Vermont Long-Range Transmission Plan— Review of VSPC Draft

February 19, 2015

OC meeting

MOVING **POWER**. MOVING **FORWARD**.

VT TRANSCO VELCO VETCO

Long Range Plan development timeline

Date	Milestone
Throughout 2014	Develop load forecast with VSPC, particularly the DPS and EVT
Summer 2014	Seek input from DUs on analysis required on sub-transmission system
Fall 2014	VSPC input on scope
1/6/2015	Issue draft for VSPC review
Jan-Feb 2015	VSPC input period on the plan
Feb 2015	Incorporate VSPC input
3/20/2015	Issue public review draft
3/20/15 – 5/30/15	Public input period
4/8 & 4/15/2015	Hold public meetings
6/1/15 - 6/30/15	Incorporate public input
7/1/15	Submit final plan to PSB

We're here

Objectives

- Review Plan highlights
- Seek input from the OC
  - Review lead and affected utility designations

Major developments since the last VT Plan

- VY retired this year
- Load levels projected to be significantly lower
  - Significant contributions from small-scale renewable generation, mostly solar
    - Plan discusses operational effects of high PV penetration
  - New forecast also includes potential effects of electric vehicles and high-efficiency cold-weather heat pumps
- ISO-NE studies indicate postponement of several previously proposed upgrades
  - Central Vermont upgrade in Rutland area
  - Southeast Vermont upgrade in Vernon area
  - Northern Vermont upgrade in Milton area
- Some substation and subtransmission upgrades associated with DU system reliability may be needed

