GridZero Mode

Introduction

GridZero is an AC input mode designed to optimize the use of renewable energy, battery storage, and utility power. It eliminates solar variability on the grid by using tailoring PV production to load demand and utilizes utility power at key moments allowing the system to operate loads that would otherwise overload the system.

GridZero Benefits

GridZero mode enables a renewable energy system owner to maximize the use of their generated electricity and minimize energy purchased from the utility by fully utilizing energy storage. Specifically, this mode puts battery and renewable energy to the most effective use while minimizing dependence on the grid.

- No sell-back of power to the utility grid necessary in order to achieve good system economics.

- Smaller inverter and battery system perform as a much larger system, seamlessly blending utility power and renewables to support surges and large loads.

- Inverter/charger remains connected and synchronized to the utility grid in case the grid is needed. If large loads require the use of grid power, no destabilizing transfer is required.

- Simple programming with only two setting adjustments needed to determine the rate, priority, and amount of energy to use.

GridZero Operation

In ***GridZero*** mode, the inverter powers the loads primarily from battery and renewable energy source, while remaining connected to the utility grid. Using the DC sources, the inverter attempts to decrease the use of the grid to zero. The inverter only draws on the grid when loads to the battery exceed the preselected values (see Figure 1). This differs from other AC input modes such as ***Grid Tied***, ***Backup***, or ***UPS***, where the utility grid is typically prioritized first over DC sources.

