

# StorEdge Solar and Energy Storage System Review



## Overall Rating as Tested

Equipment Cost	★ ★ ★
Features	★ ★ ★ ★
Installation Ease	★ ★ ★
Customer Friendliness	★ ★ ★ ★
Backup Power	★ ★ ★

### About this Review

Barry Cinnamon and his team at Cinnamon Solar and Spice Solar have scheduled a series of hands-on reviews of commercially available residential battery storage systems. Reviews are based on the installation and usage of each system using commercially available products and software, provided by manufacturers. The intent is to provide useful real-world experiences to installers, home owners and manufacturers as Behind the Meter (BTM) battery storage systems and accessories become more popular. To access the installation details and photos for this review, general information about battery storage, and ongoing review updates, go to [www.spicesolar.com/resources/storage](http://www.spicesolar.com/resources/storage).

### StorEdge Solar and Energy Storage Overview

StorEdge, from SolarEdge, is a grid tied solar inverter coupled with a battery storage system interface compatible with multiple DC battery systems. StorEdge currently supports the LG Chem RESU10 and Tesla PowerWall; other battery subsystems will be added. The StorEdge 7.6kw inverter functions virtually identically to the standard SolarEdge 7.6 kw inverter, simplifying installations for solar contractors already experienced with SolarEdge's DC optimizer design. StorEdge is DC coupled, connecting directly to either a PV array or battery or both – enabling operation in grid-tie mode and backup power mode. The StorEdge system in this review was installed and configured using the LG Chem RESU10 battery subsystem.

The StorEdge system is ideal for customers who want to store locally generated solar energy or inexpensive grid energy so that this energy can be consumed during peak electric periods, thereby reducing electricity energy charges. Key features of the StorEdge system are that various third-party battery subsystems can be connected, the system can be configured to provide emergency backup power, and the system has a number of configuration options to handle the wide range of net metering and grid interconnection requirements in the U.S. and other countries.

Many solar contractors are familiar with SolarEdge inverters and optimizers, simplifying design, installation and configuration work for the StorEdge system. In the standard SolarEdge 7.6 kw system the bottom section of the inverter assembly includes the PV DC disconnect, terminals for the DC connection to the PV array and terminals for the AC connection to the grid. In the StorEdge system this bottom section, called the Backup Unit, also contains an AC loads breaker, AC loads bypass switch, battery input, battery communications terminals, AC output to the backup loads, meter communications terminals, auto transformer terminals, fuses and a standard 9 volt lithium battery for dark start capability. This Backup Unit also provides 240 volt 60 Hz reference power and relays so that the system can operate in backup mode in the event of a utility power interruption.

SolarEdge provides comprehensive documentation, maintains a customer support hotline M-F from 6 AM to 5 PM PST, and provides a cloud-based monitoring platform that is easy for both contractors and customers to access. SolarEdge is an established solar equipment supplier with a reputation for delivering good product and service quality.

### Applications Supported

- ✓ Optimized self-consumption of solar generation
- ✓ Time of use bill management (electricity usage time-shifting)
- ✓ Power export limiting
- ✓ Demand charge reduction (peak demand shaving)
- ✓ Backup power
- ✗ Off-grid operation

### Equipment Installed and Tested:

Product	Part Number	Cost
<b>StorEdge 7.6 kw 1-Ph Grid Tied Battery Storage Inverter with Revenue Grade Meter</b>	SE7600A-USS20NNB2	\$2,600
<b>StorEdge Consumption Meter with Enclosure</b>	SE-MTR240-2-400-S1	\$480
<b>StorEdge Auto-Transformer</b>	SEAUTO-TX-5000	\$260
<b>StorEdge GSM Modem w/SIM 12 yr plan</b>	SE-GSM-R12-US-S2	\$650
<b>SolarEdge Monitoring Platform (website)</b>		
<b>SolarEdge Optimizers (one per panel)</b>		
<b>100 Amp Backup Subpanel (with breakers)</b>		\$100
<b>LG Chem RESU10H Battery Pack</b>		\$5,500
<b>Total for Battery Equipment</b>		<b>\$9,590</b>

