

A PODCAST ABOUT ENERGY

The Top 3 by E3

**Electric Grid Disturbance Trends:
The Evolving Reliability Landscape
Season 2, Episode 3 Released: 5/18/2022**



- 18 major events have occurred since 2003 including impacts from natural disasters like hurricanes and wildfires.
- Over 60% have occurred in the last 5 years, which shows an upward trend in the frequency of these types of events.
- Of those, the majority are directly attributable to solar PV and wind.

Major Event Analysis Reports

Major Event Analysis Reports

[June-August 2021 CAISO Solar PV Disturbance Report](#)

[May/June 2021 Odessa Disturbance Report](#)

[July 2020 San Fernando Solar PV Reduction Disturbance Report](#)

[January 2019 Eastern Interconnection Forced Oscillation Event Report](#)

[January 2018 South Central Cold Weather Event Report](#)

[April and May 2018 Fault Induced Solar Photovoltaic Resource Interruption Disturbances Report](#)

[September 2017 Hurricane Irma Event Analysis Report](#)

[August 2017 Hurricane Harvey Event Analysis Report](#)

[October 2017 Canyon 2 Fire Disturbance Report](#)

[August 2016 1200 MW Fault Induced Solar Photovoltaic Resources Interruption Disturbance Report](#)

[April 2015 Washington D.C. Area Low-Voltage Disturbance Event](#)

[Cold Weather Training Materials](#)

[January 2014 Polar Vortex Review](#)

[October 2012 Hurricane Sandy Event Analysis Report](#)

[October 2011 Northeast Snowstorm Event](#)

[September 2011 Southwest Blackout Event](#)

[February 2011 Southwest Cold Weather Event](#)

[August 2003 Northeast Blackout Event](#)

Reliability Guidelines:

- Industry action without NERC mandate

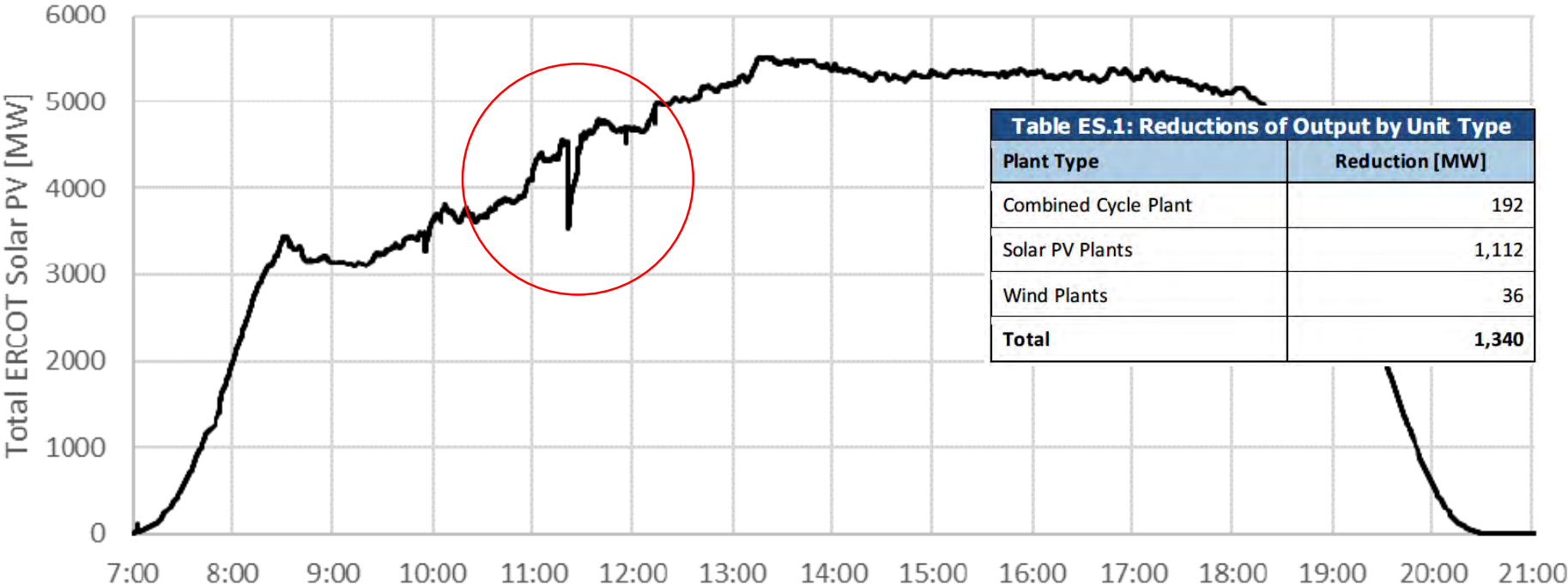
Interconnection requirements:

