Southeastern Massachusetts and Rhode Island (SEMA/RI) 2027 Needs Assessment Scope of Work

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Purpose

- Present the Southeastern Massachusetts and Rhode Island (SEMA/RI) 2027 Needs Assessment Scope of Work

Overview

- Background
- Objectives
- Study area description
- Modeling assumptions
- Peak load dispatches and transfer levels
- Summary of peak load dispatches
- Minimum load dispatches
- Study methodology
- Schedule/next steps

BACKGROUND

Background

- On June 29, 2017, the ISO posted a Notice of Initiation of the SEMA/RI Needs Assessment
  - https://www.iso-ne.com/static-assets/documents/2017/06/2027_sema_ri_needs_assessment_study_initiation_pac_notice.pdf
- The triggers for the Needs Assessment are:
  - (i): "*a need for additional transfer capability is identified by the ISO in its ongoing evaluation of the PTF's adequacy and performance*."
  - (v): "*as otherwise deemed appropriate by the ISO as warranting such an assessment.*"
- A SEMA/RI 2026 Needs Assessment report was finalized in May 2016 and an addendum report to the SEMA-RI 2026 Needs Assessment report was finalized in October 2016. A SEMA-RI 2026 Solutions Study report was finalized in March 2017 that developed solutions to time sensitive needs identified in the SEMA-RI 2026 Needs Assessment. The Needs Assessment will examine if any needs exist for the study area, and will identify the time-sensitivity of any identified needs
- The solutions identified in the 2026 Solutions Study are included in this Needs Assessment

OBJECTIVES

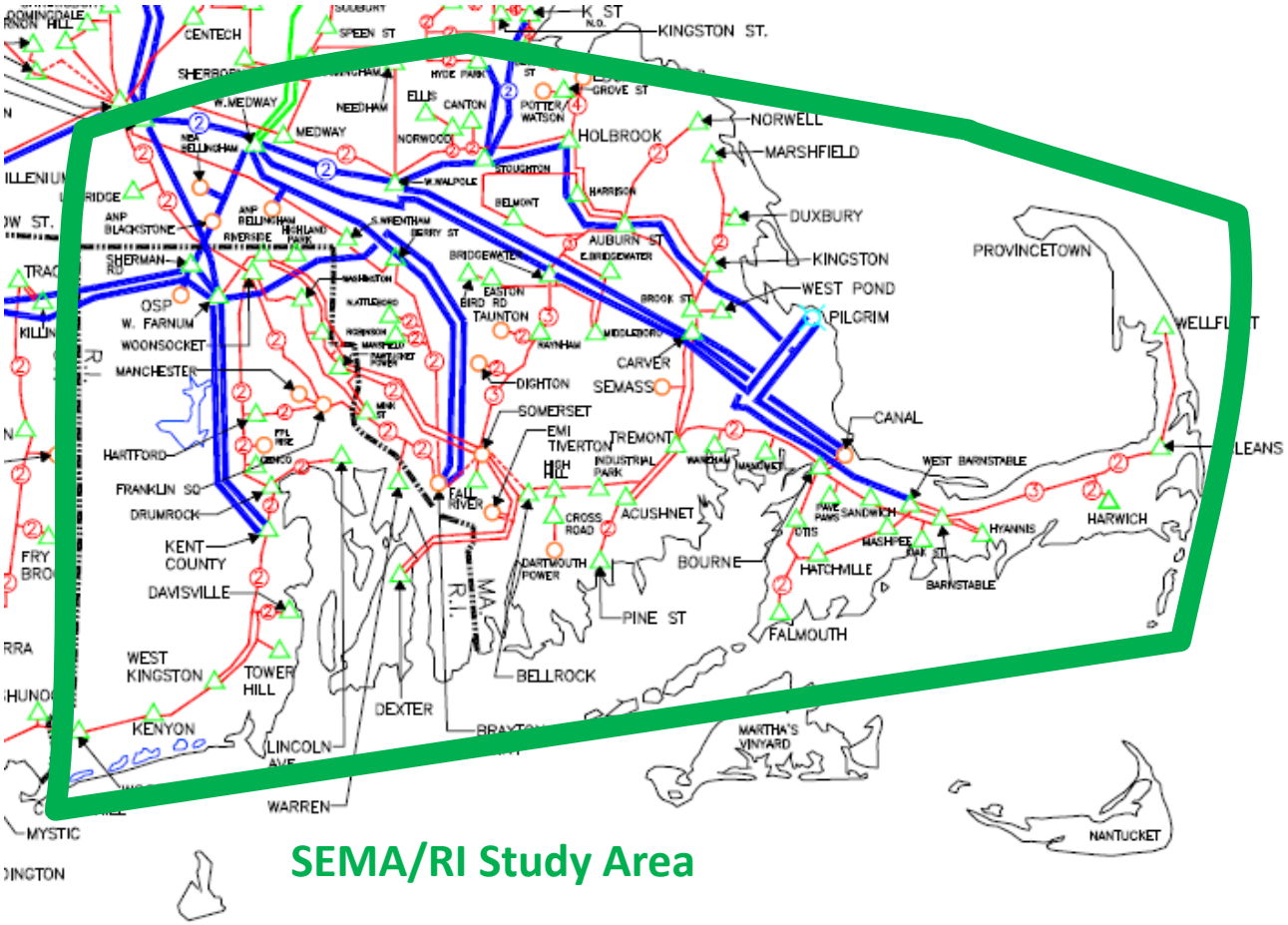
Objectives

The objective of the SEMA/RI Needs Assessment study is to evaluate the reliability performance and identify reliability-based needs in the SEMA/RI study area for the year 2027 while considering the following:

- Future load distribution
- Resource changes in New England based on FCA 11 results, 2017 PV forecast and 2017 EE forecast
- Reliability over a range of generation patterns and transfer levels
- All applicable North American Electric Reliability Corporation (NERC), Northeast Power Coordinating Corporation (NPCC) and ISO New England transmission planning reliability standards

