



Regional System Plan

Transmission Projects and Asset Condition

October 2019 Update

Planning Advisory Committee Meeting

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DIRECTOR, TRANSMISSION PLANNING



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Highlights of the RSP Project List Update

- **Major cost estimate changes that occurred between the June 2019 and October 2019 Project List**
 - (MA) Greater Boston – cost increase of \$157 million for 8 projects due to actual construction bids coming in higher than estimated costs, lengthy and extensive permitting and restrictive permitting conditions
 - (NH) Seacoast New Hampshire Solution – cost increase of \$40 million for 3 projects in Madbury-Portsmouth area due to actual construction bids coming in higher than estimated costs, lengthy and extensive permitting and restrictive permitting conditions
- **New Projects:**
 - None
- **3 Upgrades on the project list have been placed in-service since the March 2019 update:**
 - (MA) Greater Boston - 2 projects placed in-service
 - (CT) Greater Hartford & Central Connecticut (GHCC) – 1 project placed in-service



October 2019 Changes

No New Projects

Project ID #	Transmission System Upgrades	Cost (in millions \$)	Improvement/Need
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October 2019 Changes, *cont.*

3 Projects Placed In-Service and Corresponding Needs

Project ID #	Transmission System Upgrades	Cost (in millions \$)	Improvement/Need
1587	Replace the normally open 19T breaker at Southington with a 3% series reactor between Southington Ring 1 and Southington Ring 2 and associated substation upgrades (Connecticut) GHCC	8.7	Resolve thermal overloads
1327	69 kV Line reconductoring of W-23W Woodside-Northboro Rd (Massachusetts) Greater Boston – Western Suburbs	7.1	Increase load serving capability of the Western Suburbs of Boston
1550	115 kV Line reconductoring of F-158S Maplewood - Everett (Massachusetts) Greater Boston - North	6.9	Increase load serving capability in Greater Boston



October 2019 Changes, *cont.*

Cost Estimate Comparisons of Reliability Projects

June 2019 vs. October 2019 Update ⁽¹⁾

	As of Jun 2019 Plan Update (in millions \$)	As of Oct 2019 Plan Update (in millions \$)	Change in Plan Estimate (in millions \$)
MAJOR PROJECTS			
Greater Hartford & Central Connecticut (GHCC)	307	307	0
Southeast Massachusetts/Rhode Island Reliability Project	327	325	-2
Pittsfield/Greenfield Project	179	179	0
Greater Boston - North, South, Central, Western Suburbs	832	989	157
New Hampshire Solution - Southern, Central, Seacoast, Northern	328	369	41
Southwest Connecticut (SWCT)	399	399	0
SUBTOTAL ⁽²⁾	2372	2568	196
OTHER PROJECTS	9891	9900	9
NEW PROJECTS		0	0
PROJECTS WHOSE COST ESTIMATES WERE PREVIOUSLY REPORTED AS TO BE DETERMINED (TBD)			
TOTAL ⁽²⁾	12263	12468	205
Minus 'in-service'	-10915	-10939	
Aggregate estimate of active projects in the Plan ⁽²⁾	1348	1529	

