AMBER FOR BATTERIES
SOLAR AND BATTERY GUIDE

INTRODUCTION

At Amber, we want to help optimise solar and battery systems to return the most value to their owners, and the most value to the grid.

That's why we've developed this buyers' guide to address which systems work best with Amber.

Use this guide to decide:

- If you want to see if your current system (or your customer's, if you're an installer) is compatible with Amber
- If you're starting from scratch designing your solar and battery system and you wish to accelerate your return on investment by joining Amber
- To guide any solar and battery system upgrades you might be considering, if you already have a system installed and want to achieve best compatibility with Amber.

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KEY PRINCIPLES FOR AMBER FOR BATTERIES COMPATIBILITY

#1 Your system is controllable:

In short, Amber for Batteries works best if we can control both your solar and your battery. This means we're able to optimise/control your battery to charge and discharge in line with wholesale pricing, and control your solar production during any periods when feed-in tariffs turn negative.

#2 You have a big enough battery:

To do well with Amber for Batteries, you'll ideally have a battery big enough to cover your homes evening energy needs, with some excess leftover to export. You can still do well if your battery lasts you only through the higher evening peak price period - usually ending at around 9pm. You can then top up from the grid when prices fall overnight.

#3 Amber has total visibility of your solar

Amber can detect the whole picture of your solar production and energy consumption at your home. Without an accurate picture of this, it can't create an accurate and optimal daily plan for when your battery should discharge. This visibility of production and usage is primarily ensured by making sure we are able to control and monitor your inverter

#4 You have a single brand ecosystem

We tend to see fewer issues with Amber optimisation when customers have one battery and inverter brand. The exception is Tesla who don't make a solar inverter. Tesla is a good size battery and works well. It can work even better if we can also control the attached solar inverter.

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COMPATIBILITY KEY #1 - BATTERY AND SOLAR CONTROL

Battery control

We need to be able to control your battery and inverter in order to be able to optimise it in line with wholesale pricing.

If you have one of the following compatible batteries, you can join Amber for Batteries using Amber's SmartShift™ technology.

Tesla Powerwall 2
Tesla is a great battery. It will work even better with SmartShift if connected to an inverter we can control (SolarEdge). The need for control is less of an issue if the battery is connected to smaller (<6.6kW) solar systems or on homes that use lots of power in the middle of the day. These homes are less likely to have excess solar to export during periods of negative FiT.

Sungrow with a *single* hybrid inverter
Amber is compatible with Sungrow plus a hybrid inverter with the following inverter model numbers. Note: Amber cannot control the SH5k or other early models of Sungrow hybrid inverters.

- SH5.0RS
- SH6.0RS
- SH8.0RS
- SH10.0RS
- SH5.0RT
- SH10.0RT

Compatibility list cont'd on next page

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COMPATIBILITY KEY #1 - BATTERY AND SOLAR CONTROL

Other batteries compatible with Amber's SmartShift

- **LG Chem battery with SolarEdge inverter/s**
- **SolarEdge battery with a SolarEdge inverter/s**
- **AlphaESS - note that only those AlphaESS batteries whose integrated inverter module has a serial numbers starting with AL are compatible (this number can be located on the side of the top half of the battery system)**
- **Hive - same considerations apply as above as a Hive battery is a re-branded AlphaESS**

Note: If you have an AlphaESS and you can't find this serial number on your battery, it's possible your system came with a Goodwe inverter. These AlphaESS systems are not yet compatible with SmartShift.

If you have one of the following batteries, you can join Amber for Batteries and be optimised by our partner, Evergen, in line with Amber's wholesale pricing:

- Energizer
- Everready
- Hive
- Huawei
- Redback
- Solax
- Goodwe (coming soon)

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COMPATIBILITY KEY #1 - BATTERY AND SOLAR CONTROL

Solar inverter control

Ideally, for the best results with Amber, we also need to be compatible with your solar inverter.

This allows us to curtail your solar production during periods when feed-in tariffs turn negative in the wholesale market. Negative FiT is a signal from the market to stop sending renewables to the grid when there's lots of renewable energy available and not enough demand at that time.

In some cases, curtailment compatibility also means that we can turn off your inverter completely when the grid purchase price goes negative, giving you the opportunity to get paid to use grid energy.

