ALPHA ESS TECHNICAL NOTICE

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Author	Lily Wang
Relevant to Models	All ALPHA SYSTEMS

PERFORMANCE CHECK OF ALPHA SYSTEM

It is always important to check a system immediately after installation, but how can you do a “system checkup” a day or a week after the install, when you are not on site? How can a Reseller check if all is well with a System when their customer asks?

Let’s dive into both types of testing.

On-site Testing (Before Installer leaves site)

1. Check PV, then turn it off
2. Check the Loads,
3. Check the battery, then turn it off
4. Turn it all back on.

Remote system “health checks”:

1. Checking Real-time Power flows
    a. Checking PV readings
    b. Excluding PV and checking Grid readings
2. Checking Power Diagrams (The Graph stuff)
3. Checking Data on Alpha.cloud

ON-SITE TESTING

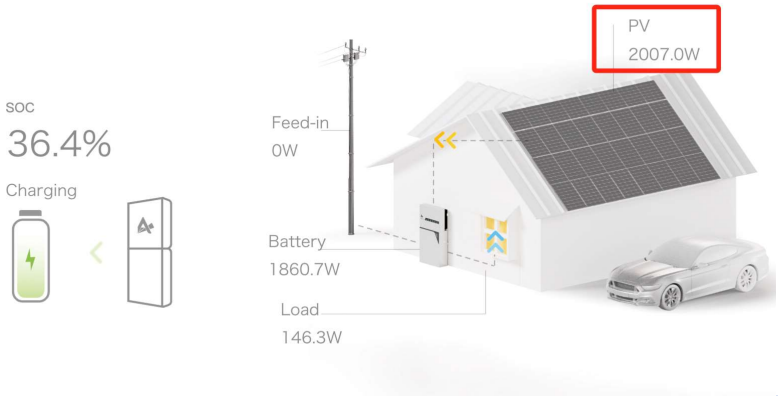
1. CHECK PV, THEN TURN IT OFF

This usually the easiest test; Simply look at the LIVE data on the Alpha App or monitoring portal (cloud.alphaess.com) and see if this matches the PV on the ac-coupled PV inverter.

PV should be a POSITIVE number, and each time you turn off a String or an inverter, the PV reading on the Alpha portal should decrease. If this is not the case, you likely have a CT reversed.

If the install includes DC-coupled PV as well, switch off the DC-Coupled PV *one string at a time* to make sure that the PV decreases, then check the ac-couped inverter app or screen after all of the DC-coupled PV has been switched off.

Watch the Battery when you turn off the Solar. If there was enough PV Generation, the battery should have been Charging. With no solar, it should start to Discharge.



2. CHECK THE LOADS

With the PV off and the Battery discharging, the goal would be to have the Grid Meter showing zero import (because the battery is meeting the loads).

Now test the Loads. To do this, use the customer's Kettle OR, if you have one, use your heat gun/hair dryer with probes on the end.

Test the kettle/hair dryer and ensure that the increased load makes sense (e.g. 2400W for a kettle) and is visible on the App.

Watch the Battery to see if it reacts to that new load.

Now switch the load off and watch the battery move to reduce the discharge.

Finally, repeat this test on another phase (if the property is multi-phase). The Load value should be approximately equal whether the hair dryer is connected to phase on or phase 2. If they differ by more than 100W, there is a good chance that you have a CT on the wrong phase (The CT is not reading the same phase that you have used for the voltage reference on the meter).

If you turn on a Load and the Load value shown on the App decreases, you likely have a CT reversed.

3. CHECK THE BATTERY, THEN TURN IT OFF

Having confirmed that the Loads are being correctly measured, ensure that the battery is matching the loads and working to keep the grid import down near zero.

Now turn the Batter DC breaker off or put the battery into an Idle state. Two things should be checked:

1. The Load Value should not have changed
2. The Load value should now match the Grid Import value.

4. TURN IT ALL BACK ON

Now that you are happy with the test results, turn on the battery and solar and make sure it is all functioning again before you leave site.

