

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-026-1

NERC standard MOD-026-1 addresses the "Verification of Models and Data for Generator Excitation Control System or Plant Volt/Var 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-026-1 requirements include (among other things):

- ✓ Verification that the unit's simulated response matches the recorded response of a voltage excursion from a staged test or measured system disturbance.
- ✓ Submission of a description of the excitation controls and any plant volt/var controls.
- ✓ Submission of approved model structures and parameters for the generator, excitation, power system stabilizer, and plant volt/var controls.

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

Model Verification Service MVS-026

GE Energy Consulting offers the MVS-026 service to assist generator owners in satisfying the NERC MOD-026-1 requirements. The service typically includes the following:

Prior to Test

- ✓ Work with generator owner to retrieve relevant station design data
- ✓ Evaluate suitability of existing measurement equipment
- ✓ Prepare detailed test procedure

At site

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

Note: MVS-026 testing is often conducted in conjunction with MVS-025 and MVS-027 testing.

After the Test

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

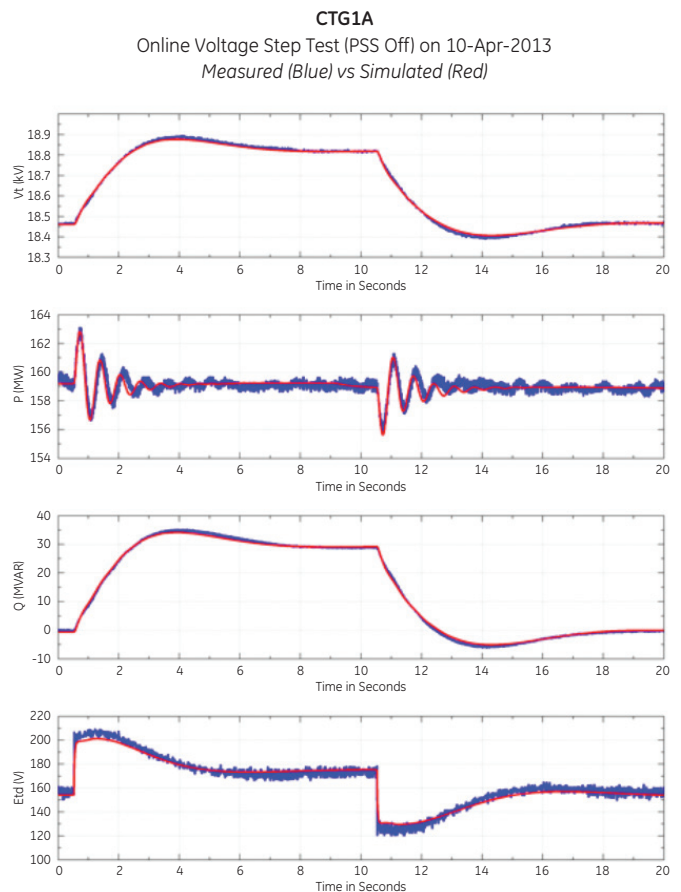
Verification of the excitation controls (including PSS and plant VAR controllers) is typically accomplished by applying a small (2-3%) step change in the voltage regulator reference, recording the response of the unit to that step, and comparing the recorded response to a simulation of the unit reacting to those same test conditions. The figure below, extracted from an MVS-026 report, shows a sample verification plot with measured and simulated terminal voltage, real power, reactive power, and generator field voltage.

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.

www.geenergyconsulting.com



Example of a Simulated Voltage Step Test Matching the Measured Response

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