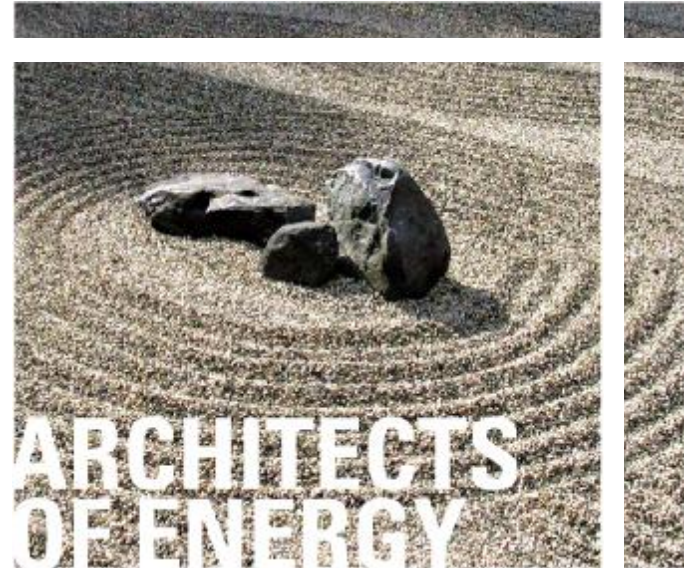


# SolarEdge

SolarEdge, Enphase Value Comparison

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## § Introduction

- § Both the SolarEdge power optimizer system and the Enphase microinverter system offer significant improvements over a traditional string inverter. The primary reason for these significant improvements is that both products Maximum Peak Powerpoint Track (MPPT) each PV module in the array individually. Tracking each PV module individually enables the following benefits:
  - § Increased energy production by eliminating the energy loss caused by module mismatch and partial shading.
  - § Multiple array, module orientations are easily supported.
  - § Per module monitoring, performance reporting, and alerts.
- § The SolarEdge power optimizer system offers additional benefits to those listed above. This document outlines the SolarEdge advantages.

# SolarEdge Advantages

- + The SolarEdge solution works with most available PV modules
  - + SolarEdge is currently shipping Power Optimizers that support most available crystalline silicon PV modules and thin film panels.
    - Enphase microinverters are designed for only 60 or 72 cell crystalline silicon PV modules.
  - + SolarEdge Power Optimizers are currently available to support larger PV module power ratings, up to 350w STC
    - Enphase microinverters currently support up to 235w STC
- + Partially shaded modules produce more energy with SolarEdge
  - + The SolarEdge AOB Power Optimizer has an MPPT range of 5 to 60 Vdc. The Power Optimizer will deliver power even if 2 out of 3 bypass diodes are conducting.
    - The Enphase microinverter MPPT range is 22 to 40 Vdc. If a module is shaded and even if 1 bypass diode conducts, the input voltage will be out of range.

# SolarEdge Advantages

- + The SolarEdge solution is less expensive than a microinverter solution
  - + A SolarEdge system is priced slightly higher than a string inverter and less than a microinverter system
  
- + The SolarEdge solution requires less time and materials
  - + The SolarEdge system is a series architecture using industry standard connectors and standard PV wire.
    - The Enphase system is a parallel architecture requiring 4 output connections per inverter (L1, L2, Neutral, and Grounding Electrode Conductor) and the more expensive Enphase harness. More connections and connectors equals higher cost and more points for failure.

# SolarEdge Advantages

- + The SolarEdge system is a transformer-less, ungrounded system. There is no need to install a continuous Grounding Electrode Conductor throughout the array. The inverter requires only an Equipment Grounding Conductor sized to match the current carrying conductors. Equipment grounding can be accomplished through the Power Optimizer mounting method. In other words, no equipment ground wire to each Power Optimizer.
  - Per NEC articles 690.47 (C) (1) through (8), 250.66, 250.166, a microinverter system requires a #8 AWG minimum, or if exposed to physical damage, a #6 AWG contiguous or irreversibly spliced Grounding Electrode Conductor connecting all microinverter chassis to the grounding electrode. Contrary to application notes published by Enphase, the NEC does not allow using the array structure to satisfy dc grounding requirements.

# SolarEdge Advantages

- + The Solaredge system supports longer string lengths of up to 25 250w Power Optimizers.
  - The Enphase system supports branch circuit lengths of up to 15 modules for 15 amp branch circuits or 17 modules for 20 amp branch circuits.
  - Enphase systems with more than one branch circuit require a dedicated AC load center prior to the AC disconnect.