- Performance requirements are left to the Transmission Owners (not adequate)
- Recommend FERC add performance requirements to the pro forma interconnection agreements
- Clarify modeling and study requirements including electromagnetic transient (EMT) models
- Require acceptance testing to validate models prior to commercial operation (not currently mandated by the NERC requirements)

Reliability Standards:

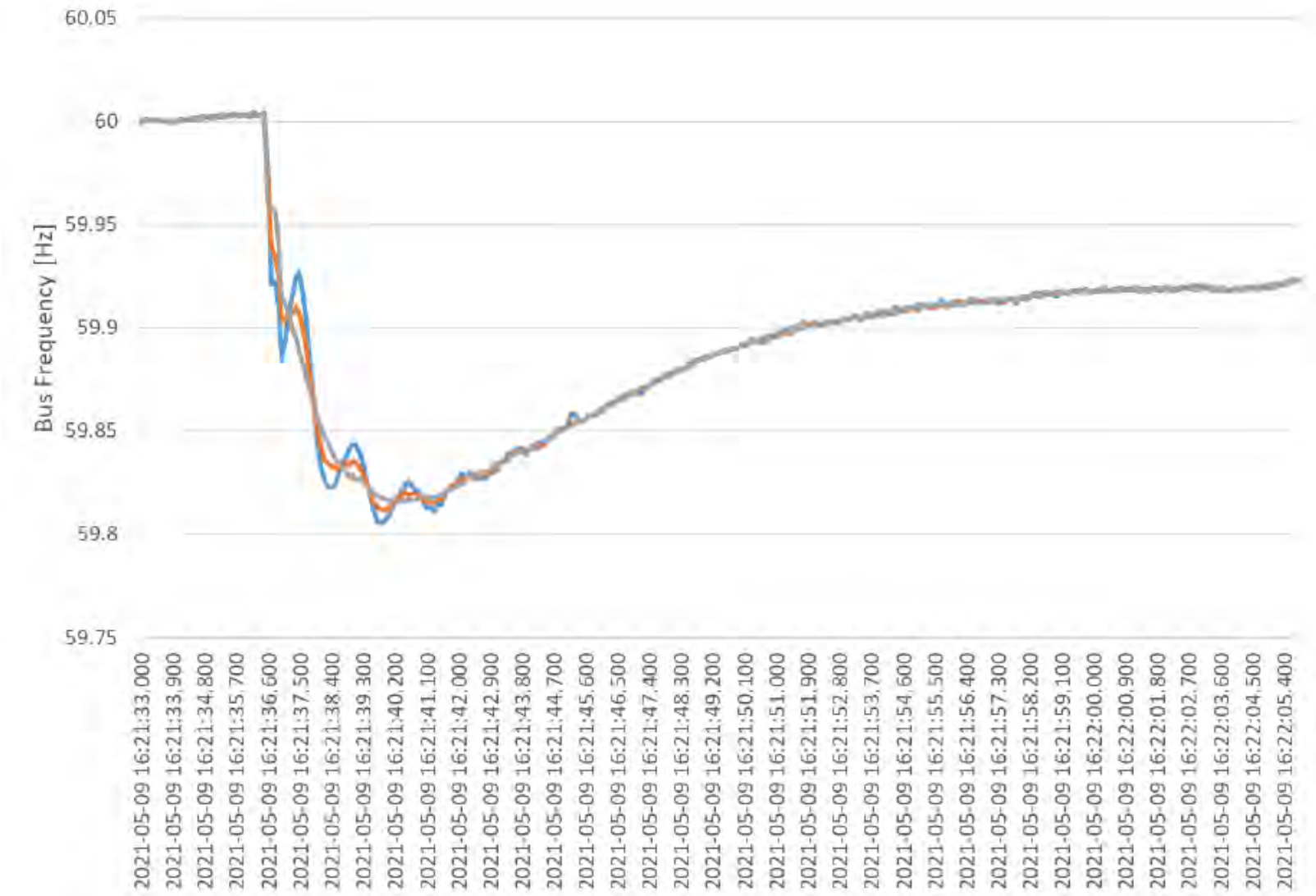
- “Modernize and Update”
- Transition to performance-based requirements (balance of compliance burden with impact to reliability)
- Performance validation standard (RC, TOPs, BAs) investigate and identify poor performing facilities during disturbance events
- True ride-through standard to replace PRC-024
- EMT modeling and model quality processes
- Monitoring data, analysis, and reporting (changes to PRC-002/004)
- Inverter specific requirements

