Regional System Plan

Transmission Projects and Asset Condition

October 2020 Update

Planning Advisory Committee Meeting

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Highlights of the RSP Project List Update

- **Major cost estimate changes that occurred between the June and October 2020 Project List**
  - (MA) Southeast Massachusetts/Rhode Island Reliability Project (SEMA/RI) – cost reduction of $61.6M due to cancellation of 3 projects
  - (CT) Southwest Connecticut Project (SWCT) – cost reduction of $12.8M for 1 project to reflect TCA cost updates
- **Sixteen new projects**
  - Eastern CT 2029 – total cost of $230.0M
    - Details of the 16 new projects are listed on the next three slides
- **Five upgrades have been placed in-service since the June 2020 update**
  - (NH) Total of 3 projects
    - Seacoast New Hampshire Solution – 3 projects
  - (MA) Total of 1 project
    - Pittsfield/Greenfield Project – 1 project
  - (CT) Total of 1 project
    - GHCC – 1 project

October 2020 RSP Project List Update

- **Sixteen New Projects**

Project ID #	Transmission System Upgrades	Cost (in millions $)	Improvement/Need
1815	Reconductor the L190-4 and L190-5 line sections (Rhode Island) Eastern CT 2029	40.0	Resolve thermal overloads
1850	Install a second 345/115 kV autotransformer (4X) and one 345 kV breaker at Card substation (Connecticut) Eastern CT 2029	20.1	Resolve thermal overloads and low voltage violations
1851	Upgrade Card 115 kV substation to BPS standards (Connecticut) Eastern CT 2029	20.3	Meet NPCC BPS standards
1852	Install one 115 kV circuit breaker in series with Card substation (Connecticut) Eastern CT 2029	2.2	Resolve low voltage violations
1853	Convert Gales Ferry substation from 69 kV to 115 kV (Connecticut) Eastern CT 2029	13.1	Resolve thermal overloads
1854	Rebuild the 100 line from Montville to Gales Ferry to allow operation at 115 kV (Connecticut) Eastern CT 2029	8.2	Resolve thermal overloads

October 2020 RSP Project List Update, cont.

- **Sixteen New Projects**

Project ID #	Transmission System Upgrades	Cost (in millions $)	Improvement/Need
1855	Reterminate the 100 line at Montville station and associated work. Energize the 100 line at 115 kV (Connecticut) Eastern CT 2029	8.2	Resolve thermal overloads
1856	Rebuild 400-1 line section to allow operation at 115 kV (Tunnel to Ledyard Jct.) (Connecticut) Eastern CT 2029	31.6	Resolve thermal overloads
1857	Add one 115 kV circuit breaker and reterminate the 400-1 line section into Tunnel substation. Energize 400 line at 115 kV (Connecticut) Eastern CT 2029	6.0	Resolve thermal overloads
1858	Rebuild 400-2 line section to allow operation at 115 kV (Ledyard Jct. to Border Bus with CMEEC) (Connecticut) Eastern CT 2029	13.4	Resolve thermal overloads
1859	Rebuild the 400-3 line Section to allow operation at 115 kV (Gales Ferry to Ledyard Jct.) (Connecticut) Eastern CT 2029	7.4	Resolve thermal overloads

October 2020 RSP Project List Update, cont.

- **Sixteen New Projects**

Project ID #	Transmission System Upgrades	Cost (in millions $)	Improvement/Need
1860	Install a 25.2 MVAR 115 kV capacitor and one capacitor breaker at Killingly (Connecticut) Eastern CT 2029	3.8	Resolve low voltage violations
1861	Install one 345 kV series breaker at the Montville 1T (345 kV) (Connecticut) Eastern CT 2029	3.3	Resolve low voltage violations
1862	Install a 50 MVAR synchronous condenser with two 115 kV breakers at Shunock (Connecticut) Eastern CT 2029	43.8	Resolve high and low voltage violations
1863	Install a 1% series reactor with bypass switch at Mystic, CT on the 1465 line (Connecticut) Eastern CT 2029	5.7	Resolve thermal overloads
1864	Convert the 400-2 Line Section to 115 kV (Border Bus to Buddington), convert Buddington to 115 kV (Connecticut) Eastern CT 2029	2.9	Resolve thermal overloads

October 2020 RSP Project List Update, cont.

