SunSource® Commercial Energy System

PRODUCT SPECIFICATIONS

Bulletin No. 210665
March 2014
Supersedes February 2014

All Energence® 3 through 12.5 ton commercial rooftop units are upgradable to the SunSource® Commercial Energy System.

Solar energy is first used to meet building cooling/heating demands. When the cooling and heating system is not operating, the system powers lighting, appliances and other electronic devices in the building. And in some locations, any surplus power is sent back to the utility company for a possible credit (check with your local utility company for availability).

The SunSource® Commercial Energy System consists of the following components:

- Energence® 3 to 12.5 ton commercial rooftop units with factory installed Solar Power Entry Option (circuit protection for solar power and line voltage wiring).
- SolarWorld Solar Modules (up to 24 modules maximum with three-phase power, up to 16 modules maximum with single-phase power) may be used to vary the amount of electricity generated.
- Enphase Microinverter that converts Direct Current to Alternating Current.
- Enphase Envoy Communications Gateway that monitors energy usage.
- Enphase Enlighten™ Performance Monitoring Website.

Wiring from the roof mounted solar modules is routed to the rooftop unit.

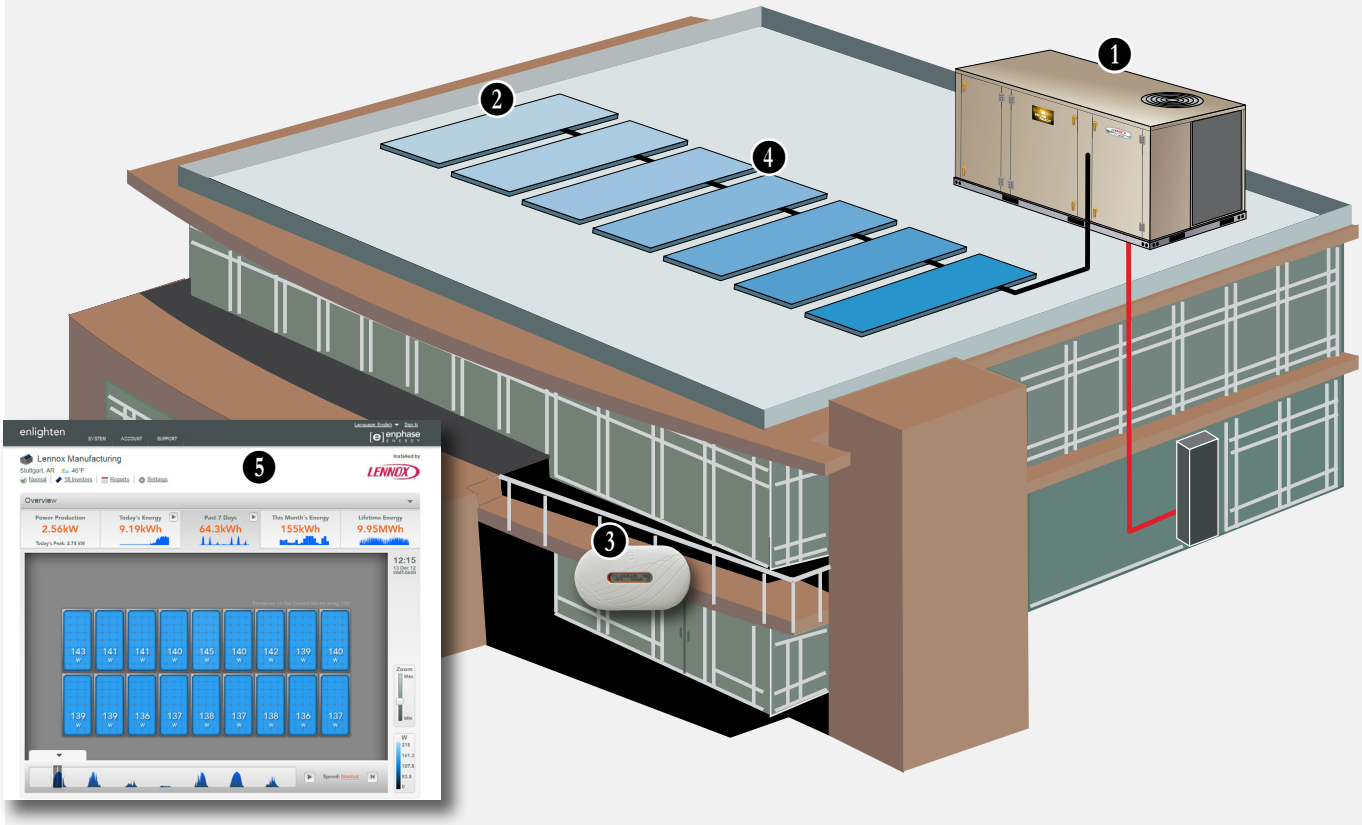
Refer to ***SunSource® Commercial Energy System Applications and Design Guidelines*** Manual (Corp. 1303-L1) for complete information on designing, sizing and installing a complete system.

APPROVALS

SunSource® Commercial Energy System is listed by ETL to UL 1995 and can be installed to comply with the NEC.

The SunSource® Solar-Ready Energence® rooftop units can help meet ASHRAE Green Standard 189.1 for high performance green buildings and help meet the LEED® EAC2 On-Site Renewable Energy Credit with the renewable energy credit.

SUNSOURCE® COMMERCIAL ENERGY SYSTEM - OVERVIEW



1. Energence® 3 to 12.5 ton commercial rooftop unit (packaged electric/electric or packaged gas/electric) with Solar Power Entry Option (factory installed circuit protection for solar power and line voltage wiring).
2. SolarWorld Solar Modules (Up to 16 for 1 phase applications, up to 24 for 3 phase application) convert sunlight into electricity to operate rooftop unit. When unit is not operating, surplus power is used in the building to power appliances and other devices.
3. Enphase Microinverter, converts Direct Current (DC) to Alternating Current (AC) power. Each solar module is paired with one Enphase Microinverter.
4. Envoy Communications Gateway send data to website for online monitoring.

   Standard Electrical outlet (1PH or 208 Wye) or connection to solar wiring (via Line Connection Filter) allows Gateway to detect Solar Module data from existing power wires.

   Broadband Internet Connection connects to online website for monitoring.
5. Enphase Enlighten™ Performance Monitoring Website allows you to see how the building energy system is working to lower utility operating costs. It also shows the environmental benefits of using renewable energy for the building.

WARRANTY

SOLAR MODULES - 10-year limited warranty. 25-year limited performance guarantee that covers a 97% output for one year and an annual solar module output decline of less than 0.7% for 24 years.

MICROINVERTER - 25-year limited warranty.

ENVOY COMMUNICATIONS MONITOR - 1-year limited warranty.

LINE COMMUNICATIONS FILTER - 1-year limited warranty.

PANELCLAW® KODIAK BEAR™ BALLASTED MOUNTING SYSTEM - 10-year limited warranty

CONTENTS

FEATURED SYSTEM COMPONENTS

Energence® LCH 3 through 6 Ton Packaged Electric/ Electric Rooftop Unit

ENERGY STAR® qualified.

Up to 18.0 SEER efficiency

Net Cooling Capacity - 34,800 to 72,000 Btuh

Optional Electric Heat - 7.5 to 30 kW

Prodigy® control system.

Quiet operation, as low as 75 dB.

R-410A refrigerant.

Dependable and efficient two-stage scroll compressor.

Optimized for use with optional *Humiditrol*® dehumidification system.

See separate Product Specifications bulletins for complete information.

Energence® Ultra-High Efficiency LCH 7.5 through 12.5 Ton Packaged Electric/Electric Rooftop Unit

ENERGY STAR® qualified.

