Jennifer Brooks Hutchinson
Senior Counsel

February 28, 2019

VIA HAND DELIVERY & ELECTRONIC MAIL

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

RE: Docket 4915 - Proposed FY 2020 Electric Infrastructure, Safety, and Reliability Plan
Responses to PUC Data Requests – Set 2

Dear Ms. Massaro:

On behalf of National Grid,[1] I have enclosed ten (10) copies of the Company's responses to data requests PUC 2-4 and PUC 2-5 in the above-referenced docket.

Please be advised that the Company's response to data request PUC 2-6 is pending and will be forthcoming.

Thank you for your attention to this transmittal. If you have any questions, please contact me at 401-784-7288.

Very truly yours,

Jennifer Brooks Hutchinson

Enclosures

cc: Docket 4915 Service List
John Bell, Division
Greg Booth, Division
Leo Wold, Esq.
Christy Hetherington, Esq.
Al Contente, Division

[1] The Narragansett Electric Company d/b/a National Grid (National Grid or the Company).

280 Melrose Street, Providence, RI 02907
T: 401-784-7288 ■ jennifer.hutchinson@nationalgrid.com ■ www.nationalgrid.com

Certificate of Service

I hereby certify that a copy of the cover letter and any materials accompanying this certificate was electronically transmitted to the individuals listed below.

The paper copies of this filing are being hand delivered to the Rhode Island Public Utilities Commission and to the Rhode Island Division of Public Utilities and Carriers.

Joanne M. Scanlon

February 28, 2019
Date

Docket No. 4915 - National Grid's Electric ISR Plan FY 2020
Docket No. 4857 - Performance Incentives Pursuant to R.I.GL. §39-1 27.7.1(e)(3)

Service List as of 1/4/2019

Name/Address	E-mail Distribution	Phone
Jennifer Hutchinson, Esq. **National Grid** 280 Melrose St. Providence, RI 02907	jennifer.hutchinson@nationalgrid.com; celia.obrien@nationalgrid.com; Joanne.scanlon@nationalgrid.com;	401-784-7288
National Grid Melissa Little John Nestor Ryan Moe Adam Crary William Richer Kathy Castro	Melissa.Little@nationalgrid.com; Ryan.Moe@nationalgrid.com; John.Nestor@nationalgrid.com; Adam.Crary@nationalgrid.com; William.Richer@nationalgrid.com; Kathy.Caston@nationalgrid.com;	
Division of Public Utilities (Division) Christy Hetherington, Esq. Dept. of Attorney General 150 South Main St. Providence, RI 02903	Chetherington@riag.ri.gov ; Dmacrae@riag.ri.gov; John.bell@dpuc.ri.gov; Macky.McCleary@dpuc.ri.gov; Jonathan.Schrag@dpuc.ri.gov; Kevin.Lynch@dpuc.ri.gov; Joseph.shilling@dpuc.ri.gov;	
Greg Booth Linda Kushner PowerServices, Inc 1616 E. Millbrook Road, Suite 210 Raleigh, NC 27609	gbooth@powerservices.com; Lkushner@powerservices.com;	919-256-5900

Office of Energy Resources (OER) Andrew Marcaccio, Esq. Dept. of Administration Division of Legal Services One Capitol Hill, 4th Floor Providence, RI 02908	Andrew.marcaccio@doa.ri.gov;	401-222-3417
Christopher Kearns, OER Carrie Gill Nick Ucci	Christopher.Kearns@energy.ri.gov; Carrie.Gill@energy.ri.gov; Nicholas.Ucci@energy.ri.gov;	
File an original & ten copies w/: Luly E. Massaro, Commission Clerk John Harrington, Commission Counsel Public Utilities Commission 89 Jefferson Blvd. Warwick, RI 02888	Luly.massaro@puc.ri.gov; John.harrington@puc.ri.gov; Cynthia.WilsonFrias@puc.ri.gov; Alan.nault@puc.ri.gov;	401-780-2107

PUC 2-4

Request:

Referencing the tables on pages 100 through 115, please revise the Tables to show only the Docket #4600 categories (by removing the "Associated Synapse Cost-Benefit Category" column) and order the categories consistent with that framework. Please ensure that the revised Tables include the following:

a. Capture all of the Docket #4600 categories, including utility low income, innovation and knowledge spillover, and non-participant (equity) rate and bill impacts;
b. Include the quantitative costs and benefits where that information is available;
c. For any category that the Company has indicated has a non-zero qualitative benefit, provide a very short explanation of why the category could not be quantified.
d. For each project for which the Company indicated a non-zero "job creation impact," if the value of this impact cannot be quantified, please provide the estimated job-years.
e. Include a column indicating the magnitude of each impact, including "unknown" where necessary; and
f. Include Line Numbers for each Row in the Tables.

