State of Rhode Island and Providence Plantations

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Peter F. Kilmartin, Attorney General

August 5, 2016

VIA HAND DELIVERY & ELECTRONIC MAIL

Luly E. Massaro, Commission Clerk
Rhode Island Public Utilities Commission
89 Jefferson Boulevard
Warwick, Rhode Island 02888

Re: **PUC Docket No. 4614 - PUC Advisory Opinion Regarding Need of the Narragansett Electric Co. d/b/a National Grid to Construct and Alter Certain Transmission Components in the Towns of Portsmouth and Middletown (Aquidneck Island Reliability Project)**

Dear Ms. Massaro:

Enclosed please find an original and five (5) copies of the PreFiled Direct Testimony of Division consultant Gregory L. Booth of PowerServices, Inc., for filing by the Division of Public Utilities and Carriers in the above-captioned proceeding. An electronic copy shall be served upon the service list.

Thank you for your attention in this matter and if you should have any questions kindly contact me at your convenience.

Very truly yours,

Christy Hetherington

Christy Hetherington
Special Assistant Attorney General

Enclosure

cc: Service List

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
PUBLIC UTILITIES COMMISSION

Issuance of Advisory Opinion to the Energy Facility Siting Board Regarding Narragansett Electric Company d/b/a National Grid's Application to Construct and Alter Certain Transmission Components in the Towns of Portsmouth and Middletown (Aquidneck Island Reliability Project)

PUC Docket No. 4614

PREFILED DIRECT TESTIMONY OF

Gregory L. Booth
President, PowerServices, Inc.
On Behalf of Rhode Island Division of Public Utilities and Carriers

August 5, 2016

Prepared by:
Gregory L. Booth, PE

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Prefiled Direct Testimony of

Gregory L. Booth, PE, President
PowerServices, Inc.

On Behalf of Rhode Island Division of Public Utilities and Carriers
Docket No. 4614

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DIRECT TESTIMONY OF GREGORY L. BOOTH, PE

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND THE BUSINESS ADDRESS OF YOUR EMPLOYER AND POSITION.

A. My name is Gregory L. Booth. I am President of PowerServices, Inc. ("PowerServices"), UtilityEngineering, Inc. ("UtilityEngineering"), and Gregory L. Booth, PLLC ("Booth, PLLC") all located at 1616 E. Millbrook Road, Suite 210, Raleigh, North Carolina 27609.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS MATTER?

A. I am testifying on behalf of the Rhode Island Division of Public Utilities and Carriers.

Q. WHAT DOES YOUR POSITION WITH POWERSERVICES, INC., UTILITYENGINEERING, INC., AND BOOTH, PLLC ENTAIL?

A. As President of PowerServices, Inc., an engineering and management services firm, UtilityEngineering, Inc., a design/build firm, and Booth, PLLC, an engineering firm, I am responsible for the direction, supervision, and preparation of engineering projects and management services for our clients, including the corporate involvement in engineering, planning, design, construction management, and testimony.

Q. WOULD YOU PLEASE OUTLINE YOUR EDUCATIONAL BACKGROUND?

A. I graduated from North Carolina State University in Raleigh, North Carolina in 1969 with a Bachelor of Science Degree in Electrical Engineering. I am a registered professional engineer in twenty-three (23) states, as well as the District of Columbia. I am also a registered land surveyor in North Carolina. I am also registered under the National Council of Examiners for Engineering and Surveying.

Q. ARE YOU A MEMBER OF ANY PROFESSIONAL SOCIETIES?

A. I am an active member of the National Society of Professional Engineers ("NSPE"), the Professional Engineers of North Carolina ("PENC"), The Institute of Electrical and Electronics Engineers ("IEEE"), American Public Power Association ("APPA"), American Standards and Testing Materials Association ("ASTM"), and the Professional Engineers in Private Practice ("PEPP"). I am also a member of the IEEE Distribution Subcommittee on Reliability and the National Fire Protection Association, and an advisory member of the National Rural Electric Cooperative Association ("NRECA")-Cooperative Research Network, which is an organization similar to EPRI.

Q. HAVE YOU ATTACHED TO YOUR TESTIMONY A COPY OF YOUR CURRICULUM VITAE?

A. Yes. My curriculum vitae is attached as *Exhibit GLB-1*, includes an overview of my experience since beginning my work in 1963, and lists testimony I have provided.

Q. PLEASE BRIEFLY DESCRIBE YOUR EXPERIENCE WITH ELECTRIC UTILITIES.

A. I have worked in the area of electric utility and telecommunication engineering and management services since 1963. I have been actively involved in all aspects of electric utility planning, design and construction, including generation, transmission, substations and distribution systems, and North American Electric Reliability Corporation compliance.

Q. HAVE YOU PREVIOUSLY TESTIFIED AS AN EXPERT BEFORE STATE UTILITY COMMISSIONS, OTHER REGULATORY AGENCIES, AND/OR COURTS?

A. Yes. I have testified on numerous occasions before the Federal Energy Regulatory Commission ("FERC"), including pre-filed testimony in both wholesale rate matters as well as in electric utility reliability complaints, including Duke Power Company and Dominion Power issues. I have also testified before the New Jersey Board of Public Utilities, the Delaware Public Service Commission, Maryland Public Service Commission, Massachusetts Attorney General Office of Ratepayer Advocacy, Minnesota Department of Public Service Environmental Quality Board, Virginia State Corporation Commission, the Pennsylvania Public Utility Commission, and the North Carolina Utilities Commission, most of them on multiple occasions. I have also filed testimony in electric utility acquisition hearings in Florida. I have testified before the Rhode Island Public Utilities Commission on numerous matters, including Docket Nos. 2489, 2509, 2930, 3564, 3732, 3564, 4029, 4307, 4218, 4360, 4592, and D-11-94. My testimony in Rhode Island has included filed and live testimony on previous transmission projects associated with the NEEWS and Interstate Reliability Projects, such as Docket Nos. 4029 and 4360. I have also testified annually in each of the National Grid filings on Infrastructure, Safety and Reliability Plan ("ISR Plan").

Q. HAVE YOU BEEN ACCEPTED AS AN EXPERT BEFORE STATE OR FEDERAL COURTS?

A. Yes. I have been accepted as an expert in the area of electrical engineering and electric utility engineering, construction and reliability matters and the NESC, NEC, OSHA EMF, and forensic engineering, including standard and customary utility operation practices in the electric utility industry and the electric industry before 17 state and federal courts.

II. SCOPE OF TESTIMONY

Q. HAVE YOU REVIEWED THE APPLICATION SUBMITTED BY NATIONAL GRID TO THE ENERGY FACILITY SITING BOARD FOR A LICENSE TO CONSTRUCT AND ALTER ENERGY FACILITIES WITHIN THE STATE OF RHODE ISLAND?

A. Yes.

Q. HAVE YOU REVIEWED THE TESTIMONY OF THE NATIONAL GRID WITNESSES, THEIR EXHIBITS, AND THE FILINGS WITH NATIONAL GRID'S ENERGY FACILITIES SITING BOARD ("EFSB") APPLICATION DATED DECEMBER 29, 2015 FOR THE AQUIDNECK ISLAND RELIABILITY PROJECT ("PROJECT")?

A. Yes, I have reviewed all of the documents as filed in Docket No. 4614.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING?

A. I am testifying on behalf of the Rhode Island Division of Public Utilities and Carriers ("Division").

Q. WHAT IS THE SCOPE OF YOUR SERVICES FOR THE RHODE ISLAND DIVISION OF PUBLIC UTILITIES AND CARRIERS ("DIVISION")?

A. Under the statute and regulations, the Division of Public Utilities and Carriers ("Division") is expected to assist the Commission in rendering its Advisory Opinion to the EFSB by its participation in the Commission Docket 4614. The Division has requested I provide an evaluation of the proposed project and review the original Narragansett Electric Company's (d/b/a National Grid) ("National Grid") application made to the EFSB addressing the project need, transmission modeling criteria, proposed solutions, cost estimates, and possible alternatives to the Project. As part of my scope of

services to the Division, I have also examined supplemental information filed by National Grid witnesses, Endrit Fiku, PE, Carlos A. Perez-Perez and David M. Campilii, PE. The Division has retained me as its expert, and, as such, I performed certain analyses to assist in formulating a recommendation, provided discussion with the Division regarding status of the review of the aforementioned documents, and produced this testimony which includes my conclusions, findings and recommendations.

