

Regional System Plan

Transmission Projects and Asset Condition

March 2022 Update



Planning Advisory Committee Meeting

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Highlights of the RSP Project List Update

- **Major cost estimate changes greater than \$5M that occurred between the October 2021 and March 2022 Project List**
 - None
- **No new projects**
- **Seven upgrades have been placed in-service since the October 2021 update**
 - (CT) Total of two projects
 - Eastern CT 2029 – two projects
 - (MA) Total of five projects
 - Boston 2028 – one project
 - Boston Area Optimized Solution – one project
 - SEMA/RI – three projects
- **No cancelled projects since the October 2021 update**



March 2022 RSP Project List Update

- **No New Projects**



March 2022 RSP Project List Update, cont.

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

Project ID #	Transmission System Upgrades	Cost (in millions \$)	Improvement/Need
1860	Install a 25.2 MVAR 115 kV capacitor and one breaker at Killingly (Connecticut) Eastern CT 2029	3.8	Resolve voltage violations
1861	Install one 345 kV series breaker with the Montville 1T breaker (Connecticut) Eastern CT 2029	3.3	Resolve thermal overloads and voltage violations
1726	Separate the 135/122 DCT lines - West Barnstable to Barnstable (Massachusetts) SEMA/RI	10.2	Resolve thermal overloads and avoid voltage collapse
1727	Retire Barnstable SPS (Massachusetts) SEMA/RI	0.4	Barnstable SPS is not required after separating DCT 122/135
1731	Install 35.3 MVAR 115 kV capacitors at High Hill Substation #644 and Wing Lane Substation #624 (Massachusetts) SEMA/RI	8.1	Resolve voltage violations
1806	Install a 115 kV breaker in series with breaker 4 at Mystic (Massachusetts) Boston 2028	3.2	Eliminate impact of breaker failure contingency
1874	Install two 11.9 ohm series reactors at North Cambridge Station on Lines 346 and 365 (Massachusetts) Boston Area Optimized Solution	15.2	Resolve thermal overloads



March 2022 RSP Project List Update, cont.

- **Cost Estimate Comparisons of Reliability Projects October 2021 vs. March 2022 Update***

	As of Oct 2021 Plan Update (in millions \$)	As of Mar 2022 Plan Update (in millions \$)	Change in Plan Estimate (in millions \$)
MAJOR PROJECTS			
Southeast Massachusetts/Rhode Island Reliability (SEMA/RI)	367	368	1
Greater Boston - North, South, Central, and Western Suburbs	1035	1035	0
Eastern CT 2029	221	221	0
Boston Area Optimized Solution (BAOS)	49	49	0
New Hampshire (NH) 2029	135	135	0
Upper Maine (UME) 2029	159	159	0
SUBTOTAL**	1965	1966	1
OTHER PROJECTS	11044	11045	1
NEW PROJECTS	0	0	0
TOTAL**	13008	13010	2
Minus 'in-service'	-11677	-11722	-45
Aggregate estimate of active projects in the Plan **	1331	1288	-43

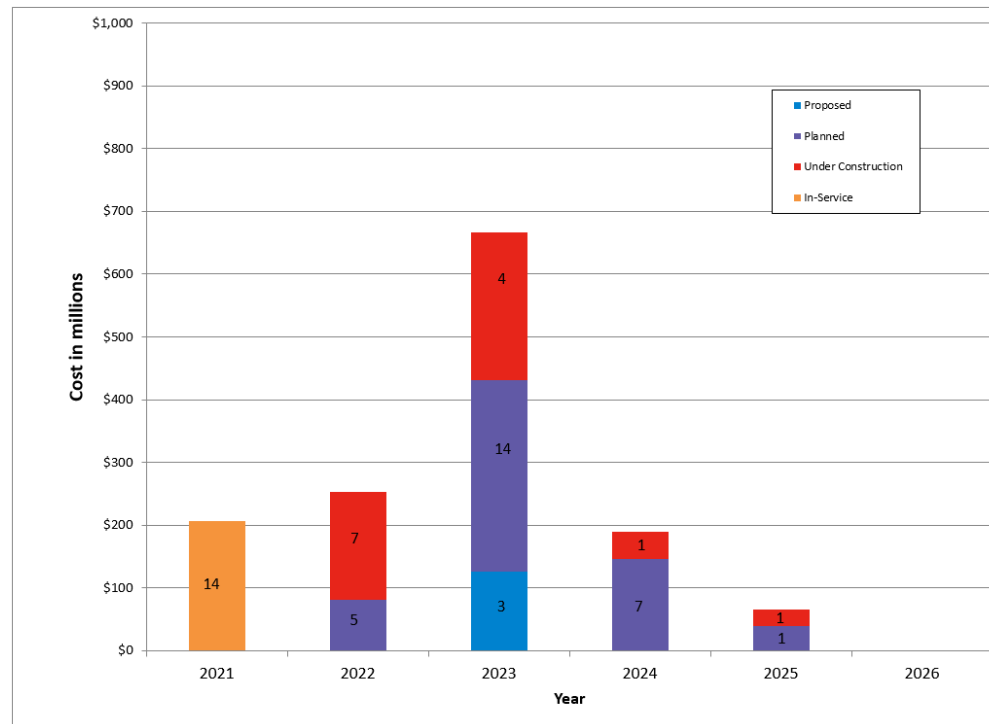
* Transmission Owners provided all estimated costs, which may not meet the guidelines described in Planning Procedure 4, Attachment D.