- **Five Projects Placed In-Service and Corresponding Needs**

Project ID #	Transmission System Upgrades	Cost (in millions $)	Improvement/Need
1316	Madbury Substation – Add one 115 kV circuit breaker (associated with new circuit, Madbury-Portsmouth) (New Hampshire) Seacoast New Hampshire Solution	3.5	Resolve thermal overloads
1317	Portsmouth Substation- Add: (1) 115 kV circuit breaker (associated with new circuit, Madbury-Portsmouth) (New Hampshire) Seacoast New Hampshire Solution	5.7	Resolve thermal overloads
1318	New 115 kV overhead/submarine circuit, Madbury-Portsmouth (New Hampshire) Seacoast New Hampshire Solution	117.7	Resolve thermal overloads

October 2020 RSP Project List Update, cont.

- **Five Projects Placed In-Service and Corresponding Needs**

Project ID #	Transmission System Upgrades	Cost (in millions $)	Improvement/Need
1663	Construct a 115 kV three breaker ring bus at or adjacent to Pochassic 37R Substation, loop line 1512-1 into the new three breaker ring bus, construct a new line connecting the new three breaker ring bus to the Buck Pond 115 kV Substation on the vacant side of the double circuit towers that carry line 1302-2, add a new breaker to the Buck Pond 115 kV straight bus and reconnect lines 1302-2, 1657-2 and transformer 2X into new positions (Massachusetts) Pittsfield/Greenfield Project	35.6	Resolves low voltage violations in the Pleasant/Blandford/Southwick/Elm area
1596	Install a 115 kV 3% series reactor on the underground cable between South Meadow and Southwest Hartford (Connecticut) GHCC	2.5	Resolve thermal overloads

October 2020 RSP Project List Update, cont.

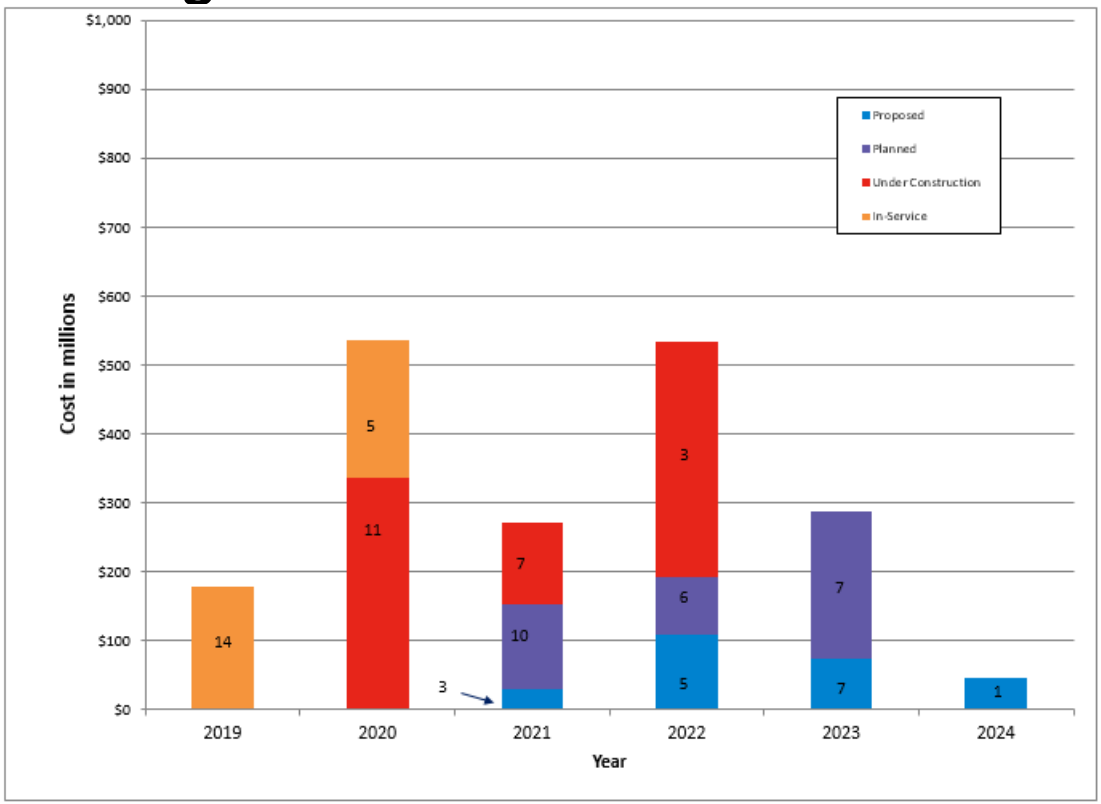
- **Cost Estimate Comparisons of Reliability Projects June vs. October 2020 Update [(1)]**

