

Division 4-1

Request:

Refer to National Grid's (the Company's) responses to PST Book 3 – Workpaper 9.1 (Peak Demand Reduction Targets):

- a) Please provide any additional relevant data that might have been redacted in reference to the demand reduction values.
- b) Referring to Page 2 of 9, please provide additional classification of "PV" considered under "PV reduction" (classification as behind-the-meter and grid-connected).
- c) Please provide any additional information on potential locations in Rhode Island (RI) for behind-the-meter solar additions, along with the expected MW potential at each of these locations.

Response:

a. The Company did not redact any data pertinent to the calculation of demand reduction values and peak demand reduction targets.

b. Solar-photovoltaic (PV) in the Company's peak forecast is based on ISO New England's PV forecast, which is included in ISO New England's Forecast Report of Capacity, Energy, Loads, and Transmission. Three mutually exclusive PV resource types are included in ISO New England's (and thus, the Company's) forecast:

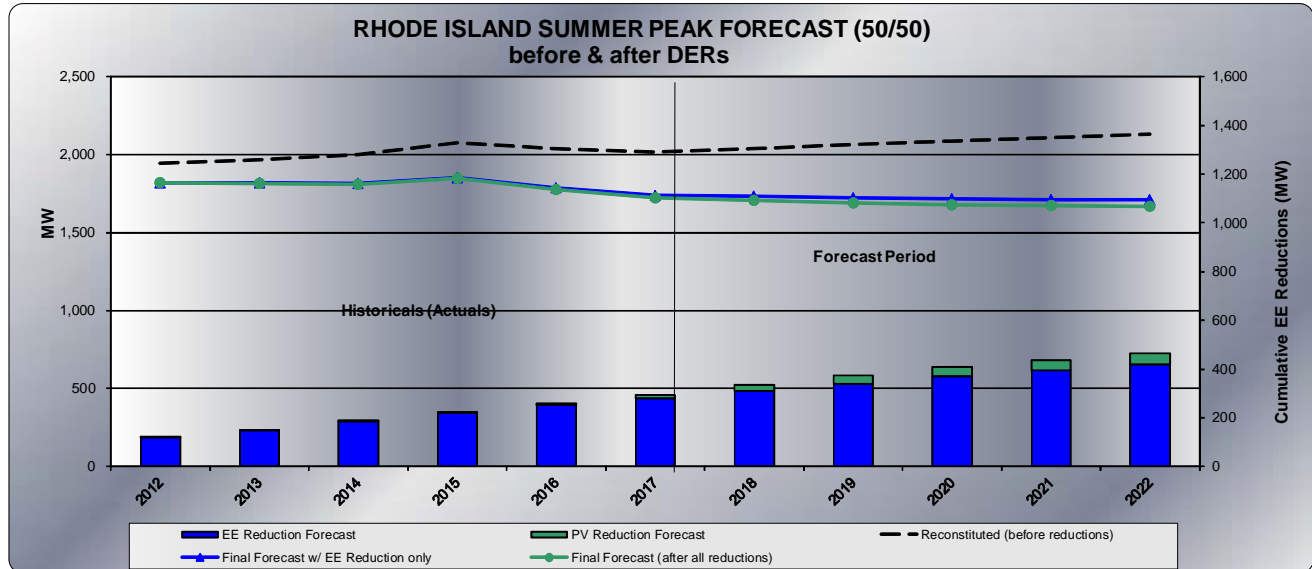
- PV as a resource in the Forward Capacity Market (FCM)
- Non-FCM energy-only resources and generators
- Behind-the-meter PV

Please see Attachment DIV 1-33-2, specifically pages 7 and 8, which is attached to this response as Attachment DIV 4-1, for a description of the methodology used for determining peak reduction due to PV in the Company's peak forecast.

c. The Company does not have any additional information at this time. The Company is actively developing a data portal that will contain a DER Opportunity Map (also termed "Heat Map"), which will provide information on where distributed energy resources could provide peak reduction benefits to the system.

