MDMS Report to EC 11/10/16

Project Status:

The NYISO team members completed their initial review and has submitted their comments to Enenex. Enernex, while working well beyond their original commitment, briefly interrupted remaining work on finalizing the report draft – now due mid November. One remaining task is the completion of the case involving loss of New England's Phase II HVDC while operating at 2000 MW which for heavy transfer conditions is usually operated at about 1600 MW. This relates to the situation where operating protocols are accidently violated. (Running this case has been delayed due to interoperability between PSS/E versions used by the NYISO and Enernex.)

Some General Conclusions from the MDMS :

1. **Automated Protection Scheme** - The Kalman based algorithm successfully identified impending instability in a timely fashion for the most severe internal **and** external "extreme"contingencies tested. The PSS/E simulations included automation of the algorithm with simulated "noisy" PMU measurements as well as 2 automated controlled interface separation scenarios.
2. **Controlled Separation Interfaces** - The controlled separation of interfaces included the Total East and the Central East interfaces. In both cases, Underfrequency load shedding is required to stabilize the system. For both, modifications to the UFLS timing is required. The Central East separation scenario also required generator tripping in the Western region in addition to UFLS.
3. **Dispatch Cases** - With regard to dispatch, the cases included both "UP margin" and "CE margin[1]" conditions which are heavy transfer, heavy load situations. Both situations required reductions to the UFLS timing. However the CE margin case required additional amounts of load shedding.
4. **Security/Redundancy** – The study included a look at a completely independent protection concept using different devices at locations local to the Total East Interface locations – namely, "out of step relays". Impedance trajectories obtained from the PSS/E simulations were examined were examined and while some locations clearly identified the impending instability, other locations did not. Therefore, the original concept where it was thought that all locations on the interface, would "mirror" the impending instability detected by the Kalman algorithm

[1] The margin cases are used for stability analysis and determination of stability-based transfer limits. The Central East and UPNY ConEd margin cases were built by 10% higher of voltage or thermal transfer limits of their interface. For 2010 ATR Central East margin case, the interface flow is 3230 MW on the Central East interface and 4326 MW on the UPNY ConEd interface. For UPNY – Con Ed margin case , the interface flow is 2973 MW on the Central East interface and 6170 MW on the UPNY ConEd interface.

did not pan out. Security measures are of paramount importance and are required by the NPCC[2] for any wide area protection system. Therefore further approaches necessary to provide the required redundancy are recommended to be part of any future work in this area.

[2] NPCC Regional Reliability Reference Directory # 7 Special Protection Systems