TEXAS RE

Recent Changes Affecting MOD-026-1

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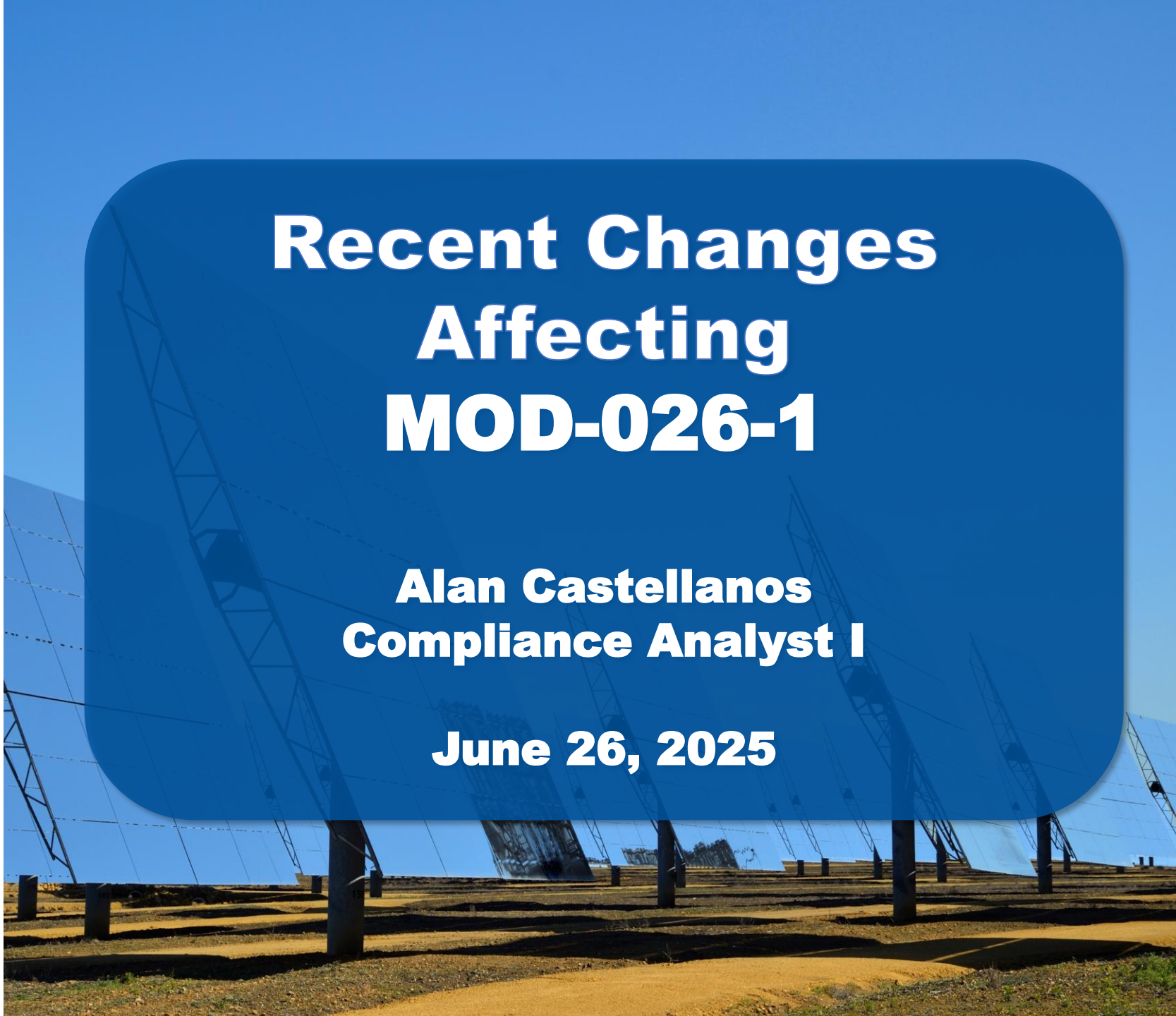


MOD-026-1 Overview

Purpose

- Verify that the generator excitation control system or plant voltage/variance control function model and the model parameters used in dynamic simulations accurately represent system behavior when assessing BES reliability

Applicability

- Generator Owners
- Transmission Owners

Requirement

- Entities shall provide information and/or respond to information requests
- Written responses shall be given within specified timelines

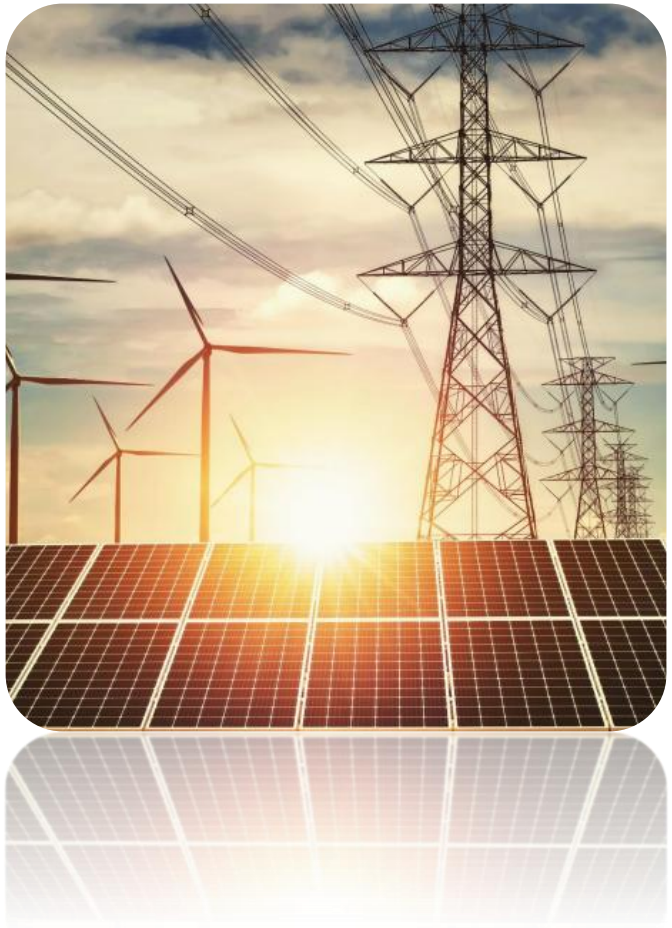
Impact of Inverter-Based Resources (IBRs)

