

Making IEEE Std. 1547 Fit for The Future

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Panel Session TD02

Implications of DG Interconnection Requirements

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DISCLAIMER

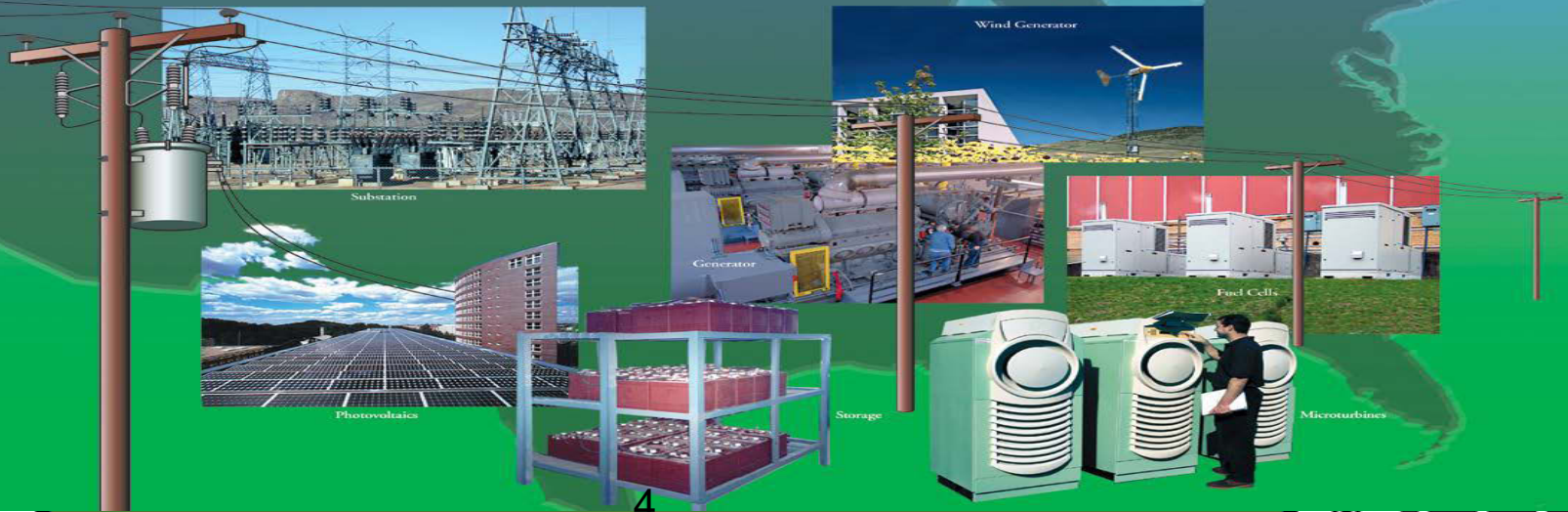
This presentation and discussion here on IEEE P1547 and P1547.1 are individual's views and are not the formal explanation or position of the IEEE.

Content

- Background IEEE Std. 1547
- Scope of P1547 revision
- New requirements in P1547
- Anticipated timeline for P1547 and P1547.1

Importance of IEEE 1547

- Energy Policy Act (2005) Cites and requires consideration of IEEE 1547 Standards and Best Practices for Interconnection; all states use or cite 1547.
- Energy Independence and Security Act (2007) IEEE cited as a standards development organization partner to NIST as Lead to coordinate framework and roadmap for Smart Grid Interoperability standards and protocols {IEEE 1547 & 2030 series being expanded};
- Federal ARRA (2009) Smart Grid & High Penetration DER projects {*use IEEE stds*}.



IEEE 1547 Standards Example Use in USA

IEEE 1547 **Interconnection** **System and Test** **Requirements**

- Voltage Regulation
- Grounding
- Disconnects
- Monitoring
- Islanding
- etc.

