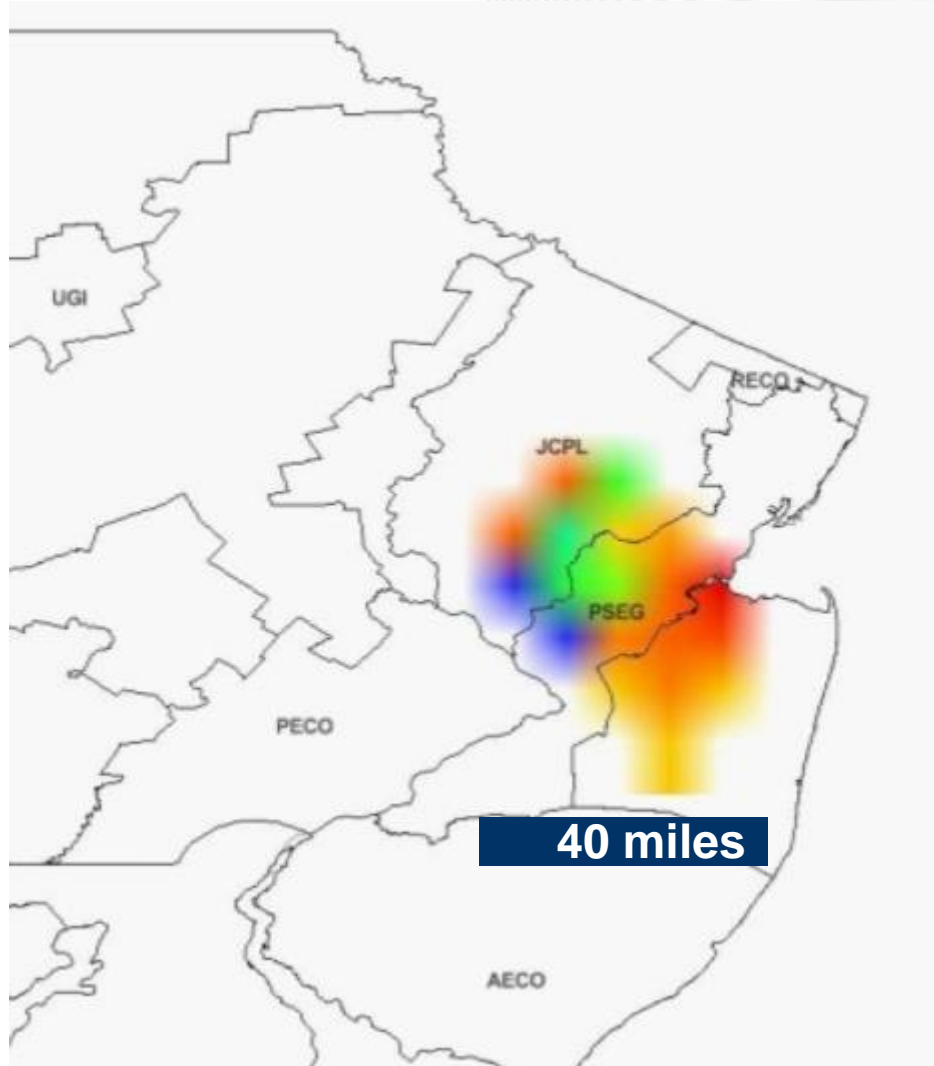
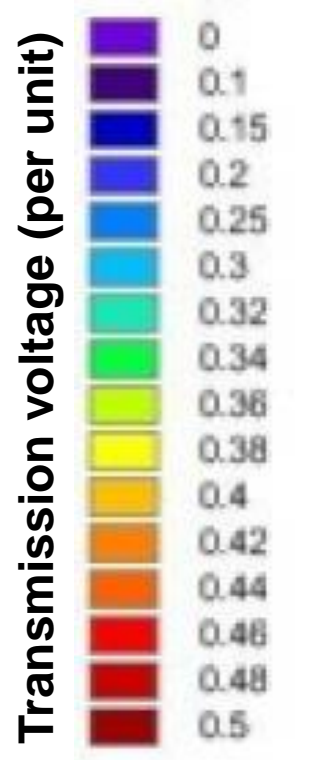


