which area of the network, and what services the device/user can access. Thus, improving the secure provisioning and management of access to network resources.
CSP 2: Internal PKI (Public Key) Infrastructure	October 2018	Implement and deploy an internal certificate authority. Establish an internal, scalable, and cost effective PKI solution, allowing more control over certificates being issued, making it more difficult for malicious actors to impersonate genuine personas.

Testimony of
Johnston and Connolly

JOINT PRE-FILED DIRECT TESTIMONY

OF

ANTHONY H. JOHNSTON

AND

CHRISTOPHER J. CONNOLLY

Dated: November 27, 2017

SUMMARY

Anthony H. Johnston is the Senior Vice President overseeing the design, development, and delivery of the National Grid's multi-year, enterprise-wide, gas-business program, referred to as the Gas Business Enablement Program, and its anticipated benefits. Christopher J. Connolly is the Vice President of Process and Business Requirements for the Gas Business Enablement Program overseeing the development of standard business processes and the implementation of Gas Business Enablement capabilities across National Grid's gas and electric distribution operations. Specifically, their joint testimony presents an overview of the Gas Business Enablement Program and the Company's proposal for associated cost recovery.

Table of Contents

I. Introduction

Q. Mr. Johnston, please state your full name and business address.

A. My name is Anthony H. Johnston. My business address is One MetroTech Center, Brooklyn, New York 11201.

Q. By whom are you employed and in what capacity?

A. I am employed by National Grid USA Service Company, Inc. (the Service Company), a subsidiary of National Grid USA (National Grid). Effective April 1, 2016, I was appointed Senior Vice President for National Grid's Gas Business Enablement Program. In this role, I am accountable for the design, development, and delivery of the Gas Business Enablement Program and its anticipated benefits.

Q. Please describe your educational background and professional experience.

A. I earned a Master of Engineering Science from Oxford University in 2002 and a Master of Business Administration from Cranfield University in 2006. I am also a Chartered Professional Engineer. I started with National Grid in 1997 and have held a number of technical positions in system operations and network design, based in the United Kingdom. I subsequently moved to the United States to join GridAmerica LLC, a wholly-owned subsidiary of National Grid based in Cleveland, Ohio, where I was engaged in transmission planning. In 2006, I returned to the United Kingdom to work in National Grid's U.K. gas distribution business, where I was responsible for network design, including renewable gas projects. In 2010, I was promoted to the position of Vice

President of Customer Operations. In this role, I had responsibility for the gas call centers, resource planning, and dispatch and mapping teams. Beginning in 2012, I served as Chief of Staff for the Company's former global Chief Executive Officer, Steve Holliday.

In 2014, I relocated to the United States as the Vice President of Customer Meter Services, where I had responsibility for more than 2,400 personnel supporting National Grid's electric and gas distribution businesses in the United States. With respect to the Rhode Island gas business, I had oversight responsibility for all field service personnel providing gas emergency response, meter-related activities (including meter installation and removal), meter reading, bill investigations, collections, and other field operations related to billing. I was also responsible for overseeing the gas dispatch centers. I held this role until assuming my current position in April 2016.

Q. Have you previously testified before any regulatory commissions?

A. Yes. I submitted pre-filed testimony to the New York Public Service Commission in the 2016 KeySpan Energy Delivery NY[1] and KeySpan Energy Delivery Long Island[2] Rate Case 16-G-0058 and 16-G-0059 and the 2017 Niagara Mohawk Power Corporation Rate Case 17-E-0238 and 17-G-0239. Most recently, I submitted pre-filed direct testimony to

[1] The Brooklyn Union Gas Company d/b/a National Grid NY (formerly d/b/a KeySpan Energy Delivery New York) (KeySpan Energy Delivery New York).
[2] KeySpan Gas East Corporation d/b/a National Grid (formerly d/b/a KeySpan Energy Delivery Long Island) (KeySpan Energy Delivery Long Island).

the Massachusetts Department of Public Utilities in the 2017 Boston Gas Company and Colonial Gas Company, each d/b/a National Grid Rate Case Docket No. D.P.U. 17-170.

Q. Mr. Connolly, please state your full name and business address.

A. My name is Christopher J. Connolly. My business address is 404 Wyman Street, Waltham, Massachusetts 02451.

Q. By whom are you employed and in what capacity?

A. I am employed by the Service Company as Vice President of Process and Business Requirements for the Gas Business Enablement Program. In this role, I am responsible for developing standard business processes across the operating companies and the implementation of capabilities in the new solutions driven from business requirements that will support enhanced customer satisfaction, improved safety and compliance performance, and enhanced employee engagement.

Q. Please describe your educational background and professional experience.

A. I received a Bachelor of Science in Mechanical Engineering Technology from Northeastern University in 1999. I have worked in the energy industry for approximately 19 years in various capacities, first as a contract engineer for DistriGas of Massachusetts Corporation beginning in June 1998 until October 1999 when I joined Boston Gas Company. From October 1999 through October 2001, I held various engineering and operations supervisory roles at Boston Gas Company including oversight for gas system

relocation and infrastructure modernization activities associated with Boston's Central Artery Tunnel "Big Dig" Project. Following its acquisition of Boston Gas Company in 2001, I continued my tenure in operations with KeySpan Corporation from 2001 to 2007 with responsibility for the design and execution of complex construction projects across KeySpan Corporation's New England service territory in Massachusetts and New Hampshire. In 2007, when National Grid acquired KeySpan Corporation, through 2016, I held a number of end-to-end process focused-leadership positions of increasing responsibility within gas engineering and operations. I co-led the development of the Process Excellence Organization in 2013 through 2015, during which time I assembled a process-focused stakeholder team responsible for identifying improvements in safe and reliable gas system operations while ensuring compliance across all jurisdictions. Further, I directed enterprise-wide engineering teams advancing complex engineering, capital work plan strategies, public works projects coordination, and gas growth analysis. In addition, the teams I supervised supported the safe and reliable execution of the gas capital work plan and provided engineering support during emergencies. From February 2015 through July 2015, I took on the role of Acting Vice President of Gas Systems Engineering and subsequently the role of Director, Gas Project Development from August 2015 through April 2016. I was named to my current position on May 1, 2016.

Q. Have you previously testified before any regulatory commissions?

A. I have testified before the Massachusetts Energy Facilities Siting Board on behalf of Colonial Gas Company d/b/a National Grid in support of its petition for approval to

replace 25 miles of high pressure distribution assets located on Cape Cod, Massachusetts in Docket No. EFSB 16-01.

Q. Would you please explain the naming conventions that you will be using in your testimony and associated schedules to identify the various entities involved in this proceeding?

A. Certainly. This proceeding is a ratemaking proceeding for the electric and gas distribution operations of The Narragansett Electric Company, which constitute the regulated operations that National Grid conducts in Rhode Island. In this case, we will refer to the regulated entity as the "Company," where the reference is to both electric and gas distribution operations on a collective basis. Where there is a need to refer to the "stand-alone" or individual electric or gas operations of The Narragansett Electric Company, we will use the terms "Narragansett Electric" or "Narragansett Gas," respectively, as appropriate. Where we refer to "National Grid USA", we will use the term "National Grid"; where we refer to "National Grid plc," we will use that specific term.

Q. What is the purpose of this joint testimony?

A. The purpose of this joint testimony is to present an overview of National Grid's multi-year, enterprise-wide, gas-business program referred to as the Gas Business Enablement Program, as well as the Company's proposal for associated cost recovery. The Gas Business Enablement Program will implement three, inter-related, core operating

capabilities (Work Management, Asset Management, and Customer Enablement) necessary to support National Grid's U.S. gas distribution business. National Grid estimates that it currently relies on approximately 117 sub-systems, applications, databases, or spreadsheet systems across the U.S. gas business to perform the work processes that support these capabilities. With full implementation, this number will be reduced by over 75 percent to less than 30 systems, sub-systems, and/or applications across six gas distribution companies operating in three jurisdictions (Rhode Island, Massachusetts, and New York). In Rhode Island specifically, National Grid estimates that implementation of the Gas Business Enablement Program will reduce the number of systems, applications, databases, and spreadsheet systems from 37 to 19. Schedule GBE-1 shows an illustrative view of the current and future state of these systems, applications, and databases.

The Gas Business Enablement Program will accomplish a number of important, customer-focused objectives. From a functional perspective, the Gas Business Enablement Program will streamline processes and create a single set of integrated applications for core operating systems, significantly improving the ability of employees to perform their job functions effectively. The Gas Business Enablement Program is also designed to improve National Grid's U.S. operating companies' ability to achieve and maintain compliance with state and federal regulatory requirements across all three jurisdictions by improving work management and the flow of information necessary for compliance. However, at its heart, the Gas Business Enablement Program is aimed at

improving the customer experience to meet the relatively high customer expectations that exist in today's operating environment, and which are simply not possible to meet using today's operating processes. Fundamentally, the implementation of Gas Business Enablement will improve the Company's ability to provide safe, reliable, and cost-effective delivery of natural gas to its customers. In addition, for certain business functions that have shared responsibilities across Narragansett Gas and Narragansett Electric, such as Customer Meter Services, Dispatch and Scheduling, and the Customer Contact Center, standardized processes and new solutions will be implemented through Gas Business Enablement to support electric customers.

