Power Plant Model Validation

NASPI Conference
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Disturbance-Based Model Verification

Periodic model verification is required by NERC MOD-026 and 027 Reliability Standards

PMU-based model validation is an acceptable and cost-effective method to comply with NERC MOD Standards

PMU-based model validation can be used by TPs to independently verify that the models provided by GOs are accurate

PMU-based model validation allows more frequent model verification and detection of control failures than once every 10 years (per NERC) or 5 years (per WECC)
Disturbance-Based Model Validation

BPA has PMU disturbance monitoring:

- **Conventional** —
  - 12 plants,
  - 130 generators,
  - 21,145 MW of generation

- **Wind** —
  - 11 plants
  - 1,200 MW of generation

- Review model performance annually, integrated business practice
Disturbance-Based Model Validation

One thing you can do today: Make PMU functionality a requirement in your generator interconnection standards
Disturbance play-in capabilities are available in GE PSLF since 2001 and Siemens PSS®E since 2015.
Power Plant Model Validation

• What a “good” model looks like:

Voltage and frequency are inputs
Active and reactive power are “measures of success”

Blue line = actual recording
Red line = model
Power Plant Model Validation

- What a bad model looks like:
  
  Voltage and frequency are inputs
  Active and reactive power are “measures of success”

Blue line = actual recording
Red line = model
BPA has nearly 4,900 MW of wind generation interconnected to its transmission system

BPA is collaborating with EPRI, UVIG, NREL research on wind power model validation using PMU data
Available Tools

Siemens PTI PSS®E, GE PSLF, PowerWorld and PowerTech TSAT have disturbance play-in capabilities

For GE-PSLF users:
- BPA PPMV sequence of GE PSLF EPCLs

For PSS®E users:
- Ryan Quint at NERC is developing Python script

BPA-PNNL PPMV
- Stand-alone data management program

NERC and WECC form a user’s group on power plant model validation