

Solar Proposal

SYSTEM OPERATION

Your system can be turned off at two locations. The first location is the dedicated circuit breakers in your circuit breaker panel in the home. The number of breakers will correspond to the size of your system. Some larger systems are not wired into the home circuit breaker. Instead, these systems can be shut down using the solar disconnect switches located outside near where your power supply enters your home.

Your new Solar system will use micro-inverters that are UL 1741 certified for grid-tied operation, which means they will cease functioning if they are unable to sense a 240 Volt power coming from the utility grid. In the event of a loss of power to the home, the inverters will also shut down. This is a safety feature built into the inverters to keep them from back feeding power into the utility lines while someone may be trying to repair them.

For ground-mounted systems using a "top-of-pole" mount configuration, the angle of the system can be manually adjusted on a seasonal basis to increase electrical output. The racking system allows for elevation angles of 15 degrees (best in summer) to 65 degrees (best in winter) in 10-degree increments.

SYSTEM MAINTENANCE AND PROCEDURES

Your solar system does not require regular maintenance or any special cleaning chemicals to maintain its efficiency. In most instances of snowfall, the snow will either slide off the panels very quickly or else melt away on the first sunny day. We do not recommend climbing on your roof, ground-racking, or pole-mounted array to remove the snow.

If you can easily reach the panels with a water hose from the ground, you may want to spray them with water or water with soap during the summer after heavy pollen accumulates, but it is typically not necessary because rain showers provide your system with any cleaning necessary.

In the event that you ever wish to have maintenance performed on your solar system, you can turn off the microinverters (and subsequently any power flowing off of the roof) by turning off either the dedicated circuit breakers in your circuit breaker panels in the home basement or by turning off the solar disconnect switches located outside the home near the utility meter.

For ground-mounted systems, the conduit carrying electrical lines from the array to your electrical meter is generally buried at 18"-24" depth. Be sure to have these lines located and clearly marked before proceeding with any future digging in the vicinity of the system.

The next several pages show you the components of our solar system to include several options for mounting, and a battery back-up system.

1. Enphase, Envoy Communications Gateway, w/ Ethernet Bridge Lifetime Enlighten Subscription, ENV-120-01



The Enphase™ Envoy Communications Gateway

The Envoy is an integral component of the Enphase Energy Microinverter system. It operates between the Enphase Microinverters and the Enphase Enlighten™ web-based monitoring and analysis software. The Envoy functions as a gateway and monitors the microinverters that are connected to the PV modules. The Envoy collects energy and performance data from the microinverters over on-site AC power lines. It then forwards that data to Enlighten, via the Internet, for statistical reporting.

The three key elements of an Enphase system are the:



1 Enphase Microinverters

- are installed beneath each solar module
- maximize energy harvest
- send AC power over AC wiring to the AC mains
- also send performance data via the AC wiring

2 Envoy Communications Gateway

- plugs into an AC outlet
- collects information via the AC wiring
- transmits data through a standard broadband router to the Internet
- collects information and transmits it to Enlighten in 5-minute intervals

3 Enphase Enlighten Monitoring

- provides monitoring and analysis
- allows performance data to be viewed from any web browser

2. Enphase M250 Inverter w/MC4 Connector™



Enphase M250 has an Integrated Ground (IG) which does not require a GEC, eliminating the cost and time associated with installing a copper grounding wire. Enphase provides one of the most advanced inverter technology for solar systems today. An Enphase Energy solution combines innovations in power electronics, networking and web-based software, to make solar systems smarter and more efficient. The Enphase M250 Microinverter has DC current input of peak power ranges from 22 to 36 volts, yet the unit has been tested to perform well at input voltages as low as 16 volts and up to a maximum of 45 volts. Each Enphase Microinverter installs directly under each solar panel with a life expectancy of well over 25 years.

System Overview

Enphase provides the world's most advanced inverter technology for solar systems. Our solution combines innovations in power electronics, networking and web-based software, to make solar systems smarter and more efficient.



2 Envoy Gateway



Simplified Networking

The Envoy Communications Gateway monitors the health and performance of each microinverter and solar module, and it sends this information to the system owner and installer via the Internet.