Q. WHAT OTHER INFORMATION HAVE YOU REVIEWED?

A. National Grid did not provide a helicopter tour of the project as with previous projects. It did, however, provide a combined Google Earth/PLS-CADD digital aerial and ground level video of the entire route. This was, in many ways, superior to a helicopter tour, since I was able to revisit any section of the system on multiple occasions throughout the analysis. Along with the transmission Google Earth/PLS-CADD I have reviewed the substation layouts and associated equipment for the new Jepson and Dexter Substations. National Grid has provided an Energy Facility Siting Board Environmental Report that I have reviewed for inputs into construction costs, facility access, and effects to natural resources as they relate to the planning process. In addition to the provided Environmental Report, I have reviewed the Visual Impact Assessment provided by National Grid. I have also reviewed the Company's responses to data requests.

Q. WHAT IS THE SCOPE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. My testimony will address my review, findings, and conclusions as they relate to the Project, as proposed, and the alternatives to the Project, including a no build option, no wires alternative ("NWA") and various transmission alternatives to the Project. My analysis has specifically focused on the need and whether the Project is cost justified, expressly determining the reasonableness of the cost of the Project, and the rationale of

National Grid's selection of the particular facility type and location. I have included in my review and consideration the cost and reliability benefits. My testimony will address the cost estimates and the appropriateness of any alternative. I will discuss areas of concurrence with the National Grid filing and witnesses, together with those areas of divergence from the testimony of the witnesses.

Q. HOW HAVE YOU ORGANIZED YOUR TESTIMONY?

A. I have organized my testimony by first discussing the methodologies employed to determine the need for the Project as well as the cost estimates. I outline my opinion associated with the transmission option selected and the substation options. Lastly, I summarize my recommendations.

III. TRANSMISSION

Q. HAVE YOU EVALUATED THE COMPANY'S RELIABILITY STUDY AND CRITERIA THAT RESULTED IN THE PROPOSED AQUIDNECK ISLAND RELIABILITY PROJECT?

A. Yes. I have reviewed the Company's Newport Area (Aquidneck Island) Transmission Solution Study Report and associated reliability criteria set forth by the North American Electric Reliability Corporation ("NERC"), the Northeast Power Coordinating Council, Inc. ("NPCC"), and the New England Power Pool ("NEPOOL") and ISO-NE, upon which this analysis has been built. For the purposes of my analysis, I have accepted the outcomes of the Newport Area (Aquidneck Island) transmission study prepared by Witness Perez-Perez in April, 2015 which demonstrates the need to construct new transmission facilities to improve reliability of the transmission system serving Aquidneck Island.

Q. HAVE YOU ASSESSED ADDITIONAL INFORMATION PREPARED BY THE COMPANY THAT SUPPORTS THE PROPOSED PROJECT?

A. Yes. The Company prepares an annual Infrastructure, Safety and Reliability Plan ("ISR Plan") that outlines capital spending on infrastructure, vegetation management expenses, and other costs related to maintaining safety and reliability of the electric distribution system. I reviewed the ISR Plan and determined that the Company has separately proposed and budgeted for substation and distribution projects that are related to the Aquidneck area Project. Funding for the ISR Plan projects in the Aquidneck area have been approved for FY 2017.

Q. HAVE YOU EVALUATED THE RELIABILITY CRITERIA USED FOR THE AQUIDNECK ISLAND RELIABILITY PROJECT?

A. Yes. I have.

Q. WOULD YOU FIRST SUMMARIZE THE FACTORS CONSIDERED IN CONDUCTING A RELIABILITY ASSESSMENT AND OUTCOMES THAT MAY RESULT IF A SYSTEM FAILS TO MEET RELIABILITY CRITERIA?

A. National Grid is required to meet NPCC and NERC standards for reliable transmission of power over a long term planning horizon. When assessing a utility system to determine if these reliability standards are met, the most critical components are thermal capacity, voltage stability, age of infrastructure, and existing design. A reliability study evaluates the system under both normal operations and contingency conditions that occur during outages. Transmission planning typically includes contingency analyses to determine if the loss of one (N-1) or two (N-1-1) critical transmission components would put the transmission system at risk of not meeting NERC and NPCC reliability criteria. Under the N-1 and N-1-1 scenarios, thermal capacity and voltage stability tend to be the first areas in which problems may occur on the transmission and substation systems due to loads that increase above the level of which the equipment or design of the system can adequately handle. Typically, solutions for voltage instability or thermal overloads include ramping up base load generation, isolating the unstable portion of the system to reroute power flow, or relying on distributed generation and load shedding customers to enable the system to perform at safe level. The inability to implement these measures will result in widespread system outages. Since load shedding of customers is not an acceptable long term solution to alleviate these problems, other alternatives must be used to ensure that voltage and capacity limits can be met by the utility. If all available alternatives are implemented and the utility continues to fail to meet voltage and capacity limits, additional solutions must be explored, such as upgraded or new transmission lines

and substations. Therefore, the purpose of a reliability study is to identify potential problems on a system under contingency conditions and provide the most economical long term solution to meet reliability criteria when issues are identified.

Q. WHAT OTHER FACTORS ARE CONSIDERED IN A RELIABILITY ASSESSMENT?

A. The age and condition of infrastructure are important considerations when evaluating the ability to operate and maintain a system while meeting required reliability criteria. When facilities are past their useful life, finding replacement parts becomes increasingly hard. When a piece of equipment cannot be repaired quickly, such as a substation transformer, outage duration increases and often affects a larger portion of the service territory as compared to a single distribution transformer outage. Equipment such as power transformers, high-side breakers, and motor operated switches require lengthy outages to replace, thereby considerably lengthening the time it takes to return the system to normal operation. It is prohibitively expensive to maintain a full inventory of spare equipment, and utilities must rely on a planning process to identify aged or compromised facilities and schedule timely replacement before catastrophic failures occur. Thus, it is expected that a reliability assessment would include an equipment condition evaluation with recommendations as needed.

Q. WOULD YOU SUMMARIZE YOUR EVALUATION OF THE COMPANY'S RELIABILITY ASSESSMENT, AND, IN PARTICULAR, THE NEED FOR THE AQUIDNECK ISLAND PROJECT IN ORDER TO MEET REQUIRED RELIABILITY CRITERIA?

A. Yes. The Company reported that under contingencies, thermal issues were observed for various substation equipment and transmission lines in the Aquidneck service area. The

Company also identified asset condition issues at the Dexter and Jepson substations. The solution to resolve the contingency issues includes upgrading transmission lines to increase the capacity, and replacing equipment with known asset conditions. Due to the extensive nature of the condition issues, and the fact that the current Jepson Substation is located in a watershed area, the Company is proposing to relocate the entire substation. The relocated and expanded substation will provide adequate capacity for reliability along with operational flexibility to better serve area loads under normal and contingency conditions. I find the proposed solutions of transmission upgrades, substation expansion, and equipment retirements to be reasonable and effective in mitigating reliability deficiencies provided that substation alternatives have been fully evaluated.

Q. DID YOU EVALUATE THE COMPANY'S PROPOSED TRANSMISSION DESIGN AND ROUTE?

A. Yes.

Q. DO YOU HAVE ANY OBSERVATIONS CONCERNING YOUR REVIEW OF THE COMPANY'S LINE ROUTE OR DESIGN DETAILS?

A. Yes. Regarding the transmission line route, the majority of work involves upgrade of the existing 61 and 62 Lines and relocation of a segment of the 63 Line. I do not have concerns with the location of the existing or relocated lines. In regard to the transmission line design, the Company has increased various components of its design, such as greater phase spacing, in a manner to enhance reliability and storm performance. I support those design enhancements. I do recommend the Company incorporate all appropriate National Electrical Safety Code modifications, which will be reflected in the upcoming 2017 edition.

Q. HAVE YOU EVALUATED UNDERGROUND TRANSMISSION AND THE ABILITY TO MEET RELIABILITY CRITERIA AS AN ALTERNATIVE TO OVERHEAD LINES?

A. Yes. National Grid considered two options for underground alternatives. One option was to use the existing right-of-way (4.5 miles), and the other was to use the Public Roadway Route (5 miles). Underground transmission removes the need for overhead towers, requires less right-of-way, and is generally considered for areas where overhead conductors cannot be physically installed. From a reliability perspective, underground transmission provides comparable capacity benefits to overhead conductors and is less susceptible to severe weather events. The benefits of underground, however, are offset by cost and need for spare circuit conductors for reliability. Although underground is less susceptible to storm damage, it generally has a shorter service life, thus replacement cost occurs earlier than that of an overhead transmission line.

Q. HAVE YOU EVALUATED THE COST ESTIMATES PREPARED BY NATIONAL GRID FOR THE PROPOSED PROJECT AND THE ALTERNATIVE PROJECTS, INCLUDING THEIR UNDERGROUND ALTERNATIVE?