Currently we are compatible with:

- SolarEdge inverters with consumption meters
- Sungrow hybrid inverters (but only one - not two!)
- Alpha ESS hybrid inverters
- **coming soon** Sungrow grid tied inverters and Fronius

See table on page 9 for more details.

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COMPATIBILITY KEY #1 - BATTERY AND SOLAR CONTROL

a. Load-following curtailment

When your solar inverter is compatible with Amber for load-following curtailment, SmartShift will ask your inverter to look at how much you're exporting during periods of negative FiT and reduce your solar generation by that amount, matching generation to your household consumption.

So if you're generating 10kw of solar energy, and your house is consuming 8kw and exporting two, your generation will be reduced to 8kw when you enable solar curtailment.

If you have an AC-coupled Tesla/AlphaESS/Sungrow battery with SolarEdge inverter and SolarEdge consumption meter, you can take advantage of load-following curtailment once your system is configured, however, curtailment will only start once your battery is fully charged.

To have your SolarEdge inverter optimised in this way, email SmartShift@amber.com.au once you're onboarded onto Amber for Batteries and say 'please enrol me for solar curtailment.' Provide your SolarEdge serial number starting with 7 (visible in the panel layout screen of your Mysolaredge app or on the side of your inverter).

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COMPATIBILITY KEY #1 - BATTERY AND SOLAR CONTROL

b. On/Off curtailment

If you have a setup that supports on/off curtailment, SmartShift will stop your solar production completely during periods of negative FiT.

SmartShift will consider the house's energy use, the cost to export and the cost to buy from grid, and choose the cheapest option.

This curtailment will begin only once your battery is fully charged and it’s important to note that if your solar system is capable of generating more energy than your battery can store while it is charging, and you are not able to consume all of that power within your home, that excess will be exported to the grid for a negative FiT until the point when your battery is full and curtailment kicks in.

When the wholesale grid price is <0c/kWh you will be getting paid to use power.

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COMPATIBILITY KEY #1 - BATTERY AND SOLAR CONTROL

The table on the following page represents all of the battery and inverter set ups that we currently know to be controllable by Amber and therefore capable of solar curtailment - either load-following or on/off curtailment.

This list will be updated as we integrate with more inverter brands and test more combinations of systems.

Note: If you have one of the inverters that features in this table AND another inverter that does not, Amber will be able to curtail the compatible inverter but not the other.

To limit exports from the incompatible inverter, we recommend maximising self-consumption of your solar during the day. You might even consider leaving your solar off in Spring and Autumn if you aren't a big energy user.

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INVERTER COMPATIBILITY (SINGLE PHASE SET UPS)

	Curtailment available?	Curtailment type	Does the battery need to be full for curtailment to begin?
1 or more SolarEdge inverter (with a consumption meter) + DC-coupled battery (LG or SolarEdge)	Yes	Load-following	No
1 or more SolarEdge inverter (with a consumption meter) + AC-coupled battery (Eg Tesla/AlphaESS)	Yes	Load-following	Yes
1 or more SolarEdge inverter (without consumption meter) + AC-coupled battery (Eg Tesla/AlphaESS)	No	N/A	N/A
1 DC-coupled Alpha ESS	Yes	Load-following	No
1 DC-coupled Alpha ESS solar/battery inverter + another solar inverter	Yes (SmartShift can only curtail the PV connected to the Alpha battery)	On/Off	Yes
1 Sungrow hybrid inverter + DC Coupled Sungrow battery	Yes	Load-following	No
1 Sungrow hybrid inverter with DC-coupled Sungrow battery + Sungrow grid tied inverter	Yes	On/Off	Yes
1 Sungrow hybrid inverter with DC-coupled Sungrow battery +another solar inverter	Yes (SmartShift can only curtail the PV connected to the Alpha battery)	On/Off	Yes
2 or more Sungrow hybrid inverters with or without batteries	Not currently supported	N/A	N/A
1 Sungrow grid-tied inverter + AC-coupled battery	Currently undergoing testing	N/A	N/A
Fronius	Coming soon...		

NOTE: THIS TABLE REPRESENTS ALL OF THE BATTERY AND INVERTER SET UPS THAT WE CURRENTLY KNOW TO BE CONTROLLABLE BY AMBER, OR WHICH WILL SOON BE CONTROLLABLE BY AMBER FOR SOLAR CURTAILMENT. IF YOUR SET-UP IS NOT IN THIS TABLE, IT IS NOT CURRENTLY SUPPORTED BY AMBER SMARTSHIFT, OR IT HAS YET TO BE TESTED.