** May not sum exactly due to rounding.

*** The cost estimates for projects in the "Major Projects" category are moved to the "Other Projects" category once they are fully completed.

March 2022 RSP Project List Update, cont.

- Investment of New England Transmission Reliability Projects by Status through 2026



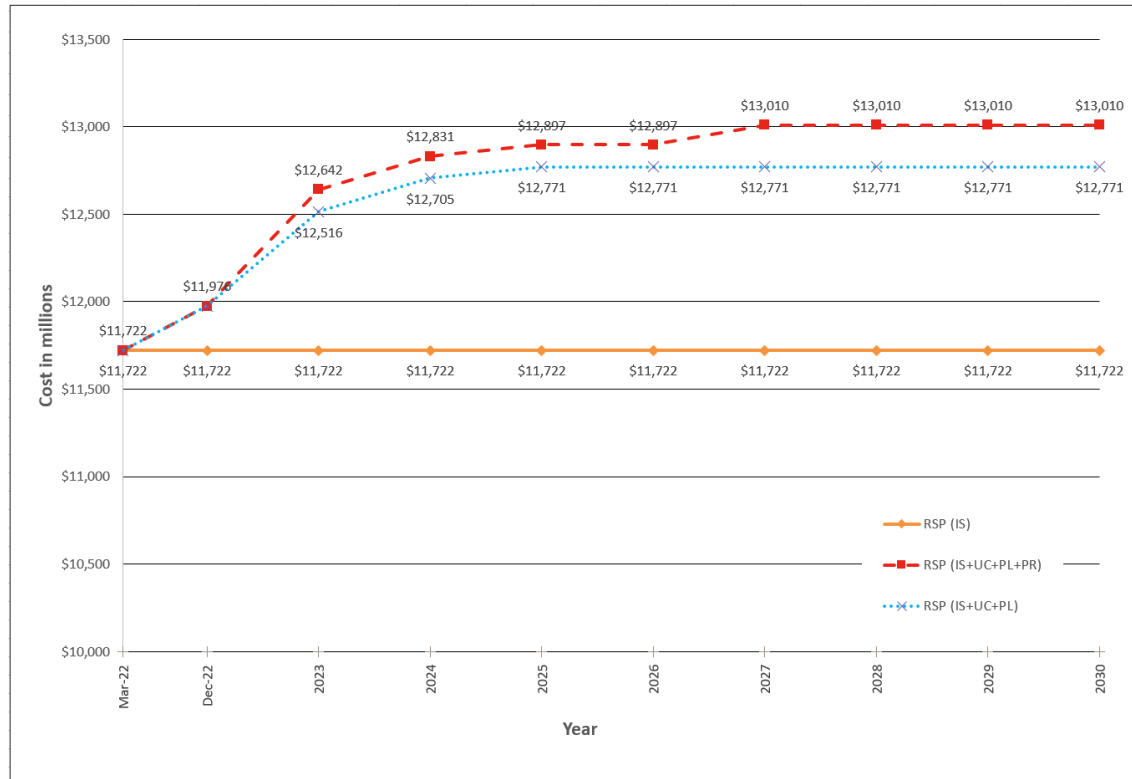
* Numbers shown represent project quantities.

