

Defensive Strategies Report to EC

GES 09/09/16

Phase 1 Testing – This phase involves testing of the Kalman based algorithm using PMU derived angle information to trigger the mitigation scheme. The mitigation involves controlled separation of the Total East interface plus underfrequency load shedding, if required, to stabilize the system after the contingency. In addition, some testing of alternately performing a controlled separation of the Central East interface is considered.

- All of the cases decided upon, involving both internal and external contingencies have undergone testing to determine impact on stability of the NY system.
- All of the stable cases are tested with the Kalman PMU based prediction algorithm while recording the results to make sure that a “false operation” does not occur.
- The unstable cases are tested using the Kalman PMU based algorithm plus mitigation (controlled separation plus UFLS) as triggered by the prediction algorithm. Delays due to communication and breaker operation are included.

Phase 2 Testing – This phase involves testing of the Kalman based algorithm AND the use of “out of step” relays to perform the controlled separation.

- Simulation results have been analyzed with focus on impedance trajectories related to what the out of step relays would “see” at key locations related to the Total East interface.
- Two extreme contingencies have been completed with similar results.
- As reported at the last meeting, observed trajectories differ greatly from those predicted using simplified models.
- Also, observed trajectories for lines comprising the same interface differ greatly with some not showing the expected pattern of instability.
- Based on these results, it is concluded that application of simple “blinder based” out of step relays may not be effective in adding the level of security desired for the overall mitigation scheme. The dynamics of the “real” NY and surrounding systems are far more complex than those of the “simplified” system used as a basis for the concept.
- While further study in this area is suggested, it would involve extensive use of system protection and system study resources beyond the scope of the MDMS project.

Draft Report –

- The final report is being drafted concurrent with the work in progress.
- A first draft of the final report is targeted to be ready for review by the NYISO and NYSRC representatives on or before 9/16.