TSP PERSPECTIVE

Comments from TSPs on model issues and model recommendations

DMTF Workshop, 1/23/2018

Outline

- Challenges during FIS studies
- Challenges integrating models into other studies
- Recommendations

TSP Perspective on Model Challenges

■ **Examples of model challenges during FIS studies**

   – *2nd generation generic modeling is prone to cause non-convergence under low short circuit capacity conditions. This can make generic modeling unusable.*

   – *User-defined modeling that has not been thoroughly tested and debugged has occasionally led to numerical instability or PSSE crashing and consequent delays in getting FIS studies completed.*

   – *Complexities associated with specifying buses and branches in user-defined power plant controllers (PPC) and statcom model data has sometimes resulted in modeling errors.*

TSP Perspective on Model Challenges

■ **Stories of time spent working with resources / manufacturers to get usable models?**

 – *Recently spent approximately 2.5 months elapsed time and dozens of conference calls working with a wind manufacturer to fix problems with the modeling of existing wind farms, specifically, modeling of PPCs and statcoms and their coordination with the equivalent wind machine model. In addition, the coordination of PPC, switched shunts, and statcom modeling tends to get quite complicated and the proper identification of bus numbers for monitored buses and branches can be very confusing and error prone.*

Another TSP Perspective

- **Examples of model challenges during FIS studies**
  - *Models received from RE's during the FIS process are sometimes lacking the necessary DLL files.*
  - *Some models are missing the necessary voltage and frequency protection models.*
- **Common model problems**
  - *PSSE error messages tend to be very cryptic. It is not always clear why a model is misbehaving or why PSSE is crashing.*

Voltage Ride-Through Issues

Voltage Ride Through (VRT) test performed during FIS for IRRs

Failing VRT is common, which sometimes causes project completion delays.
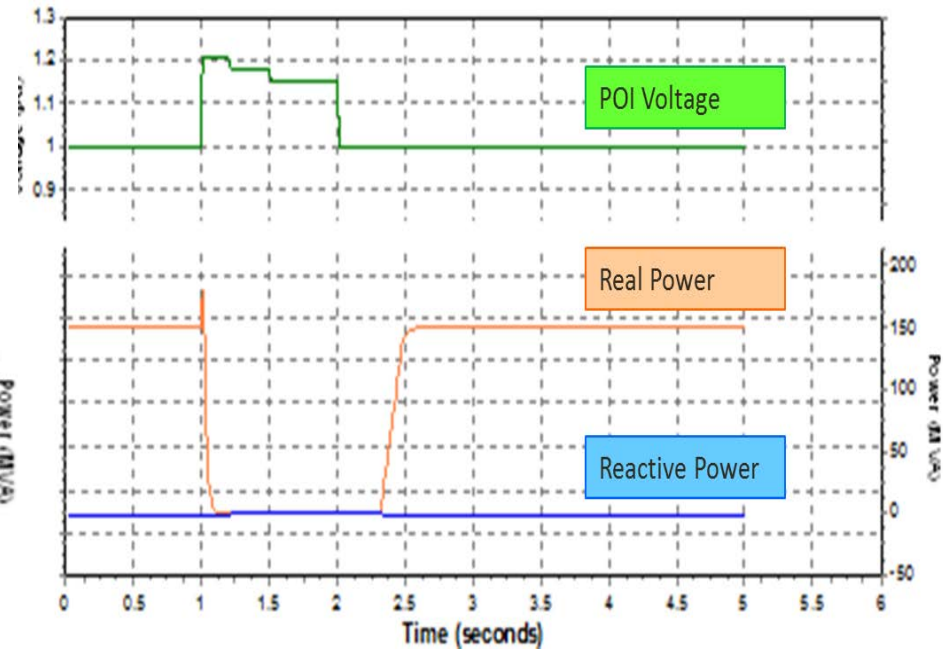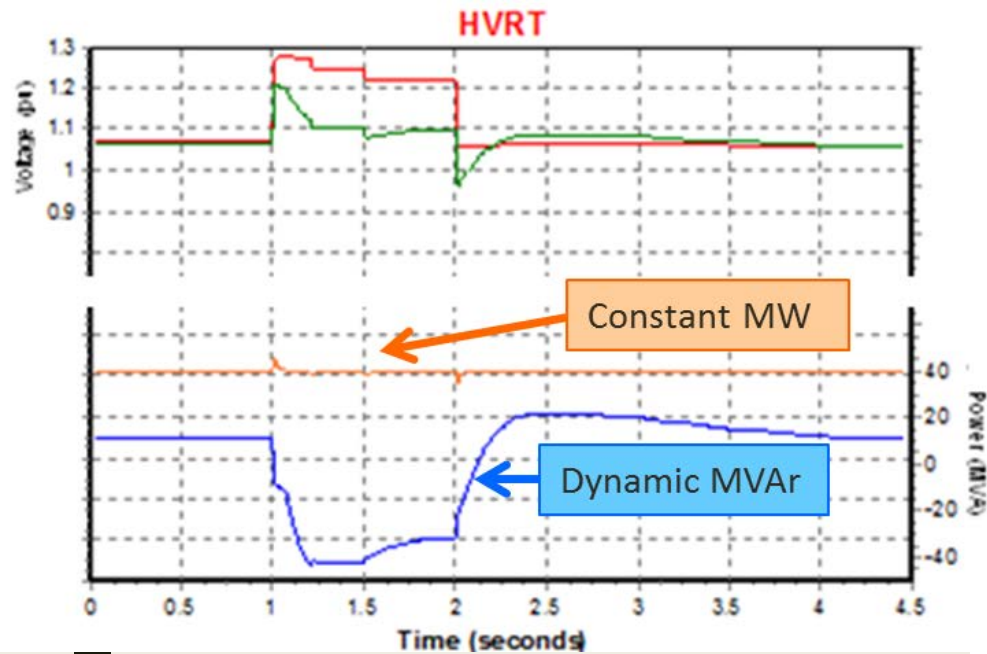
Requirements:

- Plants must achieve 'Flat' lines for 0.95 leading and 0.95 lagging Power factor at the POI (after compensating for reactive losses).

- Each IRR shall set the protection relays to remain interconnected to the ERCOT system during the following voltage conditions:
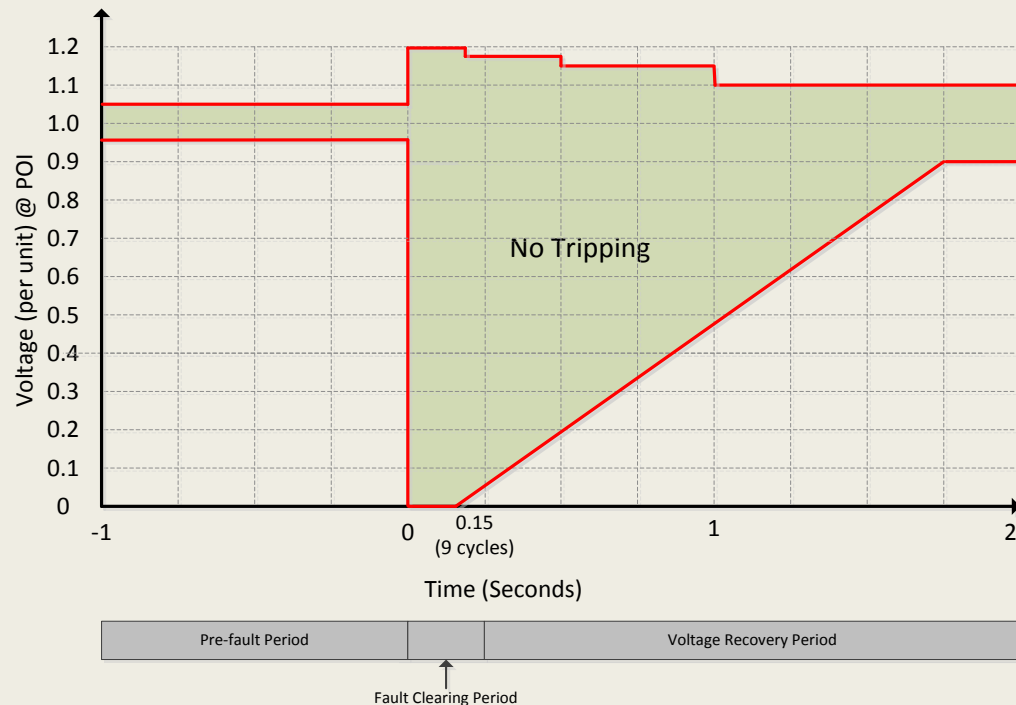
HVRT Performance