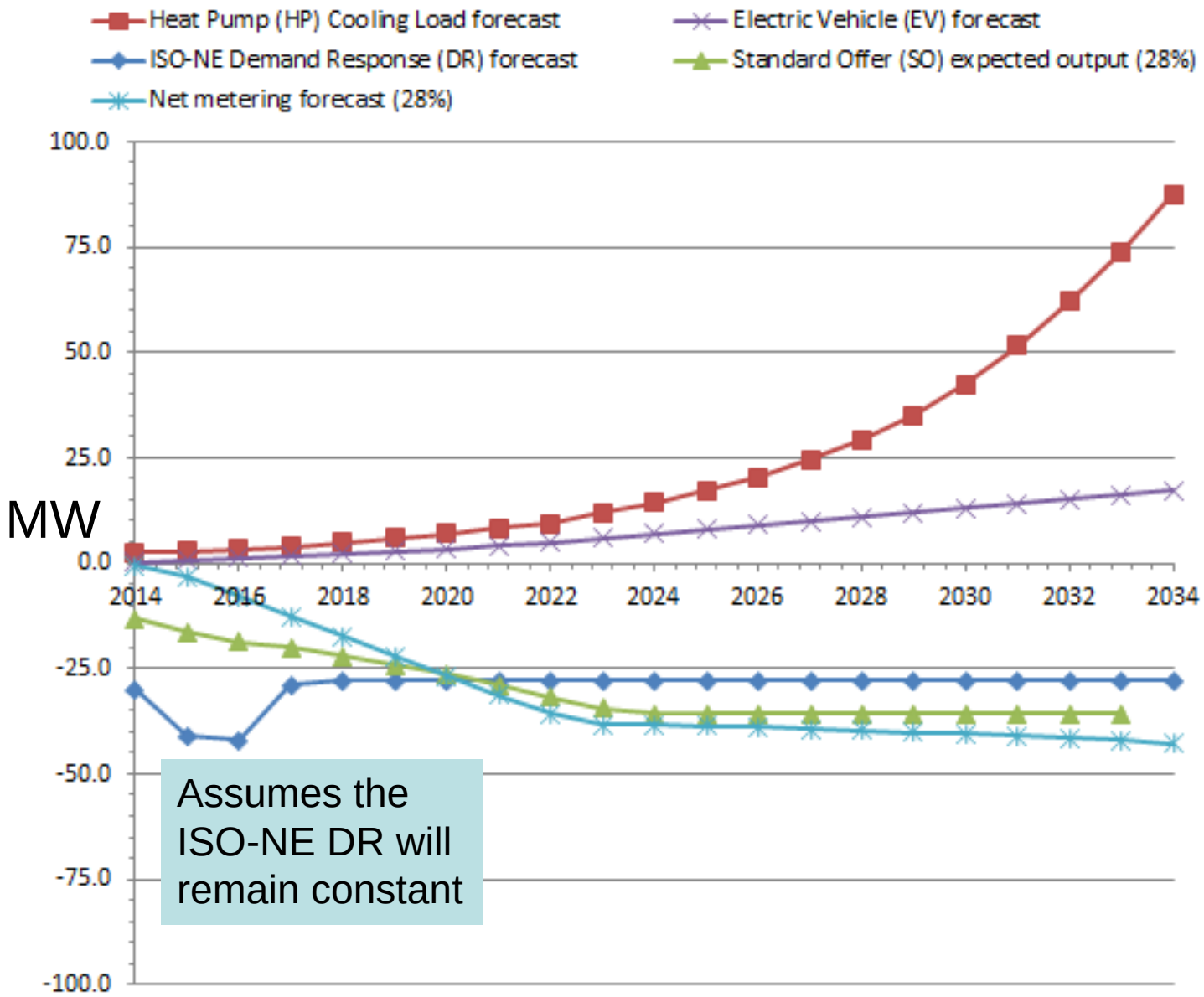
Plan highlights

- Future studies will be based on a new NERC standard
  - New NERC TPL standard effective on Jan. 1, 2016
  - New standard requires more analysis and may result in upgrades
- Plan covers only load-serving reliability concerns
  - System impacts related to generation interconnections and elective transmission are not covered
- Power industry is concerned about reduction in frequency response, fuel diversity, and operability challenges introduced by intermittent generation
- VT system has become even more dependent on transmission following VY retirement

Plan highlights (continued)

- Electric grid undergoing rapid transformation
  - Transmission competition introduced by FERC Order 1000
  - Massive retirement of base load generation
  - Accelerating penetration of intermittent generation
    - Small-scale intermittent generation is particularly challenging
- Understanding of load behavior is evolving
  - Post-recession load behavior different from pre-recession
  - Relationship between economic growth and electric demand has changed—like link between economy and wages
  - Need to untangle the effects of weather, EE, economy, small-scale renewables
- Long-term forecasts have become more uncertain
  - The load forecast has a concave shape—declining, then rising, stable for 13 years before exceeding year 1 load level

