

Response to NHT Cost Claims on Selected Projects

National Grid and Eversource

Summary

- Recent National Grid and Eversource projects have been delivered at costs very close to estimates developed at this stage of the ISO study process
- The Greater Boston Study has been on-going since 2008 with project scopes and costs refined since that time
- NHT's cost comparison is not valid for where we are today in this study

Development of cost estimates

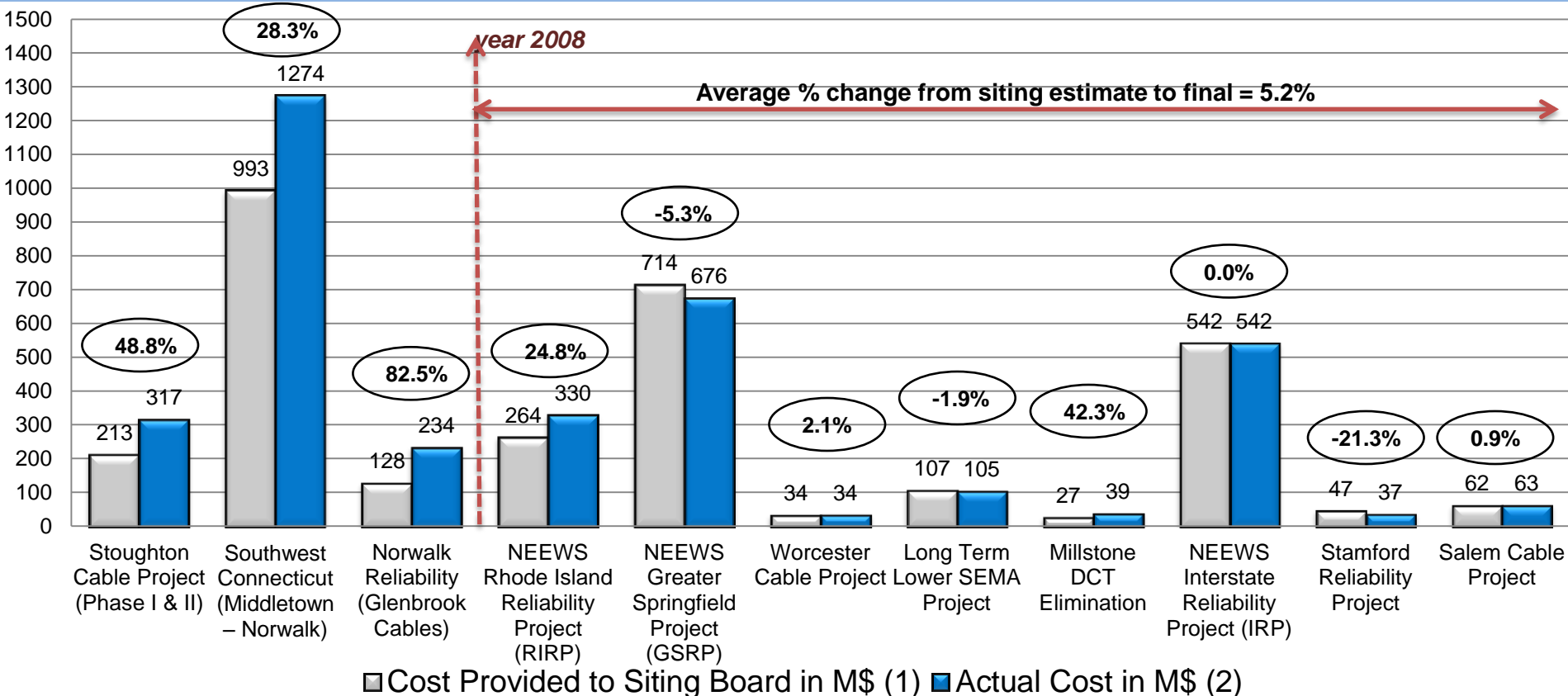
- ISO-NE recognizes multiple levels of cost estimate that differ based on the level of scope definition and engineering that has taken place at the time the cost estimate is developed.
- Estimates developed in the early stages of the ISO-NE planning process reflect an early understanding of project scope.
- As project scope is developed and engineering advances, better estimates are produced and presented to the PAC and, later, to permitting agencies.
- The AC Solution estimates provided to ISO-NE by the Transmission Owners over the past six months reflect significant scope definition and engineering.
 - For MVRP, estimate is close to that which we would provide for a siting proceeding.
- NHT's presentation dated Feb. 3, 2015 incorrectly suggests that today's AC Plan estimates should be considered equivalent to estimates developed earlier in the ISO-NE process.