A. Yes. I have reviewed the cost estimates contained in the Company's filing and in prior filings. I will comment on the National Grid estimates.

Q. WOULD YOU SUMMARIZE ANY DIFFERENCES OR COMMENTS YOU HAVE IN REGARD TO YOUR EVALUATION OF THE COMPANY'S COST ESTIMATES?

A. Yes. First it must be recognized that National Grid has prepared a study grade estimate of $63.9 million which allows for a variance of +50%/-25%. Simply stated, that means the proposed Project could cost as little as $47.93 million, and as much as $95.85 million.

Although the Company's estimates have been characterized as study grade and are not based on detailed design, they do contain substantial specifics by project component. I evaluated each component and derived an independent cost estimate of $60.9 million, which is generally the same amount as the Company's cost estimate. I found the unit costs used by the Company for overhead components to be consistent with levels in the industry. Within my $60.9 million estimate for the total project, I estimated approximately $18.5 million for overhead lines, in comparison to the $22.7 million estimate provided by National Grid. A similar analysis for all the alternative overhead project estimates was completed, and also resulted in general concurrence albeit falling at the lower end of National Grid's cost estimates. A substantially different cost estimate result was reached for the underground alternatives. It is my opinion that National Grid's cost estimate for the underground alternative is significantly understated. I have completed an independent underground cost estimate for the 61 and 62 Lines which amounted to approximately $83 million. This is nearly 4.5 times greater than an overhead option estimated at $18.5 million. My estimate excludes the need for potential reactors, substation alterations, and wetland mitigation for disturbances caused by open trenching the right-of-way, further increasing the cost of underground alternatives.

Q. HAVE YOU INCLUDED AN EXHIBIT THAT REFLECTS YOUR COST ESTIMATE ADJUSTMENTS AS DISCUSSED?

A. Yes. Exhibit GLB-2 shows Overhead Transmission and Underground Transmission estimates as compared to National Grid's.

Q. WHAT IS YOUR RECOMMENDATION BASED ON YOUR EVALAUTION OF THE PROPOSED TRANSMISSION LINE ROUTE, DESIGN, AND COST AS COMPARED TO ALTERNATIVES?

A. I find the Company's proposed routes and design for the 61 and 62 Line upgrades and the 63 Line relocation to be acceptable. Based on the Company's cost evaluation and my independent estimates provided in Exhibit GLB-2, I find underground alternatives unacceptable due to the higher costs and greater environmental impact, particularly if the existing route is utilized.

IV. SUBSTATION

Q. HAVE YOU EVALUATED THE PROPOSED SUBSTATION AND ALTERNATIVES PRESENTED BY THE COMPANY?

A. Yes. Major work is proposed for the Jepson Substation, which entails building a new station on a parcel of land across the road from the existing site and eliminating the current substation that is located within a watershed area. The new station configuration requires a larger footprint to accommodate a transmission line configuration that provides operational flexibility to meet current and future loads in the Aquidneck area. Four alternatives were evaluated by the Company. Of these, one project would split the substation on both sides of Jepson Lane, and another would construct a new station on a western parcel that is beyond the current right-of-way. I concur that these options do not provide advantages over the proposed Project, which allows the Company to locate and operate equipment on one contiguous piece of property that is very close to the existing Jepson Substation and right-of-way. Another option considered moving the station north of the existing site, but was rejected due to land preservation restrictions currently in place. If the Company were able to have those restrictions lifted, the northern parcels would be a viable option. The remaining alternative would utilize the existing Jepson Substation site to build a new station. The Company rejected this option due to land constraints and complexities requiring temporary work and outages in order to keep the current station energized during construction. The Company also stated that the site is within a watershed protection district. I evaluated the Company's site plans, which specify the location and layout of the existing and new substations. My analysis indicates that, based on physical and electrical requirements, the existing substation site is a viable alternative. However, the logistics and construction of the required capacity and circuit

exits would be more time consuming and there would be a short term decline in reliability during construction.

Q. WHAT ARE THE OPERATIONAL OR CONTRUCTION CHALLENGES ASSOCIATED WITH UTILIZING THE EXISTING SUBSTATION SITE?

A. The Company would be faced with building the transmission to distribution (T-D) portion of the substation (115 kV to 12.47 kV and 115 kV to 23 kV) in stages. The first step is preparing the available land between the existing substation and Jepson Lane, and then constructing a new section of the T-D substation. Next, load would be transferred from the old station to transformers in the new section. This would require temporary transmission arrangements. The Company would then dismantle the existing station in order to complete remaining construction on the site, including additional T-D transformers, the single proposed 115 kV to 69 kV transformer, breakers, and all associated equipment. The final step would be to make permanent transmission connections to completely energize the new station. Although the entire project will be more time consuming and complex than building a new station to the west of Jepson Lane, evaluation of information provided by the Company indicates that the existing site could be an option after incorporating design adjustments.

Q. CAN THE AQUIDENCK LOAD BE RELIABLY SERVED DURING CONSTRUCTION OF A NEW STATION AT THE EXISTING JEPSON SUBSTATION SITE?

A. Yes, the Company would be able to serve load during the transitional phase by connecting distribution circuits to new transformers while the old station is dismantled. The Project proposes two (2) 115 kV to 13.8 kV transformers, each rated 40 MVA, along with two (2) 115 kV to 23 kV transformers with 55 MVA ratings. During the transition,

single transformers for each distribution level will be installed and will have enough capacity to carry load until the full station is complete. This may leave the area deficient of capacity in the event of a single transformer failure, but the exposure should be limited to the transitional period, up to six (6) months.

Q. DOES THE UTILIZATION OF THE NEW SUBSTATION SITE LOCATION HAVE ANY MEANINGFUL BENEFITS OTHER THAN TIME?

A. It is clearly more efficient to construct a new substation on a clear piece of property and have it ready for a transfer of the higher voltage transmission service. The existing substation is a 69 kV to 12.47 kV substation, and the new substation will be a 115 kV to 12.47 kV substation. An entirely new full capacity substation on the new site can be very efficiently energized with the switch-over to the higher transmission voltage. Furthermore, one circuit of the transmission can be maintained at 69 kV, keeping the old station energized and serving load, while the other circuit of the transmission can be energized at 115 kV. This allows the energization of the new substation and systematic transfer of distribution circuits and load, without regard to time of year, load interruptions, and reliability degradation. A similar construction sequence could not be accomplished on the existing substation site.

Q. **DID YOU EVALUATE THE PROPOSED SUBSTATION COST AS COMPARED TO ALTERNATIVES?**

A. Yes. I evaluated the Company's estimate of $24.1 million for the new Jepson (D-Sub) and Retirements along with the estimate of $13.2 million for the New Jepson 115 kV (T-Sub) for a total Jepson Substation estimate of $37.3 million. My cost estimate for construction of a substation, excluding screening and sound attenuation, situated on a new site across Jepson Lane is $24.0 million. My estimate for a comparable substation

located on the existing Jepson Substation site is $26.4 million which accounts for additional engineering, design and labor necessary to sequence the construction. There are costs with either option that cannot be fully quantified at this conceptual stage, such as avoided transmission rearrangements or land preparation at the existing site. It is also conceivable that the Company could be successful in lifting restrictions on parcels of land located to the north of Jepson Substation which would remove any land constraint concerns. Given the preliminary nature of the estimates and variables with each site, I recommend that both alternatives be evaluated in more depth to confirm that the proposed Project is the most viable and cost-effective solution.

Q. IN YOUR EVALUATION OF THE JEPSON SUBSTATION, DID YOU CONSIDER THE TESTIMONY OF MIDDLETOWN'S WITNESS ALONG WITH THAT OF NATIONAL GRID?

A. Yes, I did.

Q. ARE ANY OF MIDDLETOWN'S CONCERNS LEGITIMATE, AND ARE THERE POTENTIAL WAYS TO MITIGATE THESE CONCERNS?

A. The concerns of a community should always be considered. In this instance, the concerns that have been raised are legitimate. There are several ways in which the Company can mitigate and potentially eliminate the concerns.

Q. ARE THERE POTENTIAL DESIGN OPTIONS AT THE NEW SUBSTATION LOCATION WHICH WOULD MITIGATE THE MIDDLETOWN AND RESIDENTS' CONCERNS?

A. Yes. Locating the substation further away from the road and residences on the large site, together with implementing a series of screening options would mitigate the visual concerns. However, the Wetlands and Rare Species Plan provided in the Company's

Environmental Report (Figure 6-5) indicates that this option may place the new substation in a wetlands area. Sound attenuation designs could mitigate the 60 cycle transformer noise, although this 60 cycle transformer noise would be no different than that produced at the existing substation. These alterations or improvements to the existing Project design should be compared to the screening and sound attenuation requirements for a substation expansion on the existing site, since the equipment will be closer to Jepson Lane.