IEEE 1547.1 **Interconnection** **System Testing**

- O/U Voltage and Frequency
- Synchronization
- EMI
- Surge Withstand
- DC injection
- Harmonics
- Islanding
- Reconnection

UL 1741* **Interconnection** **Equipment**

- 1547.1 Tests
- Construction
- Protection against risks of injury to persons
- Rating, Marking
- Specific DR Tests for various technologies

NEC**

Article 690 PV Systems;

Article 705: interconnection systems (shall be suitable per intended use per UL1741)

PJM Interconnection, Inc. ***Small Generator*** ***Interconnection Standards*** **FERC approved**

(0-to<10MW and 10-to-20 MW; incorporate 1547 and 1547.1)

* UL 1741 supplements and is to be used in conjunction with 1547 and 1547.1

** Articles: 480 Storage Batteries ;
692 Fuel Cell Systems;
694 Wind Electric Systems
(NEC info. based on NEC 2011)

IEEE 1547 Series of Standards

IEEE SCC21 1547 Series of Standards*

IEEE Std 1547™(2003 and 2014 Amendment 1) Standard for Interconnecting Distributed Resources with Electric Power Systems

IEEE Std P1547™(full revision) Draft Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces

IEEE Std 1547.1™(2005 and 2015 Amendment 1) Standard for Conformance Tests Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems

IEEE Std P1547.1 (full revision) Draft Standard for Conformance Tests Procedures for Equipment Interconnecting Distributed Energy Resources with Electric Power Systems and Associated Interfaces

IEEE Std 1547.2™(2008) Application Guide for IEEE 1547 Standard for Interconnecting Distributed Resources with Electric Power Systems

IEEE Std 1547.3™(2007) Guide for Monitoring Information Exchange, and Control of Distributed Resources with Electric Power Systems

IEEE Std 1547.4™(2011) Guide for Design, Operation, and Integration of Distributed Resource Island Systems with Electric Power Systems

IEEE Std 1547.6™(2011) Recommended Practice for Interconnecting Distributed Resources with Electric Power Systems Distribution Secondary Networks

IEEE Std 1547.7™ (2013) Guide to Conducting Distribution Impact Studies for Distributed Resource Interconnection

IEEE Std P1547.8™ Draft Recommended Practice for Establishing Methods and Procedures that Provide Supplemental Support for Implementation Strategies for Expanded Use of IEEE Std 1547-2003

* Colored background designates IEEE published standard; clear background is draft standard work in progress.

IEEE Std 1547a – Amendment 1, May 2014

(Amendment 1: revisions to 4.1.1, 4.2.3, and 4.2.4)

4.1.1 Voltage Regulation

... DER allowed to change its output of active and reactive power.

4.2.3 (*Response to abnormal grid ...*) Voltage

... DER allowed to “ride through” abnormalities of grid voltage;
... grid and DER operators can mutually agree to other voltage trip and clearing time settings

4.2.4 (*Response to abnormal grid ...*) Frequency

... DER allowed to provide modulated power output as a function of frequency

... .. grid and DER operators can mutually agree to other frequency trip and clearing time settings

P1547 - Full Revision

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

Scope: This standard establishes criteria and requirements for interconnection of distributed **energy** resources (DER) with electric power systems (EPS), **and associated interfaces**.

Purpose: This document provides a uniform standard for the interconnection **and interoperability** of distributed **energy** resources (DER) with electric power systems (EPS). It provides requirements relevant to the interconnection **and interoperability** performance, operation, and testing, and, safety, maintenance **and security considerations**.

Std P1547 Full Revision: Work in Progress Topics

- **Voltage regulation**

Reactive Power Capability of the DER

... capable of injecting and absorbing minimum reactive power ...

- **Voltage and Reactive Power Control**

... capabilities of modes of reactive power control functions:

Power factor; Volt-Var; Active-power power-factor; Reactive power

- **Voltage & Frequency Ride Through**

3 classes (parameter ranges)

- **Interoperability Requirements**

- **Special Interconnection Requirements** e.g.,

- Energy Storage

- Islanding/Microgrids

- Distribution Secondary Networks

Std P1547 Full Revision: Work in Progress Topics

- Area EPS Reclosing Coordination
- Dynamic Voltage Support
- Unintentional Islanding Detection
- Power Quality
 - Limitation of flicker induced by the DER, harmonics, avoidance of temporary overvoltage
- Modeling and Simulation
- Minimum Requirements for Manufacturers Stated Measurement Accuracy