Project 2020-06 Verifications of Models and Data for Generators

- Substantial growth of inverter-based resources (IBRs) in recent years (wind, solar, batteries) has prompted NERC to study revisions to applicable Standards or the need for additional Standards
- Both MOD-026-1 and MOD-027-1 Standards contain language that is specific to synchronous generators
- Revisions to clarify the applicable requirements for synchronous generators and IBRs

Project 2020-06: Definition of Inverter-Based Resource (IBR)

A plant/facility consisting of individual devices that are capable of exporting Real Power through a power electronic interface(s) such as an inverter or converter, and that are operated together as a single resource at a common point of interconnection to the electric system. Examples include, but are not limited to, plants/facilities with solar photovoltaic (PV), Type 3 and Type 4 wind, battery energy storage system (BESS), and fuel cell devices.



Reasoning Behind Changes for MOD-026-1

- Multiple IBR events 2016 – 2023
- Rapid integration of IBRs has prompted a focus by NERC on modeling
- IBR behavior during system faults requires further study
- IBRs differ from synchronous generators
- IBR models need accuracy to avoid reliability issues such as Cascading or instability
- IBRs are needed for frequency control

FERC Order 901

Directive to develop new or modified Reliability Standards for modeling verification and modeling validation for registered IBRs

The proposed revisions would further incorporate the uniform model framework verifications into FAC-002 to ensure a holistic approach for model data sharing is established since commissioning of an IBR

Affects standards: MOD-026-1 and MOD-027-1

NERC Alert Level 2 – Aggregate Report

- Over 15,000 MW of IBR loss occurred during 10 major events since 2016—10,000 MW from 2020-2024 alone
- GOs often lacked access to basic facility data
- Models failed to match field performance
- Protection settings often underused inverter capability
- 68% of facilities had limited ride-through settings; 20% used constrained “triangle” reactive capability curves

NERC Alert Level 2 – Data Consistency Problems

Ride-through voltage and frequency thresholds did not match actual inverter behavior

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Inconsistent use of positive sequence phasor domain (PSPD) vs. equipment specific electromagnetic transient (EMT) equipment-specific models

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Primary Frequency Response (PFR) flags and gains mismatched between data fields, dynamic models, and interconnection-wide files

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Planning models could not replicate actual IBR behavior during events, leading to planning failures and unexpected outages

NERC Alert Level 3 – Why We're Here Now

Trigger for Level 3 Alert

Persistent deficiencies despite Level 2 recommendations

Low data response rates even after deadline extensions

Widespread evidence of poor model validation, testing, and conformance tracking

NERC Alert Level 3 – Key Focus Areas

- Enhanced interconnection requirements (e.g., reactive power settings, ride-through performance)
- Required model validation and benchmarking
- Post-commissioning performance testing
- Lifecycle change tracking and control parameter integrity

Recommended Internal Controls for MOD-026-1

For Generator Owners (GOs)

- Carefully review model accuracy and parameter alignment before submission
- Verify control software versions are current and compatible with submitted models
- Establish a formal, documented workflow for model verification and validation
- Maintain records of all validation reports, test data, and correspondence

For Transmission Planners (TPs)

- Set clear timelines for model submission and review processes
- Send formal acknowledgement requests when receiving models or updates from GOs
- Use calendar notifications or task reminders to ensure deadlines are met
- Retain all evidence of model verification steps and communications for audit purposes

Why This Matters

MOD-026-1 relies on verified dynamic models

Inaccurate IBR models compromise reliability assessments

Essential actions support proper model validation and performance verification

What's Recently Changed: Project 2020-06

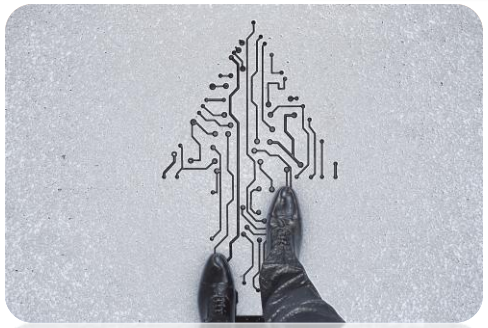
Modified Terms

Model Verification

- The process of confirming that model structure and parameter values represent the equipment or facility design and settings by reviewing equipment or facility design and settings documentation

Model Validation

- The process of comparing measurements with simulated results to assess how closely a model's behavior matches the measured behavior



What's Next

Continued monitoring of IBR modeling through NERC Alert responses

Project 2020-06 Milestone 3

Key Takeaways

IBR modeling deficiencies have resulted in major reliability events

Level 2 alert exposed industry-wide gaps, Level 3 alert introduced essential actions

Regional Entities and industry stakeholders must act together to improve IBR modeling standards and practices

Helpful Resources

- ❑ Project 2020-06
- ❑ NERC Alerts
- ❑ Recommended Modeling Practices and List of Unacceptable Models
- ❑ NERC Standard MOD-026-1

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Ensuring electric reliability for Texans