### Installation Labor Cost

	Time Estimate (hours)	Cost @\$80/hr <sup>(2)</sup>
<b>Design</b>	4	\$320
<b>Installation</b>	10	\$800
<b>Configuration</b>	2	\$160
<b>Totals</b>	<b>16</b>	<b>\$1,280</b>

(2) Not including overhead, sales and permitting

# StorEdge Solar and Energy Storage System Review

## Documentation, Training and Support

The StorEdge system is feature-rich, supporting a wide range of operating modes, grid integration capabilities, and backup power configuration options. As such, SolarEdge has done a good job providing comprehensive and readable documentation for their StorEdge inverter, including peripheral components used with the system (Consumption Meter, AutoTransformer, etc.). SolarEdge provides regular contractor training at regional solar and storage events, training with affiliated distributors, as well as scheduled and on-demand webinars. LG Chem provides documentation, training and support for their battery system, as well as integration support from SolarEdge.

## Shipping and Transportation

Contractors must be aware of the special shipping requirements that apply to large battery storage systems. In particular, DOT Hazmat Training is required for all personnel handling Lithium Ion battery systems that weigh more than 50 pounds. Most common carriers can meet these requirements, including FedEx and UPS. Contractors must make sure their staff are properly trained when handling large batteries such as the LG-Chem RESU10H. Note that these battery subsystems are very heavy and may require a heavy-duty hand truck (ideally with a vertical lift) so that the battery can be safely transported to the installation site and mounted on a wall.

## Design and Engineering

One or two batteries can be connected to each StorEdge 7.6kw inverter. For most small homes with a 4 kw PV system a single LG Chem 10 kwh battery would be sufficient to optimize self-consumption of their solar power. In this 4kw system example a 10 kwh battery would be able to store about 70% of the average daily energy generated by the PV system. This 10 kwh capacity would also be sufficient to power critical loads in a home for one or two days. Larger homes with higher evening energy consumption levels or extensive critical loads would benefit from additional battery storage.

During backup operation the system can provide 5,000 watts of continuous power from the battery, with a 6,600 watt surge. Note that this power and surge capability is generally insufficient to operate central AC systems or large loads (such as an electric dryer). Because of the maximum power limitations inherent with all battery backup systems, customers who want to power their entire home -- including AC and large appliances -- will generally be better served with a whole house generator.

Permitting for the StorEdge system is similar to a standard PV installation -- plus whatever additional requirements that may apply by the jurisdiction for battery storage. Local utilities may also require additional safety or set-point configuration changes so that the battery storage system meets their interconnection requirements. Finally, rebate administrators (such as California SGIP) will often have additional application and operating characteristic requirements.

