Verification of Conformity

Summary

This report provides a detailed assessment of the compliance of the Lunar System with the requirements specified in UL 1741-CRD PCS and UL 3141-issue 1 standards. The evaluation was conducted under controlled conditions, ensuring adherence to the outlined certification requirements. The testing, verification, and evaluation activities focused on verifying the Power Control System (PCS) integrated into these products.

Master Contract:	302773
Report Number:	80266993VOC
Project Number:	80266993

On the basis of the evaluations undertaken, the sample(s) of the below product have been found to comply with the requirements of the referenced specifications at the time the tests were carried out.

Applicant Name & Address:	Lunar Energy, Inc 755 Ravendale Dr, Mountain View, CA 94043, USA
Product(s) Tested:	Lunar ESS, Lunar Inverter, Lunar Meter Socket Adapter controller (MSAC), and ConnectDER, Inc: Meter Socket Adapter (MSA).
Model(s):	Lunar ESS: LE-ESS-20KWH, LE-ESS-15KWH, L2-ESS-15KWH, L2-ESS-20KWH, L2-ESS-25KWH, L2-ESS-30KWH, Lunar Inverter: 10-005025, Lunar MSAC: LE-MSAC-01, ConnectDER MSA: V-1-A-X.

Additional Devices Required for PCS Functionality (Optional)	None.
Maximum PCS controlled Current (Bridge & Main Panel)	200A
Relevant Standard(s)/Specification(s):	UL 1741/ Inverters, Converters, Controllers And Interconnection System Equipment For Use With Distributed Energy Resources [UL 1741, 3rd Ed, September 28, 2021, Revision May 19, 2023] Power Control Systems (PCS) Certification Requirement Decision Date: 2023-04-08, Revised: 2024-01-18. UL 3141/ Outline of Investigation for Power Control Systems, [UL 3141, issue Number: 1, January 11, 2024]
Date of test(s):	2025-07-11 to 2025-08-14
Verification Issuing Office Name and Address:	CSA Group Suite 138 - 13888 Wireless Way, Richmond, BC, V6V 0A3
Verification / Report Number(s):	Lunar ESS: 80187942. (CSA Group) Lunar Inverter: 80121274. (CSA Group) Lunar MSAC: 106184038DAL-001. (Intertek) ConnectDER MSA: 105948363DAL-001 (Intertek)
Manufacturer's equipment information & instructions documents, UL 1741 CRD, Section 208; UL 3141, Section 11:	Refer to: Lunar Battery Installation Manual, Meter Socket Adapter Controller (MSAC) Installation Manual

Lunar Power Control System (PCS): (Alternate Configuration).

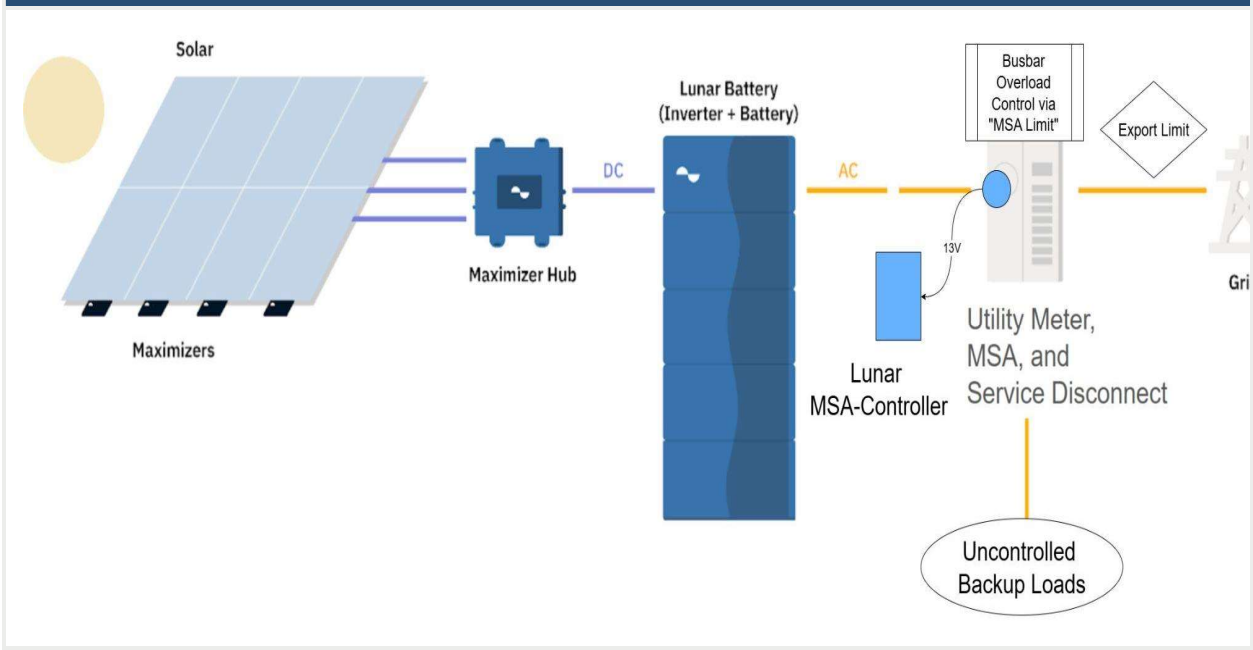
The Lunar Battery system, consisting of the Inverter and Battery Block, combined with the Lunar Meter Socket Adapter Controller (MSAC) and third-party Meter Socket Adapter (MSA), is certified for compliance with UL 1741 PCS CRD and UL 3141 Issue 1 standards, where the PCS controller is integrated within the Lunar Inverter, and demonstrating an open-loop response time of less than 2 seconds.

