

The VELCO logo is displayed in a bold, white, sans-serif font. It is positioned in the upper left corner of the slide, set against a background image of a Vermont landscape with rolling hills and power lines.

VERMONT'S TRANSMISSION RELIABILITY RESOURCE

Vermont Long Range Plan Sub-transmission Upgrades

Operating Committee Update

July 19, 2012

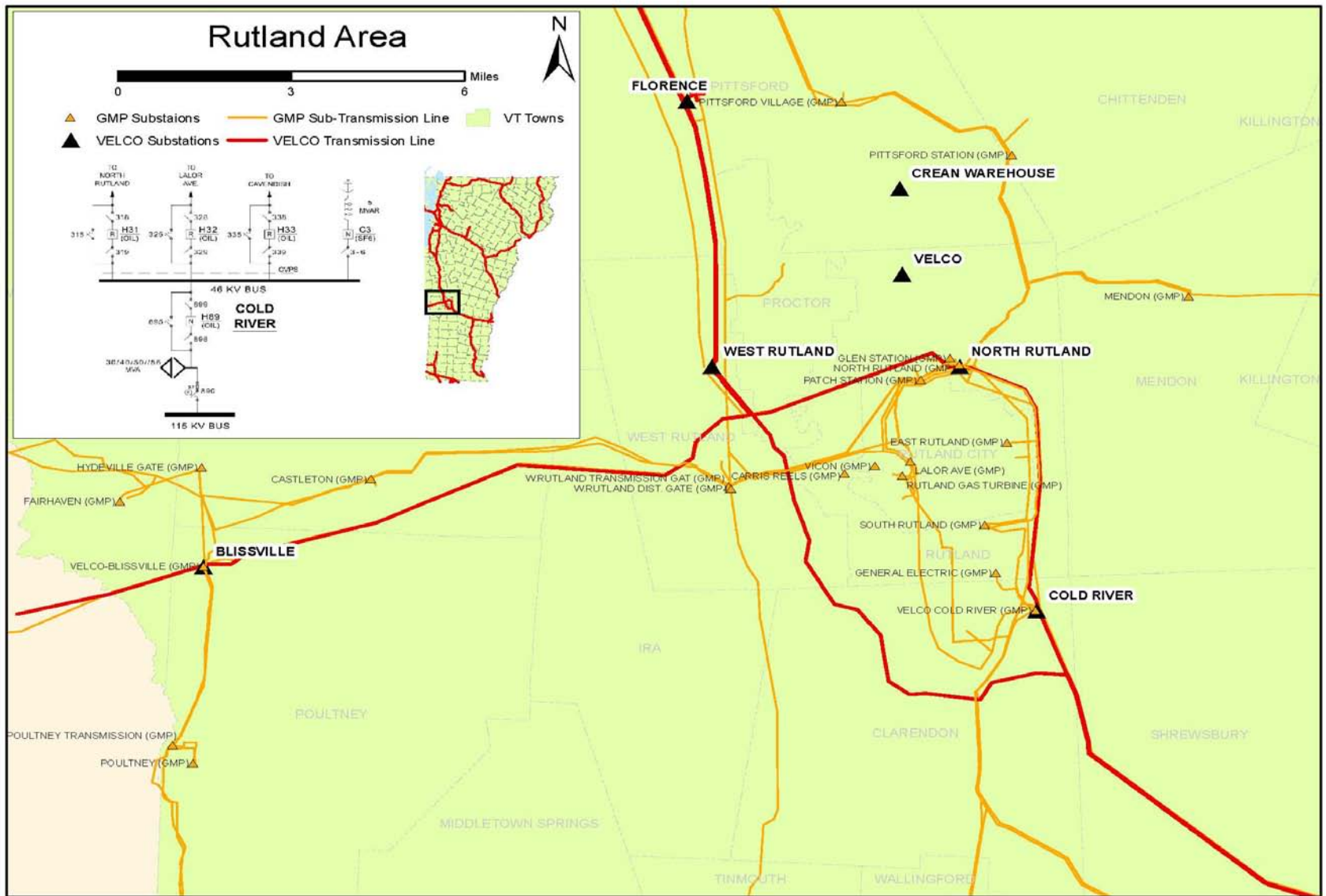
Colchester Area

Analysis	Low voltages and overloads on the sub-transmission system under N-1 conditions	
When deficiency occurs	Loss of the East Ave X36 115-34.5kV transformer or loss of the East Ave to McNeil 34.5 kV line overloads McNeil/Lime Kiln 3307 34.5 kV line.	
Critical load level & timing of need	Critical load level: Year of need:	850 MW Past
Leading transmission solution	Upgrade the 3307 34.5 kV line Lime Kiln to McNeil and install 34.5 kV capacitor banks along 3321 line Estimated cost: \$1M (provided by GMP)	
In service date	Summer 2015 (assuming typical design, public outreach, permitting and construction process timing).	
Status	Transmission and non-transmission alternatives will be evaluated by GMP.	
Proposed affected & lead utilities	Lead utility: Affected utilities:	GMP GMP and BED
NTA screening	<p><i>Q 1: Is the proposed project's cost expected to exceed \$2,000,000? A 1: No</i></p> <p><i>Q 2: Could elimination or deferral of all or part of the upgrade be accomplished through the use of non-transmission alternatives? A 2: Not applicable. Screened out in Q 1.</i></p> <p><i>Q 3: Is the likely reduction in costs from the potential elimination or deferral of all or part of the upgrade greater than \$1,000,000? A 3: Not applicable. Screened out in Q 1.</i></p>	
Equivalency	The reliability deficiencies in the Colchester region occur as a result of a single outage event. A non-transmission solution would need to be in service during all hours where the load level exceeds the critical load level. In this case, the non-transmission solution would need to be on line when the Vermont load is at or above 850 MW. A non-transmission solution would need to be located on the 34.5 kV system near McNeil.	

Rutland Area (Blissville, North Rutland, Cold River)