(This response is identical to the Company's response to Division 13-1 in Docket No. 4770.)

Figure 2



Distributed Generation (Solar – PV)

There has been a rapid increase in the adoption of solar³ throughout the state. The Company tracks historical PV and that becomes the basis of the historical values shown. The projection for the future is based on the Company's pro-rata share by load of PV in each zone that the ISO-NE shows in its annual load & capacity report⁴. The ISO-NE considers current PV and policy goals for the future. Since the Company does not have its own territory wide PV programs as it does with energy efficiency this approach ensures consistency with the statewide and area specific projections of the ISO. In the short-term (one to three years) the company reviews the quantity of applications already in the 'queue' to make sure the projections based on the share of ISO estimates are reasonable.

Figure 2 above shows the expected NECO loads and solar reductions to peaks by year. As of 2017, it is estimated that this technology may have already reduced system peak loads by 16 MW. By 2032 it is expected that these reductions may grow to 66 MW⁵, or about 3% of what load would have been had this technology not been installed. Over the fifteen year planning horizon these reductions lower annual growth from 0.1% to -0.1% per year.

³ The Company limits this discussion to the impacts of solar distributed generation because it is the single largest contributor and the fastest growing of all distributed generation technologies at this time.

⁴ 2017 Capacity, Energy, Load & Transmission Report, a report by the New England Independent System Operator, Inc., "CELT", dated May 2017.

⁵ These are Company system summer peak impacts; these are approximately 21% of connected PV MWs.

The prevalence of DERs and their continued expansion clearly show how loads have been significantly lowered due to their success.

Explicit reductions to system peaks have been made for these energy efficiency and solar PV programs.

Demand Response

Demand Response (or “DR”) are programs that actively target reductions to peak demand during hours of high expected demand and/or reliability problems. These are in contrast to the more passive energy efficiency savings discussed above that provide savings throughout the year. The DR programs enable utilities and operating areas, such as the New England Independent System Operator (ISO-NE) to take action in response to a system reliability concern or economic (pricing) signal. During these events customers can actively participate by either cutting their load or by turning on a generator to displace load from behind the customer’s meter.

The ISO-NE has been implementing these type programs for a number of years now and for the purposes of this report are referred to as “wholesale DR”. These programs have been activated several times over the last decade. The Company’s policy has been to add-back reductions from these call-outs to its reported system peak numbers. This is because the Company is not in control of the call-out days nor times and thus there is no guarantee that these ISO –NE call-outs would be at the times of Company peaks. Therefore, the Company recognizes their existence, but must plan in the event that they are not called.

Table 2 shows the estimated reductions* for the historical call-outs on the peak days.

Division 4-2

Request:

Please list all Regional System Plan (RSP) projects that RI is obligated for, over the next 10 years.

Response:

Please see the table of projects below, extracted from the October 2017 RSP Project List posted on the ISO New England website.

Major Project	Project	Projected In-Service Date	Transmission Costs (PTF)
Aquidneck Island Reliability Project	Conversion of Jepson 69 kV substation to 115 kV substation	12/2019	\$9,500,000
Aquidneck Island Reliability Project	Remove 115kV to 69 kV transformer at Dexter Substation	12/2019	\$9,000,000
Aquidneck Island Reliability Project	Convert lines 61/62 from 69 kV to 115 kV	12/2019	\$22,100,000
Southeast Massachusetts/Rhode Island Reliability Project	Kent County T3 345/115 kV transformer replacement	11/2020	\$8,100,000
Southeast Massachusetts/Rhode Island Reliability Project	Remote terminal station work (Wampanoag and Pawtucket 115 kV) for new 115 kV Grand Army GIS switching station to tie the E-183E, F-184, X3 and W4 lines (Associated with RSP 1714)	11/2020	\$2,400,000

(This response is identical to the Company's response to Division 13-2 in Docket No. 4770.)