V. PROJECT SCHEDULE

Q. HAVE YOU REVIEWED THE PROPOSED PROJECT SCHEDULE INCLUDED WITHIN THE PACKAGE?

A. Yes, I have.

Q. WHAT COMMENTS DO YOU HAVE IN REGARD TO THE PROPOSED TRANSMISSION PROJECT SCHEDULE?

A. Currently the construction schedule (Figure 4-4 of the Environmental Report) indicates that the 61/62 Line Upgrade Project is expected to be completed by January 2019. This is a very aggressive timeline considering the amount of construction, type of infrastructure, scheduling components involved, and the permitting and licensing required. My initial concern is the timeframe shown for procurement of materials. A majority of the materials are shown to be procured during 2017 and the first half of 2018, with only 3 months of time before construction is to begin. The priority of procurement of materials would need to be weighted heavier during 2017 due to long lead times currently seen within the supply chain for these types of construction activities. Lead times for transmission materials have been pushed out from suppliers and vendors, especially in the steel pole market, due to higher demand from expansive projects occurring throughout the country. While all material to complete the projects listed would not need to be purchased prior to construction, it would be greatly beneficial to acquire a backlog ensuring that construction would not be stopped due to lack of sufficient materials on hand. If procurement were to occur earlier, it would be necessary to have adequate storage space to accommodate the needed materials prior to construction crews needing access in 2019. Furthermore, there is a significant amount of transmission construction across the United States straining the contracting labor force

and substantially extending the time for steel pole deliveries to at least 4-5 months for standard poles, and a minimum of 6 months for specialty poles, such as the structures required for this project. Lastly, outages on the existing transmission lines will need to be scheduled well in advance, and this type of planning is impacted by many uncontrollable variables. A standard outage can take 6 months or more to schedule and is generally limited to times of lower demand or non-summer months. However, a schedule may be shifted or cancelled due to higher loads or weather related demand spikes. If construction crews are approved to work during periods of high demand, the efficiency diminishes due to safety requirements that must be implemented while working near energized facilities. It should be noted that the construction of facilities within the same alignment of the existing H-frame line will require removal, at a minimum, of existing line sections, affecting the amount of power that can be transmitted from the remaining transmission infrastructure during summer peaking months. The National Grid proposed transmission schedule should reflect at least a 3-year duration to realistically represent the present market.

Q. WHAT COMMENTS DO YOU HAVE IN REGARD TO THE PROPOSED SUBSTATION PROJECT SCHEDULE?

A. The construction schedule (Figure 4-4 of the Environmental Report) indicates that the new Jepson Substation is expected to be in service by September 2019. This is consistent with the Company's ISR Plan material which estimates that the Jepson Substation will be ready for load in October 2019. I believe that this timeline is too aggressive given the scope and complexity of the project. If the Company is required to perform detailed evaluations of siting options, this will delay the project design and engineering on the front end. Substation design changes may impact permitting and transmission inter-ties

which result in overall schedule delays. Taking into account these variables and the need to align with a more reasonable transmission schedule, I recommend the Company add a year to the substation timeline.

VI. CONCLUSION

Q. IN YOUR EVALUATION OF THE NATIONAL GRID FILING AND ENVIRONMENTAL REPORT, DID YOU ARRIVE AT AN OPINION REGARDING THE NEED FOR THIS PROJECT? WHAT WAS THE BASIS FOR YOUR ASSESSMENT AND OPINION?

A. Yes. I concur there is a critical need to solve the transmission system reliability limitations in the Aquidneck Island area. The solution needs to remedy N-1 and N-1-1 thermal overloads and capacity deficiencies that arise from the contingency scenarios evaluated by National Grid. In addition, substation equipment condition concerns will be alleviated by this comprehensive Project. I have evaluated the entire filing by National Grid, including all of the appendices, testimony, exhibits attached to testimony, and additional documents produced. Additionally, a portion of the basis for my opinion of the need for this Project includes the years I have been involved with the Rhode Island Division of Public Utilities and Carriers, and the reliability assessment process associated with evaluating the National Grid system in Rhode Island. It is clear that Rhode Island expects a high level of reliability from the electric utility system. It would be incongruent for the Division, and me as a consultant to the Division, to expect distribution system improvements and the achievement of a high level of distribution system reliability, while not expecting a comparable and superior level of reliability associated with the transmission delivery system. Therefore, part and parcel to my opinion is the overall reliability expectation that I have seen exhibited through my work with the Division. Additionally, I believe that the testimony, materials, and analyses provided by National Grid have been presented fairly and accurately.

Q. DO YOU BELIEVE THE PROPOSED TRANSMISSION LINE REPRESENTS THE MOST COST EFFECTIVE METHOD TO MEET THE NEED AS IT HAS BEEN PRESENTED?

A. Yes. The proposed transmission line is the optimal overhead solution since it utilizes existing rights-of-way and provides reliability with the greatest operational flexibility and capacity for the long term. The non-wire alternative is not a viable option and the underground transmission alternative is not a cost effective solution. Also, in my opinion a No Build option is unacceptable.

Q. IS IT YOUR TESTIMONY THAT THE COST ESTIMATE FOR THE PROPOSED TRANSMISSION LINE IS REASONABLE?

A. Yes. Although my evaluation found the National Grid overhead cost estimate to be slightly higher than one I would prepare, it is certainly within a reasonable study grade level. The $63.9 million for the proposed project is a reasonable estimate.

Q. DO YOU HAVE ANY OBSERVATIONS CONCERNING YOUR REVIEW OF THE COMPANY'S TRANSMISSION LINE DESIGN DETAILS?

A. Yes. The Company has increased various components of its design, such as greater phase spacing to enhance reliability and storm performance. I support those design enhancements. I do, however, recommend the Company incorporate all appropriate National Electrical Safety Code modifications to be reflected in the 2017 Edition,

Q. DO YOU BELIEVE THE PROPOSED SUBSTATION REPRESENTS THE MOST COST EFFECTIVE METHOD TO MEET THE NEED AS IT HAS BEEN PRESENTED?

A. The Company's proposal to build a new substation to the west of the existing Jepson Substation on a clear piece of property is an effective method to make system

improvements. The existing substation is a 69 kV to 12.47 kV substation, and the new substation will be a 115 kV to 12.47 kV substation. An entirely new full capacity substation can be constructed while the old station serves load, ultimately allowing for the energization of the new substation and systematic transfer of distribution circuits and load without regard to time of year and without any load interruptions or reliability degradation.

Q. YOUR TESTIMONY INDICATES THAT YOU REVIEWED THE PROPOSED SUBSTATION PROJECT AND ALL OF THE ALTERNATIVES. IS THAT CORRECT?

A. Yes.

Q. DO YOU AGREE WITH THE PROPOSED SUBSTATION? IF NOT, HAVE YOU IDENTIFIED ALTERNATIVES THAT SHOULD BE CONSIDERED?

A. I have carefully considered all of the projects as proposed by National Grid. I have evaluated each solution based on its reasonableness, effect on the surrounding environment, and its ability to meet the need cost effectively and in a timely manner. I find that one alternative, replacing Jepson Substation on the existing site, may be a cost effective and viable alternative. The Company rejected this option due to land constraints and complexities of the construction schedule. Given the preliminary information provided by the Company, I do not believe that these are insurmountable issues, potentially resulting in an equally effective solution. I recommend that both the proposed substation project with increased visual screening and sound attenuation and the alternative to build on the existing site be evaluated in detail before a final project is advanced.

Q. DO YOU HAVE ANY OBSERVATIONS CONCERNING YOUR REVIEW OF THE COMPANY'S PROJECT TIMELINE?

A. Yes. The Company has estimated completion of the Project in 2019. I find this timeline to be extremely aggressive given the remaining evaluation, engineering, design and permitting required. Material procurement and outage planning are expected to take considerable time, and I am not convinced that the Company has recognized these contingencies. I recommend that the Company revise the plan and allow for at least an additional year to complete both the transmission and substation portions.

Q. CAN YOU SUMMARIZE YOUR TESTIMONY IN ONE SENTENCE?

A. Yes. The proposed transmission line project is the preferred option, however, the Company should further evaluate the substation construction options I have outlined in my testimony.

