National Grid Local System Plan 2019

PAC Presentation

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nationalgrid

Purpose of Local System Plan

The Local System Plan (LSP) is a report that:

Describes:

- Non-PTF project that are needed to maintain system reliability
- PTF project components of a locally driven project that are needed to maintain system reliability

Reflects:

- LSP Needs Assessments
- Corresponding transmission system planning and expansion studies

Identifies:

- Local Planning Process (See Appendix)
- Criteria, Data, and Assumptions (See Appendix)

LSP Communication

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LSP Communication Continued

- For ISO initiated projects that contain both regional and local components, the TO's LSP project is associated with the ISO-NE Regional System Plan list.

- For transmission asset driven projects that contain both regional and local components, the TO's LSP project is associated with the Asset Condition project list.

National Grid's project list is located at:

http://www.nationalgridus.com/oasis/filings_studies.asp

- "LSP Project List 2019"

LSP Project List

- The LSP Project List is a cumulative listing of proposed regulated transmission solutions that may meet LSP needs
- Lower voltage facilities contained in the LSP Project List pertain to facilities supplying our wholesale customers

The LSP Project List contains the status of each project:

Project Status Descriptions *(may vary slightly from RSP definitions)*	
Concept	Project is under consideration as possible solution to a need.
Proposed	National Grid has determined that the project is an appropriate solution to a need and has -25% to +50% target cost estimate accuracy/tolerance.
Planned	PPA has been approved (if required) and project has at least -25% to +25% target cost estimate accuracy/tolerance.
Under Construction	Project is under construction.
In Service	Project is complete

2019 LSP Projects

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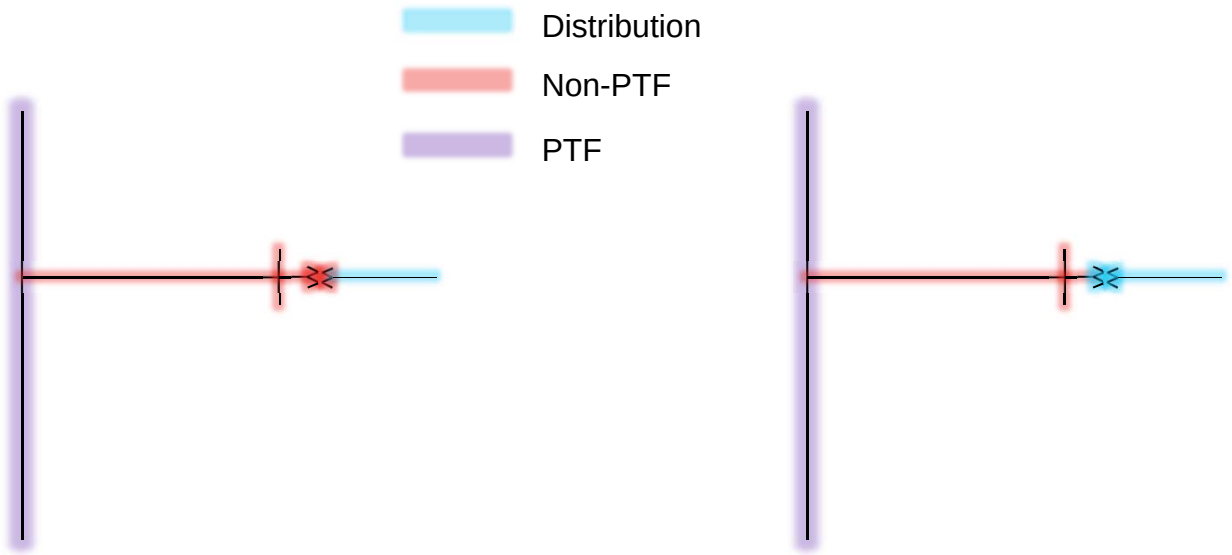
National Grid Operates Facilities in the following four states:

- Massachusetts
- New Hampshire
- Vermont
- Rhode Island

Classification of National Grid Step-Down Transformers



In Massachusetts:

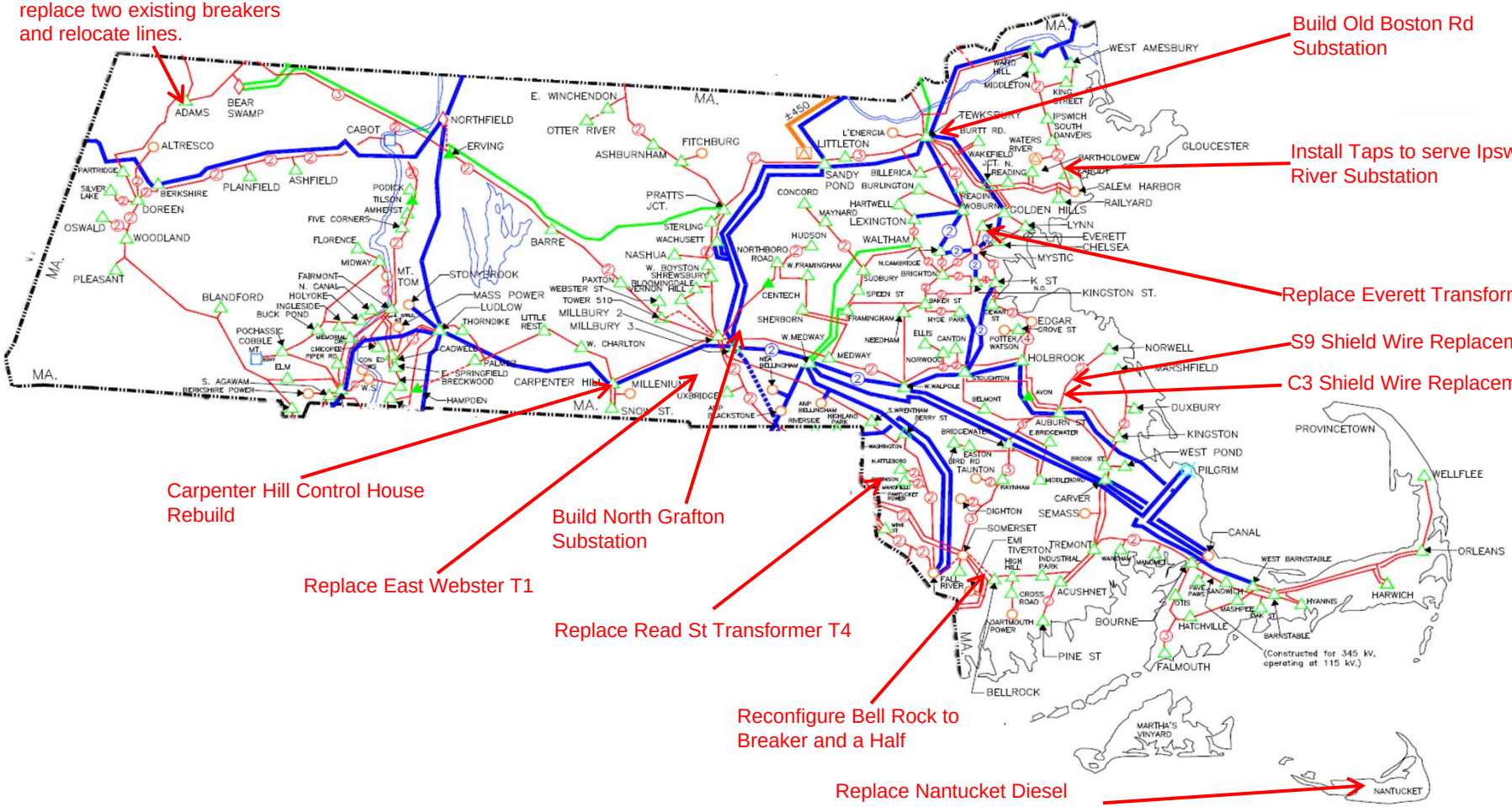
- For NEP assets, typically Distribution starts at low-side of step-down transformer
- For former EUA assets, Distribution starts at high-side of step-down transformer