REMOTE SYSTEM "HEALTH CHECK"

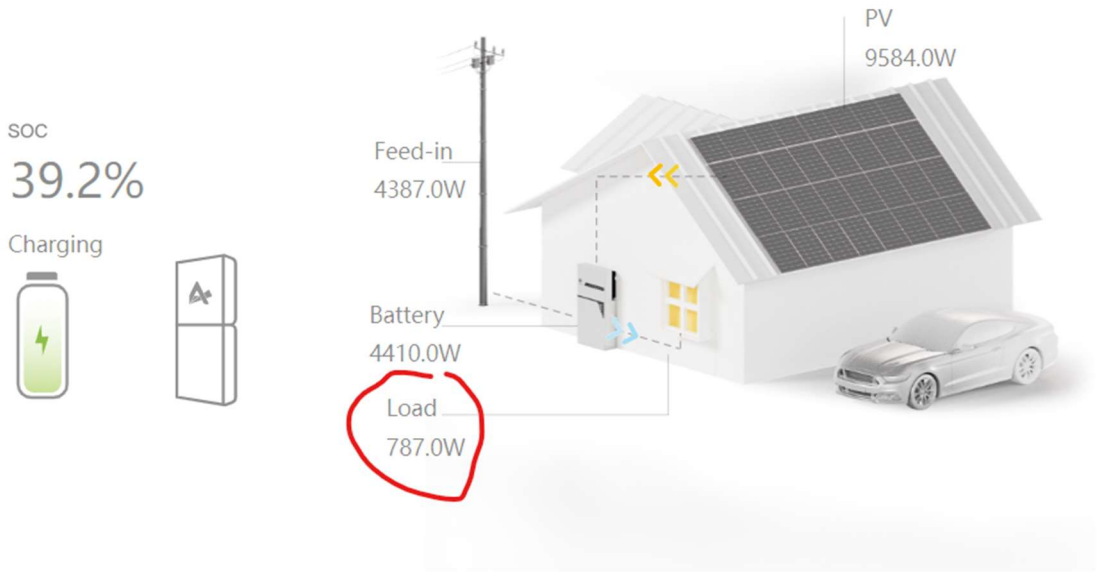
If you are checking the system after the installation is complete and the installer is not on site to flick switches on and off, it might help to have the Product Owner around to act as your eyes and hands. This will allow you to do more active checks of the system, such as turning the system off (Much like the tests in the "On Site Testing" section of this document.

If the homeowner is unavailable, or if you want to do a purely "desktop" check, the following is a good start.

1. CHECKING REAL-TIME POWER GRAPHS

The first important thing to note is that the Load displayed on the Portal/App is not measured – it is *calculated*. The system works by saying *"hey, you are generating 3kW and none of that is going to the grid. If the battery is charging at 1kW, that leaves 2kW unaccounted for…..well bugger me, that must be the amount of power the house is using).*

PV production – Grid consumption – Battery Charge rate = Load.



The key here is that the Load can calculate to be a negative number.

Load cannot be a negative number. Unless your Toaster is magically making electricity, the loads should be a positive number. Our system knows this, so it you have a negative number calculated, the result will be displayed as a ZERO.

Therefore, if you see the Load as Zero, there's probably a *problem*. Likely causes:

- A CT facing the wrong direction.
- CTs installed on the wrong phase
- Some PV has not been captured
- The Grid CT is not capturing everything coming into/out of the house.

The logic of the EMS in a multi-phase install operates as follows:

- If the sum of the three phase readings of the Grid meter is positive (consumption), the discharge power will increase;
- if the sum is negative (feed-in), the battery charging power will increase until the sum of the Grid meter readings is zero, as shown in the diagram below. Battery charge and discharge are independent of the PV meter.

****did you know that the Battery works the same with or without a PV meter/CT? The battery simply looks at export and import values and responds. The PV CT is only used to:*

a. Display the solar on the customer's graphs

b. Calculate the Load values to display on the App.