Division 4-3

Request:

From the list of projects identified under DIV 4-2, above, please identify those reliability projects that are specifically driven by load growth.

Response:

There are no projects listed in response to DIV 4-2 that are being developed to address load growth specific to a customer or focused number of customers. The projects listed in the response are driven by a combination of general area load growth and more rigorous transmission planning reliability criteria set by NERC, NPCC or ISO-NE.

(This response is identical to the Company's response to Division 13-3 in Docket No. 4770.)

Division 4-4

Request:

Please list out all transmission costs associated with the list of projects answered under DIV 4-2.

Response:

Please see the table included in the response to Division 4-2, which lists the costs associated with each project.

(This response is identical to the Company's response to Division 13-4 in Docket No. 4770.)

Division 4-5

Request:

Please list all Local System Plan (LSP) projects that RI is obligated for, over the next 10 years.

Response:

A list of LSP projects for which Rhode Island is obligated is provided in the table below.

Primary Driver	Project	2017 Update - In Service Date	Status Update for 2017	Total non-PTF Project Spend for 2017 report
Asset Replacement	Franklin Square 115kV Asset Replacements	02/2021	Concept	TBD
Asset Replacement	Admiral St-Franklin Square (Q143 and R144) 115 kV UG	01/2022	Proposed	\$51,118,000
Asset Replacement	Dunnell Park Substation	07/2020	Proposed	\$1,600,000
Load Growth	East Providence Substation	08/2022	Proposed	\$1,200,000
Asset Replacement	Seawall at South Street Sub	01/2019	Proposed	\$8,760,000
Asset Replacement	Woonsocket Station Rebuild	05/2021	Proposed	\$20,931,000
Asset Replacement	3308 Asset Condition Refurbishment (Sub-T)	03/2018	Planned	\$4,440,000
Area Reliability Assessment	Newport Area Transmission Reinforcements (Associated with RSP IDs #1669, #1670, #1671)	12/2019	Planned	\$4,580,000
Load Growth	New London Ave. (formally W. Warwick) 115 - 12.47 kV Sub	10/2018	Under Construction	\$2,508,000
Asset Replacement	South Street Substation Rebuild and T1, T2, T3 line rebuilds	03/2018	Under Construction	\$33,000,000 (\$6.9M to be reimbursed by developer)

(This response is identical to the Company's response to Division 13-5 in Docket No. 4770.)

Division 4-6

Request:

From the list of projects identified for DIV 4-5, please identify those reliability projects that are specifically driven by load growth.

Response:

Please see the table included in the Company's response to Division 4-5, which identifies the primary driver for each project.

(This response is identical to the Company's response to Division 13-6 in Docket No. 4770.)

Division 4-7

Request:

Please list out all transmission costs associated with the list of projects answered under DIV 4-5.

Response:

Please see the table provided in the Company's response to Division 4-5, which includes the costs for each project.

(This response is identical to the Company's response to Division 13-7 in Docket No. 4770.)

Division 4-8

Request:

Has the Company performed Non-Wire Alternatives (NWA) or Non-Transmission Alternatives (NTA) studies for the LSP projects listed in DIV 4-5 response?

- a) If yes, please provide relevant study reports with cost estimates comparing costs of transmission upgrades and costs associated with NWAs.

Response:

Projects with a primary driver of Asset Replacement are not evaluated for a NWA as their need is based on asset condition; this is consistent with criterion (1) of Section 2.3.A(i) of the Least Cost Procurement Standards (LCP Standards) adopted by the Rhode Island Public Utilities Commission on July 28, 2017.

Projects listed in the Company's response to DIV 4-5 with other primary drivers are addressed below:

East Providence Substation: The East Bay Long Term Study identified several asset condition and loading concerns in the East Providence area. The study proposed a new station at the East Providence area that will reduce the loading and dependence on the 23 kV sub-transmission system. A number of substations in this area have asset condition, safety, and reliability concerns that will be addressed by the new East Providence substation. Although the project plans developed for the new substation will exceed \$1 million (Section 2.3.A(ii) of LCP Standards) and the start of construction for the majority of the work will be at least 36 months in the future (Section 2.3.A (iv) of LCP Standards), there are significant asset condition issues within the study area. Therefore, the Company concluded that an NWA would not be feasible to provide a comprehensive solution.