STUDY AREA DESCRIPTION

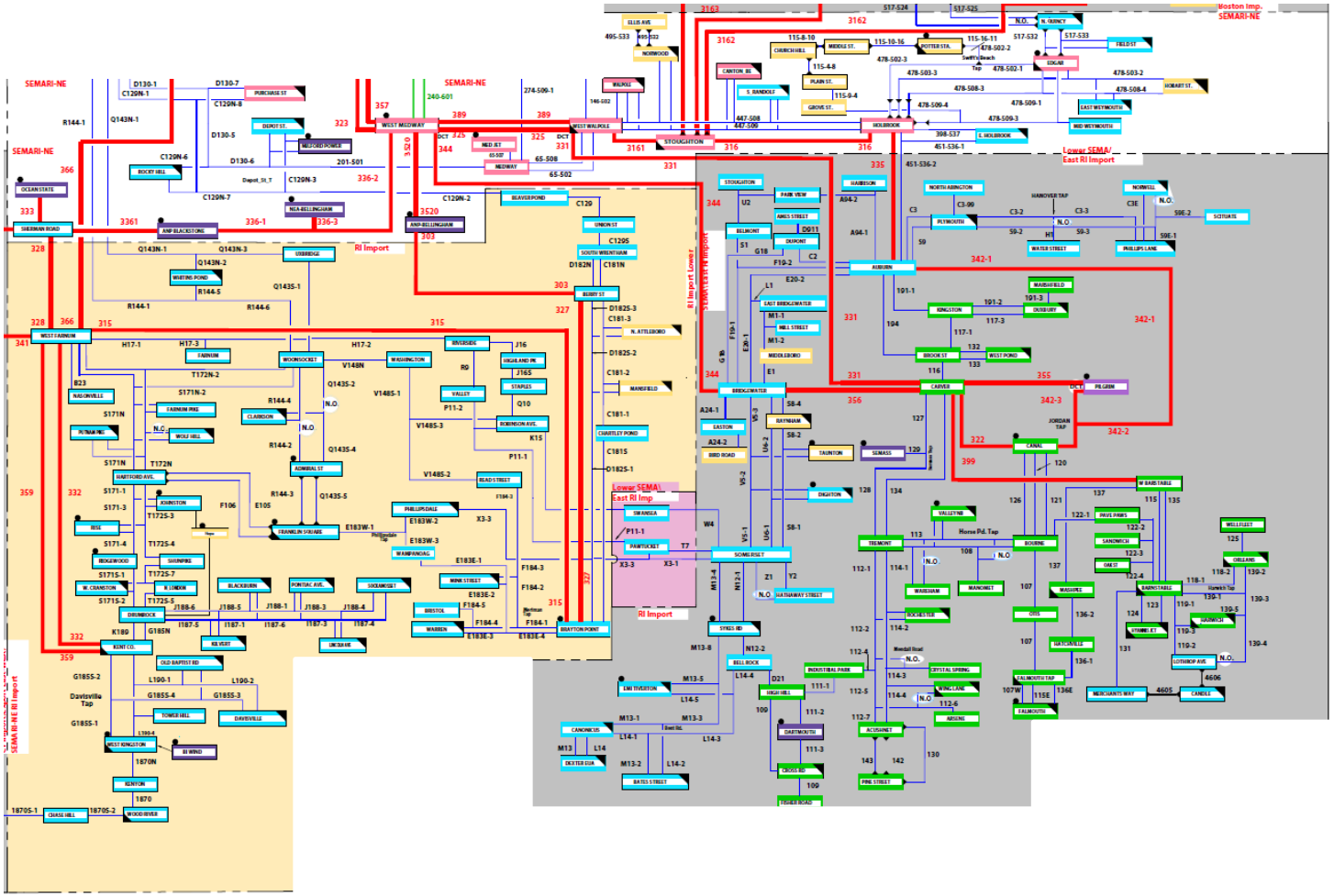
SEMA/RI Geographical Map



SEMA/RI Study Area

The map is shown for reference only and does not include all of the latest topology changes

SEMA/RI One Line Diagram



The diagram is shown for reference only and does not include all of the latest topology changes

STEADY-STATE MODELING ASSUMPTIONS

Initial Study Files

- The draft initial 2027 Needs Assessment cases and files and the draft Summary Document for 2017 Transmission Planning Base Case Library Review were posted on June 30, 2017 for stakeholder review and comment
- After the stakeholder comment period, the ISO posted:
  - the final initial 2027 Needs Assessment cases and study files, that will be used for the SEMA/RI Needs Assessment,
    - https://smd.iso-ne.com/operations-services/ceii/pac/2017/08/ceii_final_2027_needs_assessment_cases.zip
    - Any other changes made to the initial study files since their posting on 8/4/17 will be reflected in the scope of work report and will be included in the intermediate study files
  - the final Summary Document for 2017 Transmission Planning Base Case Library Review, and
    - https://smd.iso-ne.com/operations-services/ceii/pac/2017/08/ceii_summary_document_for_2017_transmission_planning_base_case_library.zip
  - the document responding to stakeholder comments
    - https://www.iso-ne.com/static-assets/documents/2017/08/response_to_stakeholder_comments_on_the_2017_transmission_planning_base_case_library_review.pdf

Modeling Assumptions

- Study Horizon
  - This study will be focused on 2027 for the ten-year horizon utilizing the 2017 Capacity, Energy, Loads, and Transmission (CELT) report
- Existing Topology
  - All transmission and generation facilities that are in-service as of June 1, 2017 are included in the base cases
- Load Levels
  - The 2017 Capacity, Energy, Loads, and Transmission (CELT) report was used to determine the forecasted loads for the peak load demand levels evaluated
    - **34,870 MW** - 90/10 summer peak load (includes T&D losses)
  - A minimum load analysis will be performed at a fixed New England load of 8,000 MW (includes T&D losses and manufacturing loads)

Modeling Assumptions, cont.

- Demand Resource Assumptions
  - New England Demand Resource Performance Assumptions

Load Level	Passive DR	Active DR	Forecasted EE
Summer Peak (90/10)	100%	75%	100%

  - **2,826 MW*** - 100% of Passive DR that cleared in the Forward Capacity Market through FCA 11 (June 1, 2020 – May 31, 2021)
  - **373 MW*** - 75% of Active DR that cleared in the Forward Capacity Market through FCA 11 (June 1, 2020 – May 31, 2021)
  - **1,715 MW*** - 100% of 2017 CELT Energy Efficiency (EE) forecast for the period beyond May 31, 2021

- Future Generation Assumptions
  - All cleared generator additions through FCA 11 will be modeled
  - All submitted retirement delist bids through FCA 12 will be excluded from the base cases

* Includes 5.5% distribution losses

Modeling Assumptions, cont.

- Photovoltaic (PV) Generation Modeled utilizing the 2017 CELT PV Generation Forecast

PV generation Modeled as Negative Load		Study Year
		2027 Summer Peak (MW)*
New England	A – PV generation (nameplate) in New England	4,732
	B – 5.5% Reduction in Distribution Losses	+260
	C – Unavailable PV generation (A+B)x(100%-26%)	-3,694
	PV generation Modeled in Case as Negative Loads (A+B)-C	**1,298**

* These values exclude explicitly modeled PV generators.

Modeling Assumptions, cont.

- New England New Load Levels (Excludes Transmission Losses)

Category	Summer Peak 2027 90/10 Load (MW)	Minimum Load 2027 (MW)
CELT Forecast	34,043	N/A
Fixed New England load	N/A	7,495
Non-CELT Manufacturing load in New England	320	320
Available FCA-11 Passive DR (modeled as negative load)	-2,826	0
Available FCA-11 Active DR (modeled as negative load)	-373	0
Available 2017 CELT EE Forecast for study year (modeled as negative load)	-1,715	0
Available 2017 CELT PV Forecast for study year (modeled as negative load)	-1,298	0
Net load modeled in New England (Excludes Station Service)	**28,151**	**7,815**

Modeling Assumptions, cont.

- Transmission Upgrades Included in the Base Cases
  - RSP Project Tracking Sheet – All reliability upgrades in the June 2017 RSP Project List (Table 1a and 1b) that were Proposed, Planned and Under Construction were included in the base cases
  - Asset Condition Tracking Sheet – In general, all Asset Condition projects that are listed in the June 2017 Asset Condition listing that were Planned, Proposed, or Under Construction are included in the base cases
  - Local System Plan (LSP) Projects Tracking Sheet – Using the information from the 2016 TOPAC, all future LSP projects for which the ISO had modeling data available have been included in the base cases
  - Approved PPAs Tracking Sheet – Transmission projects with an approved PPA as of June 1, 2017 that are not covered under the previously discussed tracking sheets and are not in-service as of June 1, 2017 have been included in the base cases
  - See Appendix E of the Summary Document for 2017 Transmission Planning Base Case Library Review to access all of the tracking sheets
    - https://smd.iso-ne.com/operations-services/ceii/pac/2017/08/ceii_summary_document_for_2017_transmission_planning_base_case_library.zip

State Sponsored Request For Proposals (RFPs)

- Section 4.1(f) of Attachment K states:

  "Specifically, the ISO shall incorporate or update information regarding resources in Needs Assessments that have been proposed and (i) have cleared in a Forward Capacity Auction pursuant to Market Rule 1 of the ISO Tariff, (ii) have been selected in, and are contractually bound by, a state-sponsored Request For Proposals, or (iii) have a financially binding obligation pursuant to a contract." (*underlining added*)