Analysis	Low voltages and overloads on the sub-transmission system under N-1 conditions	
When deficiency occurs	Loss of a 115-46kV transformer at Blissville, North Rutland or Cold River overloads the North Rutland or Cold River transformer.	
Critical load level & timing of need	Critical load level: Year of need:	1000 MW Past
Leading transmission solution	Install a 115/46 kV transformer at VELCO West Rutland substation and 46 kV capacitor banks in Poultney/Pawlet/Dorset area and rebuild parts of 46 kV lines from GMP West Rutland to North Rutland and Florence to GMP West Rutland stations. Estimated cost: at least \$35M	
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. This project is after the interconnection of Grandpas Knob Wind in the ISO queue increasing the cost considerably. VELCO has evaluated the proposed solution and found that the addition of the West Rutland transformer introduces a new system deficiency at Florence for loss of the H84 115-46 kV transformer and has proposed an alternative new South Rutland 115-46 kV station. VELCO provided a summary of the analysis and updated cost estimates for alternatives to GMP.	
Proposed affected & lead utilities	Lead utility: Affected utilities:	GMP GMP
NTA screening	<p><i>Q 1: Is the proposed project's cost expected to exceed \$2,000,000? A 1: Yes</i></p> <p><i>Q 2: Could elimination or deferral of all or part of the upgrade be accomplished through the use of non-transmission alternatives? A 2: Yes.</i></p> <p><i>Q 3: Is the likely reduction in costs from the potential elimination or deferral of all or part of the upgrade greater than \$1,000,000? A 3: Yes. A non-transmission alternative may be a hybrid solution that includes capacitor bank installations on the 46 kV system to address low voltages, particularly as a result of the Blissville transformer outage.</i></p>	
Equivalency	The reliability deficiencies in the Rutland area region occur as a result of a single outage event. A non-transmission solution would need to be on line at or above a Vermont load level of 1000 MW and be located on the 46 kV system near the North Rutland and Cold River substations.	