## Installation Details

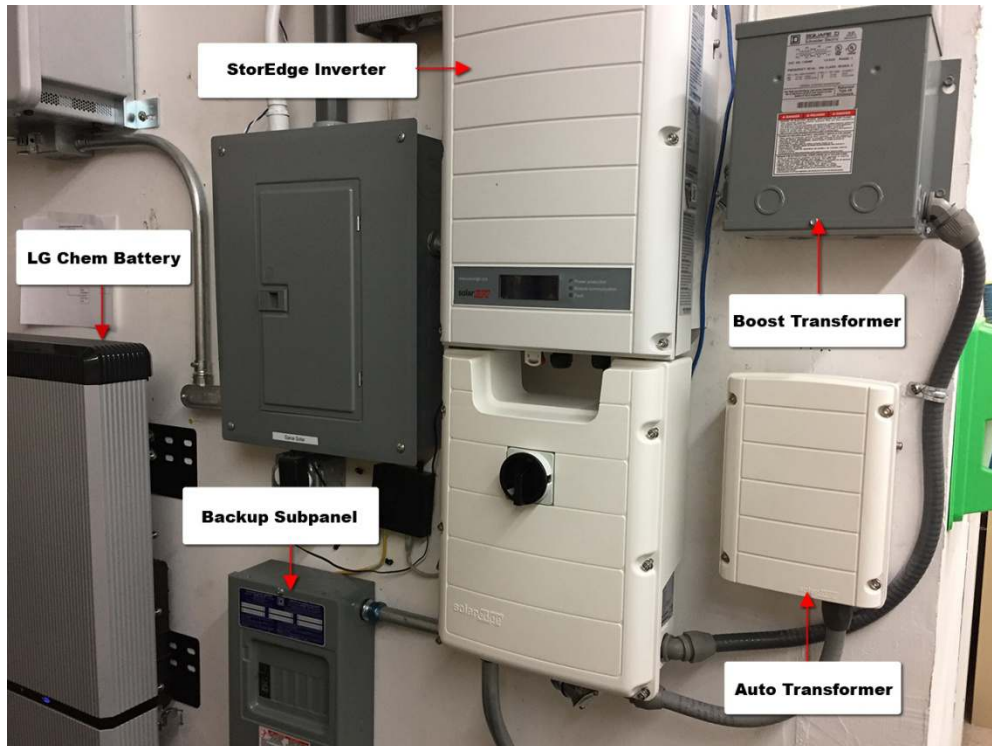
Test Site Conditions:

- Commercial building with 3 phase 208 service
- 10 60-cell solar panels with SolarEdge optimizers

As with other SolarEdge inverters, the StorEdge inverter is mounted on the wall with a bracket, connected to the AC service panel and PV panels (equipped with optimizers). Additional electrical components included a single 40-amp dual pole breaker in the main service panel, the SolarEdge Autotransformer (necessary for backup power operation), communication wire for the temperature sensor in the auto transformer, SolarEdge Electricity Meter and communication wire, a critical load subpanel, LG Chem RESU10H Battery, and communication wire to the battery. For this 208 volt three phase commercial electrical service a transformer was also installed to achieve the 240 volts necessary for the StorEdge inverter. SolarEdge's Cellular monitoring was used for this installation. The cellular SIM card is mounted within the inverter, and a cellular antenna is mounted externally on the inverter housing (note that this higher data rate cellular modem is different than the standard SolarEdge cellular modem). Instead of the cellular connection, Ethernet or Zigbee communications from the inverter to the customer's internet service is an alternative.

Since the maximum output from the inverter and battery is limited to 5,000 watts, a critical load subpanel

(or backup panel) is necessary. Critical load circuits (such as refrigerators, important lighting, furnace, hot water heater and entertainment necessities) must be moved from breakers in the main service panel to breakers in the critical load subpanel. This critical load subpanel is then fed from the inverter. In the event of a grid failure the inverter will resume powering these critical loads after a delay of about 5 seconds (not instantaneously as with an uninterruptible power supply).



StorEdge System with LG Chem Battery

The SolarEdge Electricity Meter was mounted adjacent to the service panel for the building. Two Consumption Metering current transducers (CTs) were installed on two of the three incoming AC power legs L1 and L2 so that net building energy usage could be monitored. The meter was connected to a circuit breaker making sure that L1 and L2 corresponded to the same legs as those on the CTs. A CAT5 cable was connected to the meter communications pins in the inverter.



SolarEdge Electricity Meter



Two Consumption Metering Current Transducers in Service Panel

Configuration of the system was completed by setting the appropriate DIP switches on the Inverter and Backup Unit. Additional configuration options were completed using the menu button below the inverter to navigate through the settings menus.

Once cellular communications to the SolarEdge Monitoring Platform was completed the performance of the system could be viewed remotely, including total building consumption, solar production, self-consumption, power import from the utility, power export to the utility and battery status. System operating profiles can be set by the contractor on the SolarEdge Monitoring Platform. These profiles can establish optimal charge/discharge times so that customers can charge from PV or the grid when rates are low, and discharge the battery to the home when rates are high.



