

# NOTICE OF COMPLETION

February 8<sup>th</sup>, 2022



Mr. Travis Bizjak  
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Our Reference: File E341165, Vol. 7, Project 4790295093

Project Scope: Evaluation of Enphase Ensemble for Power Control System Functionality.

Dear Mr. Bizjak:

Congratulations! UL's investigation of your product has been completed under the above Reference Number and the product was determined to comply with the applicable requirements of the UL 1741 CRD on Power Control Systems, issued on March 8, 2019, including working draft revisions to UL 1741 which specifically address the management, control and limitation of power exchange between Energy Storage Systems and AC utility systems. The PCS evaluation was conducted on a representative Enphase Ensemble System and the certification applies to the following products which were part of the tested system:

ESS operating modes: Import Only

UL (Listed) PV Inverter (s) rated 120/240Vac, maximum 64 Amps total current.

UL (Listed), Enphase Encharge Battery system

- Model numbers: ENCHARGE-3-1P-NA, ENCHARGE-3T-1P-NA , ENCHARGE-10T-1P-NA and ENCHARGE-10-1P-NA

When used in combination with the following accessories:

- UL (Listed), Enphase Enpower smart switch, model number: EP200G101-M240US00 and EP200G101-M240US01.
- UL (Listed), Enphase Envoy communications gateway, model numbers: ENV-IQ-AM3-3P, ENV-IQ-AM1-240, ENV-S-AM1-120, X-IQ-AM1-240-3C, X-IQ-AM1-240-3, X-IQ-AM1-240-3-ES, X-IQ-AM1-240-3C-ES, X-IQ-AM1-240-2, X-IQ-AM1-240-B, , XAM1-120-B, X-IQ-AM1-240-4, X-IQ-AM1-240-4C or XAM1-120
- UL (Listed), Current Transformers, Enphase Model CT-200-SPLIT (Needs 2 units) and
- UL (Listed), Current Transformers, Enphase Model CT-200-SOLID (Included with Envoy)

The completed system was evaluated for its' ability to control export levels to the AC line (grid connection) when connected to all the above sources. The export current settings (maximum allowed) for the system are adjustable and range from 0 Amps to 64 Amps (0 Watts to 15,360 Watts @ 240 Vac).

Export levels and power output from the energy storage sub-system and PV were monitored to verify that when system load levels or available power from the PV source were subjected to step changes in levels, the ESS output level was adjusted by the control system to ensure that the output to the AC line (grid connection) returned to it's pre-set level and that at steady state levels, power output from the PV source was the principal source of export power to the AC utility system.

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Maximum (Peak) Overshoot (Combined PV/ESS)	Steady state value at set level		
	100%	50%	0%
31,150 Watts	15,182 Watts	7659 Watts	110 Watts

The maximum open loop response time (OLRT) for the system evaluated in under this investigation was less than 30 seconds. In all trials the output to the AC utility system was reduced to the set level before the open loop response time had expired. The table below summarizes the maximum OLRT as well as the average OLRT for each level measured.

Measured Open Loop Response Time (OLRT) in Seconds				
Variable load settings		PCS Output control limit settings		
		L1-L2 loaded		
Trials		100%	50%	0%
100%	OLRT 1	9	6	6
	OLRT 2	8	9	7
	OLRT 3	9	8	6
	AVERAGE	8.67	7.67	6.33
66%	OLRT 1	6	6	6
	OLRT 2	9	6	7
	OLRT 3	9	5	8
	AVERAGE	8	5.67	7
33%	OLRT 1	0*	4	5
	OLRT 2	0*	3	5
	OLRT 3	0*	3.5	7
	AVERAGE	N/A	3.5	5.67

\*No overshoot during transition.

The data above reflects the findings for the system which includes the PV contribution. The Enphase Ensemble system had additional testing to verify the maximum open loop response time (OLRT) for the Encharge Battery system's contribution was less than 2 seconds. In all trials the output to the AC utility system was reduced to the set level before the open loop response time had expired.

A UL certification is a valuable marketing tool meaning your product or company has successfully met stringent requirements. We encourage you to use your product certification in your marketing activities. You can find information on how to accurately promote your UL certification at <https://www.ul.com/marketing>. If you have any questions, please contact me or any of our customer service representatives. And, Congratulations again on your achievement!

Sincerely,

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