Merchant Transmission Update

vermont electric power company

VELCO

VSPC

April 26, 2017

Merchant transmission overview

- MA legislation requiring clean energy
- New England renewable picture
- Transmission cost recovery models
- VELCO guiding principles
- Project updates
  - Vermont Green Line (Anbaric/National Grid)
  - New England Clean Power Link (TDI)
  - Northern Pass (Eversource)
  - Granite State Clean Power Link (National Grid)

MA: comprehensive energy diversity

- On August 8, 2016, MA governor signed energy law in to effect
- Hydro RFP released March 31, 2017
- Solicits clean energy proposals
- Requires RFP for 1,600 MW of offshore wind by June 2017
- Electric distribution company (EDC) required to procure clean energy (National Grid and Eversource)
- Complex process involving many parties
  - Evaluation by multiple groups in each state
- MA Dept of Public Utilities (DPU) approval required for purchased power agreements submitted by EDCs; FERC OK needed for transmission tariffs

Southern New England renewable picture

- Aggressive carbon reduction goals

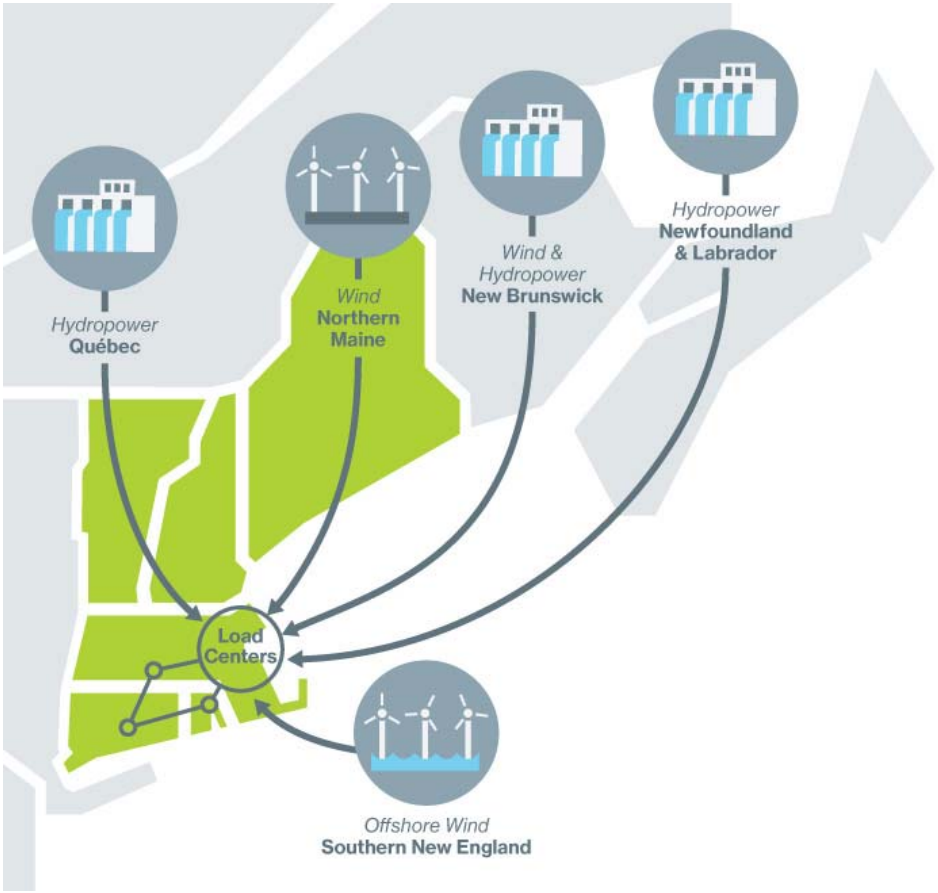
	2020*	2035*	2050*	RPS (2020)
CT	10	-	80	20
MA	25	-	80	15
RI	10	45	85	14.5
* % reduction in GHG (CO_2) emissions compared to 1990 levels				

- Meeting these targets with in-state resources will be difficult
  - Cape Wind's contracts with Eversource and NGrid cancelled in early 2015
- External resources are likely to play a significant role in meeting these targets