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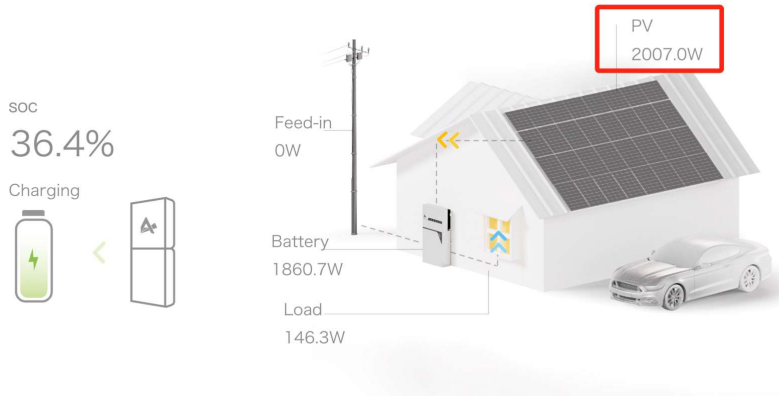
b. Calculate the Load Values to display in the App

A. PV READING CHECK

With the Customer's help, or with data from the PV Inverter app, you can easily check ac-coupled Solar Generation. Grab the PV reading from the Alpha App and compare it to the PV inverter screen or App.

DC Solar is harder to check, because it doesn't have a "second opinion" to compare against. In this case, all you can do is see if the data makes sense with the weather and with similar units in the area. If tone unit is producing half the power of a similar unit in the area, it probably has aproblem.

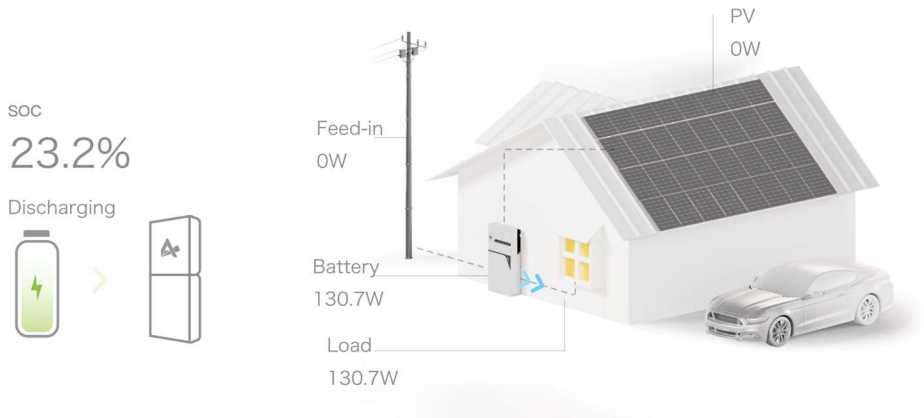


If you compare the Alpha PV reading to an ac-coupled inverter reading and they match, your PV CT is installed correctly. If it is not the same (or within 100W) then you will need to get the installer back or arrange a site visit.

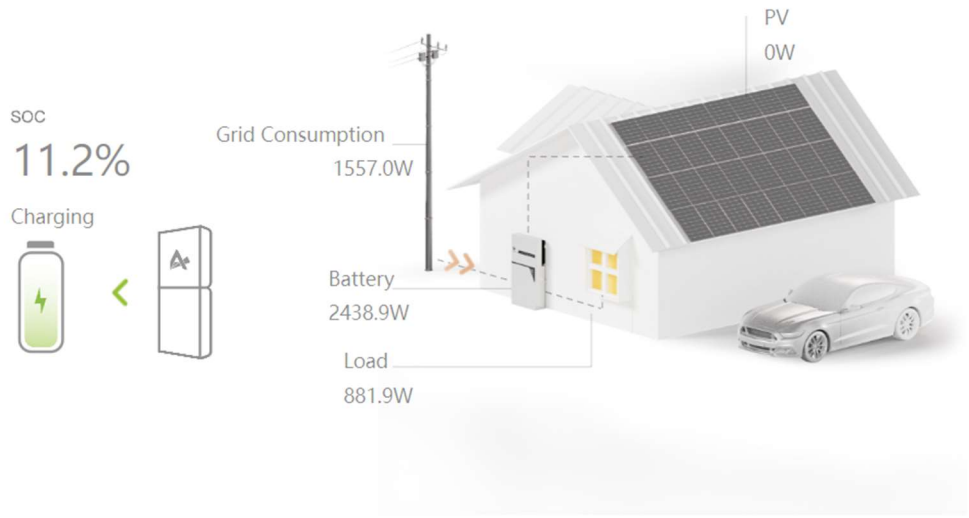
For Hybrid coupled system, please remember to add the power generated by all solar systems together.

