

# Understanding Sunlight Backup system for homeowners

This document describes the Sunlight Backup configuration using IQ8 Microinverters. Below are the sections in the document:

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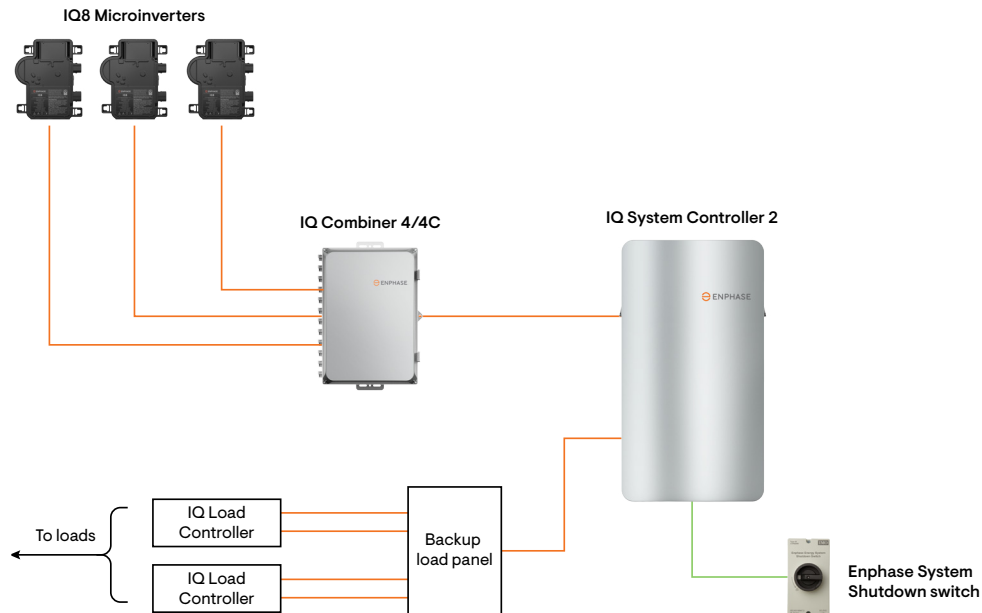
## Introduction

An Enphase Sunlight Backup system provides backup when the sun is shining. The system provides backup for up to 4x 240V or 8x 120V circuits. The system consists of IQ8 Series Microinverters, IQ System Controller 2, IQ Combiner 4C, 2x IQ Load Controller and other accessories as needed.

**NOTE:** Sunlight should only be used for the essential loads in the home. Using the solution to backup the entire home will lead to poor experience and is not supported by Enphase.

## System components

The system consists of IQ8 Series Microinverters, IQ System Controller 2, IQ Combiner 4C, 2x IQ Load Controller and other accessories as needed.



- **IQ8 Series Microinverters** is our most powerful, software-defined series of microinverters. It is powered by a proprietary, intelligent chip, that makes switching between on and off-grid virtually seamless.
- **IQ Combiner 4/4C** aggregates the solar microinverter circuits and includes the IQ Gateway. The IQ Gateway provides on-site intelligence and cloud connectivity that enables you to monitor the system remotely via the Enphase App.
- **IQ System Controller 2** automatically detects utility power outages and seamlessly transitions you to backup power. It enables grid forming IQ8 Microinverters, IQ Batteries and even third-party AC standby generators to be connected to your home.
- **IQ Load Controller** enables circuit-level control for 2x 240V loads or 4x 120V loads. Examples of 240V load are electric dryers and Level 2 electric vehicle charger. Most of the loads in your home, including lights, fans, appliance sockets are all 120V loads. A Sunlight Backup system will have 2 IQ Load Controllers to control up to 4x 240V or 8x 120V loads.
- **Enphase System Shutdown Switch** is a must-have for any IQ8-based backup system for the rare situations where you may have to turn off the Enphase Energy System. Turning the switch to the OFF position connects your home to the utility grid and disables the backup capability of the Enphase Energy System. While the switch is in the OFF position, your home is disconnected from the IQ8 Microinverters and AC standby generator, if present.