Separate forecast generated for these items



Assumes the ISO-NE DR will remain constant

New Item: uses the GMP high HP forecast

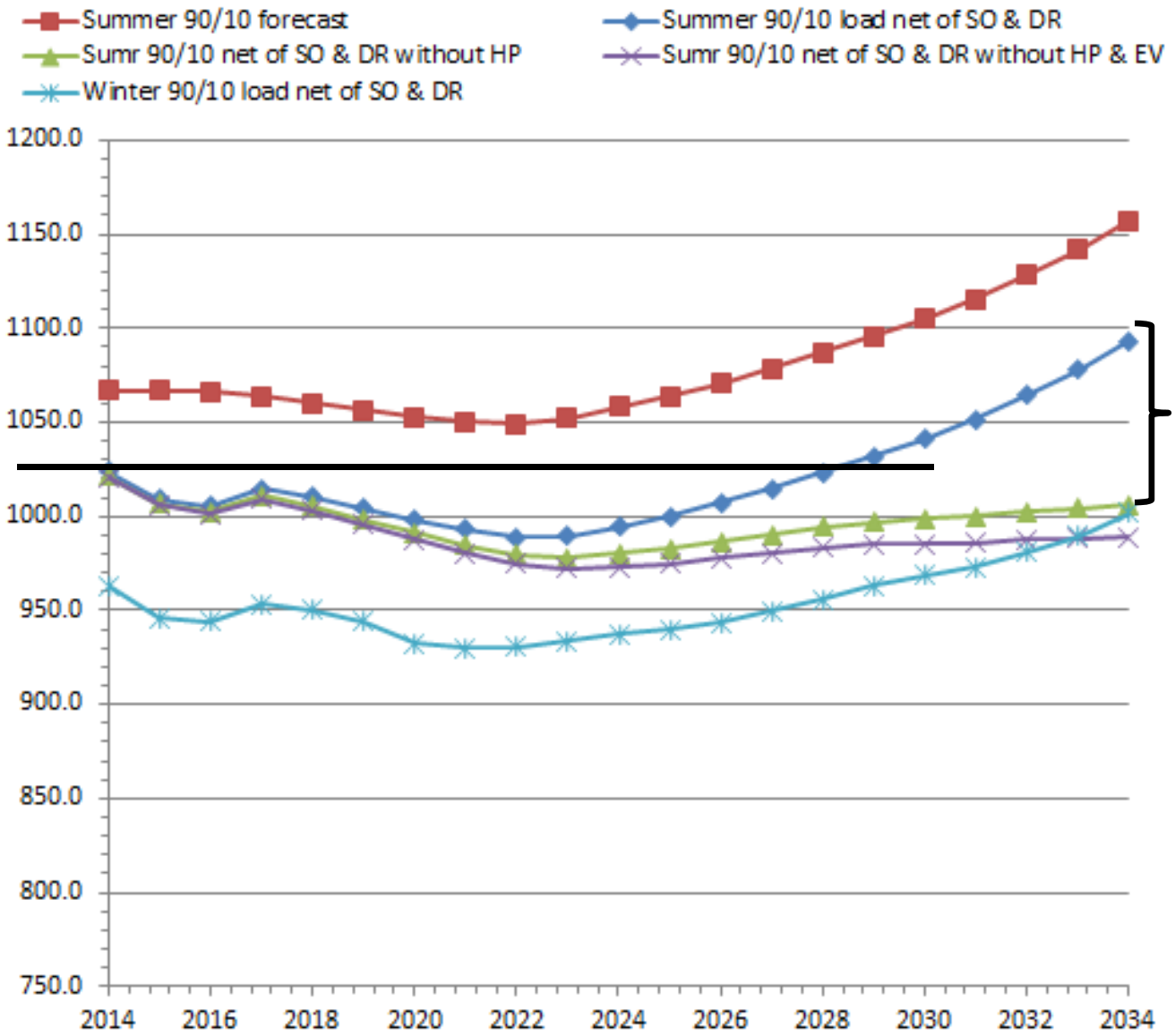
New Item: uses VEIC, Navigant and other data for EV