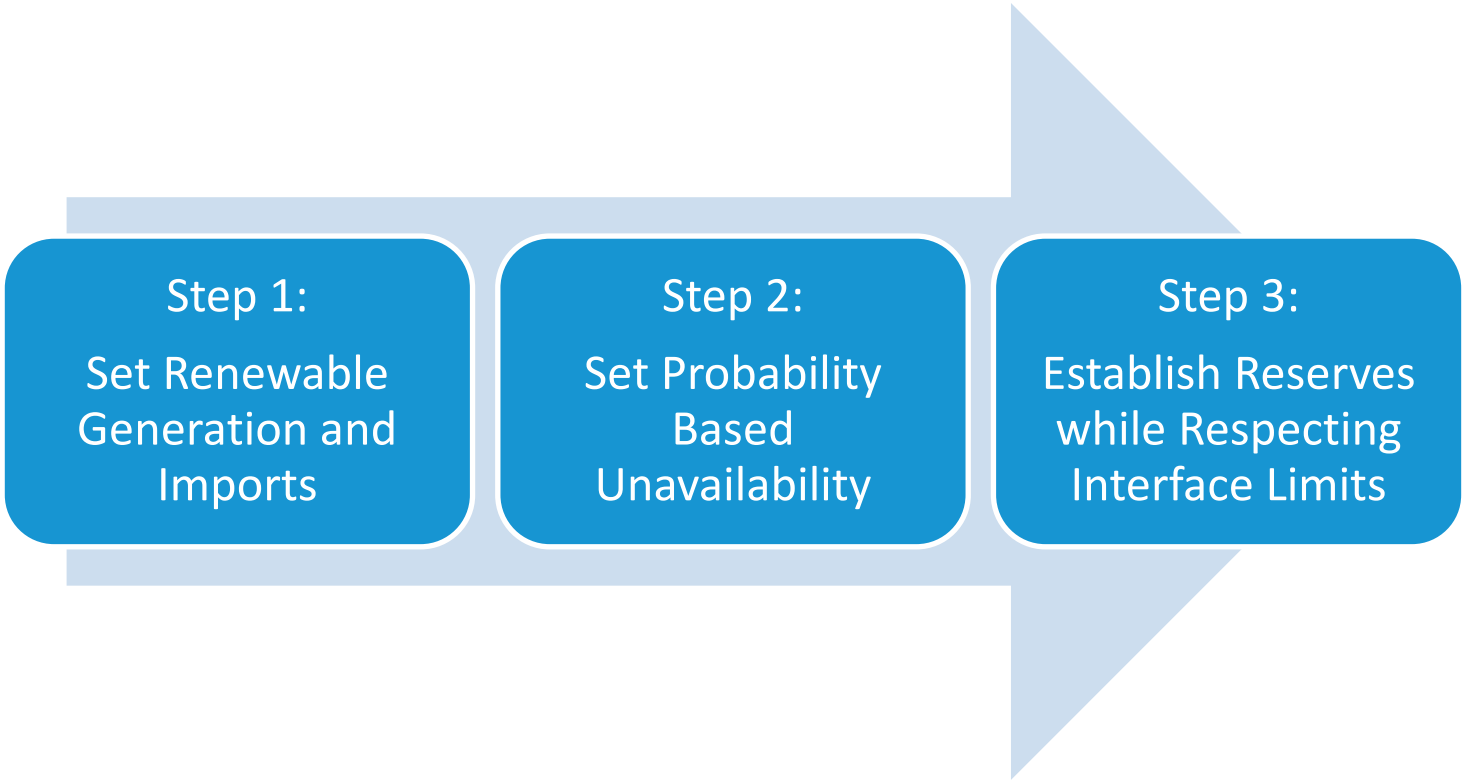
  "With respect to (ii) or (iii) above, the proponent of the market response shall inform the ISO, in writing, of its selection or its assumption of financially binding obligations, respectively."

- If there are any resources that meet criteria (ii) and (iii) stated above that the ISO should consider for inclusion in the respective study area Needs Assessments, the proponents shall do the following no later than Sunday, January 7:
  - Notify the ISO in writing via pacmatters@iso-ne.com
  - Provide the contract as part of the notification to the ISO