PCS settings are not mandatory for system installation; however, installers have the option to configure these settings to facilitate compliance with National Electrical Code (NEC) requirements and/or specific utility interconnection requirements.

NOTE 1: The Lunar PCS is supplemental protection; therefore, all PCS controlled busbars or conductors shall be protected with suitably rated overcurrent devices appropriately sized for the busbar rating or conductor ampacity. The maximum operating currents in controlled busbars or conductors are limited by the settings of the power control system and may be lower than the sum of the currents of the connected controlled power sources. The settings of the PCS controlled currents may be used for calculation of the design currents used in the relevant sections of NEC Article 690, 705,706, 750, 220, 710, and elsewhere as applicable for supplemental protection. To fully address system-level overloading or short-circuit issues, overcurrent protective devices remain essential, as outlined in the product instruction manual and NFPA 70.

NOTE 2: Please refer to verification of Conformity Letter 80233547VOC for additional information on the other configurations for Lunar PCS.

Whole Home: Lunar Battery with Meter Socket Adapter + Controller



Details on above PCS diagrams:

Options	Max Limit	Controlled Conductor / Busbar	Current Sensors details
MSA Limit (optional)	200A	Main panel busbar and feeder	Meter Socket Adapter (MSA) CTs are factory installed

Options	Max Limit	Controlled Conductor / Busbar	Current Sensors details
Export Limit (Optional)	48kW	Limits are controlled at the Main panel busbar at MSA.	BMeter Socket Adapter (MSA) CTs are factory installed

PCS Functionality:

Lunar PCS fulfills the following functionalities for control of sources, loads or combinations of both:

No.	PCS Functionality
1.	Power Import Limiting (PIL)
2.	Power Export Limiting (PEL)
3.	Busbar Overload Control (BBOC)
4.	Feeder Conductor Overload Control (FCOC)

ESS Operating Modes:

Lunar PCS is rated to perform PCS control active power exchanges between the Area EPS and energy storage system (ESS), following functions are supported by the PCS. Each mode has been evaluated and complies with the requirements of the above-mentioned standards.