Up to 21.5 IEER efficiency

Net Cooling Capacity - 92,000 to 138,000 Btuh

Optional Electric Heat - 7.5 to 60 kW

Prodigy® control system.

DirectPlus™ Blower System.

MSAV® Multi-Stage Air Volume supply air blower.

Quiet operation, as low as 88 dB.

R-410A refrigerant.

Dependable and efficient tandem scroll compressors.

See separate Product Specifications bulletins for complete information.

Energence® LCH 7.5 through 12.5 Ton Packaged Electric/Electric Rooftop Unit

ENERGY STAR® qualified.

Up to 14.0 IEER efficiency

Net Cooling Capacity - 90,000 to 136,000 Btuh

Optional Electric Heat - 7.5 to 60 kW

Prodigy® control system.

Quiet operation, as low as 88 dB.

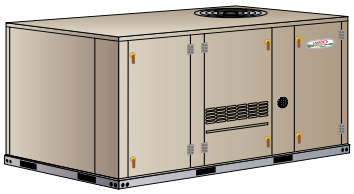
R-410A refrigerant.

Dependable and efficient two-stage scroll compressor.

Optimized for use with optional *Humiditrol*® dehumidification system.

See separate Product Specifications bulletins for complete information.

Energence® LGH 3 through 6 Ton Packaged Gas/ Electric Rooftop Unit



ENERGY STAR® qualified.

Up to 18.0 SEER efficiency

Net Cooling Capacity - 34,800 to 72,000 Btuh

Gas Input Heat Capacity - 65,000 to 150,000 Btuh

Prodigy® control system.

Quiet operation, as low as 75 dB.

R-410A refrigerant.

Dependable and efficient two-stage scroll compressor.

Optimized for use with optional *Humiditrol*® dehumidification system.

See separate Product Specifications bulletins for complete information.

Energence® Ultra-High Efficiency LGH 7.5 through 12.5 Ton Packaged Gas/Electric Rooftop Unit

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Dependable and efficient tandem scroll compressors.

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FEATURED SYSTEM COMPONENTS (continued)

Energence® LGH 7.5 through 12.5 Ton Packaged Gas/Electric Rooftop Unit

ENERGY STAR® qualified.

Up to 14.0 IEER efficiency

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Gas Input Heat Capacity - 65,000 to 150,000 Btuh.

Prodigy® control system.

Quiet operation, as low as 88 dB.

R-410A refrigerant.

Dependable and efficient two-stage scroll compressor.

Optimized for use with optional *Humiditrol®* dehumidification system.

See separate Product Specifications bulletins for complete information.

BASIC SYSTEM REQUIREMENTS

Sufficient south-facing open roof space.

Broadband Internet connection.

240V single-phase, 208V three-phase, 460V three-phase or 575V three-phase.

NOTE: Transformers must be ordered for voltages other than 240V single-phase or 208V three-phase WYE. 575V transformer is not available and must be field provided.

Grid Interconnection Agreement.

See SunSource® Commercial Energy Site Survey Checklist on page 16 for additional details.

SOLAR POWER ENTRY OPTION

A factory installed power entry option is available for Energence® commercial rooftop units that provides a connection point for SunSource® solar modules.

The option provides circuit protection (fuses) for the solar connection and rooftop unit components.

An externally accessible disconnect (non-fused) is also included to shutdown the system for service. Field wiring connections are made directly to the disconnect for the utility connection and to pigtails for easy solar connection.

Local codes may require a field provided solar disconnect and/or a field provided fused HVAC disconnect.

SOLAR MODULES

Captures solar energy to convert into AC power through the Enphase Microinverter.

Laminated solar module structure consists of the solar glass, two ethylene vinyl acetate (EVA) sheets, the solar cell matrix and a back sheet.

Thick low-iron safety glass withstands extreme weather conditions and heavy snow loads.

Solar modules are ETL/Intertek listed for the US and Canada to UL Standard 1703 and meet National and Canadian Electrical Code requirements.

Solar Module Frame
Clear anodized aluminum frame with cast aluminum corner keys.

Low profile with extended flange.

Compatible with “top-down” and “bottom-up” mounting methods.

Eight grounding locations (Four corners of the frame and four locations along the length of the module in the extended flange).

Extended cable lengths for easier installation.

ELECTRICAL COMPONENTS

Transformer
(For electrical services other than 208V WYE)
Steps up the output voltage of the Microinverters to connect directly to the rooftop unit.

SYSTEM MONITORING

Envoy Communications Gateway (Communications Booster Furnished)

The Envoy Communications Gateway monitors Microinverter (on solar modules) performance and can be connected to a broadband internet connection to send data to the Enphase Enlighten™ web site for online monitoring. The Envoy Communications Gateway is not required, but must be used if system performance monitoring is desired.

Limited system monitoring is also available locally with the Envoy Communications Gateway and a computer if no internet connection is available.

Various Event Messages are also available when monitoring the system via a computer locally.

Contents - (1) Envoy Communications Gateway, (1) Communications Booster, (1) 6 ft. power cord, (1) 10 ft. Ethernet cable.

CSA (US/C) listed.

The Envoy Communications Gateway includes a Communications Booster which may or may not be needed depending upon how far the Envoy is away from the solar modules.

Communications Booster

Ethernet bridge signal booster for the Envoy Communications Gateway. Booster is only needed if the communications gateway is installed and signal is not strong enough in the installed location. Allows the unit to be plugged into an outlet closer to the distribution panel, yet still plug into the broadband router.

See additional information on page 12.

Line Communications Filter

Envoy Communications Gateway mounted in a weatherproof NEMA 4 enclosure.

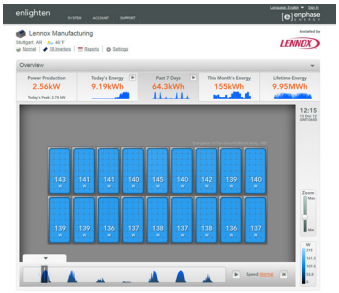
For outdoor installations, installations with transformers, or when multiple communications modules are used on one building.

Contains the Envoy Communications Gateway and terminal blocks for easy power hookup from the Microinverter branch circuits distribution to the electrical meter or distribution panel. A filter removes any electrical interference from other devices or multiple Envoy Communication Gateways in the same building.

Unit is UL listed for the US and Canada and meet National Electrical Code requirements.

See additional information on page 14.

Enphase Enlighten™ Performance Monitoring Website



Powered by the Envoy Communications Gateway, the Enphase Enlighten™ Performance Monitoring website allows the user to keep track of building energy usage and see environmental benefits in real time. Also aids in troubleshooting any solar-related issues.

See demos, view reference installations and other additional information at: http://enphase.com/products/enlighten.

See additional information on page 15.

SYSTEM ORDERING

Specify the number of Solar Module CE (Custom Engineered) Kits required. The system will be shipped as a complete package.

Each kit includes:

- One **275W** SolarWorld Solar Module
- One Enphase **M250** Microinverter
- One Enphase Engage Cable (no. of connectors are determined by total number of Solar Module Kits ordered)
- One PanelClaw® Kodiak Bear™ Flat Roof Mounting System for the Solar Module with hardware for mounting
- Custom engineering drawings and full design for solar system

Energence® 3 to 12.5 ton packaged rooftop unit must be ordered with the factory installed Solar Power Entry Option.

Enphase Envoy Communications Gateway or Line Communications Filter must be ordered separately.

Transformers must be ordered separately.