Newport Area Transmission Reinforcements (Associated with RSP IDs #1669, 1670 and #1671): As documented in Section 5.2.4 of the Energy Facility Siting Board Report, titled "Aquidneck Island Reliability Project," dated December 2015, attached as Attachment DIV 4-8:

- The proposed upgrade of the Jepson Substation is driven by asset condition issues and possible thermal overloads at the Jepson 69 kV ring bus which cannot be addressed through load reductions less than 20 percent of the relevant peak load in the area (Section 2.1.A(iii) of the LCP Standards). The Company, therefore, concluded that there is no

feasible NWA for the Jepson Substation portion of the Aquidneck Island Reliability Project.

- The load reductions that would be required on Aquidneck Island to address the possible thermal overloads driving the need to upgrade the 61 and 62 Lines are above 20 percent of the relevant peak load in the area. The Company, therefore, concluded that an NWA for this portion of the Aquidneck Island Reliability Project would not be feasible.
- The Newport and Jepson Substation distribution projects include the construction of a new 69/13.8 kV substation with four (4) 13.8 kV feeders in Newport to provide load relief and installation of a new 115/13.8 kV substation consisting of six (6) feeders at Jepson, and reconfigure the area distribution system. These projects allow for the retirement of the 4.16 kV substations at Jepson, Bailey Brook, N. Aquidneck, S. Aquidneck, and Vernon substations to address asset condition concerns. The Jepson substation project was not evaluated for an NWA as the need is based on asset condition. The development of the Newport substation project plans predates the formal NWA criteria set forth in the LCP Standards, adopted by RI PUC on July 28, 2017.

New London Avenue (formally West Warwick) 115 - 12.47 kV Sub: This project involves the construction of a new 115/12.47 kV substation in the City of Warwick to provide thermal relief to area distribution feeders, transformers, and supply lines, and support projected growth in the area. The development of the project plans predates the formal NWA criteria set forth in the LCP Standards. . The substation and associated distribution line work is in the construction phase and is scheduled to be completed by the end of 2018.

(This response is identical to the Company's response to Division 13-8 in Docket No. 4770.)



option (the immediate upgrade of the 61 and 62 Lines from 69 kV to 115 kV), this option results in less electric load growth capability on Aquidneck Island.⁶ Thus the preferred option provides a more robust supply system able to accommodate a larger amount of future load growth.

5.2.4 Non-Wires Alternative

Where a transmission need has been identified, a non-wire alternative (NWA) such as energy efficiency, demand response, distributed generation, or any combination of the same may also be considered as an option to defer the transmission solution for a period of time.

TNEC evaluated the potential for an NWA that would involve adding sufficient demand-side resources (energy efficiency, demand response, and distributed generation) at strategic locations on Aquidneck Island to defer or eliminate the need for the Project. TNEC assessed the feasibility of this approach consistent with the criteria set forth in Section 2.1.D of the System Reliability Procurement Standards (SRP Standards), adopted by the Rhode Island Public Utilities Commission (RIPUC) on June 10, 2014. The SRP Standards state in pertinent part:

- D. Identified transmission or distribution (T&D) projects with a proposed solution that meet the following criteria will be evaluated for potential NWAs that could reduce, avoid or defer the T&D wires solution over an identified time period.
 - 1. The need is not based on asset condition;
 - 2. The wires solution, based on engineering judgment, will likely cost more than \$1 million;
 - 3. If load reductions are necessary, then they are expected to be less than 20 percent of the relevant peak load in the area of the defined need;
 - 4. Start of wires alternative construction is at least 36 months in the future;
 - 5. At its discretion the utility may consider and, if appropriate, propose a project that does not pass one or more of these criteria if it has reason to believe that a viable NWA solution exists, assuming the benefits of doing so justify the costs.

