Modeling and Validation Work Group

Generator Certification Criteria

October 25, 1999

The following identifies the criteria that the M&VWG will use in determining if a unit has qualified for certification.

Reactive limits and dynamic data testing must be completed and the appropriate data/reports submitted to the WECC Technical Staff. The test requirements specify that all units 10 MW or larger are to be tested. Units smaller than 10 MW were not requested to be tested but certification will be issued if the test requirements that apply to units 10 MW or larger are met.

Reactive Limits Tests

The unit must be tested in accordance with the requirements attached to the March 21, 1997 letter from Dennis Eyre. Attached to that letter is a November 25, 1996 letter from Bill Comish that includes a *"Data Reporting Form for Reactive Limits Tests"* and details the reactive limits test requirements. The reactive limits test part of the certification criteria is met when the form is completed and provided to the WECC Staff. The test results should be considered when setting the QMAX and QMIN limits for power flow base case submittals to the WECC.

Dynamics Testing/Model Validation

The unit must be tested in accordance with the requirements attached to the March 21, 1997 letter from Dennis Eyre. Attached to that letter is a report titled *"Test Guidelines For Synchronous Unit Dynamic Testing and Model Validation"* that details the testing and validation requirements and provides examples regarding how to obtain the required data. The dynamics data part of the certification criteria is met when data to represent the generator unit is provided to the WECC Staff and the staff can verify that the data will function and not cause problems in simulations using the PSLF program, and that the proper model validation has been performed.

The following types of problems, noted during test simulations by the WECC Staff using the PSLF program, would prevent certification, although dynamics data were provided:

- Incomplete data, such as missing PSS, Governor, exciter, or machine data;
- Data that results in oscillations in a no disturbance simulation;
- Data that results in undamped or growing oscillations in a ringdown test;

The following types of problems would not prevent certification. However, continued cooperation will be needed to complete the modeling and validation:

- The test guidelines include a request for information regarding OEL, UEL, VHZ and various other devices. However, the certification will be granted even if data for these devices are not included in the master data file because the models and data

definitions needed to represent these devices were unavailable and were not documented in the March 1997 request.

- The generator is not represented in the current WECC Power Flow cases, but could be represented in future, more detailed, system network representations;
- Data does not work because of an identified PSLF program problem.

The test guidelines specify that the data should be validated by comparing test results to the results from a simulation using the submitted data. The report titled "*Test Guidelines for Synchronous Unit Dynamic Testing and Model Validation*" provides a sample model validation process on page 6. Excerpts are provided below:

- Compare the pre-test simulations to the corresponding tests. (Note: Verify that the stability simulations have the same initial values as the field tests for all voltage, current, and power quantities.)
- If the stability program time simulation plots for key variables show a reasonable fit to the test results, the existing model data is validated.
- If the stability program time simulation plots for key variables do not show a reasonable fit to the test results, it is necessary to repeat the simulations with refined estimates of parameter values until an adequate match is reached. Also verify all limiter values in the model are correct. Additional tests may have to be performed for model validation including load rejection, step response tests and frequency response tests. Obtaining the model parameters to obtain the best fit for the model to test results requires the use of dynamic control system theory, Bode plots, and data reduction methods.

If the WECC Technical Staff cannot verify from the submitted information that validation was performed the organization that provided the information will be contacted "and must submit the necessary documentation" to verify that the required validation was performed "before the certification would be issued".

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