Response:

a. Please see Attachment PUC 2-4 for updated tables capturing all Docket No. 4600 categories.
b. Quantitative costs and benefits, where that information is currently available, have been added to Attachment PUC 2-4.
c. Brief explanations, for any category that the Company has indicated has a non-zero qualitative benefit, of why the category could not be quantified have been added to Attachment PUC 2-4.
d. The Company does not currently have an internally approved industry wide accepted methodology to calculate the value of "job creation impact" or estimated job years.
e. A column indicating the magnitude of each impact has been added to attachment with updated Docket No. 4600 tables.
f. Line Numbers for each Row have been added to Attachment PUC 2-4.

Prepared by or under the supervision of: Kathy Castro

PUC 2-5, page 9

g-4. As stated in the response to subpart, g-1, the EMS/RTU program establishes control and monitoring at important locations within the distribution system that is foundational for grid modernization. It is expected that, if approved, future grid modernization solutions would include deployment of DER in a manner that can be controlled to prevent potential system conditions such as overloads and power quality issues. The ability to mitigate these concerns through grid modernization solutions will enable DER incrementally in the future.

g-5. The entry on Bates page 115 in the "Enabler Qualification" column 4600 category "National Security and US International Influence" is an error. The last sentence should read "Specifically, this program enables other technologies that could reduce society's dependency on oil."

PUC 2-5

The Company's response begins on Page 3

Request:

The following reference the Tables on Bates pages 100 through 115 please provide the following information:

a. On Bates pages 100 to 101

1. Please provide more information on what is meant by the nature of grounding and/or voltage characteristics, and how these characteristics are incremental.
2. Please confirm that the expected lower cost for interconnection is an incremental reduction and not a cost shift between ratepayers and DER developers, and please also explain or provide one example of how the system characteristics caused by this project will lower total interconnection costs.
3. Please explain if lowering interconnection costs is expected to encourage more DER to interconnect to the system, allow for more of the distribution system to host DER, allow this portion of the distribution system to host more DER, or some other meaning.
4. Please explain if the same DER-enabling outcomes of the project will also enable more load to interconnect to the system.
5. Please provide more information on how the characteristics of the system will incrementally enable the use of smart inverters for reactive compensation.
6. Please explain if there will be an expected need for reactive compensation after the project is completed that can be served by the future enablement of smart inverters, of if this need is hypothetical.
7. Please provide more information on how the characteristics of the system will incrementally enable islanding.
8. Please explain if the Company is indicating that the investment will enable sufficient worker safety which in turn will enable incremental islanding capability, and that incremental islanding capability could then enable a wider deployment of DER, or something else.
9. Please provide more information on how customer options will be greater.

b. On Bates page 102

1. Please confirm that the entry in the "Direct Impact Qualification" column for Synapse category "Reduced Distribution Costs," is not an error, and if it is not, please explain how system reliability is related to distribution capacity costs in this context.

PUC 2-5, page 2

Request: continued

2. Please explain what DER interconnection schedule impacts are, how the program will reduce these impacts, and how that reduction will lower REC costs through DER enablement.

c. On Bates page 104, please explain how reliability gained through "reduced outages" from "improved assets" is incremental to reliability gained by reducing thermal and voltage risk already accounted for in the analysis.

d. On Bates page 106

1. Please explain if the Company is indicating that the investment will enable sufficient worker safety which in turn will enable incremental islanding capability, and that incremental islanding capability could then enable a wider deployment of DER, or something else.
2. Is the Company indicating that the URD Strategy is foundational to grid modernization?
3. If not, what infrastructure, specifically, is foundational to grid modernization, why was it not included in the Grid Modernization proposal in Docket Nos. 4770 and 4780, and will it be included in the to-be-filed Grid Modernization Plan?

e. On Bates page 110, please explain how the project design is incrementally resilient, and how this incremental resilience will reduce distribution costs.

f. On Bates pages 112 to 113

1. Please confirm that the expected lower cost for interconnection is an incremental reduction and not a cost shift between ratepayers and DER developers, and please also explain or provide one example of how the system characteristics caused by this project will lower total interconnection costs.
2. Please explain if lowering interconnection costs is expected to encourage more DER to interconnect to the system, allow for more of the distribution system to host DER, allow this portion of the distribution system to host more DER, or some other meaning.
3. Please explain if the same DER-enabling outcomes of the project will also enable more load to interconnect to the system.