	As of Jun 2020 Plan Update (in millions $)	As of Oct 2020 Plan Update (in millions $)	Change in Plan Estimate (in millions $)
MAJOR PROJECTS			
Greater Hartford & Central Connecticut (GHCC)	321	321	0
Southeast Massachusetts/Rhode Island Reliability (SEMA/RI)	410	349	-62
Pittsfield/Greenfield Project	179	179	0
Greater Boston - North, South, Central, and Western Suburbs	1041	1043	1
New Hampshire Solution - Southern, Central, Seacoast, Northern	369	369	0
Southwest Connecticut (SWCT)	399	386	-13
Eastern CT 2029	0	230	230
SUBTOTAL [(2)]	**2720**	**2876**	156
OTHER PROJECTS	9885	9885	0
NEW PROJECTS	0	0	0
TOTAL [(2)]	**12605**	**12761**	**156**
Minus 'in-service'	-11086	-11252	-166
Aggregate estimate of active projects in the Plan [(2)]	**1519**	**1509**	**-10**

Notes:
(1) Transmission Owners provided all estimated costs, which may not meet the guidelines described in Planning Procedure 4, Attachment D.
(2) May not sum exactly due to rounding.
(3) The cost estimates for projects in the "Major Projects" category are moved to the "Other Projects" category once they are fully completed.

October 2020 RSP Project List Update, cont.

- **Investment of New England Transmission Reliability Projects by Status through 2024**

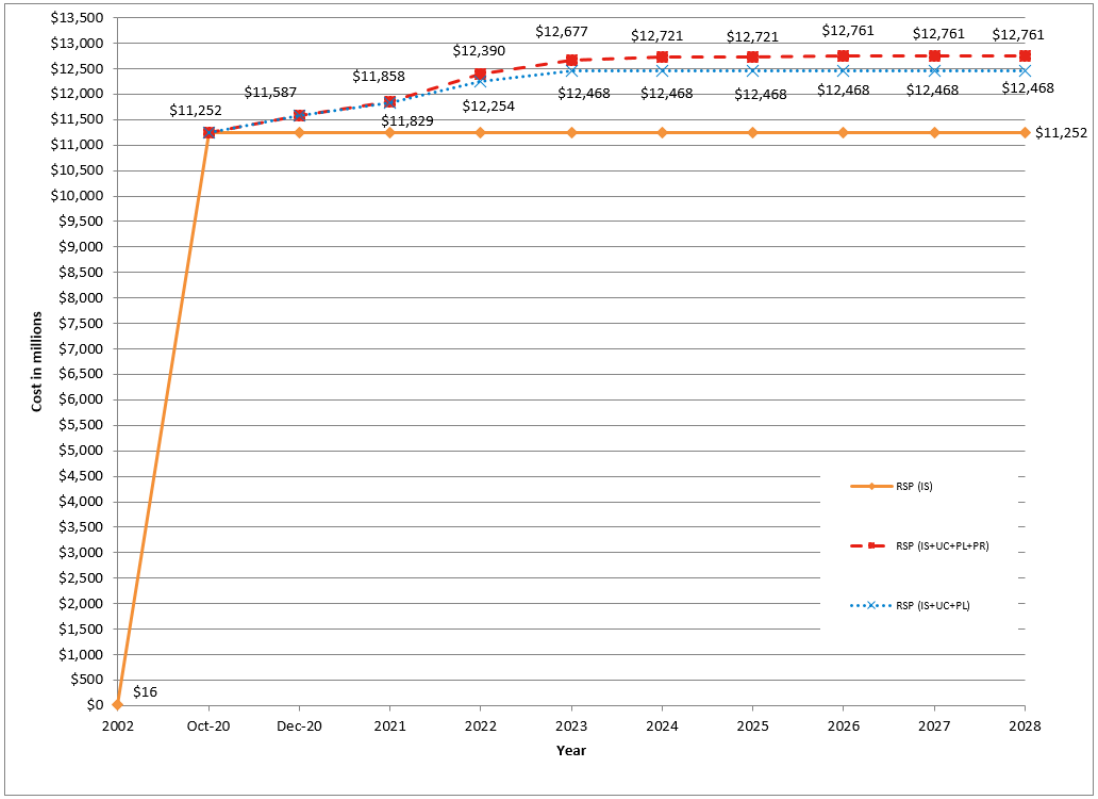


Notes:

1. Numbers shown represent project quantities.
2. Future total $ are shown at the end of the project. Totals do not reflect or show phasing in over time or the depreciation of prior projects. Total costs are associated with the year projects are placed in-service as reported in the Project List.

