NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Use of PMUs for System Model Validation

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RELIABILITY | ACCOUNTABILITY




Model Validation

- Comparison of models to observed behavior is critical

- Without periodic comparison, models can “drift” from actual system behavior over time
  - New load dynamics
  - New generator dynamics
  - As time passes, a few “insignificant” component model discrepancies accumulate and collectively aren’t so insignificant anymore

Model Validation Process

- Identify dynamic disturbance suitable for replication with system dynamics model
- Development of powerflow case to represent system conditions immediately prior to disturbance
- Perform dynamics simulation of disturbance
- Compare simulated response to measured response; a close match provides confidence that the model is valid

Powerflow Case Construction

- "Snapshot" representation of power system conditions at a specific time prior to the disturbance
- "Reverse" of typical power flow solution
  - Set real power dispatch of generators
  - Set voltage setpoint of generators
  - Set status of transmission facilities
  - Load is unknown; must find load that produces best match to observed voltages and line flows (real and reactive)
  - Identify data points that are faulty (sign errors!)

Replication of the Disturbance

- Iterative process

1. Run simulation with best available event times and information
2. Compare with available recordings and data
3. Adjust simulation and/or SOE according to observed discrepancies
4. Return to step 1

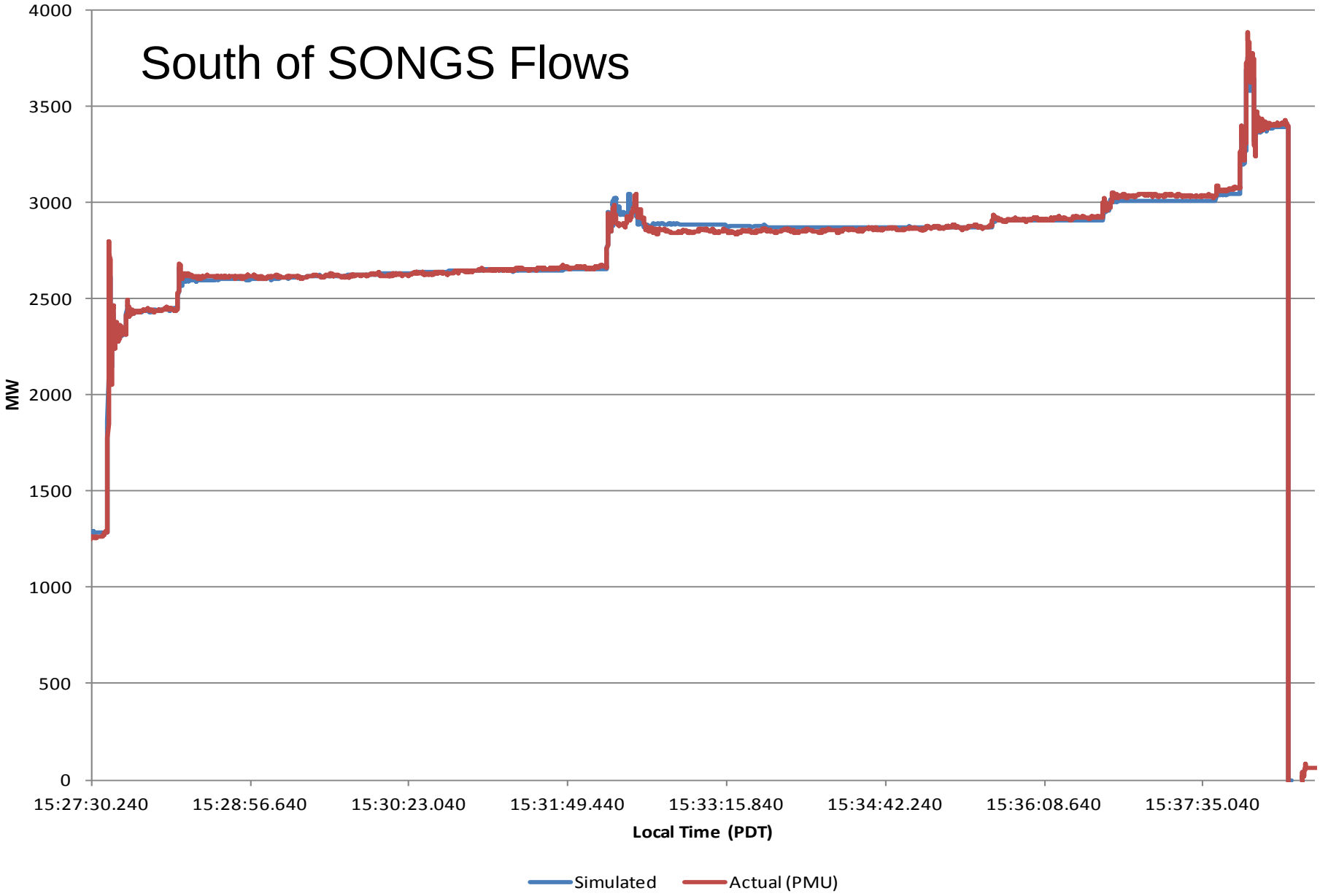
Replication of the Disturbance

- Parametric analysis
  - Some dynamic model parameters (especially load) are not precisely known
  - Several simulations performed using a range of values for these parameters
  - Parameter value(s) selected based on best overall match with recorded data
  - Does not imply that these parameter values are appropriate for other studies

Dynamic Recording Devices

- Digital fault recorders (DFR)
- Power System Disturbance Recorders (PSDR)
- Phasor Measurement Units (PMU)

Pacific Southwest Disturbance



Questions?