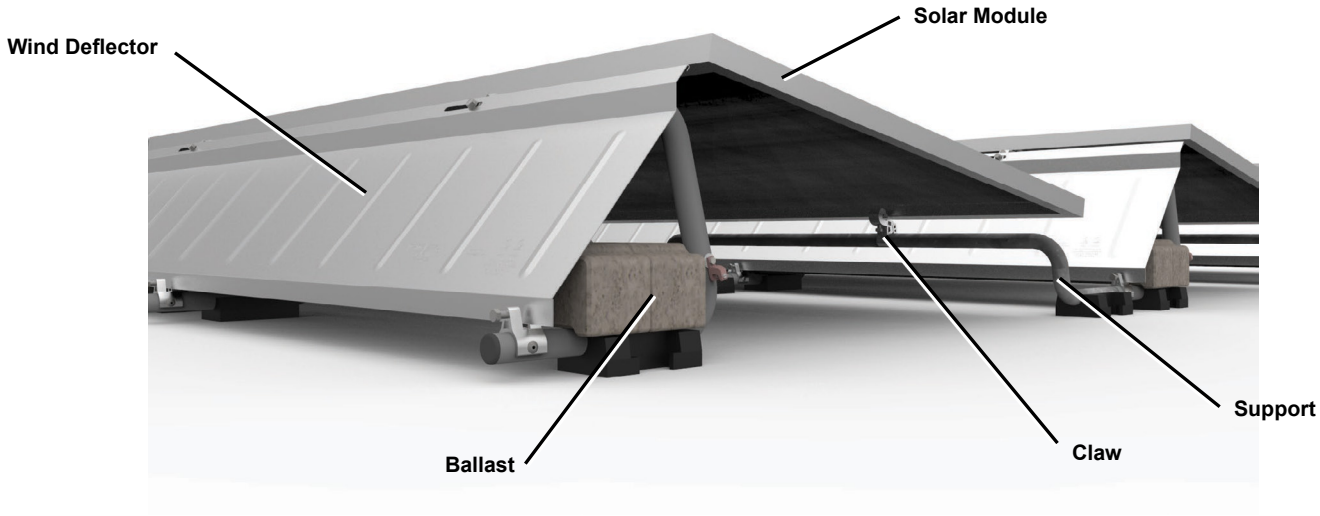
Contact your nearest Lennox Sales Representative for ordering information.

SOLAR MODULE KITS	
Description	**Order No.**
[1] One **275W** Solar Module CE (Custom Engineered) Kit - Silver Frame and One Enphase **M250** Microinverter	**10G40**
SYSTEM MONITORING	
Description	**Order No.**
Enphase Envoy Communications Gateway w/ Booster (internal)	**10R84**
Line Communications Filter (external)	**10F93**
[2] TRANSFORMERS (6 KW)	
Description	**Order No.**
E1TRFM15AD3Y (208Y to 208 VAC Delta)	**11H71**
E1TRFM15AD2Y (230 VAC Delta)	**11H28**
E1TRFM15AD3G (460 VAC Delta or Wye)	**11H29**

[1] Up to 75 modules: a custom quote is required for more than 75 modules.

[2] 575V transformer is not available and must be field provided.

FLAT ROOF MOUNTING SYSTEM



FLAT ROOF MOUNTING SYSTEM

PanelClaw® Kodiak Bear™ roof mounting system is designed to maximize array construction speed.

Innovative system consists of three major components (Support, Wind Deflector and Kodiak Claw) and requires only one socket size to assemble the complete system.

Modular, adaptable design with single module tilt-up feature.

5, 10 or 15 degree tilt angle options.

Advanced thermal compensation using A-thermalized Wind Deflectors and a non rail-based design that allows water to flow freely minimizing roof-drainage issues over time.

Easternmost and westernmost Supports can be slid towards the center of the array after installation to reduce the overall footprint and provide wider, obstruction-free walkways around the array.

Innovative interlocking ballast block design makes ballasting simple and doesn't require project installer to have ballast blocks sourced locally.

System has been tested for component finite analysis, computational fluid dynamics modeling, static load modeling and wind tunnel testing.

- **Support -** Galvanized steel tubing. (1) Support unit with pre-installed integrated, UL 2703-certified electrical ground lug (if required). Pre-installed clamps for wind deflector attachment. Integrated recycled rubber roof protection pads.
  NOTE - For northernmost/southernmost array edges, the standard Support is replaced by North or South Supports.
- **Wind Deflector -** (1) Ribbed and slotted Wind Deflector. Ribbed design for reduced material content. Chamfered edges and lightweight construction.
- **Kodiak Claw -** (2) Pre-installed 5/16"-18 hex head cap screws Stainless Steel 18-8. factory installed stainless steel screw attaches Claw to support frame.
- **Ballast Block -** Proprietary ballast blocks speed and simplify ballasting. (1) Concrete block, hydraulically compressed to 8000 psi (minimum). 46 lbs. each. High freeze/thaw resistance. Blocks may be stacked to increase weight required. Ergonomic deign for easy handling.
- **Fastener Kit -** (1) 5/16"-18 x 0.5errated flange hex head screw.

ENPHASE ENGAGE CABLE SYSTEM

- **Enphase Engage Cable** - The Engage Cable (shown with connector) is a 12 AWG cable with pre-installed connectors that plug into the Microinverter.
  See page 10.

- Four wire cable (240V single-phase)
- Five wire cable (208V three-phase)

- **Enphase Engage Cable Terminator** - Each Engage Cable is terminated at a junction or combiner box. The opposite end of the cable must be terminated with an Engage Cable Terminator cap.

- **Enphase Engage Disconnect Tool** - Specialized tool that disconnects the Engage Cable from a Microinverter or watertight sealing cap.

- **Water-tight Sealing Cap** - Use when open connections on the Engage Cable are not mated to a Microinverter.

SOLAR MODULE SPECIFICATIONS

PERFORMANCE

		[1] Performance Under Standard Testing Conditions	[2] Performance At 800 W/m², Normal Operating Cell Temperature (NOCT), AM 1.5
Maximum Power	P_{max}	275 Wp	205.0 Wp
Open Circuit Voltage	V_{oc}	39.4V	36.1V
Maximum Power Point Voltage	V_{mpp}	31.0V	28.4V
Short Circuit Current	I_{sc}	9.58A	7.75A
Maximum Power Point Current	I_{mpp}	8.94A	7.22A

[1] Standard Testing Conditions at 1000W/m2, 25°C, AM 1.5
2 Minor reduction in efficiency under partial load conditions at 25°C: at 200W/m², 95% (+/-3%) of the STC efficiency (1000 W/m²) is achieved.

COMPONENT MATERIALS

Cells per module	60
Cell type	Mono crystalline
Cell dimensions	6.14 in. x 6.14 in.
Front	Tempered glass (EN 12150)
Frame	Clear anodized aluminum
Weight	47 lbs.

THERMAL CHARACTERISTICS

NOCT	115°F
TCI_{SC}	0.004%/K
TC_{VOC}	-0.30%/K
TCP_{MPP}	-0.45%/K
Operating Temp.	-40°F to 185°F

SYSTEM INTEGRATION PARAMETERS

Maximum system voltage SC II		1000V
Maximum system voltage USA NEC		600V
Maximum reverse currents		16A
Number of bypass diodes		3
[1] UL Design Loads	Two rail system	113 psf downward, 64 psf upward
[1] UL Design Loads	Three rail system	170 psf downward, 64 psf upward
[1] IEC Design Loads	Two rail system	113 psf downward, 50 psf upward

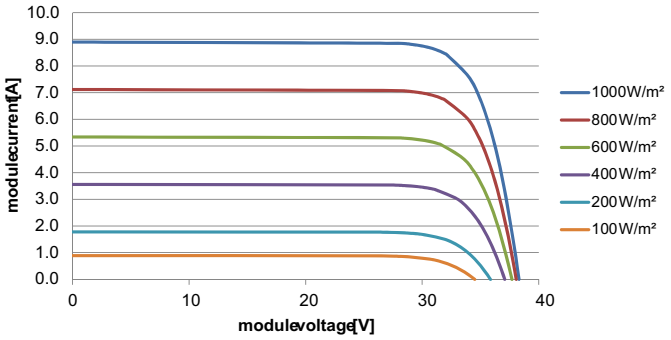
[1] Refer to the installation instructions for the details associated with these load cases.

