Observations of Generic Dynamic Models for IRRs provided by Resource Entities

Resource Integration Workshop

Jonathan Rose
ERCOT Dynamic Studies Department

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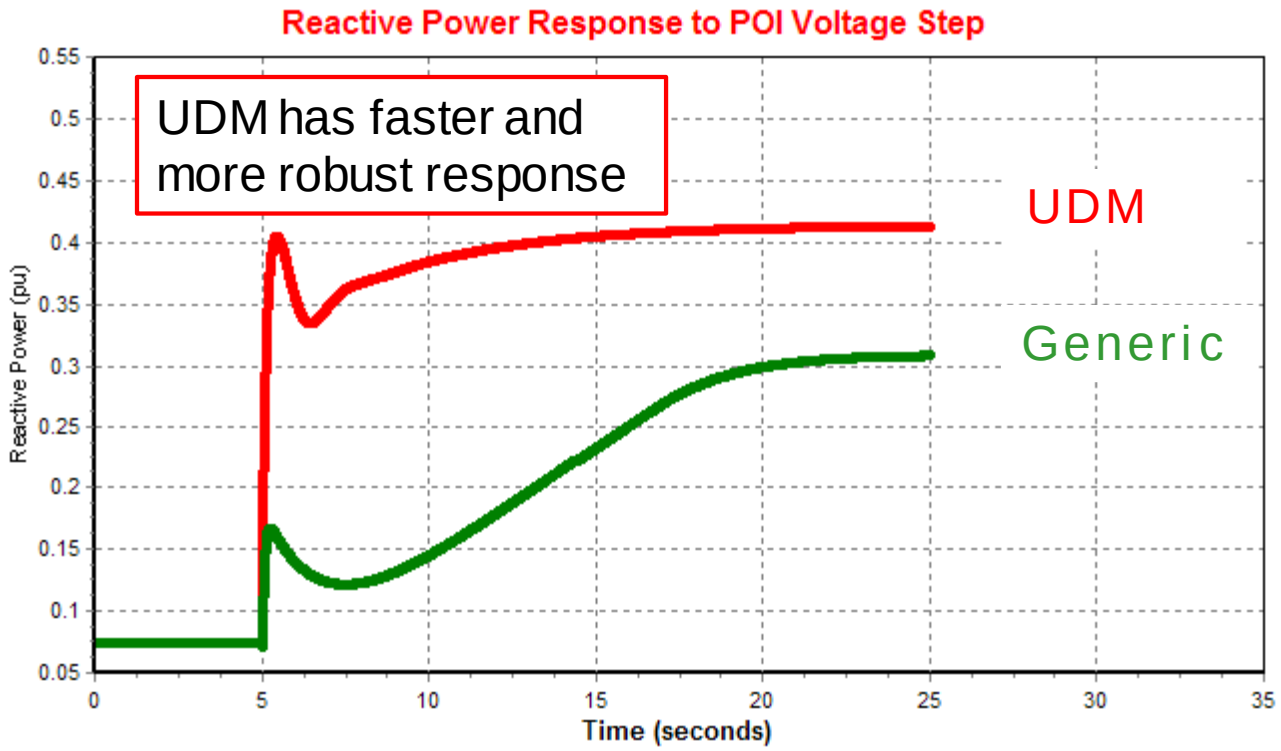
Background

- Many IRRs appear to be replacing their UDM model with generic
  - **User-Defined Model (UDM):** Manufacturer-built model
  - **Generic model**: WECC Standard library model

- Observations from provided generic IRR models:
  - Generic models contain approximations
  - Generic models may not function well under weak grid
    - Could result in instability (real or numerical?) in the ERCOT studies and potentially lower the stability limits
  - Generic models may not be adequate to represent actual facilities, especially under weak grid

