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TCA	9/07 N-Grid Study:	10/2/07 PPA Application:		11/7/07 RC Meeting:	12/4/07 TCA Application:		
Logical Work Package ("LWP"):	Reliability Issues Requiring	Associated	Preferred Solution	Presentation	TCA	PTF	Non-PTF
Objective Statement/s	Remedial Action	PPA No.	Description	Pages	Reference ##	Estimate	Estimate
LWP#1: Relieve Palmer Area 115kV Overloads And East Longmeadow Area 69kV Low Voltage Occurrences	W-175 Line Sustains N-1 O/Ls In 2007. Palmer T6 And X-176 Termination Equipment Sustain N-1 O/Ls in 2011. Shaker Road, East Longmeadow And Hampden Substations Sustain N-1 L/Vs In 2011.	NEP-07-T20	Reconductor W-175 115kV Line (Proposed In-Service: 2011)	9-13 & 48-50	PTF-35 And PTF-36	$ 10,779,113	$ -
		NEP-07-T37	Convert O-15S 69kV Line to 115kV (Proposed In-Service: 2011)		PTF-30 And NPTF-9	$ 9,242,468	$ 2,994,198
		NEP-07-T38	At Palmer Substation, Install One (1) New 115kV Circuit Breaker And One (1) New 115/13kV Transformer To Terminate / Accommodate Converted O-15S Line (Proposed In-Service: 2011)		PTF-32 And NPTF-11	$ 1,694,829	$ 2,033,795
		NEP-07-T39	Install New 115kV Switching Station In Hampden, MA (Proposed In-Service: 2011)		PTF-31	$ 5,649,430	$ -
		NEP-07-T40	At "Old" Hampden Substation, Install One (1) New 115/13kV Transformer To Terminate / Accommodate Converted O-15S Line (Proposed In-Service: 2011)		NPTF-2, NPTF-5 And NPTF-10	$ -	$ 2,932,437
		NEP-07-T41	At East Longmeadow Substation, Install One (1) New 115/13kV Transformer To Terminate / Accommodate Converted O-15S Line (Proposed In-Service: 2011)		NPTF-7 And NPTF-13	$ -	$ 2,847,400
		NEP-07-T42	At Shaker Road Substation, Install One (1) New 115/13kV Transformer To Terminate / Accommodate Converted O-15S Line (Proposed In-Service: 2011)		NPTF-6 And NPTF-12	$ -	$ 2,847,400
		~~***NONE***~~	~~At Wilbraham Substation, Install New Capacitors (Proposed In-Service: 2011)~~		~~NPTF-3 And NPTF-8~~	~~$ -~~	~~$ 446,688~~
		~~***NONE***~~	~~At Ludlow Substation, Install One (1) New 115kV Circuit Breaker (Proposed In-Service: 2011)~~		~~***NONE***~~	~~$ -~~	~~$ -~~
			SUBTOTAL			$ 27,365,840	$ 14,101,918
LWP #2: Relieve A-1 / B-2 69kV Line	B-2 Line (Pratts End) Sustains Base Case O/Ls In 2007. Vernon, Chestnut Hill, Templeton And Park Street Sustain	NEP-07-T33	Construct New 6-Mile 115kV Line Between East Winchendon And Otter River Substations (Proposed In-Service: 2011)	14-19	PTF-38	$ 7,455,440	$ -
		NEP-07-T34	At East Winchendon Substation, Install One (1) New 115kV Circuit Breaker (Proposed In-Service: 2011)		PTF-39	$ 1,016,897	$ -
		NEP-07-T35	At Otter River Substation, Expand 115kV Bus To A Six (6) Breaker Ring And Add Two (2) New 115/69kV Transformers (Proposed In-Service: 2011)		PTF-33	$ 10,248,067	$ -
		NEP- 07-T36	At East Westminster Substation, Loop A-1 69kV Line In And Out Of Substation (Proposed In-Service: 2011)		PTF-34	$ 903,909	$ -

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Overloads And Low Voltage Occurrences	Hill, Templeton And Park Street Sustain N-1 L/Vs in 2007. Pratts T4 & T6 Sustain N-1 O/Ls in 2011.	~~NONE~~	~~At Park Street Substation, Complete $300,000 Of Upgrade Work (Proposed In-Service: 2011)~~	14-15	~~NONE~~	~~$ -~~	~~$ -~~
		~~NONE~~	~~Near East Winchendon Substation, Reconductor 1.7 Miles Of J-136 115kV Line (Proposed In-Service: 2011)~~		~~NONE~~	~~$ -~~	~~$ -~~
			SUBTOTAL			$ 19,624,313	$ -