ADDITIONAL DATA

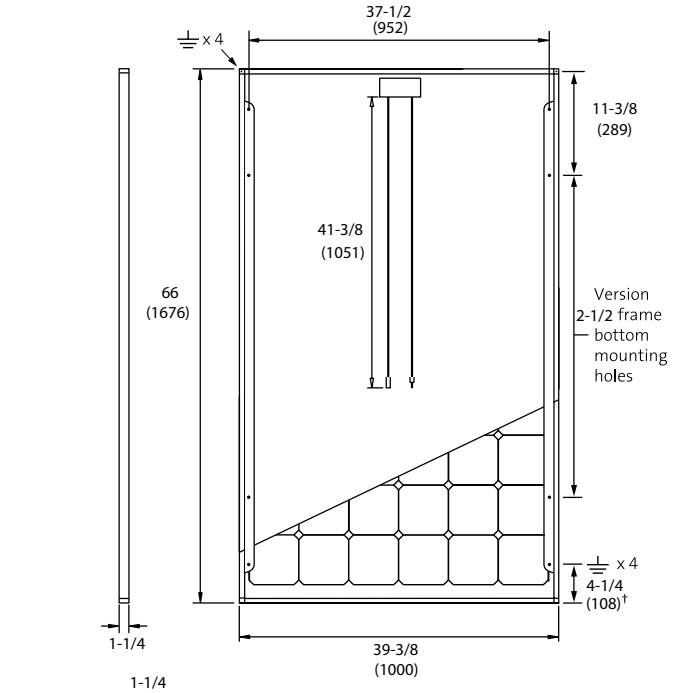
Power Sorting	-0 Wp / +5 Wp
J-Box	IP65
Connector	MC4
Module efficiency	16.10%
Fire rating UL (790)	Class C

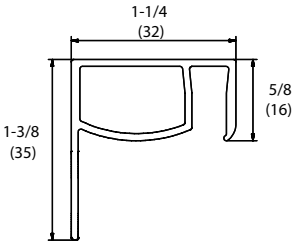
PERFORMANCE CHARACTERISTICS

IV-curves for SolarWorld Sunmodule Plus SW 270 mono silver at 25°C cell temperature



DIMENSIONS - INCHES (MM)





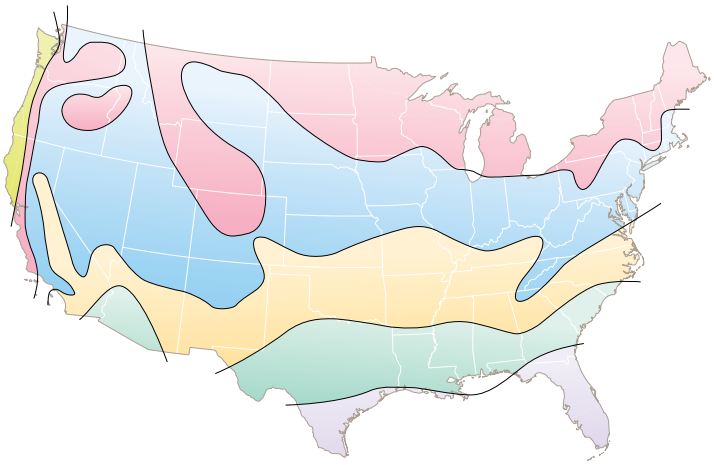
VERSION 2.5 FRAME

- Compatible with both "Top-Down" and "Bottom" mounting methods
- ⏚ Grounding Locations:
  - 4 corners of the frame
  - 4 locations along the length of the module in the extended flange†

ESTIMATED ANNUAL OPERATING COSTS SAVINGS

Overall Impact of the SunSource® Energy System on Heating and Cooling Costs

CLIMATE REGIONS



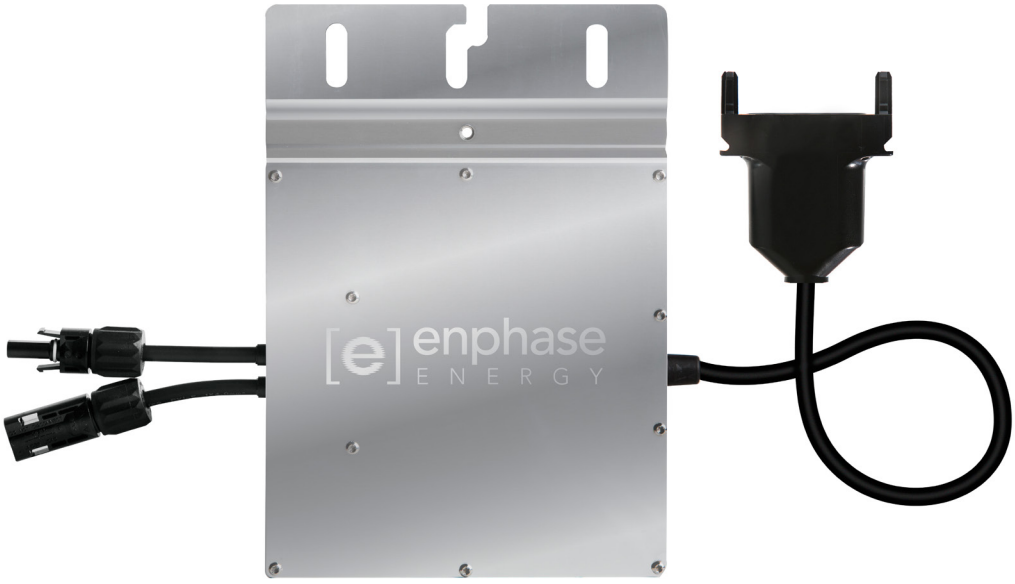
Estimated annual operating cost savings[1] of a 17 SEER Energence® rooftop unit with solar modules, compared to a 13 SEER rooftop unit.

Lennox' SunSource Commercial Energy System can help significantly reduce energy costs all across North America. In certain regions, adding additional solar modules can help the rooftop unit achieve net-zero energy status, as the SunSource system will generate more power than what the rooftop unit consumes.

[1] Estimates of annual solar energy production are calculated using National Renewable Energy Laboratory's (NREL) PVWatts. Estimates of annual operating cost savings for the rooftop units are calculated using Lennox' Total Cost of Ownership Calculator, with operating hours from 10 a.m. to 10 p.m. in a small retail environment. Estimated energy savings calculations using Energence LGH060H4E (5 ton/17 SEER 3-phase) and 275W solar modules.

Climate Regions	With 6 Modules	With 15 Modules	With 21 Modules
Region 1	39.3%	67.2%	85.8%
Region 2	40.3%	71.1%	91.6%
Region 3	43.0%	79.4%	103.6%
Region 4	46.9%	90.2%	119.1%
Region 5	61.0%	125.3%	168.1%
Region 6	56.2%	114.5%	153.4%

ENPHASE MICROINVERTER



How the Enphase Microinverter Works
The Enphase Microinverter maximizes energy production from the solar module array. Each Enphase Microinverter is individually installed on one solar module in the array.

This unique configuration means that an individual Maximum Peak Power Point Tracker (MPPT) controls each solar module. This ensures that the maximum power available from each solar module is exported to the utility grid regardless of the performance of the other solar modules in the array.