The proposed upgrade of the Jepson Substation is driven by asset condition issues and possible thermal overloads at the Jepson 69 kV ring bus which cannot be addressed through load reductions. TNEC therefore concluded that there is no feasible NWA for the Jepson Substation portion of the Project.



⁶ If the 69 kV Alternative were to be pursued, the limiting N-1 contingencies would be on the 115 kV equipment at Dexter Substation.



TNEC next identified the load reductions that would be required on Aquidneck Island to address the possible thermal overloads driving the need to upgrade the 61 and 62 Lines. In making these calculations, TNEC assumed that conductor clearance limitations on the 61 and 62 Lines would be removed. TNEC determined that:

- In 2014, 23 MW of load reductions at the Gate II and Navy No. 1 Substations would be needed to address the possible N-1 contingency thermal overloads on the 61 and 62 Lines. Peak load for this area was approximately 63 MW. The required load reduction therefore is approximately 36% of the relevant peak load.
- In 2022, 24 MW⁷ of load reductions at the Gate II, Navy and Newport substations would be needed to address the potential N-1 contingency thermal overloads on the 61 and 62 Lines. Peak load for this area is projected to be approximately 75 MW. The required load reduction is therefore approximately 32% of the relevant peak load.

An NWA for the 61 and 62 Line Upgrades clearly would fail criterion (3) of the SRP Standards. In addition, the construction start for the 61 and 62 Line Upgrades is less than the 36 months called for in criterion (4) of the SRP Standards. TNEC therefore concluded that an NWA for this portion of the Project would not be feasible.

While an NWA does not appear to be a feasible alternative for any portion of the Project, TNEC has previously implemented a targeted energy efficiency program on Aquidneck Island: the 2009-2010 Energy Action Pilot Program for Aquidneck Island and Jamestown. Between July 2009 and December 2010, TNEC conducted a community-based pilot program designed to increase energy efficiency savings from National Grid programs in Middletown, Newport, Portsmouth and Jamestown. The results of the Energy Action Pilot Program are analyzed in a report prepared by Opinion Dynamics Corporation and titled *Evaluation of National Grid's Community Pilot Program – Energy Action: Aquidneck and Jamestown* (Final Report). The Final Report found that savings from commercial electric energy efficiency programs during the pilot program were 53% above what would have been expected in the absence of a pilot program. Residential electric savings were 12.8% above the levels that would have been expected in the absence of a pilot program. However, despite this extensive marketing of energy efficiency programs to commercial and residential customers on Aquidneck Island, electric demand continues to increase.

▼
⁷ TNEC assumed that certain sub-transmission projects will be undertaken on Aquidneck Island, independent of the Project, between 2014 and 2022. As a result of these sub-transmission projects, the load reductions needed to address the Project need slightly increased between 2014 and 2022. However, the required load reductions would increase in later years as load growth continues on the island.

Division 4-9

Request:

Please provide the short-term and long-term transmission planning power flow base cases (PSS/E .raw files) and auxiliary files (contingency files, subsystem files, exclusion files, monitored element files) used for the LSP studies.

Response:

In accordance with ISO New England Planning Procedure 5-1 "Procedure For Review of Governance Participant's Proposed Plans (Section I.3.9 Applications: Requirements, Procedures and Forms)", and Planning Procedure 5-3 "Guidelines For Conducting And Evaluating Proposed Plan Application Analysis", a transmission study in support of the Proposed Plan Application was or will be performed for the following projects:

Primary Driver	Project	2017 Update - In Service Date	Status Of Transmission study
Area Reliability Assessment	Dunnell Park Substation	07/2020	Completed
Load Growth	East Providence Substation	08/2022	Not started
Asset Replacement	Woonsocket Station Rebuild	05/2021	Ongoing
Area Reliability Assessment	Newport Area Transmission Reinforcements (Associated with RSP IDs #1669, #1670, #1671)	12/2019	Completed
Load Growth	New London Ave. (formally W. Warwick) 115 - 12.47 kV Sub	10/2018	Completed
Asset Replacement	South Street Substation Rebuild and T1, T2, T3 line rebuilds	03/2018	Completed

The Company is providing all of the requested study files for the completed studies listed above, with the exception of Dunnell Park Substation. The requested study files for Dunnell Park were not transferred over by the engineer who left the Company soon after ISO-NE approved the Proposed Plan Application.