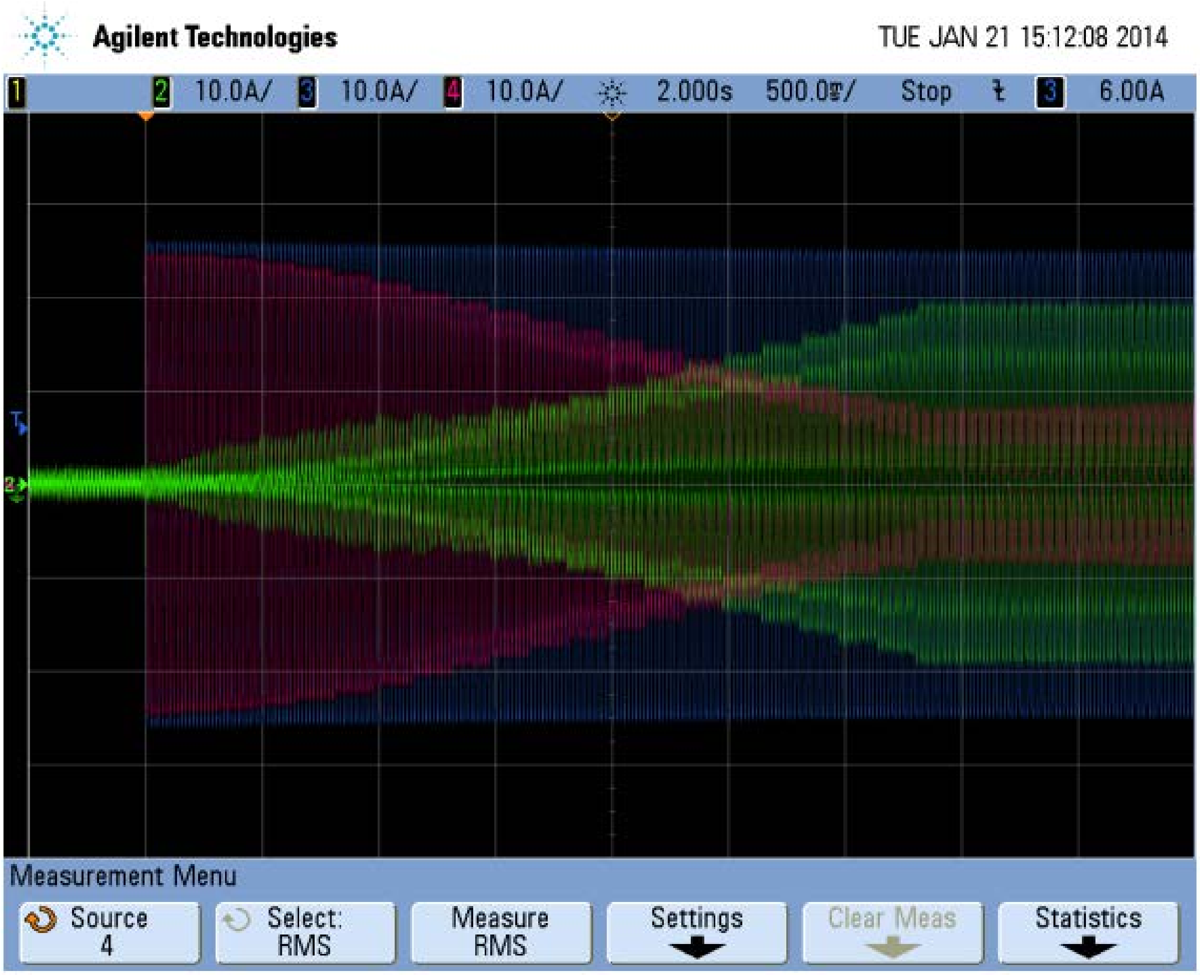

Figure 1

When load demand on the system exceeds the desired amperage (***DoD Amps***), the utility grid is used to power the load exceeding the set point. This allows a relatively small battery and inverter to serve load spikes that would otherwise overload the system (see Figure 2).

