

Panel Discussion:

Disconnection of Small Generating Facilities During Over- and Under-Frequency Events

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**Small Generator Interconnection Agreements and Procedures
Workshop**

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Affiliations

■ IEEE

- Member – Standards Coordinating Committee (SCC) 21
- Chair – IEEE P1547.7 WG (Impact Studies)
- Member – IEEE P1547.8 WG & IEEE P1547a WG

■ SGIP (Smart Grid Interoperability Panel)

- Member – Board of Directors
- Vice-Chair – BoD Technical Committee
- Member - Distributed Renewables, Generators and Storage (DRGS) DEWG
 - Member - DER-Interconnection Standards Organizing Committee

1547- 2003 Standard for Interconnecting Distributed Resources with Electric Power Systems **Reaffirmed in 2008**

1547.1 - 2005 Conformance Test Procedures for Equipment Interconnecting DR with EPS **Reaffirmed in 2011**

1547.2 - 2008 Application Guide for IEEE 1547 Standard for Interconnection of DR with EPS

1547.3 - 2007 Guide for Monitoring, Information Exchange and Control of DR

1547.4 - 2011 Guide for Design, Operation, & Integration of Distributed Resource Island Systems with EPS

1547.6 - 2011 Recommended Practice for Interconnecting DR With EPS Distribution Secondary Networks

P1547a Amendment to IEEE 1547 Standard for Interconnecting Distributed Resources with Electric Power Systems

P1547.7 Draft Guide to Conducting Distribution Impact Studies for DR Interconnection

P1547.8 Recommended Practice for Establishing Methods and Procedures that Provide Supplemental Support for Implementation Strategies for Expanded Use of IEEE Standard 1547

P1547a - Amendment to IEEE 1547

Establish updates to **voltage regulation**, and, response to area EPS **abnormal conditions of voltage and frequency**.

4.1.1 Voltage regulation

“The DR shall not actively regulate the voltage at the PCC. The DR shall not cause the Area EPS service voltage at other Local EPSs to go outside the requirements of ANSI C84.1-1995, Range A.”

4.1.1 Voltage regulation

Proposed changes – Utility perspective

- Active regulation should be allowed with the approval of the Area EPS operator.
- Active regulation by the DR shall not compromise its island detection and disconnect function (section 4.4.1)
 - Testing and certification should include anti-islanding function with voltage regulation

4.2.3 Voltage

“The protection functions of the interconnection system shall detect the effective (rms) or fundamental frequency value of each phase-to-phase voltage, except where the transformer connecting the Local EPS to the Area EPS is a grounded wye-wye configuration, or single-phase installation, the phase-to-neutral voltage shall be detected. **When any voltage is in a range given in Table 1, the DR shall cease to energize the Area EPS within the clearing time as indicated.**

Clearing time is the time between the start of the abnormal condition and the DR ceasing to energize the Area EPS. **For DR less than or equal to 30 kW in peak capacity, the voltage set points and clearing times shall be either fixed or field adjustable. For DR greater than 30 kW, the voltage set points shall be field adjustable”**

4.2.3 Voltage

Table 1—Interconnection system response to abnormal voltages

Voltage range (% of base voltage ^a)	Clearing time(s) ^b
$V < 50$	0.16
$50 \leq V < 88$	2.00
$110 < V < 120$	1.00
$V \geq 120$	0.16

^aBase voltages are the nominal system voltages stated in ANSI C84.1-1995, Table 1.

^bDR \leq 30 kW, maximum clearing times; DR $>$ 30kW, default clearing times.

4.2.3 Voltage

Proposed changes – Utility perspective

- Capacity when field adjustable set points are required should be reduced from 30 kW
- Additional column in table should be added with a range for field adjustable set points
- Increasing clearing time shall not compromise its island detection and disconnect function
 - Testing and certification should include anti-islanding function with voltage regulation
- Primary reason for setting voltage ride through higher is to prevent faults on adjacent circuits and operations on transmission system from impacting unaffected circuit.

4.2.4 Frequency

“When the system frequency is in a range given in Table 2, the DR shall cease to energize the Area EPS within the clearing time as indicated. Clearing time is the time between the start of the abnormal condition and the DR ceasing to energize the Area EPS. For DR less than or equal to 30 kW in peak capacity, the frequency set points and clearing times shall be either fixed or field adjustable. For DR greater than 30 kW, the frequency set points shall be field adjustable.

Adjustable under-frequency trip settings shall be coordinated with Area EPS operations.”

4.2.4 Frequency

Table 2—Interconnection system response to abnormal frequencies

DR size	Frequency range (Hz)	Clearing time(s) ^a
≤ 30 kW	> 60.5	0.16
	< 59.3	0.16
> 30 kW	> 60.5	0.16
	< {59.8 – 57.0} (adjustable set point)	Adjustable 0.16 to 300
	< 57.0	0.16

^aDR ≤ 30 kW, maximum clearing times; DR > 30 kW, default clearing times.

4.2.4 Frequency

Proposed changes – Utility perspective

- The frequency and time set points in Table 2 shall be field adjustable.
- Adjustable under-frequency and over-frequency trip settings shall be coordinated with the Area EPS operator.
- DR shall be permitted to reduce power output when the frequency reaches a preset setting within the range of the power reduction settings in Table 2. (how do we test for this function?)