B. GRID READING CHECK AFTER TURN OFF PV

If the customer is home to help, you can have them turn off the PV. Once the PV readings have been checked for accuracy, switch off all solar systems on the site. If the value of load does not change very substantially after switching off all PV's and the battery starts to discharge, the grid CT meter is probably in the correct direction (certain for single-phase, 3-phase can be a bit harder to be sure unless you check each individual CT reading).

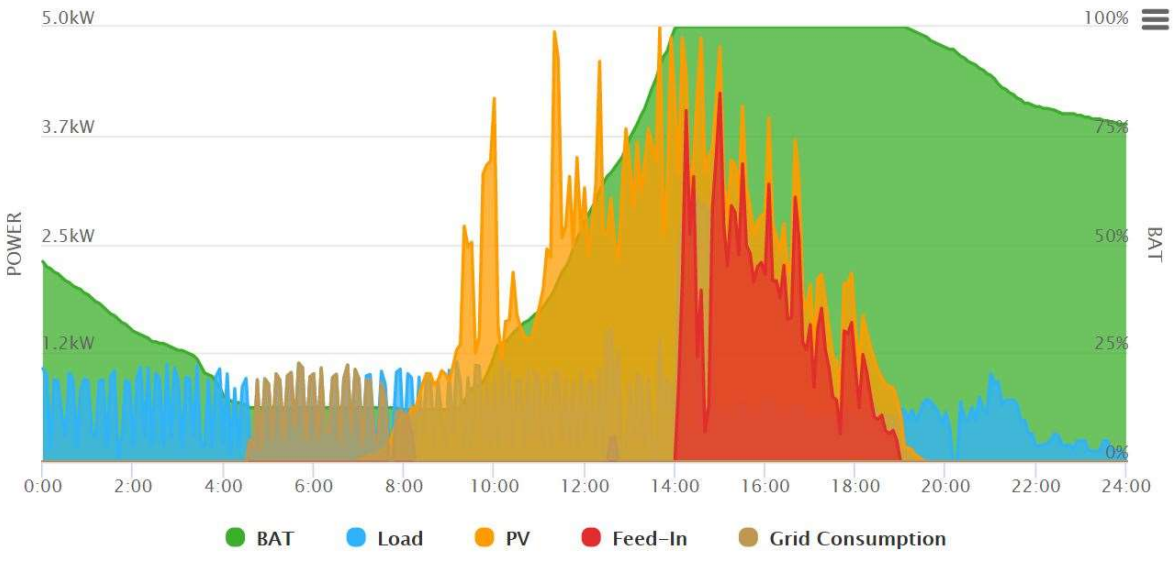


If the battery continues to charge after all PV's have been switched off, or if the “Load” decreases significantly as the PV system is switched off, then there is an issue with the installation of the CT and meter on the grid side which would require the installer to go back and re-check.



2. CHECKING POWER DIAGRAM ON ALPHA CLOUD

A normal power diagram should have the following characteristics:



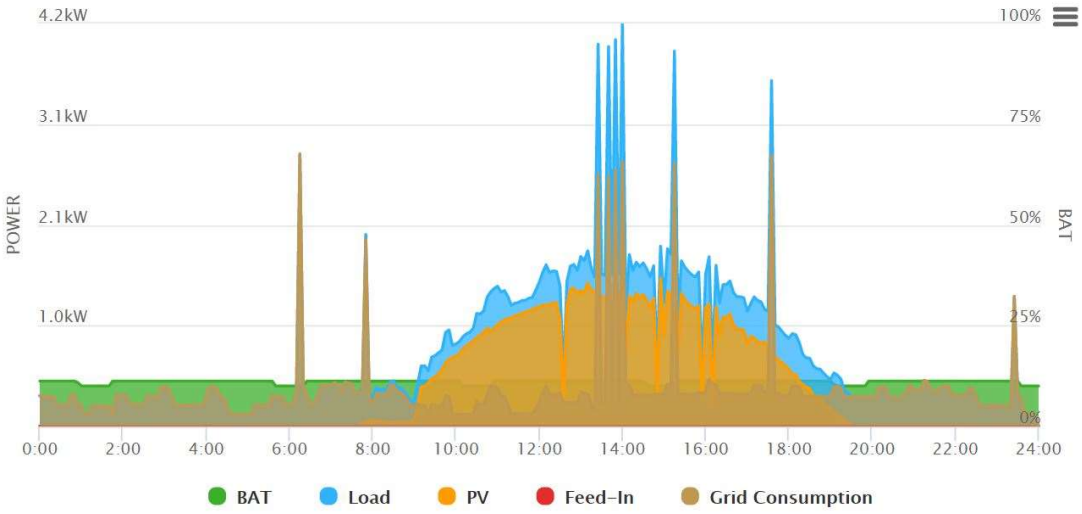
1. A bell-shaped ‘PV’ curve

2. No large amount of ‘Feed-in’ before the battery is filled and no large amount of ‘Grid Consumption’ before the battery stopped discharging.

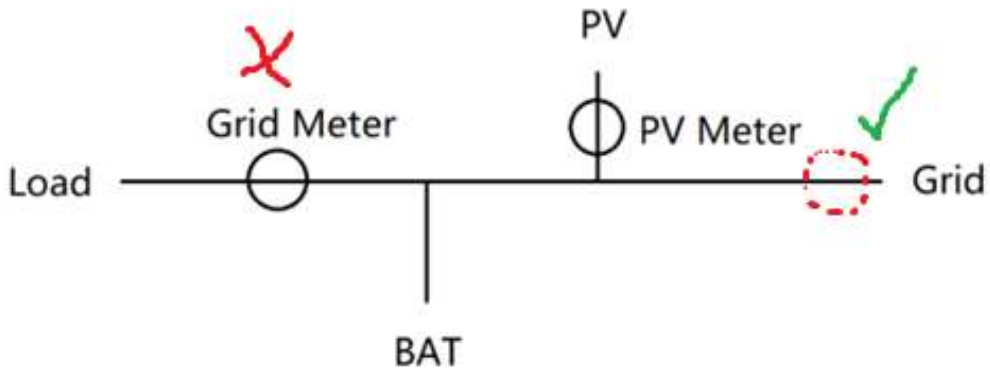
3. The ‘Load’ curve is independent and does not overlap with other curves. In other words, the Load should not match the profile of the Solar.

Fault 1: PV follows Load

1. The Load curve partially coincides with the PV curve, which means that the PV current outflow does not pass through the Grid meter, resulting in all PV output being counted as Load.
2. The Grid meter always reads positive, probably connected to a constant load, so that the battery is never charged