For reasons that we will discuss in this joint testimony, implementation of the Gas Business Enablement Program represents a critical step-change in National Grid's operating platform that will require substantial investment across all three operating jurisdictions over a multi-year period (*i.e.*, annually through Fiscal Year 2023). Because the annual cost of capital investment by the Service Company is charged to its operating affiliates as expense, recovering the incremental expense change in each year of the Gas Business Enablement Program implementation will be necessary to support the program. Accordingly, this testimony is designed to: (1) provide the Rhode Island Public Utilities Commission (PUC) with detailed information about the Gas Business Enablement Program and the reasons for its implementation; and (2) support the Company's request for recovery of the reasonable and prudently incurred costs of making a step-change improvement for the direct benefit of customers.

Q. Why is it necessary for the PUC to consider allowing cost recovery for the Gas Business Enablement Program in this proceeding?

A. The total anticipated investment in Gas Business Enablement is approximately $478.3 million across the U.S. gas distribution business, which involves three operating jurisdictions – Rhode Island, Massachusetts, and New York – serving 3.5 million gas customers. Gas Business Enablement will be implemented in stages starting with Rhode Island, followed by Massachusetts, then followed by Niagara Mohawk Power Corporation in upstate New York, and finishing with KeySpan Energy Delivery Long Island and KeySpan Energy Delivery New York in downstate New York.

For the Rhode Island component, the estimated investment of $38.5 million for Narragansett Gas and $5.0 million for Narragansett Electric will take place beginning in Fiscal Year 2017 and continuing through Fiscal Year 2023. To accomplish implementation, National Grid will incur both capital costs and operating and maintenance (O&M) expense in each year of the program. The incremental annual cost will be significant, but will be commensurate with the value gained by customers in relation to gas safety, reliability, service, and efficiency. For example, in Rhode Island, the incremental annual expense associated with the Gas Business Enablement Program during the implementation period is projected as follows:

Fiscal Year (FY) Period	Revenue Requirements for Capital Costs	O&M (Gas)	Estimated Total Annual Expense Charged to the Company
FY 2017		$1,176,955	$1,176,955
FY 2018	$66,415 (Gas) $26,083 (Electric)	$1,284,801	$1,315,216
FY 2019	$1,830,808 (Gas) $472,309 (Electric)	$3,943,863	$5,774,671
FY 2020	$2,416,340 (Gas) $634,322 (Electric)	$2,282,372	$4,698,712
FY 2021	$3,223,587 (Gas) $578,931 (Electric)	$1,128,389	$4,351,976
	TOTAL ANNUAL EXPENSE – (2017-2021)		$17,317,530

Given the ramp-up of annual expense as the Gas Business Enablement Program is implemented, it will be difficult to set a representative level of expense in base distribution rates without either locking in an annual amount that (1) is at the highpoint and inordinately large as a line item in the revenue requirement (in Fiscal Year 2019, approximately $5.7 million for Narragansett Gas and approximately $0.5 million for Narragansett Electric), thereby imposing rate recovery on customers that is not aligned with actual program costs, or (2) understates and broadly under-collects the investment made in the Gas Business Enablement Program. Moreover, program implementation (and the associated cost) is scheduled to commence in 2018, while this case is pending before the PUC, making it difficult to capture costs in the related rate decision.

Given the overriding fact that the Gas Business Enablement Program is a unique, transformative initiative providing direct and tangible benefits to customers, consideration of the Gas Business Enablement Program costs in this docket is warranted

and appropriate because: (1) the Gas Business Enablement Program involves the replacement of systems that support three major, core operating capabilities on an integrated, rather than sequential, basis, because it is cost-effective to take this approach; (2) the Gas Business Enablement Program extends across six gas and four electric distribution companies operating in three jurisdictions, with differing timelines for rate cases and rate-recovery mechanisms in each jurisdiction; and (3) program implementation spans a relatively extended timeline of up to five years with substantial incremental expense in each year.

As discussed below, the development of work management, asset management, and customer-enablement capabilities reorganized onto a single, operating platform is critically needed due to the fact that the current systems, sub-systems, and/or applications currently supporting National Grid's U.S. gas business are difficult for employees to navigate, are in many cases no longer supported by vendors, or are otherwise unsuitable to support gas operations into the future. Implementation of the systems within the Gas Business Enablement Program on an integrated basis in all three jurisdictions to establish the three major capabilities will cost customers less than implementing the same systems one at a time by jurisdiction because it will avoid costs that would arise with work completed on differing timelines, with potentially differing vendors. For these reasons, it is imperative that the Company obtain revenue support for the Gas Business Enablement Program in this case to be able to continue implementation in Rhode Island, which will

ensure customers will receive improved safe and reliable gas service with significantly improved customer service.

Q. Are you presenting any schedules in addition to this joint testimony in support of the Company's request relating to the Gas Business Enablement Program?

A. Yes. In addition to this joint testimony, we are sponsoring the following schedules in support of the Company's request for cost recovery for the Gas Business Enablement Program:

Schedule Designation	Description
Schedule GBE-1	Depiction of Current and Future State Systems in Rhode Island
Schedule GBE-2	Key Initiatives By Gas Business Enablement Workstream
Schedule GBE-3	Gas Business Enablement Corporate Governance Structure
Schedule GBE-4	Gas Business Enablement Roadmap
Schedule GBE-5	Example of Gas Operations Capabilities with Gas Business Enablement
Schedule GBE-6	Example of Customer Experience Capabilities with Gas Business Enablement

Q. How is your testimony organized?

A. Section I of this testimony is the Introduction. Section II discusses the operating challenges that are creating the imperative for development and execution of the Gas Business Enablement Program. Section III discusses the Gas Business Enablement Program governance structure and procurement process to assure program costs are reasonable and prudently incurred. Section IV describes the process changes that will result from program implementation and identifies the efficiency improvements and customer benefits that will result from program implementation. Section V reviews the Company's proposal for cost recovery to support program implementation.

II. Imperative for Development of the Gas Business Enablement Program

Q. What is the genesis of the Gas Business Enablement Program?

A. In the course of day-to-day operations, employees are facing substantial challenges in scheduling and completing work, communicating both externally and internally regarding customer service needs, capturing and accessing data necessary for the various business processes, and discerning whether, when, and how work is getting done. These challenges arise from the fact that employees must navigate numerous, disparate, inefficient, and/or manual systems and processes within the gas distribution business to perform critical functions for gas operations and to provide quality field service to gas customers. In Rhode Island, this state of affairs has made it difficult to plan, schedule, and complete mandated programs to satisfy state and federal requirements for timely completion and tracking of the work. The Company continues to rely on manual, paper-

based processes to manage the work. Where automated systems do support the Company, the functionality is limited and still requires significant manual intervention to collect and input data, run reports, and track costs.

All work streams that would normally be associated with an overarching Work Management, Asset Management, and Customer Enablement system are performed by employees relying on less-than-adequate work and asset management systems resting on a combination of software applications, databases, and spreadsheets that are used in parallel with or to facilitate existing manual processes to manage the business. National Grid has used these systems for as long as possible to support business operations. However, at this point, the need for a broad-based software solution providing a stronger operating platform is an imperative because there is risk involved in continuing to rely on the current processes and sub-systems to support safe and reliable operations while meeting customer expectations.

Q. What is creating the imperative for the Customer Enablement component of the Gas Business Enablement Program?

As National Grid is confronting the challenge of establishing a new platform for the work management and asset management systems, the landscape for serving utility customers is undergoing unprecedented change in relation to digital technology and escalating customer expectations. The electric and gas distribution industries are experiencing pressure to meet customer expectations that are being formed by customer experiences

with other goods and services vendors increasingly supported by digital technology, allowing for quick and easy customer-service interfaces, among other advancements.

For example, many of National Grid's customers transact business with other vendors that offer customer-service features such as the ability for customers to choose their communication preference with the vendor (*e.g.* to communicate with the vendor on service visits through text messages; and to take advantage of shorter appointment windows). Many service providers now have easy-to-use web portals and customer applications that offer greater scheduling and rescheduling options. With other vendors, customers frequently have the option to make and/or reschedule service appointments by taking a few moments to log in online through a mobile device and choose another time for the appointment, without ever having to interact on a personal basis with the vendor's customer-service department.

For gas utility services, the same customer has no alternative for scheduling or rescheduling an appointment than to place a telephone call to customer service and get back in the queue for the next available appointment with no direct line of sight into the options available, because only the customer service representatives have access to the appointment schedule. Customers expect to have the same level of ease and convenience with their gas or electric utility as they do with other household vendors. As a result, it is necessary for National Grid to accomplish a step-change in the delivery of customer

service that can only be achieved with a technological solution that provides a fundamental upgrade from the systems relied on to provide service today.

Collectively, these two dynamics – the resolution of operating risk in relation to the sub-systems relied on to perform work functions and the need for improvement in customer-contact alternatives – create an indisputable imperative for implementation of the Gas Business Enablement Program. It is clear that National Grid must make a step-change to create the platform that will enable more effective front-line field operations and customer service. It is also clear that the intensifying pressure to create a digital platform that will allow for quick and easy customer interactions with National Grid needs to be addressed through the development of digital solutions. Therefore, National Grid has launched the Gas Business Enablement Program to meet the imperative and will accomplish a major step-change in the operating platform for the U.S. gas business with program completion.

Q. What are the specific factors creating operating risk in relation to front-line business processes?

A. Fundamentally, National Grid's U.S. gas business is in an unsustainable position in terms of meeting operating and customer-service requirements with current, legacy systems within the rapidly changing external environment. Approximately 94 percent of the "front office" systems currently used by the U.S. gas distribution business will reach the

end of useful life within two years, making it increasingly difficult to maintain the reliability of critical, core operating systems.