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Objective Statement/s	Remedial Action	PPA No.	Description	Pages	Reference ##	Estimate	Estimate
LWP #3: Relieve 115kV Webster Street And A-127 / B-128 Line Overloads And Low Voltage Occurrences	A-127E Line (Millbury->Webster St) And A-127W (Harriman->French King) Sustain N-1 O/Ls in 2007. B-128 Line (Cabot->Millbury) Sustains N-1 O/Ls in 2007. Webster Street, Paxton, Barre, And Wendell Depot Sustain N-1 L/Vs in 2007.	NEP-07-T22	Reconductor A-127E and B-128E 115kV Lines Between Millbury #2 Substation And Tower 510 In Auburn, MA And Upgrade Associated 115kV Terminal Equipment At Millbury #2 Substation; Reconductor 115kV Tap #2 From Tower 510 To Webster Street Substation (Proposed In-Service: 2010)	20-23 & 30-34	PTF-3, PTF-4, PTF-11, PTF-12 And PTF-13	$ 6,777,194	$ -
		NEP-07-T23	Move Cabot / Montague Tap From B-128 Line To A-127 Line; Reconductor A-127W From Cabot To Wendell Depot And From Paxton, MA To Tower 510 In Auburn, MA (Proposed In-Service: 2011)		PTF-26, PTF-27 And PTF-28	$ 6,429,052	$ -
		NEP-07-T30	Construct New (Third) 115kV Line From Millbury, MA To Tower 510 In Auburn, MA (Proposed In-Service: 2011)		PTF-23	$ 7,909,203	$ -
		NEP-07-T31	At Millbury #2 Substation, Install One (1) New 115kV Circuit Breaker To Terminate New 115kV Line (Proposed In-Service: 2011)		PTF-24	$ 903,909	$ -
		NEP-07-T32	At Webster Street Substation, Install Two (2) New 115kV Circuit Breakers (Proposed In-Service: 2010)		PTF-21 And NPTF-4	$ 2,049,357	$ 2,082,234
			SUBTOTAL			$ 24,068,715	$ 2,082,234
LWP #4: Relieve Bear Swamp And Pratts Junction Area 230kV And 115kV Overloads	E-205W Line (BS To Rotterdam) Sustains N-1 O/Ls in 2007. Bear Swamp T4 And 115kV Term Equipment Sustain N-1 O/Ls In 2007. Pratts T8A And 115kV Term Equipment Sustain N-1 O/Ls In 2007. Bear Swamp 230kV Bus Sustains N-1 L/Vs in 2011.	NEP-07-T25	Reconductor / Retention E-205W 230kV Line (Proposed In-Service: 2011)	24-29	PTF-25	$ 3,389,658	$ -
		NEP- 07-T28	At Pratts Junction Substation, Replace Transformer T8A With One (1) New 230/115kV, 333MVA Unit And Install One (1) New 230kV Circuit Breaker (Proposed In-Service: 2010)		PTF-7 And NPTF-1	$ 6,027,520	$ 318,888
		NEP-07-T29	At Bear Swamp Substation, Upgrade E-131 115kV Line Termination Equipment; Install New POTT Relay Scheme On E-131 Line; Install One (1) New 230/115kV, 333MVA Transformer; And Install New 50MVar Capacitor Bank (Proposed In-Service: 2010)		PTF-17, PTF-18, PTF-19 And PTF-20	$ 6,674,109	
			SUBTOTAL			$ 16,091,287	$ 318,888
LWP #5: Replace Overdutied 115kV Circuit Breakers At Carpenter Hill Substation	Five (5) 115kV Circuit Breakers At Carpenter Hill Sustain Over-Duty Exposures In 2011 (Post Upgrade).	NEP-07-T18	At Carpenter Hill Substation, Replace Five (5) Overdutied 115kV Circuit Breakers (Proposed In-Service: 2009)	36-38	PTF-6	$ 2,125,922	$ -
LWP #6: Relieve Deerfield #4 115/69kV Transformer Overloads	Deerfield #4 T3 Sustains N-1 O/Ls In 2007.	NEP-07-T24	At Deerfield #4 Station, Install a New (Second) 115/69kV, 56MVA Transformer And One (1) New 69kV Circuit Breaker (Proposed In-Service: 2010)	39-41	PTF-22	$ 3,068,556	$ -