Features

- Plug & Play setup
- Communicates over existing electrical wires
- Connects to standard broadband router

1 Enphase Microinverter



Maximum Performance

Enphase Microinverters are installed beneath the solar modules on the roof, and they convert the maximum power from each module into standard AC electricity.

Features

- World's most efficient microinverter
- Supports low-light and low-voltage operation
- Innovative cabling for fast and easy installation

3 Enlighten Software



Advanced Monitoring

The Enlighten web-based software provides system owners and installers with detailed performance information and analytics about the solar system, as well as at-a-glance views and automated alerts.

Features

- Included at no additional cost
- Multiple viewing modes, including mobile
- Automatically identifies and diagnoses issues

ENPHASE 250 WATT 208/240 VAC MICRO INVERTER

The new M250 micro inverters from Enphase are designed to handle panels as large as 300 watts. They are compatible with 60-cell solar panels.

Model	M250-60-2LL-S22
Series	M250
Manufacturer	Enphase Energy
Additional Information	Data Sheet

Mechanical

Type	Grid Tie - Micro Inverter
Ambient Temperature Range	-40°C to +65°C
Operating Temperature Range	-40°C to +85°C
Enclosure	Outdoor - NEMA 6
Cooling	Natural Convection - No fans
Connectors	MC4
Dimensions (W x H x D)	6.7" x 6.8" x 1.18"
Weight	4.4 lbs
Shipping Method	Ground

Input (DC)

Recommended PV Power (STC)	210 W - 300 W
Max Voltage	48 V
Nominal Voltage	
Peak Power Tracking Voltage	27 V - 39 V
Operating Range	16 V - 48 V
Min/Max Start Voltage	22 V / 48 V
Max Current	9.8 A

Output (AC)

Maximum Output Power	250 W
Nominal Voltage	208 V / 240 V
Voltage Range	183 V - 229 V / 211 V - 264 V
Frequency	60 Hz (North America)
Max Current	

Features

- Optimized for higher-power modules
- Maximizes energy production
- Minimizes impact of shading, dust, and debris
- No GEC needed for micro inverter
- No DC design or string calculation required
- Easy installation with Engage Cable
- 4th-generation product
- More than 1 million hours of testing and 3 million units shipped
- Industry-leading warranty, up to 25 years

Detailed Description

The Enphase M250 Microinverter delivers increased energy harvest and reduces design and installation complexity with its all-AC approach. With the M250, the DC circuit is isolated and insulated from ground, so **no Ground Electrode Conductor (GEC) is required for the micro inverter**. This further simplifies installation, enhances safety, and saves on labor and materials costs.

The Enphase M250 integrates seamlessly with the Engage Cable, the Envoy Communications Gateway, and Enlighten, Enphase's monitoring and analysis software.

The Enphase M215 micro inverter is physically slightly smaller and can handle 60 cell panels up to 260 Watts. The Enphase M250 is larger and can handle 60 cell panels up to 300 watts.

3. Enphase Engage Cabling Drop / This product is sold by the drop. 1 drop per Enphase M215/M250 inverter Engage Cabling 240 VAC, Portrait ET10-240



The Enphase Engage Cable and Accessories

The Engage Cable is a continuous length of 2.5 mm² (12 AWG), outdoor rated cable with integrated connectors for microinverters. These connectors are preinstalled along the Engage Cable at intervals to accommodate PV module widths. The microinverters plug directly into the cable connectors.

Enphase equipment:

Enphase Engage Cable. Watertight sealing caps, as needed (for any unused drops on the cable). Terminators, as needed (for AC branch circuit cable ends), Cable clips, Enphase disconnect tool (number 2 Phillips screwdriver can be substituted),

4. Solar Panel - 275 Watt Solar Panel with standard frame**Specifications:**

American made 275W solar panels are a great choice for residential or commercial grid-tie applications, and will qualify for ARRA projects.

The solar panel represents one of the best values in the PV industry. The panel's tight power tolerance of $-0/+5\%$ ensures the highest system efficiency without the need for on-site module sorting.