In Rhode Island:

- For Narragansett Electric assets, typically Distribution starts at high side of transformer

Massachusetts Local Projects

(Planned, Under Construction, and In Service)



LSP – *Massachusetts*

(Fonts in Red are new or updates)

Primary Driver	Asset Owner by Company	Projected In Service Date	Major Project	Project	Status Update for 2019	Total non-PTF Project Cost for 2019 Report	Total Localized PTF Project Cost for 2019 Report	PPA Approval	RSP ID/Asset List ID	Needs Assessment	Solutions
Asset Condition	New England Power	Mar-24		Replace Water Street Transformer	Concept	TBD		No		Water St. 115-13.8kV transformer is leaking and has aged insulation. Repair does not stop it.	Replace the 115-13.8kV transformer
Asset Condition	New England Power	Nov-23		Replace 517-532N&517-533N Underground Cable	Concept	TBD		No		Asset condition issues and reliability concerns due to a leak. The type of cable is obsolete. Cables have had multiple leaks as a result of corrosion and mechanical fatigue and need to be replaced.	Install new solid dielectric cable in a new route with capacity for North Quincy and Field St.
Asset Condition	New England Power	Mar-25		Replace Belmont Assets	Concept	TBD		No		Asset Replacement at Belmont Substation for 9801 & 9802 oil circuit breakers and other relay assets	Replace the two Oil Circuit Breakers with Gas Circuit Breakers with remote closing and associated relays and other asset upgrades.
Asset Condition	New England Power	Jan-22		Refurbish A-179 Line	Concept	TBD		NR		Structure clearance and asset condition at Saugus River ~~River~~ in Revere, MA.	Refurbishment of A-179 line and replace shieldwire with OPGW.
Asset Condition	New England Power	Jun-23		Replace/Remove Hathaway 63TR Transformer	Concept	TBD		No		The project is an asset condition driven project (transmission and distribution assets). Looking to remove 23/13.8kV yard due to aging and inefficient use of station equipment. Poor physical condition of 23kV control house is a safety concern for workers.	Alternative 1: Upgrade the 23/13.8kV yard with 13.8kV Metal Clad switchgear and replace 63TR with 115/13.8kV transformer. Alternative 2: Relocate 106W81 & 106W82 and retire 23/13.8kV yard and remove the 63TR.

LSP – *Massachusetts Continued*

Primary Driver	Asset Owner by Company	Projected In Service Date	Major Project	Project	Status Update for 2019	Total non-PTF Project Cost for 2019 Report	Total Localized PTF Project Cost for 2019 Report	PPA Approval	RSP ID/Asset List ID	Needs Assessment	Solutions
Asset Condition	New England Power	Jan-24		Upgrade Revere Substation 55 MVA 115/23 kV Transformers	Concept	TBD		No		The 115/23 kV transformers need replacement due to asset conditions.	Upgrade of the Revere 7 T3 and T4 115-23 kV transformers to 55MVA.
Load Growth	New England Power	Nov-22		Replace East Beverly 115/34 kV Transformers	Concept	TBD		10/21/14		The overloading of the East Beverly transformers under normal and emergency conditions is the main driver for this project.	The scope of this project is to install two new 115/34kV 33/44/55MVA transformers to replace the existing T10 and T20 units. The alternative considered was to install a backup unit in parallel at the E Beverly site. This would be more expensive and less operationally convenient. In addition, it will trigger expansion of the substation fence and possible permitting and resulting delays possibly.
Point of Delivery Request from Customer	New England Power	TBD		Barre Substation	Concept	TBD		No		Accommodate Distributed Energy Resources	Upgrade two existing 115-13.8 kV 12.5 MVA and 9.4 MVA transformers to 40 MVA transformers
Point of Delivery Request from Customer	New England Power	TBD		Brookfield Substation	Concept	TBD		No		Accommodate Distributed Energy Resources	Install new substation with two 115-13.2 kV 55 MVA transformers.
Point of Delivery Request from Customer	New England Power	TBD		East Winchendon Substation	Concept	TBD		No		Accommodate Distributed Energy Resources	Upgrade existing 115-13.8 kV 20 MVA transformer with two 115-13.8 kV 55 MVA transformers and one 115-34.5 kV 75 MVA transformer
Point of Delivery Request from Customer	New England Power	TBD		Five Corners Substation	Concept	TBD		No		Accommodate Distributed Energy Resources	Upgrade two existing 115-13.2 kV 7 MVA transformers to 40 MVA transformers

LSP – *Massachusetts Continued*

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Point of Delivery Request from Customer	New England Power	TBD		Retire Lashaway 69 kV Substation	Concept	TBD		No		Accommodate Distributed Energy Resources	Remove 69-13.2 kV 12.5 MVA transformer
Point of Delivery Request from Customer	New England Power	TBD		Retire Leicester 69 kV Substation	Concept	TBD		No		Accommodate Distributed Energy Resources	Remove two 69-13.8 kV 6.25 MVA transformers
Point of Delivery Request from Customer	New England Power	TBD		Little Rest Substation	Concept	TBD		No		Accommodate Distributed Energy Resources	Upgrade existing 115-13.2 kV 40 MVA transformer with two 115-13.2 kV 55 and 40 MVA transformers and one 115-34.5 kV 75 MVA transformer
Point of Delivery Request from Customer	New England Power	TBD		Meadow Street Substation	Concept	TBD		No		Accommodate Distributed Energy Resources	Install second 69-13.2 kV 40 MVA transformer
Point of Delivery Request from Customer	New England Power	TBD		North Oxford Substation	Concept	TBD		No		Accommodate Distributed Energy Resources	Install second 115-13.2 kV 55 MVA transformer with existing 115-13.2 kV 40 MVA transformer.
Point of Delivery Request from Customer	New England Power	TBD		New Salem Substation	Concept	TBD		No		Accommodate Distributed Energy Resources	Install new substation with one 115-34.5 kV 75 MVA transformer.
Point of Delivery Request from Customer	New England Power	TBD		Palmer Substation	Concept	TBD		No		Accommodate Distributed Energy Resources	Upgrade existing 115-13.2 kV 20 MVA transformer with two 115-13.2 kV 55 MVA transformers.
Point of Delivery Request from Customer	New England Power	TBD		Retire Pondville 69 kV Substation	Concept	TBD		No		Accommodate Distributed Energy Resources	Remove two 69-13.8 kV 20 MVA transformers
Point of Delivery Request from Customer	New England Power	TBD		New Powder Mill Substation	Concept	TBD		No		Accommodate Distributed Energy Resources	Install new substation with one 115-34.5 kV 75 MVA transformer.

LSP – *Massachusetts Continued*

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Point of Delivery Request from Customer	New England Power	TBD		Royalston Substation	Concept	TBD		No		Accommodate Distributed Energy Resources	Upgrade existing 69 -4.16 kV 3.75 MVA transformer to 69-13.2 kV 40 MVA transformer
Point of Delivery Request from Customer	New England Power	TBD		Stafford Street Substation	Concept	TBD		No		Accommodate Distributed Energy Resources	Install new substation with two 115-13.8 kV 55 MVA transformers
Point of Delivery Request from Customer	New England Power	TBD		Thorndike Substation	Concept	TBD		No		Accommodate Distributed Energy Resources	Install second 115-34.5 kV 75 MVA transformer with existing 115-13.2 kV 40 MVA transformer.
Point of Delivery Request from Customer	New England Power	TBD		Webster Street Substation	Concept	TBD		No		Accommodate Distributed Energy Resources	Remove 115-13.8 kV 9.375 MVA transformer
Point of Delivery Request from Customer	New England Power	TBD		Wendell Depot Substation	Concept	TBD		No		Accommodate Distributed Energy Resources	Upgrade existing 115-13.8 kV 20 MVA transformer with two 115-13.8 kV 55 MVA transformers.
Point of Delivery Request from Customer	New England Power	TBD		Westminster Substation	Concept	TBD		No		Accommodate Distributed Energy Resources	Upgrade existing 69-13.8 kV 12.5 MVA transformer with two 115-13.8 kV 55 MVA transformers and one 115-34.5 kV 75 MVA transformer.
Reliability	New England Power	Sep-24		Maplewood Substation Asset Condition	Concept	TBD		No		Asset condition and upgrade of control house due to space constraints	Replace #4 transformer. Upgrade control house.