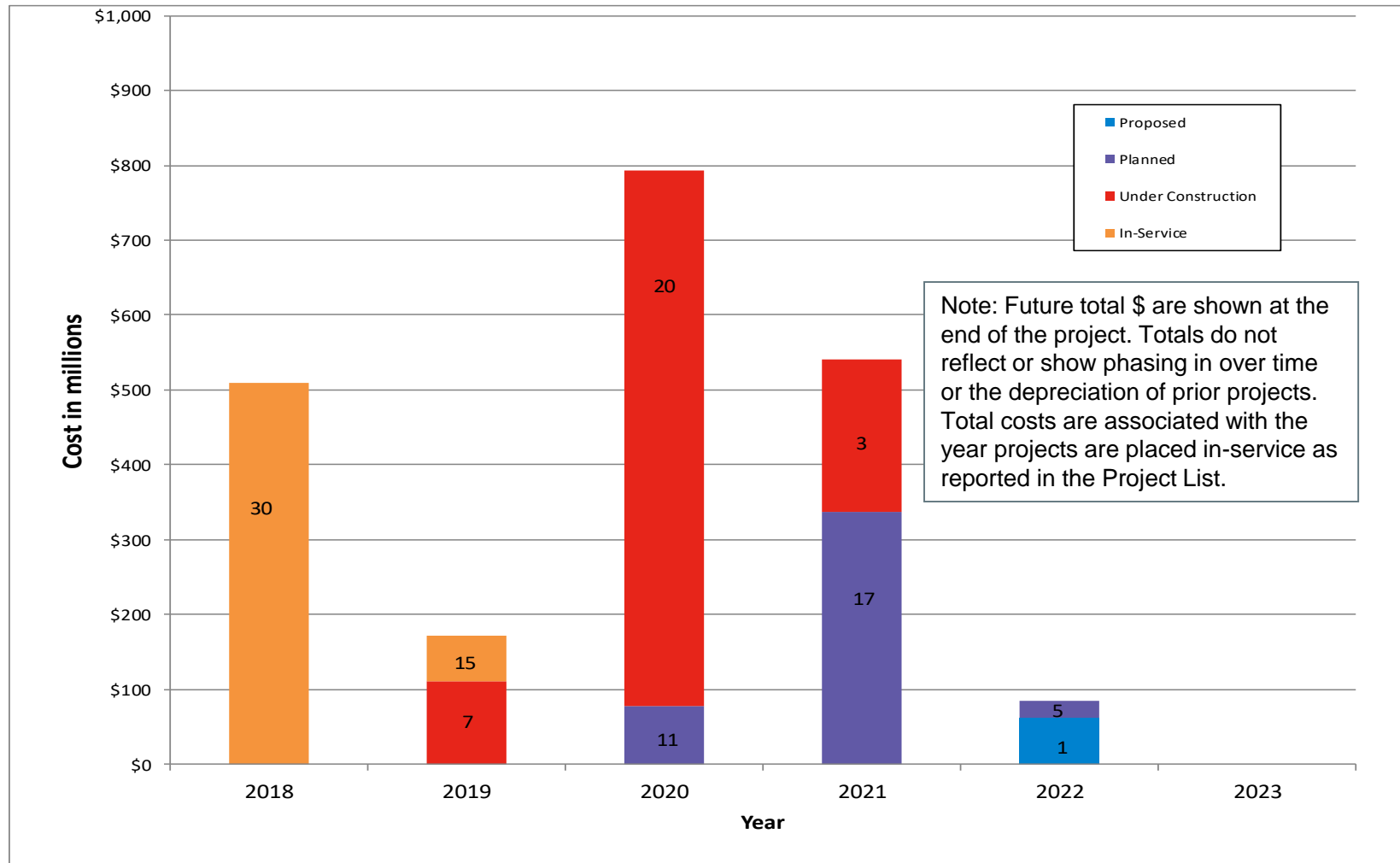
⁽¹⁾ Transmission Owners provided all estimated costs, which may not meet the guidelines described in Planning Procedure 4, Attachment D

⁽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 2019 Changes, *cont.*

Investment of New England Transmission Reliability Projects by Status through 2023

