

Overview of IEEE 1547-2018

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IEEE Standard for...

Interconnecting Distributed Resources with Electric Power Systems (2003)

16 pp

Interconnection **and Interoperability** of Distributed **Energy** Resources with **Associated** Electric Power Systems **Interfaces** (2018)

124 pp

Voltage Disturbances

Frequency Disturbances

- NERC and a few utilities began to advocate **less-sensitive setpoints for tripping:**
 - ***Keep DERs On-Line for Disturbances on BES.***
 - Still enable tripping for ***Safety on Distribution Systems.***

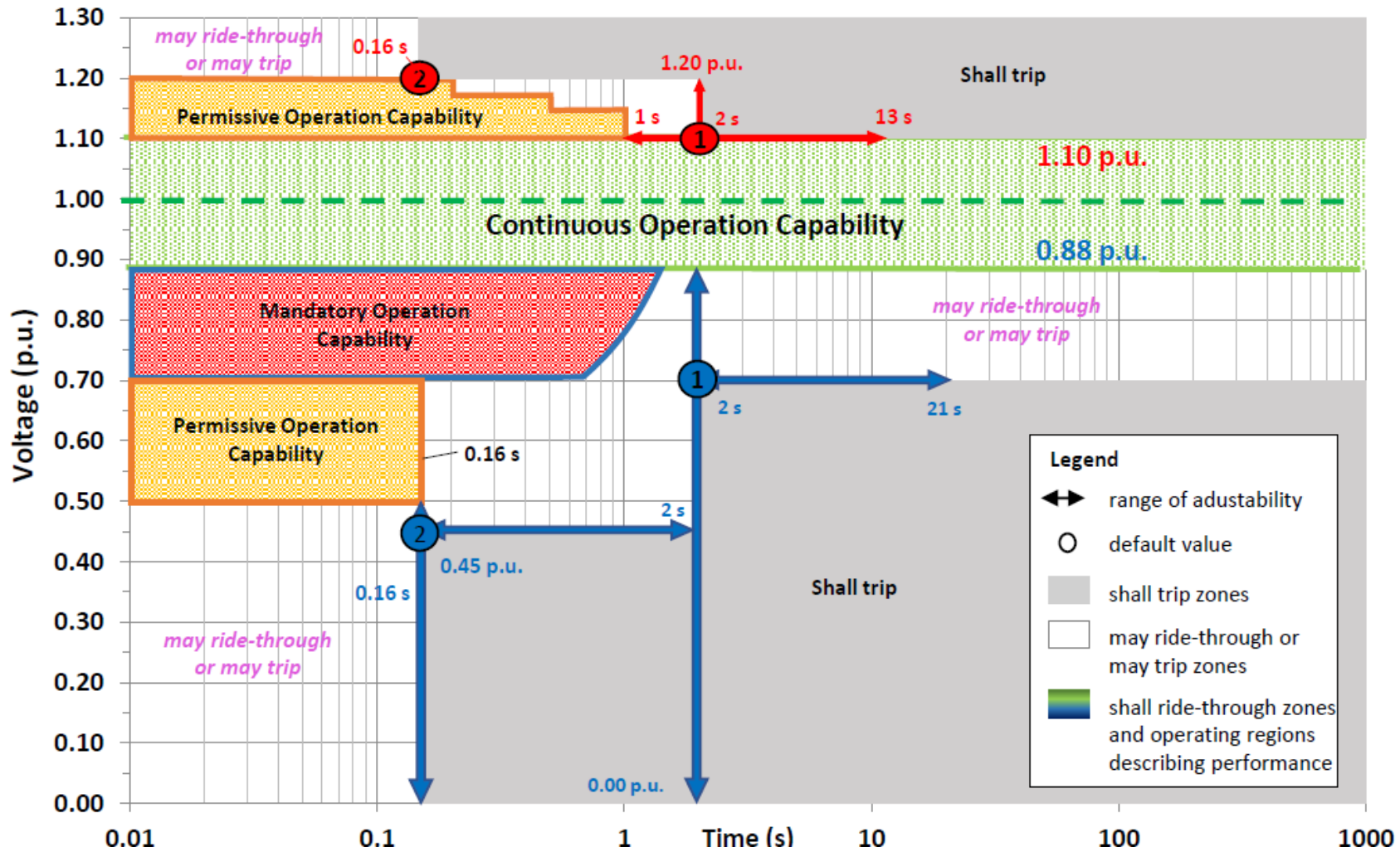
Abnormal Operating Performance Categories

Voltage & Frequency Disturbances

- **Cat I** Meets most BES Security needs. Includes small synchronous machines.
- **Cat II** *Harmonized w\NERC PRC-024* (protection settings for BES generators)
- **Cat III** High-Penetration levels where continued DER operation is needed for Distribution System.
Harmonized w\CA Rule 21.