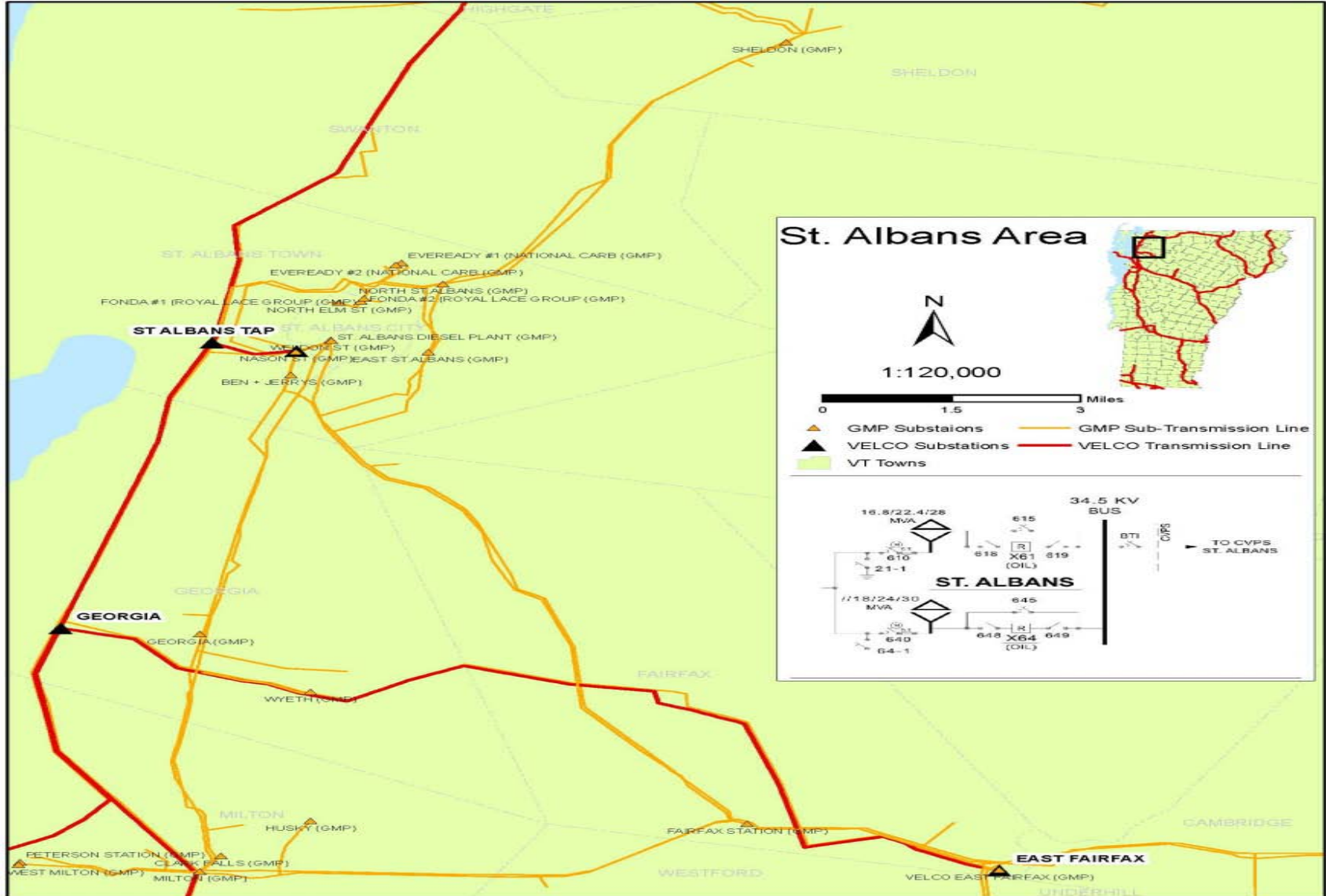
Rutland Area



St. Albans/East Fairfax Area

Analysis	Low voltages and overloads on the sub-transmission system under N-1 conditions	
When deficiency occurs	Loss of either 115-34.5kV transformer at St. Albans or E. Fairfax or loss of K42 or 800 line overloads 34.5 kV lines out of St. Albans or E. Fairfax	
Critical load level & timing of need	Critical load level: Year of need:	700 MW Past
Preferred transmission solution	The installation of a 115/34.5 kV transformer at the Georgia substation and reconductoring 34.5kV lines out of Georgia. Estimated cost: \$5.1 Million (including \$3 Million for line reconductoring and \$2.1 Million for the transformer)	
In service date	Summer 2014 (assuming typical design, public outreach, permitting and construction process timing).	
Status	Transmission alternatives were evaluated as part of the CVPS transmission study, and this solution was selected as the preferred transmission solution. Georgia substation (w/out transformer) under construction; VELCO has an ISO approved Proposed Plan Application for the Georgia transformer. Project to install transformer not initiated.	
Proposed affected & lead utilities	Lead utility: Affected utilities:	GMP GMP and VEC
NTA screening	A full NTA analysis was completed by CVPS; the analysis indicated that non-transmission alternatives are not viable;	
Equivalency	The reliability deficiencies in the St Albans/East Fairfax region occur as a result of a single outage event. A non-transmission solution would need to be in service during all hours where the load level exceeds the critical load level. In this case, the non-transmission solution would need to be on line when the Vermont load is at or above 700 MW. A non-transmission solution would need to be located on the 34.5 kV system near St Albans.	