**NOTE:** 3<sup>rd</sup> party backup generators can be added to a Sunlight Backup system. Refer your installer to “Generator Tech brief” to add a generator to the system. A generator in a Sunlight Backup system must be in **Automatic** mode. The system starts the generator and connects it to the home loads whenever there is a grid outage. However, it would use power from generator only if the power produced by microinverters is insufficient to support the home loads.

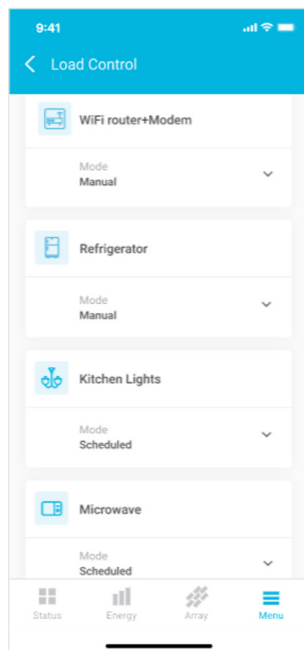
## Essential load selection

Work with your installer to select your essential loads. Keep the following points in mind while selecting the essential loads.

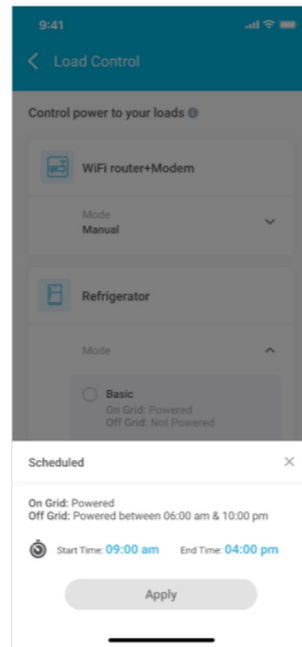
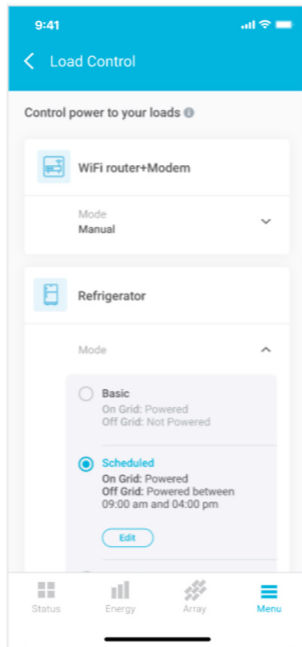
1. Enphase recommends your backup loads do not exceed 30% of the total rated AC output power of the IQ8 Microinverters on the roof. For example, the rated power output for a system with 24 IQ8 Microinverters is 5.7 kW AC. The backup loads should not exceed 1.7 kW AC (30% of 5.7 kW AC).
2. The system can backup up to 4x 240V or 8x 120V circuits. While backing up 4x 240V circuits, it controls each of the backed-up circuits individually. While backing up 8x 120V circuits, the backed-up circuits are divided into 4 groups with 2 circuits each, and the system can control each group individually.
3. Ensure that your Wi-Fi router and modem have the highest priority amongst the essential load circuits. Your installer will do this by following the guidance provided in the Sunlight Backup guide for installers and system designers.
4. When the system is running off-grid, avoid connecting other loads to the electrical outlets on the same circuit as the Wi-Fi router and modem.

## Load control configuration

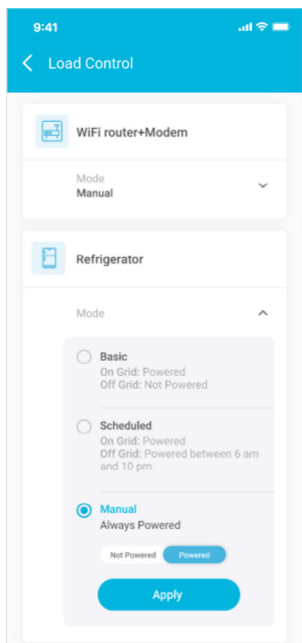
You can configure the modes for all loads controlled by the system in the Enphase App under Menu→Settings→Load control→”Load\_Name”.



