Meeting Hawaii Utility Interconnect Requirements

Version History

- Version 1.1 – Dec. 2018 – Updated HPUC Member Website Links
- Version 1.0 – Dec. 2018 – Initial Release

Contents

Introduction

The Hawaii Public Utilities Commission has specific interconnection, operating and metering requirements for generation facilities to be connected to the utility distribution systems of Hawaiian Electric Company, Inc. (HECO, serving Oahu), Hawaii Electric Light Company, Inc. (HELCO, serving Hawaii) and Maui Electric Company, Limited (MECO, serving Maui, Molokai and Lanai). SolarEdge inverters have been approved by these utility providers to support Advanced Inverter Grid Support Functions for use with the Net Energy Metering Plan (Rule 18), the Customer Self-Supply Plan (Rule 22), the Customer Grid-Supply Plan (Rule 23), the Customer Grid-Supply Plus Plan (Rule 24) and the Smart Export plan (Rule 25); they are considered standard across all interconnection agreement programs.

These functions are applicable to the SolarEdge certification to Underwriters Laboratories Standard 1741, Supplement A ("UL-1741 SA"). SolarEdge inverters are listed on each Qualified Equipment List found here:

- https://www.hawaiianelectric.com/advancedinverters
- https://www.hawaiielectriclight.com/advancedinverters
- https://www.mauielectric.com/advancedinverters

To commission SolarEdge systems in accordance with these requirements, follow the instructions below. Additional changes to inverter settings (Volt/Watt and Normal Ramp Rate) may be required as prescribed by the utility. Instructions to set and verify these additional functions are included below as well. This document applies to the inverter models listed in Appendix A, and instructions for providing compliance verification to the utility are provided in Appendix B.

Checking/Upgrading Firmware & Setting Country Code

Much of the available functionality of SolarEdge equipment is determined by the firmware (FW) version. FW with the appropriate grid control settings meeting HPUC requirements has been in production for over six months, so new hardware should come with appropriately sufficient FW versions.

→ **Check the FW version as follows:**

Select **Information ➔ Versions** from the standard menu tree options.

```
ID:     ########  ##
DSP1:   1.0210.1232
DSP2:   1.0034.0000
CPU:    3.18xx.0000
```

- For single phase non-HD-Wave inverters verify **DSP1** version is: **1.0210.1232** or above
- For single phase inverters with HD-Wave Technology verify **DSP1** version is: **1.0000.0440** or above
- For three phase inverters verify **DSP1** version is: **1.0013.1019** or above

NOTE

If no FW upgrade is required, take a picture of this screen to satisfy requirements of Appendix B – Verifying Configuration.

If an upgrade is required contact SolarEdge Support to obtain the upgrade file needed.

Instructions regarding upgrading inverter FW can be found here:
https://www.solaredge.com/sites/default/files/upgrading_an_inverter_using_micro_sd_card.pdf

→ **Set the Country Code as follows:**

The country code settings for all Hawaiian Islands (except Kauai) have been consolidated under Rule 14H, so even if Molokai/Lanai settings are available in your country code menu tree, use the appropriate Hawaii code instead. Select **Country Code ➔ Hawaii ➔ Hawaii XXX** (XXX being the appropriate grid configuration setting).

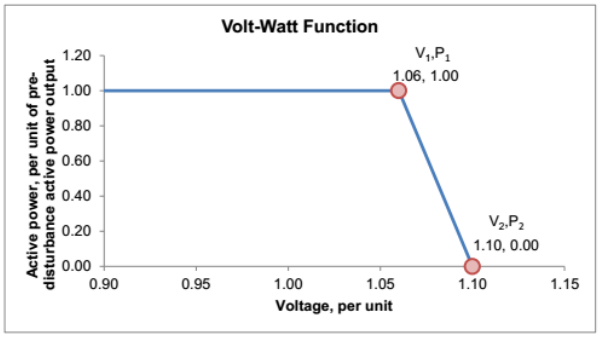
NOTE

It is important to make sure that if the FW is being upgraded, the country code should be selected after upgrading. If the country code is selected before the FW is upgraded, settings associated with changes in that country code will not be in effect.

Setting Volt/Watt, (only necessary when required by the utility)

In certain locations, the utility may insist on additionally setting a Volt/Watt (V/W) control criterion. If this is required, the following steps can be followed to establish this mode of operation.