SolarEdge Monitoring Platform

## Operation and Maintenance

Operation is completely automatic once the system is installed and configured. In the event of a grid failure, the backup subpanel will be energized by the inverter and battery within about 5 seconds. Contractors have visibility into the performance of individual solar panels, as well as certain operating characteristics of the inverter and battery. Once communications are established, SolarEdge support has access to virtually all software-configurable settings of the inverter.

## Conclusion

SolarEdge has an excellent track record for releasing stable, well-engineered and documented products. Because many contractors are already familiar with SolarEdge inverters and optimizers, installation ease of the basic PV system is fairly straightforward. SolarEdge has done a commendable job integrating PV with battery storage; nevertheless the additional work related to installing any system with battery backup power and building consumption monitoring should not be underestimated: third party battery subsystems

are relatively large and heavy; additional communications wires must be installed to the battery, autotransformer and electricity meter; more complicated setup and configuration is necessary compared to a simple PV system; and a backup loads subpanel must be wired based on the customer's needs for emergency power.

We expect that the StorEdge Solar and Energy Storage System will be one of the more reliable and user-friendly systems on the market. The fact that this system is designed to be compatible with multiple battery subsystems gives contractors a choice in system design – much as they have a choice when selecting solar panels. The complete system's price point is realistic based on the capacity of the inverter, battery and configuration options.

## Specifications

### **Output - AC (Loads/Grid)**

Rated AC Power Output	7,600 VA
Maximum AC Power Output	8,350 VA
AC Output Voltage	240 VAC (211-264)
AC Frequency	60 Hz (59.3-60.5)
Maximum Output Current	32 A
Power Factor	>0.99 (adjustable 0.9 leading, 0.9 lagging)
Typical Nighttime Power Consumption	<5 watts

### **Output – AC (Backup Power)**

Rated AC Power Output	5,000 VA
Maximum AC Power Output	6,600 VA
AC Output Voltage (L-L)	240 VAC (211-264)
AC Output Voltage (L-N)	120 VAC (105-132)
Nominal Frequency	60 Hz (55-65)
Maximum Output Current - Backup	21 A
Maximum Output Current – Per Phase	25 A
Power Factor	0.2 leading, 0.2 lagging
Automatic Switchover Time	<2 seconds
Typical Nighttime Power Consumption	<5 watts

### **Input – DC (PV and Battery)**

Transformer-less, Ungrounded	yes
Max Input Voltage	500 V
Nominal DC Input Voltage	400 V
Reverse Polarity Protection	Yes
Ground-Fault Isolation Detection	600 kOhm Sensitivity
Maximum Inverter Efficiency	98%
CEC Weighted Efficiency	97.5%

### **Input – DC (PV)**

Maximum DC Power (STC)	10,250 Watts
Maximum Input Current	23 Amps
2-pole Disconnection	Yes

### **Input – DC (Battery)**

Supported Battery Types	LG Chem RESU10H
Number of Batteries per Inverter	2
Continuous Power	3,300/5,000 Watts (Low/High Power)

	Version)
Peak Power	5,000/7,000 Watts (Low/High Power Version)
Max Input Current	8.5/17.5 Amps (Low/High Power Version)
DC Fuses on Plus and Minus	12/25 Amps (Low/High Power Version)

**Additional Features**

Supported Communication Interfaces	RS485 for battery, RS485, Ethernet, ZigBee (optional)
Battery Power Supply	Yes, 12v/53W
Revenue Grade Data, ANSI C12.1	Optional
Integrated AC, DC and Communications Unit	Yes
AC Disconnect	Yes
Manual Inverter Bypass Switch	Yes
DC Voltage Rapid Shutdown (PV and Battery)	Yes, according to NEC 2014 and 2017 690.12
Auto-transformer thermal protection	Yes