LSP – *Massachusetts Continued*

Primary Driver	Asset Owner by Company	Projected In Service Date	Major Project	Project	Status Update for 2019	Total non-PTF Project Cost for 2019 Report	Total Localized PTF Project Cost for 2019 Report	PPA Approval	RSP ID/Asset List ID	Needs Assessment	Solutions
Area Reliability Assessment	New England Power	May-22	NPCC Directory #1 Protection Modifications	NPCC Directory #1 Protection Modifications - Phase 3	Proposed	$2,003,000		NR	96	NPCC Pilot Scheme	Install OPGW on J-162 line from Tewksbury to Perry Street and tap to L'Energia Project
Asset Condition	New England Power	Jul-22		East Tewksbury Transformer Upgrades	Proposed	$7,700,000		No		Asset Condition	Option 1 : Upgrade two 40MVA 115/13.2kV transformers to 55MVA (Recommended) Option 2: Refurbishment - No available parts or manufacturer support.
Asset Condition	New England Power	2023		Rebuild Adams Substation 23 kV	Proposed	$6,174,000		No		Three significant equipment failures occurred at the 23 kV yard of the Adams substation, which has resulted in the loss of load.	Replace the existing 23kV structure with a new breaker and a half combined metal-clad switchgear and control house enclosure in the same substation yard
Asset Condition	New England Power	Sep-23		Replace East Methuen Substation Assets	Proposed	$8,863,000		No		G-133 GCB showing signs of gasket failure and is obsolete. T1 and T2 transformers have asset concerns.	Option 1: Replace both 115-13.2 kV 40 MVA transformers with two 115-13.2 kV 55 MVA transformers. Replace 115 kV circuit switchers, replace G-133 GCB, Install substation monitoring, and enhanced substation security. Option 2: Full Substation Rebuild:
Asset Condition	New England Power	Aug-25		Replace Ayer Substation Assets	Proposed	$22,500,000	-	No		Asset condition issues with majority of assets in the control house with limited space.	Replace 115kV and 69kV assets, add substation monitoring for transmission equipment, make substation BPS & OPGW ready, Build a new control.

LSP – *Massachusetts Continued*

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Asset Condition	New England Power	Jun-23		Carpenter Hill #435 Control House Rebuild	Proposed	$2,290,000		NR	145	Asset condition issues at the Carpenter Hill control house.	Rebuild the control house. Will modernize the facility and incorporate initiatives including Directory 1 - NPCC Directory 1 (Dual High Speed Protection) and NERC PRC-002 (Disturbance Monitoring and Reporting). The existing control house will be removed. Alternative: Expand the existing control house - higher cost driven by complexities associated with working on/in close proximity to the existing (in-service) control building.
Asset Condition	New England Power	Oct-22		Replace N-192 Underground Cable	Proposed	$69,972,000		No		The N-192 is a 3.6 mile underground cable with a 0.5 mile submarine section installed in 1970. The N-192 has reached its end of life based on a condition assessment performed which highlights increased oil leaks and outage durations.	A project has been initiated to replace and relocate the 115 kV underground cable system. The cable system will be replaced with a solid dielectric cable system (which does not contain any fluid and require less maintenance) between the North River Terminal and the East Beverly substation.
Asset Condition	New England Power	Aug-22		Salem Harbor - 115kV - 23kV rebuild	Proposed	$13,000,000		No	~~40~~	Asset Condition replacement at Salem Harbor substation based on testing and trouble history	Replace nine single-phase GSU transformers with two new three-phase 45/60/75 MVA 115-23 kV transformers. Replace the existing 23 kV modular station with a new breaker-and-a-half design and metalclad switchgear building. Alternative 1: Leave as is - asset condition, reliability, safety and environmental issues. Alternative 2: Replace existing 23 kV assets in place - constructability, clearance, outage and safety concerns. Alternative 3: Replace transformers and build new 23 kV low profile station - space constraint issues, also more expensive.
Asset Condition	New England Power	Oct-22		Remove Distribution Load from Tertiary Windings of Sandy Pond Substation Transformer and Install 115/23 kV Transformer	Proposed	$3,434,800		11/9/16		Reliability concern (transformer failure because of a 23 kV circuit fault) of serving 23 kV off of 345/115/23 kV transformer tertiary	Install a 115/23 kV transformer at Sandy Pond and transfer the 23 kV circuit from the tertiary of T2 (345/115/23 kV) to the new transformer. Add a 115 kV breaker in a spare 115 kV bay at Sandy Pond to feed the new transformer and one 23 kV bay and feeder position. Alternative 1: Second spare 345/115/23 kV transformer at Sandy Pond - exposure from a failure of T2 from a 23 kV sub-transmission fault. Alternative 2 - Construct a new 115/13.2 kV substation at Turnpike Road, Chelmsford MA - significantly higher cost.
Load Growth	New England Power	Jun-22		Install North Marlboro 2nd 115/13.8 kV Transformer	Proposed	$5,177,000		No		Driven by local needs to accommodate load growth in the Marlboro area.	Tap H-160 and install 2nd 40MVA 115/13.8kV transformer T2 at N Marlboro #318 Substation

LSP – *Massachusetts Continued*

Primary Driver	Asset Owner by Company	Projected In Service Date	Major Project	Project	Status Update for 2019	Total non-PTF Project Cost for 2019 Report	Total Localized PTF Project Cost for 2019 Report	PPA Approval	RSP ID/Asset List ID	Needs Assessment	Solutions
Load Growth	New England Power	May-25		Install Pembroke Substation and Plymouth Street 2nd Transformer	Proposed	$10,029,000		No		Load growth in the Hanover area around the following 115 kV stations: North Abington, Phillips Lane, Plymouth St, and Water St.	Alternative 1: Install a second 115/13.8 kV transformer at Plymouth St and replace existing 25/33/42 MVA transformer with new 33/44/55 MVA transformer, and construct a new one transformer substation at Pembroke tapping off of 191 115 kV circuit. Alternative 2: Install a second 115/13.8 kV transformer at Phillips Lane, and construct a new one transformer substation at Pembroke tapping off of 191 115 kV circuit. Alternative 3: Install second 115/13.8 kV transformers at both Phillips Land and Plymouth St.
Load Growth	New England Power	Feb-22	Attleboro Area Capacity Upgrades	Build Reynolds Avenue Substation	Proposed	$8,386,000		7/9/19		Addresses several thermal loading and asset conditions issues identified in the following areas: Chartley Pond (115/23 kV transformer and 13 kV feeders), Norton, Read St., Mink St. (13 kV feeders), S. Attleboro (23/4 kV transformer), and Clara St. (23/4 kV transformer)	Tap the C-181S and D-182S transmission lines to install a new 115/13.2 kV substation off of Reynolds Ave in Rehoboth, with two 33/44/55 MVA transformers.
Load Growth	New England Power	Jan-22		Replace Chartley Pond T1 Transformer	Proposed	$2,797,000		No		Addresses the existing summer emergency loading problem of the Chartley Pond 115/23 kV, T1 transformer.	Replace the Chartley Pond 115/23 kV, T1 transformer with a 33/44/55 MVA unit.
Load Growth	New England Power	Jun-23		Replace Mink Street T1 & T2 Transformers	Proposed	$4,963,000		No		Addresses the existing summer normal and emergency loading problems of T2 transformer & summer emergency loading problems of T1 transformer at Mink Street substation.	Replace the Mink St. #7 T1 and T2 transformers with 24/32/40 MVA, 115/13.2 kV units.
Load Growth	Massachusetts Electric Company	Jul-05	North Oxford Breaker Addition	Install a 115 kV breaker at the North Oxford substation and segment the V-174 line	Proposed	$1,600,000		7/23/15	1624	Address load growth in the area resulting in overloads	Add a 2nd 24/32/40 MVA, 115-13.2kV transformer at N. Oxford #406 substation, tapped off the V-174 line with an in-line breaker. Alternative 1: A new substation in the area Alternative 2: Expanding the existing Snow St and West Charlton substations by adding another feeder position at each. Alternatives 2 and 3 are not preferred due to higher costs and the locations of new facilities are not near the area load center in the town of Oxford.