The panel features a low profile junction box with integrated bypass diodes that is completely sealed against corrosion. The ability to rapidly dissipate excess heat allows the diodes and junction box to operate at lower temperatures. The junction box is reliably connected by a solid, welded bond to guarantee lasting functionality and is factory-equipped with high-quality, robust cables and locking connectors. All panels carry a 25-year linear performance warranty.

Features

- Made in USA
- TUV Power controlled: Lowest measuring tolerance in industry
- Every component is tested to meet 3 times IEC requirements
- Designed to withstand heavy accumulations of snow and ice
- Positive performance tolerance
- 25-year linear performance warranty and 10-year product warranty

5. Ground Racking Units



Ground Mount Units are the highest quality and fastest racking system for installers and homeowners alike. Energy One uses these ground mount units on 80% of our panel mounting applications because customers appreciate the professional appearance and ease of assembly. These ground mounting racking are the strongest in the industry having been engineered for most solar panel installations applications worldwide. Our ground racks are manufactured with all-aluminum components that are lightweight and easy to handle, yet engineered to handle the most difficult site and climatic challenges.

Specifications:

Module Tilt Range	0 to 45 degrees
E-W Pier Spacing	Up to 17'
N-S Pier Spacing	7' 6"
Max Wind Speed	150 Mph
Module Orientation	Landscape/Portrait
Wind Exposure	Category B, C & D
Maximum Snow Load	70 psf
Materials	Aluminum Cast Steel ASTM A216 Schedule 40 Pipe Stainless Steel Fasteners
Warranty	20 Yr Mfg, 10 Yr Structural

6. OPTION: Battery Backup allows you to make use of your grid-tied AC solar panel system when the utility grid is down.



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Home Battery Backup kit allows you to add 10,752 watts of battery off-grid backup to your existing home solar system with an option for 21,500 watts. If your existing solar system is 3600 watts or less, or has a string we can isolate for this application, you can add this cost effective backup and leave the lights on during power outages. This backup kit will quietly keep the batteries topped off during your normal operation of your grid tied system. When the power grid goes down, your off-grid battery backup will come-to-life, automatically begin to power your critical electrical loads. Your solar panels will keep the batteries charged so you can operate indefinitely if you manage your power draw during time the utility grid is down.

Complete system includes: System is assembled and tested by experienced factory trained technicians prior to shipment. All required internal cables and connectors come pre-wired (Battery & Cables Supplied but Not Installed) Clearly labeled connection points for AC and DC input and output. AC and DC breakers; full feature LED display for system monitoring and battery information; No maintenance, 10,752 watts deep cycle, sealed AGM batteries; Attractive, lockable steel enclosure; Multiple knockouts for conduit attachments

- 1 AC High Voltage Relay Driver Pre-Wired/Pre-Programmed w/NEC Indoor Rated Box
- 1 Magnum Energy MS4024PAE Inverter
- 1 Magnum Energy ME-RTR LCD Router
- 1 Magnum ME-BMK Battery Monitor
- 8 AGM DC224-6A 224 AG 6V (with Battery Connectors)
- 1 Battery Enclosure with Locking Door
- 1 Single Line Electrical Drawing (Wiring)

Specifications:

Magnum Energy MS4024PAE Pure Sine Wave

Input battery voltage range	36.0 - 68.0 VDC
Nominal AC output voltage	120 / 240 VAC split phase (± 5%)
Output frequency and accuracy	60 Hz ± 0.1 Hz
1 msec surge current (amps AC)	Line-Neutral: 120, Line-Line: 70
5 sec surge power (real watts)	8500
30 sec surge power (real watts)	6000
5 min surge power (real watts)	5400
30 min surge power (real watts)	4800
Continuous power output at 25° C	4400 VA (L-L)
Maximum continuous input current	144 A
Inverter efficiency (peak)	94%
No load (120 VAC output, typical)	25 watts
Waveform	Pure Sine Wave
Charger Continuous output at 25° C	60 ADC
Input current at rated output (AC amps)	17.5 AAC per leg at 120/240 VAC split phase
Power factor	Greater Than 0.95

Operating Temperatures

Operating temperature	-20° C to +60° C (-4° F to 140° F)
Non-operating temperature	-40° C to +70° C (-40° F to 158° F)

Monitor

Magnum Energy ME-ARC Remote Control

LED Display	Display shows inverter and battery status 16 x 2 line (32 characters total), alphanumeric display for programming the Magnum inverter and/ or fault messages.
Pushbutton Controls	Two ON/OFF Pushbuttons Menu allows inverter configure to site specific preferences. Rotary Knob can scroll through and select various menu items and settings.