P1547.1 - Full Revision

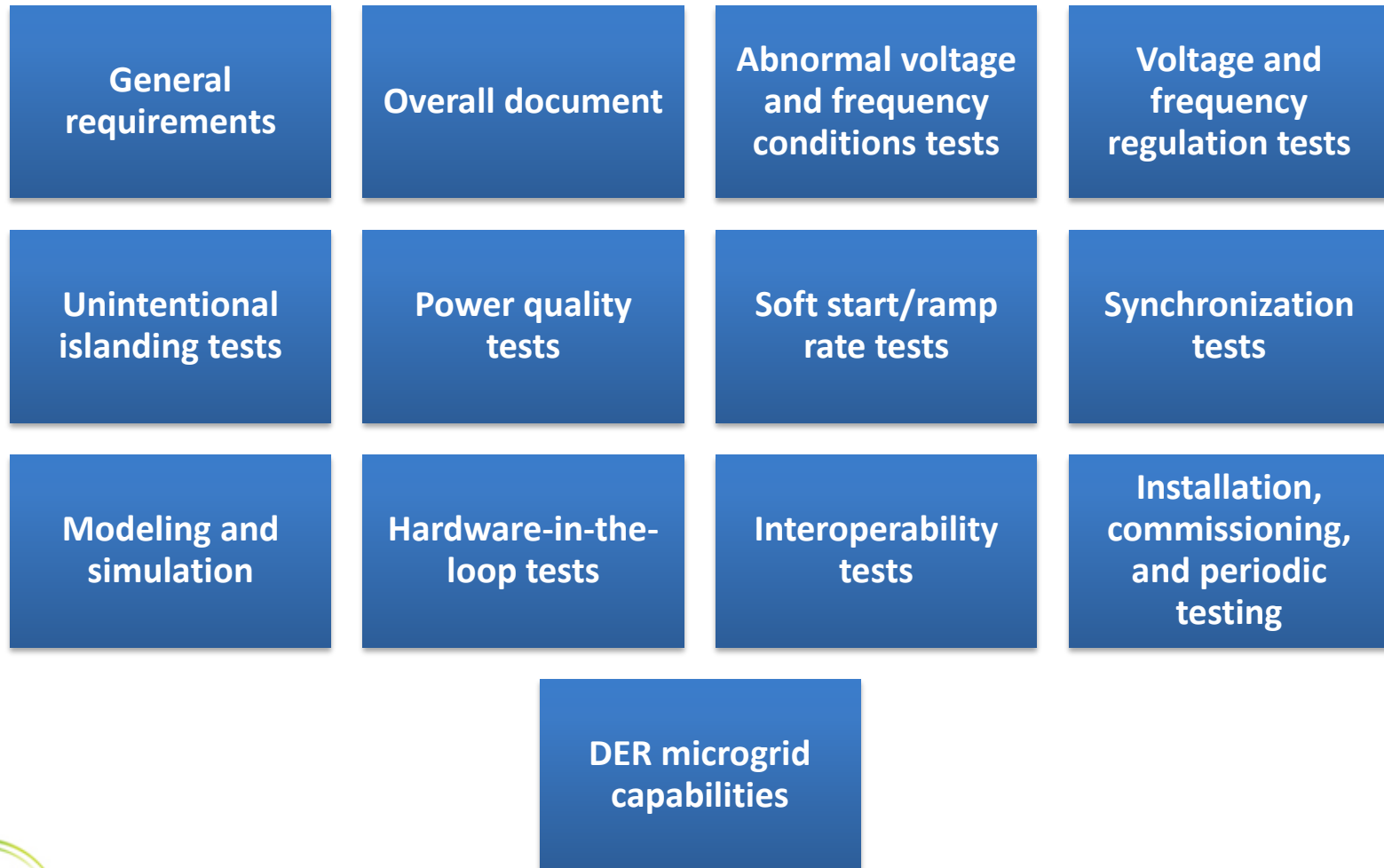
Standard Conformance Test Procedures for Equipment Interconnecting Distributed Energy Resources with Electric Power Systems and Associated Interfaces

Scope: This standard specifies the type, production, commissioning and periodic tests, and evaluations that shall be performed to confirm that the interconnection and interoperation functions of equipment and systems interconnecting distributed energy resources with the electric power system conform to IEEE Standard 1547.

Purpose: Standardized test and evaluation procedures are necessary to establish and verify compliance with those requirements. These test procedures shall provide both repeatable results, independent of test location, and flexibility to accommodate a variety of DER technologies and functions.

P1547.1 Subgroups

(As of June 2016)



IEEE P1547 and P1547.1 Timeline

- Fall/Winter 2016, WG final draft of P1547 to IEEE for ballot
- In Parallel: drafting of IEEE P1547.1 – Ready to ballot in July 2018
- UL1741 adoption of revised IEEE Standard 1547.1

*Success depends on stakeholder involvement!
Get involved...!*

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