- From the inverter LCD menu, select Power Control ➔ Active Pwr Conf. ➔ P(V)
- Select P(V) ➔ P0 <x,y> ➔ enter 0,0 ➔press enter
- Select P1 <x,y> ➔ enter 50,0 ➔press enter
- Select P2 <x,y> ➔ enter 53,100 ➔press enter
- Select P3 <x,y> ➔ enter 106,100 ➔press enter
- Select P4 <x,y> ➔ enter 110,0 ➔press enter
- Select P5 <x,y> ➔ enter 150,0 ➔press enter



These values will set the V/W setpoints in accordance with the graph to the right.

NOTE

If setting these values is required, take pictures of this screen to satisfy requirements of Appendix B – Verifying Configuration (will require 2 pictures as not all values are displayed at once).

Setting Zero Export

Many systems installed in Hawaii are required to be configured to perform Zero Export functions, meaning they do not send power back to the grid when harvested PV energy exceeds the home loads. This is done by connecting an external energy meter at the import/export point of the home (usually CTs are connected above the main breaker in the main distribution panel) which will report to the inverter the direction of power to and from the site so the inverter can vary its output and prevent excess energy from being sent to the grid.

This can be accomplished with one inverter and meter on a single inverter system, or when one inverter or Commercial Gateway is configured as the Smart Energy Manager, one meter can be used to control the output of multiple inverters.

Instructions how to configure and establish this mode of operation can be found here:

https://www.solaredge.com/sites/default/files/export_limitation_application_note_NA.pdf

Appendix A – Applicable Inverter Models

This document applies to the following inverter models, where X can be a-z, 0-9 or blank:

Single phase non-HD-Wave inverters:

- SE3000A-USXXXXXXX
- SE3800A-USXXXXXXX
- SE5000A-USXXXXXXX
- SE6000A-USXXXXXXX
- SE7600A-USXXXXXXX
- SE10000A-USXXXXXXX
- SE11400A-USXXXXXXX

Single phase HD-Wave inverters:

- SE3000H-USXXXXXXX
- SE3800H-USXXXXXXX
- SE5000H-USXXXXXXX
- SE6000H-USXXXXXXX
- SE7600H-USXXXXXXX
- SE10000H-USXXXXXXX
- SE11400H-USXXXXXXX

Three phase inverters:

- SE9K-USXXXXXXX
- SE14.4K-USXXXXXXX
- SE10K-USXXXXXXX
- SE20K-USXXXXXXX
- SE30K-USXXXXXXX
- SE33.3K-USXXXXXXX

NOTE

All programming features outlined here are also available on the smartphone Inverter SetApp application, used to configure inverters without a display. A separate document will be published to cover this same content when using SetApp.

Appendix B – Verifying Configuration

Introduction

To verify proper configuration, HPUC utilities require pictures be taken of specific screens which display information they require for verification. The purpose of this appendix is to explain which screens to photograph to meet their requirements.

Notes to take pictures are included in the document body. Pictures suggested above are noted where they correspond here.

Verify Correct FW Version

The picture noted above in the Checking/Upgrading Firmware section refers to the picture required here. This picture will display both the inverter's SN (labeled: ID) and each FW version loaded on it. Checking these values ensure the proper country code tables have been uploaded to the specific inverter.

- Select **Information ➔ Versions**

```
ID:    ########  ##
DSP1:  1.0000.0440
DSP2:  2.0000.0405
CPU:   3.2221.0000
```

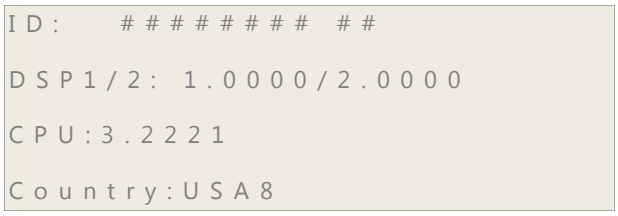
- Verify **DSP1** FW is an appropriate version, and take a picture.
  - Single phase non-HD-Wave inverters: 1.0210.1232 or above
  - Single phase inverters with HD-Wave Technology: 1.0000.0440 or above
  - Three phase inverters: **1.0013.1019 or above**

Sample Picture:

Verify Correct Country Code

This screen is in the normal display cycle viewed outside of the configuration menu tree. Checking this value ensures the proper country code is selected, and that the correct country code table is uploaded (together with the next verification step).