In particular, the ability to make modifications to the software to adapt to new needs or regulations is severely limited, if possible at all. Many of these systems are no longer supported by the vendor and the software is written in older code that is not flexible or modifiable and therefore cannot be used to address changing regulatory and customer expectations. The age of the existing applications drives a risk of system outage as reliability of the old systems continues to dwindle. The cost to update/upgrade the existing systems individually would be higher and would not result in the benefits envisioned with the Gas Business Enablement Program, which will replace the existing environment with a holistic solution on a new modern platform to address risk, reliability efficiency, and customer interaction.

Q. Are there any other considerations that impact the reliability of these systems in supporting operating activities?

A. Yes. Over time, as the gas distribution business has evolved, work processes have moved forward through reliance on successive stages of "work arounds," which have made those work processes more and more complex. Few of the legacy company practices and processes are standardized, particularly in relation to data storage, asset records, and mapping systems. The sub-systems/applications are databases, applications, and/or manual processes tracked through spreadsheets with severely limited connectivity to each

other. This complex patchwork of applications makes it very difficult for various operating units to work together or to have visibility of the work performed in the field or at a customer's home. Many of the processes are highly dependent on manual processes to track whether work is completed in compliance with applicable requirements. In addition, it is becoming increasingly difficult and costly to maintain these disparate systems and to engage employees in the work necessary to navigate the processes and to successfully meet the challenges imposed by this situation.

By replacing the existing sub-systems, applications, and databases with three core systems, the entire U.S. gas business can be reorganized onto a single operating platform, within three overarching systems to perform day-to-day work and customer interactions with greater effectiveness than is possible today.

Q. Will the implementation of Gas Business Enablement help to improve the Company's ability to achieve compliance with regulatory requirements and expectations?

A. Yes, it will. Gas safety for customers, the general public, and employees is of paramount importance. Aging, disparate, and duplicative systems hamper the Company's ability to demonstrate compliance and manage performance. They also lack the flexibility to address a changing regulatory and customer environment. Gas-safety compliance challenges arise not only as a result of system and data gaps, but also due to the difficulty of providing effective technical training to employees on complicated work methods and

procedures that are necessitated by the less-than-adequate work process associated with legacy systems. Implementation of the Gas Business Enablement Program will assist in addressing these considerations.

In addition, although regulatory requirements and expectations have been rapidly increasing since the 2010 San Bruno incident in the San Francisco area and events in Allentown, Pennsylvania and East Harlem, New York, the current systems cannot be modified to meet increasing requirements, thereby requiring manual work processes to achieve compliance. Gas Business Enablement will provide consistent applications throughout the business and provide the necessary tools to accurately track, store, and report on gas operations data. These items include the required data compilation and retention in relation to leak and corrosion repair work to manage the Company's Distribution Integrity Management Plan and Transmission Integrity Management Plan requirements and assistance in satisfying the ten key elements of the American Petroleum Institute's recommended pipeline safety standards (Recommended Practice 1173). Historic and future compliance issues are arising because of the existence of dis-jointed, disparate, outdated systems that make it difficult to keep up with current regulatory obligations and demonstrate compliance with them. In Rhode Island, for example, the disparate outdated systems make it difficult to take into account planned main replacements and repeat odor calls to the Customer Contact Center when prioritizing Grade 2 leak repair activities.

Q. Does the customer experience provided today through current systems meet the expectations of customers?

A. No. As mentioned above, without the replacement of the current systems, National Grid cannot adapt to the way customers expect to conduct business with a gas and electric utility. Customers today have different expectations of customer service. In particular, the expectation of fast, easy, mobile applications and solutions is shared by all customers, particularly as relatively younger customers join the customer base. Interactions with other industries have already established customer expectations and preferences and gas and electric utilities cannot meet these expectations without new systems. Customers expect to have access to mobile applications that can be used to set-up or reschedule service appointments, find out the status of their request, or obtain information about outages. Having mobile access and interactions with the utility that include text messages and information regarding service technicians that will be arriving to a customer's residence or business not only represents helpful information for customers, but reduces the inability to complete work due to customer availability and also constitutes a level of service and security that is unattainable in the absence of these technological solutions.

Q. What are some other examples of how customer expectations changing?

A. Today, customers of a gas or electric utility can use mobile applications to request a car for pick-up at a designated location and are almost instantly provided with the name, type of car, and picture of the person performing the pick-up, with payment made

simultaneously through the same application. Customers are also able to easily use mobile applications or websites to order groceries or other goods and have those goods delivered right to their front door within one day, or even sometimes the same day. When customers experience such a high level of service and ease of service in one area of their commercial transactions, they begin to expect that level of ease with other services they use.

For example, applications that allow customers to easily access information regarding the deployment of resources teach customers that all deployed resources can easily be tracked electronically. However, if a customer called National Grid today to ask why a National Grid truck was working at the end of the customer's street, it would not be a simple task to get that answer. The customer would need to call the Customer Contact Center and speak with a representative who would need to research the situation because the representative would not have visibility to the reason that work is being performed at the end of the customer's street. By the time an answer is provided to the customer, it may be of no use as the truck could already be gone from the area. With a single, streamlined work-management system in place across National Grid's operating jurisdictions, the Contact Center representative and others involved in the work process would have complete visibility into this information and could provide information to customers almost instantaneously.

Q. Are there other examples of how the front-line work processes and customer-service delivery can be improved through the Gas Business Enablement Program?

A. There are numerous examples of how the Company's operations would be made more effective and the customer experience improved as a result of Gas Business Enablement Program implementation. Implementation of the Gas Business Enablement Program and the establishment of an enterprise-wide Work Management, Asset Management, and Customer Enablement system will result in the upgrade of gas and customer processes conducted by the Company to perform day-to-day operations. The new systems will provide more complete data capture and enable associated data reporting; eliminate over-reliance on paper records; create greater visibility of work requirements; and improve the effectiveness of field work and customer interactions. To the customer, these changes will translate into the ability for National Grid employees to obtain information in the field regarding the customer's facilities and service requirements on a real-time basis without resorting to paper records; the ability to schedule work at one time that may otherwise have required multiple visits to the customer's residence or business; the ability to take and store pictures of the customer's facilities to track atmospheric corrosion and other conditions rather than relying on written notes; and the ability to instantly update mapping systems rather than waiting for data entry back at the office.

More formally, the Gas Business Enablement Program will design, standardize, and implement core systems to support operations and customer-service delivery in Rhode Island, Massachusetts, and New York. This includes:

1. Implementation of an enterprise-wide asset and work-management platform for the U.S. gas business;

2. Establishment of a scheduling platform to support optimized scheduling, work bundling, and routing of work;

3. Development of an integrated Geographic Information System (commonly referred to as GIS) with accurate land-based maps and conversion of gas-service records and sketches, available with mobile functionality;

4. Implementation of a field mobility solution with base capabilities that include views of work assignment, electronic work packages, capture of work status, and completion data, and capabilities to initiate work, attach pictures, and view legacy maps;

5. Implementation of the Customer Experience solution that will be deployed to the Customer Contact Center to support improved customer interactions with Contact Center representatives along with a web-based self-service customer portal;

6. Establishment of an enterprise-wide program portfolio management platform for program routing and approval, with the ability to forecast cost, integrated with scheduling, and design; and

7. Development of an Asset Investment Planning and Management tool (*i.e.*, software application) to perform asset condition assessment and risk ranking/prioritization of asset replacement.

The integration of these core systems housing records relating to gas distribution and gas transmission assets and various transactional data will support a more simplified approach to asset management and work administration. In addition, the integrated implementation of the core work management, asset management, and customer enablement systems will make available valuable tools such as a mobility solution for leak investigation and inspection work orders and enhanced employee utilization.

The Gas Business Enablement Program will also implement standardized operations processes and training in a number of areas, which have not previously been standardized

because of the complexities inherent in relying on multiple supporting systems. Some of the key work-process improvements would include:

1. Improved methods of employee training on new standardized processes and technology and a modernized approach to field technical training;

2. Establishment of data-management principles and governance processes that would manage the relationships among defined sets of data (on assets, people, work orders, etc.), the movement, cleansing, and conversion of data from a source application to a target system, data retention policies (business, regulatory, and legal holds), data archiving policies, data deletion and destruction policies, and digitization of records;

3. Specification of an organizational design including role descriptions, accountabilities, span-of-control analysis, retirement and attrition analysis, role title rationalization, and diagnostic recommendations;

4. Delineation of the standard processes for work performed by internal and contract resources;

5. End-to-end work processes will include the American Petroleum Institute's recommended pipeline safety standards (Recommended Practice 1173) to support compliance-driven requirements;

6. Identification of best practices for warehouse and transportation operations to increase material readiness and create inventory certainty; and

7. Standardization and improvement of the processes and related procedures between supply chain and gas operations functions.

Schedule GBE-2 identifies key initiatives within the Gas Business Enablement Program and the workstreams associated with each initiative.

Q. Please describe how Gas Business Enablement will address the customer experience.

A. Another key element of Gas Business Enablement is that it will provide improvements to customer and employee interaction. A flexible interface will be integrated with the core

systems to allow customers, Contact Center, and field employees to operate on a common platform and more easily access data. An application portal will be developed and integrated with work management and scheduling solutions that will allow customers to interact with the Company by receiving updates based on their preferences for appointments; addressing inquiries for new gas connections and conversions; and having access to information about work on their streets or in their neighborhoods.

