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BPS Reliability Perspectives

Reliability Starts during the Interconnection Process

Ryan Quint, PhD, PE
Director, Engineering and Security Integration, NERC
Generator Interconnection Workshop
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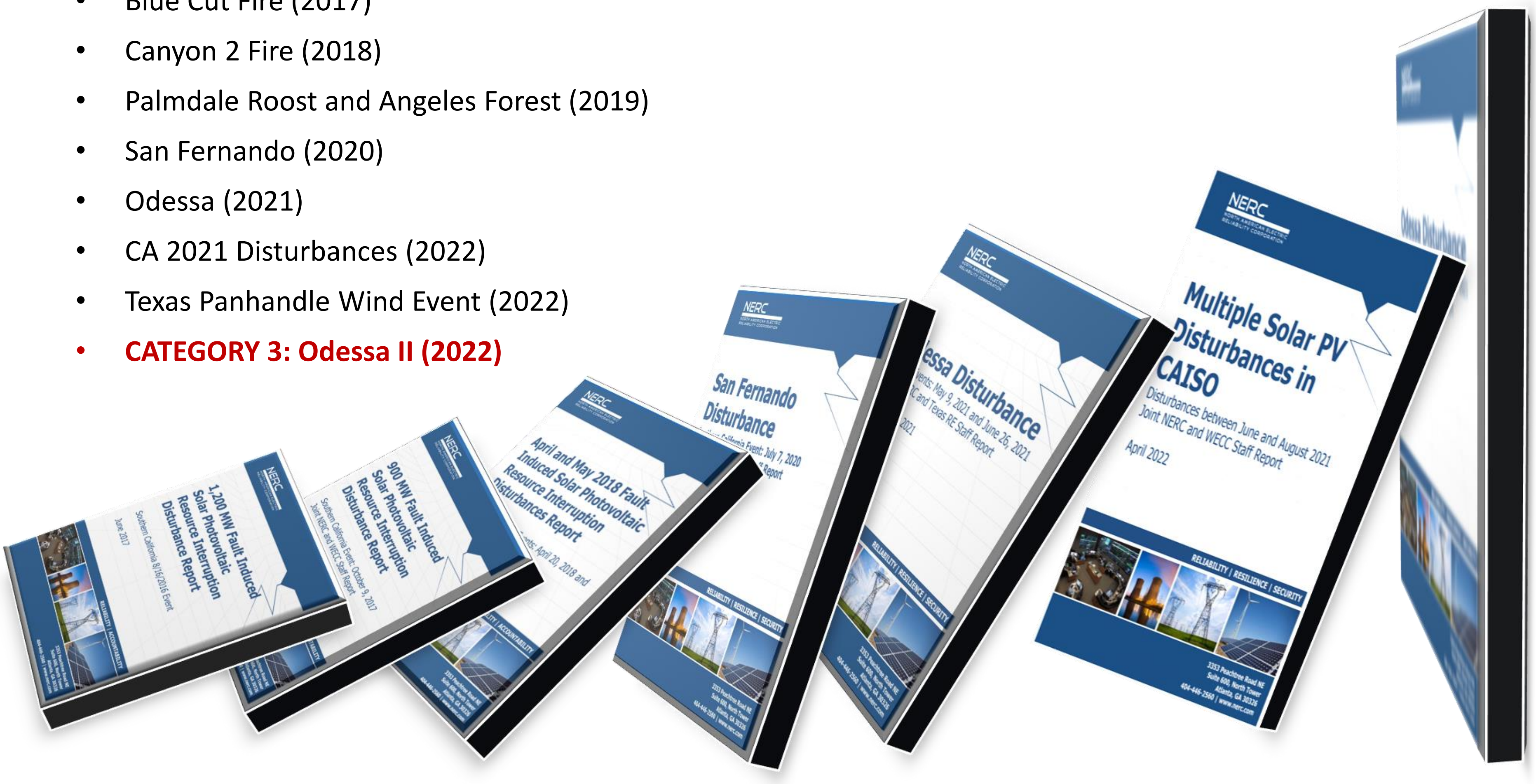
The Saga Continues...