Acceptable
Performance

Undesired
Performance

(Reference: Nodal Operating Guide Section 2.9)
http://www.ercot.com/mktrules/guides/noperating/current

Outline

- Challenges during FIS studies

- Challenges integrating models into other studies (*Generic vs UDM models*)

- Recommendations

Generic vs UDM Models and system studies

Generic

- Built into PSSE

- Automatically updated w/ new versions of PSSE

- Generally fewer compatibility issues

- (Often used by Fossil)

User-Defined (UDM)

- Require additional code (.dll, .lib, .obj) and user/design document
- Requires contacting manufacturer for new versions of PSSE
- Compatibility issues

- (Often used by Renewables)

TSP Perspective – Generic Models

■ **Common model problems**

- *Problem with generic model non-convergence noted above.*

- *There is a perpetual question about whether generic modeling is as representative of a wind or solar generation facility's dynamic behavior as it needs to be.*

- *Generic modeling has generally been pitched as appropriate for system-wide studies but not necessarily for project specific studies, especially when a project is subject to transmission system low short circuit capacity conditions.*

- *In general, modeling of renewable generation has required greater attention and time than has conventional generation.*

TSP Perspective on modeling challenges

- **Challenges specific to user-defined models**
  - *Generally, once new user-defined model(s) from wind or solar PV suppliers have had been in use for a time and the bugs worked out, they have been satisfactory.*
  - *Replacement of PSSE Conec and Conet call statements, associated OBJ or LIB files, and required recompilations of dsusr.dll modules with imbedded or implicit PSSE calls and DLLs is improving ease of use of user-defined modeling.*
  - *Some UDMs cause issues when running PSSE in batch mode. It is believed these do not correctly initialize memory variables and fail to run the second time.*

TSP Perspective – Other Studies

- **Examples of model challenges during other studies (TPL, regional, other)?**
  - *When model problems are discovered, or when models are updated due to MOD-026/027, it takes until the next year's flat start build for the model updates to be distributed to all TSP's via the MIS. It would be ideal if model updates could be sent out as patches to the flat start cases. This would ensure the best model accuracy for the whole system throughout the year as model updates are sent to ERCOT.*

- **Challenges specific to user-defined models**
  - *Some user-defined models require DLL's to be loaded from a specific folder. Sometimes this is not clear from reading the model manual. In addition, this will not be acceptable to the ERCOT DWG going forward.*

Outline

- Challenges during FIS studies
- Challenges integrating models into other studies
- Recommendations

General Model Requirements and Guidelines

- Each conventional machine must have dynamic models of major components such as: generator, exciter, governor, and power system stabilizer.

- Renewable resources must have dynamic models of major components such as: inverters, Converters, Power Plant Controller.

- User-defined models should be in .DLL format

- Models must be tuned to meet minimum required performance.

Need help from manufacturers

- Make integrating models into PSSE as simple as possible. Need documentation…

- Typically provided as a black-box model.
  - *Sufficient document and description of the controls, settings, limitations, development of the model.*
  - *Document which .dlls go with which models*

- How to better organize and communicate model updates?

(Additional discussion in afternoon session)