The Reasons We Need Better Models

Vickie VanZandt, Program Manager

Western Interconnection Synchrophasor Program

Model Validation Workshop

October 22, 2013

Premise – This Isn't Your Mother's Power System Anymore

- The Good Ol' Days:
  - Central plant
  - Stable, predictable commercial arrangements that changed only seasonally
  - Generation with lots of mass and therefore inertia
  - Voltage dependent load that gave you a break if the power system was in trouble
  - Pretty good conditions for system operators

Premise – This Isn't Your Mother's Power System Anymore

- The Complex New Days:
  - o Smaller, more distributed generation for which the grid was not designed
  - o Many more transactions that change in increments of 5-10 minutes
  - o The generation fleet's characteristics have changed – a greater percentage of intermittent, low mass machines – less inertial response to help arrest frequency decline
  - o Finally, the load has changed – less industrial, voltage dependent load, and more computer and air conditioning service

WECC

So What Does That Mean?

- A grid that is more complex and harder to operate…and demands better modeling.
- No matter how carefully operators, operating engineers, and planning engineers study the system….if the models aren‘t right…,
- ….the results they get and the limits they set aren’t right either.

So What Does That Mean?

- Of the three components,
  - o Transmission
  - o Generation
  - o Loads
- Transmission is pretty good (status of MODs notwithstanding)
- Generation is improving, but more to go
- Loads need the most work

So What Does That Mean?

- SCADA can't help much with this effort
- More frequent and time-synchronized measurements are necessary to get this model improvement done
- We happen to have some of those coming in…..

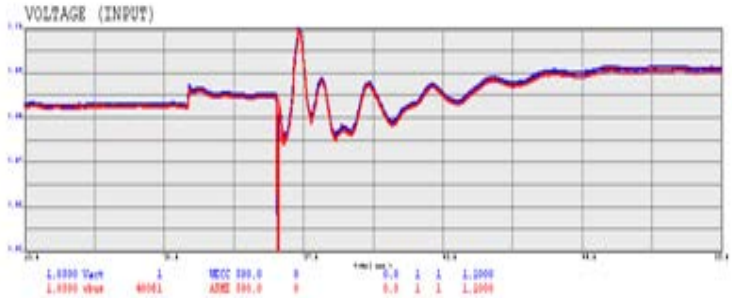
Generator Model Validation

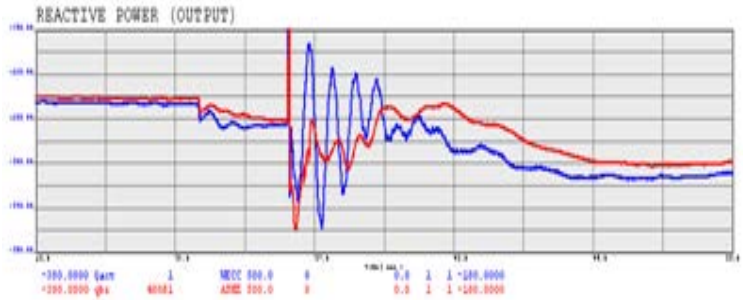
(for 1100MW Nuclear Plant)

