## Expanding the Enphase Energy System

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### Applicable countries

- Australia
- New Zealand

#### **Overview**

This technical brief describes integrating the Enphase Energy System with an existing Enphase system.

### Supporting a mix of Enphase products at the site

The following image shows the possible configurations of the Enphase Energy System for IQ System Controller 3 INT and IQ Battery 5P with IQ8, IQ7, S, or M Series Microinverters.



NOTE: Power export limiting is not supported in any configurations described in this document. Contact Enphase if you require power export limiting.



Figure 1: Process flow diagram

It is preferred that the IQ System Controller 3 INT is fitted with the maximum capacity of IQ8 or a combination of IQ7 and S Series Microinverters (within the 150% IQ Battery 5P power output and DNSP limit) to charge IQ Battery 5P and provide additional PV (photovoltaic) power in backup (L1 only).

M Series Microinverters can only be integrated with the IQ System Controller 3 INT through a second IQ Gateway, and a disconnection relay must be incorporated when connecting directly to the PV distributed energy resource (DER) as it cannot support power limiting in the backup. Refer to <u>PV and</u> <u>load shedding configuration in Enphase Energy System</u> for more information.

When IQ8 Series Microinverters are integrated into an IQ System Controller 3 INT, any existing microinverters must be set up on a second IQ Gateway. Any setup involving a second IQ Gateway requires the neutral connection between them to be PLC filtered using the recommended Bialon FFO filter.



# Configuration 1: IQ7/S Series and M Series Microinverters integration (recommended)

This setup connects IQ7 Series or S Series Microinverters into the PV DER of the IQ System Controller 3 INT. M Series Microinverters are retrofitted to a PV distribution board (PVDB) with a second IQ Gateway, and the PVDB is connected to the grid side of the IQ System Controller 3 INT. The M Series system operates independently of the Enphase Energy System, and there is no communication between them.



Figure 2: Two single-phase PV branch circuits with two IQ Battery 5P

The metering data is aggregated into one Enphase activation, similar to <u>Deploying two Envoys at the</u> <u>same site</u>.

# The solar power produced from the M Series system flows into the IQ System Controller 3 INT and is read as grid supply by the IQ System Controller 3 INT.

Configure the following additional settings:

1. To charge the IQ Battery 5P from the M Series system, in the Enphase App, under **Advanced Settings**, enable **Charge battery from the grid**.



< Adva	nood Sattings			
Charge I Disabled @ Your battery	battery from the grid will charge from solar.			0-
Battery :	shutdown level			10%
0	<b>0</b> 10%	15%	20%	25%
choose a hi	e, your battery will shut down at 10% dnarge to conserv igh value if you are experiencing bad weather that impa	e energy, in reesants by using this conserved energy when this usity grid rescons power lots solar production.	or tour panels than producing energy.	
	STATUS	III INTROY	ARRAY	MENU

2. To prevent the IQ Battery 5P from discharging when the M Series produces solar energy, set the IQ Battery 5P to operate in **Savings** mode under **Battery** settings.

< Battory			
Storm Guard © Enabled Overrides your system profile to Full Backup when a severe weather condition	alert is issued for your locality.		
Select a smart profile to centrol your battery			
Help me select a profile			
-			
Savings Minimize the use of electricity from the grid when the electricity rate is high	er. During peak hours, your home is powered in the following order of p	riority: battery, solar and grid. Any extra solar is exported to the grid.	
Self - Consumption (Active)			EDIT
Use stored solar to power your home after the sun goes down. Battery is a	ed when solar is not available.		
Increase Self-Consumption to			
272* Maximize Energy Independence			
Full Backup			
IOU% of the battery is reserved for backup.			
STATUS	ENERGY	ARRAY	MENU

3. Configure the tariff in **Electricity Rate Structure** (import and export rates). Set off peak tariff during the solar generation period and on peak tariff for the rest of the time scale.

	Electricity Rate Structure		
	Electricity Import Rate Decision/Index Ender	>	
	Add Electricity Export Rate Add the rate structure at which you get paid for exporting your solar generated electricity to the grid.	>	
N	ote a discriptly rate information is used by the gateway to determine the best battery charge and ducharge scheckle when your system profile is set as Staving? Charging this information will charge the system's behavior.		

The IQ7 Series and S Series Microinverters support charging the IQ Battery 5P and serving the load. Any excess solar power production is exported to the grid. IQ Battery 5P supports the load when the PV generation is insufficient and at night.