New Item: captures recently instituted 15% net metering cap

Assumes Standard Offer program will end

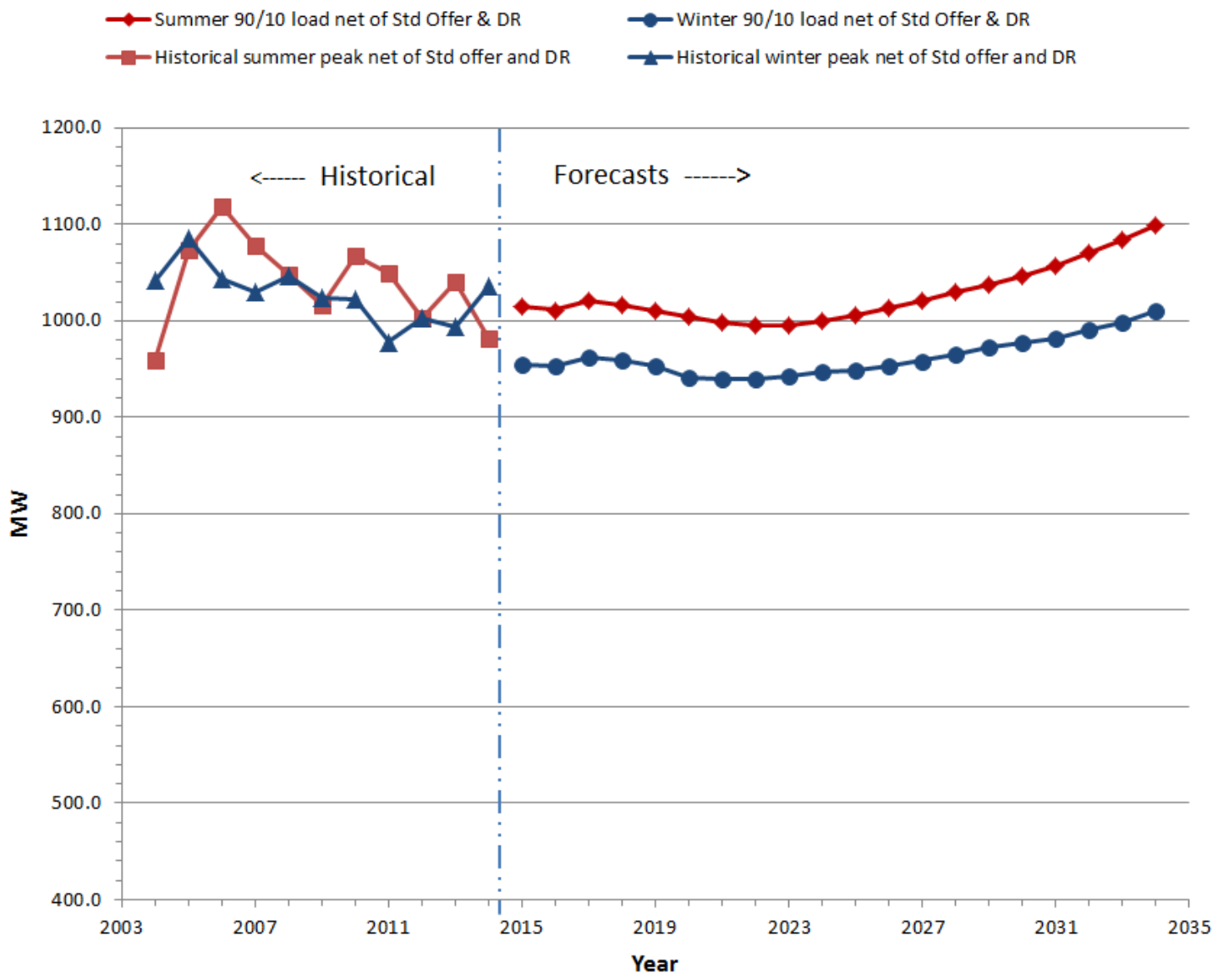
Twenty-year load forecast (high uncertainty 20 years out) —system impacts beyond 10 years do not require NTA