***AGM Batteries**

Battery Specifications (*Battery supplied with backup power unit is subject to availability, equal or better)

Nominal Voltage	6 Volts
20 - Hr. (10.0A)	200 Ah
Approximate Weight	53 lbs Each
Number of Batteries Included	8 total with all connecting cables
Shelf Life	3 Months 91%; 6 Months 82%; 12 Months 64%
Temp Dependency of Capacity (20 Hr)	104 Deg F 102%; 77 Deg F 100%; 32 Deg F 85%; 5 Deg F 65%

General

Approx Weight With Batteries	800 lbs
Warranty	Cabinet = 5 Years; Inverter = 2 Years, Batteries = 1 Year

INCENTIVES

LOCAL

Local Property Tax Credits

Local incentives are changing all the time as counties become more aware of the benefits of solar power or run out of funds. If your property taxes are lower than the credit amount in a year, you can carry the remaining credit forward so you always get the full amount.

FEDERAL

Residential Energy Efficient Property Credit

The federal rebate is 30% off your installation price. Simply fill out a one page [form](#) as part of your federal tax return, and you'll get your money as a tax rebate. If you do not expect to owe taxes this year, you can roll over your credit to the following year since the credit is available through 2016.

STATE

Maryland Residential Clean Energy Grant Program

The current Maryland grant is \$1,000 for systems up to 20kW in size. The [Maryland Energy Administration \(MEA\)](#) PV solar grants are available for both residents and small business owners.

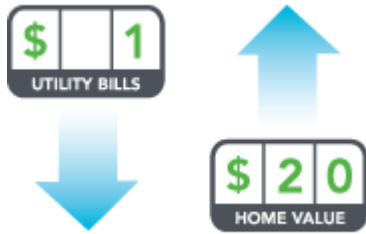
HOME VALUE INCREASES



Lock in Your Own Electricity Rates for the Future

Solar panels are one of the few home improvements guaranteed to increase the value of your home. Most home renovation choices are subjective — you may love upgrading to granite countertops this year, but when you try to sell your home, you find the buyer wants stainless steel. In contrast, the value of solar panels is objective: they decrease your electric bills, providing value to you and anyone else who owns your home.

See Your Home Value Increase Over Time



According to a study published in *The Appraisal Journal*, a home's value is increased by \$20 for every \$1 reduction in annual energy savings. So if you saved \$1,000, you'd increase your home value by \$20,000. And the U.S. Department of Energy's Office of Energy Efficiency & Renewable Energy says that a home with solar will sell twice as fast as a home without solar. [A 2011 Berkeley National Lab Study](#) reported that homes with solar panels sell faster than non-solar homes and at a higher price.

And unlike most home improvements, which depreciate in value with age, solar panels will increase in value over time as electricity prices continue to increase. What will electricity prices be in the future when you sell your home? The higher they are, the more people are willing to pay for an efficient home, so solar panels are like a hedge against increasing electricity rates. So even if you don't plan to stay in your home for a long period of time, your solar panels are still a good investment — better even than a kitchen or bath remodel.

MATERIAL PRICING - SOLAR:

Product Description	Total
Enphase, Envoy Communications Gateway,	
Enphase M250 Inverter w/MC4 Connector	
Enphase Engage Cabling Drops	
Enphase Engage Cabling extra-long Drops	
Solar Panel, 60-cell Solar Panel	
Ground Racking Units	
Ground racking wiring package, mounting brackets	
Permits, Labor Costs	
Up-Front Cost to purchase system	TOTAL: \$59,989.34
30% Federal Tax Credit	(\$17,997)
Maryland State Tax Credit	(\$1,000)
Annual Savings, SRECs, 1 st & 2 nd year Accelerated Depreciation	(\$29,996)
ROI (return on investment) – Payback Years	3.28 year