The requested study files can be found in the following attachments:

- Attachment DIV 4-9-1 through DIV 4-9-5: Newport Area Trans.
- Attachment DIV 4-9-6 through DIV 4-9-9: New London Ave.
- Attachment DIV 4-9-10 through DIV 4-9-14: South St.

Attachment DIV 4-9-15 provides a description of the individual files included in the above attachments.

(This response is identical to the Company's response to Division 13-9 in Docket No. 4770.)

Confidential Attachment DIV 4-9-1 – REDACTED INFORMATION

Attachment DIV 4-9-1 [CONFIDENTIAL] is the PSS/E loadflow case used in the Proposed Plan Application study for the Newport Area. The Company has requested protective treatment of this file in its entirety.

Confidential Attachment DIV 4-9-2 – REDACTED INFORMATION

Attachment DIV 4-9-2 [CONFIDENTIAL] is the Contingency file containing N-1 single element scenarios, used in the Proposed Plan Application study for the Newport Area. The Company has requested protective treatment of this file in its entirety.

Confidential Attachment DIV 4-9-3 – REDACTED INFORMATION

Attachment DIV 4-9-3 [CONFIDENTIAL] is the Contingency file containing N-1 single and N-1 multi-element element scenarios, used in the Proposed Plan Application study for the Newport Area. The Company has requested protective treatment of this file in its entirety.

Confidential Attachment DIV 4-9-4 – REDACTED INFORMATION

Attachment DIV 4-9-4 [CONFIDENTIAL] is the Monitored file used in the Proposed Plan Application study for the Newport Area. The Company has requested protective treatment of this file in its entirety.

Confidential Attachment DIV 4-9-5 – REDACTED INFORMATION

Attachment DIV 4-9-5 [CONFIDENTIAL] is the Subsystem file used in the Proposed Plan Application study for the Newport Area. The Company has requested protective treatment of this file in its entirety.

Confidential Attachment DIV 4-9-6 – REDACTED INFORMATION

Attachment DIV 4-9-6 [CONFIDENTIAL] is PSS/E loadflow case used in the Proposed Plan Application study for the New London Avenue substation project. The Company has requested protective treatment of this file in its entirety.

Confidential Attachment DIV 4-9-7 – REDACTED INFORMATION

Attachment DIV 4-9-7 [CONFIDENTIAL] is the Contingency file containing N-1 single and N-1 multi-element element scenarios, used in the Proposed Plan Application study for the New London Avenue Substation project. The Company has requested protective treatment of this file in its entirety.

Confidential Attachment DIV 4-9-8 – REDACTED INFORMATION

Attachment DIV 4-9-8 [CONFIDENTIAL] is the Monitored file used in the Proposed Plan Application study for the New London Avenue Substation project. The Company has requested protective treatment of this file in its entirety.

Confidential Attachment DIV 4-9-9 – REDACTED INFORMATION

Attachment DIV 4-9-9 [CONFIDENTIAL] is the Subsystem file used in the Proposed Plan Application study for the New London Ave Substation project. The Company has requested protective treatment of this file in its entirety.

Confidential Attachment DIV 4-9-10 – REDACTED INFORMATION

Attachment DIV 4-9-10 [CONFIDENTIAL] is the PSS/E loadflow case (.raw file) used in the Proposed Plan Application study for South Street Substation. The Company has requested protective treatment of this file in its entirety.

