

Guide to Selecting Inverters and Settings in Jurisdictions Without Grid Support Functionality Requirements

Forum on Inverter Grid Integration Issues
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About the Authors

This document was prepared by The Forum on Inverter Grid Integration Issues (FIGII), an ad hoc consortium of experts which seeks to address emerging high penetration Distributed Energy Resource (DER) issues through research and standardization. For further information regarding this document or FIGII, please contact Brian Lydic, Chief Regulatory Engineer, Interstate Renewable Energy Council (IREC) at brian@irecusa.org.

Introduction

Due to existing requirements of certain utilities or regions in the United States, inverters for DER systems produced since 2017 may contain grid support functionality such as ride-through, reactive or active power functions and frequency droop, as well as the ability to adjust trip settings to much longer clearing times than required by IEEE Std 1547™-2003. An inverter that includes certified functionality is tested to UL 1741 Supplement SA, and is labeled as either “*Grid Support Interactive Inverter*” or “*Grid Support Utility Interactive Inverter*”. While the interconnection standard IEEE Std 1547™-2018 contains functions similar to those tested by Supplement SA, full implementation of IEEE Std 1547™-2018 (including testing to the revised IEEE Std 1547.1™) will not happen right away. IEEE Std 1547.1™ is expected to be published around late 2019 or early 2020. Once UL 1741 adopts the revised requirements, certified equipment should be expected on the market approximately 18 months later or at least mid-2021. Utilities that have not adopted grid support functionality or changed voltage or frequency trip settings will want to ensure that commissioned inverters are set correctly (e.g., with settings aligned with IEEE Std 1547™-2003 or IEEE Std 1547a™-2014), rather than with the expanded settings of which the inverters are capable.

Further, some utilities may wish to ensure that inverters being utilized in today’s DER systems *do* contain the grid support functionality but do not wish to turn it on at this time. It is noted that activating autonomous functions or changing settings in general may require a site visit if requisite communications systems are not established to the inverter. This may make retroactive adjustment of settings or functions logistically challenging and costly.

This document is meant as a guide for utilities who would like to provide specific requirements to ensure that inverters are correctly selected and commissioned.

[Note: Ride-through capability is not generally a setting that needs to be turned on or off, but inverters are tested to ensure they perform in ride-through scenarios. Trip settings will be adhered to regardless of ride-through capability. Momentary cessation may be an adjustable setting related to ride-through capability. This document assumes that the distribution utility does not wish to specify a particular momentary cessation response. Please see NERC’s *Reliability Guideline for BPS-Connected Inverter-Based Resource Performance* (September 2018) for further information on momentary cessation requirements for transmission-connected systems.]

Old Standard Trip Settings¹ with No Grid Support Functionality Required

Utilities that wish inverters to utilize old settings (regardless of SA certification), and are not concerned whether the grid support capabilities are present or not, should specify:

“UL 1741 certified “Utility Interactive Inverter” or “Grid Support Interactive Inverter” or “Grid Support Utility Interactive Inverter” installed or commissioned with IEEE 1547-2003 settings”

OR

“UL 1741 certified “Utility Interactive Inverter” or “Grid Support Interactive Inverter” or “Grid Support Utility Interactive Inverter” installed or commissioned with IEEE 1547a-2014 settings”

Include a table like below (if desired):

Function [1547-2018 term[^]]	UL 1741 SA Term and section	SA Testing Required*	Function Enabled?
Low/High Voltage Ride-Through	Low/High Voltage Ride-Through, SA9	No	N/A
Low/High Frequency Ride-Through	Low/High Frequency Ride-Through, SA10	No	N/A
Enter service ramp rate	Soft-Start Ramp Rate, SA11	No	N/A or not available
Constant power factor mode	Specified Power Factor, SA12	No	No or not available
Voltage-reactive power mode	Volt-Var, SA13	No	No or not available
Frequency-droop operation/ frequency-power	Frequency-Watt, SA14	No	No or not available
Voltage-active power mode	Volt-Watt, SA15	No	No or not available

* UL 1741 SA testing requires testing to 1547.1-2005 or 1547.1a-2015. The grid support functionality testing contained in UL 1741 SA will be incorporated in IEEE 1547.1 and referenced by UL 1741 once revised and published. Once published, the revised IEEE 1547.1 may be used in lieu of UL 1741 SA.

[^] Not all IEEE 1547-2018 functions are included.

¹ IEEE 1547-2003 or IEEE 1547a-2014

Old Standard Trip Settings² with Grid Support Functionality Required

Utilities that wish inverters to utilize old settings but do want grid support capabilities present should specify:

“UL 1741 certified “Grid Support Interactive Inverter” or “Grid Support Utility Interactive Inverter” installed or commissioned with IEEE 1547-2003 settings with all grid support functions disabled”

OR

“UL 1741 certified “Grid Support Interactive Inverter” or “Grid Support Utility Interactive Inverter” installed or commissioned with IEEE 1547a-2014 settings with all grid support functions disabled”

Include a table like below (if desired):

Function [1547-2018 term[^]]	UL 1741 SA Term and section	SA Testing Required*	Function Enabled?
Low/High Voltage Ride-Through	Low/High Voltage Ride-Through, SA9	Yes	N/A
Low/High Frequency Ride-Through	Low/High Frequency Ride-Through, SA10	Yes	N/A
Enter service ramp rate	Soft-Start Ramp Rate, SA11	Yes	N/A
Constant power factor mode	Specified Power Factor, SA12	Yes	No
Voltage-reactive power mode	Volt-var, SA13	Yes	No
Frequency-droop operation / frequency-power	Frequency-Watt, SA14	Yes	No
Voltage-active power mode	Volt-Watt, SA15	Yes	No

* UL 1741 SA testing requires testing to 1547.1-2005 or 1547.1a-2015. The grid support functionality testing contained in UL 1741 SA will be incorporated in IEEE 1547.1 and referenced by UL 1741 once revised and published. Once published, the revised IEEE 1547.1 may be used in lieu of UL 1741 SA.

[^] Not all IEEE 1547-2018 functions are included.

² IEEE 1547-2003 or IEEE 1547a-2014