Merchant transmission investment challenge

- Pure merchant model (TDI-currently)
  - Costs recovered from customer through FERC-approved tariff
- Supplier pays model (HQ-Northern Pass)
  - Large supplier pays cost to construct transmission to provide access to market
  - HQ recovers costs through FERC-approved tariff

Developers Are Proposing to Move Renewable Energy to New England Load Centers



Map is representative of the types of projects announced for the region in recent years

- As of **January 1, 2017**, seventeen elective transmission projects had been proposed in the ISO Interconnection Queue, totaling more than **10,000 MW** of potential transfer capability, including:
  - **Large-scale hydro** resources from eastern Canada, and
  - **Onshore wind** resources from northern New England
- Projects seek to address public policy goals, not reliability needs
- In addition, **offshore wind** resources are emerging in southern New England

Source: ISO Interconnection Queue (January 2017)

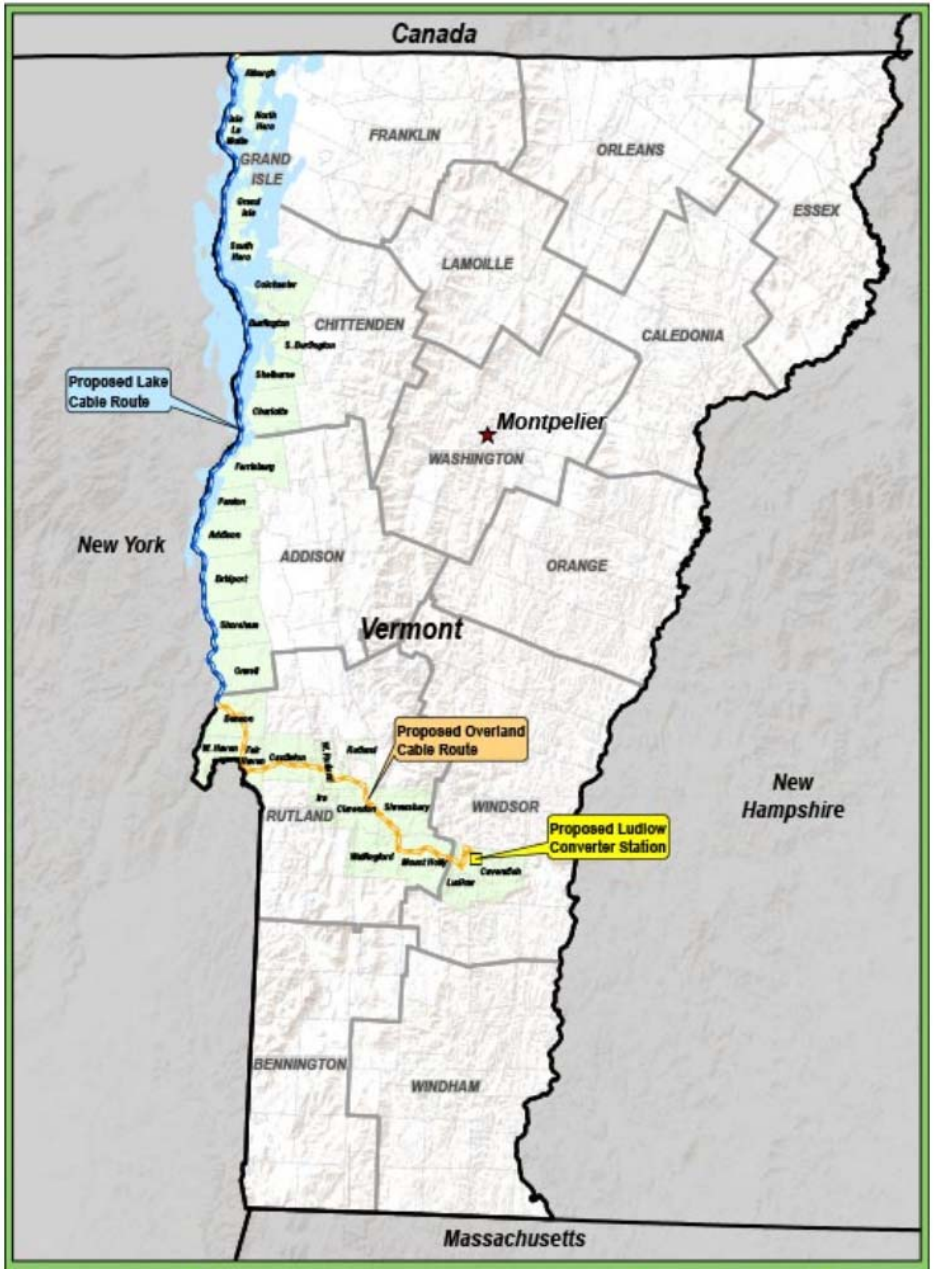
VELCO guiding principles

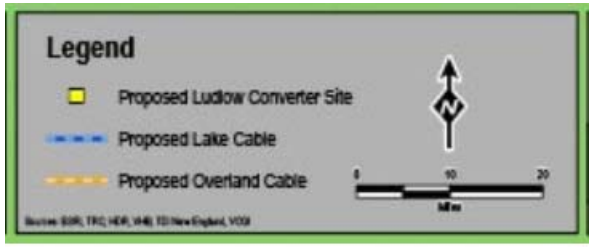