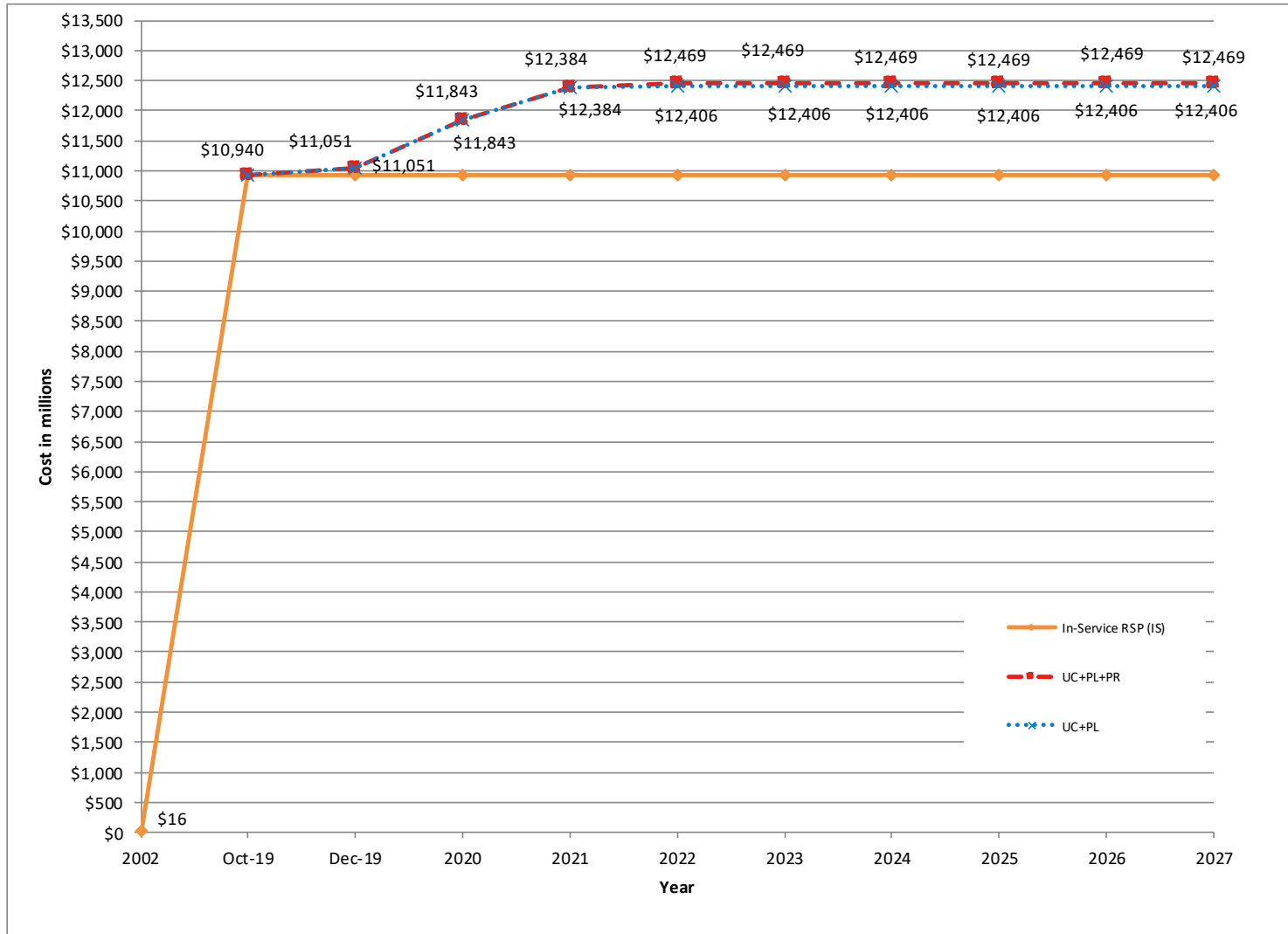


Note: Numbers shown represent project quantities



October 2019 Changes, *cont.*

Cumulative Investment of New England Transmission Reliability Projects through 2027



Note: UC – Under Construction, PL – Planned, PR – Proposed

October 2019 Changes, *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		Estimated Costs (\$millions)	Range	
		Minimum	Maximum		Minimum	Maximum
Proposed	1	-25%	25% ⁽³⁾	63	47	78
Planned	33	-25%	25%	438	328	547
Under Construction	30	-10%	10%	1028	925	1131
Total Plan (excluding Concept)	64			⁽⁵⁾ 1529	1301	1757
Concept	0			⁽⁴⁾ 0		
In-Service	3	-10%	10%	23	21	25
Cancelled						