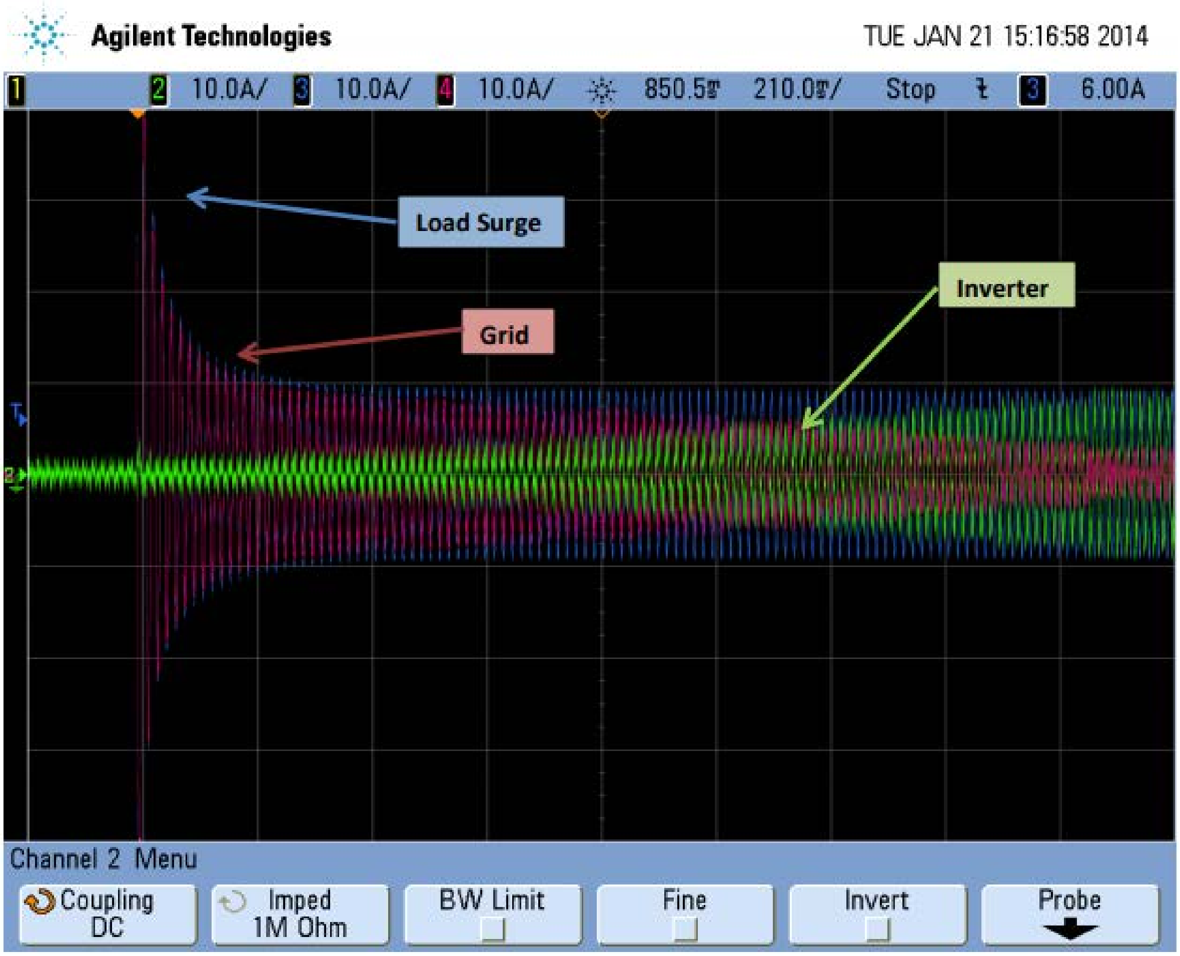

Figure 2

GridZero mode also uses the battery to power loads throughout the evening and night, reducing or eliminating the need to purchase utility power. The renewable source recharges the battery the following day. If the battery has been discharged to the lowest allowable voltage (***DoD Volts***), the utility grid is used to meet all loads until the renewable resource can fully recharge the battery.

CAUTION

The use of GridZero mode does not ensure absolutely zero energy returned to the grid. While every attempt is made to minimize this energy, small amounts of current may leak to the grid. In most cases, the inverter is constantly consuming a small amount of power. However, if large loads are reduced quicker than the response time of the inverters, this energy may flow back to the grid. Another contributing factor is the accuracy of the inverter current sensor.

Examples of GridZero Applications

Example #1: Europe

In many European countries, the past rapid adoption of PV was driven by high Feed-in Tariff (FiT) programs that incentivized solar by paying a premium for renewably generated energy.

With FiT rates now well below the retail cost of electricity in most regions, these markets have changed to an increasing focus on “Self-Consumption” programs. These programs attempt to increase the consumption of self-generated renewable energy while reducing the energy required by the home that is purchased from the utility at high rates. ***GridZero*** mode provides a path to self-consumption. It also provides a lower cost of entry for a residential renewable system because installers can specify a smaller inverter/charger and battery, while still delivering large-system performance and advantages.

Example #2: North America

In Hawaii, residents are investing their own money to save on long-term electricity costs and to benefit the environment. The result is a surplus of PV energy beyond what is used in their homes. In the past, this extra energy would be exported to the utility grid to reduce the local utility’s consumption of oil used in the generation of electricity. However, many of Hawaii’s electrical utilities have cited an abundance of solar-generated electricity, which if sold back to the grid, could actually de-stabilize it and threaten system reliability. Therefore, utilities have begun limiting the ability of homes and businesses to interconnect and export as well as requiring additional studies on whether grid upgrades are necessary. In this business environment, the uncertainty facing contractors and residents is considerable and implementing systems using conventional grid-tie technology is becoming economically unfeasible. ***GridZero*** allows homeowners to fully utilize the benefits of solar while remaining connected to the grid and, at the same time, eliminating potentially de-stabilizing solar variability from the grid.

Example #3: California

California has established a statewide goal of reducing or eliminating greenhouse gas emissions in the near future. They are achieving this by increasing the amount of energy generated by renewables while implementing zero-emissions load balancing to manage variability on the grid. With ***GridZero*** never selling to the grid, this mode answers utility concerns about both renewable energy generation and grid stability.

Conclusion

In all scenarios, because ***GridZero*** does not put power back onto the grid, but stores it for future use and prioritizes self-consumption, it resolves the utility's concern about excessive production on high-penetration circuits. The consumers can reap the benefits of self-consuming PV energy while using the grid to support surges, spikes, or high load demand.