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COMPATIBILITY KEY #1 - BATTERY AND SOLAR CONTROL

How to access curtailment with Amber

So you've checked the table above and discovered that you're curtailment compatible with Amber. Great news!

Accessing curtailment for DC-coupled batteries that Amber is compatible with is easy - Amber for Batteries customer will be auto enrolled once onboarded.

Accessing curtailment for AC-coupled batteries with inverters that Amber is compatible with currently requires newly-onboarded customers to email us after enrolment.

If you fall into the second category, email smartshift@amber.com.au with your inverter's serial/system ID once onboarded and state 'please enrol me for solar curtailment.'

If you/ your customer has a Fronius inverter, we'll be updating this guide to include a waitlist shortly, so check back soon.

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COMPATIBILITY KEY #1 - BATTERY AND SOLAR CONTROL

What to do if you're not curtailment compatible

This means we're yet to integrate your inverter brand with SmartShift. We're pressing ahead by prioritising integration with the inverter brands most commonly-owned by our customers which have the potential to allow for solar curtailment (Fronius is next).

In the absence of compatibility, it is still possible to benefit from access to wholesale prices with Amber. In this case, how much and when you export becomes important. As does your solar size/battery storage ratio or your consumption to solar ratio.

We suggest that in the absence of curtailment a 1:2 battery:solar ratio, and maximising solar self consumption in the day will deliver better outcomes with Amber because this helps to reduce exports during periods of negative FiT. Timing pool pumps and electric hot water is helpful as these act as solar sponges.

As a battery owner with Amber you'll still have the opportunity to manually discharge to the grid using the Amber app during high price periods.

On days forecast to be very sunny with low or negative FiT during the day discharging/preserving your battery in the morning is something you can do manually. This will free up space in your battery to store more of your solar in order or charge when grid prices are lower/negative in the middle of the day, in order to capture more valuable FiTs later.

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COMPATIBILITY KEY #2
CHECK YOU HAVE A BIG ENOUGH BATTERY
(OR A MODULAR ONE IN CASE YOU WANT TO EXPAND IT LATER)

To do well with Amber for Batteries, you'll ideally have a battery big enough to cover your home's evening energy needs, with some excess leftover to export. You'll likely still do well if your battery lasts you through the higher evening peak prices ~9PM. This will enable you to ride through higher prices at this time then top up from the grid when prices fall overnight (more likely in the Earnings Optimiser mode, found in SmartShift settings in the app).

The best way to ensure that you buy the right size battery is to get acquainted with your usual energy usage. If you're an Amber customer, keep an eye on your average usage across different months in the Amber app. If you have a Powerpal device or solar with consumption monitoring, this is another great way to monitor your usage. If you have neither of these, check your electricity bills to see what your usage tends to be in different seasons.

If you're looking at buying solar and a battery consider getting a slightly bigger battery and a little less solar. Solar is driving daytime energy prices down, while expensive coal and gas is driving evening prices up, meaning that being able to replace grid usage with your solar power at this later time is most beneficial.

With a big battery you can cheap charge from grid renewables and capture valuable FiTs with your battery when prices rise.

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COMPATIBILITY KEY #3:
ENSURE WE HAVE TOTAL VISIBILITY OF YOUR SYSTEM

SmartShift creates an optimal plan for your battery by looking at:

- Wholesale prices
- Your solar generation
- Your energy usage

For best results with Amber, SmartShift needs to know the whole picture of your solar production and energy consumption at your home. Without an accurate picture of this, it can't create an optimal daily plan for when your battery should discharge and charge.

If you have an additional unmetered solar system or are adding a battery to your existing solar system, you'll need to add another consumption meter to provide your battery/Amber with visibility of the generation from that solar system.

Note: Tesla Powerwalls include a meter that will capture all of your solar systems' production. This meter is an optional extra on SolarEdge, AlphaESS and Sungrow - this is a low-cost add-on that we highly recommend installing for accurate system monitoring and SmartShift decision-making.

Coming soon:

- How to ensure Amber compatibility when you have 3 phase power