

# When is IQ8 permitted to form a grid?

## Introduction

The Enphase Energy System with IQ8 Microinverters offers many configurations for different customer needs. The Solar Only configuration is installed without IQ System Controller 2 and offers savings on homeowner utility bills but does not include backup. Configurations such as Sunlight Backup without batteries or Full Energy Independence including batteries must be installed with IQ System Controller 2 and offer resilience during utility outages.

IQ8 microinverters and IQ System Controller 2 are UL 1741 listed, assuring installers and authorities having jurisdiction (AHJ) that the Enphase Energy System has been thoroughly tested and complies with all anti-islanding and rapid shutdown requirements in all configurations.

## Terminology

Term	Definition
Multimode	The ability for an inverter to switch between interactive and island mode
Interactive Mode	“Inverter intended for use in parallel with power source(s) such as an electric utility to supply common loads and capable of delivering power to the utility.” – NFPA 70 (NEC 2020). Also referred to as grid-tied, grid-interactive or utility-interactive
Island Mode	“The operational mode for stand-alone power production equipment or an isolated microgrid, or for a multimode inverter or an interconnected microgrid that is disconnected from an electric power production and distribution network or other primary power source.” – NFPA 70 (NEC 2020)
Intentional Island	“A planned electrical island that is capable of being energized by one or more Local EPSs. These (1) have DER(s) and load, (2) have the ability to disconnect from and to parallel with the Area EPS, (3) include one or more Local EPS(s), and (4) are intentionally planned.” IEEE 1547-2018

## Anti-islanding

Interactive inverters, also referred to as grid-tied, grid-interactive, or utility-interactive inverters, are required to cease to energize in the event of a utility grid power outage. This is to ensure the safety of utility workers and is accomplished with anti-islanding technology that prevents the formation of unintentional islands. IQ8 Microinverters comply with IEEE 1547 Anti-islanding requirements and ship in interactive mode.

A microgrid system, as defined by the National Electric Code Article 705 Part II, is permitted to disconnect from the utility grid and operate in island mode--forming an intentional island or microgrid that provides backup power. Multimode refers to the ability for an inverter to switch between interactive and island mode. To prevent a multimode inverter from islanding while connected to the utility grid, a system requires a microgrid interconnect device (MID) to disconnect and reconnect to the primary power source or grid.

IQ System Controller 2 (EP200G101-M240US01) contains an MID that allows disconnecting from the area electric power system and IQ8 to form an intentional island or operate in island mode. In addition, it contains distributed energy resource (DER) relays to disconnect and reconnect IQ8 Microinverters from both loads and the utility grid when a fault condition exists.

Only when IQ8 Microinverters are installed and commissioned with an IQ System Controller 2 is multimode function enabled and the IQ8 microinverters are capable of island mode. Intentional islanding only happens when IQ8 Microinverters confirm the IQ System Controller 2 they are paired with during commissioning is present and operational. If there is a fault with the IQ System Controller 2, the IQ8 Microinverters revert to interactive mode.

The IQ8 Microinverter when paired with IQ System Controller 2 as a system, will comply with all IEEE 1547 requirements for interactive mode and anti-islanding, and is evaluated by UL according to UL1741 standards.

## Rapid Shutdown

Modern PV systems implement rapid shutdown to protect first responders in addition to the anti-islanding function to protect utility workers. When IQ8 Microinverters are in interactive mode, they are not capable of forming an intentional island. For systems containing IQ8 Microinverters without IQ System Controller 2, the IQ8 Microinverters will operate only in interactive mode. In interactive mode, rapid shutdown may be initiated through the PV system disconnect or service disconnect.

However, when the IQ8 Microinverters are paired with IQ System Controller 2 and commissioned to operate in multimode, a rapid shutdown initiator is required. The Enphase rapid shutdown switch is a DPST switch located in a readily accessible location and directly wired to the IQ System Controller 2. When rapid shutdown down is initiated, the DER relays in IQ System Controller 2 open and IQ8 Microinverters revert to interactive mode thus disabling island mode. The system transitions the IQ8 Microinverters to the rapid shutdown state of less than 30 V within 30 seconds, as required by NFPA 70, Article 690.12.

To review all the UL listings for the Enphase Energy System with IQ8, visit <https://productiq.ulprospector.com/en/profile/122543/qikh.e341165>.