(1) All costs 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%

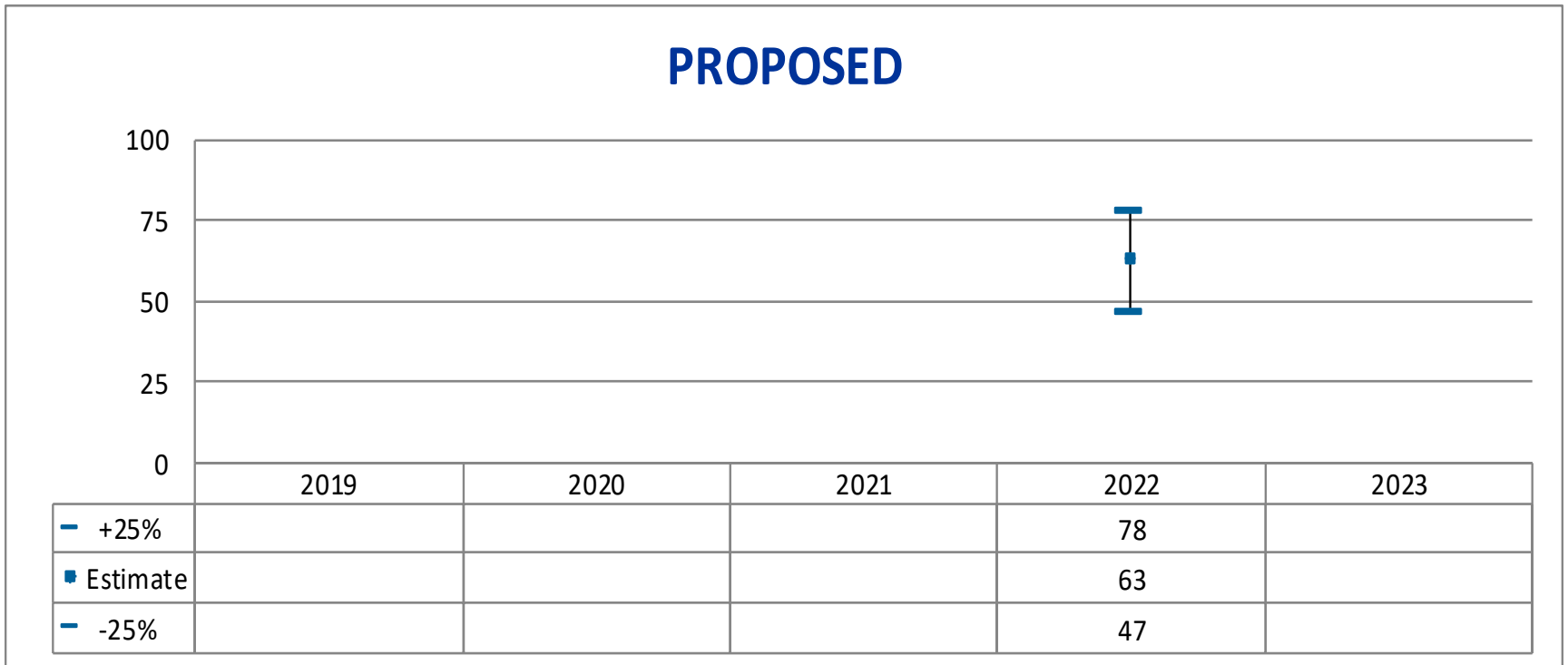
(4) Not included here are the costs of reliability projects for which no estimates have been provided.

Estimates for these projects are noted as TBD in the Project Listing and are only Concept Projects.

(5) May not add up due to rounding.

