

## Hawaiian Electric Industries (HEI) Source Requirements Document (SRD) V1.1 Compliance

### Background

The high penetration of Distributed Energy Resources, namely rooftop PV, in Hawaii has led to a number of changes to existing grid interconnection programs. As of October 12, 2015, the Net Energy Metering (NEM) program was fully subscribed and all applications submitted after this date must be filed under either of the two replacement interconnection programs: Customer Grid Supply (CGS) and Customer Self Supply (CSS).

In September 2017, further advanced grid features were defined by Hawaiian Electric Industries (HEI). HEI required UL or NRTL certification to SRD V1.1. The update was intended to resolve any potential conflicts with the companies' proposed revisions to Tariff Rule 14H between the prior SRD-UL-1741-SA-V1.0 and SRD-UL-1741-SA-V1.1.

Additional changes were implemented beginning February 20, 2018. All qualified advanced inverters that are published on the Hawaiian Electric Companies qualified equipment listings must be formally certified to perform the Grid Support Utility Interactive Inverter (GSUI) functions in Underwriters Laboratories Standard 1741, Supplement A. The Source Requirement Document (SRD) formal qualification requires inverter manufacturers to submit Certificates of Compliance from UL or a nationally recognized testing laboratory (NRTL) and to meet the requirements of Rule No. 14H, Appendix I. Any Certificate of Compliance must indicate the product was certified under UL 1741 SA using the applicable SRD values, and it must list the appropriate firmware version, country code, or applicable configuration that was tested and certified by UL or the NRTL. For Enphase products, this requires updated grid profiles, which may require new microinverter firmware. HEI also requires all inverters be added to the approved vendor list, found here: [Approved Vendor List](#).

### Enphase IQ System

Enphase has certified the IQ Series Microinverters to be compliant with the new requirements set forth by the HEI SRD V1.1. The IQ System refers to IQ Series Microinverters with an IQ Envoy.

**Note:** S Series Microinverters are no longer in production. However, units still in inventory meet the requirements. For customers that have specified S Series, HEI has indicated that they may upgrade to IQ Series product without penalty. For these applications, Enphase has created the following power down (PD) profiles that fulfill the new SRD requirements:

- HEI SRD V1.1 O+M+H CGS w/VW PD
- HEI SRD V1.1 O+M+H CGS no VW PD
- HEI SRD V1.1 O+M+H CSS w/VW PD
- HEI SRD V1.1 O+M+H CSS no VW PD

These power down profiles work specifically with the IQ 6 Series inverters. In order to update the inverters to the power down profile the Enphase Envoy will need a minimum software version of 4.10.xx. Contact Enphase Customer Support at [enphase.com/en-us/support/contact](http://enphase.com/en-us/support/contact) if you have questions about this process.

Customer Self Supply (CSS) systems have a requirement to limit the export of power from the PV system to the grid. Essentially all power that is produced by the system must be consumed on site instead of being exported to the grid in return for credits. To comply with the needs of the Hawaiian market and interconnection requirements, Enphase IQ Series systems are capable of limiting the production of the

PV system to match the site consumption needs and limiting the amount of energy exported to compliant levels. HEI's CSS program does make a case for on-site storage, thus creating a more compelling reason to install Enphase IQ Series Microinverters that are not only CSS compliant, but storage ready as well. To support storage, plan to install the IQ Envoy with consumption CTs, which handles the control of the self-supply functionality and Enphase IQ Battery.

## Regulatory Timeline

- **October 1, 2015:** As of this date all applications submitted require PV inverters to be certified and capable of complying with Transient Overvoltage/ultra-fast trip (Tr-OV-2) and Frequency/Voltage Ride-Through (FVRT) requirements set forth by the Hawaiian Electric Companies.
- **October 12, 2015:** NEM is fully subscribed and no longer offered to new customers. Current NEM Agreements and customers with pending applications that were submitted prior to 10/12/2015 will continue under NEM
- **October 13, 2015:** All new applications for interconnection must be submitted under either Customer Grid Supply (CGS) or Customer Self-Supply (CSS) programs.
- **January 1, 2016:** All new PV system applications require advanced inverters capable of a fixed power factor of 0.95. Advanced inverters must also be capable of being updated to comply with all 11 advanced inverter functions within one year of UL1741 Supplement A being approved.
- **September 26, 2017** All new PV system applications are required to comply with HEI SRD V1.1. The requirements set forth by the HEI SRD V1.1 require advanced inverters to provide advanced grid functions (AGF) such as Frequency-Watt (FW), Volt-Watt (VW), Volt-VAR (VV), and specific ramp rates that follow a trip event.
- **February 20, 2018,** Order No. 35266 documents the clean version of Rule No. 14H, Appendix I.