# Smart Inverter Standards

Andrew Levitt  
Senior Market Strategist, Emerging  
Markets



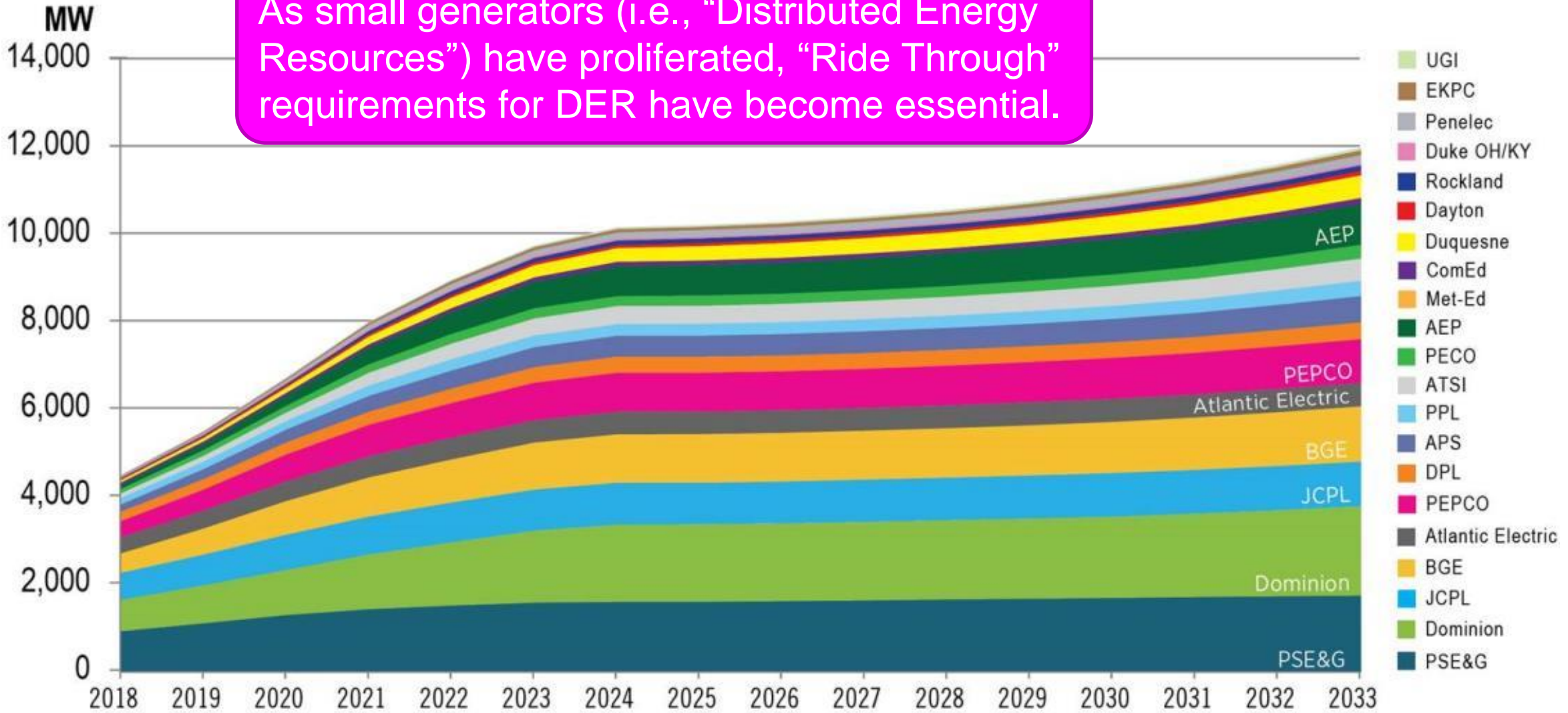
- Generator and line contingencies can cause abnormal conditions, e.g. significantly high or low voltage or frequency.
- “Ride Through” is the capability of a generator to remain connected during abnormal conditions.
- “Ride Through” requirements for large generators are essential for BES reliability.