Similarly, an employee application portal will be developed and further integrated with the work management, scheduling, dispatch, and Geographic Information System to support one view of relevant information, such as asset and field data including past transactions for Contact Center representatives and field employees to better communicate with customers and meet their needs. This interface also builds the capabilities necessary to rapidly adapt processes, capture data, and address developing channels for customer engagement in the evolving future energy marketplace.

III. Gas Business Enablement Governance and Procurement

Gas Business Enablement Governance Framework

Q. How is National Grid approaching the management of the Gas Business Enablement Program given the broad scope, complexity, and cost of the program?

A. Given the broad scope, complexity, and cost of the Gas Business Enablement Program, National Grid has proceeded with program development using a well-defined management structure with defined leadership roles and accountabilities [depicted in

Schedule GBE-3]. In that context, National Grid has made a number of decisions in structuring the Gas Business Enablement governance framework to incorporate lessons learned from the past. For example, the planning assumptions for the Gas Business Enablement Program avoid a "Big Bang" approach to implementation and, instead, adopt a phased approach reflecting process, technology, and organizational limitations and opportunities.

In addition, National Grid is planning to deploy "off-the-shelf" capabilities to the maximum extent possible to minimize the customization of the system and preserve the flexibility and functionality of the system as designed. In addition, the Gas Business Enablement Program has developed a well-defined program roadmap to reduce risk in implementation and to provide clear visibility of critical path dependencies to assure successful implementation as each phase progresses [provided as Schedule GBE-4]. Lastly, National Grid has initiated a rigorous, competitive, and analytical process to identify third-party partners to assist in designing, planning, and executing the Gas Business Enablement Program subject to clearly defined contractual parameters and performance requirements.

This Gas Business Enablement Governance Framework and the rigorous procurement process employed to identify third-party partners to assist in developing the Gas Business Enablement Program are significant management tools to make sure that program costs are reasonably and prudently incurred in the course of achieving the identified program

benefits for customers. In particular, National Grid has limited the risk associated with implementation through a fixed-cost arrangement with the program-delivery vendors and clearly defined requirements and work-scopes within the contracts developed jointly by the National Grid team and vendors during the procurement process.

Q. Please provide an overview of the Gas Business Enablement governance framework, team, and delivery partners.

A. There are several components to the Gas Business Enablement governance framework, as shown in Schedule GBE-3. These components include the following:

The **Steering Group** will have ultimate authority over, and responsibility for, the completion of the Gas Business Enablement Program on a reasonable and prudent basis. The Steering Group consists of the U.S. Chief Executive Officer, U.S. Chief Financial Officer, Executive Vice President of Network Operations, Safety and Capital Development, Senior Vice President and U.S. Chief Information Officer, Senior Vice President of Human Resources and Chief Diversity Officer, Global Chief Procurement Officer, Group Director of Business Excellence, and Senior Vice President of Regulatory Affairs. The Steering Group will focus on program delivery and will provide strategic advice and guidance, address resource requirements, maintain prioritization of the work effort among other operational needs, and manage escalated issues (including changes to the portfolio anchors, potential increases in program costs, and review of unplanned customizations).

The **Senior Vice President of Gas Business Enablement** reports to National Grid's Executive Vice President of Network Operations, Safety, and Capital Development with accountability to the Steering Group for the successful delivery of the Gas Business Enablement Program and its anticipated benefits.

The National Grid **Gas Business Enablement Leadership Team** includes the Vice President of Process and Business Requirements, the Vice President of Solution Development and Delivery, the Vice President of Business Design and Readiness, and the Head of the Portfolio Management Office. Each of these business leaders has a defined role in the process, establishing accountability for: (1) defining the standard "to be" business processes, embedding data management and governance, and capturing and delivering the business requirements; (2) developing and delivering the information systems solution to meet gas business operating requirements and the ongoing support model; (3) defining the future gas operating model developing and implementing a change program to deliver the process, system, and cultural changes; (4) developing and deploying a refreshed approach to technical field training; and (5) keeping the Gas Business Enablement Program to time and budget goals, and maintaining compliance with program objectives.

The **Design Authority** consists of the Senior Vice President of Gas Process and Engineering along with Vice Presidents from the gas business, including Vice Presidents from each jurisdiction and work functions intrinsically related to, and affected by, the

Gas Business Enablement Program. This group works with the Gas Business Enablement Leadership Team and ensures that business leaders are informed on progress and key issues, sign-off on business decisions, endorse business requirements, and take responsibility for delivery of business benefits.

Independent, third-party **Delivery Partners** will work with National Grid as the program design and deployment leads to execute work on pre-designated work streams and will assist in building change leadership capability at all levels in the gas business so that employees (who are deeply immersed in the current practices and processes engendered by legacy systems) are prepared to realize the full capabilities and competencies of the Gas Business Enablement Program, once implemented. To ensure success of the program for National Grid's customers a value assurance partner has been chosen as an independent quality assurance function, monitoring the performance of the Gas Business Enablement Program and its workstreams and reporting to the Steering Group progress and recommendations for improvement.

The **Value Assurance** function will be performed by an independent, third party to ensure not only successful delivery of the program but also achievement of the anticipated benefits.

Q. Please describe what types of changes or outcomes will require approval from the Steering Group other executive leadership.

A. The Gas Business Enablement Program requires annual review by the U.S. Sanctioning Committee and the U.S. Senior Executive Sanctioning Committee, including annual approval of the budget for each fiscal year. In addition to the annual sanctioning process, any changes to the major portfolio anchors of the program, increase in program costs, or unplanned work requires the review and approval of the Steering Group. Lastly, the external Delivery Partners have executed fixed-price contracts for this program with specified program performance parameters. This structure provides for a process that will have fewer instances of large change in program costs over the course of the implementation and holds the external partners accountable for successful implementation of the portions of the program for which they are responsible.

Q. How will the Gas Business Enablement Program team assess the readiness of the business to begin using components of the Gas Business Enablement Program, as those components become functional?

A. The Gas Business Enablement Leadership Team will work with the Design Authority that is comprised of the Vice Presidents across the gas business, supporting functions, and jurisdictions to identify, by geography and functional group, readiness of their function to begin use of the Gas Business Enablement Program components as they become available. This will be accomplished by evaluating jointly developed readiness criteria at identified “go/no go” checkpoints to ensure that the functional group is prepared to

proceed. In addition, performance will be monitored throughout the "go-live" process and beyond to identify any problem areas that need to be addressed. The readiness criteria will include, but are not limited to, system readiness (including functionality and technical infrastructure) determined through user testing, people readiness determined through training delivery and leadership observations, and business readiness determined through review of processes and procedures.

Q. What is the purpose and value of "Change Management" within the Gas Business Enablement Program?

A. The best technology available to the Company will not deliver the potential value achievable for customers without the commitment of our employees to leverage the capabilities of the technology to drive performance. As a result, training and other "change management" strategies will be utilized to engage employees in the implementation of the Gas Business Enablement Program. Gas Business Enablement's Change Management strategy is designed to build leadership capability, define and reinforce new mindsets and behaviors to create a culture of focus and accountability, and transition the organization to new ways of working to better serve customers in line with their increasing expectations. Change management will also help to facilitate rapid adoption of new processes and work tools following program implementation.

As part of the change-management process, National Grid will provide comprehensive training to all users of the systems, both field and office workers as well as first line and

upper levels of management. Training materials and training exercises will be tailored to the audience, and the training will be delivered using various media such as computer-based instruction, video, classroom, mobile, and written help guides.

Although there is cost and time involved in training employees to levels adequate to not only operate, but optimize the functionality of the Gas Business Enablement Program components, there is great value that will be produced by this training. National Grid recognizes the significance of this aspect of the Gas Business Enablement Program and has created the change management office responsible for stakeholder engagement, training development, and deployment prior to implementation of the systems.

Gas Business Enablement Procurement Process for Delivery Partners and Value Assurance

Q. Please describe the scoping and authorization process for the Gas Business Enablement Program and associated procurement.

A. In November 2015, the conceptual basis for the Gas Business Enablement Program was brought to the Group Executive Committee for review, approval, and initial funding. This authorization was necessary to initiate the process to scope the solution and create the overarching strategy for procurement, implementation, and governance. The Group Executive Committee approved the concept for Gas Business Enablement and created the Gas Business Enablement Steering Group. The Group Executive Committee authorized funding in the amount of $25 million to perform an assessment of program alternatives and commence program planning. The Gas Business Enablement Steering Group was

charged with reviewing and approving the initial program scope and procurement strategy. Mr. Johnston was appointed Senior Vice President of Gas Business Enablement on January 1, 2016 and formally moved into the position in April 2016.

From there, Mr. Johnston began to build a competent, experienced program team dedicated exclusively to Gas Business Enablement Program implementation, with the expectation that independent, third-party service providers would be procured to assist in design, planning, and implementation of the Gas Business Enablement Program components. Once assembled, the program team worked for five to six months to evaluate each jurisdiction to identify current operating challenges in each jurisdiction and begin to develop an effective and efficient end-state vision. Members of the program team also visited other utility companies to learn about their experiences and gather input on lessons learned. In addition, National Grid conducted a detailed software review process that included demonstrations with software vendors. A formal evaluation of software applications was conducted with scoring of each solution from business, technical, and commercial perspectives.

The result of this Phase I strategic assessment helped to develop an efficient roadmap, an appropriate project scope, and a reliable cost estimate. This information was the basis of the procurement process to select partners for the second phase of the program, to implement the roadmap.

Q. How does National Grid plan to assure successful program management and a productive partnership with its external consultants?