LSP – *Massachusetts Continued*

Primary Driver	Asset Owner by Company	Projected In Service Date	Major Project	Project	Status Update for 2019	Total non-PTF Project Cost for 2019 Report	Total Localized PTF Project Cost for 2019 Report	PPA Approval	RSP ID/Asset List ID	Needs Assessment	Solutions
Point of Delivery Request from Customer	New England Power	May-21		Build Hendersonville Substation in Everett, MA	Proposed	$11,734,000		12/28/16		Accommodate the load growth in the Hendersonville area of Everett, MA (due to proposed Wynn Everett Casino).	Solution: A new 115/13.8 kV substation is proposed at a new site 3 Charlton Street in the Hendersonville area of Everett, and it will tap both the O-167 and P-168 lines radially. The new substation will have two 115/13.8 kV 33/44/55 MVA transformers. Alternative: Install a new substation at existing Everett #37 substation - higher cost
Area Reliability Assessment	New England Power	Jun-22	Southeast Massachusetts/Rhode Island Reliability Project	Reconfigure Bell Rock to breaker and a half station, split M13 line at Bell Rock and terminate 114 line at Bell Rock. Install new breaker in series with N12/D21 tie breaker, upgrade D21 line switch and install 37.5 MVAR capacitor.	Planned	$100,000		4/30/18	1721	Southeast Massachusetts/Rhode Island Reliability Project	Connect the existing two load serving transformers at Bell Rock to the new bay position.
Asset Condition	Massachusetts Electric Company	Aug-20		Replace S9 Shieldwire	Planned	$10,454,000		NR		The shield wire on the S9, S9E, and H1 lines are copper cladded steel. This type of wire has been proven as a failure risk and is to be replaced.	Replace the existing S9/S9E shieldwire from Auburn Substation to Norwell Substation with two-3/8" EHS shieldwire (9.0 miles), and the shieldwire from Norwell Substation to Scituate Substation with one-OPGW (2.5 miles). The two existing shieldwires on the H1 Line (Tap from S9 Line) will be replaced with one-3/8" EHS and one-OPGW (2.5 miles). Certain structures and insulators will also need to be replaced due to their condition.
Load Growth	New England Power	Sep-20		Replace East Webster 412 T1 Transformer	Planned	$2,529,000		8/8/14		The town of Webster, MA has experienced increased demand, and in addition to normal area load growth, spot loads have accelerated the need for an increase to area capacity.	Upgrade the E. Webster 69/13.2kV transformer 30 MVA T1 to a Alternative: East Webster expansion with two new feeders and upgrading Pondville T1 and T2 - higher cost and geographic constraint to serve area load

LSP – *Massachusetts Continued*

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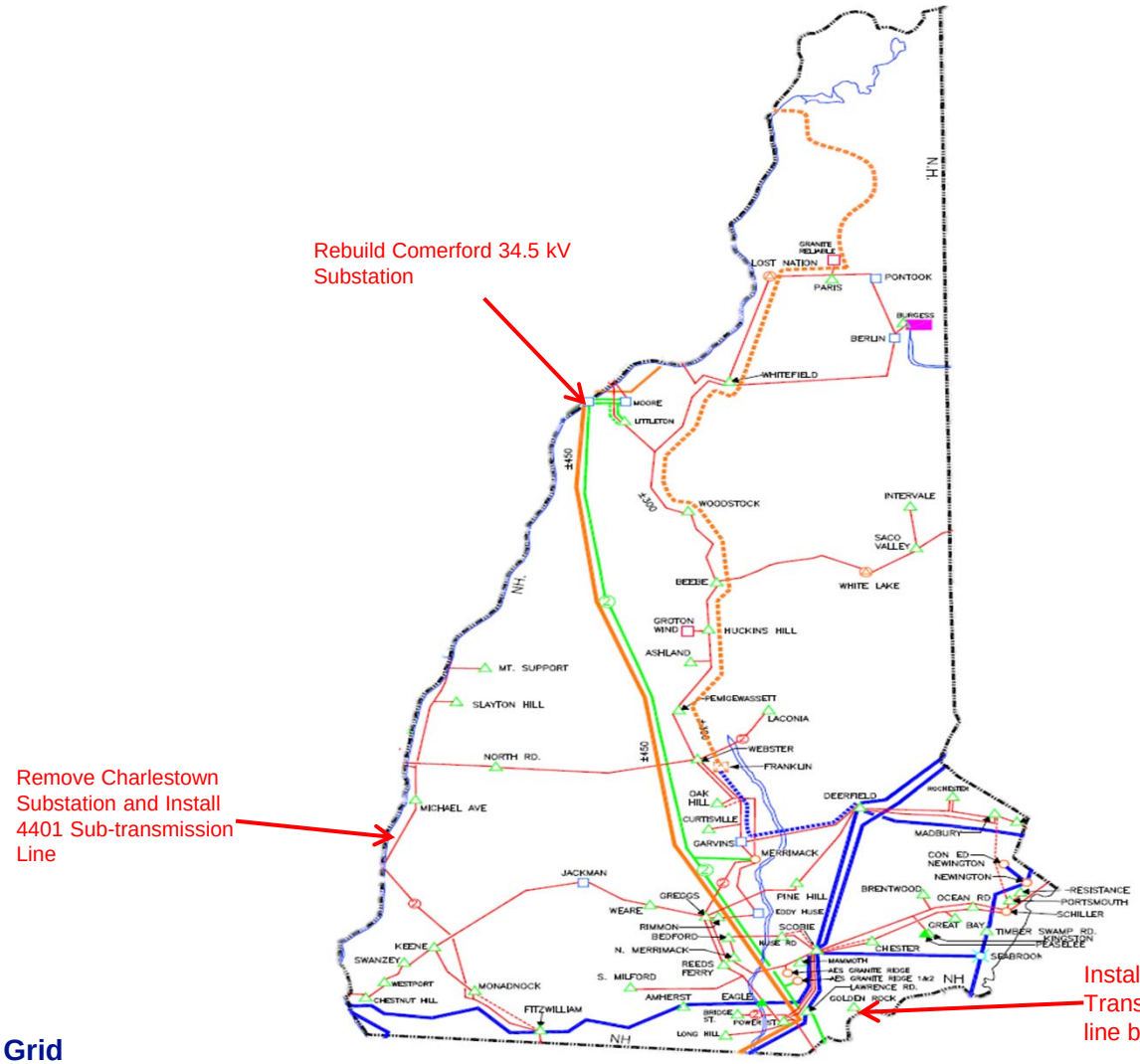
Load Growth	New England Power	Nov-19		Build North Grafton 69/13.8 kV Substation	Under Construction	$4,095,000	$838,000	8/8/14		The North Grafton substation, which is tapped off the 69 kV X-24W line, serves the town of North Grafton, Millbury and Westborough. Due to expected load growth in this area, including significant customer development, there is a need for more capacity in this area.	Preferred alternative is to build a new North Grafton Substation tapped off the X-24W line with one 69/13.8 kV, 24/32/40 MVA LTC transformer and remove the existing 69/4.16 kV transformer at N. Grafton. Load from substations in surrounding towns will be transferred to the new substation in North Grafton to help alleviate some overloaded feeders. Alternative - Rebuild Millbury substation with more feeders. This alternative is more costly and provides less capacity.
Load Growth	New England Power	Dec-19		Build Old Boston Road Substation (formerly Wamesit Substation)	Under Construction	$7,203,000	$237,000	11/8/12		identified capacity issues on the distribution systems in Lowell and Tewksbury, MA, known as Merrimack Supply Area. Major supply transformers are located in Tewksbury #22, Perry St., Billerica and Sandy Pond. The tertiary windings of the Tewksbury T2 and T4 230-115-14kV transformers are expected to be overloaded in 2017 on contingency.	New substation with two 115/13.2kV, 33/44/55 MVA transformers on Tewksbury #22 property, a 115 kV tap line on both the K-137E and J-162 and install a load break on K-137. Alternative: Tap the A-153 line instead of the K-137 line. The A-153 tap would have to pass under the K-137 line. This alternative would be more expensive.
Reliability	New England Power	May-20		C3 Shieldwire Replacement	Under Construction	$10,723,000		N/A		Asset condition C3 line shield wire has loss of strength and needs to be replaced	Replace shield wire due to strength loss and install OPGW to expand fiber optic communication network. Replace deteriorated poles and insulators.