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Logical Work Package ("LWP"):	Reliability Issues Requiring	Associated	Preferred Solution	Presentation	TCA	PTF	Non-PTF
Objective Statement/s	Remedial Action	PPA No.	Description	Pages	Reference ##	Estimate	Estimate
LWP #7: Relieve Adams Area 115V Low Voltage Occurrences	Adams 115kV Bus Sustains N-1 L/Vs in 2011.	NEP-07-T26	At Adams Substation, Install A Third 115kV Circuit Breaker (Proposed In-Service: 2011)	42-44	PTF-37	$ 1,559,243	$ -
LWP #8: Relieve Central Mass Area 115kV Overloads	Greendale 115kV Breaker Sustains N-1 ~~Overduty~~ overload Exposure in 2007. P-142 Line Sections Sustain N-1 O/Ls In 2007. O-141 Line Sections Sustain N-1 O/Ls In 2011. Wachusett T3 Sustains N-1 O/Ls In 2011. I-135 & J-136 Line Sections Sustain N-1-1 O/Ls In 2009.	NEP-07-T14	At Greendale Substation, Replace One (1) 115kV Circuit Breaker (Proposed In-Service: 2009)	45-47	PTF-1	$ 584,629	$ -
		NEP-07-T15	Reconductor P-142 115kV Line West Boylston / Rolf Ave / Bloomingdale (Proposed In-Service: 2010)		PTF-14 And PTF-15	$ 2,172,647	$ -
		NEP-07-T16	Reconductor O-141 115kV Line Nashua Street / Quinsigimond Jct / Millbury (Proposed In-Service: 2010)		PTF-8	$ 1,610,992	$ -
		NEP-07-T17	At Millbury #2 Substation, Upgrade O-141 And P-142 115kV Terminal Equipment (Proposed In-Service: 2009)		PTF-2	$ 1,381,849	$ -
		NEP-07-T19	At Wachusett Substation, Install One (1) New 345/115kV, 448MVA Transformer (Proposed In-Service: 2011)		PTF-29	$ 11,411,849	$ -
		NEP-07-T27	Reconductor I-135S and J-136S 115kV Lines Pratts To Flag Pond And Upgrade Associated Terminal Equipment At Pratts Junction Substation (Proposed In-Service: 2010)		PTF-5, PTF-9 And PTF-10	$ 6,509,148	$ -
			SUBTOTAL			$ 23,671,114	$ -
~~**LWP #9:** Relieve East Webster Area 69kV Low Voltage Occurrences And Millbury #2 115/69kV Transformer 3 Overloads~~	~~East Webster Sustains N-1 L/Vs **IN 2015 (?)** . Millbury T3 Sustains N-1 O/Ls **IN 2015 (?)** .~~	~~**NONE**~~	~~N/A~~	~~51-52~~	~~**NONE**~~	~~$ -~~	~~$ -~~
LWP #10: Improve Operability At Searsburg Station	***NOT CLEAR*** **T**he Y-25 69 kV line (Bennington VT to Deerfield MA) is 28 miles long with no sectionalizing breaker anywhere along the length of the line. Every time there is a fault on the Y-25 line, all the customers are tripped. The customers include Green Mt Power (GMP) loads at Dover/Mt Snow (7.2 MW peak load) and Wilmington (5.6 MW peak load). At Searsburg 69 kV Switch yard, disconnect switches exist, but no breaker is installed. Operations personnel do have remote control over switches 254, 255, 253 and 252, but following a fault on the Y-25 line, these switches must be opened and closed several times before the fault location can found and isolated. Faults may be closed into several times before the fault can be isolated.	NEP-07-T21	At Searsburg Station, Install One (1) 69kV In-Line Circuit Breaker (Proposed In-Service: 2010)	***NONE Not included in presentation***	PTF-16	$ 1,205,504	$ -
						$ 118,780,494	$ 16,503,040

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Comments
The capacitors at Wilbraham will be installed on the 13 kV bus. They did not require a PPA and were therefore not included in the TCA application.
This breaker is on the NU system (NU). Therefore, NU must submit the PPA/TCA. However, NU will not submit the PPA/TCA until National Grid is sure the New Hampton Station can be built and permitted. If New Hampton Station can't be built and permitted, the Ludlow breaker will not be needed, since National Grid will choose another option that does not require the breaker at Ludlow.

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The Park St work is a rehabilitation project independent of the Western MA upgrades. The reason Park St (69 kV station) is listed in the study report is because the Western MA study recommended the station be insulated for 115 kV during the rehabilitation to facilitate possible 115 kV conversion of the A-1 and B-2 69 kV lines in the future. This cost is not reflected in the TCA application because the total rehabilitation cost is less than $5M and does not require a TCA application.
This upgrade does not need to be done. The overhead conductor already has sufficient thermal capability. The original PPA study had incorrect ratings for this conductor. After the PPA report was written, it was determined that the conductor had sufficient thermal ratings. Therefore, no PPA/TCA was submitted.

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This item was included in the PPA study report, however the PPAs for this work were withdrawn because the 2015 in-service date exceeds the 5-year guideline in PP5-1. This work was accordingly not included in the TCA application.