National Grid and Eversource have delivered recent projects consistent with estimates developed at the current stage of project definition and engineering

What is a better comparison?

- The Greater Boston AC Plan suite of projects have progressed much further in both planning and engineering than the ‘initial’ estimates used by NHT for comparison purposes
- In order to more accurately reflect where the Greater Boston estimates are now with respect to final costs, one needs to compare costs filed with siting boards to final project costs.
- We expect to file the Merrimack Valley Reliability Project (MVRP) in late March 2015 in MA and June 2015 in NH.
- The other two major AC projects are nearing that level of accuracy with siting filings anticipated in early summer 2015.

Comparison of engineered cost filed with siting agencies to final cost of NHT selected projects



Recent Project Average: 5.2% change
Total Project Average: 18.3% change, well within the 25% accuracy level for estimates at this stage

Recent Experience – NEEWS Projects

- National Grid and Eversource have recently collaborated on the NEEWS projects – a suite of projects developed to address transmission system needs in southern New England.
- The Advanced NEEWS projects were delivered for \$123.6 million, well below the TCA cost estimates of \$146.9 million.
- The Greater Springfield Reliability Project also was delivered at a substantially lower cost than the PAC estimate.
- Costs for the Rhode Island Reliability Project have exceeded the PAC estimate, but not to the extent alleged by NHT.
- The Interstate Reliability Project is currently under construction. The \$542 million cost estimate has not changed since it was presented to the PAC in February 2012. National Grid and Eversource anticipate delivering this project at or below the \$542 million estimate.
- The NEEWS projects – particularly GSRP and RIRP – are of substantially greater complexity than any of the projects in the AC Solution.

Overall we expect to deliver the NEEWS projects within a tolerance of \$3 million on a base of over \$1.6 billion compared to the siting estimates

NEEWS Projects: Summary

Greater Springfield Project

- Preferred Solution presented to PAC in May 2008
- Cost estimate at time of siting filings (October 2008): \$714 million
- Final cost: \$676 million
- Construction completed: November 2013

Rhode Island Reliability Project

- Preferred Solution presented to PAC in May 2008
- Cost estimate at time of siting filing (September 2009): \$246.9 million or \$264 million in 2012 dollars
- Final cost: \$329.7 million in 2012 dollars (for same scope)
- Construction completed: May 2013

Interstate Reliability Project

- Updated Solutions Study issued in February 2012
- Cost estimate at time of siting filings: \$542 million
- Current projected cost: \$542 million
- Projected completion date: December 2015

Advanced NEEWS Projects delivered below TCA estimates by \$24.3 million

Other Recent Experience

Salem Cable Replacement Project

- Project scope revised multiple times in response to changes in generation at Salem Harbor
- Final Design presented to PAC in November 2013
- Cost estimate at time of siting filings (September 2013): \$62.4 million
- Current cost estimate: \$63.0 million

Stamford Reliability Project

- Preferred Solution presented to PAC in April 2011
- Cost estimate at time of siting filing (January 2013): \$47 million
- Final cost: \$37 million -- **\$10 million under estimate**
- Construction completed: November 2014

Millstone DCT Separation

- Preferred Solution presented to PAC January 2011
- Cost estimate at time of siting filing (August 2011): \$27.2 million
- Final cost: \$38.7 million – increase due primarily to subsurface conditions
- Construction completed: June 2013

Additional Supporting Material

NEEWS GSRP

- Preferred solution for Springfield presented to PAC on December 3, 2007
 - 2006 PAC presentation cited by NHT presented “informed but preliminary decisions about preferred solutions”
- Integrated preferred solutions for the four NEEWS projects, including GSRP, presented to PAC on May 19, 2008
- Connecticut and Massachusetts siting filings, made in October 2008, presented a project cost estimate of \$714M, developed at +/- 25% accuracy
- Siting approvals were issued in March and September 2010
 - Siting review was delayed by ISO-NE’s reassessment of need, concluded in June 2009
 - Siting duration 1.9 yrs
- Submittal of first siting filing to project completion: 5.08 yrs.
- Final study to project completion - 3 years, 2 months.
- Actual final cost \$676 million (lower than TCA estimate)
- Percent Decrease Siting Estimate to Final = - 5.3%

NEEWS GSRP versus MVRP

	NEEWS GSRP	MVRP
Generators connected to lines in ROW	6	1
Substations with work	5 – major 8 - minor	2-minor
Miles of ROW requiring more than 1 transmission line relocations	23	0.5
Construction Durations (in years) (Note 1)	3	1.5
# of structures (Note 1)	670	451
# of foundations (Notes 1 and 2)	765	149
ROW Length (miles)	39	24.6
Circuit miles of construction	96.4	40

Note 1 – MVRP numbers listed are expected based on current design.

