U.S. DOE-NERC Workshop on Fault-Induced Delayed Voltage Recovery (FIDVR) & Dynamic Load Modeling

Summary

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Take Aways pt 1

Current State of Load Modeling

- Explicit representation of the dynamic behavior of load is now essential for planning studies of the performance of the transmission system
- The CMPLDW represents the current state-of-the-art in dynamic load modeling

Fundamentals, Testing & Modeling of Air-Conditioners

- The physics of stalled residential central AC units have long been understood and can now be modeled accurately
- A solid understanding of the propensity of populations of central AC units to stall (or not stall) in response to faults is now also close at hand

Take Aways pt 2

Manufacturing Perspective, Future Trends & Technologies

- We are moving toward a future in which the majority of end-use loads will no longer be directly coupled to the grid – instead they will be coupled through power electronic interfaces
- On-going communication and information exchange with end-use (load, storage, generation) manufacturing communities is essential – and *they are waiting to hear from us*

Load Model Data

- The CMPLDW was developed to model explicitly a range of dynamic load behaviors and account for the effects of the distribution systems that connect loads to transmission
- WECC's experience developing and using CMPLDW has led to rapidly maturing, systematic modeling practices, including reliance on DOE-developed tools – Yet, more needs to be done to facilitate (ease) the use of CMPLDW in conducting planning studies

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Take Aways pt 3

Field Measurements

- Field measurements of AC stalling have been instrumental in directing needed improvements in modeling studies aimed at reproducing FIDVR
- This experience has taught us that there is no substitute for field measurements in improving our understanding, in the future, of the aggregate behavior of a changing population of end-use loads

Experiences conducting studies using CMPLDW

- Phased adoption has allowed utilities to gain experience and build confidence in using CMPLDW
- Systematic sensitivity studies help to identify specific inputs to the CMPLDW that deserve focused attention
- Vendor engagement needed

Take Aways pt 4

Reliability Focus

- FIDVR originating from within distribution is no longer the most significant load-related issue for the operational security of the bulk power system
- CMPLDW is evolving and use of it should be considered a “best practice”, although not a required practice
- The transient voltage dip criteria is being reconsidered
- Traditional generation and load technologies, by design, had either performance margins or grid-friendlier behaviors, respectively, that reduced concerns regarding what could not be studied adequately with conventional simulation tools
- These margins and behaviors are disappearing as both fleets (generation and loads) change and hence our exposure to the limitations of what can be studied with current simulation tools is increased

Take Aways pt 5

Reliability Focus (continued)

- Looking forward we need to revisit the purposes served and manner by which future planning studies are conducted, starting with the reliability objectives they seek to support
- The value of modeling is insight not numerical outputs
- We must acknowledge explicitly that there is a trade-off between planning criteria that emphasize continuity of service to customers in the face of high probability disturbances and planning criteria that emphasize the sustained security of the bulk power system (including re-establishment of supply) in the face of low probability but severe events.

Contacts for Follow-Up

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