Northern Pass Transmission Project
ETU #499 Update
DRAFT

NEPOOL Reliability Committee Meeting

February 16, 2016

RC Meeting Agenda

- NPT Project Update
- Voltage Source Converter Technology benefits
- Transmission System Upgrade Comparisons
- SSTI study update
- Next Steps

NPT Project Update

- The NPT project has been changed to include Voltage Source Converter technology which enables additional undergrounding capabilities for the HVDC line
  - In order to facilitate these changes, NPT submitted a new ETU application in February 2015.
  - ISO-NE Interconnection studies are nearing completion
  - Preliminary study results for the NPT project are included in this presentation for information only
  - NPT expects to request the Reliability Committee for a recommendation to approve the I.3.9 at the March 22, 2016 RC meeting
- NPT will now be capable of supplying 1090 MW at the Deerfield substation

NPT HVDC Transmission Line Update

- Des Cantons Substation to Canadian/US border
  - ~ 49 miles of overhead
- Canadian/US border to Franklin Converter Station
  - ~158 miles, which now includes ~ 60 miles of underground (UG) cable (original project included 8 miles of underground cable)
- Franklin Converter Station to Deerfield Substation ~ 34 miles overhead

Voltage-Source Converter Benefits

Technology	Previous Proposal HVDC Classic	Current Proposal HVDC VSC
Semiconductor Control	Thyristor (turn-on only)	IGBT (turn-on and off)
Power Control	Active Power only	Active and Reactive Power
AC Filters	0.5 Mvar / MW	Minimal amount may be required based on converter studies
Minimum Short-Circuit Ratio	>2	0
Black Start Capability	No	Yes

Northern Pass Transmission Project
ETU #499 System Upgrades

- Overall, the Northern Pass Transmission project system upgrades, required for interconnection, have not changed significantly
- 345-kV transmission line thermal upgrades are still required
- The substation locations for placement of reactive compensation has not changed
  - The size of the reactive compensation will be adjusted to meet the requirements of the most recent ISO-NE Interconnection studies
- The Franklin Substation shunt capacitive compensation has decreased approximately 98% because of the project decision to use voltage-source converter technology
- Mitigation is still required to eliminate the risk of a single event that causes the loss of both the Northern Pass Transmission project and the existing Phase II HVDC at the line crossing in southern Quebec. NPT will propose similar acceptable mitigation as described in the previous proposal.

Franklin Converter Station

Previous Proposal HVDC LCC Technology	Current Proposal HVDC VSC Technology
1200* MW	1090* MW, ±250 Mvar
± 300 kV	± 320 kV
750 Mvar capacitors/filtering	15 Mvar capacitive filter**
Two 60 Mvar reactors	One 50 Mvar reactor**
0/+100 Mvar SVC	Not required

*MWs supplied at Deerfield Substation
** Preliminary Results – subject to change

345-kV Deerfield Substation Capacitive Compensation

Previous Proposal HVDC LCC Technology	Current Proposal HVDC VSC Technology
200 Mvar shunt capacitors	300 Mvar shunt capacitors*
0/ +400 Mvar SVC	0/+225 Mvar SVC*

* Preliminary Results - subject to change

345-kV Scobie Pond Substation
Capacitive Compensation Change

HVDC LCC Technology	HVDC VSC Technology
210 Mvar shunt capacitors	275 Mvar* shunt capacitors
Add circuit-breaker in series with #9126 breaker	Add circuit-breaker in series with #9126 breaker*
Add circuit-breaker in series with #262 breaker	Add circuit-breaker in series with #262 breaker*

* Preliminary Results - subject to change

Transmission Line Upgrades

Previous Proposal HVDC LCC Technology	Current Proposal HVDC VSC Technology
345-kV Line 391 (Buxton to Scobie Pond) looped into Deerfield Substation	345-kV Line 391 (Buxton to Scobie Pond) looped into Deerfield Substation*
Upgrade 345-kV Line 373 Deerfield to Scobie Pond	Upgrade 345-kV Line 373 Deerfield to Scobie Pond*
Upgrade 345-kV Line 391S Deerfield to Scobie Pond	Upgrade 345-kV Line 391S Deerfield to Scobie Pond*
Line 326 SPS Thermal Set-point Increase	Not Required*
Not required	Upgrade 115-kV line Y151 Power Street to Pelham**

* Upgrades are preliminary and subject to change
** To be coordinated with Greater Boston Preferred Solution

Sub-synchronous Torsional Interaction Study Update

- ABB has been selected as the vendor for the HVDC equipment
  - ABB is performing the SSTI design studies using PSCAD models to evaluate generators identified in screening studies for any potential interaction
  - Results are expected by late February to be provided to SSG/STF

Next Steps

- Working Group and Task Force approvals of Interconnection study results including SSTI results and Seabrook Generator Short Circuit review – Late February / Early March
- Request for RC recommendation for approval – March 22, 2016

Questions

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