Heat pumps get us back to year 1 loads in 13 years

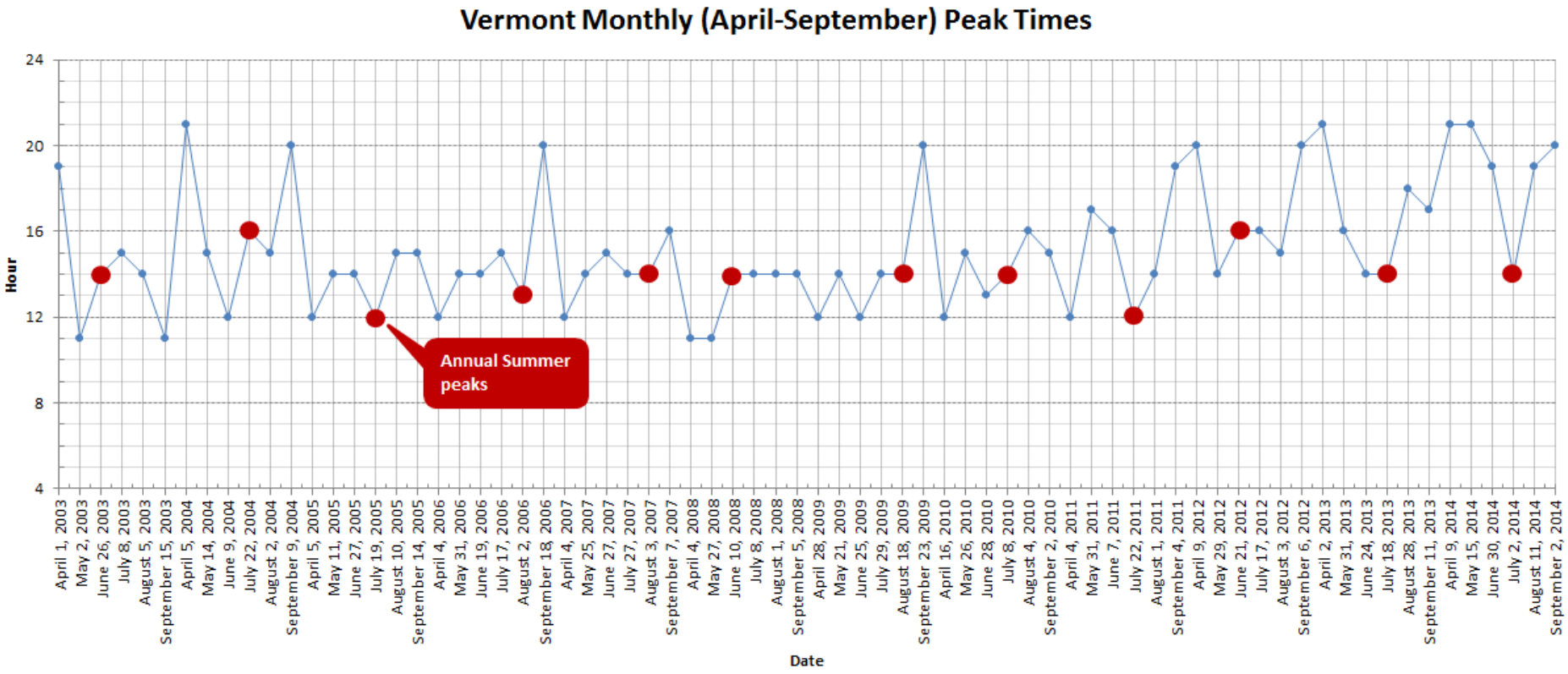


87MW delta based on high case

Load forecasts tested in long-range plan analysis



Summer monthly peaks beginning to occur later



- Later monthly peaks observed starting in 2012
- In 2014, May, June and August peaked after 6 PM for first time ever
- System studies and demand management programs need to consider changes in timing of monthly peaks

Bulk system results summary

Summary of Bulk System Regional Grouping & Transmission Solutions	Proposed Lead & Affected Distribution Utilities	Estimated Transmission Project Cost & (VT Share)[13]	Screened In or Out of Full NTA Analysis
Connecticut River Valley • Rebuild Coolidge-Ascutney 115 kV line and 46 kV lines • Rebuild the Chelsea substation • Split the Hartford capacitor bank into two smaller capacitor banks • Install a +50/-25 MVAr SVC at Ascutney.	*Lead*: GMP Affected: All VT	$138M ($10M)	Out
Central Vermont • Rebuild Coolidge-Cold River 115 kV line.	*Lead*: GMP *Affected*: All VT	$75M ($3M)	Out

Connecticut River Area

Location	Connecticut River area	
Analysis	Coolidge to Ascutney overload and subsystem overloads. Low and high voltages, as well as voltage collapse.	
When deficiency occurs	Line overloads and voltage concerns for a single contingency (N-1 conditions) and two succeeding contingencies (N-1-1.)	
Critical load level & timing of need[13]	**Coolidge-Ascutney capacity**	
	Critical load level	940 MW
	Year of need	2021
	Coolidge-Ascutney asset condition	
	Critical load level	N/A
	Year of need	2017
	Voltage concerns	
	Critical load level	775 MW
	Year of need	In the past

Connecticut River Area (continued)

Leading transmission solution	Rebuild 115 kV line and 46 kV lines, rebuild the Chelsea substation, split the Hartford capacitor bank into two smaller capacitor banks, and install a +50/-25 MVAr SVC at Ascutney. Estimated cost: $138M. The Vermont share of this cost will be approximately $10M, assuming most of the project is classified as a pool transmission facility.
In service date	2017
Status	ISO-NE Needs Assessment and Solution Assessment have been completed. VELCO NTA screening analysis has been completed. ISO-NE has approved the proposed plan applications per section I.3.9 of the ISO-NE Tariff. VELCO is currently preparing documents for the section 248 filing.
Proposed affected & lead utilities	**Lead utility:** GMP **Affected utilities:** All Vermont DUs
NTA screening	**Screens out of full NTA analysis**