New Hampshire Local Projects

(Planned, Under Construction, and In Service)



LSP – *New Hampshire*

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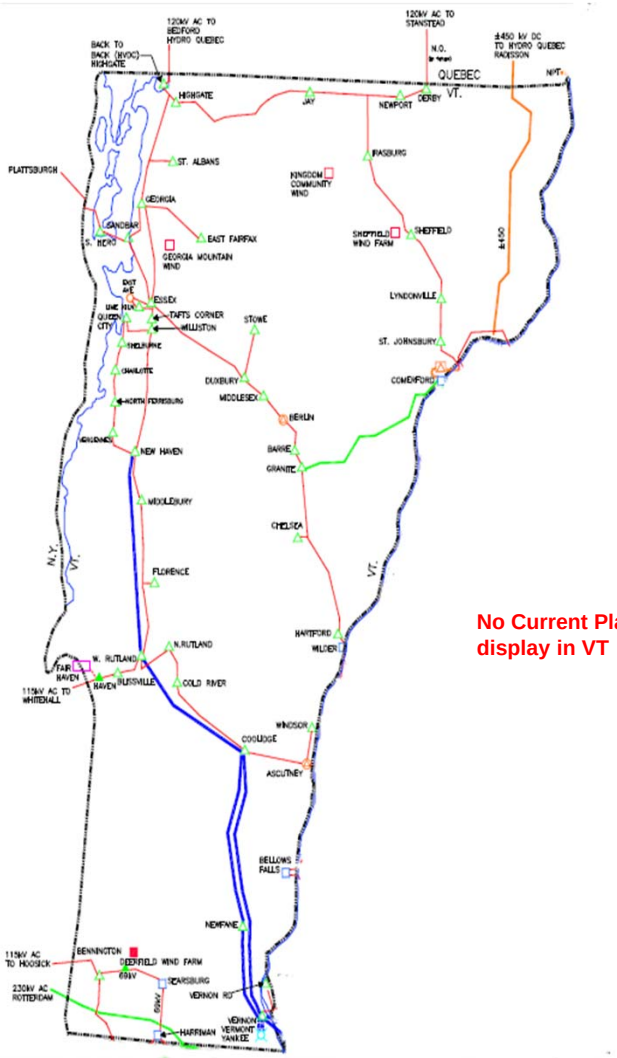
Primary Driver	Asset Owner by Company	Projected In Service Date	Major Project	Project	Status Update for 2019	Total non-PTF Project Cost for 2019 Report	Total Localized PTF Project Cost for 2019 Report	PPA Approval	RSP ID/Asset List ID	Needs Assessment	Solutions
Asset Condition	New England Power	Jul-24		Separate Moore #20 Assets	Concept	TBD		No		Asset Separation from TransCanada due to shared control house being at max capacity.	Alternative 1: Rebuild Moore No.20 substation on land purchased from Great River Hydro. New control house and substation monitoring. Alternative 2: Separate only the control house, and replace assets in place. Not ideal because of space concerns for transformer replacements. T1-T4 would be sold off to Great River Hydro.
Asset Condition	New England Power	Oct-22		Replace Moore #20 Transformer #7 GSU Transformer	Concept	TBD		No		Dissolved gas analysis (DGA) indicates that Moore 20 transformer #7 show signs of high temperatures in oil and dissolved gases that are produced when paper insulation is overheated. Power factor tests also indicate a hot spot that was causing the overheating in the paper insulation.	Replace transformer #7 at Moore Substation due to poor asset condition. Also replace the 4A2 (170) oil circuit breaker, 1795 airbrake, and associated equipment. Alternative 1: Leave as is - not recommended as it could lead to catastrophic failure. Alternative 2: Removal of transformer #7 and associated equipment - not recommended as it would reduce transfer capability due to low voltage at PSNH 115 kV bus Berlin under contingency conditions.
Asset Condition	New England Power	Jan-21		Rebuild Comerford 34.5 kV Substation	Planned	$11,277,000		NR		Asset condition and operational issues. High failure rates, obsolescence and deterioration of 34.5 kV equipment. Reliability, environmental (PCB oil), and safety issues (minimum approach distance and clearances) not up to present day standards	Replace all six existing ~~six~~ oil circuit breaker with 1200 Amp breakers, disconnect switches, copper bus, insulators, and control house.
Load Growth	New England Power	Jan-21		Install Golden Rock 2nd 115/13 kV Transformer and In-Line Breaker and loop G-133W into the substation	Under Construction	$2,885,280	$11,935,720	1/31/17		Liberty Utility conducted a study in the Salem, New Hampshire area to address load growth and the retirement of a modular 23 -13.2 kV substation. Liberty Utility concluded that more capacity was needed to accommodate the issues in the study area.	Installation of a 33/44/55 MVA 115 – 13.2 kV transformer at the National Grid owned Golden Rock substation. Loop the G-133W line in and out of the Golden Rock substation and install a 115 kV in-line breaker. Alternative: Transmission alternatives - Golden Rock is the closest location to Salem, New Hampshire area, and the substation was designed for future expansion and will not require fence expansion.

Vermont Local Projects

(Planned, Under Construction, and In Service)



No Current Planned, Under Construction, or In Service work to display in VT

LSP – *Vermont*

(Fonts in Red are new or updates)