- Event occurred in May 2021 around 11:30 AM
- Wind and PV 34% and 9% of total generation (mix)

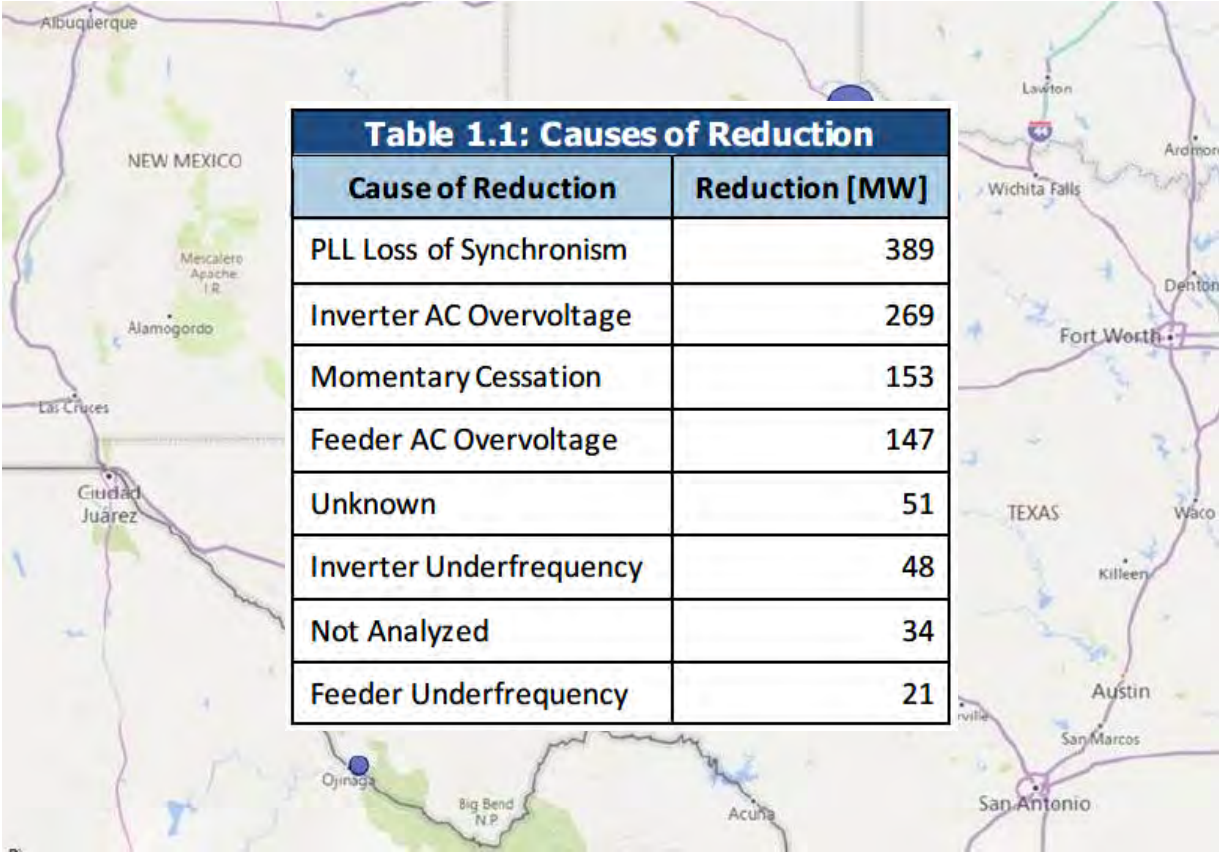


https://www.nerc.com/pa/rrm/ea/Documents/Odessa_Disturbance_Report.pdf

Odessa Disturbance Event



- Phase-to-ground fault caused by failed surge arrestor on combustion turbine
- Voltages initially depressed
- Voltage and phase angle variations caused widespread reduction of PV and wind output
- Disturbance affected facilities up to 200 miles from the initial fault
- All reductions were a result of plant controller logic and protection



- Blue Cut Fire disturbance (August 2016)
- Canyon 2 Fire disturbance (October 2017)
- Palmdale Roost and Angeles Forest (April/May 2018)
- San Fernando disturbance (July 2010)



Reliability Guideline

BPS-Connected Inverter-Based Resource
Performance

September 2018

Reliability Guideline

Improvements to Interconnection Requirements
for BPS-Connected Inverter-Based Resources

September 2019

- Guidance not being followed
- Lack of interconnection performance requirements
- Insufficient Reliability Standards
 - Transition from documentation to performance
 - “Hidden protection”
 - Protection set for compliance and not capability
 - Event analysis and reporting
 - Modeling

Table 2.1: Solar PV Tripping and Modeling Capabilities and Practices

Table 2.2: Positive Sequence Models for Affected Facilities		
Resource	Standard Library Model	User-Defined Model
Wind	1	2
Solar PV	16	2

Table 2.3: EMT Models for Affected Facilities

Resource	Available EMT Model	No EMT Model
Wind	2	1
Solar PV	15	3

measured underfrequency — feeder protection

NO

NO

- Push for Electromagnetic Transient (EMT) modeling
- Standardization of models
- System model validation recommendation

- Adoption of reliability guidelines
- Improvements to interconnection process
- “Significant” improvement of NERC Standards for inverter-based resources
 - Performance standard
 - Replace PRC-024 with a true ride-through