## Enphase Grid Profiles

Grid Profiles define utility approved operating parameters for Enphase Microinverters. Applying a grid profile ensures compliance and interoperability with the local electric utility. The names of the grid profiles vary to distinguish regional and behavior differences. To help identify the difference between the profiles, the following is a breakdown of the profile name elements:

- O+M+H = Oahu+Maui+Hawaii
- L+M = Lanai+Molokai
- CSS = Customer Self Supply
- CGS = Customer Grid Supply
- w/VW = Volt-Watt function enabled
- no VW = Volt-Watt function disabled

You can find additional information on the profile trip points in the certificate of compliance documents at [enphase.com/support](http://enphase.com/support).

## Customer Grid Supply (CGS)

Complying with the requirements of the Customer Grid Supply (CGS) program requires no special configurations for an Enphase system. Systems approved for CGS are approved for backfeed. However, energy that is delivered to the grid is credited at a pre-determined rate. Enphase Microinverters installed within the CGS program are required to comply with the HEI Systems Requirement Document (SRD) V1.1. An IQ Envoy is required for the application and verification of these settings.

### *System Requirements:*

- Install the Enphase IQ System:
  - IQ Envoy
  - IQ Microinverters (IQ 6 or IQ 6+, IQ 7, IQ 7+, and/or IQ 7X)
  - Enphase Energy Storage Systems (Enphase IQ Battery, Enphase ACB)

- Apply of one of the following Customer Grid Supply profiles during the commissioning process:
  - HEI SRD V1.1 O+M+H CGS no VW
  - HEI SRD V1.1 O+M+H CGS w/VW
  - HEI SRD V1.1 L+M CGS no VW
  - HEI SRD V1.1 L+M CGS w/VW
- Generate the grid profile report through Enlighten
- Submit the grid profile report to [DER-SelfCertification@hawaiianelectric.com](mailto:DER-SelfCertification@hawaiianelectric.com)

## Customer Self Supply (CSS)

Customers wishing to apply for the Customer Self Supply (CSS) program can receive the benefit of an expedited interconnection process, however, these systems are required to comply with the rules that are specific to this program. Systems installed under the CSS program are not credited for any power that is exported to the utility. The following rules have been put in place that limit the duration and cumulative amount of exported energy. Inverters that have been certified for installation under this program have demonstrated that they are capable of complying with all the export rules in place.

### Inadvertent Export Rules

**Event Duration Limit:** Systems may export power. However, the duration of export shall be fewer than 30 seconds for any single event.

**Event frequency:** There are no limits on the frequency of exports in any given period

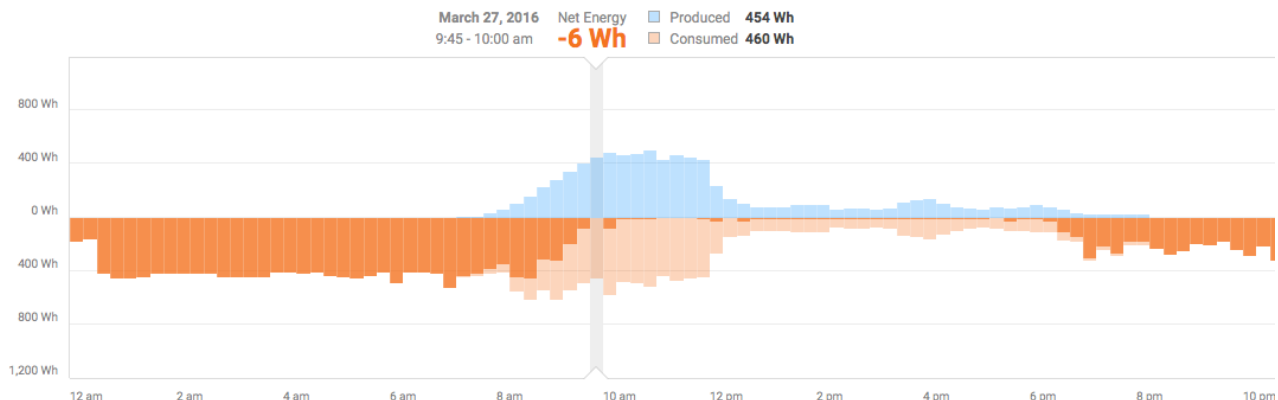
**Net Export Limit:** Systems shall not export more than the generating facilities nameplate rating (kW gross) multiplied by one hour per customer billing cycle. (Example: the inadvertently exported energy of a 5 kW system shall not exceed 5 kWh per billing cycle.)