Q. DOES THIS COMPLETE YOUR TESTIMONY?

A. Yes.

AFFIDAVIT OF GREGORY L. BOOTH, PE

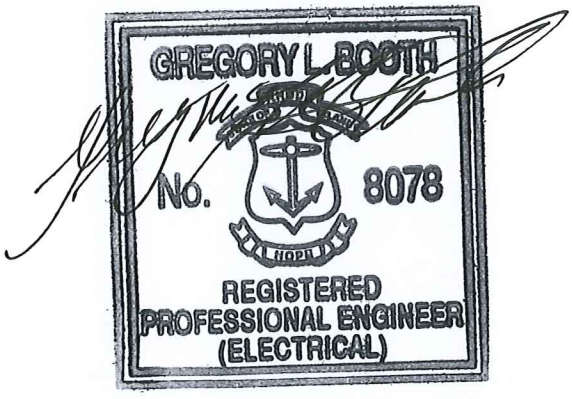
Gregory L. Booth, does hereby depose and say as follows:

I, Gregory L. Booth, on behalf of the Rhode Island Division of Public Utilities and Carriers, certify that testimony, including information responses, which bear my name was prepared by me or under my supervision and is true and accurate to the best of my knowledge and belief.

Signed under the penalties of perjury this the 5th day of August, 2016.

Gregory L. Booth

I hereby certify this document was prepared by me or under my direct supervision. I also certify I am a duly registered professional engineer under the laws of the State of Rhode Island, Registration No. 8078.



Gregory L. Booth, PE

Exhibit GLB-1

Gregory L. Booth, PE
Resume

GREGORY L. BOOTH, PE, PLS
President
PowerServices, Inc.
Gregory L. Booth, PLLC

RESUME

Gregory L. Booth is a registered professional engineer with engineering, financial, and management services experience in the areas of utilities, industry private businesses and forensic investigation. He has been representing over 300 clients in some 40 states for more than 40 years.

Mr. Booth has been accepted as an expert before state and federal regulatory agencies, including the Federal Energy Regulatory Commission, the Delaware Public Service Commission, the Florida Public Service Commission, the Minnesota Department of Public Service Environmental Quality Board, the Massachusetts Attorney General Department of the Advocacy, the New Jersey Board of Public Utilities, the North Carolina Utilities Commission, the Pennsylvania Public Utility Commission, the Rhode Island Public Utilities Commission, and the Virginia State Corporation Commission. He has been accepted as an expert in both state and federal courts, including Colorado, Delaware, Florida, District of Columbia, Missouri, New York, North Carolina, Oklahoma, Pennsylvania, South Carolina, Virginia, West Virginia, Wisconsin and numerous Federal Court jurisdictions. Mr. Booth has provided expert witness services on over 500 tort case matters, and over 50 regulatory matters. Investigation and testimony experience includes areas of wholesale and retail rates, utility acquisition, territorial disputes, electric service reliability, right-of-way acquisition and impact of electromagnetic fields and evaluation of transmission line options for utility commissions. Additionally, Mr. Booth has extensive experience serving as an expert witness before state and federal courts on matters including property damage, forensic evaluation, fire investigations, fatality, and areas of electric facility disputes and Occupational, Safety and Health Administration violations and investigations together with National Electric Code and National Electrical Safety Code and Industry Standard compliance.

The following pages provided are the education and experience from 1963 through the present, along with courses taught and publications.

Resume

GREGORY L. BOOTH, PE, PLS

Mr. Booth is a Registered Professional Engineer with engineering, financial, and management experience assisting local, state, and federal governmental units; rural electric and telephone cooperatives; investor owned utilities, industrial customers and privately owned businesses. He has extensive experience representing clients as an expert witness in regulatory proceedings, private negotiations, and litigation.

PROFESSIONAL EDUCATION:

NORTH CAROLINA STATE UNIVERSITY; Raleigh NC, Bachelor of Science, Electrical Engineering, 1969

REGISTRATIONS:

Registered as Professional Engineer in Alabama, Arizona, Colorado, Connecticut, Delaware, District of Columbia, Florida, Georgia, Kansas, Maryland, Minnesota, Mississippi, Missouri, New Hampshire, New Jersey, North Carolina, Oklahoma, Pennsylvania, Rhode Island, South Carolina, Texas, Commonwealth of Virginia, West Virginia, and Wisconsin

Professional Land Surveyor in North Carolina

Council Record with National Council of Examiners for Engineering and Surveying

EXPERIENCE:

1963-1967
Technician
Booth & Associates

Transmission surveying and design assistance, substation design assistance; distribution staking; construction work plan, long-range plan, and sectionalizing study preparation assistance for many utilities, including Cape Hatteras EMC, Halifax EMC, Delaware Electric Cooperative, Prince George Electric Cooperative, A&N Electric Cooperative; assistance generation plant design, start-up, and evaluations.

1967-1973
Project Engineer
Booth & Associates

Transmission line and substation design; distribution line design long-range and construction work plans; rate studies in testimony before State and Federal commissions; power supply negotiations; all other facets of electrical engineering for utility systems and over 30 utilities in 10 states.

1973-1975
Professional Engineer
Associates
1975-1994
Executive Vice President
Booth & Associates

Directed five departments of Booth & Associates, Inc.; provided engineering services to electric cooperatives and other public Booth & power utilities in 23 states; provided expert testimony before state regulatory commissions on rates and reliability issues; in accident investigations and tort proceedings; transmission line routing and designs; generation plant designs; preparation and presentation of long-range and construction work plans; relay and sectionalizing studies; relay

	design and field start-up assistance; generation plant designs; rate and cost-of-service studies; reliability studies and analyses; filed testimony, preparation and teaching of seminars; preparation of nationally published manuals; numerous special projects for statewide organizations, including North Carolina EMC. Work was provided to over 130 utility clients in 23 states, PWC of the City of Fayetteville, NC, Cities of Wilson, Rocky Mount and Greenville are among the utilities in which I have provided engineering services in North Carolina during this time frame. Services to industrial customers include Texfi Industries, Bridgestone Firestone, Inc. and many others.
1994-2004 President Booth & Associates	Responsible for the direction of the engineering and operations of Booth & Associates, Inc. for all divisions and departments. The engineering work during this time frame has continued to be the same as during 1974 through 1993 with the addition of greater emphasis on power supply issues, including negotiating power supply contracts for clients; increased involvement in peaking generation projects; development of joint transmission projects, including wheeling agreements, power supply analyses, and power audit analyses. The work during this time frame includes providing services to over 200 utility clients across the United States, including NCEMC and NRECA.
2004-Present President Gregory L. Booth, PLLC	Provide engineering and management services to the electric industry, including planning and design. Providing forensic engineering, product evaluation, fire investigations and accident investigation, serving as an expert witness in state and federal regulatory matters and state and federal court.
2005-Present President PowerServices, Inc. PowerServices, Inc.	Responsible for the direction of the engineering and operations of PowerServices, Inc. for all divisions and departments. Provide engineering and management services to the electric industry, including planning and design and utility acquisition. Providing forensic engineering, product evaluation, fire investigations and accident investigation, serving as an expert witness in state and federal regulatory matters and state and federal court.

WORK AND EXPERTISE:

ELECTRIC UTILITIES:
(more than 300 clients)

- Utility acquisition expert, including providing condition assessment, system electrical and financial valuation, electrical engineering assessment, initial Work Plan and integration plans, acquisition loan funds, testimony, assessment and consulting services for numerous electric utility acquisitions. Utility clients for acquisition projects include Winter Park, FL acquisition of Progress Energy, FL, system in the City limits, A & N Electric Cooperative acquisition of the Delmarva Power & Light Virginia jurisdiction, Shenandoah Valley Electric Cooperative acquisition of Allegheny Energy Virginia jurisdiction, Rappahannock Electric Cooperative acquisition of Allegheny Energy Virginia

jurisdiction, and numerous other past and currently active electric utility acquisitions.

- System studies, including long-range and short-range planning, sectionalizing studies, transmission load flow studies, system stability studies (including effects of imbalance and neutral-to-earth voltage), environmental analyses and impact studies and statements, construction work plan, power requirements studies, and feasibility studies.
- Fossil and hydro generation plan analysis, design, and construction observation.
- Transmission line design and construction observation through 230 kV overhead and underground.
- Switching station and substation design and construction observation through 230 kV.
- Distribution line design and staking, overhead and underground.
- Design of submarine cable installations.
- Supervisory control and data acquisition system design, installation and operation assistance.
- Load management system design, installation and operation assistance.
- Computer program development.
- Load research and alternative energy source evaluation.
- Field inspection, wiring, and testing of facilities.
- Relay and energy control center design.
- Mapping.
- Specialized grounding for abnormal lightning conditions.
- Ground potential rise protection.
- Protective system/relay coordination.