Before Calibration

Blue = Actual Response

Red = Simulated Response

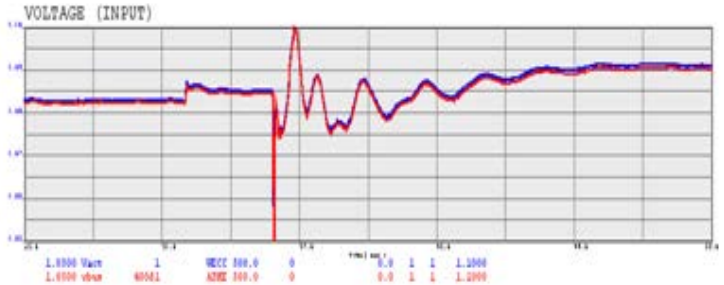


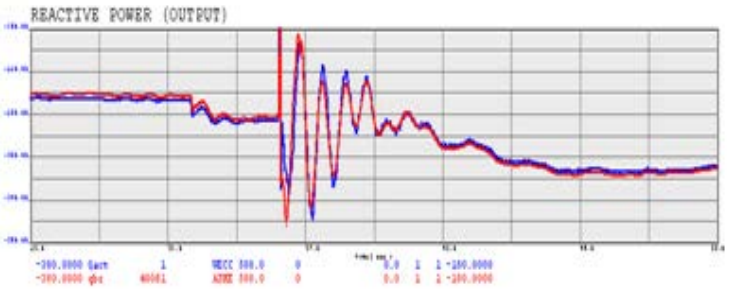


After Calibration

Blue = Actual Response

Red = Simulated Response





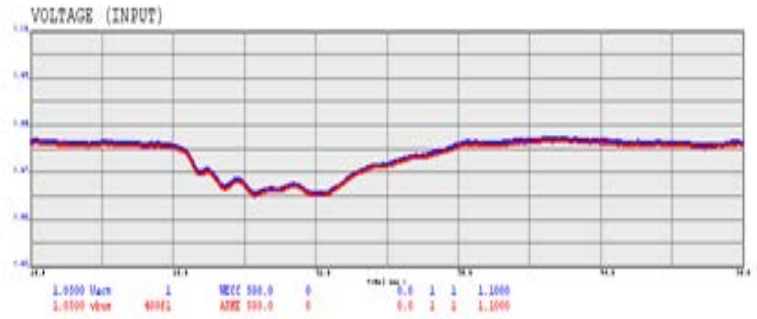
Generator Model Validation

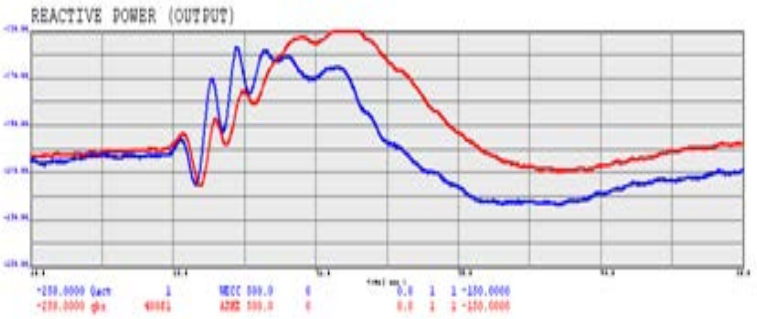
(for 1100MW Nuclear Plant)