** 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.



March 2022 RSP Project List Update, cont.

- Cumulative Investment of New England Transmission Reliability Projects through 2030



* IS – In Service, UC – Under Construction, PL – Planned, PR – Proposed

** 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.

March 2022 RSP Project List Update, cont.

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

Project Stage (Status)	Component / Project / Plan Count	Estimate Range		Estimated Costs (\$millions)	Range	
		Minimum	Maximum		Minimum	Maximum
					(\$millions)	
Proposed	7	-25%	25%**	239	179	298
Planned	27	-25%	25%	570	428	713
Under Construction	13	-10%	10%	479	431	527
Total Plan	47			*** 1288	1038	1538
In-Service	7	-10%	10%	44	40	49
Cancelled	0	-25%	25%	0	0	0

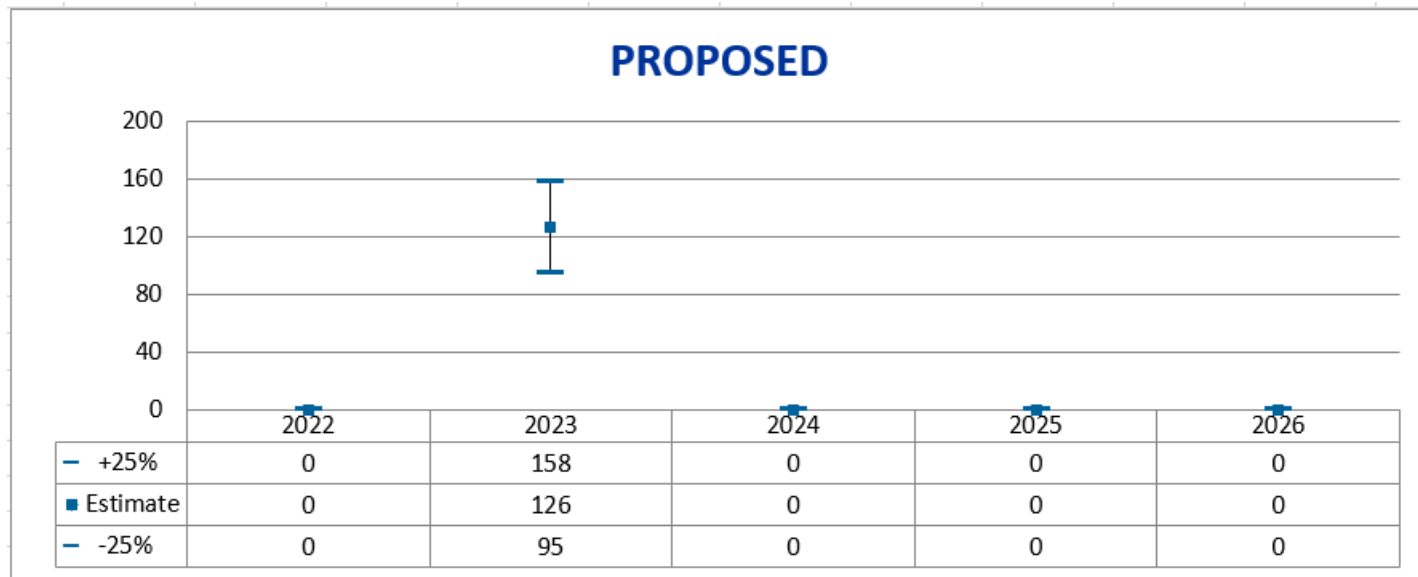
* All costs are provided by Transmission Owners. The costs in the table reflect all projected in-service dates.

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

*** May not add up due to rounding.

March 2022 RSP Project List Update, cont.