Even if individual solar modules in the array are affected by shading, soiling or orientation, the Microinverter ensures optimum performance for each associated solar module. The result is maximum energy production from the SunSource® Energy System.

Enphase Microinverters for 3-Phase Applications
Each Enphase Microinverter automatically connects to one phase of a 3-phase system. It senses the grid and synchronizes to that phase. When applied in groups of three it creates a balanced 3-phase system. If systems are installed in something other than multiples of three a small imbalance will be created across the phases. The maximum output of each inverter is 1.0A. This would be the maximum imbalance possible.

Enphase Microinverter Status LED Indications and Error Reporting
Startup LED Operation:

Six short green blinks when DC power is first applied to the Microinverter indicates a successful Microinverter startup sequence.

Six short red blinks when DC power is first applied to the Enphase Microinverter indicates a failure during Microinverter startup.

Post-Startup LED Operations:

Flashing Green - Producing power and communicating with Envoy

Flashing Orange – Producing power and not communicating with Envoy

Flashing Red – Not producing power

GFDI Fault:
A solid red status LED when DC power has been cycled, indicates the Enphase Microinverter has detected a ground fault (GFDI) error. The LED will remain red and the fault will continue to be reported by the Envoy until the error has been cleared. The error can only be cleared via the Envoy after the ground fault condition has been remedied.

Other Faults:
All other faults are reported to the Envoy.

Enphase Engage Cable
The Engage Cable is a 12 AWG cable with pre-installed connectors that plug into the Microinverter. The cable can be cut, spliced, and extended like a standard outdoor-rated electrical wire. The connectors can accommodate solar modules positioned in a landscape or portrait orientation, commerical installations are typically landscape.

All cable connectors are labeled to show voltage designation. Voltage types available are 208VAC 3-phase or 240VAC split-phase. Most commercial applications use 208VAC 3-phase (five conductors). 240VAC split-phase include four conductors and should be used for 208VAC split-phase applications.

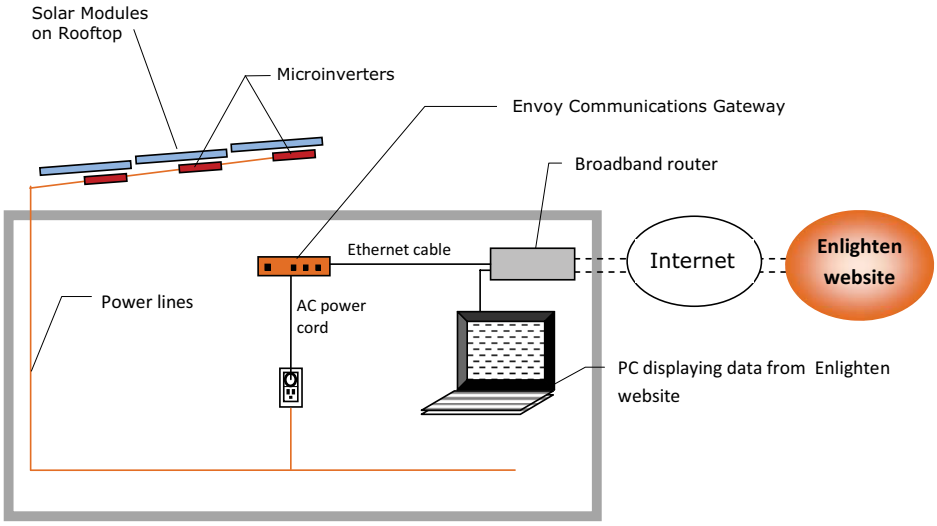
Because Enphase Microinverters output onto two phases, 3-phase cabling balances the phases by rotating conductor usage from one Enphase Microinverter to the next. The same Enphase Microinverter can be used in either application but the Engage Cable must be properly selected for the electrical service.

ENPHASE MICROINVERTER OPERATING PARAMETERS

Model No.	M250	
INPUT DATA (DC)		
Recommended Input Power (STC)	210 - 300W	
Maximum Input DC Voltage	48V	
Peak Power Tracking Voltage	22V - 39V	
Operating Range	16V - 48V	
Min./Max Start Voltage	22V / 48V	
Max. DC Short Circuit Current	15A	
Max. Input Current	9.8A	
OUTPUT DATA (AC)		
Voltage	**208 VAC**	**240 VAC**
Maximum Output Power	250W	250W
Rated (continuous) output power	240W	240W
Nominal Output Current	1.15A (A_{RMS} at nominal duration)	1.0A (A_{RMS} at nominal duration)
Nominal Voltage / Range	208V / 183 - 229V	240V / 211 - 264V
Extended Voltage / Range	N/A	N/A
Nominal Frequency / Range	60.0 / 57 - 61 Hz	60.0 / 57 - 61 Hz
[1] Extended Frequency / Range	57 - 62.5 Hz	57 - 62.5 Hz
Power Factor	>0.95	>0.95
Maximum Units Per 20A Branch Circuit	24 (three phase)	16 (single phase)
Maximum Output Fault Current	850 mA_{RMS} for 6 cycles	
EFFICIENCY		
CEC Weighted Efficiency	96.5%	
Peak Inverter Efficiency	96.0%	
Static MPPT Efficiency (weighted, reference EN50530)	96.5%	
Night Time Power Consumption	65mW max	
MECHANICAL DATA		
Ambient Temperature Range	-40°F to 149°F	
Operating Temperature Range (Internal)	-40°F to 185°F	
Dimensions (W x H x D) less mounting bracket	6.8 in. x 6.8 x 1 in.	
Weight	4.5 lbs.	
Cooling	Natural Convection - No Fans	
Enclosure Environmental Rating	Outdoor - NEMA 6	
FEATURES		
Compatibility	Pairs with most 60-cell PV Solar Modules	
Communication	Power Line	
Warranty	25-year Limited Warranty	
Monitoring	Free Lifetime Monitoring via Enlighten Software	
Compliance	UL1741/IEEE1547, FCC Part 15 Class B CAN/CSA-C22.2 NO. 0-M91, 0.4-04, and 107.1-01	

[1] Frequency ranges can be extended beyond nominal if required by the utility.

ENPHASE ENVOY COMMUNICATIONS GATEWAY



The Enphase Envoy Communications Gateway is an integral component of the SunSource® Energy System. It operates between the Microinverters on the Solar Modules and the Enphase Enlighten™ Performance Monitoring website and analysis system. The Envoy functions as a gateway and monitors the Microinverters that are connected to the modules.

The Envoy collects energy and performance data from the Microinverters over existing home AC power wiring. It then forwards that data to the Enphase Enlighten™ web-based monitoring and analysis, via the Internet, for statistical reporting.

The Microinverter system is a fully integrated device that converts the DC output of a single Solar Module into grid-compliant AC power. In addition to performing the DC to AC conversion, it maximizes the modules' energy production by utilizing a sophisticated Maximum Power Point Tracking (MPPT) algorithm. This integrated system maximizes energy harvest, increases system reliability, and simplifies design, installation and management.

The Enphase Enlighten™ web-based monitoring and analysis system analyzes the per-module data collected by each Microinverter. Enlighten automatically detects any shortfall in energy production, identifies possible causes, and suggests solutions to correct the problem. The Enphase Enlighten website is constantly monitoring every module on every installation.

Installation and operation of the Envoy requires no special computer or networking knowledge, nor any specialized equipment. It simply plugs into a broadband Internet router for communications with the Enphase Enlighten™ monitoring and analysis website. The Envoy communicates with the individual Microinverters over the existing power wires in the building.

After the Envoy is installed, no additional configuration is required.