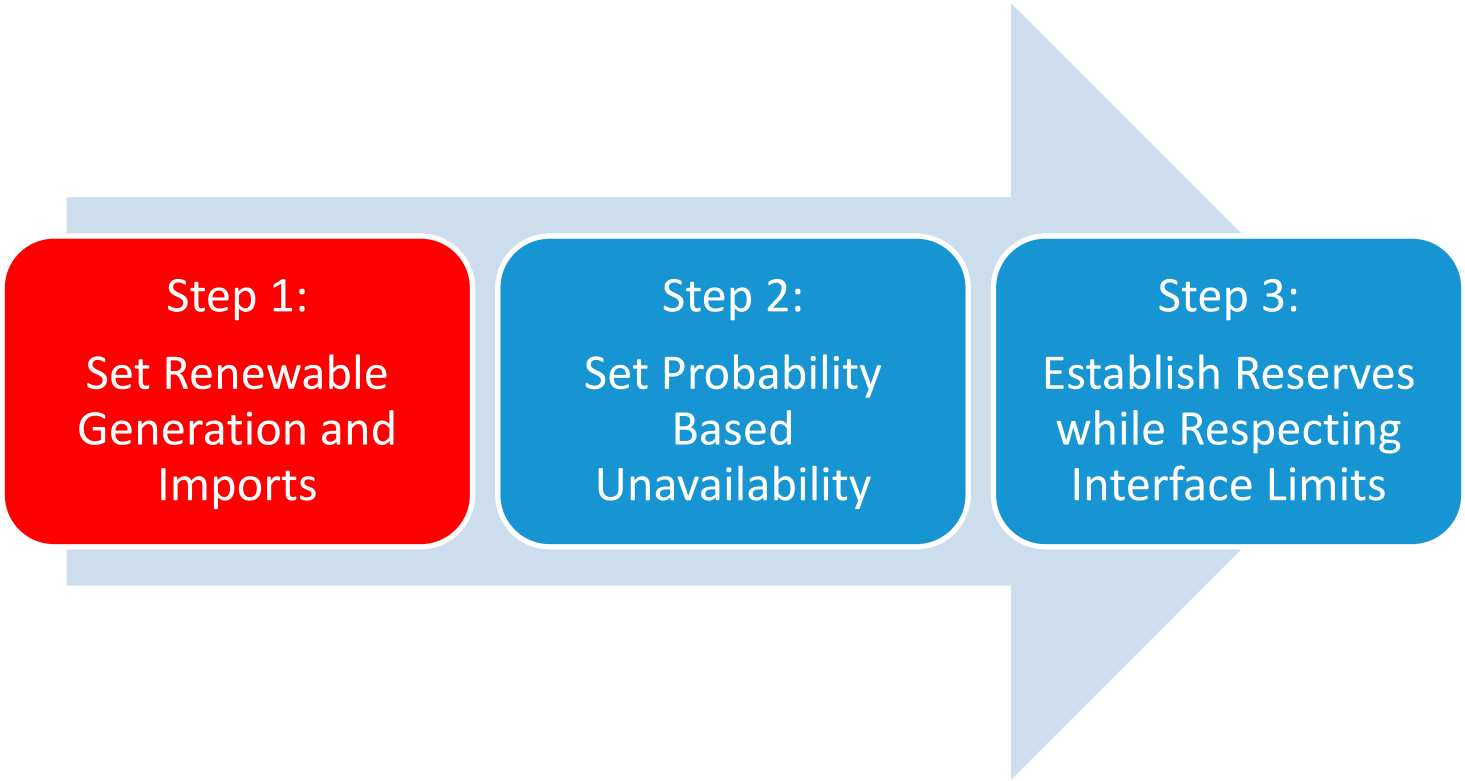
PEAK LOAD DISPATCHES AND TRANSFER LEVELS

Steps to Create the Needs Assessment Dispatches

- The following process was used to create the ECT study area dispatches



Steps to Create the Needs Assessment Dispatches

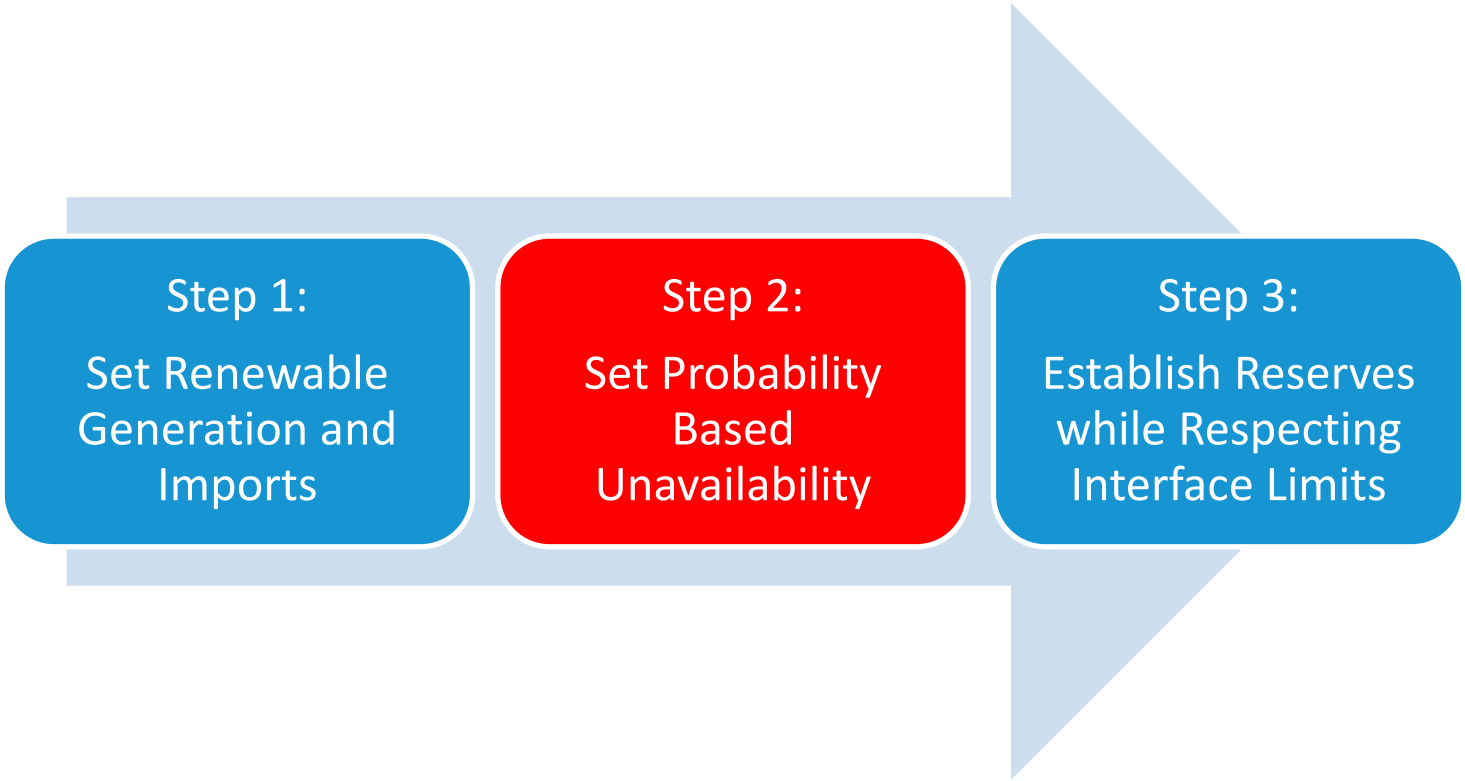


Step 1 – Set Renewable Generation and Imports

- Renewable generation in New England including the SEMA/RI study area is dispatched based on historical availability
- The table below specifies the ranges of imports from external areas that are proposed for the Needs Assessment

Inter-area Interface	Dispatch Range (MW)
New Brunswick to New England tie (NB-NE)	0 and 700
New York to New England AC ties (NY-NE)	0 and 1,400
Cross Sound Cable HVDC From Long Island to New England (CSC)	0
Phase II HVDC from Quebec to New England (Phase II)	950 and 1,400
Highgate HVDC From Quebec to New England (Highgate)	200

Steps to Setup the Needs Assessment Dispatches



Step 2 – Set Probability Based Unavailability

- The table below summarizes the maximum unavailable generation that will be considered in the SEMA/RI Needs Assessment

Type of Group	Group of Generators	Max MW Unavailable at 90/10 Peak Load
Study Area (Largest Generator – Edgar – 723 MW)	SEMA/RI Generators	1,002
Study Area + Adjacent Area	SEMA/RI + Boston Generators	1,232
	SEMA/RI + ECT Generators	1,220
Receiving End of System Stress	Eastern New England	1,554
	Western New England	1,424

Step 2 – Set Dispatches

- The non-renewable generators unavailable per dispatch are shown in the table below
  - Dispatches ending with A – East to West stress
  - Dispatches ending with B – West to East stress

1A	2A	3A	4A	5A	6A	7A	8A
Johnston	Manchester 11	RISE	ANP Bellingham 1	Dartmouth	Dighton	Manchester 11	RISE
Pawtucket Power	Cleary 9	Cleary 9	Edgar	Tiverton	Oak Bluffs	NEA Bellingham	Ocean State Power
RRIG	Dartmouth	Dighton	Montville 5	Burrillville	Tiverton	Canal 3	Medway Peaker 1
Tiverton	SEMASS	Medway Peaker 1	Plainfield	Potter 2	West Tisbury	Milford Power	West Medway Jet 3
Canal 1	Oak Bluffs	West Medway Jet 3	UCONN	TA Watson 1	ANP Blackstone 2	Montville 5	Montville 5
West Medway 1	West Tisbury	Montville 5	New Haven Harbor	Montville 5	Medway Peaker 1	Plainfield	Plainfield
Montville 5	Canal 3	Plainfield	Dexter	Plainfield	West Medway Jet 3	UCONN	UCONN
Plainfield	Milford Power	UCONN	CDECCA	UCONN	Montville 5	New Haven Harbor	New Haven Harbor
UCONN	Montville 5	New Haven Harbor	West Springfield 2	New Haven Harbor	Plainfield	Dexter	Dexter
New Haven Harbor	Plainfield	New Haven Peaker	Altresco	South Meadow 11	UCONN	CDECCA	CDECCA
New Haven Peaker	UCONN	CDECCA	Mass Power	Dexter	Kleen	West Springfield 1	West Springfield 1
CDECCA	New Haven Harbor	West Springfield 1	Stony Brook 2A	CDECCA	CDECCA	West Springfield 2	West Springfield 2
West Springfield 2	South Meadow 11	West Springfield 2	Stony Brook 2B	West Springfield 1	Berkshire	Berkshire	Berkshire
Berkshire	Dexter	Berkshire		West Springfield 2	Altresco	Altresco	Altresco
Mass Power	CDECCA	Mass Power		Berkshire	Stony Brook 2A	Stony Brook 2A	Stony Brook 2A
Stony Brook 2A	West Springfield 1			Stony Brook 2A		Stony Brook 2B	Stony Brook 2B
	West Springfield 2			Altresco		Mass Power	
	Berkshire						
	Mass Power						

Legend	
	Generators Unavailable in Study Area
	Generators Unavailable in Adjacent Areas
	Generators Unavailable in Receiving End

A 20 MW threshold for units unavailable in the Adjacent Area and Receiving End was used

Step 2 – Set Dispatches, cont.

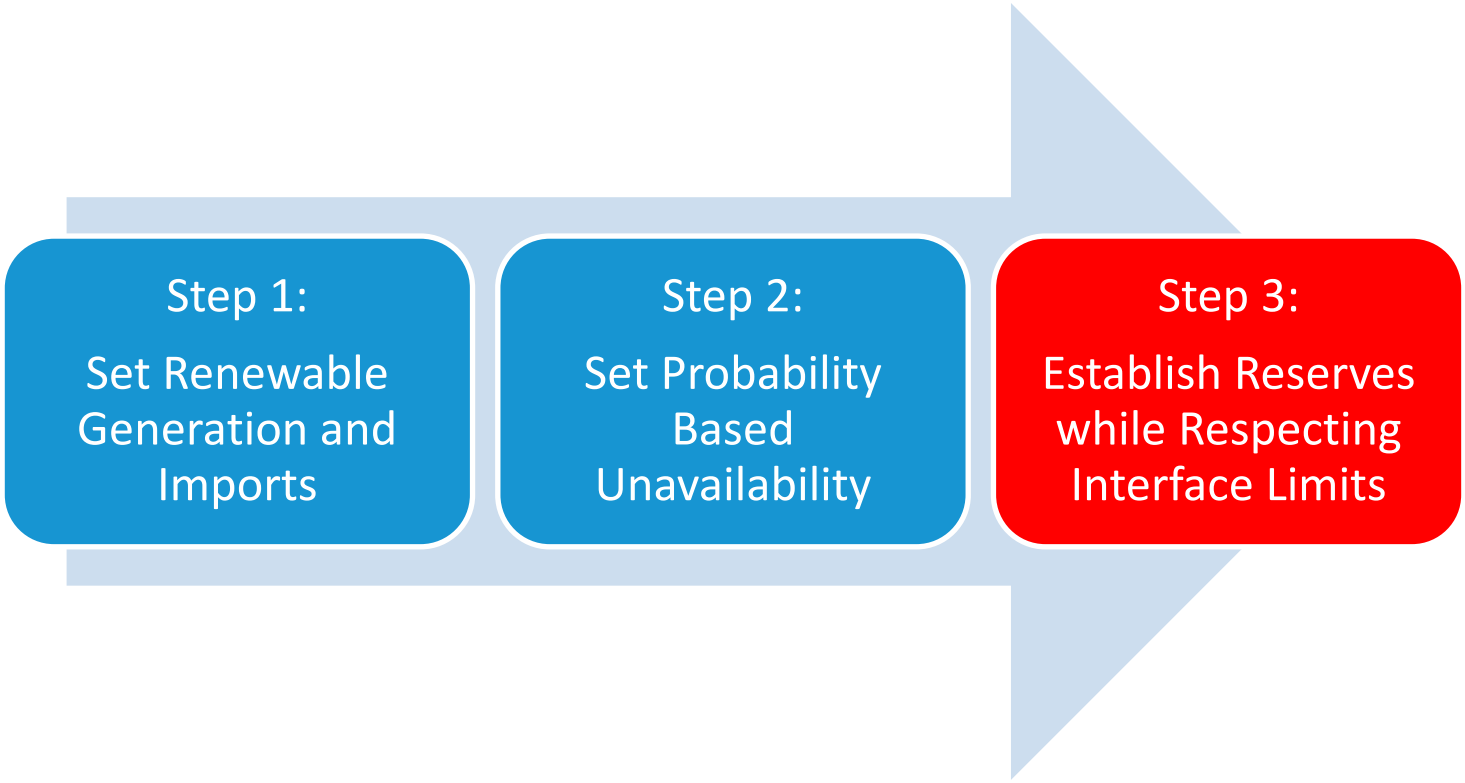
- The non-renewable generators unavailable per dispatch are shown in the table below
  - Dispatches ending with A – East to West stress
  - Dispatches ending with B – West to East stress