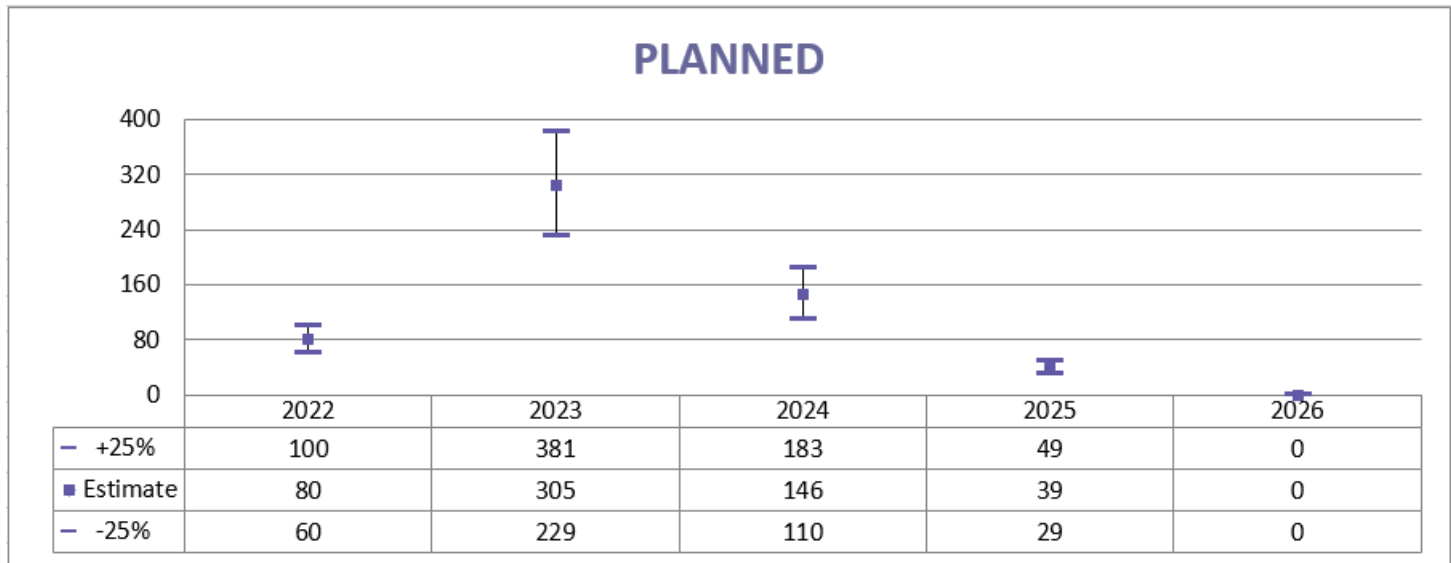
- Project Cost Estimate Tolerances by Status and Year in Millions \$



* 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.

March 2022 RSP Project List Update, cont.

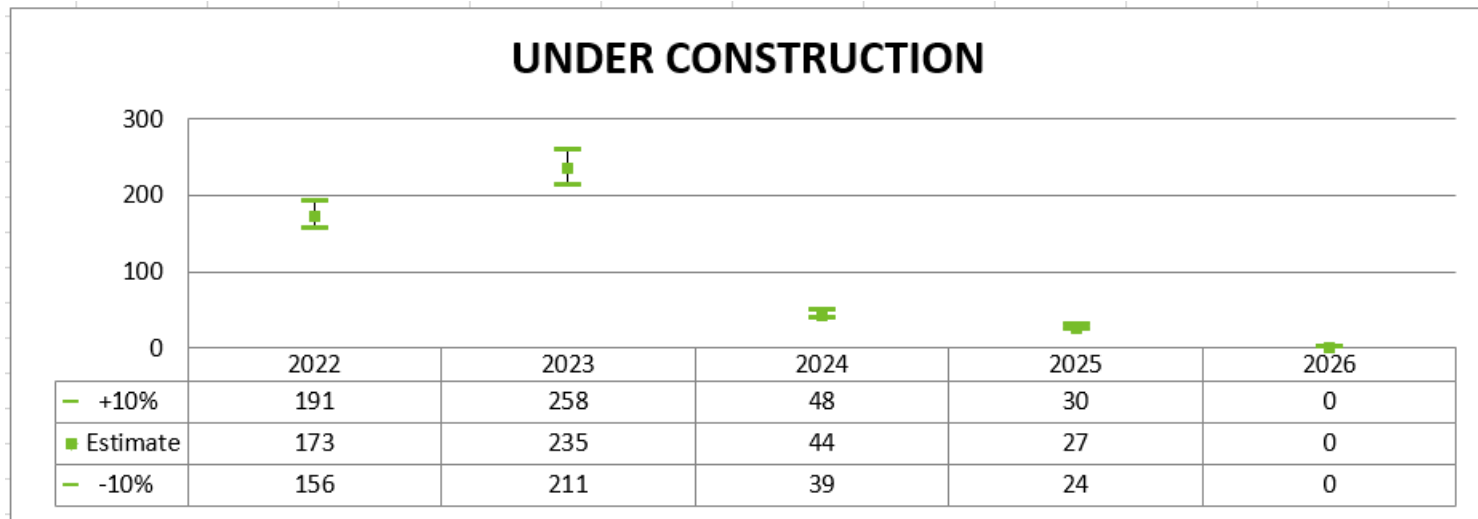
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March 2022 RSP Project List Update, cont.