After the Envoy is installed and completes its initial scan, it assembles an internal database of all known Enphase Microinverters at the site it manages. At regular intervals, the Envoy polls each Microinverter for its energy data. Using the site's Broadband router, the Envoy then forwards that information on to the Enphase Enlighten™ monitoring and analysis website. The Envoy also reports any error conditions that affect itself or the Microinverters. You can view both energy data and error conditions at the Enphase Enlighten™ web-based monitoring and analysis system.

A Menu Button on the panel allows user to view system status on the LCD panel display and initiate scans and communication checking.

If there is no Internet access at the installation site, it is still possible to communicate directly with the Envoy using the Ethernet port and a personal computer with a web browser. Home Screen, Produciton Screen and Inventory Screen allow user to monitor the system. Event Messages are also displayed on the computer screen. See next page for a complete list of event messages.

SPECIFICATIONS

COMMUNICATIONS INTERFACE	
Powerline	Enphase Proprietary
Ethernet	10/100 Auto-sensing, Auto-negotiation
POWER REQUIREMENTS	
AC Outlet	120 VAC, 60 Hz
Power Consumption	2.5 Watts typical, 7 watts maximum
MECHANICAL DATA	
Dimensions - in. (mm) (W x H x D)	8.8 x 4.4 x 1.7 (222.5 x 112 x 43.2)
Weight	12 oz.
Ambient Temperature Range	-40°F to 149°F
Cooling	Natural Convection – no fans
Enclosure Environmental Rating	Indoor - NEMA 1
FEATURES	
Standard Warranty	1 year
Compliance	UL 60950, EN 60950, FCC Part 15 Class B

Table lists messages that the Envoy can produce to indicate certain conditions. These messages appear on screen when your computer is connected to the Envoy local interface. These messages can provide Enphase Customer Support with information, should you need to call for assistance.

EVENT MESSAGES

Home Screen	Inventory Screen	Description
AC Frequency Out Of Range	ac-freq-oor	The frequency of the AC grid has exceeded the limits specified by UL 1741.
AC Voltage Out Of Range	ac-voltage-oos-p# (# = 1, 2 or 3)	The voltage of the indicated AC phase (relative to neutral) has exceeded the limits specified by UL 1741.
Audible alarm active	audible-active	The inverter's buzzer is active, either due to an internally detected error or by user command.
Bad Flash Image	bad-flash-image	The inverter is not producing power because one of its flash memory images is corrupt. Contact Enphase Energy customer support at 877- 797-4743 for assistance.
Commanded Reset	commanded-reset	The inverter has reset, either following a successful image download or by user command.
Control Request		This event logs a user control request made using the Administration > Device Conditions and Controls page or via Enlighten.
Critical Temperature	critical-temp	The inverter is producing less power in an attempt to not overheat (see Over Temperature)
DC Too High	dc-voltage-hi	The DC input voltage to the inverter is too high; check that the PV module and inverter are compatible.
DC Too Low	dc-voltage-lo	The DC input voltage to the inverter is too low; this is a normal condition at night, but during the day may indicate a bad or missing DC connection to the inverter.
Download to module begun		The Envoy has begun an image download to the indicated inverter.
Download to module ended		The Envoy has successfully downloaded an image to an inverter.
Download to module failed		The Envoy was unable to successfully download an image to an inverter.
GFI Tripped	gfi-tripped	An inverter has detected ground fault current greater than one amp. The error can only be cleared via the Envoy after the ground fault condition has been remedied. The GFI can be cleared using the Device Conditions and Controls page unless the failure is permanent. Contact Enphase Energy customer support at 877-797-4743 for assistance.
Grid Gone	grid-gone	The AC utility grid is no longer present.
Grid Instability	grid-instability	The inverter is not producing power due to one or more of these conditions: AC Frequency Out Of Range, AC Voltage Out Of Range, or Grid Gone. Note that Grid Instability will remain for about 5 minutes after the underlying conditions clear.
Module added		The Envoy has detected and is now associated to a new inverter.
Module failed to report		The Envoy has not received a response to the last three messages sent to an inverter.
Module Sleeping		Inverter is off for the night
Over Temperature	over-temp	The inverter is not producing power, because it is too hot.
Power generation off by command	forced-pwr-prod-off	The inverter is not producing power by user command.
Power On Reset	power-on-reset	The inverter has powered on after having both AC and DC disconnected.
Shutdown		The Envoy shut down its internal processing.
Skipped Cycles	skipped-cycles	The inverter has not produced power for more than 5% of the most recent production interval; this may be due to real problems in the grid, or a hardware failure of the inverter.
Startup		The Envoy started its internal processing.

LINE COMMUNICATIONS FILTER

Envoy Communications Gateway mounted in a weatherproof NEMA 4 enclosure.

For outdoor installations, installations with transformer or when multiple communications modules are used on one building.

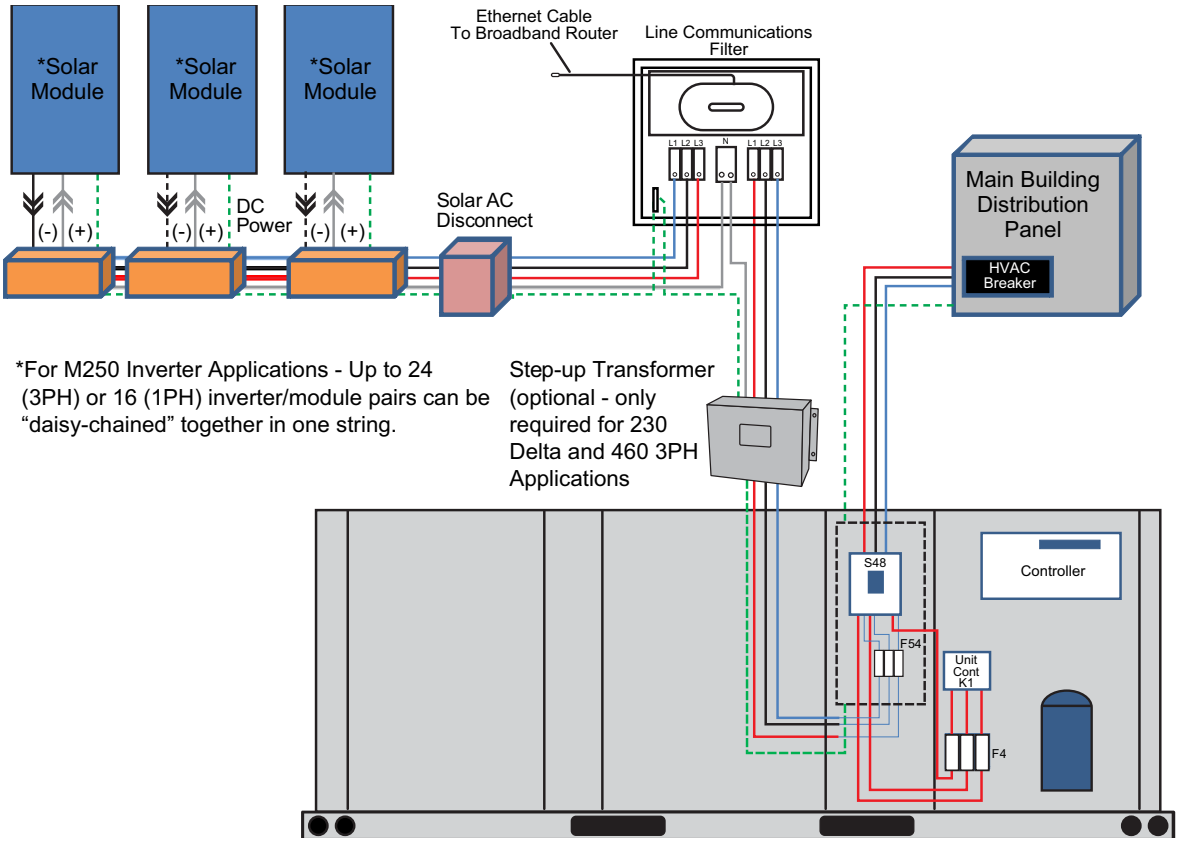
Contains the Envoy Communications Gateway and terminal blocks for easy power hookup from the Microinverter branch circuits distribution to the electrical meter or distribution panel. A filter removes any electrical interference from other devices or multiple Envoy Communication Gateways in the same building.

