

Introduction

The North American Electric Reliability Corporation (NERC) has adopted several standards to increase Bulk Electric System reliability by confirming the accuracy of the equipment models used in system planning studies. These standards require the periodic verification of model accuracy through testing, analysis, and data reporting. Responding to these standards requires specific testing and analysis skills that may not be readily available with in-house staffing.

GE's Energy Consulting organization offers NERC Model Verification Services (MVS) to provide generation owners with a convenient and cost-effective solution for implementing these standards. GE has more than 15 years of experience implementing similar standards to develop implementation techniques for the NERC standards. The goal of these techniques is to provide accurate results with a minimum disruption of the generation operation.

Benefits of Using GE Energy Consulting

- **Experience:** Proven track record with over 1500 unit tests safely performed on all major manufacturers' equipment.
- **Expertise:** Pioneers in power system modeling and analysis; developers of PSLF power system simulation software.
- **Efficiency:** Refined test procedures require minimal generator test time.
- **Education:** Our experts provide new understanding of equipment capabilities and limitations.

MOD-027-1

NERC standard MOD-027-1 addresses the "Verification of Models and Data for Turbine/Governor and Load Control or Active Power/Frequency Control Functions". The standard applies to individual generating units (and to the gross aggregate rating of certain multi-unit plants) with nameplate capacities greater than 100 MVA (Eastern Interconnection), 75 MVA (Western Interconnection), or 50 MVA (ERCOT). The MOD-027-1 requirements include (among other things):

- ✓ Comparison of the unit's simulated and measured MW responses for either
 - A significant frequency excursion from a system disturbance,
 - A speed governor reference test with the unit on-line, or
 - A partial load rejection (if it can be shown how this response relates to what the on-line response would be)
- ✓ Submission of a description of the governor and load control or active power control equipment.
- ✓ Submission of approved model structures and parameters for the turbine/governor and load controls.

The complete standard is available at the NERC web site ("Reliability Standards" at www.nerc.com).

Model Verification Service MVS-027

GE Energy Consulting offers the MVS-027 service to assist generator owners in satisfying the NERC MOD-027-1 requirements. The service typically includes the following:

Prior to Test

- ✓ Work with generator owner to retrieve relevant station design data
- ✓ Work with generator owner to retrieve recordings of system disturbances and review those recording to determine if they are suitable for verification
- ✓ Evaluate suitability of existing measurement equipment
- ✓ Prepare detailed test procedure



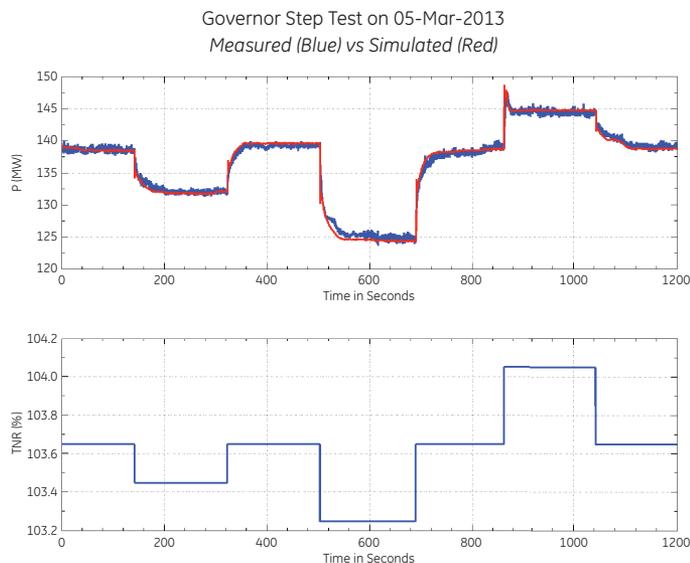
At site (if staged testing is required)

- ✓ Final review of test procedure with operators
- ✓ Connect additional data recording equipment if necessary

After the Test (after either staged testing or retrieval of disturbance recordings)

- ✓ Analyze data
- ✓ Adjust model parameters as necessary to achieve a match of simulated and measured responses
- ✓ Prepare final report

Verification of the turbine/governor can be effectively accomplished by introducing step changes in the governor reference, recording the response of the unit to those steps, and comparing the recorded responses to simulations of the unit reacting to those same test conditions. The figure below, extracted from an MVS-027 combustion turbine report, shows a sample verification plot for a series of reference steps.



Example of a Simulated Load Reference Step Test Matching the Measured Response



GE Energy Consulting

For nearly a century, a core group of leading GE technical and business experts has focused on solving the electric power industry's most pressing challenges—driving the evolution of electric power systems with greater affordability, reliability, and efficiency. GE's Energy Consulting team provides innovative solutions across the entire spectrum of power generation, delivery, and utilization.

For more than 15 years, GE Energy Consulting has performed model verification services on more than 1,500 units from all major generator manufacturers. The accumulated expertise from this experience allows Energy Consulting to perform the testing with the highest degree of efficiency and safety.

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For More Information Please Contact Us At:

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