PUC 2-5, page 3

Request: continued

4. Please explain if there will be an expected need for reactive compensation after the project is completed that can be served by the future enablement of smart inverters, of if this need is hypothetical.
5. Please explain if the Company is indicating that the investment will enable sufficient worker safety which in turn will enable incremental islanding capability, and that incremental islanding capability could then enable a wider deployment of DER, or something else.
6. Please provide more information on how customer options will be greater.

g. On Bates pages 114-115

1. Is the Company indicating that the EMS/RTU Program is foundational to grid modernization?
2. If not, what infrastructure, specifically, is foundational to grid modernization, why was it not included in the Grid Modernization proposal in Docket Nos. 4770 and 4780, and will it be included in the to-be-filed Grid Modernization Plan?
3. Please explain if the same DER-enabling outcomes of the project will also enable more load to interconnect to the system.
4. Please explain how better deployment of DER and DR incrementally enables DER.
5. Please confirm that the entry in the "Enabler Qualification" column for 4600 category "National Security and US International Influence" is not an error, and if it is not, please provide further explanation of the incremental health benefits identified by the Company.

Response:

a-1. The Admiral Street project, identified in the Providence Area Study, addresses various asset condition issues on a number of 4.16 kV and 11.5 kV systems in the area. The study recommends the expansion of the 12.47 kV effectively grounded system and conversion of the majority of 11.5 kV and 4.16 kV circuits.

Unlike the 12.47 kV system, some of the underground 11.5 kV systems are not effectively grounded. Interconnecting a distributed generator onto a system with this grounding characteristic may result in unacceptable over voltages that may cause damage to Company and customer equipment. To prevent these issues, ground fault detection is required for any size of distributed generation proposing to interconnect to not-effectively grounded systems. The additional equipment resulting from this

requirement increases customer equipment related interconnection costs compared to those interconnecting to effectively grounded systems.

A 4.16 kV system has higher current characteristics for a given power level than a 12.47 kV system. As a result, it is less cost to fit more distributed generation on a 12.47 kV system on a per unit of power basis.

The grounding and voltage characteristics of the projects are not incremental. The Company is providing "enabler" information as a possible way to demonstrate how certain utility investments have benefits beyond direct impacts to the Docket 4600 categories.

a-2. Yes, the expected lower cost for interconnection is not a cost shift between customers and DER developers because it is a function of the equipment DER developers install for their projects. As described in subpart a-1, above, there are characteristics associated with the planned work that results in a system that can interconnect more DER. The proposed plan for Admiral Street was chosen to meet system needs, which results in a system that enables DER. The two tables below provide examples on how voltage conversions and grounding characteristics can enable more DER.

Voltage Conversion Example:

Voltage	Rating (Amps)	Amount of DG equivalent to rating (MW)
4.16 kV	400	2.88
12.47 kV	400	8.63

Grounding Example – Underground Systems:

Company Equipment	Not-effectively Grounded System – All DG	Effectively Grounded System – DG > 1MW	Effectively Grounded System – DG < 1MW
Switchgear	X	X	
Recloser	X	X	Fuse
Potential Transformers	X		
Primary Meter	X	X	X
Demarcation Switch	X		

Note: X indicates equipment required for DG interconnection. More equipment requirements equate to higher interconnection costs and longer interconnection schedules due to the complexity of the interconnection.

a-3. The Admiral Street project will convert a majority of the 11.5 kV and 4.16 kV circuit to 12.47 kV effectively grounded circuits. As stated in subpart a-1 above and described in subparta-2 above, the conversion to a grounded system will result in reduced equipment requirements and in turn lower project costs making it more financially viable to interconnect DER. Additionally, the conversion of the majority of the circuits will allow the associated portion of the distribution system to host more DER.

a-4. The voltage conversions would work in a similar manner for load as for generation. That is, for a given unit of power, more can be connected to a 12.47 kV system than a 4.16 kV system. A change from a not-effectively to effectively grounded system does not enable more load to be connected, but will support single-phase, phase to ground loads unlike a not- effectively grounded system.

a-5. Please see the responses to subparts a- 1 through a-4 for information on how this project will result in systems that will be capable of enabling more DER. Potential interconnections may include DG facilities utilizing smart inverter devices which may offer opportunities to provide system benefits, such as reactive compensation, if or when they occur.

a-6. The expected need for reactive compensation after the project is completed that can be served by the future enablement of smart inverters is hypothetical.

a-7. As stated in the response to subpart a-1 and described in subpart a-2, the resulting system will enable more DER, which in turn provides the generation required to enable islanding.

a-8. The Company is not indicating that the investments related to this project themselves will enable sufficient worker safety for islanding. The investments enable more DER, which may lead to sufficient generation levels to support intentional islanding. The Company is indicating that although the investments may enable islanding, there is an outstanding safety concern. Worker safety as it relates to islanding is dependent on monitoring and control of all possible power sources so that crews can identify deenergized line sections that can be grounded and safe to work.

a-9. As stated in the response to subpart a-1 and described in subpart a-2, the resulting system enables more DER; therefore, more customers could participate in the empowering or optional programs.