A. In the first phase of program development, National Grid relied on a "Design Assurance" partnership to obtain independent advice on the quality of the program roadmap by testing whether the roadmap was complete and able to be successfully delivered. In addition, National Grid evaluated the estimates of potential costs and benefits associated with the program.

Following a comprehensive procurement process in the second phase of program development, National Grid selected two vendors to assist in moving the program forward. These vendors were PricewaterhouseCoopers (as the overall Delivery Partner) and Accenture (as the SalesForce Integrator). PricewaterhouseCoopers will serve as the lead system integrator for the Gas Business Enablement Program, with responsibility for assisting in the development and deployment of standard processes and solutions for Work Management, Asset Management, Geographic Information System implementation, and Data Management supporting each of the workstreams, along with overall delivery through the Portfolio Office and Change Management activities. Accenture is responsible for assisting in the development and deployment of the field mobility application, along with dispatch, scheduling including resource management and Customer Contact Center solutions along with development of the end-to-end customer processes and other elements of the Customer Engagement model. Kotter International, a world-leading change consultancy based in Cambridge, Massachusetts, was selected to

assist in the Strategic Change Management role, and PA Consulting was chosen to provide a third-party, independent view of the progress of the program to the Steering Group (Value Assurance).

Q. How will this intensive program-management structure help to control costs and achieve effective and timely implementation?

A. The fundamental purpose of the competitive procurement process is to develop the components of the Gas Business Enablement Program using capable and experienced third-party vendors that have the competency to assist in delivering the program on time, on budget, and with the stated capabilities. The Value Assurance function, independent of both the Company and the other third party vendors, will ensure that the program effectively meets the functionality and financial goals throughout the development process, and will have a direct line to program management. A rigorous process was followed to develop detailed Statements of Work for each workstream, as well as to develop Module Plans and an Integrated Program Plan to correlate the work efforts of the two System Integrators.

Thus, the key features of the contractual arrangements that will help to control program costs are the following:

- A carefully delineated Statement of Work by workstream for program completion;
- A complementary cultural fit between National Grid and its selected Delivery Partners;

- An integrated project plan aligned across workstreams and Delivery Partners;
- Alignment of goals and incentives between the National Grid team and its Delivery Partners;
- Negotiated fixed-cost contracts; and
- Utilization of a Value Assurance partner, reporting directly to the Steering Group, for independent oversight and control.

This approach will assure that the costs to fully implement the Gas Business Enablement Program are reasonable and prudently incurred to achieve the benefits available for customers through program implementation.

IV. Perspective on the Before and After Scenarios

Q. Please describe the planned implementation.

A. National Grid is implementing Gas Business Enablement in phases by breaking down the program by work types and geography. National Grid will begin implementation with the Rhode Island jurisdiction, which is highly reliant upon paper-based operations, and where both gas and electric operations will benefit and implementation risk can be mitigated given the jurisdiction's relatively smaller footprint. Initial focus in Rhode Island will be to implement the first solutions supporting asset management and work management activities related to the scheduling, assignment and dispatch of work, completion of work on a mobile device with electronic data capture, and the ability report the status of a particular job in real time. Implementing these updated solutions as quickly as possible to largely replace the current paper-based processes and disparate, outdated, and unsupported core applications with field mobility functionality will help

reduce the risk associated with those critical, unsupported applications for these asset management and work management activities. Additional capabilities will be implemented iteratively with greater functionality over the duration of the Gas Business Enablement Program as quickly as possible to increase asset and transactional records accuracy and enable employees to work more efficiently thus improving productivity.

This strategy will create a foundation for building incremental enhanced capabilities supporting safety performance, operations effectiveness, and customer experience. The first release implementation of the enterprise-wide solution will occur in Fiscal Year 2018 for the Company's gas distribution operations with initial deployment of the first minimum viable product solutions for corrosion, instrumentation and regulation, and collections. Following the release in Rhode Island, the Company will begin to deliver and implement Gas Business Enablement in other service territories. Schedule GBE-4 provides the roadmap regarding implementation of the key initiatives encompassed within the Gas Business Enablement Program. As shown in that schedule, implementation for Massachusetts is set to begin in Fiscal Year 2019 and for New York in Fiscal Year 2020.

Q. Please describe some of the specific programs/capabilities that will go in-service for the Company.

A. As mentioned above, the first phase of implementation in Rhode Island will occur in Fiscal Year 2018. This first phase in Rhode Island will involve the implementation of the

work-management functionalities supporting the Instrumentation and Regulation and Corrosion functions, as well as processes for field collections and customer meter services activities, basic scheduling, dispatching, and field data capture. In addition, the asset-management system will be placed in service for the Gas Transmission and Distribution Integrity Management Processes, which will standardize and improve data accuracy and enhance gas system safety and reliability.

The next phase of implementation in Fiscal Year 2019 for Rhode Island would include systems and capabilities to enhance the customer experience. These capabilities would include field visibility to customer payment history, field acceptance of credit card payments, field printing, call center visibility to collections status, and field visibility to maps. This phase will also involve full deployment of capabilities across Field Mobile applications to support all customer meter services activities, including real-time communications between call center, dispatch, field employees, and other customer support groups. Lastly, the standard Geographic Information System data model will be fully utilized in Rhode Island at this time.

The next phase to occur in Fiscal Year 2021 for Rhode Island would include systems and capabilities to enhance gas construction and leak-repair activities. These capabilities would include a standardized unit cost library enabling more accurate cost estimates, contractor mobility, customer appointment booking, mobile time tracking, and field asset correction and geographic location. Once these backbone systems are delivered in Rhode

Island over the four-year period (Fiscal Year 2018 through Fiscal Year 2021), the enhanced capabilities will begin functioning during Fiscal Year 2021 and Fiscal Year 2023. These enhanced capabilities will include items such as customer self-service, field crew/customer interaction portal, complex design tool for construction, and asset risk visibility.

Q. Please describe how National Grid's gas distribution operations currently function, from an overall perspective.

A. Today, National Grid's gas distribution operations operate from an inefficient patch-work of legacy systems and manual spreadsheets to perform critical gas operation activities. The current sub-systems and applications are only able to operate on older, unsupported operating systems and are accessed in the field from older hardware (*e.g.* truck-mounted laptops) that are beyond their useful life. These field devices require regular maintenance, causing inefficiency and necessary work arounds while these devices are being serviced. Procuring parts for these devices is becoming increasingly difficult because manufacturers no longer support the products.

The disparate systems make it difficult for employees to navigate the systems and are prone to human error, missing data, delays in information, lack of visibility among functions, and lack of ability to adapt to future regulatory expectations. For example, the many systems used today require manual controls, local tracking, and follow up as part of scheduling required work activity in the field including warning tags. Scheduling,

dispatching, and tracking of gas work today requires many manual controls across different systems, making full visibility of work required and how it is performed difficult.

For perspective of the volume of work, National Grid responds to approximately 2,300 service appointments *per day* across its three operating jurisdictions. This volume of work creates a significant challenge for National Grid to meet with current operations goals.

Q. How will these circumstances differ once Gas Business Enablement is fully implemented?

A. Once the Gas Business Enablement Program is fully implemented, the U.S. gas distribution business will operate from a standard suite of integrated software applications comprised of three core systems utilized by employees to execute critical work activities. These systems will include modern software applications with the ability to configure, integrate, and enhance over time in order to adapt to future operational, regulatory, and customer expectations. There will no longer be overall reliance on manual controls and/or multiple spreadsheets, but rather will allow for full visibility of required work, scheduling, and performance across functions. The work force will be trained on the new systems in a uniform way making work consistent enterprise-wide, subject to varying regulatory compliance requirements.

All work will be contained in an integrated suite of systems with pre-defined rules that will automatically schedule work in advance of a due date, and there will be central visibility to ensure all mandated activities are completed in a timely fashion. As an example, all field workers will have mobile devices that will allow warning tags to be completed electronically and printed in the field, which will enable validation of information as the tag is completed, and will give the Company an electronic copy of the tag. It will also enable follow up work to be automatically scheduled, significantly reducing the reliance on manual processes and controls, and provides the Contact Center visibility to tag information and enables better customer service for customer follow-up calls. National Grid will be able to track and manage crew and individual worker productivity, including the standardization of business processes for enhanced visibility of work and more efficient scheduling. Gas Business Enablement will also include a new Geographic Information System to improve National Grid's ability to capture, store, access, and analyze geographical asset information concerning its gas distribution and transmission network. The Geographic Information System will provide a single view of all assets, which will facilitate data-driven investment and maintenance decisions. This will strengthen National Grid's ability to operate a safe, reliable gas distribution and transmission system and drive continuous improvement in regulatory compliance and transparency with more complete data capture and reporting. Schedule GBE-5 illustrates the gas system capabilities post-Gas Business Enablement implementation.

Q. Please describe what the National Grid customer experience is like prior to Gas Business Enablement implementation.

A. Today, a customer does not have many options to engage with the Company other than a phone call placed to the Customer Contact Center or limited interaction through the Company's website. For example, to make a service appointment today, a customer must contact the Contact Center and speak to a representative to schedule an appointment. In addition, any question about repair work or other service questions would require a phone call to the Contact Center and significant follow-up to determine the status of work and/or why work is being performed in a customer's neighborhood.

Q. How will the customer experience differ after Gas Business Enablement Program implementation?

A. The Gas Business Enablement Program will provide enhanced customer service through improved scheduling and dispatch, with enhanced appointment booking and frequent communications with customers according to their media preferences, as well as the ability to create a 360-degree view of past, scheduled, and potential future work for customers. Following Gas Business Enablement implementation, in addition to contacting the Contact Center, the customer will have the option to use the National Grid website to make the appointment, and will be presented with a screen showing the available appointment windows. The customer will also have the option to receive a phone call or text message when the field worker leaves for the appointment. Finally, if a customer called to find out what work was being done on their street, they would be able

to receive an accurate answer from the Contact Center in real-time. Schedule GBE-6 illustrates the customer experience capabilities after Gas Business Enablement Program implementation.