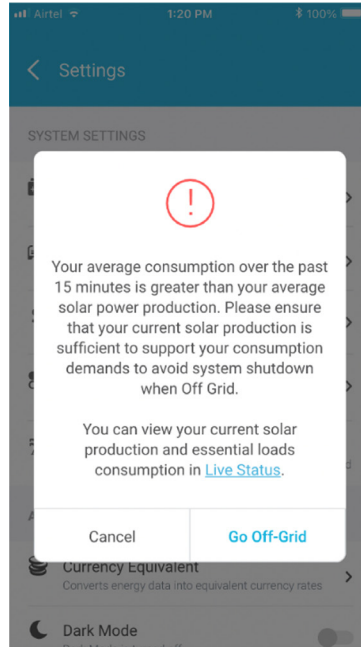
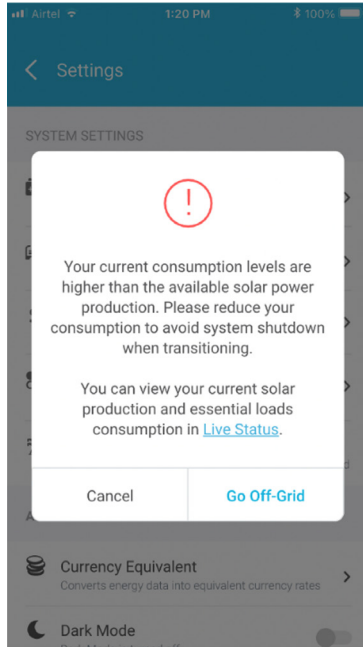
- Your installer will have connected your internet modem, router, cell phone charger, etc. to highest priority essential load circuit. Change the mode of this circuit to **Manual** in the Enphase App (Menu→Settings→Load control→”Load\_Name”), if not done so already by your installer. This ensures that the circuit is powered on as soon as power is available when running off-grid.
- All the other essential loads will be in the **Scheduled** mode. These are scheduled to operate from 9 am to 4 pm by default. You can change the time window to any time between 7 am to 8 pm to match your local sunrise/sunset conditions using the Enphase Homeowner App (Menu→Settings→Load control→”Load\_Name”→Scheduled).



- Enphase recommends you stagger the turn on and turn off times of various loads so that the heaviest loads operate when solar power produced is maximum, typically between 11 am and 3 pm. You can also change this to match your system’s solar power production. Power production data per day can be seen in the Enphase App Energy tab.
- At any point, you can change a load to the Manual mode and turn it on while the system is off-grid. Ensure that the current PV production is sufficient to support the load before you do this (Menu→Settings→Load control→”Load\_Name”→Manual).



- Do not transition manually to off-grid using the Enphase Homeowner app (Menu->Settings->Grid Control) if the system alerts you that the solar power production is less than the current consumption level.



**NOTE:** If any load is set to **Basic** mode, it will remain powered off while the system is off-grid. If a load is set to **Generator** mode, it will only be powered on while off-grid if the generator is providing power to the system.

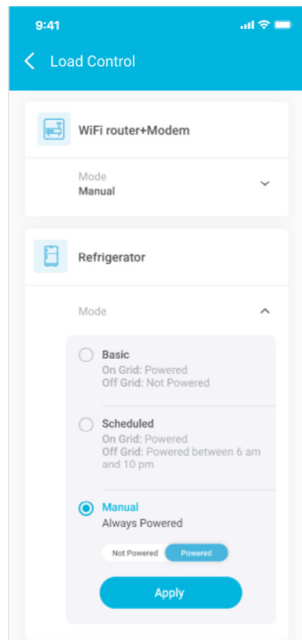
**NOTE:** Enphase App and IQ Gateway do not support Load control configuration without an internet connection.