# SolarEdge Advantages

- + Powerline communications is simpler, more reliable with SolarEdge
  - + The SolarEdge inverter uses DC powerline communications to communicate with its associated Power Optimizers. The DC powerline circuits are a closed system because the inverter isolates the DC circuits from noise and interference created by equipment on the utility side of the inverter. No special circuit arrangements or filters are required.
    - The Enphase system uses powerline communications on the AC branch circuits. Powerline communications in an AC environment is fragile. The AC environment is susceptible to noise and interference from all the AC equipment at the site.
  - + SolarEdge uses “safe voltage” technology – if the PowerBox loses communication, the PV circuit goes to a safe, low voltage.

# SolarEdge Advantages

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- The Enphase microinverter system requires that the array be divided electrically into manageable blocks (approx. 34kw) for each internet gateway. Filters must then be installed to isolate the gateways, adding cost and complexity. Enphase systems larger than 34kw are difficult to design, install, and commission. Ethernet extenders are often required to overcome interference and signal strength issues on residential installations.



# SolarEdge Advantages

- + SolarEdge offers greater networking flexibility
  - + SolarEdge inverters have a number of options for communicating with each other as well as connecting to the internet, RS-232, Ethernet, wired or wireless, RS-485, wired or wireless, ZigBee wireless. Ethernet, RS-232, RS-485 are included with the inverter with no additional cost. RS-485 is used by many off the shelf third party solutions.
    - The Enphase internet gateway must be purchased separately for \$365.00. The Enphase system internet gateway only provides an Ethernet connection. Any other form of communication needs to be acquired from a third party.
  - + In a multi-inverter system, one inverter can be configured as the master with all other inverters reporting to the master. The master would require a single internet connection.
    - Each Enphase gateway will require an Ethernet connection.

# SolarEdge Advantages

- + SolarEdge supports the SunSpec alliance for easier integration with other monitoring packages.
  - Enphase communications is proprietary, you must use their monitoring package.
- + The inverter stores module level data for 20 to 30 days. Module level data can be downloaded locally anytime to help analyze problems.
- + Module level monitoring can be turned on at any time with access to the previous 20 to 30 days of data.

# SolarEdge Advantages

- + Higher Reliability with a SolarEdge System
  - + Unlike microinverters, SolarEdge's DC-DC approach distributes to PV module level only the minimum amount of electronics required for MPPT, communication and safety. Since DC/AC conversion is done centrally, less components are multiplied. Lower part count = higher reliability
  - + Heat dissipation: SolarEdge's >98% Power Optimizer efficiency means that less than 2% is lost as heat. Enphase's efficiency is around 96%, meaning 4% is lost as heat, which is double the heat Power Optimizers dissipate.
    - Microinverters duplicate the entire inverter on each module, which inevitably leads to higher price, higher complexity, and lower reliability.
    - Due to the Microinverter's high voltages, all related active electronic components cannot be packed into an ASIC chipset which results in higher part count and lower reliability.

# Possible Questions

- § Does the SolarEdge inverter provide a single point of system failure?
  - § Only in a single inverter system. It is true that if the SolarEdge inverter is offline for any reason all its' associated modules are not producing power. However, since the SolarEdge inverter is transformerless, it is extremely efficient with low thermal cycling, low parts count , and is a highly reliable product. And, the SolarEdge inverter is installed in a less harsh environment. Larger systems are best designed with multiple SolarEdge inverters, so a single inverter offline would partially reduce production.
- § Is a SolarEdge system less efficient because it is doing a dual conversion?
  - § No, the combined efficiency of the Power Optimizers and Inverter is still around 96%
- § Is powerline communication mission critical for SolarEdge?
  - § The Power Optimizers must be able to communicate with the inverter in order to produce power. Since this is done in the DC circuits and isolated from noise and interference on the utility side of the inverter, powerline communications is very robust in a SolarEdge system.

# SolarEdge Advantages

## § Summary

- § Both the SolarEdge power optimizer system and the Enphase microinverter system offer significant improvements over traditional string or central inverters. However, the SolarEdge system outshines the Enphase system in the following areas:
  - § Works with most available PV modules
  - § Less expensive for equipment and installation
  - § No grounding electrode conductor run throughout the array
  - § More modules per string, fewer strings, greater flexibility
  - § Simpler more reliable DC powerline communications
  - § More networking options, included at no additional cost
  - § Higher Reliability
- § The SolarEdge power optimizer system provides the highest energy production, ease of system design and installation, and reliable performance, all for a lower cost.