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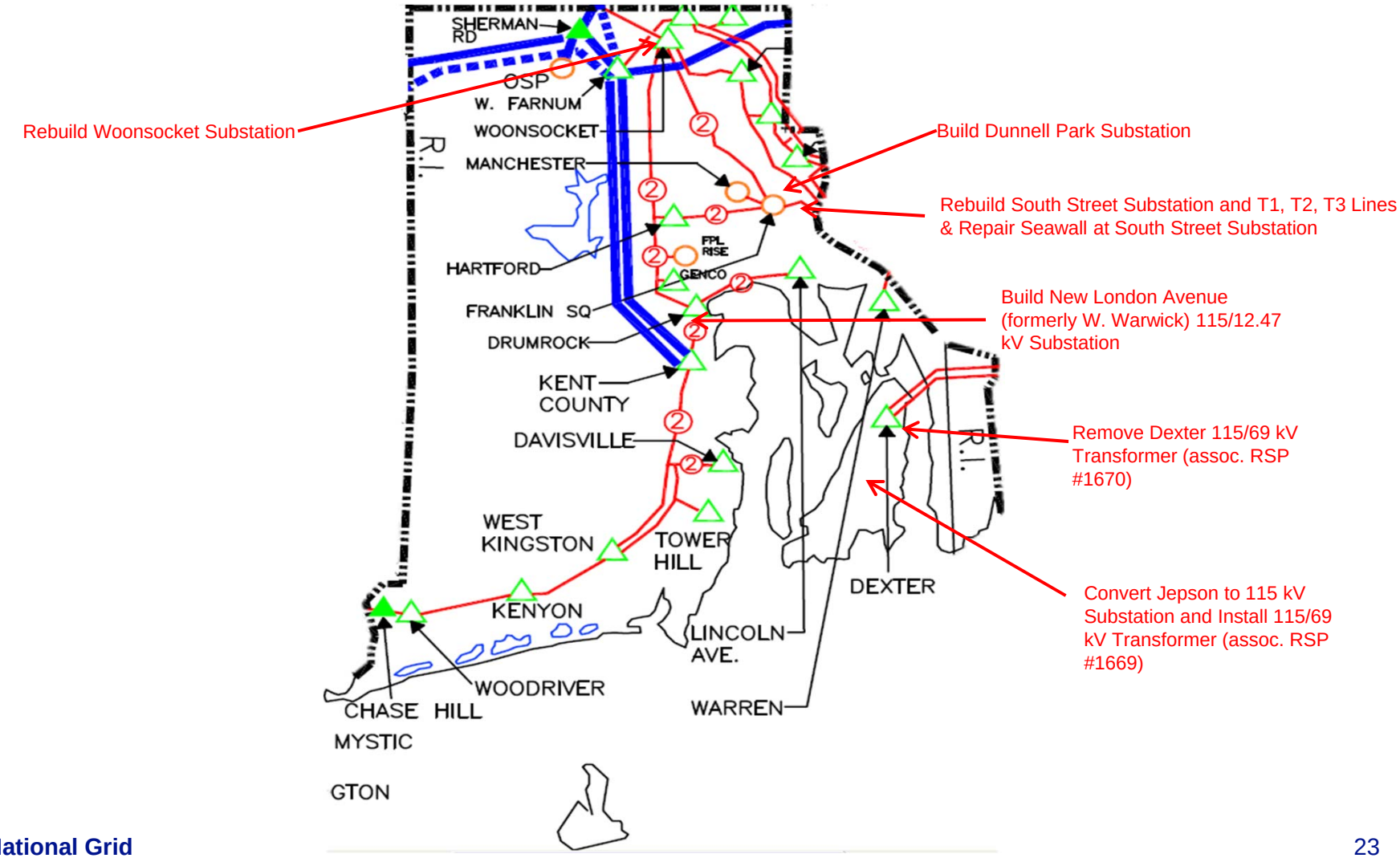
Asset Condition	New England Power	Oct-23		Rebuild Vernon Station 13	Concept	TBD		No		Asset Separation	Replace assets at Vernon Station 13 - This will include in-line disconnects - recent failures - other asset replacements will be determined.
Asset Condition	New England Power	Jun-24		Separate Wilder Assets	Concept	TBD		No		Asset separation from TransCanada at Wilder Substation, VT due to shared control house being at max capacity.	Rebuild 13.8kV and 46kV yard equipment and control house at a new location.

Rhode Island Local Projects

(Planned, Under Construction, and In Service)



LSP – *Rhode Island*

(Fonts in Red are new or updates)

Primary Driver	Asset Owner by Company	Projected In Service Date	Major Project	Project	Status Update for 2019	Total non-PTF Project Cost for 2019 Report	Total Localized PTF Project Cost for 2019 Report	PPA Approval	RSP ID/Asset List ID	Needs Assessment	Solutions
Asset Condition	Narragansett Electric Company	Sep-25		West Kingston Asset Management	Concept	TBD		No		The T1 transformer 20/26.7/33.3 MVA was manufactured in 1965 and needs to be replaced due to poor asset condition.	Replace with a unit similar to the T2 33/44/55 MVA transformer installed in 2004.
Point of Delivery Request from Customer	Narragansett Electric Company	Mar-21		QP 793, 794, and 795 - Wickford Junction Station	Concept	TBD		No		Distributed generation interconnection request from customer.	New 115-34.5 kV substation with a 4 breaker 115kV ring bus. The 115 kV L-190 line will loop through the Wickford Junction Substation to interconnect QP 793 (40 MW), QP 794 (10 MW), and QP 795 (56.5 MW).
Asset Condition	Narragansett Electric Company	Dec-24		Convert Wampanoag Transmission Substation to BPS and Install Monitoring	Proposed	$3,540,000		No		Wampanoag 115 kV has been identified as a BPS addition.	Additional IEC61850 monitoring that is being done in parallel with Wampanoag 115 kV substation BPS work.
Asset Condition	New England Power Narragansett Electric Company	Sep-25		Separate Manchester Street / Franklin Square Assets	Proposed	$14,717,000		No		Remove National Grid equipment from Dominion control house in Manchester and Franklin St.	Build a new National Grid owned control house and separate protection and controls from Dominion.
Asset Condition	Narragansett Electric Company	May-23		Rebuild Admiral Street Substation	Proposed	$1,158,000		5/16/2018		Asset condition issues at Admiral St substation, including obsolete breakers, protection equipment, and fire suppression system with no spare parts.	New 115-12.47 kV 40 MVA transformers at Admiral Street Substation to facilitate retirement of existing 11 kV and 4 kV substations. The feeders are being converted and transferred to the new 12.47 kV switchgear, which will consist of two transformers, supplied from the Q-143 and R-144 from Franklin Square substation to Woonsocket substation.

LSP – *Rhode Island Continued*

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Asset Condition	Narragansett Electric Company	Apr-22		Replace Franklin Square 115 kV Assets	Proposed	$9,984,000		No		~~Replace the 115kV disconnects at Franklin Square.~~Reliability concern due to asset age, condition assessment results, and failure history.	Transformer and disconnect replacements at Franklin Square 115 kV substation.
Asset Condition	Narragansett Electric Company	Mar-22	-	Replace Admiral St-Franklin Square (Q143 and R144) 115 kV Underground Cables	Proposed	$51,118,000		No		Reliability due to condition assessment study results, recent outages, the joint failure history, and line importance factor.	Replace cables and increase capacity. Replace with new 1,500 kcmil copper solid dielectric cables within the existing duct and manhole system.
Load Growth	Narragansett Electric Company	Jan-24		Build First Street Substation (formerly East Providence Substation)	Proposed	$1,200,000		No		This project is part of a comprehensive distribution system solution that addresses thermal loading of equipment, contingency response capability, asset condition concerns, safety concerns, and reliability concerns in the East Bay area of Rhode Island.	Tap the E-183W transmission line to supply a new 115/12.47 kV First Street substation with a single 40 MVA transformer.
Point of Delivery Request from Customer	Narragansett Electric Company	TBD		3052 Line - QP 489 to Sherman Road	Proposed	$30,100,000 (paid by Developer)		10/21/16	1713	QP 489, Clear River Energy Center (CREC), a 1,030 MW gas-fired combined cycle generating station, in Burrillville, Rhode Island connecting to Sherman Road 345 kV.	Construct a new 6.8 mile 345 kV transmission line (the 3052 Line) from the proposed CREC plant to The Narragansett Electric Company's Sherman Road Switching Station in Burrillville RI, and the addition of a new 345 kV bay at Sherman Road Switching Station.
Reliability	New England Power	Nov-24		Lafayette Substation	Proposed	$3,168,000	$1,044,000	No		Reliability, Load Risk, and Asset Condition	Develop a new 115/12.47kV substation with a single transformer at the existing Lafayette Substation site. The station shall be built with 3V0 protection. Install a new Single Span 115kV Tap Line from the L190.