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



* 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
Southeast MA/RI Reliability (SEMA/RI)	Approved 5/2017, 4/2018	Submitted	Project completion 2017-2025
Greater Boston – North, South, Central and Western Suburbs	Approved 4/2015, 5/2015, 6/2016	Submitted	Project completion 2013-2023
Eastern CT 2029	Approved 6/2021	Not Submitted	Project completion 2021-2026
Boston Area Optimized Solution (BAOS)	Approved 5/2021	Submitted	Project completion 2023
New Hampshire (NH) 2029 Solution	Approved 1/2022 (New Hampshire Transmission) Not Submitted (Eversource)	Not Submitted	Project completion 2023
Upper Maine (UME) 2029 Solution	Approved 2/2022 (Versant Power) Not Submitted (Avangrid)	Not Submitted	Project completion 2023-2027

March 2022 Asset Condition List Update

- **Twenty-three New Projects**

Project ID #	Transmission System Upgrades	Cost (in millions \$)
305	Line K42 Asset Condition Line Replacement (Vermont)	49.0
306	V-174 115 kV Line Asset Condition Refurbishments and OPGW installation (Massachusetts)	26.3
307	M-139/N-140 115 kV Lines Pilot Protection Schemes (Massachusetts)	9.4
308	Moore #20 Substation Asset Condition and Separation (New Hampshire)	49.3
309	Southwest Connecticut (SWCT) Substation Relay Upgrades - Glenbrook 115 kV (Connecticut)	10.0
310	Southwest Connecticut (SWCT) Substation Relay Upgrades - Plumtree 115 kV and 345 kV (Connecticut)	19.3
311	Southwest Connecticut (SWCT) Substation Relay Upgrades - Norwalk 115 kV and 345 kV (Connecticut)	16.4
312	Laminated Wood Structure Replacement Program Phase II - 3403 345 kV Line (Connecticut)	8.4



March 2022 Asset Condition List Update

- **Twenty-three New Projects**

Project ID #	Transmission System Upgrades	Cost (in millions \$)
313	345 kV Structure and Shield Wire Replacements - 329 Line (Connecticut)	6.2
314	345 kV Structure and Shield Wire Replacements - 352 Line (Connecticut)	5.8
315	115 kV Structure Replacements and Shield Wire - 191 Line (Massachusetts)	19.2
316	115 kV Structure Replacements and Shield Wire - 117 Line (Massachusetts)	5.9
317	Edgar Station #150 Brown Glass and Obsolete Equipment Replacement (Massachusetts)	6.5
318	115 kV Structure Replacements - 211-508 Line (Massachusetts)	5.8
319	115 kV Structure Replacements - 391-508 Line (Massachusetts)	5.0
320	115 kV Structure Replacements - 533-508 Line (Massachusetts)	5.0



March 2022 Asset Condition List Update

- **Twenty-three New Projects**

Project ID #	Transmission System Upgrades	Cost (in millions \$)
321	Laminated Wood Structure Replacement Program Phase II - A152 115 kV Line (New Hampshire)	15.3
322	Laminated Wood Structure Replacement Program Phase II - V191 115 kV Line (New Hampshire)	11.0
323	115 kV Structure and Shield Wire Replacements - T198 Line (New Hampshire)	19.1
324	P145 Line Rebuild - Asset Condition and OPGW (New Hampshire)	52.0
325	Laminated Wood Structure Replacement Program Phase II - R187 115 kV Line (New Hampshire)	7.5
326	Laminated Wood Structure Replacement Program Phase II - S188 115 kV Line (New Hampshire)	7.3
327	Laminated Wood Structure Replacement Program Phase II - M164 115 kV Line (New Hampshire)	6.0



March 2022 Asset Condition List Update, cont.