October 2019 Changes, *cont.*

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

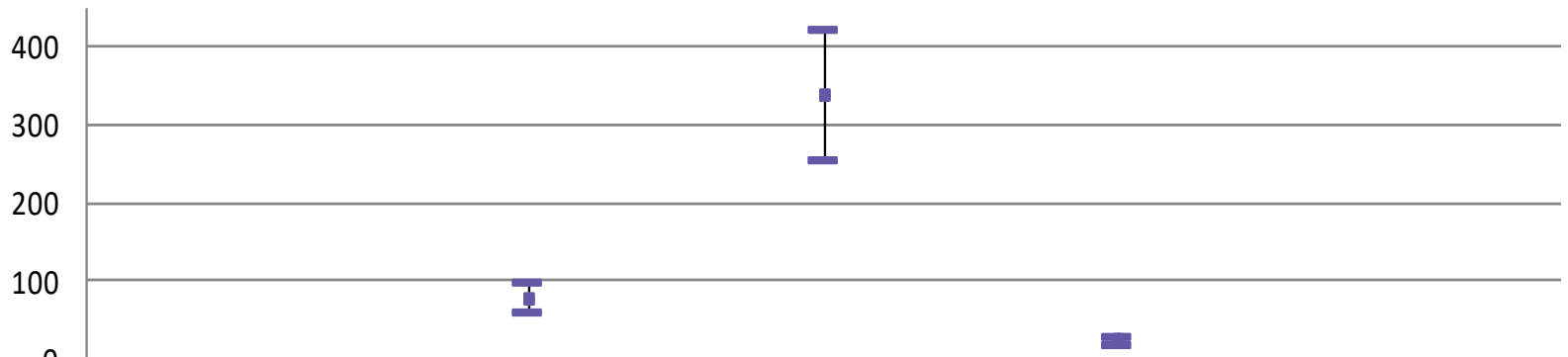


Note: Future total \$ are shown at the end of the project. Totals do not reflect or show phasing in over time or the depreciation of prior projects. Total costs are associated with the year projects are placed in-service as reported in the Project List.

October 2019 Changes, *cont.*

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

PLANNED



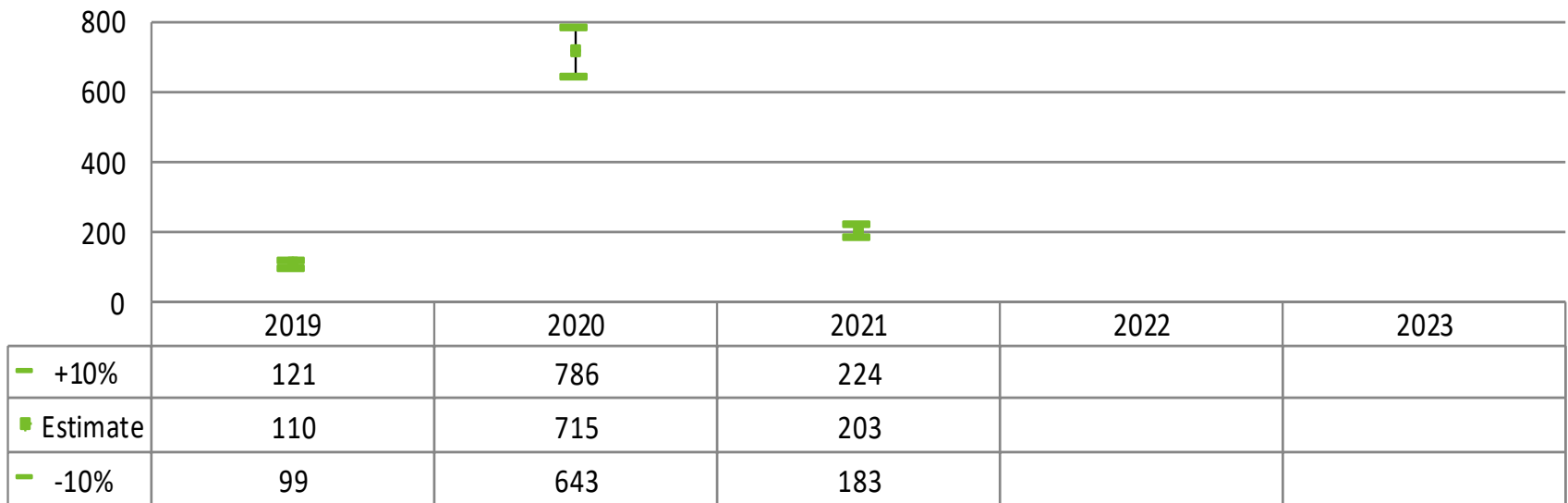
	2019	2020	2021	2022	2023
- +25%		97	422	28	
■ Estimate		78	338	23	
- -25%		58	253	17	