Unit is UL listed for the US and Canada and meets National Electrical Code requirements.

SPECIFICATIONS

UNIT RATINGS	
Operating Voltage	208/240 VAC
Maximum Voltage	600 VAC
Continuous Current	100 Amps
Maximum Overcurrent Protection Device	125 Amps
Short Circuit Current	10kA RMS Symettrical
TERMINAL BLOCK DATA	
L1, L2, L3	Single 2/0 Maximum
Neutral	2/0 Maximum and 350 mcm Maximum
Equipment Grounding	4 AWG Maximum
MECHANICAL DATA	
Operating temperature range	-40ºF to +149Fº
Power consumption	5 W
Dimensions (W x H x D)	15-3/4 x 15-3/4 x 6 in.
Weight	31 lbs.
Cooling	Natural Convection – No Fan
Enclosure environmental rating	Outdoor – NEMA TYPE 4
FEATURES	
Communication Interface	Ethernet, 10/100 Auto Sensing, Auto Negotiating
Warranty	1 Year
Compliance	UL508A

c UL US LISTED

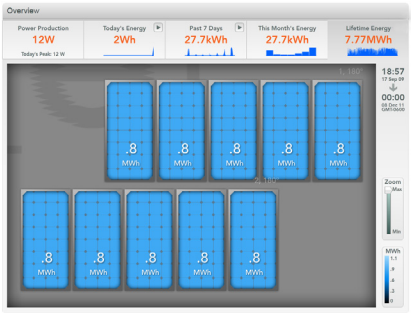


PERFORMANCE-MONITORING WEBSITE

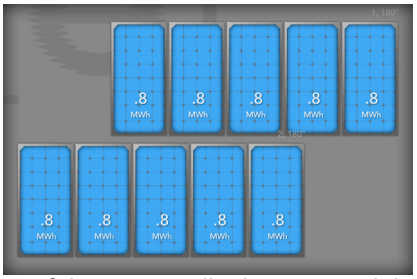
The performance-monitoring website delivers visible proof of the SunSource® Commercial Energy System's reliability, and allows the user to better understand its operation. The user can log onto the website any time to view an easy-to-interpret display of both real-time and historic performance data and analysis.

*Free lifetime monitoring service.

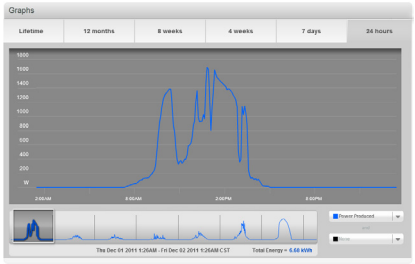
*Performance monitoring website provided by an independent third party, Enphase Energy, Inc.



The overview pane displays current system status, current energy production, the energy produced for the day, the month and the lifetime of the SunSource system.

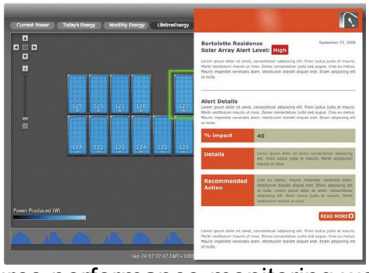


This section of the screen displays an aerial view of the roof, showing how the solar modules are physically configured. The user can view energy production information for each module on a current, daily, monthly and lifetime basis.



View time-lapse animation of the solar array (bottom of screen) to see how power generation is affected by the sun and obstructions such as shade trees or nearby obstructions.

Constant Monitoring And Analysis Ensures Reliability



The SunSource performance-monitoring website also analyzes production shortfalls, establishes a possible cause and suggests solutions to remedy the situation.

Beyond monitoring and analysis, the website can even notify the homeowner and the installing contractor if a problem occurs. At the time of installation, the system can be instructed to send the user, or the Installer, an alert if a production issue or some other situation warrants attention.

The performance monitoring website also automatically calculates the environmental benefits provided by the SunSource® Commercial Energy System.

SUNSOURCE® COMMERCIAL ENERGY SYSTEM - SITE SURVEY CHECKLIST

CUSTOMER NAME: **DATE:**

CUSTOMER ADDRESS: (Street, City, State and Zip Code) **ELECTRIC UTILITY:**

QUOTE NO. **ORDER NO.**

SECTION I − SITE AND CUSTOMER

1.	**Does site have the appropriate voltage and building electrical configuration?**	**Commercial Single-Phase HVAC Unit Applications** The utility-interactive SunSource® Commercial Energy System for split-phase power will only interconnect and supply power if the grid power meets the following specifications: • L1 - L2 voltage measures between 211 Volts and 264 Volts _____ • Line to neutral/ground voltage measures between 106 and 132 Volts _____ • Frequency measures between 59.3 Hz and 60.5 Hz _____	240/120 (1-Phase) ☐ 208/120 (1-Phase) ☐
		Commercial Three-Phase HVAC Unit Applications The utility-interactive SunSource® Commercial Energy System will only interconnect and supply power if the grid power meets the following specifications: • L1 - L2 - L3 voltage measures between 183 Volts and 229 Volts _____ • Line to neutral/ground voltage measures between 106 and 132 Volts _____ • Frequency measures between 59.3 Hz and 60.5 Hz _____ • Nominal 208 VAC Wye configuration _____ *NOTE - A transformer can be used to step-down 460 and 230VAC building voltage to the appropriate levels and adapt to delta systems.*	208 Wye ☐ 230 Delta ☐ 460/277 Wye ☐ 460 Delta ☐ Other: _____
2.	**Array Information**	• No. of solar modules: _____ • No. of columns: _____ • No. of rows: _____ • Distance to HVAC Rooftop Unit (ft.): _____ • Distance to distribution panel (ft.): _____ • Mounting System Type: ☐ Ballasted ☐ Other _____	- - -
3.	**Is the building's electrical distribution panel adequate?**	Generally, the distribution panel should be rated 100 AMP for 208/230 VAC systems or 50 Amp for 460 VAC systems for one SunSource® Commercial Energy system installation. For two systems, the panel should be twice as large. (Also see **Code Compliance** section).	Yes ☐ No ☐
4.	**A. Does site have good southern exposure?**	Perform a solar site survey using a Solar Pathfinder™ or other survey tool to assess the solar resource available. Next, use the web-based program, PVWatts, from the National Renewable Energy Lab, to estimate the monthly and annual solar energy generation potential NOTE: For more information concerning Solar Pathfinder, see *Lennox Corp. 1303-L1, Application and Design Guidelines* for more information	Yes ☐ No ☐
	B. Is it free of shading?	Comments: _____	Yes ☐ No ☐

This checklist is to be used as an aid in assessing the conditions that prevail at a particular site. A "**NO**" check-box answer does not necessarily mean a system cannot be installed. Rather, it may indicate that there may be additional action needed - for example, additional electrical work is required.

For more detailed information see Lennox Corp. 1303-L1. ***SunSource® Commercial Energy System Application and Design Guidelines***.