- Tap the LCD button (non-HD-Wave) or enter key (HD-Wave) until you see **ID** on the top left



- Verify **Country** value on the bottom row is appropriate as explained below
- Take a picture of this screen

Single Phase

Hawaii AUTO – **USA12**

Hawaii 208V – **USA7**

Hawaii 240V – **USA8**

Hawaii 208V No N – **USA9**

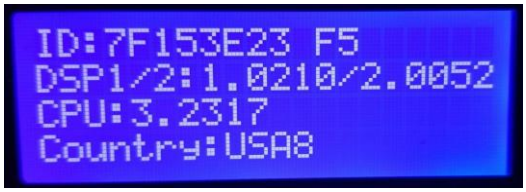
Hawaii 240 No N – **USA10**

Three Phase

Hawaii 208V – **USA7**

Hawaii 277 – **USA11**

Sample Picture:

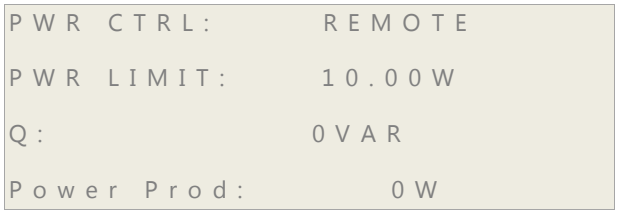


Verify Country Code Following FW Upgrade

The purpose of this step is to verify that the country code was selected **after** the FW was upgraded. If a previously released insufficient FW version were active when the country code was selected, the old Hawaii Country Codes would configure reactive power control as a single 0.95 lagging power factor (PF). The new settings require a dynamic control of reactive power known as Volt/VAR (V/VAR) where the reactive power varies with the change in grid voltage.

This screen is also in the normal display cycle viewed outside of the configuration menu tree.

- Tap the LCD button (non-HD-Wave) or enter key (HD-Wave) until you see **PWR CTRL** on the top left



- Check that the 3rd line is labeled **Q**, indicating correct country code was selected after FW update

- If the 3rd line says **Cos Phi: -0.950**, then the old parameters are still selected and the proper Hawaii Country Code needs to be selected
- Take a picture of this screen

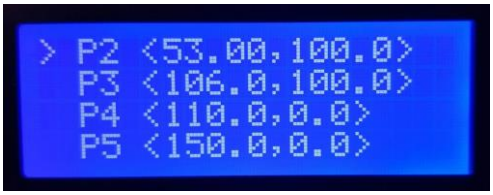
This is the final verification required to ensure that grid protection setpoints associated with voltage and frequency ride through, V/VAR and V/W are configured. If any step could not be verified as outlined above, contact SolarEdge Support for assistance.

Sample Picture:

Verify V/W

The description where to take the required pictures to verify V/W values are changed is described in the document above where it is explained how to program them.

Sample Pictures:

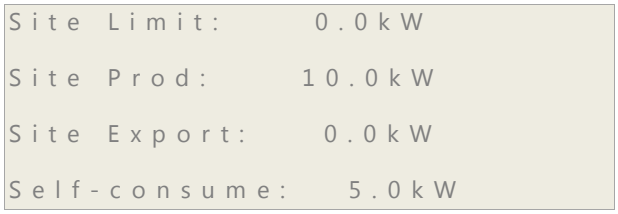


Verify Zero Export Configuration

Single Inverter System

This check is also done by taking a picture of a single screen in the normal display cycle viewed outside of the configuration menu tree. If the inverter is properly configured to limit power by measuring exported power the site export limit on the Smart Energy Manager (SEM) status screen will be displayed.

- Tap the LCD button (non-HD-Wave) or enter key (HD-Wave) until you see **Site Limit** on the top left



- Check that the 3rd line reads "**Site Export"** and that the value here is set to **0.0kW**.
- Take a picture of this screen.

Sample Picture:

Multiple Inverter System

All indications here are checked on the SEM inverter.

a. On the SEM, follow the check in the section above to verify that **Site Export** is set to **0.0kW**.

b. Verify that the inverter or Commercial Gateway is correctly configured as the SEM of the other inverters on site. In the normal menu tree, select **Communication ➔ RS485-1 Conf <M> ➔ Slave List <#>** where "#" will be the number of inverters connected to it. When the Slave List menu is selected, all the inverter serial numbers, controlled by that master device, will be listed. Scroll down to see the full list if there are more than 4.

Sample Pictures: