

Intercompany Memorandum

To: Frank Etori
Cc: Hantz Pr sum , Kim Moulton, Chris Diebold, Scott Harding
From: Dean LaForest
Date: February 1st, 2008
Re: Feasibility of VFT (variable frequency transformer) installation at Newport

Recent inquiries from entities within Vermont as to viability and feasibility of installing a variable frequency transformer (VFT) and importing power into Vermont have led to a brief examination of the potential for installing and use of such a device. This memo focuses on the feasibility analysis performed for such an installation, the assumptions made in the analysis and the results.

The examination was made using a peak summer case modeling year 2011 conditions. This was done to model the impact of completion of the NRP, Lamoille and East Avenue projects. The Coolidge Connector was assumed not yet constructed. To thoroughly test system thermal limits and the ability of the VFT to potentially be accepted as a “capacity resource” in New England, generation in Vermont and New Hampshire was placed on-line and maximized. This included:

- Dispatching Vermont hydro at over 100 MW
- Dispatching Vermont’s peaking units all on-line
- Dispatching proposed new Vermont plants (VPPSA’s Swanton proposal, Sheffield Wind and small other small plants) on-line
- Dispatching Connecticut River hydro (Comerford, Moore, McIndoes, Wilder and Bellows Falls) at max
- Dispatching Merrimack and AES Londonderry on-line

The base case modeled typical phase shifter flows over PV20 and Blissville, modeled F-206 flows into Granite at the high end of normal, and minimized flow into NH over the Saco Valley phase shifter (over the Y-138 line). This yielded a peak load case with high transmission use in northern Vermont, minimal imports into Vermont from the southern 345 kV lines (i.e. Vermont Yankee to Coolidge) and high north to south flows on the Comerford to Tewksbury 230 kV corridor.

The analysis examined one and two VFTs each importing 100 MW. Consequently, VFT imports of 100 and 200 MW were considered. The VFTs were modeled as generators with +/- 20 MVAR capabilities for analysis simplicity; the minimal VAR range mimicked the presumed ability of the VFT to support the VT system with

reactive power from the Quebec network with the construction of the VFT. The redispatch for the VFT when placed on-line was taken in southeastern New England.

Both the 100 and 200 MW VFT cases appeared acceptable on an all-lines-in basis with no apparent overloads or low voltages. However, the transmission corridors from Highgate and Moshers' Tap south were both heavily utilized, especially in the 200 MW VFT case. Under single contingencies the 200 MW VFT case had several unacceptable outcomes, including local outages that resulted in both overloaded circuits and severe undervoltage. Remote outages also resulted in overloads. The 100 MW VFT case did not have the local post-contingency issues besides one overloaded subtransmission circuit for loss of a parallel transmission circuit. One remote outage resulted in a minor overload of a parallel transmission element.

Based on these results the 100 MW VFT appears feasible, but may have minor interconnection concerns locally, based on post-contingency performance on local networked subtransmission assuming all existing and proposed generation resources are on-line. The remote overload concern is one likely existing today which may well be rectified by a local reliability upgrade in the next few years. The 200 MW VFT proposal, on the other hand, would require significant new local transmission facilities to deal with the identified constraints on the local transmission network. An initial estimate of the scope of the local reliability upgrade required for the VFT would include rebuilding / reconductoring many tens of miles of local 115 kV line to increase thermal capacities, and would likely also include new local reactive resources.

Runbacks of the facilities may preclude some of the upgrades, but would likely preclude at least some of the VFT's capacity from being considered "integrated with the network" and potentially viable in the Forward Capacity Market (FCM).