- **Thirty Projects Placed In-Service**

Project ID #	Transmission System Upgrades	Cost (in millions \$)
299	115 kV Structure Replacements - Line 456-522 (Massachusetts)	5.7
300	115 kV Structure Replacements - Line 240-510 (Massachusetts)	11.6
253	345 kV Line Structure Replacement - Line 338 (Massachusetts)	8.7
207	115 kV Wood Pole Replacement – 1161 (Massachusetts)	22.6
301	230 kV Structure Replacements - Line 342-603 (Massachusetts)	5.5
295	C-129N/D-130 115 kV Line Fiber Installation (Massachusetts)	11.2
257	Copper Conductor and Shield Wire Replacement - Line 1588 (Connecticut)	9.6
264	345 kV Line Structure and PINCO insulator Replacement - Line 368 (Connecticut)	9.9

March 2022 Asset Condition List Update, cont.

- **Thirty Projects Placed In-Service**

Project ID #	Transmission System Upgrades	Cost (in millions \$)
227	115 kV Wood Pole Replacement - 1756 (Connecticut)	24.5
292	Branford 11J A3 Bus Replacement Project (Connecticut)	10.3
244	115 kV Copper Conductor and Wood Pole Replacement - Line 1191 (Connecticut)	38.1
242	Horton Cove Asset Condition and OPGW Project (Connecticut)	13.9
130	115 kV Structure Replacement Project - Line 1465 (Connecticut)	7.7
223	115 kV Wood Pole Replacement – 1607 (Connecticut)	7.6
166	345 kV Structure Replacement Projects - Line 330 (Connecticut)	17.1
167	345 kV Structure Replacement Projects - Line 348 (Connecticut)	15.1

March 2022 Asset Condition List Update, cont.

- **Thirty Projects Placed In-Service**

Project ID #	Transmission System Upgrades	Cost (in millions \$)
173	345 kV Structure Replacement Projects - Line 387 (Connecticut)	18.1
176	345 kV Structure Replacement Projects - Line 3419 (Connecticut)	11.1
124	115 kV Structure Replacement Project - Line 1448 (Connecticut)	6.9
144	Millstone Substation 15G High Creep Insulator Replacement (Connecticut)	16.6
139	115 kV Structure Replacement Project - Line 1772 (Connecticut)	10.3
218	115 kV Wood Pole and Shield Wire Replacement – 1232 (Connecticut)	2.4
288	NH 115 kV Laminated Wood Structure Replacement Program Phase I - L175 Line (New Hampshire)	19.3
286	Eddy Substation Control House Relocation and Rebuild (New Hampshire)	6.1



March 2022 Asset Condition List Update, cont.