Note 2: GSRP had many multiple pole structures and hence number of foundations is greater than number of structures

Project Risk for MVRP is not close to experience of GSRP

- Different structure design without significant foundation work
- Outage Plan is significantly less complex than GSRP
- Mileage of transmission line relocations is not comparable.
- Majority of GSRP had dense urban construction

NEWS RIRP

- Initial Estimate, \$150M in 2006 dollars; early on recognized this estimate required updating
- Estimate Revised and presented in May 2008 Presentation to PAC \$250M in 2008 dollars. (or \$271M in 2013 Dollars)
- Siting Started September 2008 and Completed August 2010 (23 months)
- RI EFSB filing submittal in September 2008 - \$244.9M in 2008 dollars with accuracy of +/-25%
- RI EFSB filing supplemental submittal in June 4, 2009 - \$246.9M in 2009 dollars with a +/- 25%
- \$246.9 → Results in \$264.2 M in 2012 dollars
 - Estimate to did not include several items because they were not part of EFSB Jurisdictional Review. This included work at Drumrock, Hartford Ave, Franklin Sq., South Wrentham, 23kV Line relocations, K189 work, and 315 line relays at Brayton which totaled \$35.3M (actual 2012 dollars)

NEWS RIRP

- Construction Completed May 2013 (2 years, 9 months) - complicated ROW
 - Significant rock coring throughout ROW
 - Seven distribution substations and two generators led to extremely complex outages
 - 58 revisions to the outage plan were required to accommodate substations, generators, site conditions and weather
- Actual Final Cost \$365M, A draft TCA has been submitted to ISO for their review and will be presented to RC in a few months.
 - Most significant factor in project cost increase - subsurface rock, not known at time of filing.
 - Estimated \$19M, but actual was \$60M, therefore this resulted in a \$41M change for project
- Final Cost Comparison with respect to EFSB filing
 - \$365M less 'out of scope' items of \$35.3M = \$329.7
 - Comparing to a \$264.2M Siting Filing in 2012 dollars yields an 24.8% change, which was within accuracy of 2008 and 2009 siting filing estimates.
 - Factoring in the Rock Coring Unknowns demonstrates a much tighter tolerance to siting filing.
 - $(\$329.7 - \$41M) = \$288.7M$ compared to siting filing of \$264.2M yields a 9.3% increase in cost.

NEEWS RIRP versus MVRP

	NEEWS RIRP	MVRP
Generators connected to lines in ROW	2	1
Substations with work	4-major 3-minor	2- minor
Miles of ROW requiring more than 1 transmission line relocations	21.4	0.5
Construction Durations (in years) (Note 1)	2.75	1.5
# of structures (Note 1)	750	451
# of foundations (Note 1)	750	149
ROW Length (miles)	21.4	24.6
Circuit miles of construction	62	40

Note 1 – MVRP numbers listed are expected based on current design.

Project Risk for MVRP is not close to experience of RIRP

- Different structure design without significant foundation work
- Outage Plan is significantly less complex than RIRP
- Mileage of transmission line relocations is not comparable.

NEEWS IRP - appropriate cost comparison

- Project Cost Estimate in ISO Solutions Report as well as Estimate in June and July 2012 Siting filing \$542M developed at +/-25% accuracy
- Current Project Cost Forecast right on target of Siting Filing
- Percent Projected Increase Final / Siting Filing Quality Estimate = 0%
- Initial Study to Project Completion is a duration of 9 years, however, final study to project completion is only 3.5 years
- Submittal of first Siting Filing (Dec 2011) to project completion is 4 years (projected Dec. 2015)
- Siting for NEEWS more complex than Greater Boston AC Plan
 - NEEWS longer line -75 miles total and three state siting
 - Greater Boston AC Plan – 40 miles total and two state siting

NEEWS IRP – NHT's cost comparisons should actually show only 2.65% increase

- Initial Estimate, \$400M in 2006 dollars, Applying appropriate escalation → \$469M out-turn dollars (2014 and 2015)
- Although project received PPA in 2008, multiple restudy efforts and the scope changed, with final Study Completed in May 2012, Solutions Report Sept 2012
 - Added Sherman Road \$36.6M out-turn dollars
 - Added 328 Reconductoring/Rebuild \$36.5M out-turn dollars
 - Removed Sherman Road Original Scope \$11M out-turn dollars
 - Removed 347 line Reconductoring - \$3.1M out-turn dollars.
 - Overall Scope changes - additional \$59M out-turn dollars
- Project Cost based on initial estimate considering escalation and scope changes: \$528M (\$469M+\$59M)
- \$542 is only 2.65% increase from \$528