 - New analysis and reporting requirements
 - Inverter specific performance requirements
- EMT modeling and system model validation
- Model quality requirements

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Standards Announcement

Project 2017-01 Modifications to BAL
White Paper

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Standards Announcement

Modifications of Models and

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Project 2021-06 Modifications to IRO-010 and
TOP-003

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REMINDER

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Project 2021-01 Modifi
and PRC-019

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Project 2019-06 Cold Weather

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Project 2021-04 Modifications to PRC-002-2
Standard Authorization Requests

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Standards Announcement

Project 2021-02 Modifications to VAR-002

18 Open Projects affecting nearly 40 Standards

NAES NERC Reunion: A Reliability Gathering

Most would agree, the last couple of years have presented unique challenges for the Reliability Industry. As the shadow of the Pandemic recedes, NAES is excited to extend an invitation to reconnect in the real world. The NAES NERC Team offers three days of events, speakers, and informative breakout sessions discussing contemporary industry trends, challenges, and first-hand experiences. Take this opportunity to reconnect with old colleagues and meet new ones who share our collective pursuit of grid reliability and security.

August 22-25, 2022
W Hotel, Seattle, WA



Thank you for listening! Please feel free to contact either John or Ginger for additional information about the podcast or NERC services.

Ginger Elbaum

E3 Consulting

Managing Director

Ginger.Elbaum@e3co.com

John Schmoker

NAES Corporation

NERC Compliance Testing Services Project Manager

John.Schmoker@naes.com