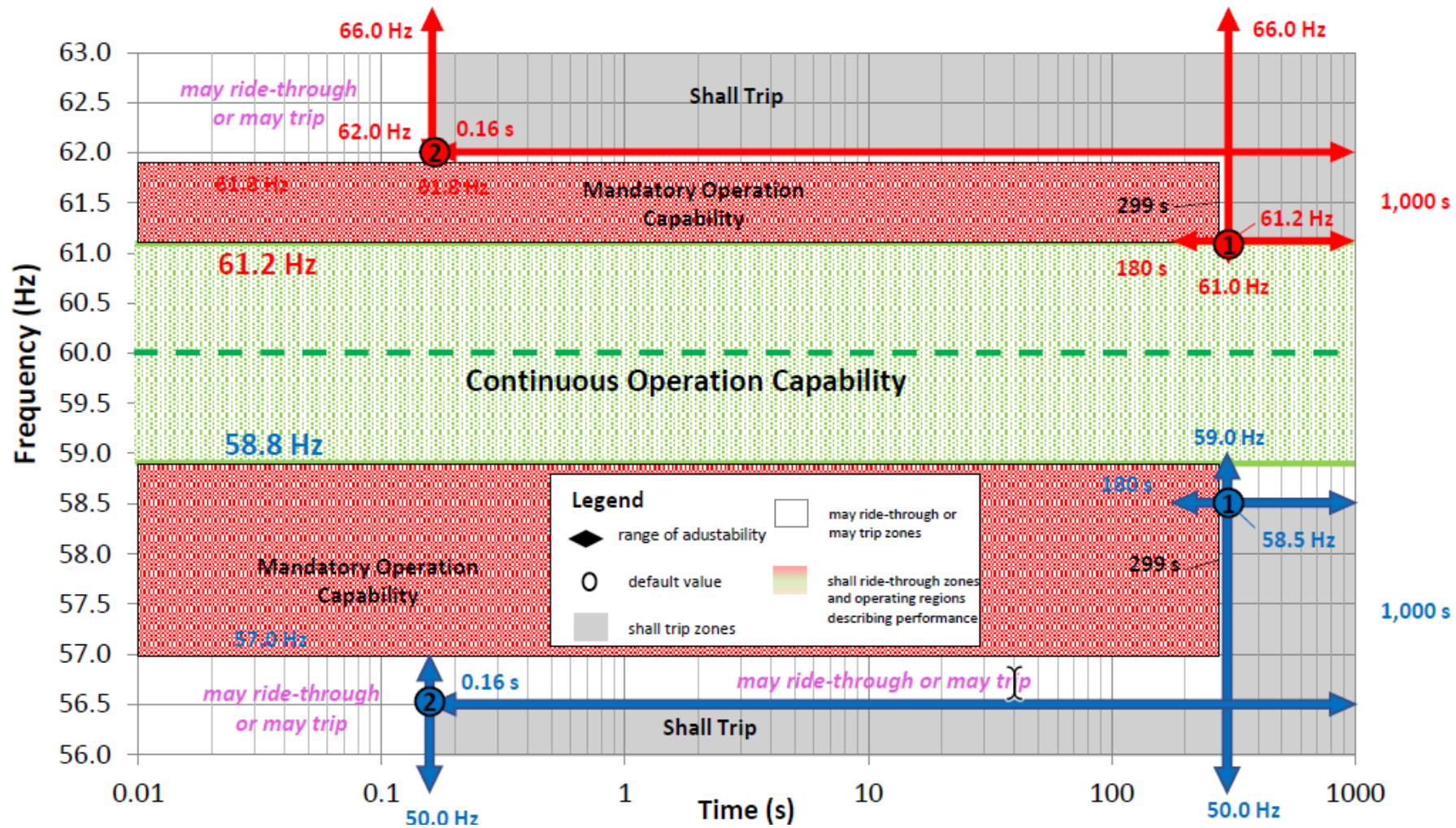
Voltage Trip

New Standard – Category I (for Illustrative Purposes Only)