- Interconnecting TO: preserve reliability
- Preserve independence (FERC Standards of Conduct)
  - Consider multiple projects
- Maximize risk-adjusted value
  - Recover expenses, obtain revenue stream for customers
  - Provide services (e.g., ROW, engineering, O&M)
- Evaluate investment possibilities
  - Explore appropriate investment scenarios for general good of state of Vermont
  - Risk/reward parameters consistent with prudent utility practice

VT Clean Power Link (TDI)

- 1,000 MW—all underground
- Route: HQ—VELCO Coolidge substation
- System impact study (SIS) complete—extensive AC upgrades in VT (some in NH and MA)—but ongoing refinement
- All permits in hand (e.g., CPG, ACOE, Presidential Permit)
  - Note that VPSB conditioned CPG on satisfactory review of ISO SIS which remains in play
- Costs recovered through FERC tariff

TDI route


Canada
FRANKLIN
ORLEANS
GRAND ISLE
ESSEX
LAMOILLE
CHITTENDEN
CALEDONIA
Proposed Lake Cable Route
Montpelier
WASHINGTON
New York
ADDISON
ORANGE
Vermont
Proposed Overland Cable Route
New Hampshire
RUTLAND
WINDSOR
Proposed Ludlow Converter Station
BENNINGTON
WINDHAM
Massachusetts