LSP – *Rhode Island Continued*

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Area Reliability Assessment	Narragansett Electric Company	Sep-20	Aquidneck Island Reliability Project	Remove 115kV to 69 kV transformer at Dexter Substation	Planned	$3,570,000		3/31/17	1670	Overloading of 115-69 kV transformer at Dexter, overloading of 69-13.8 kV transformer at Jepson, overloading of 69 kV lines and address voltage problem in Newport.	Remove 115-69 kV transformer at Dexter and maintain supply to existing 115-13.8 kV transformer.
Asset Condition	Narragansett Electric Company	May-21		Build Dunnell Park Substation (formerly Southeast Substation)	Planned	$4,400,000		10/21/14		Pawtucket No. 1 station consists of a four story brick building built 1907 and outdoor switchgear. The indoor building houses distribution switchgear and other electrical equipment. The indoor substation has safety risks due to design and equipment condition. Its outmoded design no longer meets currently accepted safety practices. 73 and 74 transformers overload for loss of one onto the other.	Build a new 115/13.8kV metal clad station on York Ave in the City of Pawtucket with two 55 MVA 115-13.8kV transformers. Supply station from existing 115kV lines crossing site, X-3 and T-7. –Alternative - develop a new 115/13.8kV metal clad substation at Pawtucket No. 1 with two 55 MVA 115-13.8kV transformers. Infrastructure from Pawtucket is all underground requiring a new manhole and ductline systems. This alternative would be more expensive.
Area Reliability Assessment	Narragansett Electric Company	Mar-20	Aquidneck Island Reliability Project	Conversion of Jepson 69 kV substation to 115 kV substation	Under Construction	$6,230,000		3/31/17	1669	Overloading of 115-69 kV transformer at Dexter, overloading of 69-13.8 kV transformer at Jepson, overloading of 69 kV lines and address voltage problem in Newport.	Conversion of Jepson to 115 kV and replacement of transformers and addition of 115-69 kV transformer.
Asset Condition	Narragansett Electric Company	Apr-20		Rebuild Woonsocket Substation	Under Construction	$23,990,000		5/16/18		Increase reliability to the Providence load supplied by Clarkson and Admiral Street substations, while anticipating the long term plan to replace the Q-143S and R-144 underground cables.	Expand the 115 kV Woonsocket substation with two additional breaker-and-a-half bays feeding four line positions. The Q-143S and R-144 circuits will split at Woonsocket substation and terminate into their own line positions. Alternative: Deferment/Do Nothing - reliability issues to supply Clarkson Street and Admiral Street substations.

LSP – *Removed From List*

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Massachusetts											
Area Reliability Assessment	New England Power	Dec-18	Central/Western Massachusetts Upgrades - Group 6 - Miscellaneous Western Ma Projects	Adams - install two new 115 kV breakers and replace two existing 115 kV breakers and associated line relocations	In Service	$60,000		12/7/12	945	Transmission system reinforcement in Western Massachusetts	Swap location of the 115/69 kV T3 transformer and the 115/23 kV T4 transformer at Adams substation
Asset Condition	New England Power	Jul-19		Replace Nantucket Diesel Generation (i.e. Bunker Road Project phase 1)	In Service	$45,409,000		2/20/19		Replace/Upgrade generation units at Bunker Rd Substation unit due to asset condition and future supply contingency issues.	Install one 15 MW (nameplate) generator at Bunker Road and remove the existing 2 – 3 MW generators.
Asset Condition	New England Power	Jul-19		Replace Nantucket Diesel Generation (i.e. Bunker Road Project phase 2)	In Service	$33,192,000		2/20/19		Replace/Upgrade generation units at Bunker Rd Substation unit due to asset condition and future supply contingency issues.	Install a 6 MW, 48kWh battery energy storage system at Bunker Road
Asset Condition	New England Power	Dec-18		Replace Everett #37 115/23 kV Transformer	In Service	$8,361,000		12/27/17		Three 115-23.5-4.16 kV transformers need replacement due to contingency overload and unserved load. Transformers also need replacement due to asset condition.	The transformers at Everett substation are three winding units two are 115-23.5-4.16kV; 25/33.3 MVA & one is a 50/66.6 MVA design. All three transformers will be replaced with two larger three phase two winding units. The two new transformers will be 115-23kV; 40/66/75 MVA units. The 4.16kV yard at Everett 37 is being retired in the near future so there is no longer a need for tertiary windings on these transformers.
Load Growth	New England Power	Jun-19		Replace Everett #37 115/13.8 kV Transformer	In Service	$9,954,000		3/1/11		Two 115-13.8 kV transformers need replacement due to contingency overloading. Loss of 1 transformer overloads the other past the summer emergency rating and could lead to extended outage.	Phase I - Upgrade the 115/13.8 kV transformers from 40MVA to 55MVA - complete. Phase II Replace five air breaks on the high side of transformers with circuit switchers. Install new 115 kV Control House.
Load Growth	New England Power	Dec-18		Replace Read Street Substation T4 Transformer with 40 MVA	In Service	$5,038,000		8/28/13		Accommodate load growth in area. Per MECo distribution planning.	Replace Read St T4 transformer with 24/32/40 MVA, 115/13.2 kV transformer, and build a new 115 kV tap off of the V-148S / F-184 tie line to support the installation of the new T4 transformer.
Point of Delivery Request from Customer	New England Power	Apr-19		Install Taps to serve Ipswich River Substation in Peabody, MA	In Service	(reimbursed by PMLP)		4/16/15		Load growth and Flood mitigation of existing Ipswich River Peabody substation.	Peabody Muni will remove existing single transformer Ipswich River 115–23 kV substation currently tapped from B-154N line and install a new two transformer (36/48/60 MVA) Ipswich River 115–23 kV substation which will tap both the B-154N and the C-155N lines. National Grid will build and own each tap structure. PMLP own conductor from National Grid structure to their substation.