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 2019 Changes, *cont.*

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

UNDER CONSTRUCTION



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	Partial 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	Approved 5/17, 4/18	TCA Submitted	Project completion 2017-2021
Central/Western MA Reinforcements	Approved 12/07, 3/11	Group 1 2/29/2012	Project completion 2009-2022
Greater Boston – North, South, Central and Suburbs	Approved 4/15, 5/15, 6/16	TCA Submitted	Project completion 2013-2021

Status of Major Transmission Projects, *cont.*

	PPA	TCA	Construction
New Hampshire Solution – 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 2013-2020
Greater Hartford & Central Connecticut (GHCC)	Approved 4/15	TCA Submitted	Project completion 2015-2020

October 2019 Asset Condition

34 New Projects

Project ID #	Transmission System Upgrades	Cost (in millions \$)
164	345 kV Structure Replacement Projects - Line 310 (Connecticut)	19.9
165	345 kV Structure Replacement Projects - Line 321 (Connecticut)	6.5
166	345 kV Structure Replacement Projects - Line 330 (Connecticut)	17.1
167	345 kV Structure Replacement Projects - Line 348 (Connecticut)	19.4
168	345 kV Structure Replacement Projects - Line 352 (Connecticut)	12.5



October 2019 Asset Condition

34 New Projects

Project ID #	Transmission System Upgrades	Cost (in millions \$)
169	345 kV Structure Replacement Projects - Line 362 (Connecticut)	5.1
170	345 kV Structure Replacement Projects - Line 364 (Connecticut)	17.3
171	345 kV Structure Replacement Projects - Line 368 (Connecticut)	7.3
172	345 kV Structure Replacement Projects - Line 383 (Connecticut)	22.2
173	345 kV Structure Replacement Projects - Line 387 (Connecticut)	18.2

October 2019 Asset Condition

34 New Projects

Project ID #	Transmission System Upgrades	Cost (in millions \$)
174	345 kV Structure Replacement Projects - Line 3041 (Connecticut)	9.7
175	345 kV Structure Replacement Projects - Line 3252 (Connecticut)	7.5
176	345 kV Structure Replacement Projects - Line 3419 (Connecticut)	11.9
177	345 kV Structure Replacement Projects - Line 3424 (Connecticut)	7.9
178	345 kV Structure Replacement Projects - Line 3754 (Connecticut)	8.2



October 2019 Asset Condition

34 New Projects

Project ID #	Transmission System Upgrades	Cost (in millions \$)
179	345 kV Structure Replacement Projects - Line 336 (Massachusetts)	6.6
180	345 kV Structure Replacement Projects - Line 3361 (Massachusetts)	6.3
181	345 kV Structure Replacement Projects - Line 312 (Massachusetts)	41.3
182	345 kV Structure Replacement Projects - Line 354 (Massachusetts)	29.6
183	345 kV Structure Replacement Projects - Line 3419 (Massachusetts)	26.0

October 2019 Asset Condition

34 New Projects

Project ID #	Transmission System Upgrades	Cost (in millions \$)
184	345 kV Structure Replacement Projects - Line 393 (Massachusetts)	11.0
185	345 kV Structure Replacement Projects - Line 381 (Massachusetts)	12.5
186	345 kV Structure Replacement Projects - Line 326 (New Hampshire)	5.2
187	345 kV Structure Replacement Projects - Line 367 (New Hampshire)	14.1
188	345 kV Structure Replacement Projects - Line 373 (New Hampshire)	10.3



October 2019 Asset Condition

34 New Projects

Project ID #	Transmission System Upgrades	Cost (in millions \$)
189	345 kV Structure Replacement Projects - Line 379 (New Hampshire)	9.7
190	345 kV Structure Replacement Projects - Line 381 (New Hampshire)	8.3
191	345 kV Structure Replacement Projects - Line 385 (New Hampshire)	14.0
192	345 kV Structure Replacement Projects - Line 391 (New Hampshire)	16.4
193	115 kV Structure Replacement Projects - Line 1470 (Connecticut)	11.1



