MDMS2 Project Status Report

11/9/18

Update 12/07/18

General:

Robert Golen (NYISO) has provided access to an MDMS2 folder on the NYISO econnect site. Access to this site is available to all MDMS team members using a digital key provided by the NYISO. Any CEII information can be placed into or viewed by team members. Robert has provided that emails will automatically be generated to participating team members when new information is deposited. This information can be viewed by all participants. So far, Quanta, the NYSRC (G. Smith) and NYPA have succeeded in logging on to the portal. At present only the Firefox browser is works with this portal.

As the need arises, Quanta will set up a separate system for the TOs to transmit private confidential information directly to Quanta. CenHud has set their process. NYPA and Ngrid are in progress with their method. This information can only be accessed by Quanta.

Progress vs SOW:

Task 2-Review Prior Work and Simulation Case Development

Task 2.1 **Prior Work** - Completed

Task 2.2 **Case Development –**

The 2022 base case has been received from the NYISO. The case is being updated to include DER Inverter based resources per the Gold Book. This includes behind the meter resources as well as BES connected resources. The base case, as received, does not contain UFLS modeling. Quanta to check with the NYISO. First, the updated case **without DER resources** added will be stressed with EC 12 to check for instability as was observed previously with the2015 model. Then testing will be performed with added DER per the NYISO gold book and the IBR queue.

With regard to Inverter Based Resource Models to be used in simulations, existing PSS/E models will be used as follows:

- Grid connected utility-scale IBRs:
    - Wind: generic Type 4, version 2, wind generator (WT4G2) and electrical control model (WT4E2)
    - Solar: generic generator/converter interface (REGCAU1), electrical controls model (REECBU1) and plant controller (REPCAU1)

        - Note: NERC PRC-024-2 voltage ride through settings will be used, which is coordinated with the Category II setting of the IEEE Std 1547-2018.
        - Note: Momentary cessation will not be modeled for utility-scale IBRs per NERC guidance

- BTM Solar IBRs:
    - Converter model (REECAU1) connected in parallel with the composite load model
    - Category I of the IEEE Std 1547-2018 voltage ride through settings will be used to model the worst-case scenario to evaluate the impact caused by the loss of IBRs during major disturbances.
        - Note: Momentary cessation could not be fully modeled with current PSS/E generic model REECAU1 or REECBU1. Both models are unable to fully model the Category III settings of the IEEE Std 1547-2018.
- Base Dispatch:
    - Utility-Scale Wind will be dispatched at **10%** of the installed capacity (note per recent NYISO presentation, July capacity factor is 15%)
    - Utility-scale Solar will be dispatched at 15% of installed capacity
    - BTM Solar will be dispatched at **15%** of installed capacity (per recent NYISO presentation BTN solar is running at 17% in July)
    - A sensitivity case will be created to dispatch BTM Solar at **80%** of the installed capacity for evaluating the impact at high IBR output condition

Impact of selected contingencies on inverter based resources will be evaluated as a next step. Impact of the selected contingencies is currently under investigation.

During the recent DER workshop it was confirmed that there is a limitation of existing PSS/E inverter-based resources (IBRs) models. It has confirmed by modeling experts attending the workshop that existing PSS/E standard models are not capable of allowing such resources to be controlled during the simulation runs, which is consistent with Quanta's initial assessment. Developing a customized model would divert too much resource and efforts away from the main tasks of this project, and there is a high risk the developed model may not function as desired. Considering this, it was agreed that exploring the possibility of controlling IBRs as a new mitigation measure for major disturbances will be postponed until appropriate PSS/E models become available.

A separate case is being developed to model **the Northeast Interconnection** which includes NY, New England, the Maritimes and Ontario. This Interconnection will be connected to the rest of the Eastern Interconnection using HVDC ties.. Impact of selected contingencies on inverter based resources will be evaluated as a next step for this configuration also. Dynamic response testing is currently underway.

Task 2 **Reporting**

A report on Task 2.1 has been released. A draft report on Task 2.2 (Case Development) is in progress and will be circulated once the current evaluations are completed.

Task 3- Instability Detection Algorithm and Mitigation Measures development

Task 3.1 **Algorithm Development**

The MDMS instability detection algorithm and associated test cases were transferred from Enernex to Quanta via the NYISO secure site. Cases run on Quanta's computer matched those performed by Enernex for MDMS validating the correct transfer of code. Improvements to the instability detection process are under consideration including sampling before the event, wider separation of PMUs, algorithm simplification plus use of local protection to achieve additional security.

In addition, a concept of detecting severe external events using PMU data from neighboring areas is under development. The concept will involve preventative action that can be taken by operators for slowly evolving situations as well as automatic actions for rapidly evolving events and contingencies.

The Python scripts (program code that simulates the instability detection algorithm and mitigation measures) developed during the MDMS project will be moved from MDMS cases to stressed 2022 cases with added inverter-based resources for algorithm testing and validation on the 2022 cases.

Task 3.2 **Mitigation Measures**

Task 3 **Reporting**

A draft report has been issued (partial 3.1) on the assessment of the MDMS work . Some shortcomings and potential improvement areas were noted.

Task 4- Testing

Task 4.1 Testing of Detection Algorithms and Mitigation Measures

Task 4 **Reporting**