PUC 2-5, page 6

b-1. The entry on Bates page 102 in the "Direct Impact Qualification" column for Synapse category "Reduced Distribution Costs," is an error. It should read "[t]his asset condition project does not impact distribution capacity costs." In addition, the "Direct Impact" column should state "0".

b-2. DER facilities may impact protection systems at a substation, which require replacement or upgrades to assets, such as circuit breakers, prior to authority to interconnect. In these cases, the schedule to replace these assets may have impacts to DER projects. Consequently, the projects may no longer be financially viable for the developer.

The Substation Breakers and Recloser Strategy Program targets the replacement of obsolete and unreliable assets with new units with the latest protection and control technology. This technology is also better suited to interconnect DER. The cost to replace these assets would be captured in this program and the DER developers would not be subject to pay unless a request is made to accelerate the installation. As obsolete and unreliable assets are replaced via this program, the impact to DER interconnection schedules will significantly decrease making it more economically feasible for projects to move forward and interconnect. Whether this results in the lower REC costs is not clear because even though there could be more RECs available (and, therefore, more supply than possible demand today) in the market from more renewable DER, any future changes to the Renewable Energy Standard could eliminate any possible over-supply of RECs in the market.

c. Reduced outages of Underground Cable due to improved assets is related to environmental exposure and mechanical failures. For example, a certain vintage crosslinked polyethylene (XLPE) cable has a tendency for insulation breakdown, which leads to cable failure and extended outages to customers. When the asset is replaced, this outage risk is mitigated whether it is replaced with a lower impedance (voltage risk mitigation) or higher rated (thermal risk mitigation) cable.

d-1. Please see the response to a-8. The Company is not indicating that the investments related to the URD Cable Strategy program themselves enable sufficient worker safety for islanding. Worker safety as it relates to islanding is dependent on monitoring and control of all possible power sources so that crews can identify deenergized line sections which can be grounded and safe to work.

Prepared by or under the supervision of: Ryan Constable and Kathy Castro

d-2. No. The entry on Bates page 106 in the "Enables DER" and "Enabler Qualification" columns for Synapse category "Reduced Risk - Islanding," is an error. It should read 0.

d-3. The EMS/RTU program and VVO/CVR project are foundational to grid modernization. These initiatives were not included in the Grid Modernization proposal in Docket Nos. 4770 and 4780 because they were already included in the yearly ISR Plan filings. The Grid Modernization Plan will provide a roadmap of potential investments beyond the term of the current Multi Year Rate Plan (MRP); however, requests to fund those investments will be included as part of a future general rate case or MRP, or ISR Plan filings.

e. The Westerly and Hope flood mitigation projects are related directly to system resiliency. National Grid uses the term resiliency in association with climate resiliency, which is the ability to function under stresses imposed by climate change, such as increased possibility of flooding. Resiliency projects reduce distribution costs should the climate issue occur.

f-1. The Substation Metalclad Switchgear Replacement Strategy and Program addresses metalclad switchgears that have known operating issues or are of the same type and manufacturer as equipment that has failed at other locations. The Front Street substation will be retired as part of this program and the 4.16 kV Facilities in the area will be converted to 12.47 kV. The conversion of most of the circuits will allow the associated portion of the distribution system to host more DER.

The Company confirms that expected lower cost for interconnection is not a cost shift between customers and DER developers. The table below provide example on how voltage conversion can enable more DER.
Voltage Conversion Example:

Voltage	Rating (Amps)	Amount of DG equivalent to rating (MW)
4.16 kV	400	2.88
12.47 kV	400	8.63

Also, please see the responses to a-1 and a-2, above.

Prepared by or under the supervision of: Ryan Constable and Kathy Castro

f-2. The conversion of most of the circuits will allow the associated portion of the distribution system to host more DER.

f-3. The voltage conversions would work in a similar manner for load as for generation. That is for a given unit of power, more can be connected to a 12.47 kV system than a 4.16 kV system. Please see the response to a-4.

f-4. The expected need for reactive compensation after the project is completed that can be served by the future enablement of smart inverters is hypothetical. Please see the response to a-6.

f-5. The Company is not indicating that the investments related to this project themselves will enable sufficient worker safety for islanding. Worker safety as it relates to islanding is dependent on monitoring and control of all possible power sources so that crews can identify deenergized line sections which can be grounded and safe to work. Please see the response to a-8.

f-6. As described in the response to subpart f-1 and stated in subpart 2-5-f-2, the resulting system enables more DER, therefore more customers could participate in the empowering or optional programs. Please see also the response to 2-5-a-9.

g-1. Yes, the EMS/RTU program is foundational to grid modernization. The program establishes control and monitoring at important locations within the distribution system.

g-2. Please see the response to subpart d-3, above.

g-3. Yes, for certain loads which require greater monitoring and control, such as electric vehicles, the same enabling characteristics apply. Another example is energy storage, which can be a load or a source. The EMS/RTU program is a foundational investment for greater amounts of energy storage.