Accessing GridZero

GridZero must be enabled using the MATE3 series system display. Two parameters are adjusted by the installer or system operator to dictate how the inverter/charger selects the priority of energy to use (see Figure 3 below). The two parameters are:

- ***DoD Volts*** (Depth of Discharge Voltage): lowest allowable battery voltage

- ***DoD Amps*** (Depth of Discharge Amperage): highest allowable amperage draw from the battery

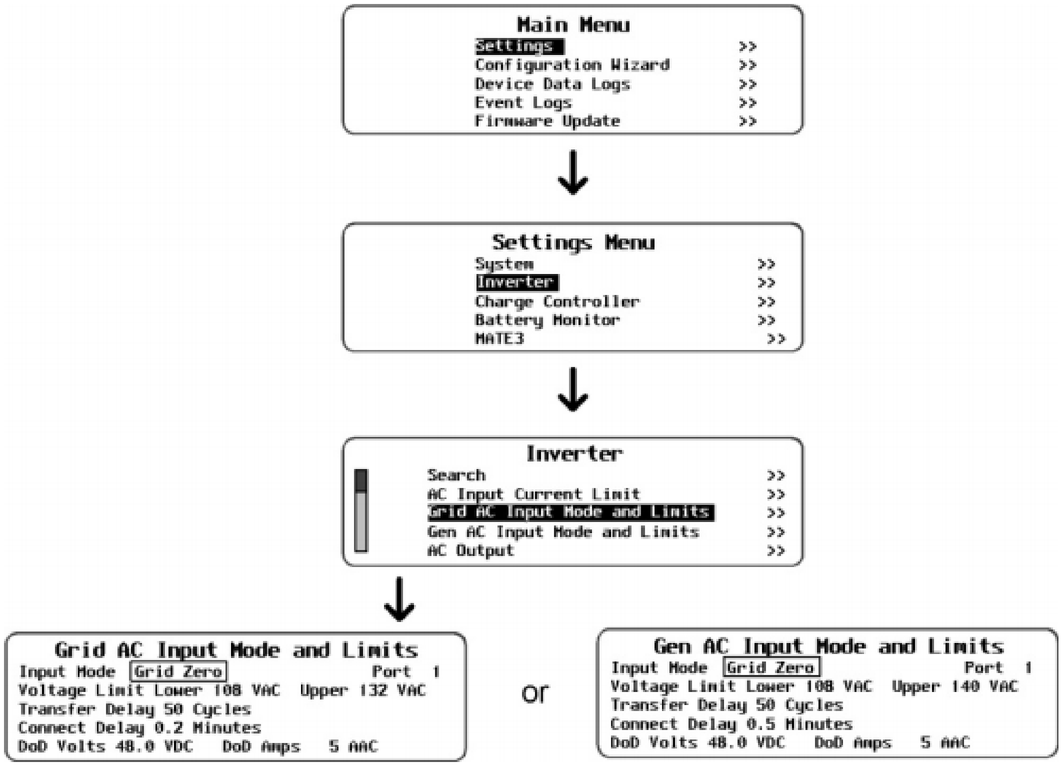

Figure 3

Any time the batteries exceed the ***DoD Volts*** setting, the inverter will send power from the batteries to the loads. As the battery voltage decreases below the ***DoD Volts*** setting, the inverter will draw power from the grid to maintain the loads. When ***DoD Volts*** is set low, more renewable energy is delivered from the batteries to the loads. However, it also leaves less of a reserve in the event of a grid failure. When ***DoD Volts*** is set high, the batteries will not discharge as deeply and will retain more reserve.

To prevent damage to the batteries from rapid discharge, the rate of discharge is limited using the ***DoD Amps*** setting. This item should be set lower than the amperage provided by the renewable source.

The batteries should not be completely discharged and must maintain some capacity to support the loads in case of grid failure. The exact voltage and percentage will vary with battery type and size. The renewable energy source must exceed the size of the loads, because the only allowable charging is from renewable energy. The inverter's battery charger does not function in ***GridZero*** mode.

Considerations

- If the renewable energy source is not greater than the size of the inverter loads, this mode cannot be used correctly. The renewable source must be capable of charging the batteries as well as running the loads.
- The inverter’s battery charger cannot be used in this mode. However, the charger menu settings and timer operations are not changed when this mode is selected.
- The battery will discharge whenever possible in the attempt to “zero” the grid usage. If the ***DoD Amps*** setting is limited or loads are not present, the batteries will be unable to accept much renewable recharging the next time it is available.

About OutBack Power Technologies

OutBack Power Technologies is a leader in advanced energy conversion technology. OutBack products include true sine wave inverter/chargers, maximum power point tracking charge controllers, and system communication components, as well as circuit breakers, batteries, accessories, and assembled systems.

Other

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