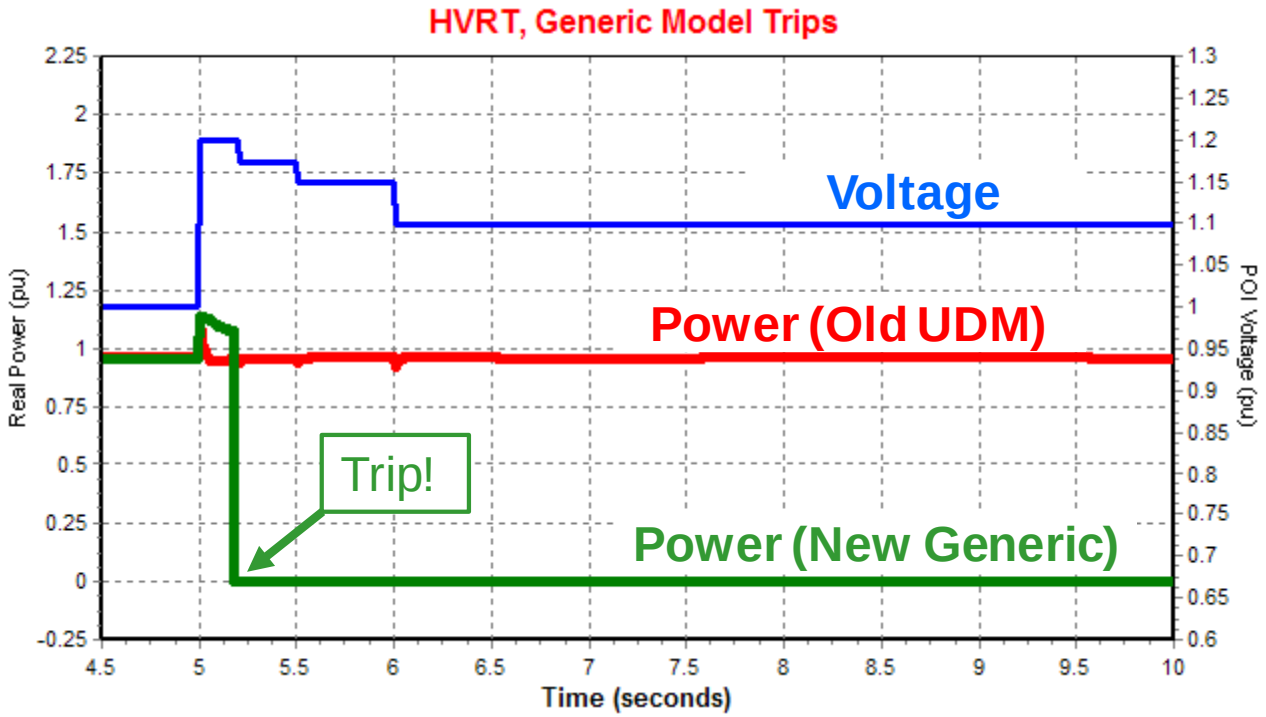
ERCOT Benchmarks

- ERCOT has reviewed the new generic models against the previously provided UDM models for several IRRs.
- So far, about 80% show significant differences in dynamic response. Often, the new generic model has a worse response.