LSP – *Removed From List Continued*

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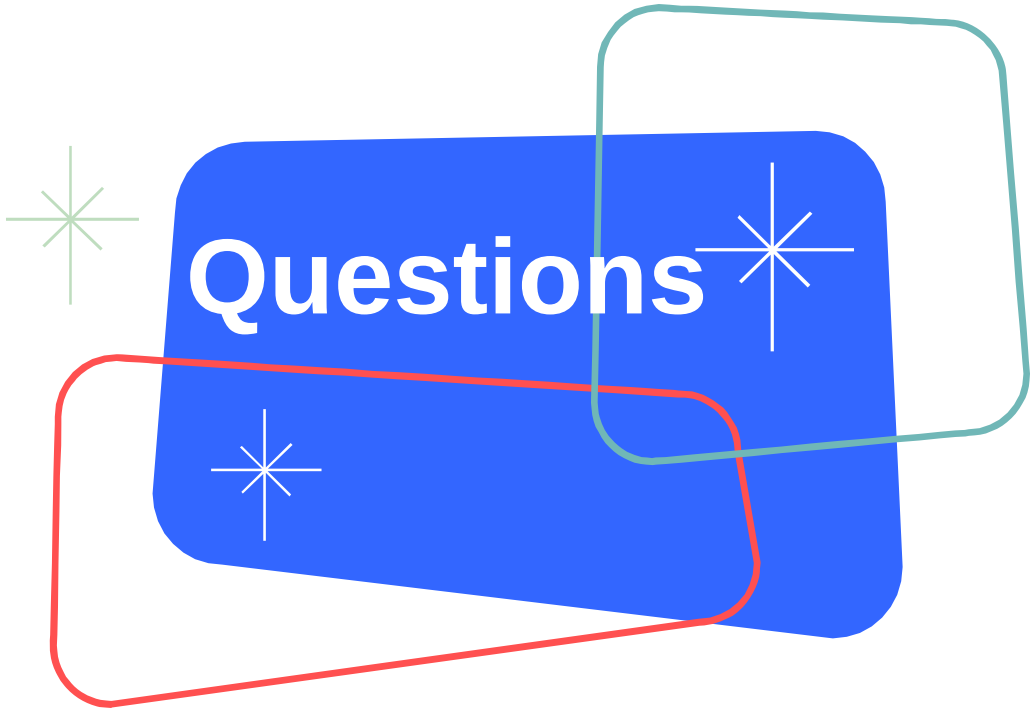
New Hampshire											
Asset Condition	New England Power	Jun-19		Remove Charlestown Substation and Install 4401 Sub-transmission Line	In Service	$1,279,000		NR		Charlestown substation retirement	Removal of all NEP assets at Charlestown substation and new structures in the substation to allow the 4401 line to pass through to the north.
Rhode Island											
Asset Condition	Narragansett Electric Company	May-19		Repair Seawall at South Street Substation	In Service	$8,748,000		NR		The South street substation is being rebuilt. The deteriorating seawall needs to be repaired/rebuilt to accommodate the new construction. The area around the substation and the seawall is also part of a proposed public access "River walk," so public safety is also a concern.	Install/repair approximately 1050 feet of waterfront seawall at the South Street substation. Alternative 1: Do Nothing - potential safety issues for the general public. Alternative 2: Alternate repair options for the different sections of the seawall - some of the alternate options would require a change to the current design of the "River Walk," which could prove to be challenging when presented to CRMC. Also, several options are significantly more expensive than the recommended option. (Estimated Cost: Up to $10.489M)
Asset Condition	Narragansett Electric Company	Apr-19		Rebuild South Street Substation and T1, T2, T3 Lines	In Service	$36,920,000 ($6,983,000 to be reimbursed by developer)		2/23/16		Significant asset condition concerns at the South Street Sub for the transformers, breakers, switches, feeder reactors, and battery system. Building layout is such that it precludes the implementation of modern installation standards to replace original equipment. Developer proposed a project in the area of the existing substation. Developer also requested undergrounding 115 kV lines from Franklin Square to South Street sub.	The project includes a new substation on the existing South Street substation site in the City of Providence, RI. The new substation includes three 115-11 kV, 33/44/55 MVA LTC transformers and an indoor substation building with indoor metal clad switchgear. Additionally, the project includes moving the three 115 kV transmission lines from overhead to underground for 0.3 miles long from Franklin Square to the new South Street substation. The existing South Street 115/11kV station and existing overhead transmission lines will be removed.
Load Growth	Narragansett Electric Company	Oct-18		Build New London Avenue (formerly W. Warwick) 115/12.47 kV Substation	In Service	$816,000	$1,660,000	6/1/10		Heavy loading issues on 23 kV & 12.47 kV distribution systems and transformers in the area of West Warwick, Coventry, Warwick, and Cranston.	Proposal of a new 115-12.5 kV substation with a 115 - 12.5 kV 24/32/40 MVA transformer for New London Ave, Warwick, RI. Tap off T-172 and site clearing. Alternative 1: Expansion of West Cranston and Kent County substations. Alternative 2: New 115 - 12.5kV sub in Cranston. Alternatives were dismissed due to excessive costs.

LSP Public Policy

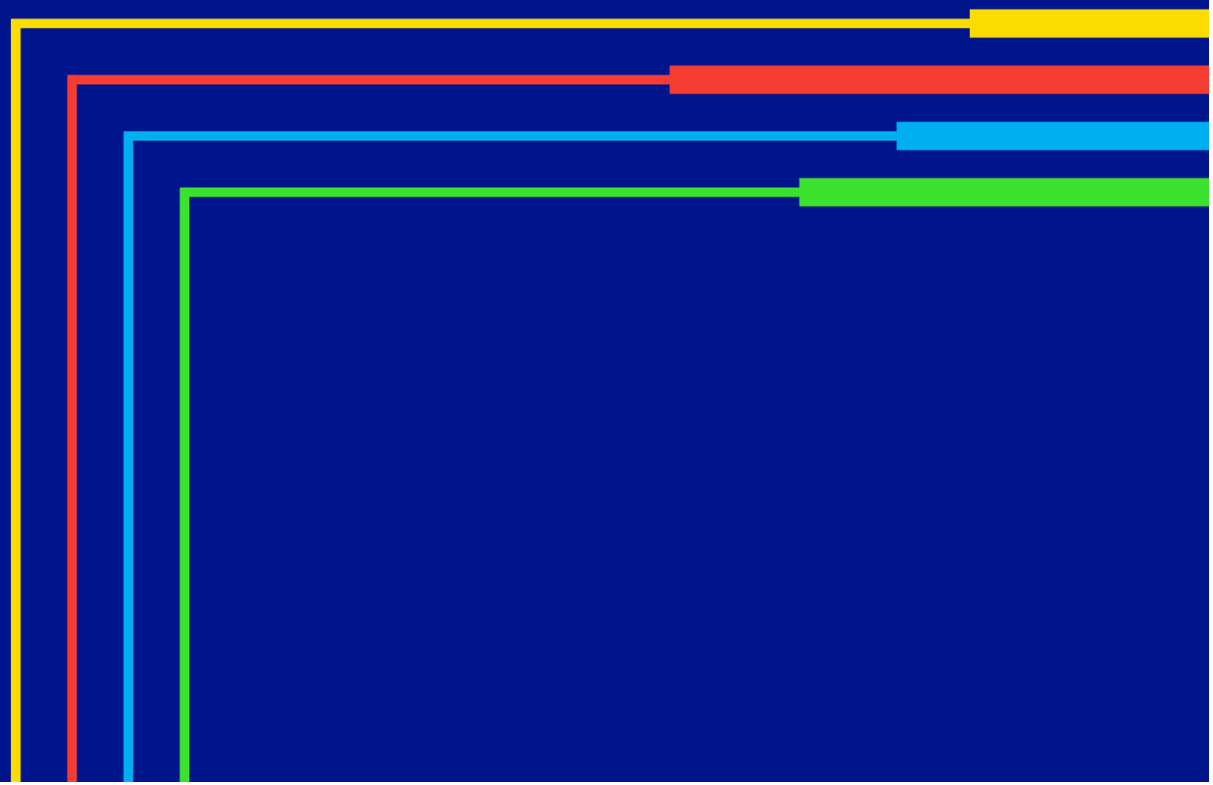
- In 2017, NESCOE communicated that there were no state or federal Public Policy Requirements “driving transmission needs relating to the New England Transmission System”
- In 2017, ISO-NE communicated that it was not aware of any local Public Policy Requirements.
- Thus, National Grid determined there were no Public Policy Requirements identified in the ISO-NE PPTU that are driving needs on National Grid’s Non-PTF system.
- National Grid has not received any input since the last LSP Public Policy update in October, 2017, concluding the cycle.

Questions

PAC, Transmission Customers, and other Stakeholders have 30 days to provide any written comments for consideration by National Grid.



Appendix



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Criteria

All National Grid facilities that are part of the interconnected National Grid system shall be designed in accordance with the National Grid Transmission Planning Guide (TGP28)

The National Grid Transmission Planning Guide is posted on our website under:

http://www.nationalgridus.com/transmission/c3-8_standocs.asp

- "Transmission Planning Guide"

Local System Planning Process

Local studies can result from:

- Load Growth
- Area Reliability Assessment
- Point of Delivery Request from Customer
- Asset Replacement

Local System Planning Process

A Planner:

- summarizes the results from the needs assessment and provides: *criteria*, *data* and *assumptions used in study*
- builds study cases with proposed alternatives
- determines the most effective solution
- summarizes the results of the solutions study

Data and Assumptions

Resources for studies:

- ISO-NE Library cases for load flow and ASPEN short circuit studies
- CELT Report Load forecasts for NE wide loads
- Customer provided forecasted loads for local areas

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