- Blue Cut Fire (2017)
- Canyon 2 Fire (2018)
- Palmdale Roost and Angeles Forest (2019)
- San Fernando (2020)
- Odessa (2021)
- CA 2021 Disturbances (2022)
- Texas Panhandle Wind Event (2022)
- **CATEGORY 3: Odessa II (2022)**



https://www.nerc.com/pa/rrm/ea/Pages/Major-Event-Reports.aspx

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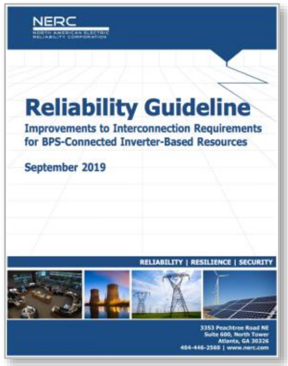
Three-Pronged Approach

1. **Industry Adopt NERC Reliability Guidelines**
   - Industry Engagement, Outreach, Education, and Collaboration
   - Best Practices and Education



2. **Improvements to FERC Generator Interconnection Procedures and Agreements**
   - Focused Improvements to Commissioning Processes
   - IEEE P2800-2022

3. **Enhancements to NERC Reliability Standards**
   - Addressing Model Quality Issues and Inadequate Reliability Studies
   - Post-Event Performance Validation and Addressing Abnormal Performance Issues

NERC's IBR Strategy

Risk Analysis	Interconnection Process Improvements	Best Practices and Education	Regulatory Enhnacements
Event Analysis	Improvements to GIAs and GIP	Reliability Guidelines	NERC Standards Projects
Disturbance Reports	Enhanced Interconnection Requirements	Webinars and Workshops	BES Definition Review
Alerts	Modeling and Study Improvements	Outreach and Engagement	Inverter-Specific Requirements and Standards
Lessons Learned	IEEE P2800-2022	Emerging Reliability Risk Issues	Risk-Based Compliance

Recommended Practices and Industry Guidance

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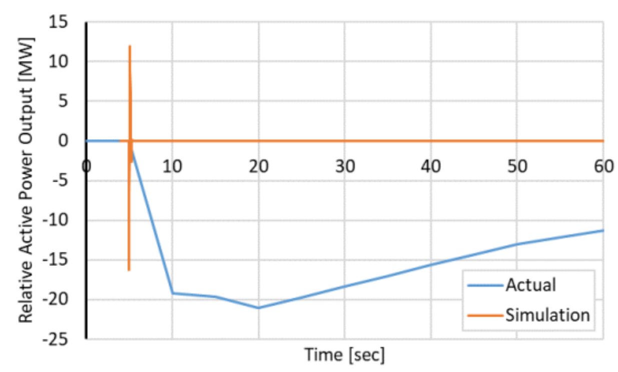
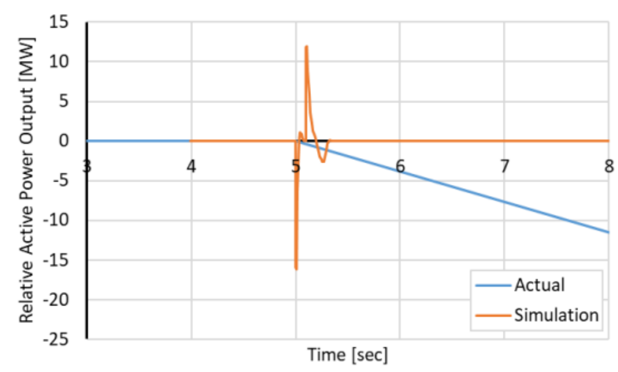
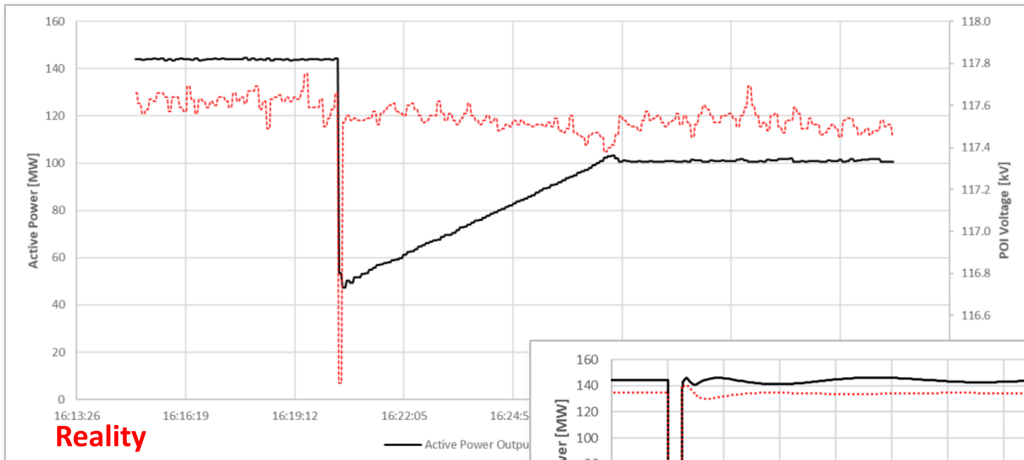
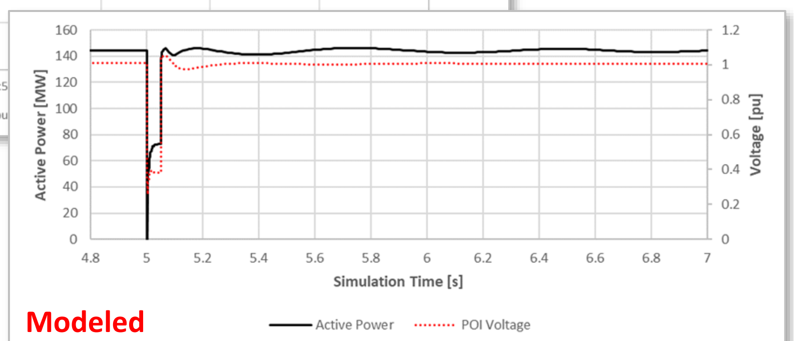
Accurate Modeling Needs