GENERATION DESIGN / FAILURE ANALYSES:

- Intermediate and peaking generation (gas and oil fired through 400 MW).
- Peaking generation (diesel and gas through 10,000 kW)
- Wind generation.
- Solar (PV) generation.
- Hydroelectric generation.

TELECOMMUNICATION: UTILITIES:

- Subscriber and trunk carrier facilities design.
- Stand-by generation and DC power supplies
- DC-AC inverters for interrupted processor supplies.
- Plant design and testing.
- Fiber optics and other transmission media.
- Microwave design.
- Pole attachment designs.
- Pole attachment agreements and rental rates calculations.

FINANCIAL SERVICES:

- Long-term growth analyses and venture analyses.
- Lease and cost/benefit analyses.
- Capital planning and management.
- Utility rate design and service regulations.

- Cost-of-Service studies.
- Franchise agreements.
- Corporate accounting assistance.
- Utility Commission testimony (State and Federal).

FORENSIC ENGINEERING:

- Compliance with NESC, NEC, OSHA, IEEE, ANSI, ASTM and other codes and industry standards.
- Equipment and product failure and analysis and electrical accident investigation (high and low voltage equipment).
- Stray voltage, electrical shocking, and electrocution investigations.
- Building code investigations.
- New product evaluation.
- MCC, MDP failure analysis and arc flash analysis
- Electrical fire analysis

INDUSTRIAL/ELECTRICAL ENGINEERING:

- Building design (commercial and industrial).
- Building code application and investigation.
- Electric thermal storage designs for heating, cooling, and hot water.
- Standby generation and peaking generation design.
- Electric service design (residential, commercial, and industrial).

INSTRUCTIONAL SEMINARS AND TEXT:

- Seminars taught on arc flash hazards and safety, including National Electrical Safety Code regulations for utilities.
- Courses taught on Distribution System Power Loss Evaluation and Management.
- Courses taught on Distribution System Protection.
- Text prepared on Distribution System Power Loss Management.
- Text prepared on Distribution System Protection.
- Seminars taught on substation design, NESC capacitor application, current limiting fuses, arresters, and many others electrical engineering subjects.
- Courses taught on accident investigations and safety.
- Courses taught on Asset Management.
- Courses taught on OSHA and Construction Safety.

TESTIMONY AS AN EXPERT:

- Concerning rate and other regulatory issues before Federal Energy Regulatory Commission and state commissions in Delaware, Florida, Maryland, Massachusetts, Minnesota, New Jersey, North Carolina, Pennsylvania, Rhode Island, and Virginia.
- Concerning property damage or personal injury before courts in Colorado, District of Columbia, Florida, Maryland, Minnesota, Missouri, New Jersey, New York, North Carolina, Oklahoma, Pennsylvania, South Carolina, Texas, Virginia, West Virginia, and Wisconsin.

FIELD ENGINEERING:

- Transmission line survey and plan and profile.
- Distribution line staking.
- Property surveying.
- Relay and recloser testing.
- Substation start-up testing.
- Generation acceptance and start-up testing.
- Ground resistivity testing.
- Work order inspections.
- Operation and maintenance surveys.
- Building inspection and service facility inspection.
- Construction Management
  - Generation
  - Transmission
  - Substation
  - Distribution
  - Building Electrical Installations
  - GSA construction projects
  - NASA construction projects
  - University construction projects

PROFESSIONAL ORGANIZATIONS:

a. National Society of Professional Engineers (NSPE)
b. Professional Engineers in Private Practice (PEPP)
c. National Council of Examiners for Engineering & Surveying (NCEES)
d. Professional Engineers of North Carolina (PENC)
e. National Fire Protection Association (NFPA)
f. Associate Member of the NRECA
g. NRECA Cooperative Network Advisory Committee (NRECA-CRN)
h. The Institute of Electrical and Electronics Engineers (IEEE) (Distribution sub-committee members on reliability)
i. American Standards and Testing Materials Association (ASTM)
j. Occupational Safety and Health Administration (OSHA) Certification
k. American Public Power Association (APPA)
l. American National Standards Institute (ANSI)

ACTIVE AND HISTORIC REGULATORY CASES
BY GREGORY L. BOOTH, PE, PLS

Commonwealth of Virginia State Corporation Commission

Rappahannock Electric Coopertive, 247 Industrial Court, Fredericksburg, VA 22408

Case No. PUE-2009-0010 (HE)

2007

Delmarva Power & Light System Acquisition Purchase for A & N Electric Cooperative, Post Office Box 290, 21275 Cooperative Way, Tasley, VA 23441 and Old Dominion Electric Cooperative, 4201 Dominion Boulevard, Glen Allen, VA 23060

Case Nos. PUE-2007-00060, 00061, 00062, 00063, and 00065 (HE)

2009

Potomac Edison/Allegheny Energy System Acquisition Purchase for Shenandoah Valley Electric Cooperative, 147 Dinkel Ave., Hwy 257, Mt. Crawford, VA 22841

Case No. PUE-2009-00101 (HE)

2011

Virginia, Maryland & Delaware Association of Electric Cooperatives Commonwealth of Virginia at the relation of the State Corporation Commission in the Matter of Determining Appropriate Regulation of Pole Attachments and Cost Sharing in Virginia

Case No. PUE-2011-00033 (HE)

2013

Northern Virginia Electric Cooperative Pole Attachment Dispute with ComCast

PUE-2013-00055 (HE)

Delaware Public Service Commission

Delaware Electric Cooperative, Inc., Retail Rate Case and Reliability Cases

(HE)

Federal Energy Regulatory Commission

Public Works Commission of the City of Fayetteville, NC v. Carolina Power & Light Company

ER76-, ER77-, ER78, ER81-344, ER84- (HE)

2000

North Carolina Electric Membership Corporation v. Duke Energy Corporation and Duke Electric Transmission

ER01-282-000 and ER01-283-000 (HE)

HE = Hearing
WT = Written Testimony

PowerServices, Inc.
Engineering and Management Services
July 27, 2016

ACTIVE AND HISTORIC REGULATORY CASES
BY GREGORY L. BOOTH, PE, PLS

Federal Energy Regulatory Commission

2000

North Carolina Electric Membership Corporation v. Virginia Electric Power Company dba North Carolina Power

EL90-26-00-000 (HE)

2015

Application for Authorization Pursuant to Section 203(a)(1)(A) and 203(a)(2) of the Federal Power Act and Request for Waivers of Certain Filing Requirements

Dkt EC15-___-000

Florida Public Service Commission (PSC)

2007

Municipal Utility Underground Consortium Pre-Filed Testimony for Storm Hardening and Undergrounding Assessment

Docket Nos. 07023-EI, 080244-EI, and 080522-EI (HE)

2007

Gulf Power Company's Storm Hardening Plan Pre-filed Testimony on Behalf of City of Panama City Beach, Florida

Florida PSC Docket No. 070299-EI (HE)

Massachusetts Department of Public Utilities

2012

Massachusetts Office of Attorney General Commonwealth of Massachusetts Department of Public Utilities Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid Review for Storm Response and Recovery of 2008 Storm Costs

DPU 11-56 (WT) (HE)

2012

Massachusetts Office of Attorney General Western Massachusetts Electric Company, Northeast Utilities System, Review for Recovery of Storm Costs

DPU 11-102/DPU 11-102A (WT) (HE)

2013

Massachusetts Office of Attorney General Nstar Review for Recovery of Storm Costs

DPU 13-52 (WT) (HE)

HE = Hearing
WT = Written Testimony

ACTIVE AND HISTORIC REGULATORY CASES
BY GREGORY L. BOOTH, PE, PLS

Massachusetts Department of Public Utilities

2014

Massachusetts Office of Attorney General National Grid Solar Generation Phase II Program Assessment

D.P.U. 14-01 (WT)

2014

Massachusetts Office of Attorney General Western Massachusetts Electric Company, Review of Storm Recovery Reserve Cost Adjustment "SRRCA"

D.P.U. 13-135 (WT) (HE)

2016

MA Elec. Co. and Nantucket Elec. Co. d/b/a National Grid, Fitchburg Gas and Electric Light Co. d/a/a Unitil and NSTAR Elec. Co. and Western MA Elec. Co. d/b/a Eversource for Approval by the DPU of their Grid Modernization Plan

DPU 120-123

Minnesota Department of Public Service/Environmental Quality Board

Transmission Line Assessment Minnesota Department of Public Service and Minnesota Environmental Quality Board

(HE)

New Hampshire Public Utilities Commission

2004

City of Bedford v. Public Service of New Hampshire

New Jersey Public Service Commission

Sussex Rural Electric Cooperative Retail Rate Cases

(HE)