October 2019 Asset Condition

34 New Projects

Project ID #	Transmission System Upgrades	Cost (in millions \$)
194	110-510 & 110-511 lines 115 kV HPFF refurbishment (Massachusetts)	95.0
195	Sand Bar Substation - Mitigate several Asset Condition concerns: Control House, P&C, circuit breakers, switches (Vermont)	10.6
196	Berlin Substation - Mitigate several Asset Condition concerns: Control House, P&C, circuit breakers & switches. Install a second protection system (Vermont)	5.9
197	1130 Line OPGW Replacement (Connecticut)	8.2



October 2019 Asset Condition, *cont.*

12 Projects Placed In-Service

Project ID #	Transmission System Upgrades	Cost (in millions \$)
23	Section 388 & 3023 Structure Replacement (Maine)	72.9
169	345 kV Structure Replacement Projects - Line 362 (Connecticut)	5.1
174	345 kV Structure Replacement Projects - Line 3041 (Connecticut)	9.7
84	Eversource Laminated Structure Replacement Project - Line 1921 (Connecticut)	10.8
135	Eversource 115 kV Structure Replacement Project - Line 1766 (Connecticut)	5.8



October 2019 Asset Condition, *cont.*

12 Projects Placed In-Service

Project ID #	Transmission System Upgrades	Cost (in millions \$)
115	1608 115 kV Line Cable Replacement (Connecticut)	8.2
117	Eversource 115 kV Structure Replacement Project - Line 1050 (Connecticut)	7.2
47	Southern CT Loop Line Structure Replacements - 1342 115 kV (Connecticut)	27.6
66	Laminated Structure Replacement Project - Line 1211/1161 (Massachusetts)	12.6
109	115 kV Structure Replacement Project - Line 1327 (Massachusetts)	3.8