Central Vermont Area

LOCATION	CENTRAL VERMONT AREA	
Analysis	Coolidge to Cold River overload. No voltage concerns assuming the Connecticut River up-grades are completed.	
When deficiency occurs	Line overloads when more than one element is out of service (N-1-1 condition).	
Critical load level & timing of need	Critical load level Year of need	1030 MW 2028. Predicting loads below the critical need level until 2028.[14]
Leading transmis-sion solution	Rebuild 115 kV line. Estimated cost: $75M.	
In service date	2028	
Status	On hold. The need will be reevaluated as part of the next long range plan in 2018.	
Proposed affect-ed & lead utilities	**Lead utility:** GMP **Affected utilities:** All Vermont DUs	
NTA screening	**Screens out of full NTA analysis**	

Predominantly bulk system results summary

Summary of Predominantly bulk system solutions	Proposed lead & affected distribution utilities	Estimated project cost	Screened in or out of full NTA analysis
Rutland Area (Blissville, North Rutland, Cold River) • Closure of the West Rutland 46 kV tie • Rebuild of 46 kV lines • Addition of 46 kV capacitor banks • Potential installation of West Rutland 115/46 kV transformer	*Lead*: GMP Affected: GMP	$##M for 46 kV upgrades $8M for transformer	In
Northern Area (Jay, Newport, Irasburg, Burton Hill) • Burton Hill 46 kV capacitor banks • Moshers Tap station	*Lead*: VEC *Affected*: VEC, Barton, Orleans	$3M for cap banks $12M for station	Undetermined

Rutland area

LOCATION	RUTLAND AREA (BLISSVILLE, NORTH RUTLAND, COLD RIVER)	
Analysis	Low voltages and overloads.	
When deficiency occurs	Overloads will occur when one element is out of service (N-1 conditions.) This is a predominantly bulk system deficiency that affects the sub-transmission system.	
Critical load level & timing of need	Critical load level Year of need	1000 MW Past
Leading transmission solution	Addition of 46 kV capacitor banks, closure of the West Rutland 46 kV tie, and the rebuild of 46 kV lines at an estimated cost of at least $####M, based on the current scope. Depending on redundancy requirements, a new 115/46 kV transformer may be added at West Rutland at an estimate cost of $###M.	
In service date	Summer 2015 (assuming typical design, public outreach, permitting and construction process timing) subject to additional analysis by GMP.	
Status	Transmission and non-transmission alternatives are being evaluated by GMP.	
Proposed affected & lead utilities	**Lead utility:** GMP **Affected utilities:** GMP	
NTA screening	**Screens in of full NTA analysis**	
Equivalency	The reliability deficiencies in the Rutland area occur as a result of a single outage event. A non-transmission solution would need to be on line at or above a VT load level of 1000 MW and be located on the 46 kV system near the North Rutland and Cold River substations.	

Northern area

LOCATION	NORTHERN AREA (JAY, NEWPORT, IRASBURG, BURTON HILL)	
Analysis	Low voltages in the northern subarea.	
When deficiency occurs	Low voltages will occur when one element is out of service (N-1 conditions.) This is a predominantly bulk deficiency that affects the sub-transmission system.	
Critical load level & timing of need	Critical load level Year of need	Undetermined Highly dependent on the status and amount of a single large customer's load. Load levels elsewhere in the northern part of the VEC system, such as the Jay ski resort, can also affect the timing.
Preferred transmission solution	Addition of 46 kV capacitor banks. Upgrade of the Moshers Tap. These upgrades will be completed in stages as the load continues to grow. **Estimated costs:** Burton Hill 46 kV capacitor banks $3M Moshers Tap upgrade $3M	
In service date	Unknown at this time.	
Status	Analyses continue to be performed to take into account any changes in load predictions and other factors.	
Proposed affected & lead utilities	**Lead utility:** VEC **Affected utilities:** VEC, Barton, and Orleans	
NTA screening	*Undetermined. Could not reach a definitive conclusion since the timing is undetermined.*	