1B	2B	3B	4B	5B	6B	7B	8B
Johnston	Manchester 11	RISE	ANP Bellingham 1	Dartmouth	Dighton	Manchester 11	RISE
Pawtucket Power	Cleary 9	Cleary 9	Edgar	Tiverton	Oak Bluffs	NEA Bellingham	Ocean State Power
RRIG	Dartmouth	Dighton	Kendall	Burrillville	Tiverton	Canal 3	Medway Peaker 1
Tiverton	SEMASS	Medway Peaker 1	MATEP	Potter 2	West Tisbury	Milford Power	West Medway Jet 3
Canal 1	Oak Bluffs	West Medway Jet 3	Schiller 5	TA Watson 1	ANP Blackstone 2	Kendall	Kendall
West Medway 1	West Tisbury	Kendall	VERSO COGEN 1	Kendall	Medway Peaker 1	MATEP	MATEP
Kendall	Canal 3	MATEP	Yarmouth 1	MATEP	West Medway Jet 3	Schiller 5	Schiller 5
MATEP	Milford Power	Putnam 1	SEA Stratton	Wheelabrator	Footprint	VERSO COGEN 1	VERSO COGEN 1
Schiller 5	Kendall	Schiller 5	Merrimack 1	Schiller 5	Putnam 1	Yarmouth 1	Yarmouth 1
VERSO COGEN 1	MATEP	Yarmouth 1		VERSO COGEN 1	Schiller 5	SEA Stratton	Yarmouth 2
Yarmouth 1	Wheelabrator	Yarmouth 2		Yarmouth 1	VERSO COGEN 1	Merrimack 1	Merrimack 1
Yarmouth 2	Schiller 5	Merrimack 1		Yarmouth 2	Yarmouth 1		
Merrimack 1	VERSO COGEN 1			Merrimack 1	Yarmouth 2		
	Yarmouth 1				Merrimack 1		
	Yarmouth 2						
	Merrimack 1						

Legend	
	Generators Unavailable in Study Area
	Generators Unavailable in Adjacent Areas
	Generators Unavailable in Receiving End

A 20 MW threshold for units unavailable in the Adjacent Area and Receiving End was used

Steps to Setup the Needs Assessment Dispatches



Step 3 - Establish Reserves

- In this step, the reserves are established while respecting the interface limits
- The priority order for reserve establishment is as follows:
  - Priority 1 – Study Area and Receiving End Weekly Hydro units
  - Priority 2 – Receiving End non-renewable generators and pumped hydro units
  - Priority 3 – Sending End non-renewable generators
- The reserves will be established following the priority order noted above

Step 3 - Establish Reserves

- For the reserves the total of 1200 MW of reserves are established as follows
  - Priority 1 Reserves – There are 179 MW on the Western Receiving End. There are 489 MW on the Eastern Receiving End of weekly hydro units
  - Priority 2 Reserves – There are 870 MW of pumped hydro units and 151 MW of Receiving End non-renewable generators that result in a total of 1021 MW of priority 2 reserves on the Western Receiving End. There are 348 MW non-renewable generators on the Eastern Receiving End
  - Priority 3 Reserves
    - East to West - Since Priority 1 and Priority 2 reserves cover the total 1200 MW reserve requirement there is no need to consider any Sending End non-renewable generators in the total reserves established
    - West to East – An additional 363 MW of reserves is needed on the Sending End

Step 3 – Establish Reserves

- The table below shows the amount of reserves available to be turned on after the first contingency in the N-1-1 analysis

Dispatch	Adjecent Area	Stress	Receiving End (MW)	Priority 1 Reserves		Priority 2 Reserves		Priority 3 Reserves		Total Reserves
				Weekly Hydro Receiving End (MW)	Weekly Hydro Sending End (MW)	Pumped Hydro WMA (MW)	Non-Renewable Generators Receiving End (MW)	Weekly Hydro Sending End (MW)	Non-Renewable Generators Sending End (MW)	
1A	ECT	E/W	Western	179	0	870	151	0	0	1,200
2A	ECT	E/W	Western	179	0	870	151	0	0	1,200
3A	ECT	E/W	Western	179	0	870	151	0	0	1,200
4A	ECT	E/W	Western	179	0	870	151	0	0	1,200
5A	ECT	E/W	Western	179	0	870	151	0	0	1,200
6A	ECT	E/W	Western	179	0	870	151	0	0	1,200
7A	ECT	E/W	Western	179	0	870	151	0	0	1,200
8A	ECT	E/W	Western	179	0	870	151	0	0	1,200
1B	Boston	W/E	Eastern	489	0	0	348	179	184	1,200
2B	Boston	W/E	Eastern	489	0	0	348	179	184	1,200
3B	Boston	W/E	Eastern	489	0	0	348	179	184	1,200
4B	Boston	W/E	Eastern	489	0	0	348	179	184	1,200
5B	Boston	W/E	Eastern	489	0	0	348	179	184	1,200
6B	Boston	W/E	Eastern	489	0	0	348	179	184	1,200
7B	Boston	W/E	Eastern	489	0	0	348	179	184	1,200
8B	Boston	W/E	Eastern	489	0	0	348	179	184	1,200

Step 3 – Respect Interface Limits

- The final step is to check if the establishment of reserves on the receiving end results in the violation of any key interfaces in the vicinity of the study area or the receiving end of the stress
- All interfaces are within their limits and the reserves are considered acceptable

Interface Name	Limit (MW)	90/10 Range (MW)
East-West	3,500	-1,580 to 269
West-East	2,200	-269 to 1,580
North-South	2,725	1,107 to 2,091
SEMA/RI Export	3,400	-323 to -167
Boston Import	5,700	2,971 to 2,439

SUMMARY OF PEAK LOAD DISPATCHES

Summary of Peak Load Dispatches – MWs Unavailable and Transfer Levels

Dispatch	Load Level	Adjacent Area	MW Unavailable in Study Area and Adjacent Area (Maximum MW^)			MW Unavailable in Receiving End (Maximum MW^)		External Interfaces Targets# (Maximum Transfer Capability in MW)			Additional Interfaces (Maximum Transfer Capability in MW)				
			SEMA/RI (1002)	SEMA/RI + ECT (1220)	SEMA/RI + Boston (1232)	Western (1,424)	Eastern (1,554)	NY-NE (1400)	NB-NE (700)	Phase II (1400)	E-W (3500)	W-E (2200)	N-S (2725)	Boston Import (5700)	SEMA/RI Export (3400)
1A	90/10	ECT	982	1212	N/A	1407	N/A	0	700	1400	251	N/A	2077	2483	-226
2A	90/10	ECT	942	1181	N/A	1421	N/A	0	700	1400	269	N/A	2051	2441	-226
3A	90/10	ECT	973	1212	N/A	1402	N/A	0	700	1400	249	N/A	2061	2441	-195
4A	90/10	ECT	985	1216	N/A	1409	N/A	0	700	1400	249	N/A	2072	2441	-184
5A	90/10	ECT	964	1186	N/A	1221	N/A	0	700	1400	233	N/A	2034	2439	-205
6A	90/10	ECT	840	1080	N/A	1422	N/A	0	700	1400	265	N/A	1945	2440	-323
7A	90/10	ECT	999	1214	N/A	1415	N/A	0	700	1400	258	N/A	2091	2441	-173
8A	90/10	ECT	984	1215	N/A	1414	N/A	0	700	1400	256	N/A	2072	2441	-188
1B	90/10	Boston	981	N/A	1228	N/A	1551	1400	0	950	N/A	1580	1107	2881	-220
2B	90/10	Boston	942	N/A	1220	N/A	1549	1400	0	950	N/A	1567	1107	2867	-220
3B	90/10	Boston	973	N/A	1227	N/A	1510	1400	0	950	N/A	1534	1151	2847	-190
4B	90/10	Boston	985	N/A	1231	N/A	1550	1400	0	950	N/A	1574	1113	2838	-177
5B	90/10	Boston	964	N/A	1227	N/A	1553	1400	0	950	N/A	1575	1107	2852	-200
6B	90/10	Boston	840	N/A	1221	N/A	1551	1400	0	950	N/A	1571	1107	2971	-318
7B	90/10	Boston	999	N/A	1232	N/A	1554	1400	0	950	N/A	1569	1113	2825	-167
8B	90/10	Boston	984	N/A	1217	N/A	1554	1400	0	950	N/A	1559	1107	2825	-184

