



# PCS Certificate of Compliance

November 14, 2023

Project #X0847  
Report #LIT14230847

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Subject: UL1741 PCS CRD Export Only and PEL Mode Testing for the Enphase PV + Battery Energy storage system

Dear Mr. Baligar

This test report represents the results of our evaluation/testing of the PV + Battery Energy storage system to the requirements contained in following standards:

**UL1741 3rd Ed CRD for Power Control Systems (PCS), Dated April 8, 2023**  
**UL1741 2nd Ed CRD for Power Control Systems (PCS), Dated March 8, 2019**

Compliance with the CRD includes management, control, and limitation of power exchange between Energy Storage Systems and Area EPS/AC utility systems.

The PCS evaluation was conducted on a representative Enphase Energy System 3.0 and the certification applies to the following configurations which were part of the tested system in the PCS modes defined below.

PCS Modes	PV Model <sup>2</sup>	ESS Model <sup>2</sup>	Max PV Ratings	Max ESS Ratings	Max PV+ESS Rating	Additional Devices needed for PCS functionality	Optional Devices	Range of PCS controlled export power <sup>3</sup>	Measured Average/Maximum OLRT
Export Only <sup>1</sup>	Enphase UL Listed PV	IQ Battery 5P	64A/ 15.36kVA	128A/ 30.72kVA	192A/ 46.08kVA	IQ Gateway/ CT's	IQ System Controller <sup>2</sup>	15,360 to 0 Watts	0.64s/ 2s
		IQ Battery 3T/10T		64A/ 15.36kVA	128A/ 30.72kVA			15,360 to 0 Watts	
Aggregate Power Export Limit <sup>1</sup>	IQ8 PV	None	64A/ 15.36kVA	N/A	64A/ 15.36kVA	IQ Gateway/ CT's	IQ System Controller <sup>2</sup>	15,360 to 0 Watts	0.64s/ 2s
	IQ8 PV	IQ Battery 5P IQ Battery 3T/10T	64A/ 15.36kVA	128A/ 30.72kVA 64A/ 15.36kVA	192A/ 46.08kVA 128A/ 30.72kVA	IQ Gateway/ CT's	IQ System Controller <sup>2</sup>	15,360 to 0 Watts 15,360 to 0 Watts	0.64s/ 2s

<sup>1</sup> Tested with PCS eSW 1.2.0

<sup>2</sup> Please see System configuration table further for exact variations of SKU model numbers.

<sup>3</sup> The system with PV nameplate as stated in Maximum continuous PV current/Power column and PV + ESS nameplate as stated in Maximum continuous PV+ESS current/ Power column can be controlled via PCS to limit power exported (to the AC line) to a value within the range stated in this column.

**Export Only Mode:**

This is a PCS mode where the storage system was evaluated for its ability to control import levels from the grid and only allow the export power to grid. Import levels and power consumed by the energy storage were monitored. Test verified that when PV power or system load levels were subjected to step changes and the ESS did not import from the grid.

**Aggregate Power Export Limit:**

This is a PCS mode where an Enphase PV and Storage system was evaluated for its ability to control export levels to the AC line (grid connection). Export levels by the energy storage and PV were monitored. Tests verified that when PV power or system load levels were subjected to step changes, the system controlled the power within the configurable limits set.



The table below describes the System configuration and SKUs associated with tested PCS mode(s)

System Component	Product SKUs	Equipment required in PCS mode?	
		Export-only	Aggregate Power Export Limit
Enphase PV	IQ8H-240-72-2-US, IQ8-60-2-US, IQ8PLUS-72-2-US, IQ8M-72-2-US, IQ8A-72-2-US, IQ8-60-M-US, IQ8PLUS-72-M-US, IQ8M-72-M-US, IQ8A-72-M-US, IQ8H-240-72-M-US, IQ8MC-72-M-US, IQ8AC-72-M-US, IQ8HC-72-M-US	Optional	Required
Enphase Battery	Enphase IQ Battery 5P (Encharge battery 3rd generation): IQBATTERY-5P-1P-NA, B05-T02-US00-1-3-RMA consisting of UL (Listed) IQ8D-BAT/IQ8D-BAT-240 Inverter(s) rated 120/240Vac, intended to be connected to a battery and will charge and discharge the battery. Enphase IQ Battery 3T/10T (Encharge battery 2nd generation): ENCHARGE-3T-1P-NA, ENCHARGE-10T-1P-NA. consisting of UL (Listed) IQ8X-BAT-US/IQ8X-BAT-US-NB Inverter(s) rated 120/240Vac, intended to be connected to a battery and will charge and discharge the battery.	Required	Optional
Enphase IQ Gateway	X-IQ-AM1-240-5, X-IQ-AM1-240-5C, ENV-IQ-AM1-240, ENV2-IQ-AM1-240, ENV-S-AM1-120, X-IQ-AM1-240-3, X-IQ-AM1-240-3C, X-IQ-AM1-240-3-ES, X-IQ-AM1-240-3C-ES, X-IQ-AM1-240-4, X-IQ-AM1-240-4C, X2-IQ-AM1-240-4, X2-IQ-AM1-240-4C	Required	Required
CTs	For solar production monitoring: At least 1 unit CT-200-SOLID For consumption monitoring: At least 2 units of CT-200-SPLIT or CT-200-CLAMP For battery monitoring: At least 1 unit of CT-200-SPLIT or CT-200-CLAMP	Required	Required
Enphase IQ System Controller	IQ System Controller 3/3G: SC200D111C240US01, SC200G111C240US01 IQ System Controller 2: EP200G101-M240US01	Optional	Optional

This PCS supports:

- Up to 3 circuit inputs, one PV and two ESS, each with up to 8 daisy-chained IQ Battery 5P units (or)
- Up to 2 circuit inputs, one PV and one ESS with 12 IQ Battery 3T units.

Each ESS circuits' charge/discharge current with IQ Battery 5P can be limited from 64 Amps to 8 Amps continuous.

1. PV inverter breakers on the combiner box and system controller must be properly sized.
  - a. The maximum breaker size for a PV inverter branch in a combiner box is 20A.
  - b. The maximum breaker size for PV inverter circuits in the system controller is 80A.
2. Battery inverter breakers on the combiner box or system controller must be properly sized.
  - a. The maximum breaker size for a single IQ Battery 5P-based branch in a combiner box is 20A.
  - b. The maximum breaker size for the batteries in the system controller input is 80A per circuit.
3. The back feed breaker in the Main Panel must be sized properly based on the main panel busbar and grid breaker, maximum breaker size of 80A is tested with the test setup.
4. Please refer to the equipment installation instructions for system configuration details.

If there are any questions regarding the results contained in this report, please contact me or any Bureau Veritas CPS customer service representative.

Sincerely,

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Principal Engineer  
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Reviewed by,

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