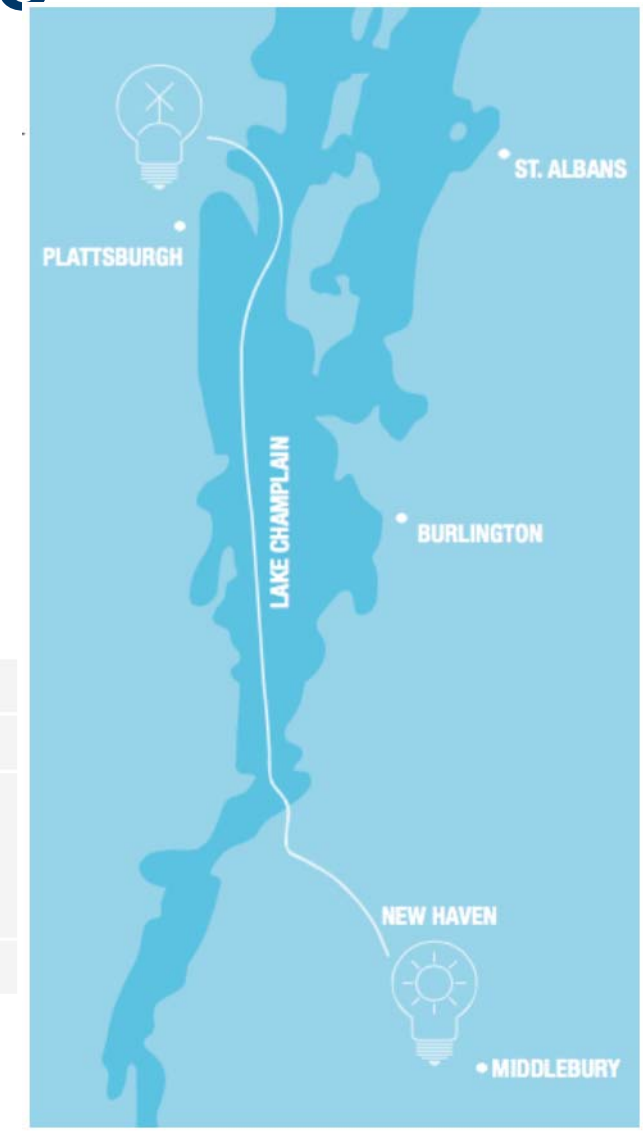

Legend
Proposed Ludlow Converter Site
Proposed Lake Cable
Proposed Overland Cable

Vermont Green Line (NGrid)

- 400 MW—all underground
- Route: Plattsburgh, NY to VELCO's New Haven, VT substation
- ISO-NE study (SIS) complete but being appealed—$100+M upgrades in VT
- §248 filed October 2016
- Suppliers: HQ (hydro), new wind in NY
- VELCO-Anbaric MOU (5/17/13)
  - Convert loan and expenses to equity or
  - Recover loan w/interest
  - Options to manage all phases of project (permitting to O&M)

Vermont Green Line route

DEVELOPERS	Anbaric & National Grid (Green Line Infrastructure Alliance)
PURPOSE	Clean, renewable and reliable electric transmission for New England
COMPONENTS	• ~6 miles of underground cable in NY • ~40 miles of sea cable under Lake Champlain • ~13 miles of underground cable in VT • Converter stations at each end of the cable to connect to the local electric grid
LOCAL INVESTMENTS	• Est. $600 million



Northern Pass (Eversource/HQ)

- 1,090 MW—overhead and underground
- Route: HQ—new substation in central NH
- SIS complete—AC upgrades in NH
- NH siting controversial
  - Resolution expected by fall 2017
- Suppliers: HQ (hydro), possibly a wind supplier
- Supplier pays model (HQ-Northern Pass)
  - Large supplier pays cost to construct transmission to provide access to market
  - HQ recovers costs through FERC-approved tariff

Northern Pass route

forward nhplan

- Delivery of 1,090 MW of clean, reliable hydropower to New Hampshire
- Increased underground route to 60 miles
- No view impacts in the White Mountain National Forest, Appalachian Trail and Franconia Notch areas
- Use of advanced cable technology with fewer, lower and streamlined structures

