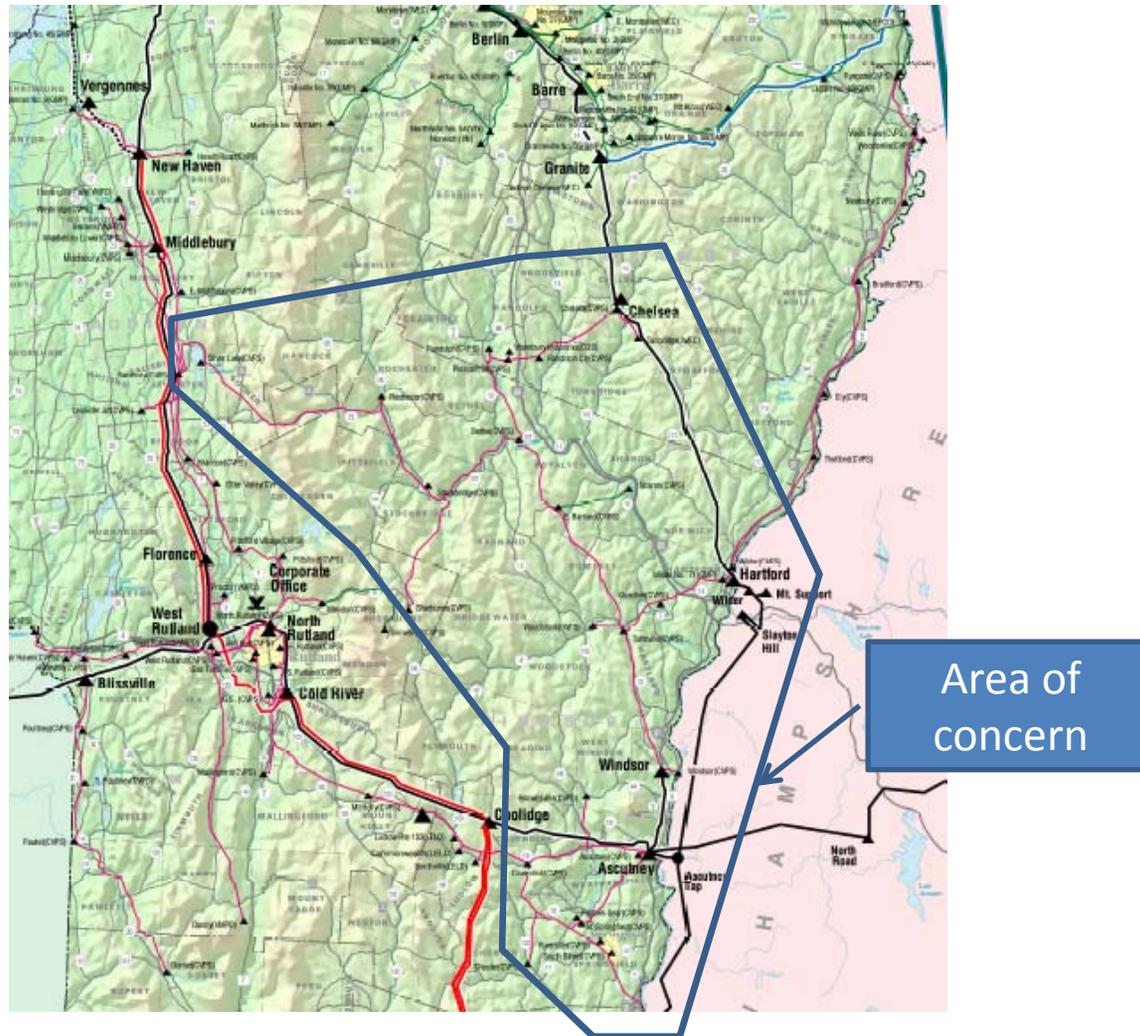


Hartford / Ascutney Area Study Summary

Rev 5 - November 2012

Orientation

The area of concern includes Salisbury and eastward, Chelsea and southward, Springfield and northward, and Bellows Falls and westward.



Problems

- The worst area contingency and the study's main concern is the loss of VELCO's Hartford 115/46 kV transformer. Thermal and voltage operating criteria are both violated quite seriously (19% overload on the Quechee-Taftsville 46 kV line and 82% voltage at Ely 46 kV bus, for the present-day system prior to the White River load addition). The possibility of a cascading collapse and/or a 46 kV line clearance problem is considerable.
- The pending addition of GMP's White River Substation (assumed to be 10.25 Mw with 95% power factor, at present, growing to 11.27 Mw with 95% power factor in 20 years) significantly exacerbates this existing contingency problem, as it will be located near to the weak spot that results from the contingency.

Solution Alternatives

Possible solutions appear to be (in order of ascending cost):

- Closure of the normally-open Wilder 46/115/13.8 kV tie (either permanently or on an emergency only basis) to add area support. This option is the least expensive but requires affirmative and timely cooperation from NGRID. We are in the process of conducting a supplemental planning analysis for NGRID to address its concerns with this proposal. **Estimated capital cost: \$1.75M**
- Addition of 5.4 Mvar of remotely-switched shunt capacitors (preferably 2 x 2.7 Mvar) to GMP's planned White River sub and reconductoring of the 46 kV Taftsville-Quechee-Norwich 46 kV line. No multi-company collaboration required. **Estimated capital cost: \$2.21M**
- Addition of a +5.0 Mvar/-2.5 Mvar solid-state var compensator (statcom or SVC) at GMP's planned White River 46 kV substation and reconductoring of the 46 kV Taftsville-Quechee-Norwich 46 kV line. No multi-company collaboration required. **Estimated capital cost: \$3.75M**
- Permanent closure of the normally open Bradford-Newbury 46 kV tie, creating an "Eastern Loop", and replacement of the Ryegate 46/34.5 kV transformer with a new, larger unit. Reconductor the Newbury tap-Woodville 46 kV line (just south of Ryegate). This option is more expensive than some others but has the added advantage of eliminating a significant amount of radially supplied load. No multi-company collaboration required. **Estimated capital cost: \$4.95M**
- Addition of a second transformer 115/46 kV transformer bank at Hartford for parallel operation with the existing bank. Collaboration with VELCO required but not with any companies outside of Vermont. **Estimated capital cost: \$20.2M**

Note: NTAs and NTA/TA hybrids have little chance of providing an economic solution based on the NTA screening tool, which screens out NTA solutions when the transmission savings are less than \$2.5M as is the case here for at least two transmission solution alternatives.

Next Steps...

1. Complete supplemental planning analysis of Wilder 46 kV tie closure solution alternative on behalf of NGRID.
2. Finalize cost analysis of all possible solution alternatives.
3. Choose and implement solution alternative.