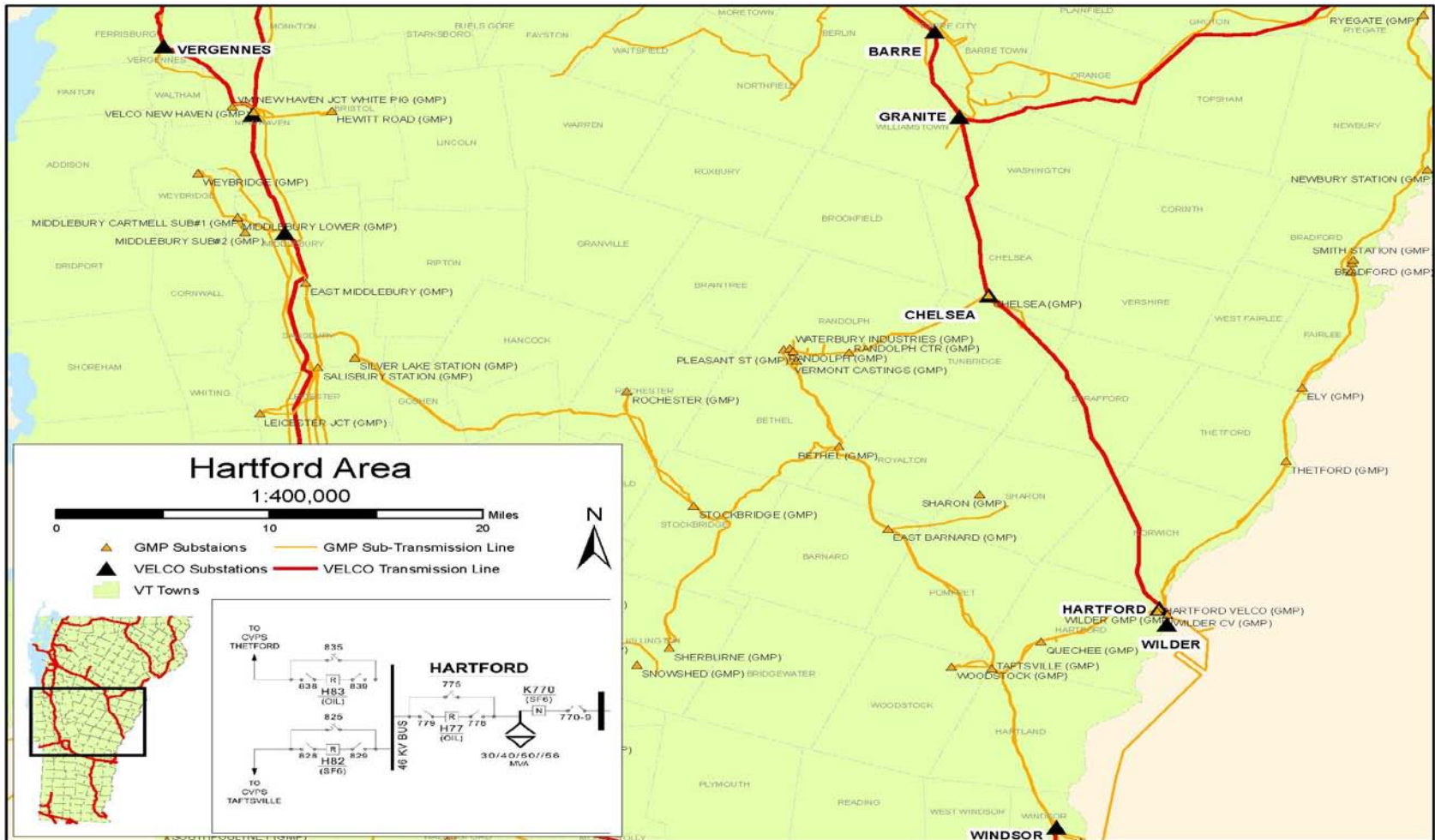
St. Albans Area



Hartford Area (Hartford, Chelsea)