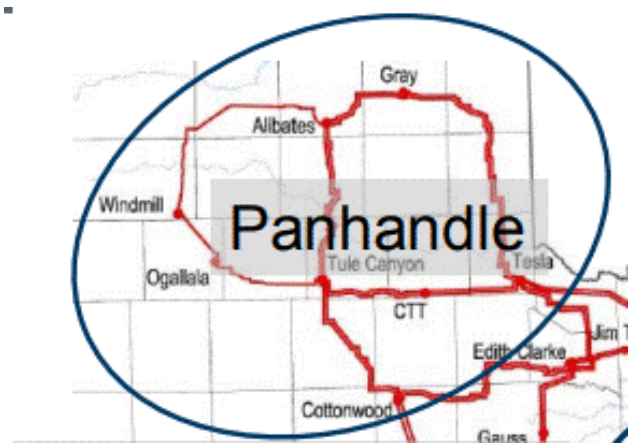
ERCOT Benchmarks

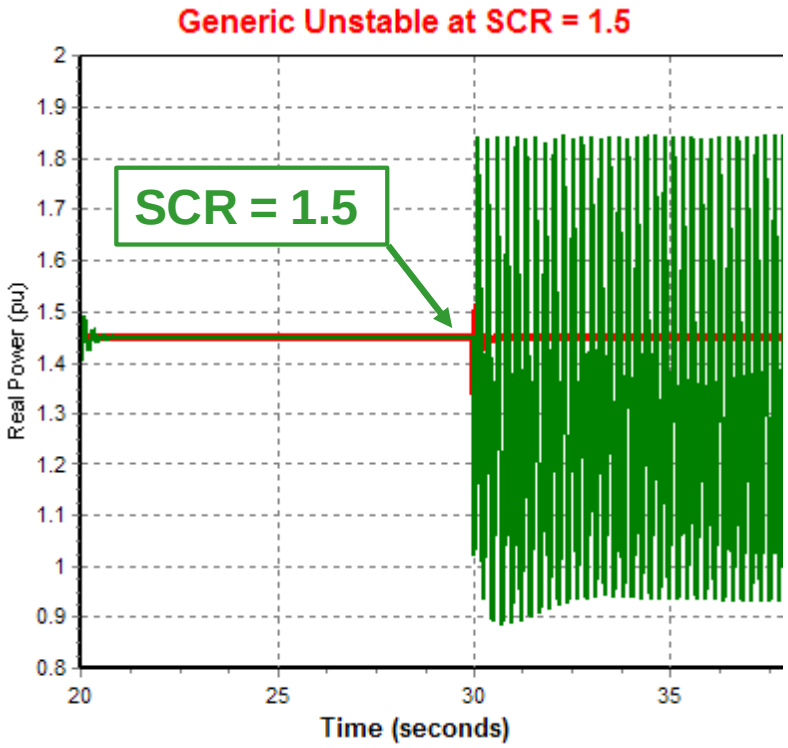
- New models often not meeting Protocol Requirements.



Weak Grid Performance

- Generic Models often fail in weak grids
- **Hypothetical Question:** If all the wind farms in the Panhandle were to replace their UDM models with Generic, what would happen to the interface limit?





Why Are Sites Going Generic?

- Generics are promoted as having several advantages:
  - Less maintenance cost
  - Compatible with several software platforms

- Many consultants prefer generic models in MOD 26/27
  - Only need to understand one model
  - Generic models "easier" to tune, due to open format and good documentation

- So far, ~27 IRR sites have moved to a generic model (total of 62 IRR sites are now using generic models)

Misconceptions about MOD 26/27

- Purpose of MOD 26/27 is to validate an existing model
- MOD 26/27 studies are generally **not sufficient to create a new model** (e.g. build a generic model when a UDM was previously used)
- NERC does not mandate the use of Generic Models in MOD 26/27.
  - Per NERC, the acceptable model list is up to the TP. Per ERCOT DWG procedure manual, ERCOT will accept any model that performs reasonably and is not listed as "unacceptable" in the NERC model list*.

As recently seen in a MOD 26/27 report…

Disclaimer

[redacted] The modeling data presented herein are intended to produce simulation results that closely approximate the response of the plant to these disturbances, and do not in any way represent the physical implementation of the specific inverter or plant control algorithms.

*NERC model list:
https://www.nerc.com/comm/PC/System%20Analysis%20and%20Modeling%20Subcommittee%20SAMS%20201/Acceptable_Models_List_-_2019-08-01.xlsx

Cautions when Going Generic

- Manufacturers highly recommend working with them to build a generic model
  - Manufacturers understand the actual controls, which is superior to blindly running comparison tests because certain control behavior may only be visible under certain situations

- Talk with manufacturers about the limitations of generic models
  - If a generic model might show a lower stability limit in system studies, you might want to know that

- Run a variety of benchmark tests
  - ERCOT typically runs: POI voltage step up and down, Frequency step up and down, HVRT, LVRT, and a Short Circuit Ratio (SCR) test.

Next Steps

- ERCOT would like to discuss how together we can ensure model quality
  - All models should undergo a standard set of tests (PGRR075)
  - Generic models have the unique concern that they were created without the manufacturer involvement.
  - Should we have additional vetting requirements?
    - OEM must approve the model?
    - Benchmark against OEM provided PSCAD?