^ Maximum MW is the Maximum unavailable MW of non-renewable generators based on probabilistic methods

Actual interface transfers may vary slightly from the targets due to power flow mismatches

Summary of Peak Load Dispatches - Dispatch Data

- For each dispatch, the following slides summarize the:
  - Stress
  - Relationship between the study area, adjacent area and receiving end of system stress,
  - Amount of generation (MW) unavailable in each area,
  - Relevant generators turned off in each area, and
  - Generators in the receiving end which make up the reserves

Summary of Peak Load Dispatches – Dispatch 1A

Receiving End of System Stress = Western New England

Actual Gen Unavailable in Western NE outside SEMA/RI and ECT= 1177 MW

Generators Unavailable > 20 MW

- New Haven Harbor – 465 MW
- Mass Power – 250 MW
- Berkshire – 234 MW
- Stony Brook 2A – 67 MW
- CDECCA – 60 MW
- New Haven Peaker – 45 MW
- West Springfield 2 – 39 MW

Total Reserves in Receiving End = 1,200 MW

List of Reserves > 20 MW

- Northfield 1 – 292 MW
- Northfield 2 – 292 MW
- Bear Swamp 1 – 286 MW
- Middletown 12 – 48 MW
- Middletown 13 – 48 MW
- Devon 13 – 31 MW

Adjacent Area = ECT

Actual Gen Unavailable in ECT = 231 MW

Relevant Generators Unavailable > 20 MW

- Montville 5 – 85 MW
- Plainfield – 43 MW
- UCONN – 28 MW

Study Area = SEMA/RI

Actual Gen Unavailable = 981 MW

Largest Gen Unavailable in SEMA/RI

- Canal 1 – 581 MW

Additional Relevant Generators Unavailable

- Tiverton – 272 MW
- Pawtucket Power – 57 MW
- West Medway Jet 1 – 42 MW
- Johnston – 27 MW
- RRIG – 2 MW

- East to West

Summary of Peak Load Dispatches – Dispatch 2A

Receiving End of System Stress = Western New England

Actual Gen Unavailable in Western NE outside SEMA/RI and ECT= 1181 MW

Generators Unavailable > 20 MW

- New Haven Harbor – 465 MW
- Mass Power – 250 MW
- Berkshire – 234 MW
- CDECCA – 60 MW
- Dexter – 59 MW
- West Springfield 2 – 39 MW
- West Springfield 1 – 38 MW
- South Meadow 11 – 36 MW

Total Reserves in Receiving End = 1,200 MW

List of Reserves > 20 MW

- Northfield 1 – 292 MW
- Northfield 2 – 292 MW
- Bear Swamp 1 – 286 MW
- Middletown 12 – 48 MW
- Middletown 13 – 48 MW
- Devon 13 – 31 MW

Adjacent Area = ECT

Actual Gen Unavailable in ECT = 239 MW

Relevant Generators Unavailable > 20 MW

- Montville 5 – 85 MW
- Plainfield – 43 MW
- UCONN – 28 MW

Study Area = SEMA/RI

Actual Gen Unavailable = 942 MW

Largest Gen Unavailable in SEMA/RI

- Canal 3 – 340 MW

Additional Relevant Generators Unavailable

- Milford Power – 205 MW
- Manchester 11 – 160 MW
- Cleary 9 – 109 MW
- Dartmouth – 64 MW
- SEMASS – 52 MW
- Oak Bluffs – 8 MW
- West Tisbury – 5 MW

- East to West

Summary of Peak Load Dispatches – Dispatch 3A

Receiving End of System Stress = Western New England

Actual Gen Unavailable in Western NE outside SEMA/RI and ECT= 1163 MW

Generators Unavailable > 20 MW

- **New Haven Harbor – 465 MW**
- **Mass Power – 250 MW**
- **Berkshire – 234 MW**
- **CDECCA – 60 MW**
- **New Haven Peaker – 45 MW**
- **West Springfield 2 – 39 MW**
- **West Springfield 1 – 38 MW**

- East to West

Total Reserves in Receiving End = 1,200 MW

List of Non-renewable Reserves > 20 MW

- **Northfield 1 – 292 MW**
- **Northfield 2 – 292 MW**
- **Bear Swamp 1 – 286 MW**
- **Middletown 12 – 48 MW**
- **Middletown 13 – 48 MW**
- **Devon 13 – 31 MW**

Adjacent Area = ECT

Actual Gen Unavailable in ECT = 239 MW

Relevant Generators Unavailable > 20 MW

- **Montville 5 – 85 MW**
- **Plainfield – 43 MW**
- **UCONN – 28 MW**

Study Area = SEMA/RI

Actual Gen Unavailable = 973 MW

Largest Gen Unavailable in SEMA/RI

- **RISE – 564 MW**

Additional Relevant Generators Unavailable

- **Dighton – 166 MW**
- **Cleary 9 – 109 MW**
- **Medway Peaker 1 – 98 MW**
- **West Medway Jet 3 – 35 MW**

Summary of Peak Load Dispatches – Dispatch 4A

Receiving End of System Stress = Western New England

Actual Gen Unavailable in Western NE outside SEMA/RI and ECT= 1178 MW

Generators Unavailable > 20 MW

- **New Haven Harbor – 465 MW**
- **Mass Power – 250 MW**
- **Altresco – 155 MW**
- **Stony Brook 2A – 67 MW**
- **Stony Brook 2B – 65 MW**
- **CDECCA – 60 MW**
- **Dexter – 59 MW**
- **West Springfield 2 – 39 MW**

- East to West

Total Reserves in Receiving End = 1,200 MW

List of Non-renewable Reserves > 20 MW

- **Northfield 1 – 292 MW**
- **Northfield 2 – 292 MW**
- **Bear Swamp 1 – 286 MW**
- **Middletown 12 – 48 MW**
- **Middletown 13 – 48 MW**
- **Devon 13 – 31 MW**

Adjacent Area = ECT

Actual Gen Unavailable in ECT = 231 MW

Relevant Generators Unavailable > 20 MW

- **Montville 5 – 85 MW**
- **Plainfield – 43 MW**
- **UCONN – 28 MW**

Study Area = SEMA/RI

Actual Gen Unavailable = 985 MW

Largest Gen Unavailable in SEMA/RI

- **Edgar – 723 MW**

Additional Relevant Generators Unavailable

- **ANP Bellingham 1 – 262 MW**

Summary of Peak Load Dispatches – Dispatch 5A

Receiving End of System Stress = Western New England

Actual Gen Unavailable in Western NE outside SEMA/RI and ECT= 1169 MW

Generators Unavailable > 20 MW

- New Haven Harbor – 465 MW
- Berkshire – 234 MW
- Altresco – 155 MW
- Stony Brook 2A – 67 MW
- CDECCA – 60 MW
- Dexter – 59 MW
- West Springfield 2 – 39 MW
- West Springfield 1 – 38 MW
- South Meadow 11 – 36 MW

Total Reserves in Receiving End = 1,200 MW

List of Non-renewable Reserves > 20 MW

- Northfield 1 – 292 MW
- Northfield 2 – 292 MW
- Bear Swamp 1 – 286 MW
- Middletown 12 – 48 MW
- Middletown 13 – 48 MW
- Devon 13 – 31 MW