Analysis	Low voltages on the sub-transmission system in the Hartford subarea for N-1 conditions	
When deficiency occurs	Loss of the Hartford H77 115-46kV transformer or a Hartford K50 line Breaker Failure removes Hartford sources and causes low voltages around Hartford area (Taftsville/Woodstock/Quechee)	
Critical load level & timing of need	Critical load level: Year of need:	1000 MW Past
Leading transmission solution	The installation of a 115/46 kV transformer at the Hartford substation. Estimated cost: \$20M	
In service date	Summer 2015 (assuming typical design, public outreach, permitting and construction process timing)	
Status	Transmission and non-transmission alternatives are being evaluated by GMP. No further action has been taken by VELCO	
Proposed affected & lead utilities	Lead utility: GMP Affected Utilities: GMP	
NTA screening	<p><i>Q 1: Is the proposed project's cost expected to exceed \$2,000,000? A 1: Yes</i></p> <p><i>Q 2: Could elimination or deferral of all or part of the upgrade be accomplished through the use of non-transmission alternatives? A 2: Yes</i></p> <p><i>Q 3: Is the likely reduction in costs from the potential elimination or deferral of all or part of the upgrade greater than \$1,000,000? A 3: Yes</i></p>	
Equivalency	The reliability deficiencies in the Hartford region occur as a result of a single outage event. The non-transmission solution would need to be on line at or above a Vermont load level of 1000 MW and located on the 46 kV system between the Hartford and Bradford substations, and between Silverlake and Hartford.	

Hartford Area



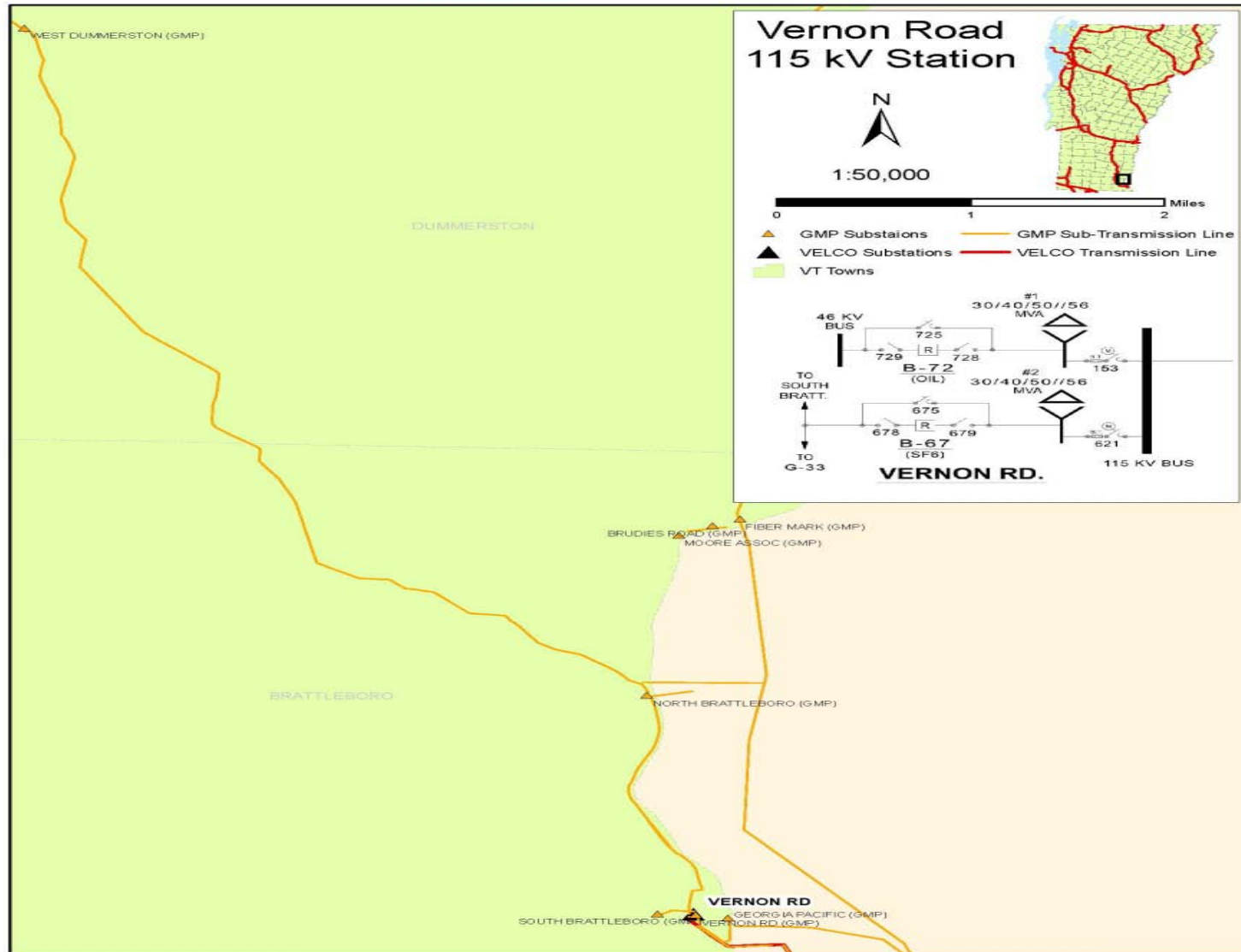
Northern Area (Highgate, Jay, Newport, Irasburg, Burton Hill)