Frequency Trip

New Standard (for Illustrative Purposes Only)



Vigilance on Voltage & Frequency Settings

- Provide **Settings** to DER Owners\Installers.
- Commissioning **Tests**.
- Periodic **Retests** (maybe *inspections*).
- Interoperability- **Alarms**.
- Education
 - Public\Members
 - Installers

REMEMBER - *Who Owns/Controls the Inverter?*

Reactive Power and Voltage Regulation

New Standard

- Requires DER to be **Capable** of **Regulating Voltage** through **Reactive Power Control**.
- Prescribes Five Different Methods which DER must be capable of.
- **Notes:**
 - Requirement of **DER equipment manufacturers**.
 - Settings are to be at **sole discretion of Co-Op/Utility**.
 - Co-Op/Utility may also choose to **not** use this capability.

Good News!

- Can help stabilize Voltage on Distribution circuits.
- Reduce wear on Voltage Regulators & LTCs.
- Can mitigate flicker and other voltage fluctuations.
- May reduce the need for reconductoring to offset effects of voltage swings.

Caution!

Law of Unintended Consequences

- **Evaluate** circuit & DER **carefully** to choose method and settings.
- As other DERs are added, may need to **reevaluate** original method & settings.
- Load increases, decreases or reconfiguration of circuit can all come into play.
- Any of these methods **may lead to power quality issues** if not closely managed.

Category A and B (Voltage Regulation)

- **Cat A** Meets VAR & Control requirements for all DER systems presently in use.
- **Cat B** Enhanced requirements which can benefit the power system, but which some DER systems may not meet.

AGIR

Authority Governing Interconnection Requirements

- Distinct from AHJ (Authority Having Jurisdiction)
- May be an ISO, PUC, Municipality, or Co-Op Board.
- Some elements may be controlled by different groups.
- Covers selection of:
 - Cat I, II or III for Abnormal Performance
 - Cat A or B on Reactive Power & Voltage Regulation
 - Settings for both
- PJM already meeting with utilities on these issues.

Interoperability

Goes Well Beyond Original Standard

- All DER Required to Have Capability of Exchanging Information
- Mandatory Information Elements in Clause 10
- DER to Support at Least One of These Protocols
 - DNP 3.0
 - Modbus
 - IEEE 2030.5 (SEP2)

NRECA Papers

- Series of Four **Tech Surveillance** Articles on Cooperative.com:
 - ***The Background For Change***
 - ***Reactive Power and Voltage Regulation***
 - ***Disturbance Performance***
 - ***Power Quality and Other Concerns***
 - **NRECA Articles on Development of IEEE 1547**

Note- All Articles Were Prior to Final Ballot & Publication of IEEE 1547-2018.

Guide to IEEE 1547

- Starting Point for Applying Standard
- Idea From T&D MAG
- Draft Completed in September
- Delayed by IEEE - Copyright Concerns
- [NRECA Guide to IEEE 1547-2018](#)
- [IEEE Standards: 1547-2018](#)

GUIDE TO THE IEEE 1547-2018 STANDARD AND ITS IMPACTS ON COOPERATIVES

March 2019



Next Step - IEEE P1547.1

- Companion Standard for **Testing** of DER
- Specifies Methods for Conducting Tests from Base Standard
- Applies to Manufacturers and Utilities
- Needed Before Base Standard Truly Becomes Viable
- Expect **Ballot in May, Publication in October**

Comparison to Original

Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems (2005)

54 pp

Conformance Test Procedures for Equipment Interconnecting Distributed **Energy Resources with Electric Power Systems **and Associated Interfaces (2019)****

265+ pp

For More Information on 1547.1

Recent TechSurveillance Paper

REVISION OF IEEE STANDARD 1547.1®

Business & Technology Surveillance

REVISION OF IEEE STANDARD 1547.1®— THE DER INTERCONNECTION TESTING AND VERIFICATION STANDARD

By Reigh Walling, Walling Energy Systems Consulting

JANUARY 2019



Thank You!

Questions?

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