Source: [http://www.nerc.com/comm/PC/Integration%20of%20Variable%20Generation%20Task%20Force%2011/IVGTF17\\_PC\\_FinalDraft\\_December\\_clean.pdf](http://www.nerc.com/comm/PC/Integration%20of%20Variable%20Generation%20Task%20Force%2011/IVGTF17_PC_FinalDraft_December_clean.pdf)

# DER deployment increasing in PJM and elsewhere

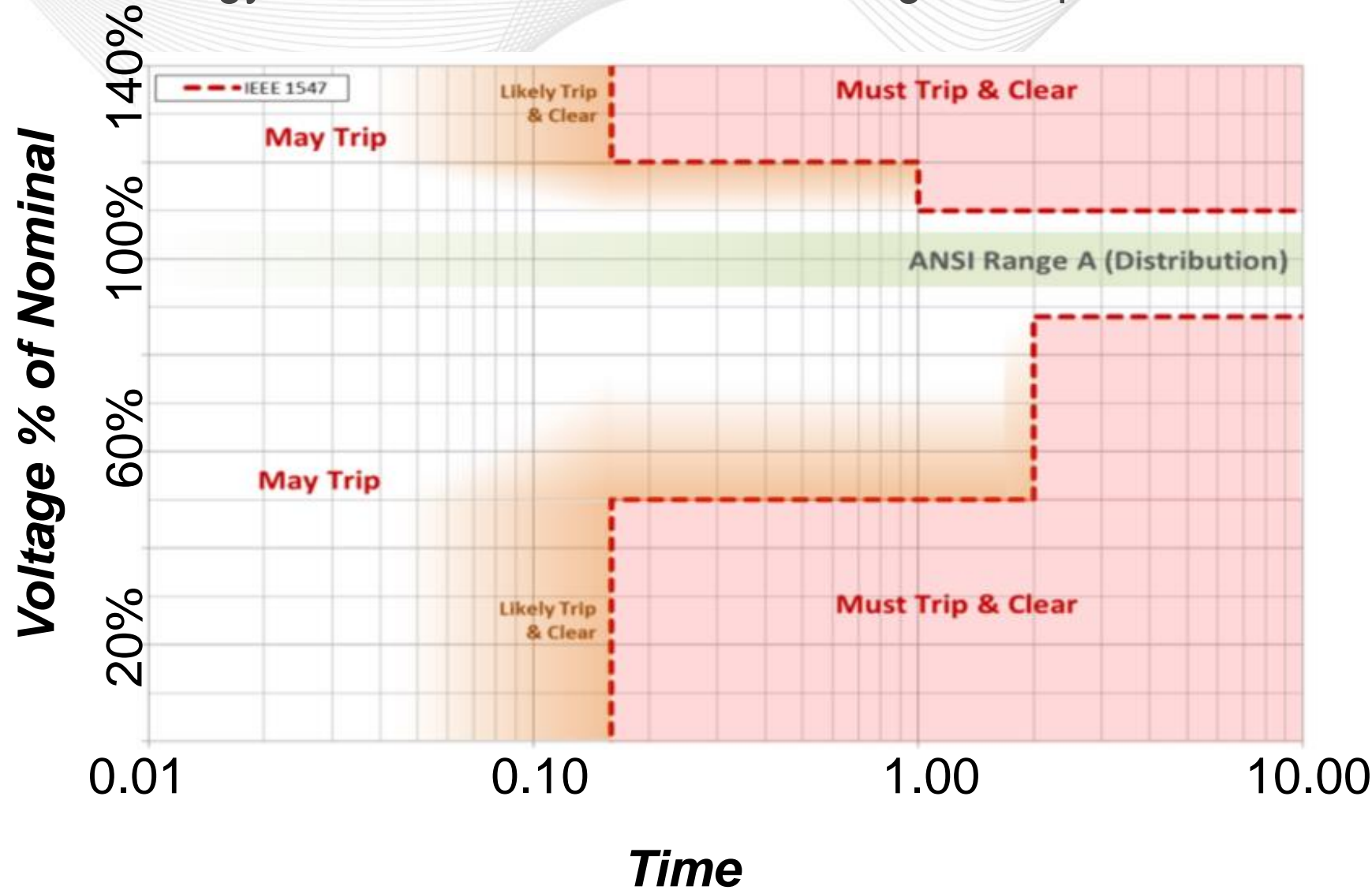
As small generators (i.e., “Distributed Energy Resources”) have proliferated, “Ride Through” requirements for DER have become essential.