Worcester Cable Project

- March 31, 2009 PAC Presentation outlining preferred project and alternatives provided cost estimate of \$33.4M (\$31.1M PTF and \$2.3M non-PTF) in out-turn or 2013 dollars (+/- 25% accuracy)
- Filed in July 2009 with MA EFSB Siting Board with an estimate for the cable of \$25.13 M and \$8.4M associated substation work at Vernon Hill, Bloomingdale, Millbury and Rolfe Ave, for a total of \$33.53M in out turn dollars.
- TCA Submitted on April 2009 for \$33.36M (\$31.06M PTF and \$2.3M non-PTF) stating an accuracy of +/- 25% again in out-turn dollars
- Final Actual Total cost was \$34.23M (\$29.57M PTF and \$4.6M Non-PTF)
- Percent change Final / Siting Filing Quality Estimate = $\$34.23/\$33.53\text{M} = 2.1\%$ increase
- It is inappropriate for NHT to point to initial estimate
 - January 23, 2006 PAC Presentation – clearly states 'Costs are yet to be finalized'
 - The initial estimate provided in RSP listing was a 2005, order of magnitude estimate of \$7M for Cable alone and no associated substation work.

Salem Cable Project

- National Grid presented in November 2013 an outline of the alternatives and preferred solution for the Salem Cable Project.
- Filed in September 2013 with MA EFSB Siting Board with an estimate for the combined cable and substation project of \$62.43M +/-25%
- Siting Board Approval in November 2014 (14 Months duration)
- Current MA EFSB certified estimate \$63M +/-10%
- Percent change Current Certified Estimate / Siting Filing Quality Estimate = 0.9 % increase

Salem Cables – NHT's comparison is not valid

- A PPA for this asset condition work had been submitted with an earlier study (Merrimack Valley/North Shore) for the entire region.
- Initial Estimate NHT is referring to is based on a Nov. 17, 2011 PAC presentation, and the cost was only for cable – no substation costs.
- However, National Grid withdrew (i.e. canceled) its PPA on April 27, 2012 citing changes in project scope and schedule, which were mainly due to issues surrounding Salem Harbor Retiring and interconnection of Footprint Power.
- The project was moved back to 'conceptual' status in June 2012. This effectively wipes the slate clean.
- In the Nov 20, 2013 PAC presentation National Grid made it clear that re-use of existing duct banks for one of the circuits was no longer valid due to depth and condition of ducts. Four new options were presented with updated costs. The most economic project was selected at \$62.4M (cable plus station costs).
- A new PPA was filed on Dec. 9, 2013 and project was returned on next RSP listing to a status of 'planned'

Stoughton Cables

- Project developed before current PP-4 and PAC process.
- Cost increased from initial estimate because of sharp increases in labor, materials, quality assurance, program management and AFUDC
- Although initial estimate was 49% low, this was a very cost-efficient project:

	Representative UG Project Comparison – 2008 \$ (Earlier projects escalated at 5%; Later projects deescalated at 3%)			
Project	Stoughton - K Street	Middletown - Norwalk (CL&P)	Stamford Cables	Glenbrook Cables
Voltage / Technology	345-kV HPFF	345-kV XLPE	115-kV XLPE	115-kV XLPE
Length (miles)	18.94	17.6	1.4	8.7
Length (ckt miles)	47.58	35.2	1.4	17.4
# cables in trench	9	6	3	6
Cable Size	2500 kcmil	3000 kcmil	3500 EN kcmil	3500 kcmil
Completion Date	2006	2008	2014	2008
Actual Completed Cost (\$M)	\$216	\$445	\$37	\$216
Avg Cost / mile (\$M)	\$11.4	\$25.3	\$26.4	\$24.8
Avg Cost / circuit mile (\$M)	\$4.5	\$12.6	\$26.4	\$12.4
Avg Cost / Circ mile (at 2008 \$)	\$5.0	\$12.6	\$22.1	\$12.4

Stamford Reliability Project

- Preferred solution presented to PAC in April 2011
- Connecticut siting filing, made in January 2013, presented a project cost estimate of \$47 million
- Siting approval was issued in September 2013
 - Duration of siting process = 0.6 years
- Project was placed in service November 2014
 - Project duration 2.6 yrs
- Actual final project cost is \$37 million
- Percent Decrease Final / Siting Quality Estimate = - 21%

Millstone Double Circuit Tower Elimination

- Preferred solution presented to PAC in January 2011
- Connecticut Siting filing, made in August 2011, presented a project cost estimate of \$27.2 million
- Siting approval was issued October 2011
 - Siting duration = .1 year
- Project was placed in service June 2013
 - Project duration of 2.4 yrs from presentation of preferred solution to in-service
- Actual final project cost is \$38.7 million
 - Percent increase Final / Siting Quality Estimate = 42.2%
 - Cost increase was due mainly to sub-surface site conditions discovered during detailed design, which required extensive changes including steel structures (for wind loading), many with foundations (because of unstable soil), rather than wood H-frames.