**Control System Failure:** In the event that a system exports real power to the grid for longer than the acceptable event duration of 30 seconds, the system shall cease to energize within two seconds and will enter a safe operating mode until real power output control has been reestablished.

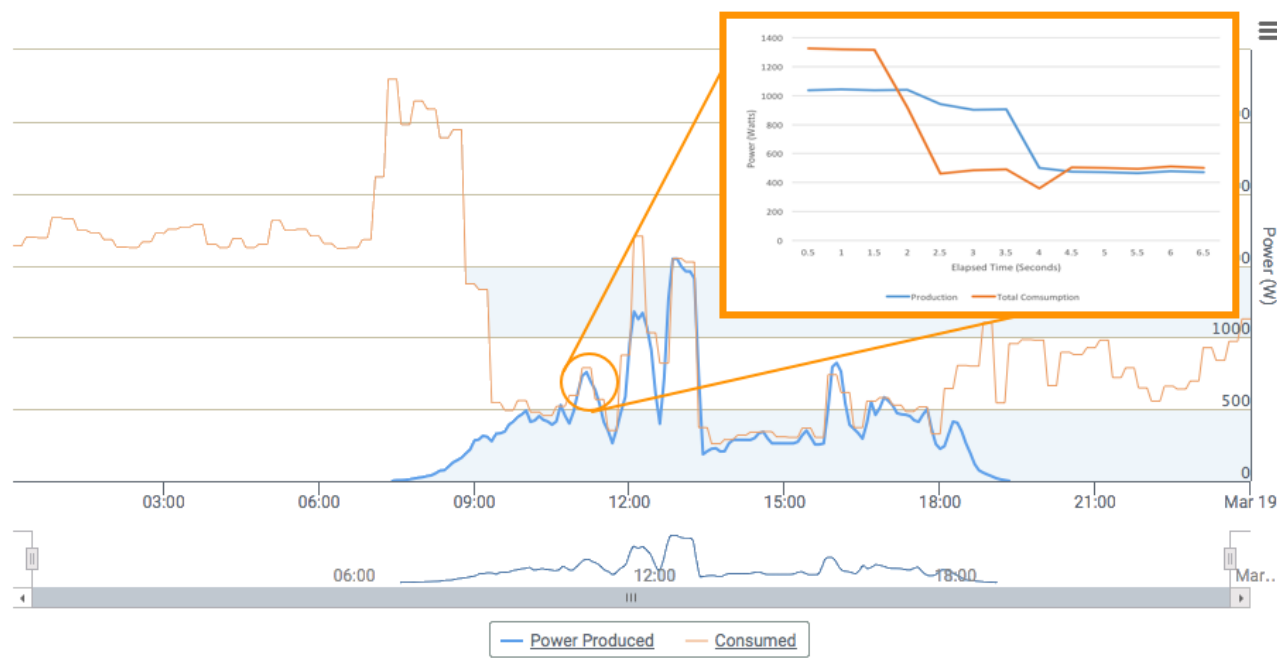
## Enphase Export Limiting Performance

An Enphase system can support Customer Self Supply by using a special CSS profile and an IQ Envoy with consumption CTs installed at/near the utility service location. When configured for CSS, the Enphase system still automatically limits the PV generation so that no energy is exported to grid.

The following screenshot was taken from an active system in Enlighten with zero-export settings enabled. Since there is no storage installed at the site, the PV system curtails power production if the production of the system exceeds the consumption needs of the site. From 9:45 am until 6 pm in the evening, IQ Envoy was actively controlling the output of the system to match the site consumption and limit export. Systems equipped with the Enphase AC Battery or IQ Battery can store excess energy produced to further offset energy consumption outside of solar production hours.



The Enphase Energy Management System uses data collected by the or IQ Envoy consumption and production meters and automatically adjusts the output of the microinverters anytime that the output of the PV system is capable of exceeding the sites consumption needs. This power curtailment functionality is essential to maximize the system output while limiting the export of power to the grid. These adjustments to microinverter power output are sent from the Envoy over the powerline, meaning there is no need for external communications to be installed. Pulling data from the consumption meter every 500ms and making adjustments to microinverter output at 1.5 second intervals, an IQ Envoy with self-consumption enabled will consistently react to inadvertent export events in two to four seconds, well within the 30 seconds allotted by the utility.