October 2020 RSP Project List Update, cont.

- **Cumulative Investment of New England Transmission Reliability Projects through 2028**



Notes:

1. IS – In Service, UC – Under Construction, PL – Planned, PR – Proposed
2. Future total $ are shown at the end of the project. Totals do not reflect or show phasing in over time or the depreciation of prior projects. Total costs are associated with the year projects are placed in-service as reported in the Project List.

October 2020 RSP Project List Update, cont.

- **Reliability Project Counts and Aggregated Cost Estimates by Project Stage with Applied Accuracy Ranges (1)**

Project Stage (Status)	Component / Project / Plan Count (2)	Estimate Range Minimum	Estimate Range Maximum	Estimated Costs ($millions)	Range Minimum ($millions)	Range Maximum
Proposed	17	-25%	25% (3)	293	220	366
Planned	23	-25%	25%	422	316	527
Under Construction	21	-10%	10%	795	715	874
Total Plan	**61**			(4) **1509**	**1251**	**1767**
In-Service	5	-10%	10%	165	148	181
Cancelled	3	-25%	25%	62	46	77

Notes:

(1) All costs are provided by Transmission Owners. The costs in the table reflect all projected in-service dates.

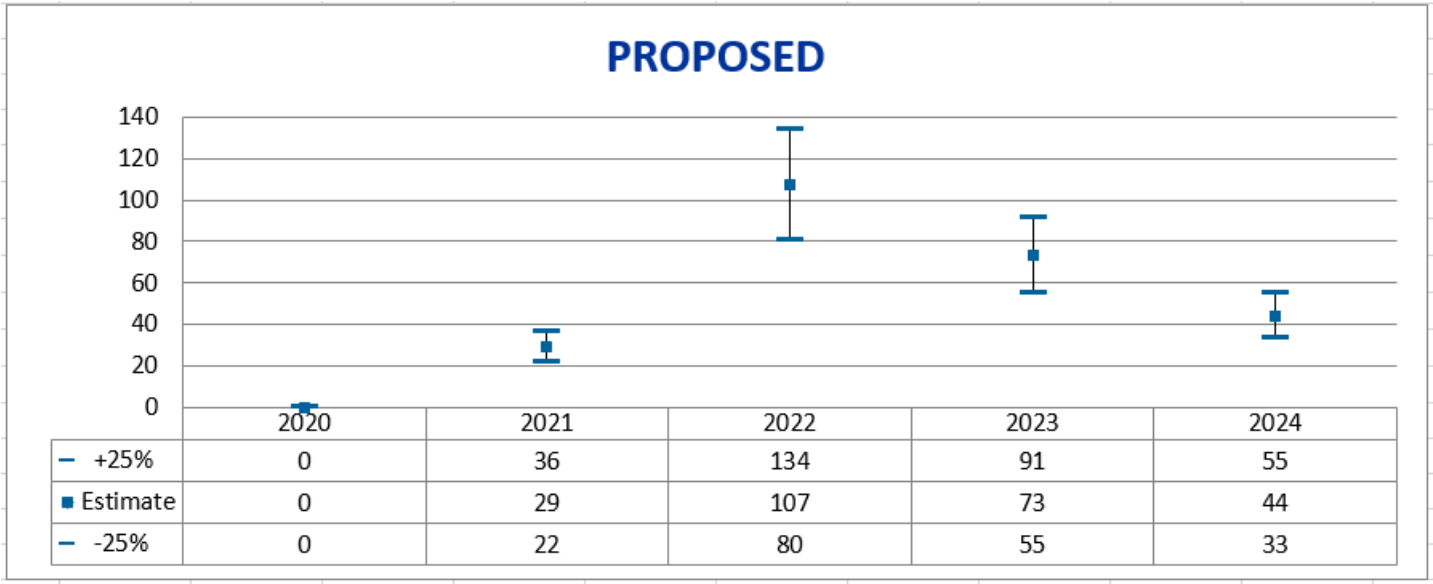
(2) Efforts need to be made to describe projects on a more consistent basis.

(3) All estimates may not yet be at this level of accuracy; many estimates may be -25%/+50%.

(4) May not add up due to rounding.

October 2020 RSP Project List Update, cont.