V. Proposal for Ratemaking Treatment

Q. What is the anticipated cost of the Gas Business Enablement Program on an overall basis?

A. The total cost of the Gas Business Enablement Program for National Grid's U.S. gas distribution business is currently estimated at approximately $478.3 million over the period from Fiscal Year 2017 to Fiscal Year 2023. Of this amount, approximately $315.1 million represents capital costs and approximately $163.2 million represents one-time operating expenses necessary to complete the Gas Business Enablement initiatives. Although delivery of the Gas Business Enablement Program initiatives is expected to occur within the total costs stated herein, it is important to note that program costs may shift between the years as each of the programs completes detailed design. Therefore, an additional $61 million has been budgeted as contingency in the event of unforeseen scope changes, changing market conditions affecting vendor and procurement costs, and unanticipated program complexity; this contingency has not been reflected in the Company's revenue requirements for Narragansett Gas or Narragansett Electric.

Q. What is the anticipated cost of the Gas Business Enablement Program for the Company?

A. Because the Gas Business Enablement Program is a shared investment, only a portion of the total investment would be allocated to Narragansett Gas and Narragansett Electric. Further, given that the program will be implemented over a multi-year period, the costs for Narragansett Gas and Narragansett Electric will be incurred at various points in time over the next few years. The allocation would be in the form of rent expense as part of the overall Information Services Service Company rent expense allocated to Narragansett Gas and Narragansett Electric. The total costs for Gas Business Enablement attributable to Narragansett Gas and Narragansett Electric are $10.2 million in operating expense and $33.8 million in Service Company capital costs allocated to Narragansett Gas and Narragansett Electric as rent expense.[3] Narragansett Gas's portion of the annual rent expense attributable to the Gas Business Enablement Program investment is $2.4 million, $2.8 million, and $3.2 million in the Rate Year and the two subsequent twelve-month periods ending August 31, 2020 (Data Year 1) and August 31, 2021 (Data Year 2) (Data Year 1 and Data Year 1 are collectively referred to as the Data Years), respectively, as shown on Schedule MAL-36, Page 5 provided with the pre-filed direct testimony of Company Witness Melissa A. Little. Narragansett Electric's portion of the annual rent expense attributable to the Gas Business Enablement Program investment is $619,818 in the Rate Year, and $611,224 and $557,442 in Data Year 1 and Data Year 2, respectively, as shown on Schedule MAL-36, Page 11.

[3] This includes the depreciation of $25 million and return of $8.7 million over the full life of the assets (through Fiscal Year 2033).

The Company's share of the $10.2 million total incremental operating expense in the Rate Year, as shown on Schedule MAL-36, Page 6, is $1.1 million for Narragansett Gas. This schedule also shows the forecast of incremental operating expense allocated to the Company for the Data Years.

Q. Please explain how costs for the Gas Business Enablement Program will be allocated to Narragansett Gas and Narragansett Electric.

A. In general, Gas Business Enablement Program costs will be allocated using the customer cost causation allocator under the guidelines of the Service Company Cost Allocation Manual. The majority of the program will be allocated among National Grid's gas distribution operating companies, with the exception of two workstreams: (i) Scheduling, Dispatch, and Mobility and (ii) Customer Engagement. These two workstreams will provide benefits to the electric distribution companies and therefore the costs associated with them will be shared with National Grid's electric distribution affiliates. The current expectation is that the allocation proportions among the jurisdictions for overall Gas Business Enablement costs will be approximately seven percent to Narragansett Gas and Narragansett Electric; 25 percent to Massachusetts operating affiliates; and 68 percent to New York affiliates.

Q. Please explain what costs comprise the incremental operating expense for the Company in the Rate Year and Data Years.

A. The incremental project operating expense included in Schedule MAL-36 relates to end-user training, data conversion from the legacy applications to the new Gas Business Enablement Program applications, business process documentation that is non-system related, and Gas Business Enablement Program management of schedule, resources, finance, risks, and performance.

Q. Does the Test Year include costs for the Gas Business Enablement Program?

A. Yes. The Test Year includes certain non-recurring costs for the Gas Business Enablement Program related to the development of the business case, assessment of processes and applications, and high-level design for the Gas Business Enablement Program. The Company has made a normalizing adjustment of $1.5 million for Narragansett Gas to remove these non-recurring costs from the Rate Year.

Q. Are there any incremental post-implementation run the business costs associated with Gas Business Enablement?

A. Yes. As shown on Schedule MAL-36, the Company will incur additional run the business costs to support the Gas Business Enablement Program post-implementation. These costs include (i) a team to support business functions in the use of the new systems, design new processes to take full advantage of the new system, and monitor business controls embedded in the system; (ii) hardware, software, and mobile solutions

license maintenance fees and subscriptions; and (iii) support costs to maintain certain legacy applications following implementation until these legacy applications are replaced or maintained in an upgraded future state, as appropriate.

Support costs for the legacy applications will decrease from the Rate Year to the Data Years. Additional support costs will be required for legacy applications that will continue to remain after full implementation because of regulatory reporting needs and outstanding legal hold obligations.

As legacy software systems are retired due to functional replacement as part of the Gas Business Enablement Program, the run the business costs for operating the servers, software systems, and field devices will be eliminated. As shown on Schedule MAL-36, the Company has netted these costs against the forecast run the business costs expected in the Rate Year.

Q. What are the incremental post-implementation run the business costs associated with Gas Business Enablement in the Rate Year and Data Years?

A. As shown on Schedule MAL-36, Page 6, the Company's allocated share of these costs is $3.1 million in the Rate Year and $1.3 million in each of the Data Years.

Q. Have forecast cost reductions associated with the Gas Business Enablement Program been reflected in this filing?

A. Yes. Although it is unknown if the savings estimates can be achieved, the Company has made an adjustment to the Rate Year and Data Years for its gas business to reflect its allocated share of the estimated savings from Gas Business Enablement Program initiatives. The adjustment reduces the revenue requirement by ($0.057) million in the Rate Year, ($0.371) million in Data Year 1, and ($0.768) million in Data Year 2.

Q. How does the Company propose to recover the expenses associated with Gas Business Enablement Program implementation?

A. The Company is proposing to defer operating expenses incurred prior to the Rate Year and amortize those costs over a ten-year period based on the projected deferral balance at August 31, 2018. Cumulative operating expenses incurred by the Company for Gas Business Enablement through June 30, 2017 amounted to $1.5 million. The Company is also proposing to defer all post-Test Year Gas Business Enablement one-time operating costs on the Company's books to be amortized over a ten-year period, with return. The resulting annual amortization of $1,016,617 would be recoverable in the Company's cost of service over the ten-year period commencing September 1, 2018. These amounts are shown on Schedule MAL-36, Page 6.

For Gas Business Enablement expenses forecasted to be incurred during the Rate Year, the Company will recover rent expense consisting of the ten-year amortization amount with return in the total amount of $28.7 million at the Rate Year projected levels based on the estimated dates those investments are placed in-service. Operating expenses incurred

during the Rate Year would be recovered over a ten-year period, which is the useful life of the Gas Business Enablement capital investments. Incremental run-the-business costs would be recovered at the Rate Year projected levels net of incremental savings.

Q. How has the Company reflected the costs for Gas Business Enablement in the revenue requirements for Narragansett Gas and Narragansett Electric?

A. As shown on Schedule MAL-36, Page 6, the Company's share of O&M expenses is $10.2 million for Narragansett Gas. This amount has been included as an expense as shown on Page 6 of that schedule. The annual amortization of Gas Business Enablement O&M costs, $1,016,617, has been included in the cost of service for Narragansett Electric as shown on Page 6 of Schedule MAL-36. As part of this proceeding, the Company is requesting the PUC to approve the creation of a regulatory asset for the amortization of the Gas Business Enablement Program costs.