- East to West

Adjacent Area = ECT

Actual Gen Unavailable in ECT = 222 MW

Relevant Generators Unavailable > 20 MW

- Montville 5 – 85 MW
- Plainfield – 43 MW
- UCONN – 28 MW

Study Area = SEMA/RI

Actual Gen Unavailable = 964 MW

Largest Gen Unavailable in SEMA/RI

- Burrillville – 501 MW

Additional Relevant Generators Unavailable

- Tiverton – 272 MW
- Potter 2 – 73 MW
- Dartmouth – 64 MW
- TA Watson 1 – 54 MW

Summary of Peak Load Dispatches – Dispatch 6A

Receiving End of System Stress = Western New England

Actual Gen Unavailable in Western NE outside SEMA/RI and ECT= 1183 MW

Generators Unavailable > 20 MW

- **Kleen – 635 MW**
- **Berkshire – 234 MW**
- **Altresco – 155 MW**
- **Stony Brook 2A – 67 MW**
- **CDECCA – 60 MW**

Total Reserves in Receiving End = 1,200 MW

List of Non-renewable Reserves > 20 MW

- **Northfield 1 – 292 MW**
- **Northfield 2 – 292 MW**
- **Bear Swamp 1 – 286 MW**
- **Middletown 12 – 48 MW**
- **Middletown 13 – 48 MW**
- **Devon 13 – 31 MW**

Adjacent Area = ECT

Actual Gen Unavailable in ECT = 239 MW

Relevant Generators Unavailable > 20 MW

- **Montville 5 – 85 MW**
- **Plainfield – 43 MW**
- **UCONN – 28 MW**

Study Area = SEMA/RI

Actual Gen Unavailable = 840 MW

Largest Gen Unavailable in SEMA/RI

- **Tiverton – 272 MW**

Additional Relevant Generators Unavailable

- **ANP Blackstone 2 – 256 MW**
- **Dighton – 166 MW**
- **Medway Peaker 1 – 98 MW**
- **West Medway Jet 3 – 35 MW**
- **Oak Bluffs – 8 MW**
- **West Tisbury – 5 MW**

- East to West

Summary of Peak Load Dispatches – Dispatch 7A

Receiving End of System Stress = Western New England

Actual Gen Unavailable in Western NE outside SEMA/RI and ECT= 1199 MW

Generators Unavailable > 20 MW

- New Haven Harbor – 465 MW
- Mass Power – 250 MW
- Berkshire – 234 MW
- Altresco – 155 MW
- Stony Brook 2A – 67 MW
- Stony Brook 2B – 65 MW
- CDECCA – 60 MW
- Dexter – 59 MW
- West Springfield 2 – 39 MW
- West Springfield 1 – 38 MW

Total Reserves in Receiving End = 1,200 MW

List of Non-renewable Reserves > 20 MW

- Northfield 1 – 292 MW
- Northfield 2 – 292 MW
- Bear Swamp 1 – 286 MW
- Middletown 12 – 48 MW
- Middletown 13 – 48 MW
- Devon 13 – 31 MW

Adjacent Area = ECT

Actual Gen Unavailable in ECT = 215 MW

Relevant Generators Unavailable > 20 MW

- Montville 5 – 85 MW
- Plainfield – 43 MW
- UCONN – 28 MW

Study Area = SEMA/RI

Actual Gen Unavailable = 999 MW

Largest Gen Unavailable in SEMA/RI

- Canal 3 – 340 MW

Additional Relevant Generators Unavailable

- NEA Bellingham – 294 MW
- Milford Power – 205 MW
- Manchester 11 – 160 MW

- East to West

Summary of Peak Load Dispatches – Dispatch 8A

Receiving End of System Stress = Western New England

Actual Gen Unavailable in Western NE outside SEMA/RI and ECT= 1184 MW

Generators Unavailable > 20 MW

- New Haven Harbor – 465 MW
- Berkshire – 234 MW
- Altresco – 155 MW
- Stony Brook 2A – 67 MW
- Stony Brook 2B – 65 MW
- CDECCA – 60 MW
- Dexter – 59 MW
- West Springfield 2 – 39 MW
- West Springfield 1 – 38 MW

Total Reserves in Receiving End = 1,200 MW

List of Non-renewable Reserves > 20 MW

- Northfield 1 – 292 MW
- Northfield 2 – 292 MW
- Bear Swamp 1 – 286 MW
- Middletown 12 – 48 MW
- Middletown 13 – 48 MW
- Devon 13 – 31 MW

Adjacent Area = ECT

Actual Gen Unavailable in ECT = 231 MW

Relevant Generators Unavailable > 20 MW

- Montville 5 – 85 MW
- Plainfield – 43 MW
- UCONN – 28 MW

Study Area = SEMA/RI

Actual Gen Unavailable = 984 MW

Largest Gen Unavailable in SEMA/RI

- RISE – 564 MW

Additional Relevant Generators Unavailable

- Ocean State Power – 286 MW
- Medway Peaker 1 – 98 MW
- West Medway Jet 3 – 35 MW

- East to West

Summary of Peak Load Dispatches – Dispatch 1B

- West to East Stress

Receiving End of System Stress = Eastern New England

Actual Gen Unavailable in Eastern NE outside SEMA/RI + Boston = 327 MW

Study Area = SEMA/RI

Actual Gen Unavailable = 981 MW

Largest Gen Unavailable in SEMA/RI
- **Canal 1 - 581**

Additional Relevant Generators Unavailable
- **Tiverton – 272 MW**
- **Pawtucket Power – 57 MW**
- **West Medway Jet 1 – 42 MW**
- **Johnston – 27 MW**
- **RRIG – 2MW**

Adjacent Area = Boston

Actual Gen Unavailable in Boston = 243 MW

Relevant Generators Unavailable > 20 MW
- **Kendall – 174 MW**
- **MATEP – 59 MW**

Generators Unavailable > 20 MW
- **Merrimack 1 – 128 MW**
- **Yarmouth 2 – 54 MW**
- **Yarmouth 1 – 53 MW**
- **Schiller 5 – 48 MW**
- **VERSO COGEN 1 – 44 MW**

Total Reserves in Receiving End = 837 MW

List of Non-renewable Reserves > 20 MW
- **Waters River – 30 MW**
- **Tamworth – 22 MW**

Total Reserves in the Sending End = 363 MW

Summary of Peak Load Dispatches – Dispatch 2B

- West to East Stress

Receiving End of System Stress = Eastern New England

Actual Gen Unavailable in Eastern NE outside SEMA/RI + Boston = 327 MW

Study Area = SEMA/RI

Actual Gen Unavailable = 942 MW

Largest Gen Unavailable in SEMA/RI
- **Canal 3 – 340 MW**

Additional Relevant Generators Unavailable
- **Milford Power – 205 MW**
- **Manchester 11 – 160 MW**
- **Cleary 9 – 109 MW**
- **Dartmouth – 64 MW**
- **SEMASS – 52 MW**
- **Oak Bluffs – 8 MW**
- **West Tisbury 5 MW**

Adjacent Area = Boston

Actual Gen Unavailable in Boston = 281 MW

Relevant Generators Unavailable > 20 MW
- **Kendall – 174 MW**
- **MATEP – 59 MW**
- **Wheelabrator – 30 MW**

Generators Unavailable > 20 MW
- **Merrimack 1 – 128 MW**
- **Yarmouth 2 – 54 MW**
- **Yarmouth 1 – 53 MW**
- **Schiller 5 – 48 MW**
- **VERSO COGEN 1 – 44 MW**

Total Reserves in Receiving End = 837 MW
List of Non-renewable Reserves > 20 MW
- **Waters River – 30 MW**
- **Tamworth – 22 MW**

Total Reserves in the Sending End = 363 MW

Summary of Peak Load Dispatches – Dispatch 3B

- West to East Stress

Receiving End of System Stress = Eastern New England

Actual Gen Unavailable in Eastern NE outside SEMA/RI + Boston = 283 MW

Study Area = SEMA/RI

Actual Gen Unavailable = 973 MW

Largest Gen Unavailable in SEMA/RI
- **RISE – 564 MW**

Additional Relevant Generators Unavailable
- **Dighton – 166 MW**
- **Cleary 9 – 109 MW**
- **Medway Peaker 1 – 98 MW**
- **West Medway Jet 3 – 35 MW**

Adjacent Area = Boston

Actual Gen Unavailable in Boston = 254 MW

Relevant Generators Unavailable > 20 MW
- **Kendall – 174 MW**
- **MATEP – 59 MW**
- **Putnam 1 – 21 MW**

Generators Unavailable > 20 MW
- **Merrimack 1 – 128 MW**
- **Yarmouth 2 – 54 MW**
- **Yarmouth 1 – 53 MW**
- **Schiller 5 – 48 MW**

Total Reserves in Receiving End = 837 MW
List of Non-renewable Reserves > 20 MW
- **Waters River – 30 MW**
- **Tamworth – 22 MW**