- **Project Cost Estimate Tolerances by Status and Year in Millions $**

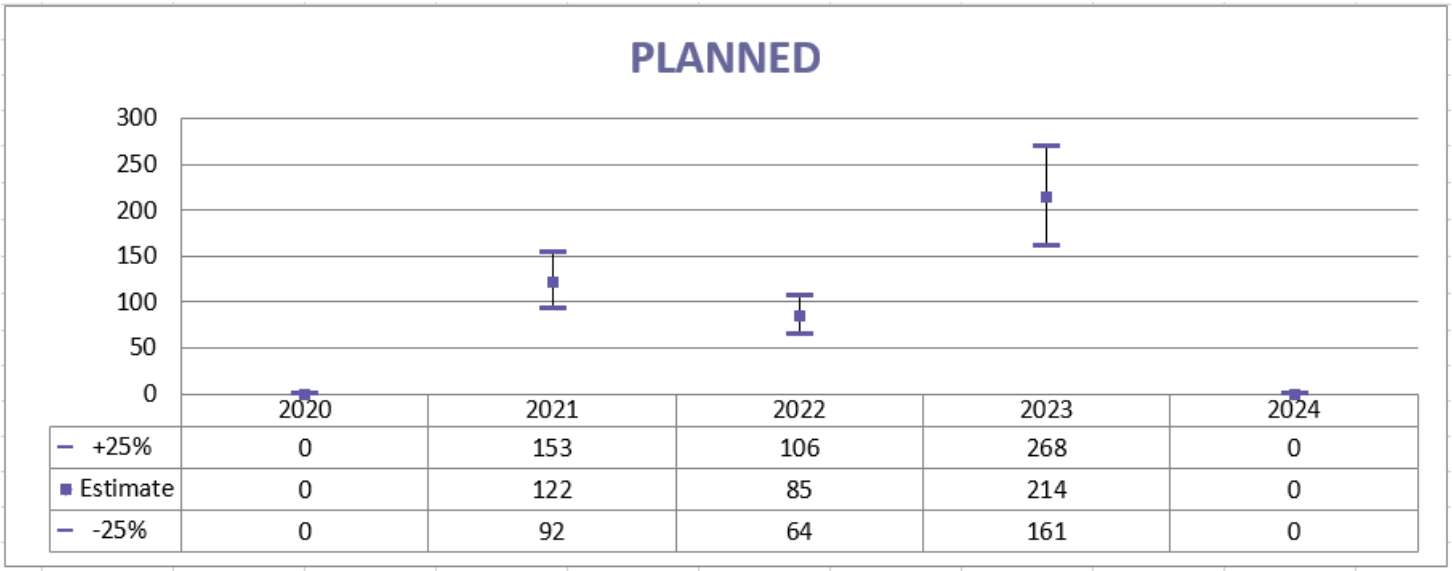


	2020	2021	2022	2023	2024
+25%	0	36	134	91	55
Estimate	0	29	107	73	44
-25%	0	22	80	55	33

Note: Future total $ are shown at the end of the project. Totals do not reflect or show phasing in over time or the depreciation of prior projects. Total costs are associated with the year projects are placed in-service as reported in the Project List.

October 2020 RSP Project List Update, cont.