2004

New Jersey Board of Public Utilities, Focused audit of the planning, operations and maintenance practices, policies and procedures of Jersey Central Power & Light Company

Docket No. EX02120950 (HE)

2015

Jersey Central Power & Light Company ("JCP&L") and Mid-Atlantic Interstate Transmission, LLC ("MAIT") FERC 7 Factor Test Evaluation

BPU Docket No. EM15060733

HE = Hearing
WT = Written Testimony

ACTIVE AND HISTORIC REGULATORY CASES
BY GREGORY L. BOOTH, PE, PLS

New Jersey Public Service Commission

2016

Atlantic City Electric Company for Approval of Amendments to its Tariff to Provide for an Increase in Rates and Charges For Electric Service Pursuant to NJSA 48:2-21 and JJSA 48:2-21.1

DPU Docket No. ER16030252 OAL Docket No. PUC 5556-16

North Carolina Utilities Commission

Larry Eaves, et. al. v. Town of Clayton

(HE)

Poly-Loc v. Town of Tarboro

(HE)

1990

Delora Dennis, et. al. v. Haywood EMC

E-7, Sub 474, EC-10, Sub 37, E013, Sub 151 (HE)

2001

Wake EMC Right of Way Acquisiton

(TE)

2002

Property of Ed Harris v. Progress Energy Carolina
Siler City Transmission Line Issues

General Court of Justice Superior Court Division, File No. 03 CVS SP 251, 252, 253, 254, 255 (WT) (HE)

2004

John Wardlaw, et. al. Interveners v. Progress Energy Carolinas

Docket No. E-2, Sub 855 (HE)

2011

Frontier Communications of the Carolinas, Inc.

11-CVS-17175

HE = Hearing
WT = Written Testimony

ACTIVE AND HISTORIC REGULATORY CASES
BY GREGORY L. BOOTH, PE, PLS

Pennsylvania Public Utility Commission

2004

Investigation regarding the Metropolitan Edison Company Pennsylvania Electric Company and Pennsylvania Power Company Reliability Performance

Docket No. I-00040102 (WT) (HE)

2006

Investigation regarding Pennsylvania Rural Electric Association / Allegheny Electric Cooperative Rates

Docket Nos. R-00061366, R-0061367, et. al. (WT) (HE)

2007

Wellsboro Electric Company participants Included C&T Enterprises, Inc., comprised of Wellsboro Electric Company, Claverack Rural Electric Cooperative, Inc., Tri-County Rural Electric Cooperative, Inc., and Citizens Electric

Docket No. P-2008-2020257 (WT) (HE)

2014

PREA 2014 Intervention Assistance, Analysis of Service Reliablity Concerns Regarding West Pennsylvania Power Company, Pennsylvania Electric Company, Metropolitian Edison Company (First Energy Company)

Docket Nos. R-2014-2428742, -2428743, -2428744, -248745 (WT)

2015

MAIT and PENELEC for Authorizing the Transfer of Certain Transmission Assests from MET-Ed & PENELEC to MAIT

Rhode Island Public Utilities Commission

1997

Testimony before the Rhode Island Utilities Commission, on behalf of Rhode Island Division of Public Utilities and Carriers, May 15, 1997

Docket No. 2489 (WT) (HE)

2003

Testimony before the Rhode Island Utilities Commission on behalf of Rhode Island Division of Public Utilities and Carriers, December 2003

Docket No. 2930 (WT) (HE)

HE = Hearing
WT = Written Testimony

ACTIVE AND HISTORIC REGULATORY CASES
BY GREGORY L. BOOTH, PE, PLS

Rhode Island Public Utilities Commission

2004

Issuance of Advisory Opinion to Energy Facility Siting Board Regarding The Narragansett Electric Company's Application to Relocate Transmission Lines Between Providence and East Providence, 2004

Docket No. 3564 (WT) (HE)

2006

Issuance of Advisory Opinion to Energy Facility Siting Board Regarding the Narragansett Electric Company d/b/a National Grid's Application to Construct and Alter Major Energy Facilities, 2006

Docket No. 3732 (WT) (HE)

2007

Issuance of Advisory Opinion to RIDPUC in the Matter of the Joseph Allard Fatality Involving Verizon and National Grid

2008

Issuance of Advisory Opinion to Energy Facility Siting Board Regarding the Narragansett Electric Company d/b/a National Grid's Application to Construct and Alter Major Energy Facilities, 2008

Docket No. 4029 (WT) (HE)

2010

Rhode Island Division of Public Utilities and Carriers Narragansett Tariff Investigation

Docket No. R.I.P.U.C. 4065

2010

National Grid Proposed Electric Infrastructure, Safety and Reliablity Plan for FY 2012 Submitted Pursant to R.I.G.L. § 39-1-27.7.1

Docket No. 4218 (WT) (HE)

2012

National Grid Electric FY 2013 Electric Infrastructure, Safety and Reliablity Plan

Docket No. 4307 (WT) (HE)

2012

National Grid Hurricane Irene Response Assessment, 2012

Docket No. D-11-94 (WT) (HE)

HE = Hearing
WT = Written Testimony

ACTIVE AND HISTORIC REGULATORY CASES
BY GREGORY L. BOOTH, PE, PLS

Rhode Island Public Utilities Commission

2012

Public Utilities Commission Review of Storm Contingency Funds of Electric Utilities

Docket No. 2509 (WT) (HE)

2012

Commission's Investigation Relating to Stray and Contact Voltage

Docket No. 4237 (WT)

2012

Rhode Island Public Utilities Commission Interstate Reliability Assessment

Docket No. 4360 (WT) (HE)

2012

National Grid Electric Infrastrucutre, Safety, and Reliablity Plan for 2014

Docket No. 4382 (WT) (HE)

2014

National Grid Electric Infrastructure, Safety, and Reliablity Plan 2015 Proposal

Docket No. 4473 (WT) (HE)

2014

National Grid's FY 2016 Electric Infrastructure, Safety and Reliability Plan

Docket No. 4539

2015

Division's Investigation into Verizon's Vegetation Management Practices

2015

Wind Energy Development, LLC (WED) and ACP Land, LLC Petition for Dispute Resolution Relating to Interconnection

Docket No. 4483 (WT)

2015

National Grid Electric Infrastructure, Safety, and Reliablity Plan FY 2017

Docket No. 4592

HE = Hearing
WT = Written Testimony

ACTIVE AND HISTORIC REGULATORY CASES
BY GREGORY L. BOOTH, PE, PLS

Rhode Island Public Utilities Commission

2016

PUC Advisory Opinion Regarding Need of The Narragansett Electric Co. d/b/a National Grid to Construct and Alter Certain Transmission Components in the Towns of Portsmouth and Middletown (Aquidneck Island Reliablity Project)

Docket No. 4614

Exhibit GLB-2

Overhead and Underground Transmission
Cost Estimate Comparisons

PowerServices, Inc.

Construction Cost Estimate

Owner: National Grid		**Date:**	**6/29/2016**
Facility: Aquidneck Island Reliability Project		**Est. By:**	**LBJ**
Project: Cost Estimate		**Project No.:**	
Description: 115kV Transmission Estimate			