Subsystem results

SUB-TRANSMISSION POTENTIAL RELIABILITY ISSUES GROUPED BY LOCATION							
Location	Year Needed (Projects need-ed in past listed as 2015 in this table)	90/10 Load Forecast for Year (MW)	Contingency	Reliability Concern	N-1 Criteria Violation	Affected DUs	Lead DU
Hartford	2015	<1030	Subtransmission	Thermal	Rvegate – Wells River – Woodsville	GMP	GMP
Hartford	2015	<1030	Subtransmission	Low voltage	Rvegate – Hartford	GMP	GMP
Chelsea	2015	<1030	Transmission	Low Voltage	Chelsea area	GMP	GMP
Chelsea / Hartford	2015	<1030	Transmission	Voltage collapse	Chelsea and Hartford areas	GMP	GMP
Ascutney	2015	<1030	Subtransmission	Low Voltage	Lafayette – Bellows Falls	GMP / PSNH	GMP
Ascutney	2015	<1030	Subtransmission	Thermal	Bellows Falls – Vilas2	GMP / PSNH	GMP
Ascutney	2015	<1030	Transformer Subtransmission	Thermal	Ascutney - Highbridge – Lafayette	GMP / PSNH	GMP
Ascutney	2015	<1030	Transformer Subtransmission	Thermal	Lafayette – Maple Ave – Claremont – Joy	GMP / PSNH	GMP
Blissville	2015	<1030	Transformer	Low Voltage	Blissville area	GMP	GMP
Blissville	2015	<1030	Transformer	Thermal	North Rutland – West Rutland	GMP	GMP
Blissville	2015	<1030	Transformer	Thermal	West Rutland - Castle-ton - Hydeville - Bliss-ville	GMP	GMP
Rutland	2015	<1030	Transformer	Thermal	North Rutland	GMP	GMP
Rutland	2015	<1030	Transformer	Thermal	West Rutland - Proctor - Florence	GMP	GMP

Subsystem results, continued

SUB-TRANSMISSION POTENTIAL RELIABILITY ISSUES GROUPED BY LOCATION							
Location	Year Needed (Projects needed in past listed as 2015 in this table)	90/10 Load Forecast for Year (MW)	Contingency	Reliability Concern	N-1 Criteria Violation	Affected DUs	Lead DU
Montpelier	2015	<1030	Subtransmission	Low Voltage	Rvegate / Newbury	GMP	GMP
Montpelier	2015	<1030	Transformer Subtransmission	Thermal	Berlin - Mountain View Tap	GMP	GMP
Montpelier	2015	<1030	Subtransmission	Voltage collapse	South End / Webster-ville / Legare	GMP	GMP
Montpelier	2015	<1030	Subtransmission	Thermal	Legare – Mt Knox – Websterville	GMP	GMP
Montpelier	2015	<1030	Subtransmission	Low Voltage	Moretown – Irasville - Madbush	GMP / WEC	GMP
Montpelier	2015	<1030	Subtransmission	Thermal	Montpelier – W Berlin – Northfield	GMP / WEC	GMP
Burlington	2015	<1030	Transformer Subtransmission	Thermal	Gorge – McNeil	GMP / BED	GMP
Newport	2015	<1030	Transformer	Low Voltage *	Irasburg – Portland Pipe	VEC / Barton / Orleans	VEC
Newport	2015	<1030	Transmission	Voltage Collapse *	Newport area	VEC / Barton / Orleans / WEC / GMP	VEC
St Johnsbury	2015	<1030	Subtransmission	Low Voltage	Comerford – Bay Street	GMP	GMP
St Johnsbury	2015	<1030	Subtransmission	Thermal	Comerford – Gilman	GMP	GMP

* No concerns were identified with the Itron winter load forecast; however, low voltages and voltage collapse can occur with higher winter load levels in the Newport load zone, particularly at a large customer's site, which is currently inactive, but may reconnect the load.

Distribution utility input

- Much pre-drafting collaboration with lead utilities
  - Direct
  - Through VSPC Forecasting Subcommittee
- **Need review and comment from DUs (and all VSPC) this month**
- Participation in public outreach desired

Next steps

- Complete VSPC feedback process (3/6/2015)
- Issue public draft 3/20/2015
- Conduct outreach—April-May
  - Web site with comment feature
  - Public meetings in Montpelier (4/15) and Rutland (4/8) advertised statewide
  - Offers to Regional Planning Commissions to go to them with presentation
  - Invitations to local energy committees to attend RPC presentations
- Compile public input
- Issue final report (7/1/2015)