- **Project Cost Estimate Tolerances by Status and Year in Millions $**

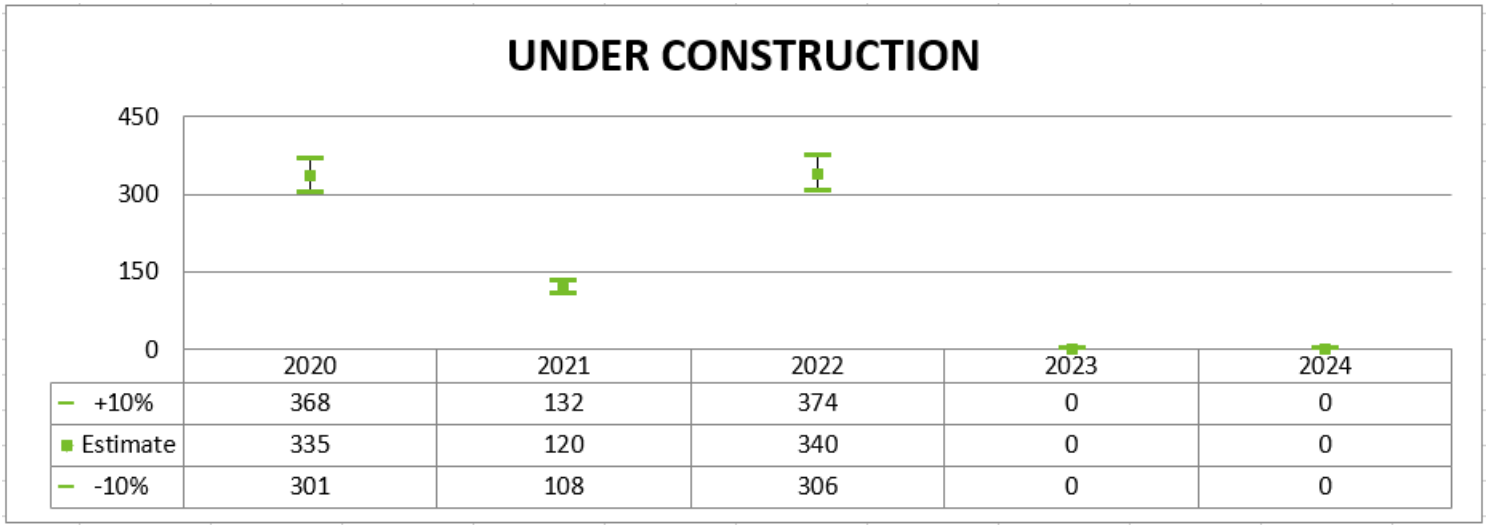


	2020	2021	2022	2023	2024
+25%	0	153	106	268	0
Estimate	0	122	85	214	0
-25%	0	92	64	161	0

Note: Future total $ are shown at the end of the project. Totals do not reflect or show phasing in over time or the depreciation of prior projects. Total costs are associated with the year projects are placed in-service as reported in the Project List.

October 2020 RSP Project List Update, cont.

- **Project Cost Estimate Tolerances by Status and Year in Millions $**



	2020	2021	2022	2023	2024
+10%	368	132	374	0	0
Estimate	335	120	340	0	0
-10%	301	108	306	0	0

Note: Future total $ are shown at the end of the project. Totals do not reflect or show phasing in over time or the depreciation of prior projects. Total costs are associated with the year projects are placed in-service as reported in the Project List.

Status of Major Transmission Projects

	PPA	TCA	Construction
Pittsfield/Greenfield Project	Approved 12/12, 01/16, 05/16	2/11/16, 7/17/17, 2/15/19	Project completion 2014-2020
Southwest Connecticut (SWCT)	Approved 4/15	Complete 7/16/15, 4/15/16, 5/13/16, 1/3/18, 2/15/19	Project completion 2013-2021
Southeast MA/RI Reliability (SEMA/RI)	Approved 5/17, 4/18	TCA Submitted	Project completion 2017-2023
Central/Western MA Reinforcements	Approved 12/07, 3/11	Group 1 2/29/2012	Project completion 2009-2022
Greater Boston – North, South, Central and Western Suburbs	Approved 4/15, 5/15, 6/16	TCA Submitted	Project completion 2013-2023
New Hampshire – Western, Central, Southern and Seacoast	Approved 3/13	Seacoast 11/5/15 Southern 1/7/16 Western 12/17/15 Central 11/25/15	Project completion 2013-2022
Greater Hartford & Central Connecticut (GHCC)	Approved 4/15	TCA Submitted	Project completion 2015-2020
Eastern CT 2029	Not Submitted	Not Submitted	Project completion 2021-2026

October 2020 Asset Condition List Update

- **Five New Projects**

Project ID #	Transmission System Upgrades	Cost (in millions $)
240	Rebuild the Golden Hills #90 Substation (Massachusetts)	9.3
241	Glenbrook STATCOM Replacement (Connecticut)	21.6
242	Horton Cove Asset Condition and OPGW Project (Connecticut)	13.4
243	115 kV Lattice Tower Asset Condition and OPGW Project - Line 1768 (Connecticut)	22.6
244	115 kV Copper Conductor and Wood Pole Replacement – Line 1191 (Connecticut)	38.1

October 2020 Asset Condition List Update, cont.