SECTION I – SITE AND CUSTOMER (Continued)

5. Is the roof suitable for mounting solar modules?

1. Is there enough area for the solar modules? One solar module requires about 25 square feet.

NOTE - Do not exceed the maximum number of solar modules that can be connected to each HVAC unit:
Enphase M250 Microinverter - 16 for 1 phase applications, 24 for 3 phase applications.

Yes ☐ No ☐

2. What type of roof is it? There are several types of mounting kits to accommodate the more common styles of roofs. (Since the solar modules must be removed during a re-roof, it is best not to install the solar modules on a roof in poor condition. Take note of the pitch of the roof and the height of the eaves. OSHA has fall protection compliance guidelines. For example, see *OSHA Directive STD 03-00-001*.

Flat Roof ☐ Pitch Roof ☐

- Roof Pitch (i.e., 5-12) or Tilt Angle (22.6°): _____
- True Orientation (0 to 360°): _____
- Parapet Height (ft.): _____

Roof Type

☐ Rolled Composition ☐ Tar and Gravel ☐ EPDM (Rubber)
☐ Torch Down ☐ Metal (Standing Seam) ☐ Metal (Corrugated)
☐ Metal (Ribbed/Trapezoidal) ☐ Other:

Metal Type: _____

Rafter Information

☐ Vertical Rafters ☐ Horizontal Rafters ☐ Purlins
☐ Structural Member Spacing (inches on center)

Rafter Cross Cut Dimensions (2 x 4, 2 x 6, 2 x 8): _____ Material: _____

3. In flat roof applications, stanchions (anchors) may be required as a supplement to a simple ballast system. This will be determined during the site evaluation. The type of information that will be needed are: exposure category (B, C, D), design wind speed, design snow load, roof maximum load limits, etc.

Yes ☐ No ☐

Occupancy Category: ☐ I ☐ II ☐ III ☐ IV

Wind Loading Class: ☐ B ☐ C ☐ D **Wind and Snow Data**

Seismic Loading Zone: ☐ 0 ☐ 1 ☐ 2A ☐ 2B ☐ 3 ☐ 4 ☐ 5

[1] Maximum Wind Speed (mph): _____ **Seismic Map**

[1] Snow Load (lbs./ft.^{2}): _____

Maximum Roof Load (lbs./ft.^{2}): _____

Base Elevation Above Sea Level (ft.): _____

Maximum Building height - Ground Level to Highest Ridge (ft.): _____

[1] *Obtain from Authority Having Jurisdiction (AHJ).*

NOTE: Lennox is not responsible for determining design requirements and roof attachments. The American Society of Civil Engineers standard ASCE 7-05 provides an analytic method for determining wind, snow and seismic loads.

6. Will the solar modules be closer to HVAC unit or distribution panel?

Wiring may be routed to the solar power circuit from either the HVAC rooftop unit or the electrical distribution panel. Indicate preferred installation method.

HVAC ☐ Panel ☐

This checklist is to be used as an aid in assessing the conditions that prevail at a particular site. A "**NO**" check-box answer does not necessarily mean a system cannot be installed. Rather, it may indicate that there may be additional action needed - for example, additional electrical work is required.

For more detailed information see Lennox Corp. 1303-L1. ***SunSource® Commercial Energy System Application and Design Guidelines***.

SUNSOURCE® COMMERCIAL ENERGY SYSTEM - SITE SURVEY CHECKLIST

SECTION I − SITE AND CUSTOMER (Continued)

7.	**Check for ease of modifications to distribution panel.**	If the solar power circuit back feeds through the HVAC branch circuit breaker (in the distribution panel), it will need to be relocated to a slot that is at the opposite end from the main breaker. *NOTE - The HVAC branch circuit breaker does not need to be relocated if the sum of the main panel breaker rating and the solar fuse (F54) rating is less than the electrical distribution panel's buss bar rating.* If the solar power circuit is run directly to the distribution panel, a new breaker (20 AMP for 230 VAC systems or 10 AMP for 460 VAC systems) will need to be installed in one of the slots that is at the opposite end from the main breaker. This step is to get an early view of issues such as no available slots or difficulty relocating the HVAC branch circuit breaker. In addition, the back feed breaker, whether it is the HVAC branch circuit breaker or a separate breaker (20 AMP for 230 VAC systems or 10 AMP for 460 VAC systems) is suitable if it is a conventional breaker and the terminals are NOT marked Line and Load. It should not be a GFCI or arc-fault type circuit breaker.	Easy ☐ Hard ☐
8.	**Does the customer have an "always on" internet connection?**	An internet connection, with broadband router is required for the Envoy Communications Gateway to connect to the monitoring service. While use of the Envoy and the service are highly recommended, they are not required for the solar power system to operate. *NOTE - If a transformer is used, a Line Communications Filter is recommended and should be connected on the solar side of the transformer.*	Yes ☐ No ☐

SECTION II − INTERCONNECTION AND NET-METERING

9.	**Does the electric utility have a net-metering program?**	It is necessary to notify the electric utility of the customer's intention to install a utility-interactive solar power generation system. Most utilities are familiar with these systems and will already have a policy and rules for "net-metering".	Yes ☐ No ☐
10.	**Does the electric utility have any special requirements?**	Some utilities will require an indicating, lockable disconnect switch on the solar power system. If the utility has some form of incentive program, they may require the solar power system to be sub-metered. When the utility has requirements like this, they sometimes provide the required hardware.	Yes ☐ No ☐
11.	**Does the utility require a Revenue grade meter for REC or SREC tracking?**	If yes, who supplies the meter? ☐ Utility ☐ Customer What type of meter do they require? *Note: Some utilities are specific to make and model of Revenue metering.*	Yes ☐ No ☐
12.	**If there is an incentive program, is there a minimum kW threshold?**	For example, some utilities require a 1kW and 2kW threshold for some rebate/incentive programs.	Yes ☐ No ☐
13.	**Does customer understand this is not a grid independent system?**	It is important to make sure the customer understands that this is a utility-interactive PV system and WILL NOT generate power when the grid is down. In addition the SunSource® Commercial Energy System will not produce power concurrently with a back-up generator.	Yes ☐ No ☐

This checklist is to be used as an aid in assessing the conditions that prevail at a particular site. A "**NO**" check-box answer does not necessarily mean a system cannot be installed. Rather, it may indicate that there may be additional action needed - for example, additional electrical work is required.

For more detailed information see Lennox Corp. 1303-L1. ***SunSource® Commercial Energy System Application and Design Guidelines***.

SECTION III – CODE COMPLIANCE

14.	**Have all the local electrical code requirements been identified?**	In almost all US jurisdictions, the National Electric Code (NEC) will be cited as the authority for electrical inspections. In Canada, it is the Canadian Electric Code (CEC). There may be additional local requirements. NEC section 690 gives the requirements for solar PV installations. Wind and structural load calculations are sometimes requested by code officials. If this is the first time to install a SunSource® Commercial Energy System in this jurisdiction, it is advisable to meet with the local inspection department to find out what requirements exist. This will save time in the long run since the permit submission can address any special requirements.	Yes ☐ No ☐
15.	**Grounding electrode required for the solar PV systems.**	Local jurisdiction may require a separate grounding electrode for the solar modules.	Yes ☐ No ☐

16. Provide a sketch of the solar module layout

This checklist is to be used as an aid in assessing the conditions that prevail at a particular site. A "**NO**" check-box answer does not necessarily mean a system cannot be installed. Rather, it may indicate that there may be additional action needed - for example, additional electrical work is required.

For more detailed information see Lennox Corp. 1303-L1. ***SunSource® Commercial Energy System Application and Design Guidelines***.

REVISIONS

Section	Description
System	Added usage for Energence 7.5-12.5 Ton rooftop units.
Transformers	New 208Y to 208V Delta model added.