Cumulative Non-wholesale Solar MW



# Distributed Energy Resources Lack “Ride Through” Requirement

- IEEE Standard 1547-2003 technical standard setting DER interconnection requirements.
- Universally referenced in federal and state law, regulations, and utility rules
- Lacks “ride through” requirement.



Source: Draft NERC IVGTF Task 1-7 Report

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### IEEE P1547

IEEE Approved Draft Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces

STANDARD by IEEE, 04/07/2018

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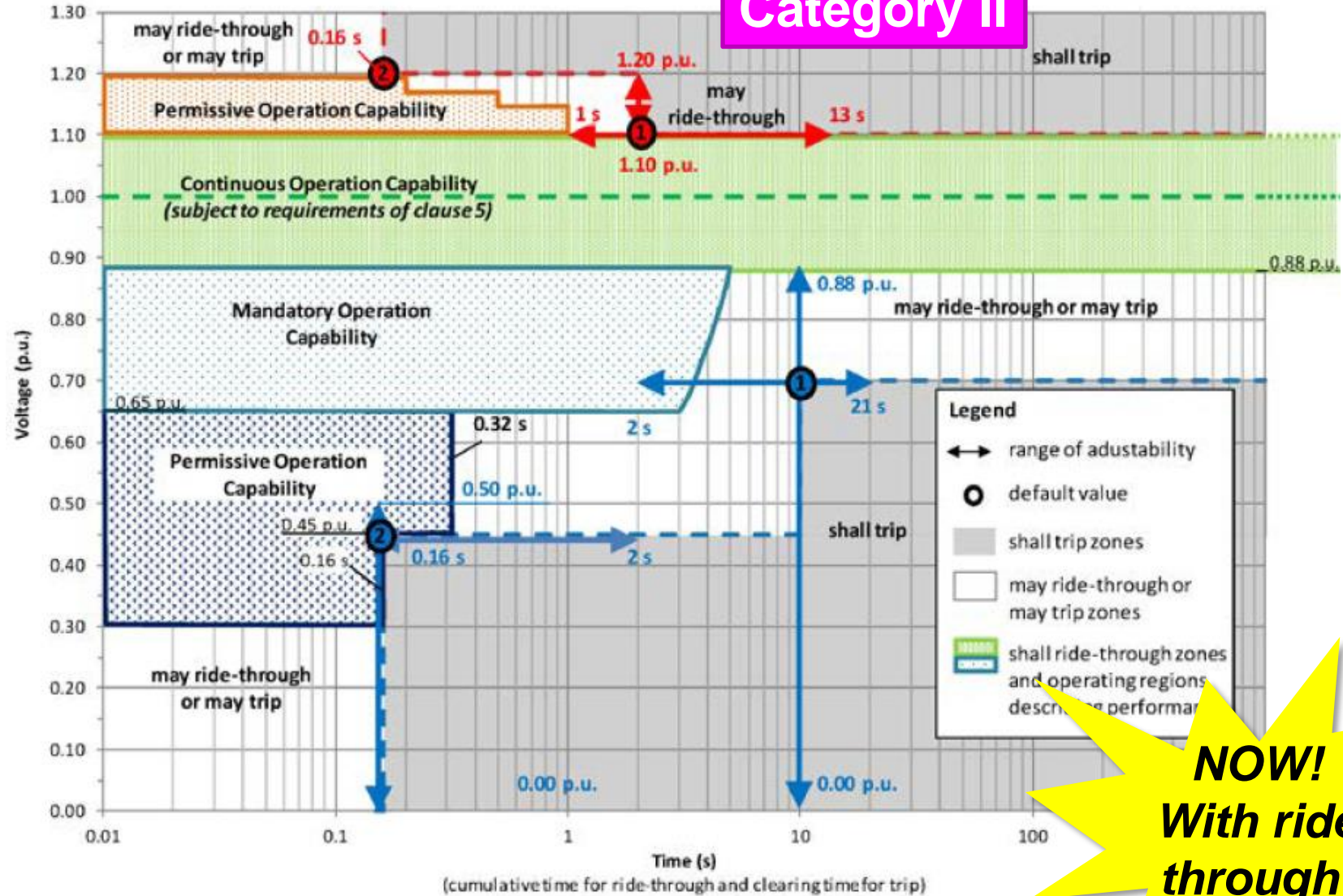
Available Formats	Options	Availability	Priced From ( in USD )	
PDF		P1547/D7.3, Dec 2017 - APPROVED DRAFT	\$145.00 Members pay\$116.00	<a href="#">Add to Cart</a>