Before Calibration

Blue = Actual Response

Red = Simulated Response

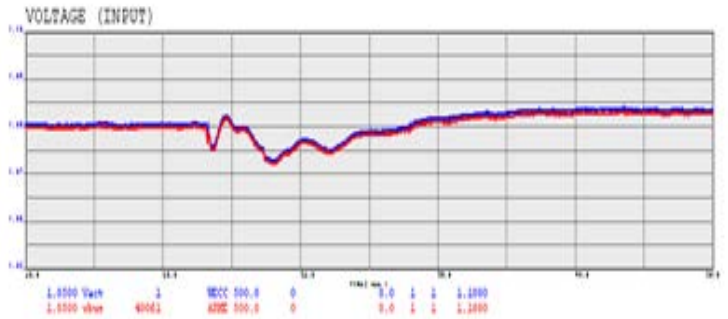


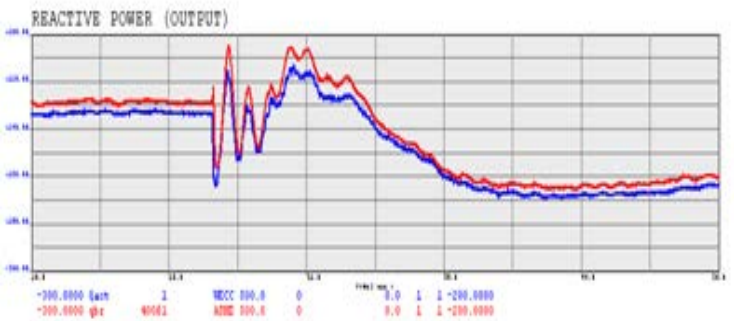


After Calibration

Blue = Actual Response

Red = Simulated Response

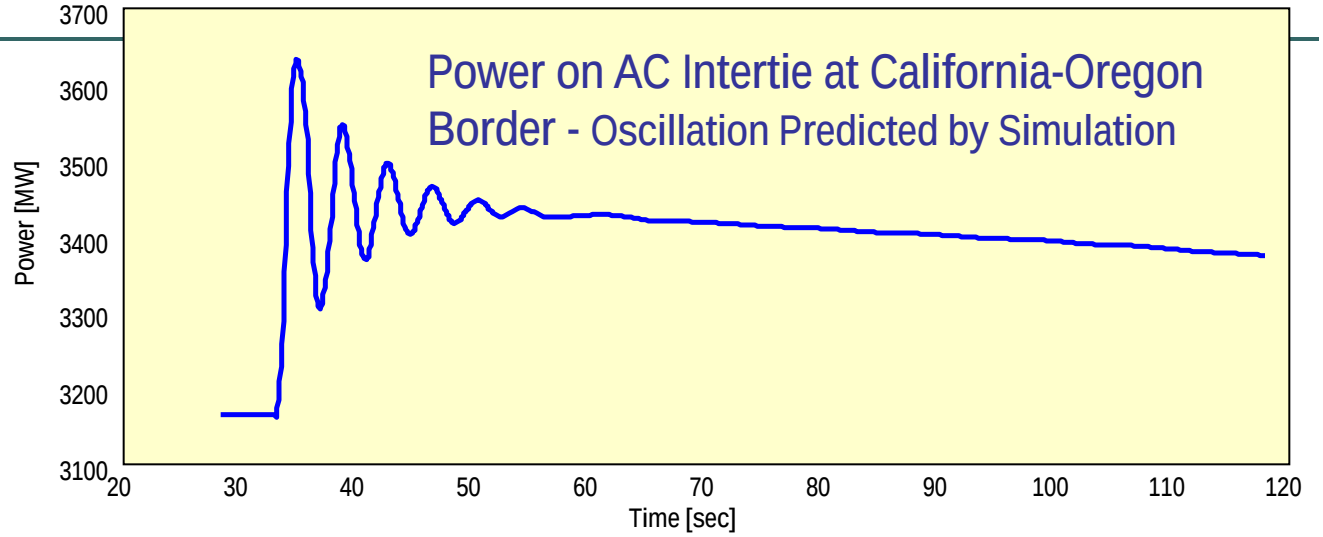




Yikes

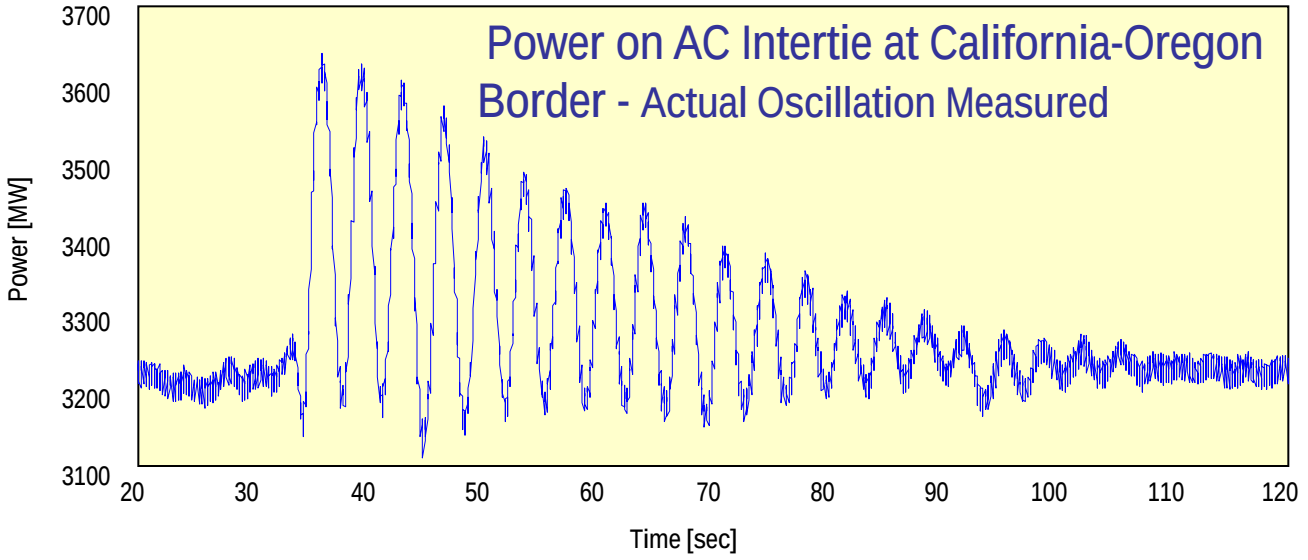
This Is What We Thought Would Happen

(Simulation)



This Is What Actually Happened

August 4, 2000 Oscillation - Alberta Separation



….and now, on with the Case Studies