In an electrical outage, IQ Battery 5P continues to power the backup load on L1. It generates a microgrid for the IQ7/S Series Microinverters on L1 to continue to run based on microgrid control. Any non-backed-up load connected to the IQ System Controller 3 INT's non-backed-up lugs is cut off from supply.

Devices	Functions in normal	Functions in backup mode
	mode	
IQ System Controller 3 INT	Functions as a main hub for all	Facilitates microgrid in the
	devices.	backup.
IQ Battery 5P	Provides peak demand	Same function as in normal mode.
	support and full nighttime load	Microgrid control for IQ7/S Series
	support.	Microinverters.
<b>IQ7/S Series Microinverters</b>	Generates energy to supply	Continues to generate energy to
	the load and charges the	supply the load and charges the
	IQ Battery 5P.	IQ Battery 5P.
M Series Microinverters	Generates energy to support	Anti-islanded and remains idled.
	the IQ System Controller 3 INT	
	(load).	

# Configuration 2: IQ8 Series in IQ System Controller 3 INT with IQ7/S/M Series Microinverters in a PV distribution board upstream



Figure 3: Single-phase PVDB upstream consisting of IQ7/S/M Series Microinverters

This setup connects IQ8 Series Microinverters into the PV DER of the IQ System Controller 3 INT. The IQ7, S, and M Series Microinverters are retrofitted to a PVDB with a second IQ Gateway, and the PVDB is connected to the grid side of the IQ System Controller 3 INT. The IQ7, S, and M Series system operates independently of the Enphase Energy System, and there is no communication between them.

The metering data is aggregated into one Enphase activation, similar to <u>Deploying two Envoys at the</u> <u>same site</u>.



# The solar power produced from the M Series system and the AC batteries discharge flows into the IQ System Controller 3 INT and is read as grid supply by the IQ System Controller 3 INT.

Configure the Enphase Energy System operating mode according to Configuration 1, Steps 1 and 2. At night, the IQ Battery 5P naturally discharges first to serve the load, and the AC battery is only relied on when the load demand is higher than the IQ Battery 5P output power. If the AC battery is preferred to discharge first, delay the ON peak time in the time scale.

< Electricity Import Rate			RESET EDIT
Electricity Rate Structure : Time of Use			
	90700		90'09
0 0.200 3/KWh 0.11-Peak 0.430 4/KWh ■ Peak 1(14:00 - 21:59)		Delay the ON peak To delay the IQ Battery 5P discharge	22 24
	li.	#	=

The IQ System Controller 3 INT functions similar to Configuration 1 with the addition:

- Instead of any PV excess from IQ System Controller 3 INT going to the grid, it goes to the PVDB first and may charge the AC battery if or when the IQ7/S/M Series Microinverters are not producing enough.
- If the IQ7/M/S Series Microinverters produce excess, the excess flows to IQ System Controller 3 INT to support the load when the IQ8 Microinverters are not producing enough or are sized inadequately. The IQ Battery 5P does not charge from this when they are not set to charge from the grid.

When the process mentioned above occurs, the IQ System Controller 3 INT reads the IQ7/S/M Series production excess as grid supply. Still, the multi-gateway setup ensures that metering telemetry remains consistently correct.

In an electrical outage, the PVDB is anti-islanded, and the IQ System Controller 3 INT operates in a microgrid environment, continuing to power the backup loads similar to Configuration 1.

Devices	Functions in normal mode	Functions in backup mode
IQ System Controller 3 INT	Functions as a main hub for all devices.	Facilitates microgrid in the backup.
IQ Battery 5P	Provides peak demand support and full nighttime load support.	Same function as in normal mode. Microgrid control for IQ7/S Series Microinverters.
IQ8 Series Microinverters	Generates energy to supply the load and charges the IQ Battery 5P. May charge the AC battery.	Continues to generate energy to supply the load and charges the IQ Battery 5P.



IQ7/S Series Microinverters	Generates energy to supply the load and charges the AC battery.	Anti-islanded and remains idled.
M Series Microinverters	Generates energy to supply the load and charges the AC battery.	Anti-islanded and remains idled.