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# Revised 1547-2018 Standard Mandates “Ride Through”

**Category II**

- IEEE Standard 1547-2018 offers 3 flavors of “Ride Through”—Category I, II, and III.
- Within each Category, default trip settings are broadly adjustable.
- Up to Authorities Having Jurisdiction (e.g., utilities, local regulators, PJM) to specify Category and (optional) modified trip settings



**NOW!  
With ride through!**



## PJM Role in Implementation of New IEEE 1547-2018 Standard

- Most DER is under local jurisdiction, and PJM has very limited authority.
- In general, the distribution utility is the primary utility stakeholder for establishing DER trip and ride through parameters.
- PJM supports implementation of DER “Ride Through” requirements.
- PJM is available to support and coordinate with distribution utility efforts to establish new requirements based on the revised IEEE 1547-2018.
- PJM recognizes that the revised standard establishes an explicit role for PJM: *“Area EPS operators may specify values within the specified range subject to the limitations on voltage trip settings specified by the regional reliability coordinator”*.
- PJM requires 1547-2003 for a limited set of DER, expects to update rules to revised 1547-2018 standard. PJM will seek utility input as part of that process.

Given broad options in 1547-2018—consensus among distribution utilities on single PJM-wide set of ride through requirements and trip settings would be beneficial.

Feb 28: Preliminary trial workshop w/ 4 utilities (T and D)

March: Report out on trial workshop

Summer: Workshop w/ for all PJM utilities (T and D)

2018: Ongoing collaboration

2019: Final Documentation of Consensus Ride Through and Trip Parameters

PJM Rules

Distribution Utility Discussions under Local Regulation





# Inverter-Based Resource Webinar Series

## NERC

NORTH AMERICAN ELECTRIC  
RELIABILITY CORPORATION



ELECTRIC POWER  
RESEARCH INSTITUTE



DATE and TIME	SESSION	REGISTRATION LINK
Wednesday, March 21 2pm – 4pm EST	Inverter Fundamentals – Distributed Energy Resources (DER) and Bulk Power System (BPS) Connected Resources	<a href="#">join the meeting</a> 1-855-797-9485 640 232 196
Thursday, April 5 2pm – 4pm EST	Distributed Energy Resource (DER) Impacts	<a href="#">join the meeting</a> 1-855-797-9485 644 957 932
Wednesday, May 2 2pm – 4pm EST	Inverter-Based Resources Connected to the Bulk Power System	<a href="#">join the meeting</a> 1-855-797-9485 641 929 120
Thursday, May 17 2pm – 4pm EST	Inverter modeling for protection, harmonics, EMT studies, and review of real-world VER related events	<a href="#">join the meeting</a> 1-855-797-9485 641 686 608
Wednesday, June 13 2pm – 4pm EST	Recommended Performance for Inverter-Based Resources Connected to the Bulk Power System – NERC Reliability Guideline	<a href="#">join the meeting</a> 1-855-797-9485 644 506 277

[http://www.nerc.com/comm/PC/Documents/Inverter\\_Based\\_Resources\\_Webinar\\_Series\\_Flyer-draft\\_02.05.18.pdf](http://www.nerc.com/comm/PC/Documents/Inverter_Based_Resources_Webinar_Series_Flyer-draft_02.05.18.pdf)