- **Thirteen Projects Placed In-Service**

Project ID #	Transmission System Upgrades	Cost (in millions $)
24	Section 396 & 3001 Structure Replacement (Maine)	19.9
186	345 kV Structure Replacement Projects - Line 326 (New Hampshire)	3.6
65	Eversource Laminated Structure Replacement Project - Line 1512 (Connecticut)	15.1
76	Eversource 345 kV Structure Replacement Project - Line 371 (Connecticut)	12.8
83	Eversource Laminated Structure Replacement Project - Line 1675/1080 (Connecticut)	18.1
89	Montville 16X Transformer Replacement (Connecticut)	4.3
119	Eversource 115 kV Structure Replacement Project - Line 1256 (Connecticut)	10.0
126	Eversource 115 kV Structure Replacement Project - Line 1620 (Connecticut)	10.0

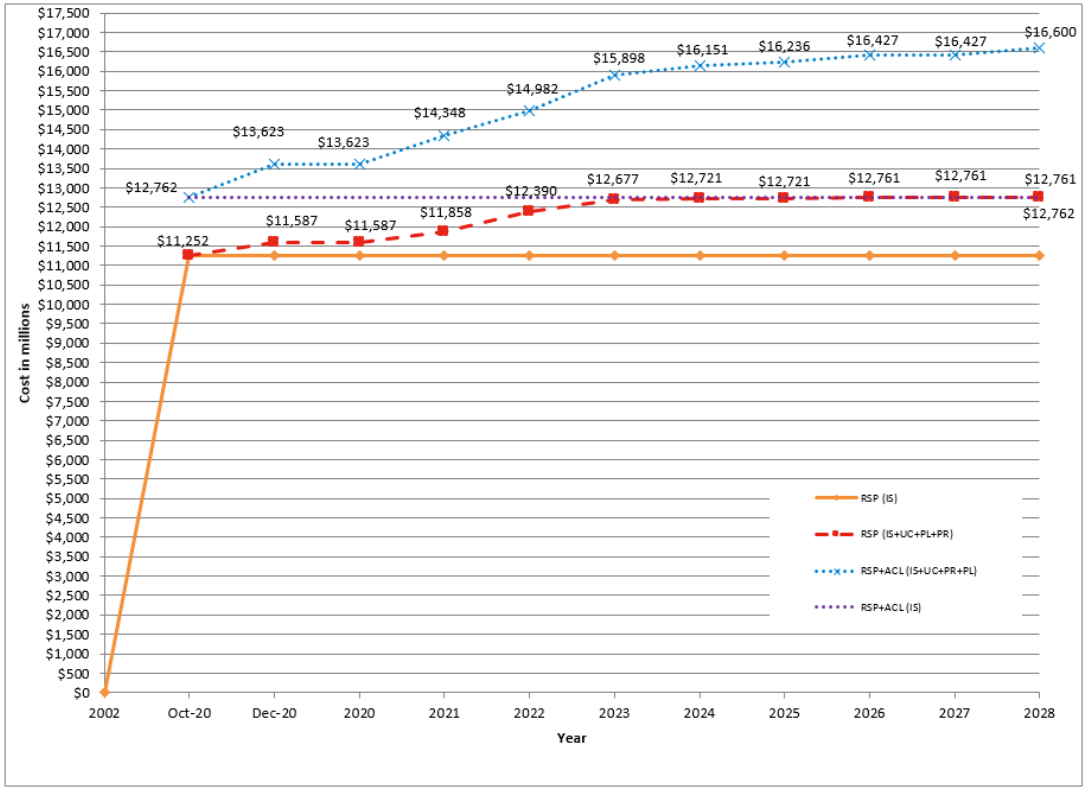
October 2020 Asset Condition List Update, cont.

- **Thirteen Projects Placed In-Service**

Project ID #	Transmission System Upgrades	Cost (in millions $)
168	345 kV Structure Replacement Projects - Line 352 (Connecticut)	12.8
222	115 kV Wood Pole Replacement – Line 1505 (Connecticut)	7.1
231	115 kV Line Rebuild and Asset Condition Project - Line 1355 (Connecticut)	7.5
211	115 kV Wood Pole and Shield Wire Replacement – Line 1858 (Massachusetts)	11.3
238	115 kV Granville Junction to Atwater 1853 line (formerly 1512) OPGW Project (Massachusetts)	4.8

October 2020 Asset Condition List Update, cont.

- **Cumulative Investment of New England Transmission Reliability Projects and Asset Condition through 2028**



Notes:

1. IS – In Service, UC – Under Construction, PL – Planned, PR – Proposed
2. Future total $ are shown at the end of the project. Totals do not reflect or show phasing in over time or the depreciation of prior projects. Total costs are associated with the year projects are placed in-service as reported in the Project List.