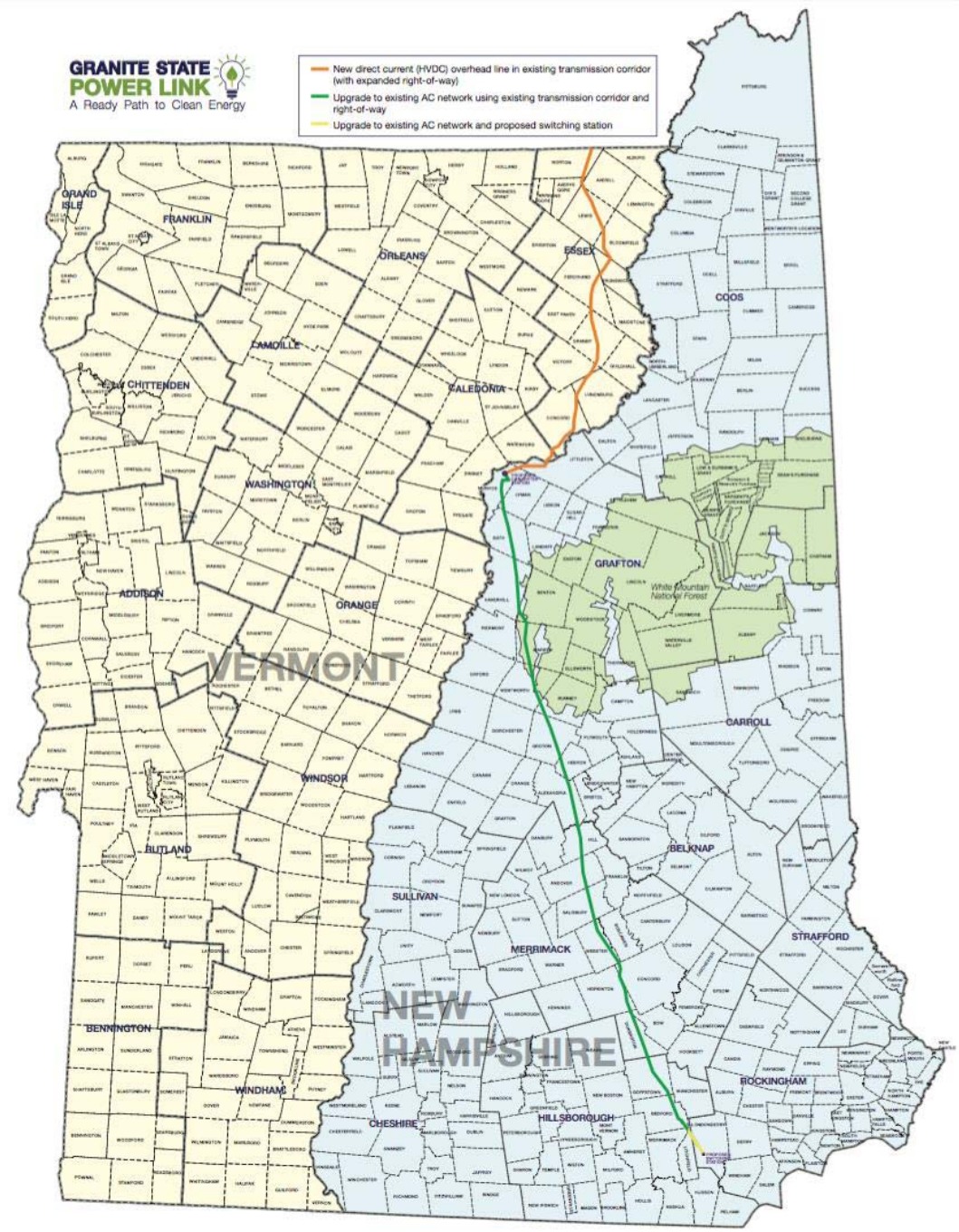
Proposed Overhead Route (132 miles)
Proposed Underground Route (60 miles)
Total miles: 192 miles
Proposed Converter Terminal
Existing Substation to be Upgraded

THE NORTHERN PASS℠

VELCO

Granite State Power Link (NGrid)

- 1,200 MW—overhead and underground
- Route: HQ—Norton, VT, to Monroe, NH, new HVDC line
  - Upgrade existing line Monroe, NH, to southern NH
  - Proposal would use VETCO ROW for 51 miles of underground DC transmission
- Interconnection request filed at ISO-NE in January 2017
- No state siting activity
- Suppliers: TBD
- Announced March 2017


GRANITE STATE
POWER LINK
A Ready Path to Clean Energy
New direct current (HVDC) overhead line in existing transmission corridor (with expanded right-of-way)
Upgrade to existing AC network using existing transmission corridor and right-of-way
Upgrade to existing AC network and proposed switching station
GRAND ISLE
FRANKLIN
ORLEANS
ESSEX
COOS
CAMOILLE
CHITTENDEN
CALEDONIA
WASHINGTON
GRAFTON
White Mountain National Forest
ADDISON
ORANGE
VERMONT
CARROLL
WINDSOR
RUTLAND
BELKNAP
SULLIVAN
MERRIMACK
STRAFFORD
NEW HAMPSHIRE
BENNINGTON
WINDHAM
ROCKINGHAM
CHESHIRE
HILLSBOROUGH

Status of state and ISO approvals

- TDI
  - Received VT certificate of public good for underground work
    - subject to securing CPG's for the above-ground work
  - ISO-NE: Studies completed, accepted all conditions in study and has approval from ISO-NE
- Vermont Green Line
  - Filed VT 248 application
  - ISO-NE: Studies completed, may challenge some aspects of study results at FERC, received approval from ISO-NE
- Northern Pass
  - Filed application and in hearings.
  - ISO-NE: studies completed & received approval from ISO-NE
- Granite State CPL
  - Interconnection request filed Jan 2017