Q. Does this conclude your testimony?

A. Yes.

Schedules of
Johnston and Connolly

Index of Schedules

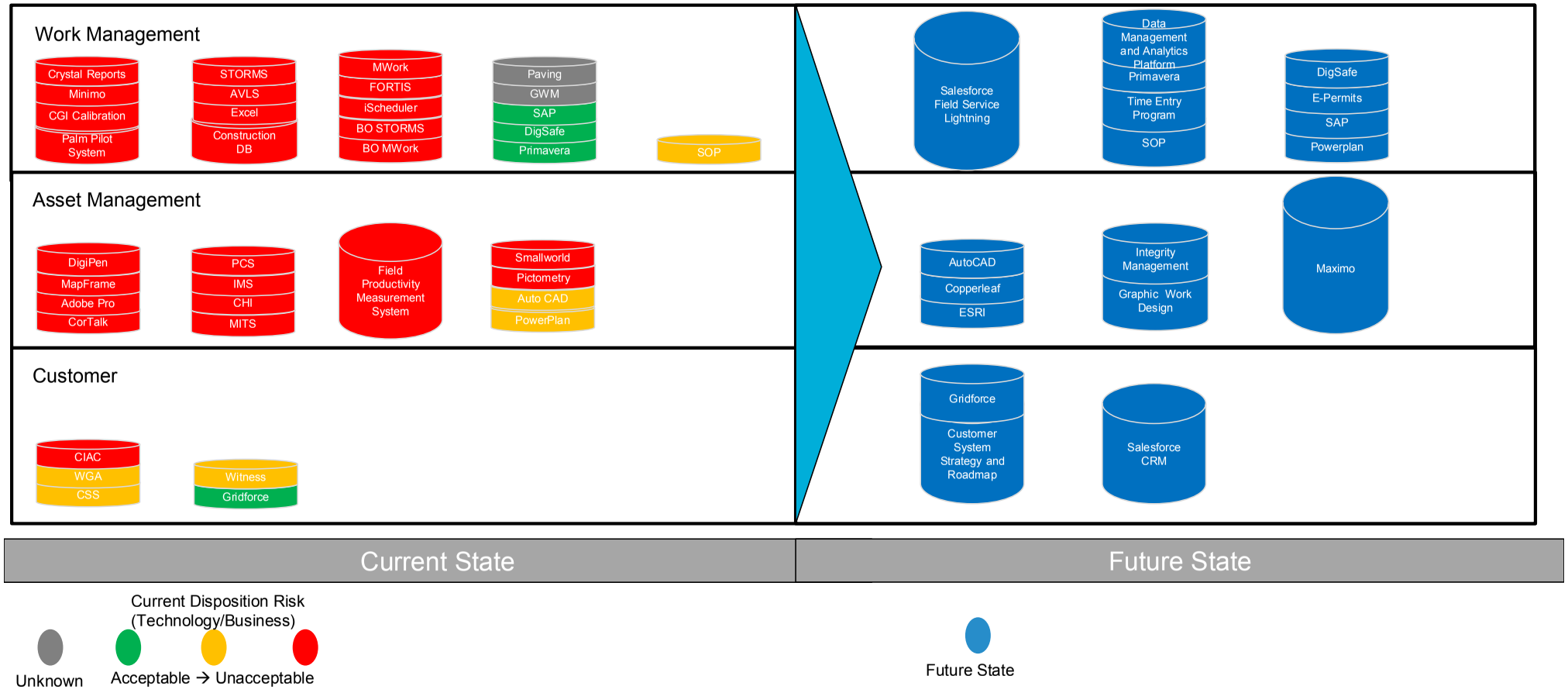
Schedule GBE-1

Schedule __ (GBE-1)

Depiction of Current and Future State Systems in Rhode Island

nationalgrid

Current to Future State – Rhode Island [Illustrative]



THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule GBE-1
Page 1 of 1

Schedule __ (GBE-2)

Key Initiatives By Gas Business Enablement Workstream

Key Initiatives

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Workstreams	Initiatives					
GBE Portfolio Office						
Change Management	Program Level People Strategy	Stakeholder Management & Engagement	Enablement	Business Readiness & Sustainment	Workforce Strategy / Labor Strategy	
Change Leadership	Organizational Change Readiness	Volunteer Network	Organizational Alignment			
Operating Model	Value Realization	Operations Performance Improvement	Organizational Structure & Design	Governance		
Asset Management	Integrity Management – Corrosion and I&R	Integrity Management – TIMP and DIMP	Asset Investment Planning and Management (AIPM) – Enhancements and Integrations	Advanced Analytics – Platform and Use Cases		
Customer Engagement	Structured Experiences	Contact Center Interaction	Field Interaction	Customer Interaction	Large Commercial & Industrial; Landlord Interaction	Supporting Through Data
GIS	GIS Consolidation	GIS Data Remediation	Landbase Conflation	GIS/EAM Integration	Graphical Work Design (GWD)	Complex Design (CAD) & Estimating (ESW)
Work Management Field Enablement	Business Architecture Design	Corrosion and I&R	Customer, Collections, Resource Mgmt	CU Governance and Library	PowerPlan Integration	
	Construction Work, Leak Inspection and Leak Repair	Projects and Program Management	Work Forecasting & Planning Solution	WMFE Optimization		
Supply Chain	Material Traceability	SC Master Data Improvements	Fulfillment Model / Inventory Optimization	Integrated Supply & Demand Planning / Integrated Business Planning	Warehouse & Network Optimization	
Field Technical Training	Employee Competence	Standard Operating Procedures	Technology			
Data Management	Data Governance	Data Profiling & Cleansing	Data Quality Dashboards & DQI Metrics	Integration & Conversion	Advanced Analytics	
ISE	Integration	Technology Initiatives	Enabling Capabilities			
Value Assurance						

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule GBE-2
Page 1 of 1

Schedule __ (GBE-3)

Gas Business Enablement Corporate Governance Structure

GBE governance framework, team and delivery partners:

Steering Group: Ensures focus remains on value delivery, provides strategic advice & guidance, ensures program has required resources, supports enterprise prioritization conflicts, and manages escalated issues (including changes to portfolio anchors, increases in program costs & unplanned customizations).

- US CEO
- US CFO
- EVP, Net. Ops, Safety, and Cap. Del.
- SVP, US CIO
- SVP, HR and Chief Diversity Officer
- Global CPO
- Group Director, Business Excellence
- SVP, Regulatory Affairs

GBE Sponsor:
SVP Gas Business Enablement:
Accountable for ensuring the successful delivery of the program and its anticipated benefits

Design Authority:

- **SVP Gas Process & Engineering & VPs from the Gas Business (including from JDxs) & impacted functions**
- **Inform** – ensure business leaders are informed on progress and key issues
- **Decide** – sign-off key business decisions that have broader business impacts
- **Endorse** – business requirements (i.e. design) and Go / No Go Decisions
- **Own** – defined business benefits and delivery of them

National Grid GBE Leadership Team:

- **VP of Business Process & Requirements :** Accountable for defining the standard 'to be' business processes, ways or working, data and business requirements
- **VP of Solution Development & Delivery:** Accountable to develop and delivery the IS solution to meet the business's requirements, develop & deliver the on-going support model
- **VP of Business Design & Readiness :** Accountable for the future gas operating model, developing & implementing a change program to deliver the process, system & cultural changes, and develop & deploy a refreshed approach to technical field training
- **Head of the Portfolio Management Office :** Accountable for keeping the program to time & budget, and maintaining compliance with the Critical Success Factors

Value Assurance:

- **PA Consulting -** To provide independent assurance that GBE is on track for successful delivery of the program & anticipated benefits

Delivery Partners:

- **PWC**– overall program lead, lead SI for EAM (Maximo), lead for change management office, operating model, PMO, data management, & IS enabling
- **Accenture** – lead SI for Scheduling, Dispatch, Mobility & Customer Engagement (Salesforce)
- **Kotter International** – building change leadership capability at all levels in the gas business to support the change

Core IS:

- Integration to legacy systems
- Digital Risk & Security
- Running environments
- Supporting implemented systems

THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule GBE-3
Page 1 of 1

Schedule GBE-4

Schedule __ (GBE-4)

Gas Business Enablement Roadmap

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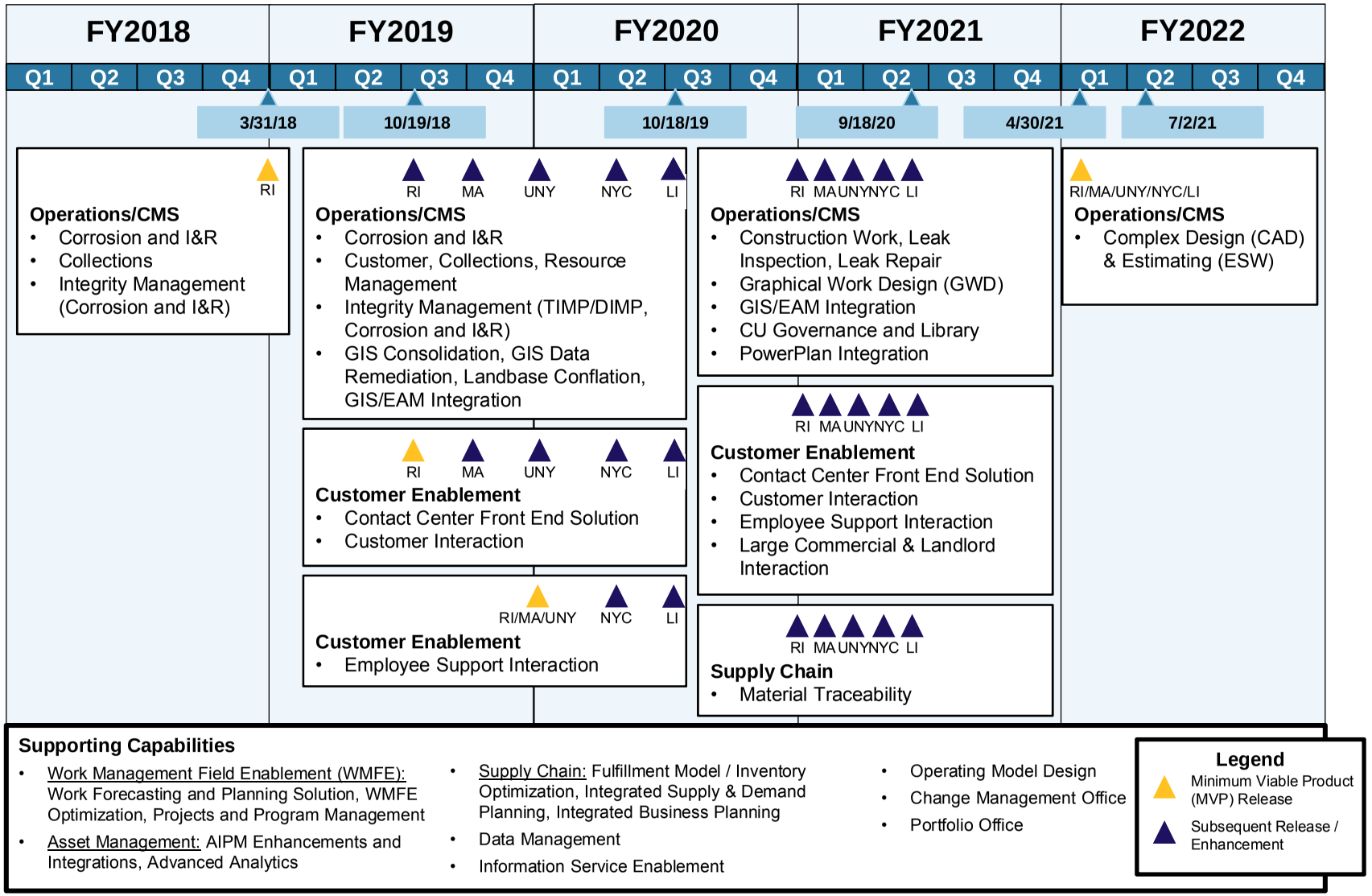
High-Level GBE Program Roadmap



THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule GBE-4
Page 1 of 1

Schedule GBE-5

Schedule __ (GBE-5)

Example of Gas Operations Capabilities with Gas Business Enablement

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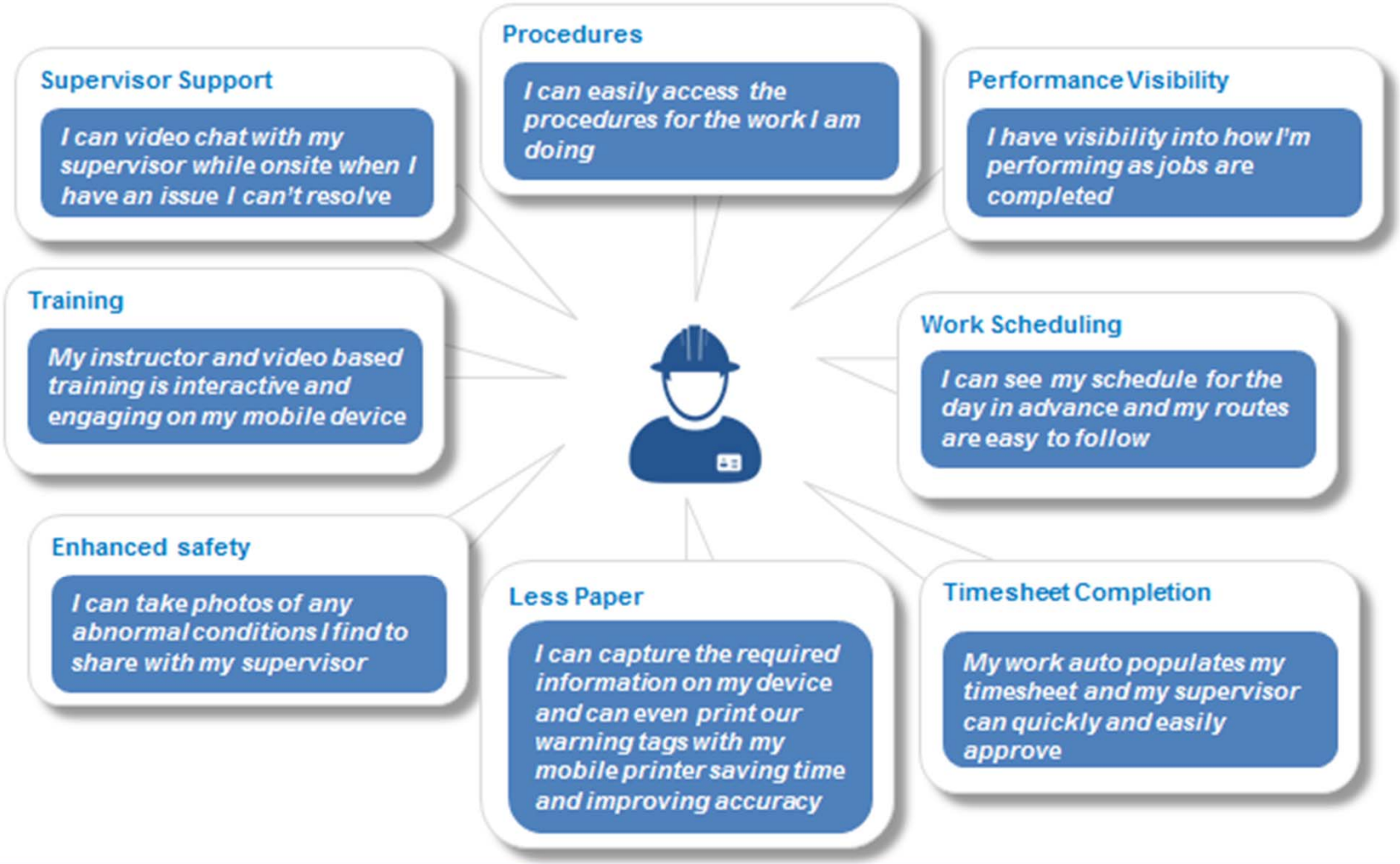
Employee Capability Aspirations



THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule GBE-5
Page 1 of 1

Schedule GBE-6

Schedule __ (GBE-6)

Example of Customer Experience Capabilities with Gas Business Enablement

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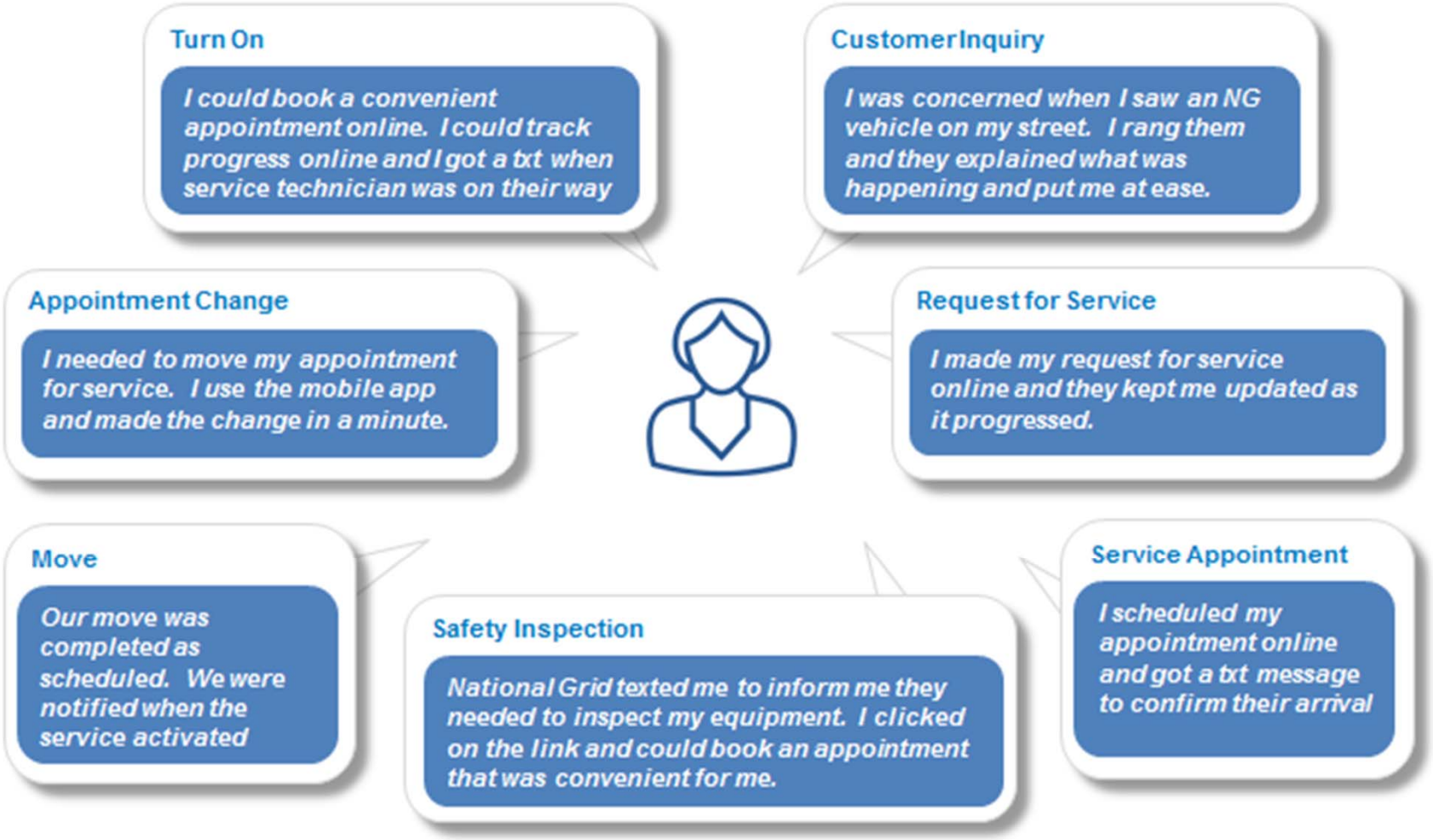
Customers Capability Aspirations



THE NARRAGANSETT ELECTRIC COMPANY
d/b/a NATIONAL GRID
RIPUC Docket No. 4770
Schedule GBE-6
Page 1 of 1