Southwest Connecticut (Middletown – Norwalk)

- Project developed before PP-4 and current PAC process
 - ISO-NE first supported project in December 2004 – 12 months after siting filing
 - 2002 presentation referenced by NHT for initial cost estimate was conceptual cost for an all-overhead 345-kV loop in SWCT
- Project was initially filed with Connecticut Siting Council in December 2003
 - At the time, project scope consisted of 45 miles overhead 345-kV line and 24 miles HPFF underground cable.
- During siting process, project was redesigned to address ISO-NE reliability concerns
 - Change from HPFF to XLPE cable
 - Additional substation work
- Redesigned project presented to CSC in December 2004, with an estimated cost of \$837M to \$993M
 - Range reflected preliminary design and open issues in siting proceeding
 - CSC Siting Council thereafter required route changes and additional scope for EMF

Southwest Connecticut (Middletown – Norwalk)

- Siting approval was issued in April 2005
 - Approval 1.5 years from application
- Project was energized 12/16/2008, 3.75 years from application
- TCA cost was \$1.274B; ISO-NE localized \$69M and allowed regional recovery of \$1.205B
- Increase in cost 28.3%; close to +25% margin; regionalized cost exceeded estimate presented to CSC by approximately 21%

Norwalk Reliability (Glenbrook cables)

- Project developed before PP-4 and current PAC process
- Project selected as preferred solution while in siting, 4/29/05
- Siting application 5/21/2004, granted 7/20/2005
- Siting duration 1.2 years
- In-service 12/16/2008, 3.6 years from selection
- In-service date timed to coincide with Middletown – Norwalk; not required before then
- Cost estimate presented to CSC \$128.2M
- TCA estimate \$234.2M
- ISO-NE localized \$30.5M and allowed regional recovery of \$203.7 M
- Increase in total cost over siting cost 82.6%; increase in regionalized cost over siting estimate 59%
- Increase due primarily to conflicts with uncharted existing utility plant in dense urban area and other unanticipated subsurface conditions.

Greater Boston UG cable estimate comparisons

- Estimates for Unique AC component are 23% higher than comparable (land) Unique DC components
- AC Components have slightly more scope

Project	Unique AC UG Components		Unique DC (land) UG Components		
	Mystic - Woburn	Wakefield - Woburn	Sealink DC	Sealink AC	Sealink AC
Voltage / Technology	115-kV HPFF	345-kV XLPE	200-kV XLPE	115-kV XLPE	345-kV XLPE
Length (miles)	7.7	7.7	15.3	1.3	0.4
# cables in trench	3	3	2	6	3
Cable Size	2500 kcmil	3000 kcmil			
Ductbank Width [config]	24"	30" [2 x 2]	24"	36.75" [3 x 2]	36.62" [3 x 1]
Estimate (\$M)	\$70	\$76	\$130 (combined)		
Avg Cost / mile (\$M)	\$9.5		\$7.6		

**Estimates of Greater Boston Study
AC and DC Components are Consistent**

Merrimack Valley Reliability Project (MVRP)

- Initial Estimate – April 2011 RSP – Proposed \$63.4M (+50%/-25%).
- Updated June 2012 -\$101.6M - Proposed (+50%/-25%)
- Updated June 2014 – \$122.9M – engineering at this time was close to a +/-25%, matches info in November 2014 and December 2014 PAC Presentations
- Current estimate is nearly siting filing accuracy
 - Currently updating estimate based on latest engineering and anticipating cost to be nearly equal to \$123M and quality will be at 25% tolerance range
 - Incorporates knowledge of subsurface conditions along ROW good due to work previously completed on Y-151 along majority of ROW.

Conclusion

- Average recent estimate accuracy compared to “Siting Filing Quality Estimate” → 5.2%
- Duration of projects should be compared from *Final* Solution Selection at PAC to completion of siting and to completion of construction.

The AC Solution by National Grid and Eversource is the cost-effective solution