

TECHNICAL STATEMENT

Topic: LG Chem RESU10H when used in AC-Coupled Battery Backup Systems

Product Names:

LG Chem RESU10H

SMA Sunny Boy Storage 3.8/5.0/6.0-US

SMA Sunny Boy Storage Automatic Backup Unit

Model Numbers:

LG Chem RESU10H-C

SMA SBSx.x-US-10

SMA SBS-ABU-200-US-10

Summary:

The LG Chem RESU10H-C battery is approved for use in grid-tied energy storage systems, however the use in backup power systems is only conditionally approved based on limitations which prevent the battery from being recharged while operating without grid power available.

This conditional approval is described in Section 1.2 of the document “**Technical Information - SUNNY BOY STORAGE - Approved Batteries and Information on Battery Communication Connection**” which is available at the direct link below or by navigating to the **Downloads** → **Background Knowledge** section of the Sunny Boy Storage US website: <https://www.sma-america.com/products/battery-inverters/sunny-boy-storage-38-us-50-us-60-us.html>
Direct document link: <https://files.sma.de/downloads/SBS-Batteries-TI-en-16.pdf>

Explanation of LG Chem RESU10H-C Behavior in AC-Coupled Energy Storage Systems:

Unlike batteries with a native voltage, the LG Chem RESU10H-C battery relies on integrated electronics to step-up the internal battery voltage to a higher voltage (~490V nom.) which is compatible with modern string inverter technologies. The power electronics integrated into the battery require a short disruption in current flow in order to transition from discharging mode to charging mode, or vice-versa. During grid-tied operation, the transition period is hardly noticeable since there are no disruptions to the power supplied into the home. Additionally, the grid-tied PV inverter(s) are not limited in its ability to recharge the LG Chem RESU10H-C battery when the solar resource is sufficient to do so. However, when operating in a backup mode, the battery becomes the backup grid energy source which powers the grid forming battery inverter (i.e. SMA Sunny Boy Storage). Furthermore, the SMA Automatic Backup Unit electrically disconnects the backup circuit from the utility grid and/or fossil-fuel home generators in order to prevent any possibility of back-feeding the utility grid or fossil-fuel home generator. The PV inverter(s), however, are typically AC coupled to the backed-up load panel in order to allow the PV system to extend the duration of the energy storage system backup power supply. While this is certainly possible with the SMA Sunny Boy Storage equipment, the use of the LG Chem RESU10H-C battery in backup systems is only conditionally approved because the battery's onboard power electronics do not provide a steady supply of power to the Sunny Boy Storage battery inverter during periods when the battery transitions it discharging/charging state. This results in brief disruptions to the backup power supply and

will cause the AC coupled PV inverter(s) to reset/reconnect upon restoration of backup power supply. This behavior effectively prevents the PV inverter(s) from recharging the LG Chem RESU10H-C when operating in backup mode. This behavior is the same regardless if there are multiple LG Chem RESU10H-C batteries connected to the Sunny Boy Storage inverter. This would be the same situation with any AC-coupled energy storage platform.

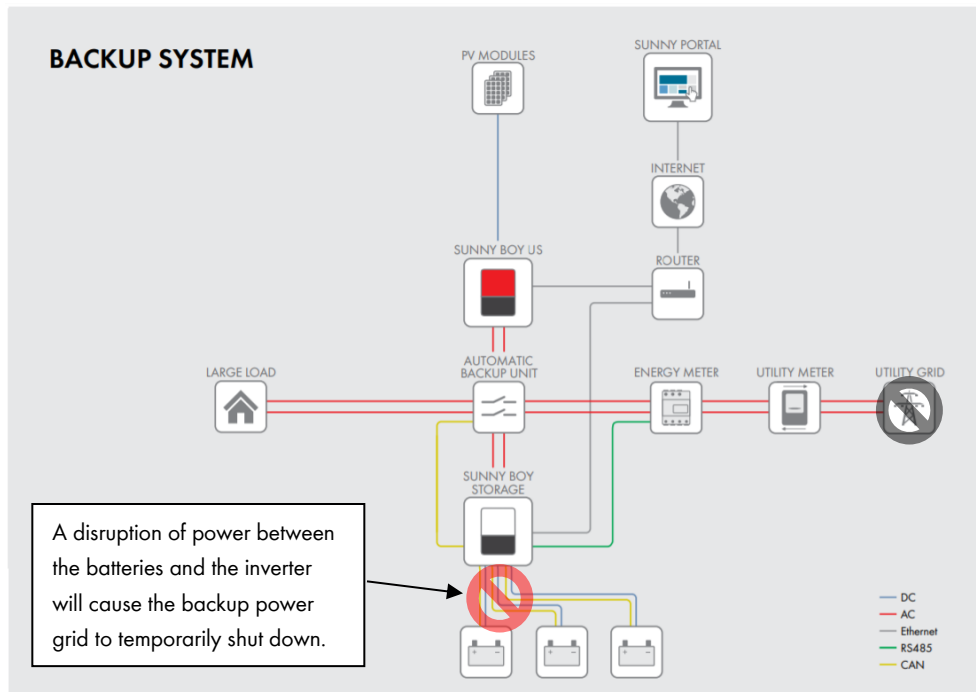


Figure 1: A typical AC-coupled backup power system configuration

The reason for the conditional approval is because SMA developed a software function in 2019 which intentionally reduces the PV inverter power output using a frequency-shift-power-control scheme to allow the PV inverter(s) to contribute only a very limited amount of power to the backed-up loads which does help extend the duration of the backup power system while still reducing the likelihood of disruptions occurring to the backed-up grid. However, the consequence of this reduced PV power control scheme is that the LG Chem batteries will not recharge during backup mode. The Sunny Boy Storage can even disable the PV production entirely during backup mode, if so desired.

The following software parameter selections are available for the Sunny Boy Storage which can be found under **Device Parameters → Backup → Output Power Limitation of PV Inverter:**

- **Dynamics;** (Default Value) The PV power is dynamically adjusted via frequency changes. This backup operating mode setting is recommended for fully approved batteries for backup mode operation, but not for the LG Chem RESU10H-C due to the likelihood of backup power disruptions occurring.

- **Dynamic with automatic switch off;** The PV power is dynamically adjusted via frequency changes. However, if unstable battery behavior continues to occur, the system will automatically switch to the “Permanently derated” operating mode described below. This backup operating mode setting is recommended for the LG Chem RESU10H-C, if used in a backup system configuration. However, there will be reductions on the amount of PV power supplied which could help extend the backup power duration.
- **Permanently derated;** The frequency of the backup grid is shifted outside of the allowed operating range of the PV inverter(s) in order to prevent them from starting. This backup operating mode setting is only recommended when the disruption to the backup grid is not desired at all.

In conclusion, SMA only conditionally approves the LG Chem RESU10H-C battery for use in backup power systems. The condition being that the PV inverter(s) are not able to effectively recharge the battery(ies) when operating in backup mode. Please consider using batteries which are fully approved for backup power systems when designing robust AC-coupled backup power systems. The list of approved battery types for the Sunny Boy Storage US is found in Section 1.2 of the “**Technical Information - SUNNY BOY STORAGE - Approved Batteries and Information on Battery Communication Connection**” can be found by navigating to the **Downloads → Background Knowledge** section of the Sunny Boy Storage US website: <https://www.sma-america.com/products/battery-inverters/sunny-boy-storage-38-us-50-us-60-us.html>