October 2019 Asset Condition, *cont.*

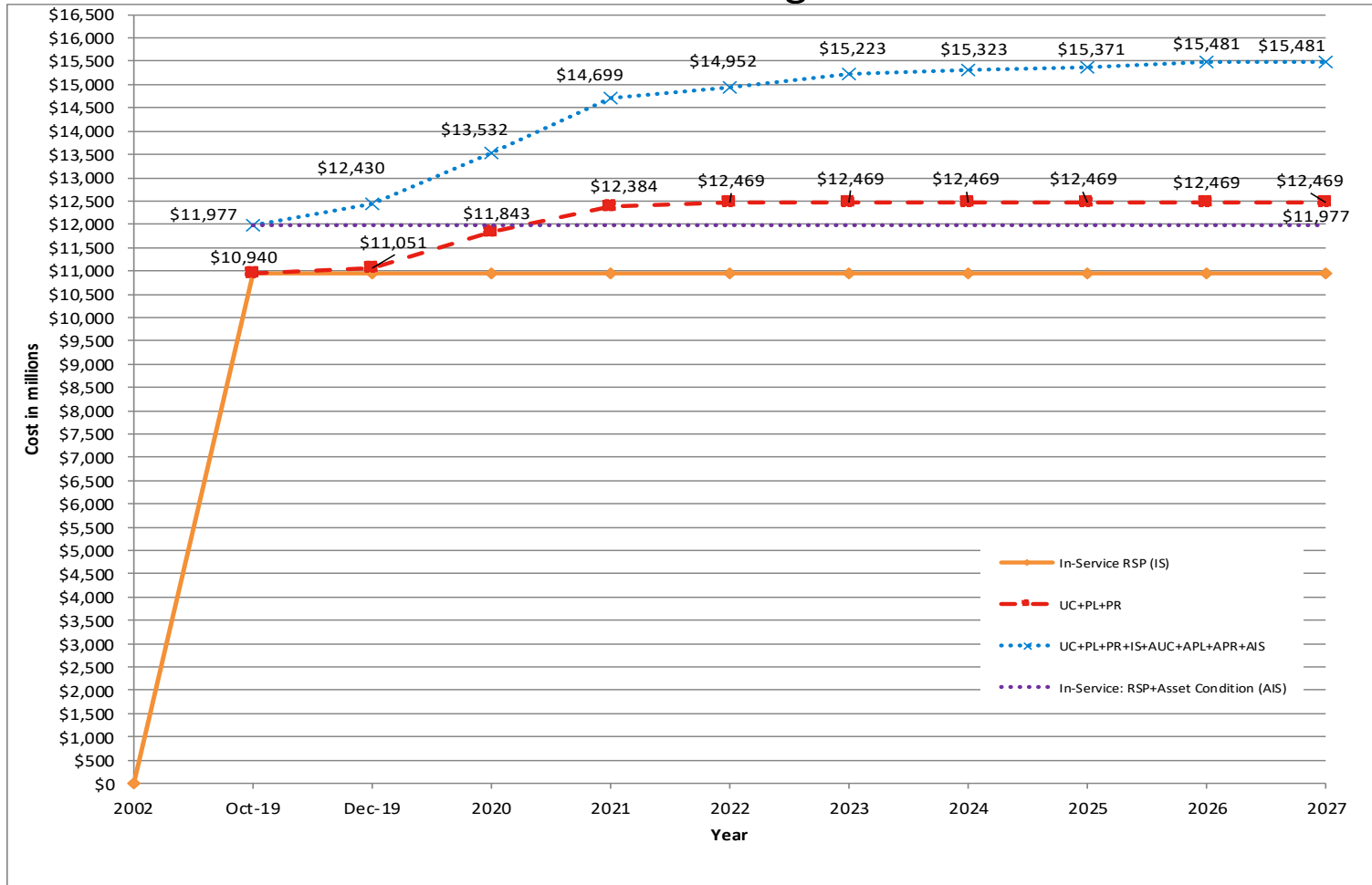
12 Projects Placed In-Service

Project ID #	Transmission System Upgrades	Cost (in millions \$)
110	115 kV Structure Replacement Project - Line 1428 (Massachusetts)	12.1
15	Install a new Medway control house which is to be built to BPS standards in a location within the existing station footprint. (Massachusetts)	12.3



October 2019 Changes, *cont.*

Cumulative Investment of New England Transmission Reliability Projects and Asset Condition through 2027



Note: RSP - UC – Under Construction, PL – Planned, PR – Proposed, IS – In-service
 Asset Condition - AUC – Under Construction, APL – Planned, APR – Proposed, AIS – In-service

Appendix



Summary: Project Listing Definitions

- **ISO New England Inc. Transmission, Markets and Services Tariff Section II Attachment K, Regional System Planning Process**
 - Project Listing Subcategories**
 - **Concept:** shall include a transmission project that is being considered by its proponent as a potential solution to meet a need identified by the ISO in a Needs Assessment or the RSP, but for which there is little or no analysis available to support the transmission project. (Project not well-defined, costs not well-defined, solution implementation not supportable).
 - **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 have been completed). (Still subject to Schedule 12C review for Transmission Cost Allocation)

Project Listing

Project Listing Column
Definitions for:

- Reliability Projects
- Interconnection Projects
- Market Efficiency Upgrades
- Elective Projects

Project Listing – Column Definitions

Part Number (Part #)

The Part #'s designate the 'need' category of the project. Original categories are not changed when a project is placed 'In-Service' or 'Cancelled'.

Part 1 – These projects are Reliability Upgrades.

1a: Planned or Under Construction

1b: Concept or 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: Concept or 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: Concept or 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: Concept or Proposed

Project Listing – Column Definitions, *cont.*

Project ID

This number is generated from 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 given to a project that consists of smaller subprojects.

Project / Project Component

A brief, high-level description of the project is entered here. It will either include 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.

Concept: Shall include a transmission project that is being considered by its proponent as a potential solution to meet a need identified by the ISO in a Needs Assessment or the RSP, but for which there is little or no analysis available to support the transmission project.

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 pool-supported 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:

- Concept Project

- 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%)