Analysis	Low voltages on the sub-transmission system in the northern subarea for N-1 conditions	
When deficiency occurs	Loss of source at Newport (either the Stanstead line from HQ or the Newport T2 transformer) causes low voltages around Newport (Newport/Island Pond/Barton/etc.)	
Critical load level & timing of need	Critical load level Years of need: Burton Hill 46 kV capacitors Newport Station upgrade Irasburg transformer upgrade Moshers Tap upgrade	1000 MW Past 2014 2016 2022
Preferred transmission solution	The upgrade of the Newport 115/46 kV station to supply the load when the Stanstead line is out of service. Addition of 46 kV capacitor banks. Upgrade of the Irasburg transformer and the Moshers Tap to supply additional loads. These upgrades will be completed in stages as the load continues to grow. Estimated costs: \$19M (Burton Hill/Newport/Irasburg/Moshers respectively: \$3M/\$7M/\$6M/\$3M)	
In service date	Completed in stages, starting as early as 2013.	
Status	Studies of transmission and non-transmission alternatives have been completed. However, analyses continue to be performed to take into account changes in load predictions and other factors. VELCO confirmed the 2012 need for a capacitor at Burton Hill; VEC requested more time to evaluate alternatives such as power factor correction on the distribution system in Barton & Orleans; no further action has been taken. VELCO is performing an analysis in 2012 (anticipated Q3) to confirm the need and timing of the Newport upgrade; VELCO initiating condition assessment of Newport with anticipated spring 2013 regulatory filing. No further action has been taken on the other upgrades proposed for Irasburg or Moshers Tap	
Proposed affected & lead utilities	Lead utility: VEC	Affected utilities: VEC, Swanton, Enosburg, Barton, and Orleans
NTA screening	A full NTA analysis was completed by VEC and VELCO.	
Equivalency	The non-transmission solution would need to be on line at or above a Vermont load level of 1000 MW and located on the 46 kV system between the Jay and Irasburg substations.	

Vernon Road 115 kV Station

Analysis	Loss of load in the Brattleboro subarea during maintenance activities or under N-1 conditions.	
When deficiency occurs	Loss of the K186 line or Vernon Road 69 kV transformer or 115 kV bus disconnects 69 kV load	
Critical load level & timing of need	Critical load level Year of need	<700 MW Past
Preferred transmission solution	The installation of 115 kV breakers at the GMP Vernon Road substation Estimated cost: \$1.9 Million	
In service date	Summer 2013 (assuming typical design, public outreach, permitting and construction process timing).	
Status	Transmission analysis has been completed by GMP. GMP will complete the upgrades by June 2013. VELCO received Proposed Plan Application (I.3.9) approval from the ISO in June 2012	
2012 Proposed affected & lead utilities	Lead utility:	GMP
	Affected utilities:	GMP
	Regional:	NGRID, Northeast Utilities
NTA screening	<p><i>Q 1: Is the proposed project's cost expected to exceed \$2,000,000? A 1: No</i></p> <p><i>Q 2: Could elimination or deferral of all or part of the upgrade be accomplished through the use of non-transmission alternatives? A 2: Not applicable. Screened out in Q 1.</i></p> <p><i>Q 3: Is the likely reduction in costs from the potential elimination or deferral of all or part of the upgrade greater than \$1,000,000? A 3: Not applicable. Screened out in Q 1.</i></p>	
Equivalency	The reliability deficiencies in the Brattleboro region occur as a result of a single outage event. The non-transmission solution would need to be on line at all hours and located on the 69 kV system near Brattleboro.	

Vernon Road



IBM Area