PCS ESS Modes	Import Permission	Export Permission	Description	Maximum Open Loop Response time (msec)	Average Open Loop Response time (msec)
Unrestricted Mode	Charge from the grid is allowed.	Battery & PV	The battery can charge from PV and the grid. Battery and PV can export to the grid.	61.535 msec	5.6918 msec
Export Only Mode	Charge from grid is not allowed	Battery & PV	The battery can charge from PV only. Battery and PV can export to the grid.	753.598 msec	11.19373 msec

PCS ESS Modes	Import Permission	Export Permission	Description	Maximum Open Loop Response time (msec)	Average Open Loop Response time (msec)
Import Only Mode	Charge from the grid is allowed.	PV Only	The battery can charge from PV and the grid. Only PV can export to the grid.	309.262 msec	10.0109 msec
No Exchange Mode	Charge from grid is not allowed	PV Only	The battery can charge from PV only, Only PV can export to the grid.	226.679 msec	12.08352 msec

Test Summary:

The testing confirmed the key functionalities of the PCS. Following testing were performed and testing procedures adhered strictly to the requirements of the standards. External current sensors listed below were integrated and validated to ensure precision in the current measurement and system monitoring.

UL 1741 CRD	UL 3141	Test	Result
203.5	8.3	Step Change in Load Test	PASS
203.6	8.4	Step Change in Generation Test	PASS
204.1.1	8.6.2	Export Limiting from all sources to EPS	PASS
204.1.1	8.6.2	Export Limiting from all sources to EPS-Generation	PASS
204.1.1	8.6.2	Import Limiting from area EPS	PASS
204.1.1	8.6.2	Import Limiting from area EPS - Generation	PASS
204.4	8.6.5	Export Limiting from Energy Storage Systems (ESS)	PASS
204.5	8.6.6	Import Limiting to Energy Storage Systems (ESS)	PASS
205.5	8.7	Startup/Self check Abnormal Tests	PASS
205.7	8.7	Operating Abnormal Tests	PASS

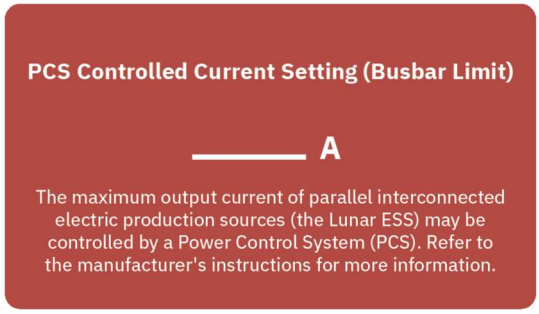
External Current Sensors to be used for PCS for this configuration:

None.

Marking Labels:

Appropriate marking labels were reviewed and verified for compliance with UL1741, UL 3141 labeling requirements. Following Markings are provided for PCS:

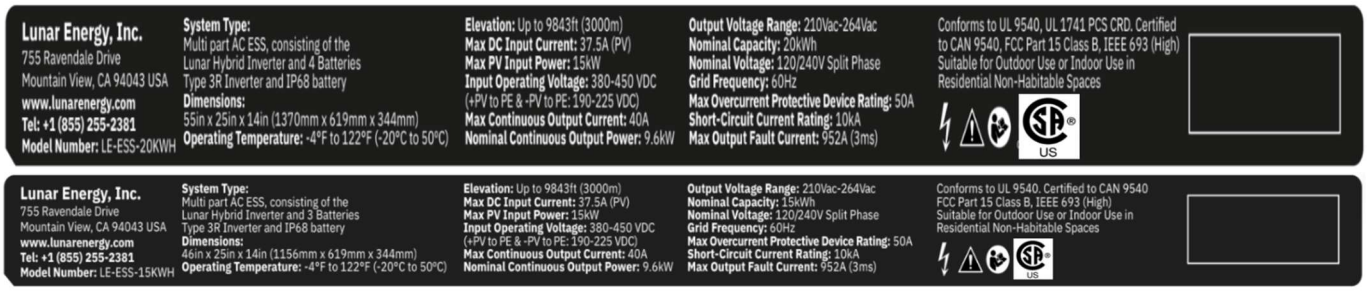
1. Panel Limit label:
   - A limit label applied to the panelboard where the MSA is installed.
   - For both Limit labels the installer shall write in the User Set Limit



2. Lunar Inverter Label:



3. Lunar ESS Label:



Conclusion:

The Lunar PCS system has demonstrated full compliance with the applicable standards, reflecting its capability to perform critical power control functions reliably and safely.

Thank you for the opportunity to service your product testing needs. Please do not hesitate to contact our engineering or sales team for any questions you may have.

Issued by:

Signature: PeterLim

Name: Peter Lim

Date: August 25, 2025

Power and Energy

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