# System behavior

Power produced in a Sunlight Backup system depends on the solar irradiance at your location, which can vary depending on cloud cover, shading on the PV panels, time of the year and other factors. While running off-grid, the system may shutdown if the power produced is less than what is needed to power the loads. To prevent a system shutdown, work with your installer and ensure that the system follows the guidance on load selection provided in the section above.

In the event of a shutdown, the system will automatically recover and restore power to the essential loads. While recovering, the system will try to identify the load causing the shutdown and disconnect it to ensure that the other essential loads can be powered on. This logic is described in detail below:

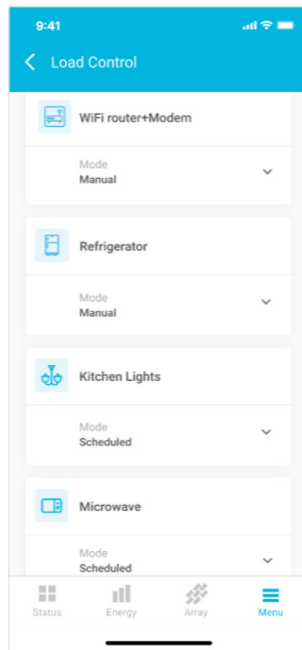
- When the system shuts down while running off-grid i.e., microgrid collapses, all the essential loads are powered off.
- If there is sunlight available, the system can take up to two minutes to restart and start restoring power to the essential loads. At this point the loads that are in **Manual** mode and are configured to be powered on will turn on.
- Next the system will power rest of the essential loads in a pre-determined order as outlined below:
  - The order in which the loads are powered on is the same in which the loads are displayed in the Enphase App (Menu→Settings→Load control).
  - Time interval between loads being powered on is 22 seconds.
- If there is a system shutdown within 22 seconds of a load being powered on, the system considers that load to be responsible for the shutdown.
- If a load causes five system shutdowns, the system fully disables that load—the load is powered off and will not be automatically powered on when the system is off-grid. You can use the Enphase App to turn the load on when irradiance increases (for example in the afternoon) by changing the load to Manual mode (Menu→Settings→Load control->"Load\_Name"→Manual).



- If the load is successfully powered for more than five minutes, the system will reset the collapse/shutdown counter for that load. For example, consider a load that has already caused the system to shutdown three times. During the next system start, the microgrid does not collapse for five minutes after adding the load to the microgrid. In this case, the system will reset the shutdown counter for the load and will shed the load only if it causes a fresh set of five system shutdowns.
- All essential loads will be powered on automatically when the system connects back to the grid or connects to a generator.
- If all the loads are blacklisted, the system will retry the above sequence after one hour.



Consider a system with the following loads:



The table below shows a timeline from system shutdown until the point when all loads are powered back on. Note that this table assumes all loads can be successfully powered on the first try, post system restart. The sequence below will repeat if there are successive failures. If any load causes up to five system shutdowns that load will be skipped, and the 22 seconds delay associated with that load will also be skipped during the next system restart.

EVENT	TIME TAKEN (HOURS: MINUTES: SECONDS)	TIME ELAPSED SINCE SYSTEM SHUTDOWN (HOURS: MINUTES: SECONDS)
System shutdown/Microgrid collapse	N/A	00:00:00
System restart with highest priority loads powered on <ul style="list-style-type: none"> <li>• IQ8 Microinverters restart and provide 240V output</li> <li>• Wi-Fi router + Modem is powered on</li> </ul>	00:00:52 to 00:01:57	00:00:52 to 00:01:57
Refrigerator is powered on	00:00:22	00:01:14 to 00:02:19
Kitchen lights is powered on	00:00:22	00:01:36 to 00:02:41
Microwave is powered on	00:00:22	00:01:58 to 00:03:03