Line Item	Item or Construction Unit	Quantity	Unit of Measure	Labor Cost	Material Cost	Labor & Materials	Extended Cost
1.	Steel Caissons (15'x5')	50	EACH	$8,080.36	$4,030.00	$12,110.36	$605,518.00
2.	Tangent Foundation (15'x5')	661.5	CU YD	$1,200.00	$300.00	$1,500.00	$992,250.00
3.	Angle Foundation (25'x6')	225	CU YD	$1,200.00	$300.00	$1,500.00	$337,500.00
4.	Single DDE Foundation (35'x8')	486	CU YD	$1,200.00	$300.00	$1,500.00	$729,000.00
5.	Double DDE Foundation (35'x10')	138	CU YD	$1,200.00	$300.00	$1,500.00	$207,000.00
6.	Dewatering	50	EACH	$700.00	$0.00	$700.00	$35,000.00
7.	Pole, Steel Tangent (85')	63	EACH	$3,050.00	$6,100.00	$9,150.00	$576,450.00
8.	Pole, Steel Angle (90')	15	EACH	$3,760.00	$9,520.00	$13,280.00	$199,200.00
9.	Pole, Steel Single DDE (90')	18	EACH	$5,075.00	$15,450.00	$20,525.00	$369,450.00
10.	Pole, Steel Double DDE (95')	2	EACH	$6,450.00	$22,050.00	$28,500.00	$57,000.00
11.	Pole, Wood, 80'	2	EACH	$850.00	$1,250.00	$2,100.00	$4,200.00
12.	Tangent Structure (TU-1AA)	63	EACH	$1,930.50	$750.00	$2,680.50	$168,871.50
13.	Angle Structure (TU-3A)	15	EACH	$2,340.56	$775.00	$3,115.56	$46,733.40
14.	Single Circuit DDE (TS-5A)	18	EACH	$4,321.00	$820.00	$5,141.00	$92,538.00
15.	Double Circuit DDE (TU-5A)	3	EACH	$3,861.00	$875.00	$4,736.00	$14,208.00
16.	Static Tangent (TM-4A)	39	EACH	$65.00	$45.00	$110.00	$4,290.00
17.	Static Deadend (TM-4E)	11	EACH	$75.00	$60.00	$135.00	$1,485.00
18.	OPGW Tangent	39	EACH	$125.00	$75.00	$200.00	$7,800.00
19.	OPGW Deadend	11	EACH	$225.00	$110.00	$335.00	$3,685.00
20.	795 kcmil ACSR	142560	FOOT	$5.25	$3.77	$9.02	$1,285,891.20
21.	3/8" EHS Static Conductor	23760	FOOT	$0.50	$1.80	$2.30	$54,648.00
22.	36 Count OPGW	23760	FOOT	$4.00	$2.25	$6.25	$148,500.00
23.	OPGW Splice	15	EACH	$3,000.00	$200.00	$3,200.00	$48,000.00
24.	OPGW Transmission Loop	4	EACH	$1,200.00	$700.00	$1,900.00	$7,600.00
25.	Pole Grounding (TM-9)	99	EACH	$125.00	$80.00	$205.00	$20,295.00
26.	Jumper (TM-7)	72	EACH	$200.00	$150.00	$350.00	$25,200.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
					Subtotal - Construction w/o Contingencies		$6,042,313.10
			8%			Contingencies	$483,385.05
						Subtotal	$6,525,698.15
			12%		Engineering, General and Administrative		$783,083.78
						Project Total	$7,308,781.93

PowerServices, Inc.

Construction Cost Estimate

Owner: National Grid		**Date:**	**6/29/2016**
Facility: Aquidneck Island Reliability Project		**Est. By:**	**LBJ**
Project: Cost Estimate		**Project No.:**	
Description: 69kV Transmission Removal			

Line Item	Item or Construction Unit	Quantity	Unit of Measure	Labor Cost	Material Cost	Labor & Materials	Extended Cost
1.	Poles, Wood 70	100	EACH	$1,050.00	$0.00	$1,050.00	$105,000.00
2.	Poles, Wood 80	40	EACH	$1,275.00	$0.00	$1,275.00	$51,000.00
3.	Distribution Line Removal	64	EACH	$1,600.00	$0.00	$1,600.00	$102,400.00
			EACH	$0.00	$0.00	$0.00	
			EACH	$0.00	$0.00	$0.00	
			EACH				
4.	Tangent H-Frame (TH-1A)	50	EACH	$1,800.00	$0.00	$1,800.00	$90,000.00
5.	Angle H-Frame (TH-3A)	2	EACH	$1,900.00	$0.00	$1,900.00	$3,800.00
6.	DDE H-Frame (TH-5A)	18	EACH	$2,250.00	$0.00	$2,250.00	$40,500.00
7.	Three Pole	24	EACH	$1,650.00	$0.00	$1,650.00	$39,600.00
8.	636 MCM AAC	145,000	FOOT	$2.05	$0.00	$2.05	$297,250.00
9.	3/8" HS Static	46464	FOOT	$1.20	$0.00	$1.20	$55,756.80
			FOOT	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
				Subtotal - Construction w/o Contingencies			$785,306.80
			8%			Contingencies	$62,824.54
						Subtotal	$848,131.34
			0%	Engineering, General and Administrative			$0.00
						Project Total	$848,131.34

PowerServices, Inc.

Construction Cost Estimate

Owner: National Grid		**Date:**	**6/29/2016**
Facility: Aquidneck Island Reliability Project		**Est. By:**	**LBJ**
Project: Cost Estimate		**Project No.:**	
Description: Access and ROW Maintenance			

Line Item	Item or Construction Unit	Quantity	Unit of Measure	Labor Cost	Material Cost	Labor & Materials	Extended Cost
1.	Construct Access Road	3725	FOOT	$0.00	$0.00	$0.00	$0.00
2.	Repair Access Road	3725	FOOT	$0.00	$0.00	$0.00	$0.00
3.	Construct Access Pad	28125	SQ FT	$30.00	$15.00	$45.00	$1,265,625.00
4.	Wetland Matting	425000	SQ FT	$15.00	$3.00	$18.00	$7,650,000.00
5.	Construct Timber Bridges	5	EACH	$10,000.00	$2,000.00	$12,000.00	$60,000.00
6.	Shed Removal	2	EACH	$4,500.00	$0.00	$4,500.00	$9,000.00
7.	Stone Wall Removal	75	FOOT	$55.00	$0.00	$55.00	$4,125.00
8.	Vegetation Mowing	54.5	ACRE	$600.00	$0.00	$600.00	$32,700.00
9.	Danger Tree Removal	32	EACH	$750.00	$0.00	$750.00	$24,000.00
10.	Side Trimming	5.45	ACRE	$1,200.00	$0.00	$1,200.00	$6,540.00
11.	Temporary Line Clearing	0.31	ACRE	$15,000.00	$0.00	$15,000.00	$4,650.00
12.	Enviromental Monitoring	1	LOT	$75,000.00	$0.00	$75,000.00	$75,000.00
13.	Public Road Sweeping	1	LOT	$32,000.00	$0.00	$32,000.00	$32,000.00
14.	Access Grading	1	LOT	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
24			EACH	$0.00	$0.00	$0.00	$0.00
				Subtotal - Construction w/o Contingencies			$9,163,640.00
			8%			Contingencies	$733,091.20
						Subtotal	$9,896,731.20
			5%	Engineering, General and Administrative			$494,836.56
						Project Total	$10,391,567.76

PowerServices, Inc.

Construction Cost Estimate

Owner: National Grid		**Date:**	**7/10/2016**
Facility: Aquidneck Island Reliability Project		**Est. By:**	**TAE**
Project: Cost Estimate		**Project No.:**	
Description: 115kV Transmission Estimate Underground			

Line Item	Item or Construction Unit	Quantity	Unit of Measure	Labor Cost	Material Cost	Labor & Materials	Extended Cost
1	Concrete Duct Bank	14000	CUBIC YD	$500.00	$1,200.00	$1,700.00	$23,800,000.00
2	6" PVC Conduit	380160	FOOT	$6.00	$12.00	$18.00	$6,842,880.00
3	2" PVC Conduit	190080	FOOT	$3.25	$6.00	$9.25	$1,758,240.00
4	Splice Box	48	EACH	$12,000.00	$18,500.00	$30,500.00	$1,464,000.00
5	5' x 4 ' Trenching	47520	FOOT	$16.00		$16.00	$760,320.00
6	Dewatering	35520	FOOT	$60.00	$0.00	$60.00	$2,131,200.00
7.	Primary Splices	236	EACH	$150.00	$225.00	$375.00	$88,500.00
8.	OPGW Splice	236	EACH	$1,200.00	$175.00	$1,375.00	$324,500.00
9.	Coduit Duct Spacers	950	EACH	$5.00	$12.00	$17.00	$16,150.00
10.	Substation Terminations	12	EACH	$800.00	$1,400.00	$2,200.00	$26,400.00
11.	800 MIL XLPE Conductor	285120	FOOT	$30.00	$45.00	$75.00	$21,384,000.00
12.	36 Count OPGW	23760	FOOT	$5.00	$3.25	$8.25	$196,020.00
13.	Road Crossings	10	EACH	$7,000.00	$3,200.00	$10,200.00	$102,000.00
14.	OH to UG Transitions	4	EACH	$3,000.00	$6,000.00	$9,000.00	$36,000.00
			EACH	$0.00	$0.00	$0.00	$0.00
15	Wetland Mitigation	5	ACRE	$0.00	$25,000.00	$25,000.00	$125,000.00
			EACH	$0.00	$0.00	$0.00	$0.00
16	ROW Improvements	1	LOT	$0.00	$0.00	$0.00	$10,291,567.00
			FOOT	$0.00	$0.00	$0.00	$0.00
			FOOT	$0.00	$0.00	$0.00	$0.00
			FOOT	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
			EACH	$0.00	$0.00	$0.00	$0.00
					Subtotal - Construction w/o Contingencies		$69,346,777.00
			8%			Contingencies	$5,547,742.16
						Subtotal	$74,894,519.16
			12%		Engineering, General and Administrative		$8,987,342.30
						Project Total	$83,881,861.46