APPENDIX

Summary: Project Listing Definitions

- **Major ISO New England Inc. Transmission, Markets and Services Tariff Section II Attachment K, Regional System Planning Process Project Listing Subcategories**
    - **Proposed:** The project will include a regulated transmission solution that has been proposed in response to a specific Needs Assessment or the RSP and has been evaluated or further defined and developed in a Solutions Study or in the competitive solutions process and communicated to PAC. (Project well-defined, cost estimate quality sufficient for comparison of alternatives).
    - **Planned:** The project will include a Transmission upgrade that has been approved by the ISO, pursuant to Section I.3.9 (presumes Needs Assessment and Solutions Study/competitive solution process have been completed). (Still subject to Schedule 12C review for Transmission Cost Allocation)

Note: On December 10, 2019, FERC accepted Tariff changes that removed the 'Concept' category.

Project Listing

- **Project Listing Column Definitions for**
  - Reliability Projects
  - Interconnection Projects
  - Market Efficiency Upgrades
  - Elective Projects

Project Listing – Column Definitions, cont.

- **Part Number (Part #)**
  - The Part #'s designate the 'need' category of the project[1]
    - Part 1: these projects are Reliability Upgrades
      - 1a Planned or Under Construction
      - 1b Proposed
    - Part 2: these projects are Generator Interconnection Upgrades
      - 2a Planned (I.3.9 approval with Generator Interconnection Agreement including FCM related transmission upgrades to meet the Capacity Capability Interconnection Standard), or Under Construction
      - 2b Proposed (at a minimum, a completed System Impact Study and I.3.9 approval but no Generator Interconnection Agreement)
    - Part 3: these projects are Market Efficiency Upgrades
      - 3a Planned or Under Construction
      - 3b Proposed
    - Part 4: these projects may be promoted by any entity electing to support the cost of transmission changes. The entity sponsoring the changes will have their own justification for their actions
      - 4a Planned or Under Construction
      - 4b Proposed

Note:

[1] Original categories are not changed when a project is placed 'In-Service' or 'Cancelled'.

Project Listing – Column Definitions, cont.

- **Project ID**
  - The Project ID is generated by ISO-NE System Planning
- **Primary Equipment Owner**
  - The company listed here is the responsible equipment owner/provider designated to design and implement the project
- **Other Equipment Owner**
  - For projects that involve multiple Transmission Owners, the company listed here is also a responsible equipment owner/provider designated to design and implement the project
- **Projected Month/Year of In-Service**
  - The month/year entered is the date the project is expected to be placed in service
- **Major Project**
  - Name is given to a project that consists of smaller subprojects
- **Project/Project Component**
  - The month/year entered is the date the project is expected to be placed in service
  - A brief, high-level description of the project is entered here
    - Includes major pieces of substation equipment and/or types of line work to be performed

Project Listing – Column Definitions, cont.

- **Status**
  - In Service
    - The project has been placed in operation
  - Under Construction
    - The project has received necessary approvals and a significant level of engineering or construction is underway
  - Planned
    - The project will include a Transmission upgrade that has been approved by the ISO pursuant to Section I.3.9 of the Tariff
  - Proposed
    - A regulated transmission solution that has been selected by the ISO in response to a Needs Assessment and communicated to PAC
  - Cancelled
    - Project has been cancelled

Project Listing – Column Definitions, cont.

- **PPA Approval (Review of Market Participant's Proposed Plans)**
  - A date in this column signifies when the project received approval pursuant to Section I.3.9 of the ISO-New England Tariff. This approval indicates that the project will have no adverse impact on the stability, reliability, or operating characteristics of the system.
    - A 'no' indicates that an approval is required, but has not been received yet
    - An 'NR' indicates that an I.3.9 approval is not required
- **TCA Approval (Transmission Cost Allocation)**
  - A date in this column signifies when the project PTF costs were reviewed and approved. This approval indicates that it has been agreed whether, and by how much, the scope of the project and associated costs exceed regional needs.
    - An 'NR' indicates that a TCA approval is not applicable because the project has been cancelled, has no/minimal PTF cost, or is associated with the interconnection of a resource or Elective Transmission Upgrade.
- **Estimated Costs**
  - The PTF project cost estimate presented here should be the best estimate available. It is understood that the estimate accuracy may vary dependent on the maturity of the project. Accuracy tolerances for these estimates are targeted as follows:
    - Proposed Project that has been reviewed and approved to proceed by ISO-NE (+50%/-25%)
    - I.3.9-Approved Project (+/-25%), and
    - TCA-Approved Project (+/-10%)