Proposed Modeling Requirements

329. Specifically, we propose to revise Attachment A to Appendix 1 of the *pro forma* LGIP, and Attachment 2 of the *pro forma* SGIP to require each interconnection customer requesting to interconnect a non-synchronous generating facility to submit to the transmission provider: (1) a validated user-defined root mean square (RMS) positive sequence dynamics model; (2) an appropriately parameterized, generic library RMS positive sequence dynamics model, including a model block diagram of the inverter control system and plant control system, that corresponds to a model listed in a new table of acceptable models or a model otherwise approved by WECC; and (3) a validated EMT model, if the transmission provider performs an EMT study as part of the interconnection study process.

- ✓ Suite of ***accurate*** models is critical to conducting adequate BPS reliability studies moving forward
- ✓ Each model type plays a ***unique*** role in different types of reliability studies

330. First, regarding the validated user-defined model, we propose to define a "user-defined model" as any set of programming code created by equipment manufacturers or developers that captures the latest features of controllers that are mainly software based and represents the entities' control strategies but does not necessarily correspond to any particular generic library model. In order for this model to be "validated," it must be confirmed that the equipment behavior is consistent with the model behavior. This can involve, for example, an attestation from the interconnection customer that the model accurately represents the entire generating facility, attestations from each equipment manufacturer that the user defined model accurately represents the component of the generating facilities, or test data.

- ✓ User-defined models reflective of actual installed (planned) equipment, controls, settings, modes, and protection is ***critical***
- ✓ Models must ***match*** actual equipment behavior; otherwise, reliability studies are useless

Proposed Modeling Requirements

331. Second, regarding the table of acceptable generic library models, this table is based on the current WECC list of approved dynamic models for renewable energy generating facilities.[468] WECC's list of approved dynamic models has also been integrated into NERC Guidelines.[469] These models represent the current state of the art with regard to dynamic modeling requirements for non-synchronous generating facilities.

- ✓ Standard library model, parameterized with appropriate plant-specific settings; ***not*** generic parameters

- ✓ Modeling accuracy is ***critical*** to reliability studies; inaccurate models lead to inaccurate studies, which lead to poor interconnection decision making and unreliable operation
- ✓ Models need to include controls, modes of operation, settings, and protections that could affect ***ability to ride through and provide essential reliability services***

332. We believe that these models represent the full spectrum of modeling data that transmission providers need to perform accurate interconnection studies for non-synchronous generating facilities. We recognize that the modeling data we propose to require from non-synchronous generating facilities may be more voluminous than that required of synchronous generating facilities; however, this data submission requirement is intended to result in a comparable level of modeling accuracy among all generating facilities.

Proposed Modeling Requirements

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333. An interconnection customer's failure to provide the above information within the deadlines established in the *pro forma* LGIP and *pro forma* SGIP would make the interconnection request incomplete and will be considered invalid in accordance with section 3.4.3 of the *pro forma* LGIP and section 1.3 of the *pro forma* SGIP. Pursuant to those provisions, if the interconnection customer does not cure the deficiency within the 10-day cure period, the interconnection request will be considered withdrawn pursuant to section 3.7 of the *pro forma* LGIP and section 1.3 of the *pro forma* SGIP.

- ✓ **Necessary modeling linkage to "first-ready"** – interconnecting customers need to be able to provide accurate modeling information at time of interconnection…

- ✓ …and process can accommodate changes or modifications along the way, but these **must be re-studied** from a reliability perspective – new models are necessary to reflect those changes.

334. We also propose to modify subsection 4.4.4 of the *pro forma* LGIP and section 1.4 of the *pro forma* SGIP to require that any proposed modification of the interconnection request be accompanied by updated models of the proposed generating facility. This will ensure that the transmission provider will be able to accurately model the impact of the interconnection request throughout the interconnection process.

Questions and Answers

Ryan D. Quint, PhD, PE
Director, Engineering and Security Integration
North American Electric Reliability Corporation
202-400-3015 office | 202-809-3079 cell
ryan.quint@nerc.net