# Configuration 3: IQ8 Series in IQ System Controller 3 INT with IQ7/S/M Series Microinverters in a PV distribution board downstream



Figure 4: Enphase Energy System and a PVDB downstream

This setup connects the IQ8 Series to the PV DER of the IQ System Controller 3 INT. The IQ7, S, and M Series Microinverters are retrofitted to a PVDB with a second IQ Gateway, and the PVDB system is connected to the nominal load side of the IQ System Controller 3 INT. The IQ7, S, and M Series system operates independently of the Enphase Energy System, and there is no communication between them.



# NOTE: Commission the two systems separately. Therefore, metering is separate, requiring two Enphase activations.

The IQ7/S/M Series Microinverters support non-backed loads and charge AC batteries. The AC batteries support non-backed-up nighttime load. Any excess production from this PVDB flows into IQ System Controller 3 INT and is first used to support the backup load circuit.

IQ System Controller 3 INT reads the aggregate backed-up and non-backed-up load as offset by the PV distribution board system. This is also reflected accurately in the utility meter reading.



# NOTE: When the PVDB system produces excess that has to be exported to the grid, the IQ System Controller 3 INT reads this as negative consumption and displays a metering error.

A second pair of Production CT(s) must be connected parallel to the Production CT terminals on the IQ Gateway of the IQ System Controller 3 INT to correct the metering error. The IQ Battery 5P may



charge from the excess production from the PVDB with or without the additional Production CT(s) installed.

The graphical illustration below shows the correcting of load readings using additional Production CT to capture the production from the PVDB system.



Figure 5: Correcting load readings using Production CT(s)

In an electrical outage, the nominal line is cut off, and the PVDB is anti-islanded. IQ System Controller 3 INT operates in a microgrid environment, continuing to power the backup load according to Configuration 1.

Devices	Functions in normal mode	Functions in backup
		mode
IQ System Controller 3 INT	Functions as a main hub for all	Facilitates microgrid in the
	devices.	backup.
IQ Battery 5P	Provides peak demand support and	Same function as in normal
	full nighttime load support.	mode. Microgrid for
		IQ7/S Series Microinverters.
IQ8 Series Microinverters	Generates energy to supply the load and charges the IO Battery 5P.	Continues to generate energy to supply the load and charges the
		IQ Battery 5P.
IQ7/S Series Microinverters	Generates energy to supply the	Anti-islanded and remains idled.
	load and charges the IQ Battery 5P.	
M Series Microinverters	Generates energy to supply the load and charges the AC battery.	Anti-islanded and remains idled.



#### Scenarios and applications

The following are some of the common scenarios and solutions using the Enphase Energy System.

Scenario	Solution	Description
I need an all-in-one solution that manages my IQ Battery 5P and my existing IQ7/S/M Series Microinverters.	Configuration 1	Configuration 1 consolidates all Enphase devices in a single hub. Operation and monitoring are optimized.
		The availability of relay control ensures that any M Series Microinverter can be incorporated into IQ System Controller 3 INT.
I am installing an IQ System Controller 3 INT and IQ Battery 5P at the main house. IQ7/S/M Series Microinverter is installed in a shed. I can add PV on the main house.	Configuration 1 or 3	Configuration 1 is suitable if you can install a dedicated PV sub- main from the shed to the IQ System Controller 3 INT PV DER. If this is not possible, and no significant load is expected at the shed, you can run the shed's sub- main straight into the IQ System Controller 3 INT's PV DER. If this is unachievable, Configuration 3 is another feasible solution.
I am installing IQ System Controller 3 INT and IQ Battery 5P at the main house. IQ7/S/M Series Microinverter is installed at the shed. I cannot add PV to the main house.	Configuration 1 or 3	Configuration 1 is suitable if you install a dedicated PV sub-main from the shed to the IQ System Controller 3 INT PV DER. If this is not possible and no significant load is expected at the shed, you can run the shed's sub- main straight into the IQ System Controller 3 INT PV DER. The System Controller must have some PV to run through the PV DER to charge the IQ Battery 5P.
I am installing an IQ System Controller 3 INT, IQ Battery 5P, and IQ8 Series Microinverters. They are retrofitted to the existing IQ7/S/M Series Microinverters installed on the same dwelling where my Enphase Energy System is going.	Configuration 2	Configuration 2 is suitable for this scenario as this setup is comparatively optimized per Configuration 1, and every Enphase device reports to the same Enphase Account.

If the above configurations do not meet your requirements, contact Enphase Support at (1800) 006-374 (AU) or email <u>support\_au@enphaseenergy.com</u>.



### **Revision history**

Revision	Date	Description
TEB-00059-1.0	September 2023	Initial release

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