Total Reserves in the Sending End = 363 MW

Summary of Peak Load Dispatches – Dispatch 4B

- West to East Stress

Receiving End of System Stress = Eastern New England

Actual Gen Unavailable in Eastern NE outside SEMA/RI + Boston = 322 MW

Study Area = SEMA/RI

Actual Gen Unavailable = 985 MW

Largest Gen Unavailable in SEMA/RI
- **Edgar – 722 MW**

Additional Relevant Generators Unavailable
- **ANP Bellingham 1 – 262 MW**

Adjacent Area = Boston

Actual Gen Unavailable in Boston = 243 MW

Relevant Generators Unavailable > 20 MW
- **Kendall – 174 MW**
- **MATEP – 59 MW**

Generators Unavailable > 20 MW
- **Merrimack 1 – 128 MW**
- **Yarmouth 1 – 53 MW**
- **SEA Stratton – 49 MW**
- **Schiller 5 – 48 MW**
- **VERSO COGEN 1 – 44 MW**

Total Reserves in Receiving End = 837 MW
List of Non-renewable Reserves > 20 MW
- **Waters River – 30 MW**
- **Tamworth – 22 MW**

Total Reserves in the Sending End = 363 MW

Summary of Peak Load Dispatches – Dispatch 5B

- West to East Stress

Receiving End of System Stress = Eastern New England

Actual Gen Unavailable in Eastern NE outside SEMA/RI + Boston = 326 MW

Study Area = SEMA/RI

Actual Gen Unavailable = 964 MW

Largest Gen Unavailable in SEMA/RI
- **Burrillville – 501 MW**

Additional Relevant Generators Unavailable
- **Tiverton – 272 MW**
- **Potter 2 – 73 MW**
- **Dartmouth – 64 MW**
- **TA Watson 1 – 54 MW**

Adjacent Area = Boston

Actual Gen Unavailable in Boston = 263 MW

Relevant Generators Unavailable > 20 MW
- **Kendall – 174 MW**
- **MATEP – 59 MW**
- **Wheelabrator – 30 MW**

Generators Unavailable > 20 MW
- **Merrimack 1 – 128 MW**
- **Yarmouth 2 – 54 MW**
- **Yarmouth 1 – 53 MW**
- **Schiller 5 – 48 MW**
- **VERSO COGEN 1 – 44 MW**

Total Reserves in Receiving End = 837 MW
List of Non-renewable Reserves > 20 MW
- **Waters River – 30 MW**
- **Tamworth – 22 MW**

Total Reserves in the Sending End = 363 MW

Summary of Peak Load Dispatches – Dispatch 6B

- West to East Stress

Receiving End of System Stress = Eastern New England

Actual Gen Unavailable in Eastern NE outside SEMA/RI + Boston = 326 MW

Study Area = SEMA/RI

Actual Gen Unavailable = 840 MW

Largest Gen Unavailable in SEMA/RI
- **Tiverton – 272 MW**

Additional Relevant Generators Unavailable
- **ANP Blackstone 2 – 256 MW**
- **Dighton – 166 MW**
- **Medway Peaker 1 – 98 MW**
- **West Medway Jet 3 – 35 MW**
- **Oak Bluffs – 8 MW**
- **West Tisbury – 5 MW**

Adjacent Area = Boston

Actual Gen Unavailable in Boston = 384 MW

Relevant Generators Unavailable > 20 MW
- **Footprint – 345 MW**
- **Putnam 1 – 21 MW**

Generators Unavailable > 20 MW
- **Merrimack 1 – 128 MW**
- **Yarmouth 2 – 54 MW**
- **Yarmouth 1 – 53 MW**
- **Schiller 5 – 48 MW**
- **VERSO COGEN 1 – 44 MW**

Total Reserves in Receiving End = 837 MW
List of Non-renewable Reserves > 20 MW
- **Waters River – 30 MW**
- **Tamworth – 22 MW**

Total Reserves in the Sending End = 363 MW

Summary of Peak Load Dispatches – Dispatch 7B

- West to East Stress

Receiving End of System Stress = Eastern New England

Actual Gen Unavailable in Eastern NE outside SEMA/RI + Boston = 322 MW

Study Area = SEMA/RI

Actual Gen Unavailable = 999 MW

Largest Gen Unavailable in SEMA/RI
- **Canal 3 – 340 MW**

Additional Relevant Generators Unavailable
- **NEA Bellingham – 294 MW**
- **Milford Power – 205 MW**
- **Manchester 11 – 160 MW**

Adjacent Area = Boston

Actual Gen Unavailable in Boston = 233 MW

Relevant Generators Unavailable > 20 MW
- **Kendall – 174 MW**
- **MATEP – 59 MW**

Generators Unavailable > 20 MW
- **Merrimack 1 – 128 MW**
- **Yarmouth 1 – 53 MW**
- **SEA Stratton – 49 MW**
- **Schiller 5 – 48 MW**
- **VERSO COGEN 1 – 44 MW**

Total Reserves in Receiving End = 837 MW
List of Non-renewable Reserves > 20 MW
- **Waters River – 30 MW**
- **Tamworth – 22 MW**

Total Reserves in the Sending End = 363 MW

Summary of Peak Load Dispatches – Dispatch 8B

- West to East Stress

Receiving End of System Stress = Eastern New England

Actual Gen Unavailable in Eastern NE outside SEMA/RI + Boston = 326 MW

Study Area = SEMA/RI

Actual Gen Unavailable = 984 MW

Largest Gen Unavailable in SEMA/RI
- **RISE – 564 MW**

Additional Relevant Generators Unavailable
- **Ocean State Power – 286 MW**
- **Medway Peaker 1 – 98 MW**
- **West Medway Jet 3 – 35 MW**

Adjacent Area = Boston

Actual Gen Unavailable in Boston = 243 MW

Relevant Generators Unavailable > 20 MW
- **Kendall – 174 MW**
- **MATEP – 59 MW**

Generators Unavailable > 20 MW
- **Merrimack 1 – 128 MW**
- **Yarmouth 2 – 54 MW**
- **Yarmouth 1 – 53 MW**
- **Schiller 5 – 48 MW**
- **VERSO COGEN 1 – 44 MW**

Total Reserves in Receiving End = 837 MW
List of Non-renewable Reserves > 20 MW
- **Waters River – 30 MW**
- **Tamworth – 22 MW**

Total Reserves in the Sending End = 363 MW

MINIMUM LOAD ASSUMPTIONS AND DISPATCHES

Minimum Load Assumptions

- A 2026 minimum load Needs Assessment for SEMA/RI was completed in August 2017*
- Solutions are being developed in the Solutions Study**

* https://smd.iso-ne.com/operations-services/ceii/pac/2017/08/ceii_final_sema_ri_min_load_needs_assessment_report.pdf

** https://www.iso-ne.com/static-assets/documents/2017/09/2026_sema_ri_minimum_load_solutions_study_initiation_pac_notice.docx

SHORT CIRCUIT ASSUMPTIONS

Short Circuit Basecase Assumptions

- The short circuit basecase used for the SEMA/RI Needs Assessment is based on the expected topology in the 2022 compliance steady state base case
  - No significant project is expected in the 2022-2027 timeframe, and hence the 2022 case was considered acceptable
- The 2022 case includes the impact of all PPA approved generators and ETUs (including resources without an obligation through the FCM)
  - The resources with an approved PPA that do not have an obligation through the FCM cannot be relied upon to resolve a reliability need (and are therefore not considered in steady state),
  - However, they do contribute to the available short circuit current as they may be in service as part of the energy dispatch of the system
- All generators in the short circuit model will be considered online for this study

STUDY METHODOLOGY

Study Methodology

- Steady state thermal and voltage analysis will be performed, for N-0 (all-facilities-in), N-1 (all-facilities-in, first contingency), and N-1-1 (facility-out, first contingency) for the described set of generation dispatches and inter-regional stresses
  - Up to 1,200 MW generation re-dispatch will be allowed between the first and second contingency
  - If any needs are identified in the summer peak cases:
    - an analysis will be completed to indicate whether the needs are time sensitive or not
    - a critical load level (CLL) analysis will be completed
- Short circuit analysis will be performed with representation of the latest generation additions and retirements in the study area

SCHEDULE/NEXT STEPS

Schedule/Next Steps

- Please submit comments on the materials in this presentation to pacmatters@iso-ne.com by Sunday, January 7th
- Post the draft study area 2027 Needs Assessment Scope of Work report and intermediate study files – January 2018
- Complete the study area 2027 Needs Assessment and present to PAC and post report – Q2 2018

Questions