Public Service
of New Hampshire

The Northeast Utilities System

Northern New Hampshire New Resource Interconnection Options and Costs

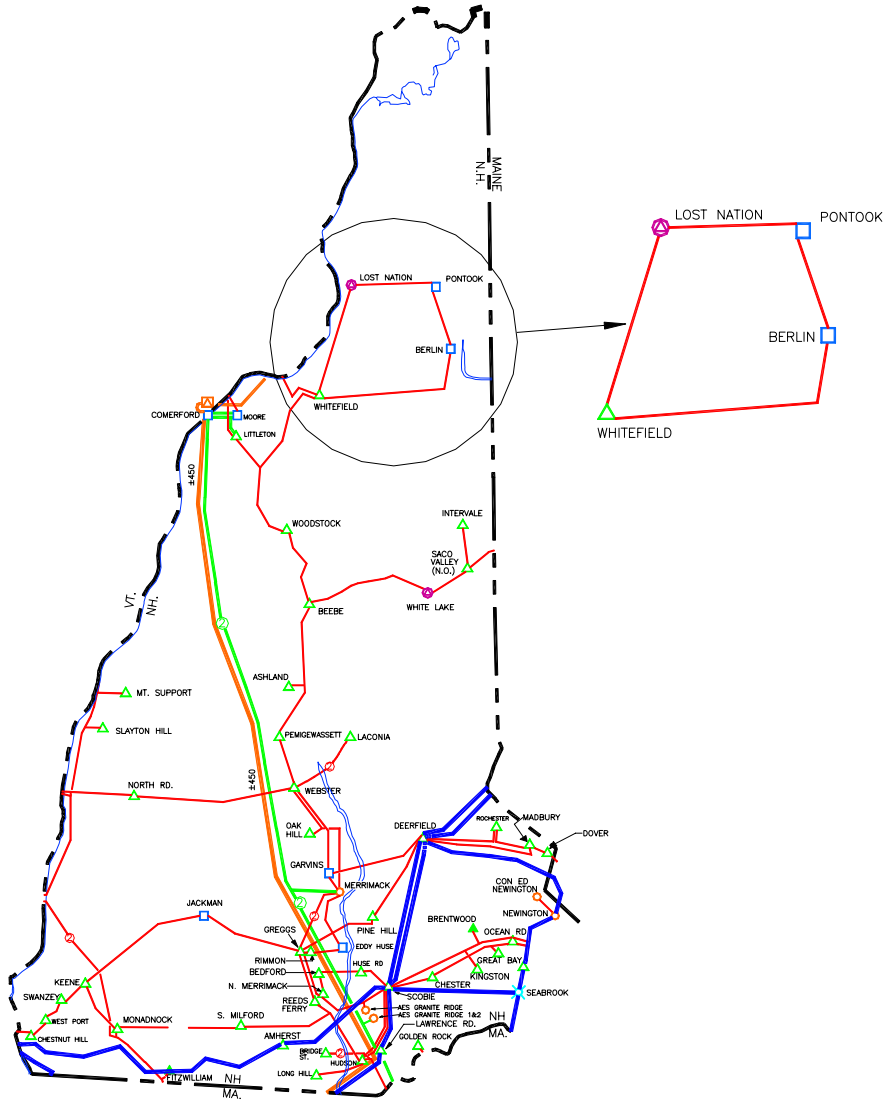
NH Transmission Committee

November 24, 2008

Introduction

- PSNH continues to look for cost-effective transmission expansion options to reliably interconnect northern New Hampshire renewable generation to the transmission grid.
  - Major issue: thermal and stability problems exists in this area to export significant energy from additional generation resources.
- ISO is currently undertaking a NH 10-Year ISO-NE Study (“Reliability Study to Serve Load”). The study may justify reliability upgrades that benefit the interconnection of northern NH renewable generation.

New Hampshire Northern Loop – Existing System

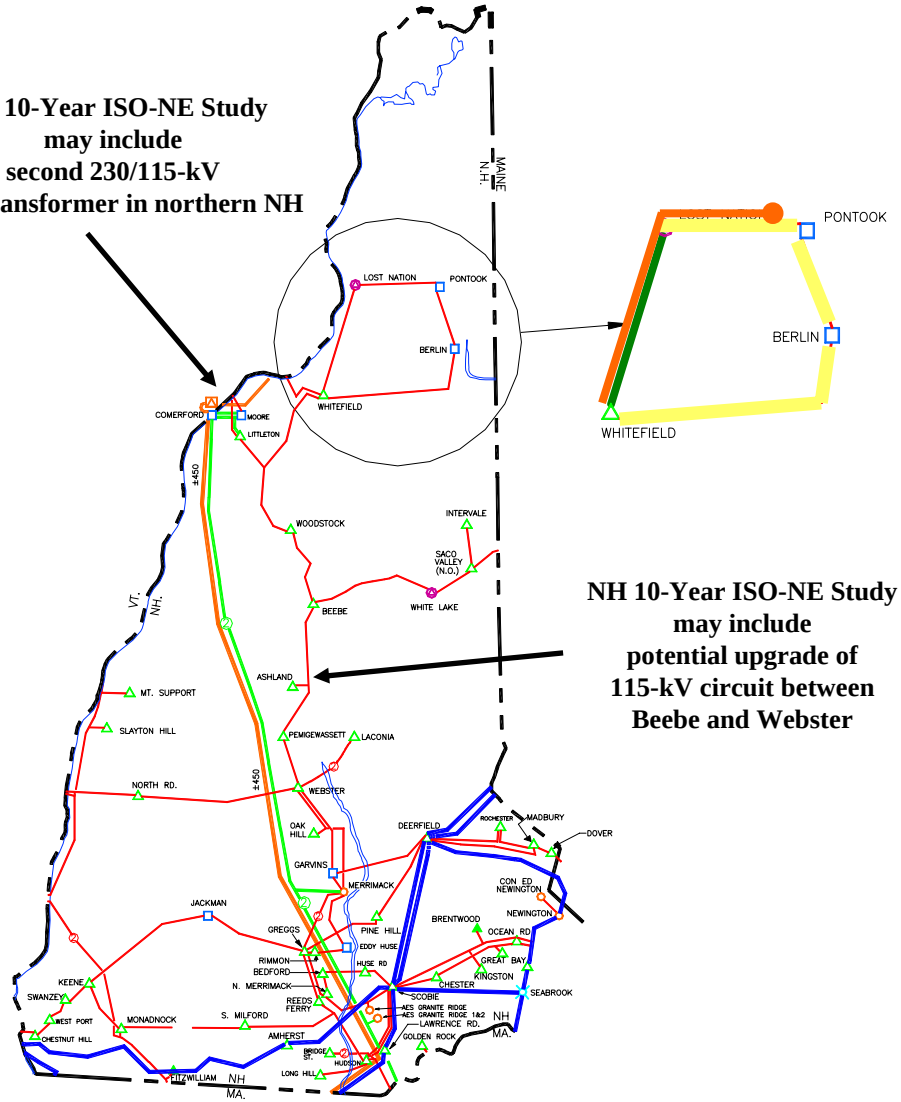


The Northern New Hampshire loop is defined by the 115-kV transmission facilities between the Whitefield, Berlin and the Lost Nation Substations

- Northern NH summer peak load = 70 MW (3% of NH peak)
- Northern NH generation = 70 MW (summer), consisting of hydro, biomass and jets
- Approximately 570 MW of northern NH generation in the current ISO-NE queue (queue order is critical)
  1. 100 MW wind
  2. 146 MW wind
  3. 34 MW wind
  4. 6 MW landfill
  5. 41 MW biomass
  6. 61 MW biomass
  7. 180 MW wind

System Upgrades for Additional Generation with Costs

NH 10-Year ISO-NE Study may include second 230/115-kV autotransformer in northern NH



NH 10-Year ISO-NE Study may include potential upgrade of 115-kV circuit between Beebe and Webster

MW	Cost of Upgrade or Addition	Comments
100	Approx. $20M (SIS studies being completed)	• Equipment upgrades at Littleton substation • New substation W-179 • Re-sag Northern 115-kV loop - yellow • Developer has filed with NH Site Evaluation Committee • Wind generation is first in the queue
300	$100-155M* * Subject to completion of NH 10-Year ISO-NE Study	• Voltage control devices (DVAR or STATCOM) may be required • **<u>Unit stability and thermal problems could limit the amount of generation that can be added</u>**

Interconnection and System Upgrade Costs

- Initial system upgrade estimates were $150M to $200M, new estimates are in the range of $125M - $155M.
- Subject to the conclusion of the NH 10-Year ISO-NE Study, there may be a reduction in the new cost estimate from $125M - $155M to $100M - $130M.

Note

- Cost estimates are “conceptual” as defined by PAC. Stability and thermal studies will determine the need for specialized control devices. Those costs are not included in these estimates.
- Stability and thermal limitations are likely to limit the amount of new generation that can be connected to 400MW or less.

Expansion Options with Preliminary Costs

1 - Rebuild the existing Littleton to Whitefield to Lost Nation to Dummer 115 kV line to a single pole double circuit 230/115 kV line. Rebuild the existing Beebe to Webster 115 kV line, resag the existing NGRID Dunbarton to Merrimack and North Litchfield to Tewksbury 230kV line. Install a 230/115 kV single phase auto (with spare unit) at Dummer. (NH route U199-X178). Approximate cost $145 M.

1A- Same as 1 except Q195 vs X178-U199. Approximate cost $135M.

2 - Same as 1A except replace existing Q195 and D142 with a 230 kV line. Approximate cost $125M.

3 - Same as 1 except terminate 230 kV line to Comerford rather than Littleton. Approximate cost $155M.

3A - Same as 1A except terminate 230 kV line to Comerford rather than Littleton. Approximate cost $145M.

4 - Same as 2 except terminate 230 kV line to Comerford rather than Littleton. Approximate cost $135M.

Note: Preliminary Cost estimates are in 2008 dollars

Potential Reduction to Transmission Upgrade Cost

- Reliability upgrades (up to $25M)
  - Beebe – Webster 115 kV line
  - 2nd Littleton autotransformer

- Other use of area ROW (up to $40M)

Note:

Combined reduction about $45M due to common facilities

Time Line

- NH 10-Year ISO-NE Study expected to be completed in 2Q 2009.
- PSNH conceptual interconnection results to be completed in 1Q-2Q 2009.