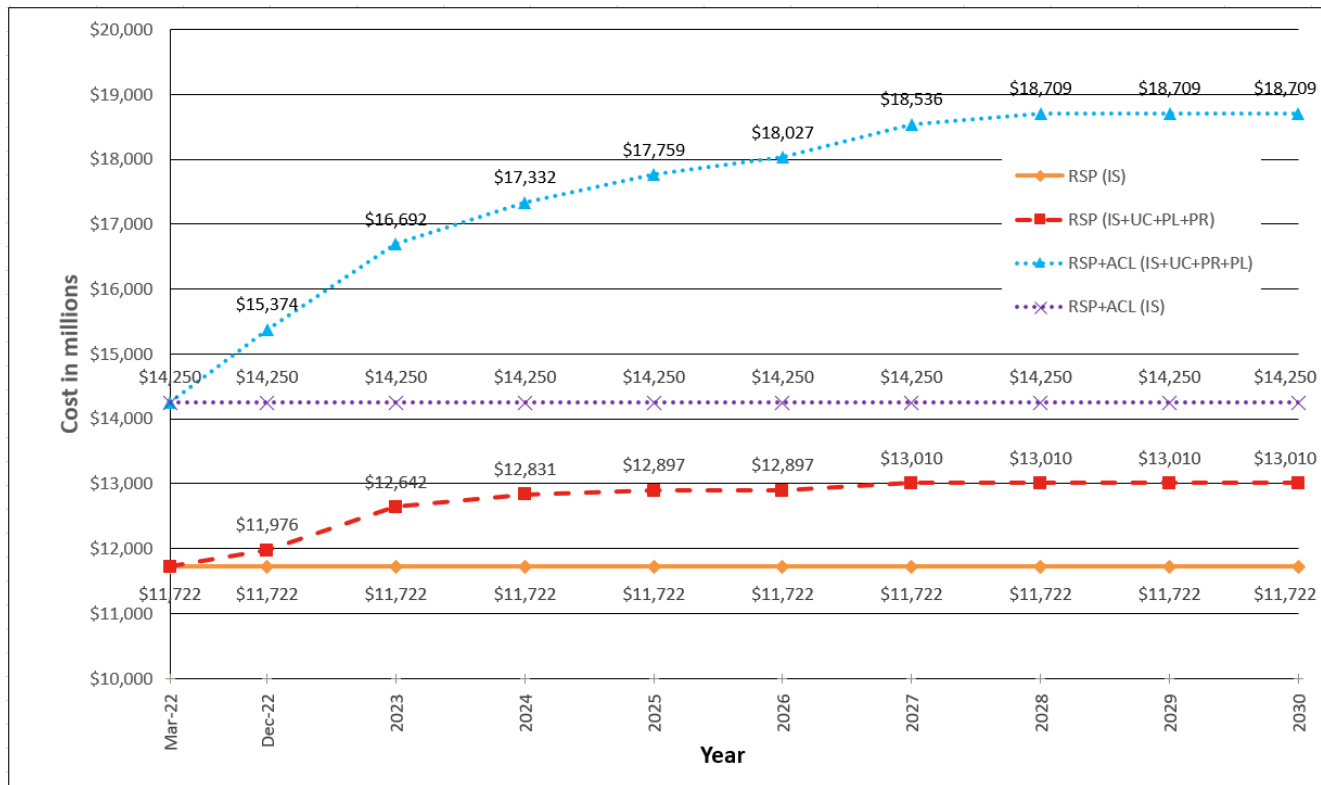
- **Thirty Projects Placed In-Service**

Project ID #	Transmission System Upgrades	Cost (in millions \$)
287	NH 115 kV Laminated Wood Structure Replacement Program Phase I - G128 Line (New Hampshire)	12.6
273	Copper Conductor and Shield Wire Replacement Projects - C129 Line (New Hampshire)	12.1
275	Copper Conductor and Shield Wire Replacement Projects - G128 Line (New Hampshire)	5.0
276	Copper Conductor and Shield Wire Replacement Projects - L163 Line (New Hampshire)	23.3
277	Copper Conductor and Shield Wire Replacement Projects - X104 (New Hampshire)	7.0
274	Copper Conductor and Shield Wire Replacement Projects - D108 Line (New Hampshire)	6.8



March 2022 Asset Condition List Update, cont.

- Cumulative Investment of New England Transmission Reliability Projects and Asset Condition through 2030



* IS – In Service, UC – Under Construction, PL – Planned, PR – Proposed

** 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.

Questions



APPENDIX



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*
 - Part 1: these projects are Reliability Upgrades
 - » 1a Planned (must be the preferred solution to solve the needs and have I.3.9 approval) or Under Construction
 - » 1b Proposed (is supported by a Solutions Study or a Competitive Solution Process)
 - Part 2: these projects are Generator Interconnection Upgrades
 - » 2a Planned (I.3.9 approval with 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 Interconnection Agreement)
 - Part 3: these projects are Market Efficiency Upgrades
 - » 3a Planned (must be the preferred solution to solve the needs and have I.3.9 approval) or Under Construction
 - » 3b Proposed (is supported by a Competitive Solution Process)
 - 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 (I.3.9 approval with Interconnection Agreement) or Under Construction
 - » 4b Proposed (I.3.9 approval but without Interconnection Agreement)

* 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
 - A regulated transmission solution upgrade that has been approved by the ISO pursuant to Section I.3.9 of the Tariff, or
 - An interconnection related transmission upgrade that has been approved by the ISO pursuant to Section I.3.9 of the Tariff with Interconnection Agreement
- Proposed
 - A regulated transmission solution that has been selected by the ISO in response to a Needs Assessment and communicated to PAC, or
 - An interconnection related transmission upgrade that has been approved by the ISO pursuant to Section I.3.9 of the Tariff, but without Interconnection Agreement
- Cancelled
 - Project has been cancelled

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

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%)
 - An “NR” indicates that the PTF cost estimate is less than \$5M, either for the individual project or for the entire project when the individual project is part of a larger project (typically shown as Major Project), and/or not eligible for regional cost