Confidential Attachment DIV 4-9-11 – REDACTED INFORMATION

Attachment DIV 4-9-11 [CONFIDENTIAL] is the Contingency file containing N-1 single element scenarios, used in the Proposed Plan Application study for South Street Substation. The Company has requested protective treatment of this file in its entirety.

Confidential Attachment DIV 4-9-12 – REDACTED INFORMATION

Attachment DIV 4-9-12 [CONFIDENTIAL] is the Contingency file containing N-1 single and N-1 multi-element element scenarios, used in the Proposed Plan Application study for South Street Substation. The Company has requested protective treatment of this file in its entirety.

Confidential Attachment DIV 4-9-13 – REDACTED INFORMATION

Attachment DIV 4-9-13 [CONFIDENTIAL] is the Monitored file used in the Proposed Plan Application study for South Street Substation. The Company has requested protective treatment of this file in its entirety.

Confidential Attachment DIV 4-9-14 – REDACTED INFORMATION

Attachment DIV 4-9-14 [CONFIDENTIAL] is the Subsystem file used in the Proposed Plan Application study for South Street Substation. The Company has requested protective treatment of this file in its entirety.

Project and Attachment Name	Original File Name	Description
<u>Newport Area Trans</u> Attachment DIV 4-9-1 CONFIDENTIAL Attachment DIV 4-9-2 CONFIDENTIAL Attachment DIV 4-9-3 CONFIDENTIAL Attachment DIV 4-9-4 CONFIDENTIAL Attachment DIV 4-9-5 CONFIDENTIAL	20smpk_WE_AIRP.sav ISO BCDB CTGs - 20smpk_Newport_AIRP - 2020-07-15 - First Level.con ISO BCDB CTGs - 20smpk_Newport_AIRP - 2020-07-15.con ISO-NE_Interfaces_SEMARI_rev9_2014_ERO.mon ISO-NE_Subsystems_Dispatch_Units_7-10-2012_2014_ERO.sub	PSS/E loadflow case used in the Proposed Plan Application study for the Newport Area Contingency file containing N-1 single element scenarios; used in the Proposed Plan Application study for the Newport Area Contingency file containing N-1 single and N-1 multi-element element scenarios; used in the Proposed Plan Application study for the Newport Area Monitored file used in the Proposed Plan Application study for the Newport Area Subsystem file used in the Proposed Plan Application study for the Newport Area
<u>New London Ave</u> Attachment DIV 4-9-6 CONFIDENTIAL Attachment DIV 4-9-7 CONFIDENTIAL Attachment DIV 4-9-8 CONFIDENTIAL Attachment DIV 4-9-9 CONFIDENTIAL	2007-SERIES_2015_smpk.sav After_Project_2015.ctg swri.mon swri.sub	PSS/E loadflow case used in the Proposed Plan Application study for New London Ave Sub Contingency file containing N-1 single and N-1 multi-element element scenarios; used in the Proposed Plan Application study for New London Ave Sub Monitored file used in the Proposed Plan Application study for New London Ave Sub Subsystem file used in the Proposed Plan Application study for New London Ave Sub
<u>South St.</u> Attachment DIV 4-9-10 CONFIDENTIAL Attachment DIV 4-9-11 CONFIDENTIAL Attachment DIV 4-9-12 CONFIDENTIAL Attachment DIV 4-9-13 CONFIDENTIAL Attachment DIV 4-9-14 CONFIDENTIAL	2019_SUM_PK_NGRID_final_POST_South St-New.raw ISO BCDB CTGs - First Level_South St.con ISO BCDB CTGs - Full List_South St.con mon_South St.mon sub_South St.sub	PSS/E loadflow case (.raw file) used in the Proposed Plan Application study for South Street Contingency file containing N-1 single element scenarios; used in the Proposed Plan Application study for South Street Contingency file containing N-1 single and N-1 multi-element element scenarios; used in the Proposed Plan Application study for South Street Monitored file used in the Proposed Plan Application study for South Street Subsystem file used in the Proposed Plan Application study for South Street