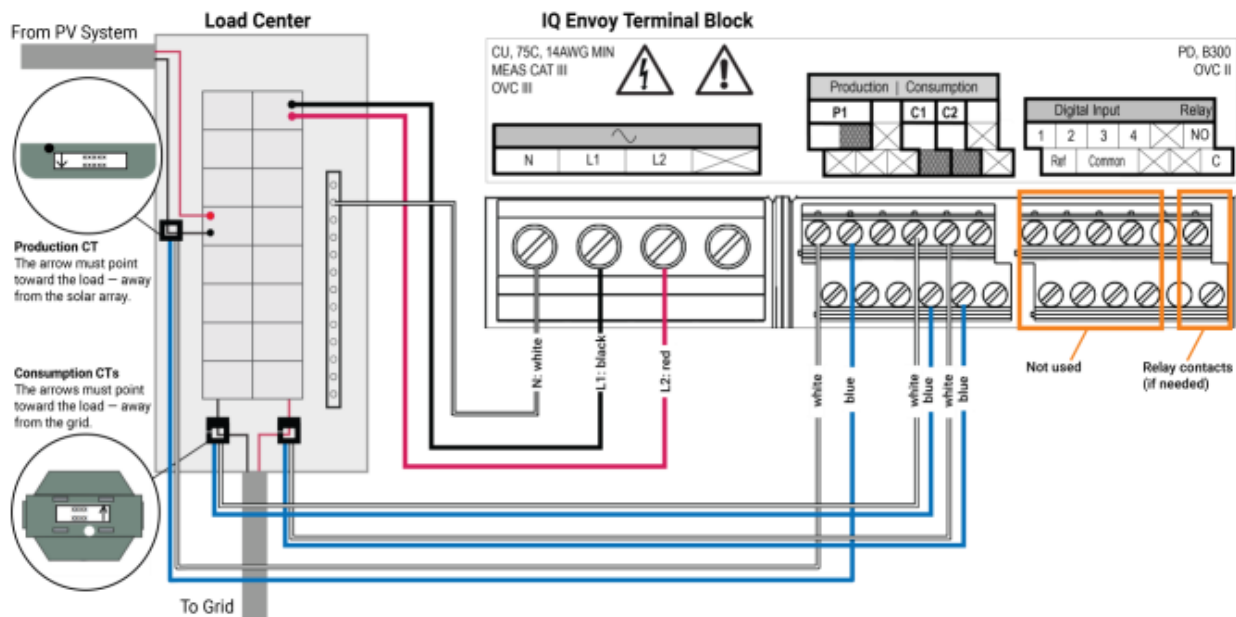


In some instances, there may be drastic fluctuations in net loads at a site, and while the Enphase systems have proven to react quickly to these changes, there may be an inadvertent export of power. Since the Envoy samples the site net consumption every 500ms, the system quickly reacts to these inadvertent export events within an average of two seconds, well within the 30 second duration limit imposed by the utility. The above image offers a more detailed view and illustrates how the PV system adapts power output to match the consumption needs of the site. In this scenario, the reduction in system power output was a direct result of the drop in net consumption at the site, and inadvertent export duration was limited to less than three seconds.

**System Requirements:**

- Install the Enphase IQ System:
  - IQ Envoy
  - IQ Microinverters (IQ 6 or IQ 6+, IQ 7, IQ 7+, and/or IQ 7X)
  - Enphase Energy Storage Systems (Enphase IQ Battery, Enphase ACB)

- Install consumption metering (consumption CTs required)



- Apply one of the following Customer Self Supply profiles during the commissioning process:
  - HEI SRD V1.1 O+M+H CSS no VW
  - HEI SRD V1.1 O+M+H CSS w/VW
  - HEI SRD V1.1 L+M CSS no VW
  - HEI SRD V1.1 L+M CSS w/VW
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## Conclusion

An Enphase IQ Series Microinverter system has all the functionality required to comply with the CSS and CGS programs of the HEI SRD V1.1. You can read about the process for setting the grid profile in our *Getting Started Guide: Update for Hawaii HEI Grid Profile* at [enphase.com/support](http://enphase.com/support).

For further information, contact Enphase Customer Support at [enphase.com/en-us/support/contact](http://enphase.com/en-us/support/contact).