

The VELCO logo is displayed in a bold, white, sans-serif font. It is positioned on the left side of the top banner, which features a scenic background of rolling hills with autumn foliage and several transmission towers.

VERMONT'S TRANSMISSION RELIABILITY RESOURCE

Interconnecting Wind Generation in Northern Vermont

June 6, 2013

Overview of the interconnection process

- All generators >5 MW must follow ISO-NE's Large Generator Facility Interconnection Process to connect to NE's transmission system
- Process ensures new generation does not compromise grid reliability and stability, i.e., no significant adverse impact on system reliability
 - May require system upgrades and/or restrictions on the generator's output
- Generator submits Interconnection Request to ISO-NE specifying generator characteristics, location and type of interconnection
 - Types: Minimum Interconnection Standard (MIS) or Capacity Resource
- Most new generators pursue connection via MIS
 - MIS does not:
 - Allow the generator to be counted as a capacity resource
 - Compromise the reliability, operability or stability of the transmission system
 - Guarantee the generator unrestricted operation
 - Results in lower interconnection costs

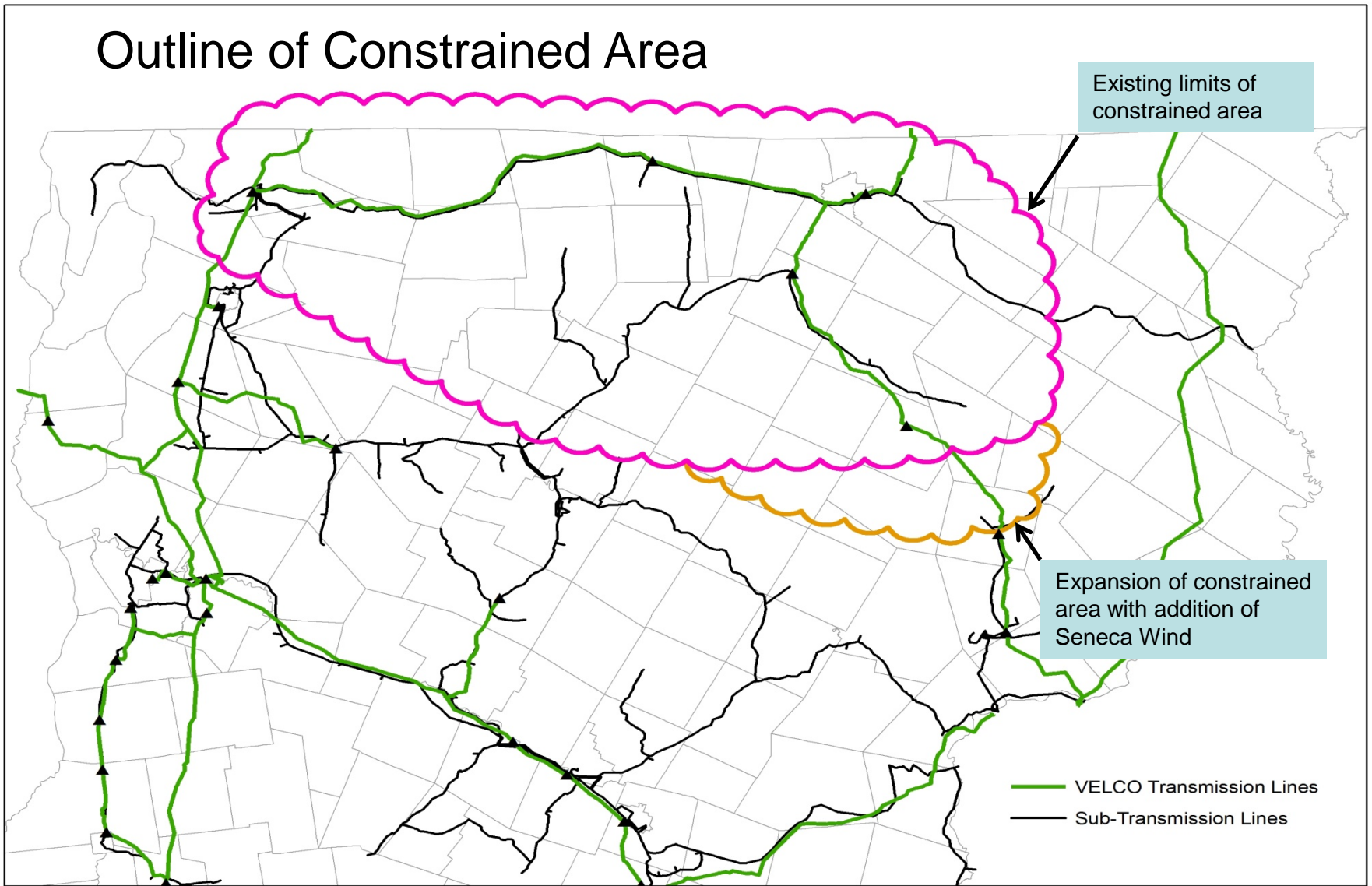
Overview of the interconnection process

- Process includes several sequential studies:
 - **Feasibility study:** high-level assessment of grid reliability impacts and grid reinforcements required to maintain reliability
 - **System Impact Study (SIS):** detailed analysis of generator's impact on grid reliability and upgrades needed to mitigate impacts.
 - **Facilities study:** optional study to identify the design details of the specific facilities needed to interconnect the generator
 - **Interconnection study:** optional study following the SIS to evaluate project impact in relation to other system factors, e.g., transmission line status and other generators. Additional evaluation of stability, power flow, voltage impacts and system protection issues.
- Interconnection Agreement documents grid reinforcements to be paid by applicant, schedule for their completion and operational requirements for the generator

Northern Vermont Transmission System

- Area of relatively small load — ~75 MW summer peak — served by 115 & 46 kV transmission lines
 - “Skinny system,” designed to serve this small load
- >140 MW of new generation installed since 2008
 - System still reliable yet now exports power to Vermont/New England
- Export limit varies based on multiple system parameters (e.g., voltage levels, reactive power requirements, etc.)
 - System occasionally reaches limit, i.e., system is constrained
 - To preserve reliability generators in northern Vermont have been curtailed
- In constrained areas (i.e., where transmission system cannot export all available generation), generation will compete for market access based on bid price; equal priced units curtailed on a pro rata basis and other market rules

Northern Vermont Transmission System



Potential impact of additional generation in northern Vermont

- New generation will be connected under Minimum Interconnection Standard requirements unless the generator requests a more robust interconnection
- Grid reinforcements required to interconnect new generation will maintain reliability and stability of the transmission system
- Unlikely these reinforcements will materially increase export capacity in northern VT
- If export capacity does not increase and more generation is added, additional curtailment of all generation in northern Vermont likely
- Significant adverse financial impact possible on existing and new generators in northern VT
- ISO will develop operating protocols to minimize curtailments
- Long-term solutions:
 - Site generation in more advantageous locations in VT
 - Reinforce transmission/subtransmission system to facilitate increased exports
 - Align public policy goals (e.g., RPS targets) with transmission pricing policy to realize public benefits