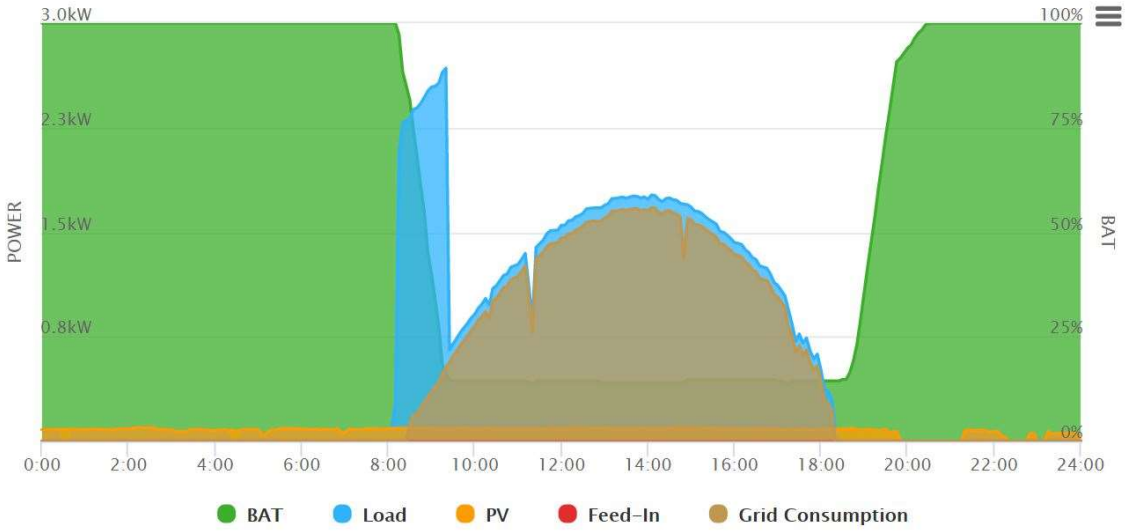


It is presumed that the wiring on site probably has the Grid CT measuring the Loads instead of the Grid (see below).

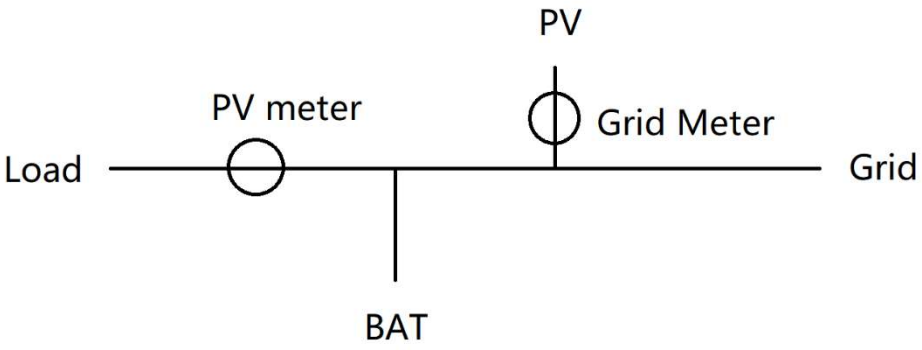


Fault 2: Battery discharging during daytime and charging during the night

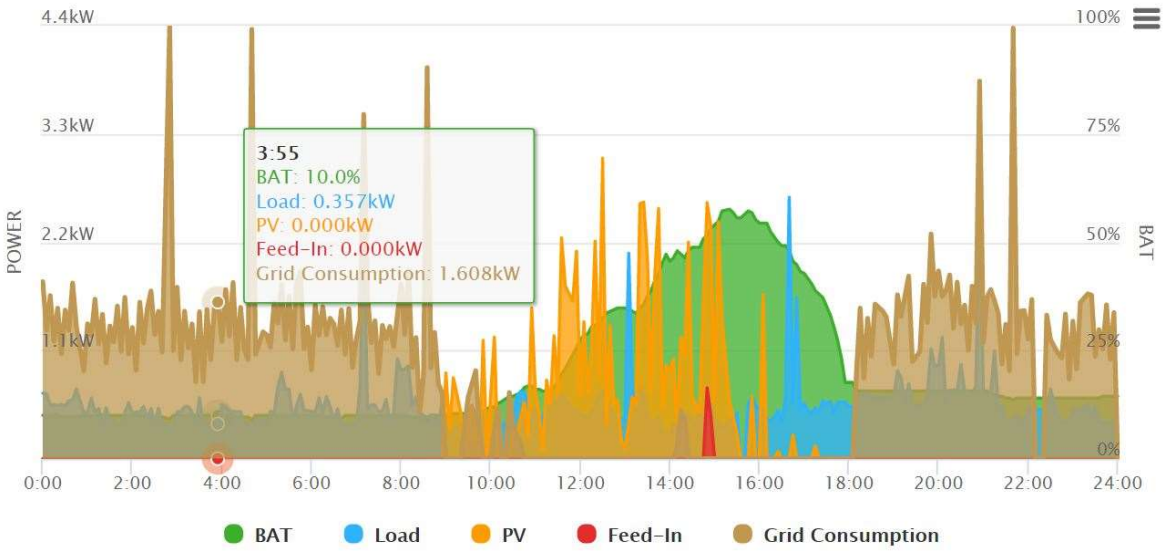
1. Battery charging and discharging does not affect the Grid meter reading, which means that the current is not passing through the cable which the Grid meter CT is clamped on.
2. Grid meter readings same as PV generation



It is presumed that the wiring on site may have looked like this.

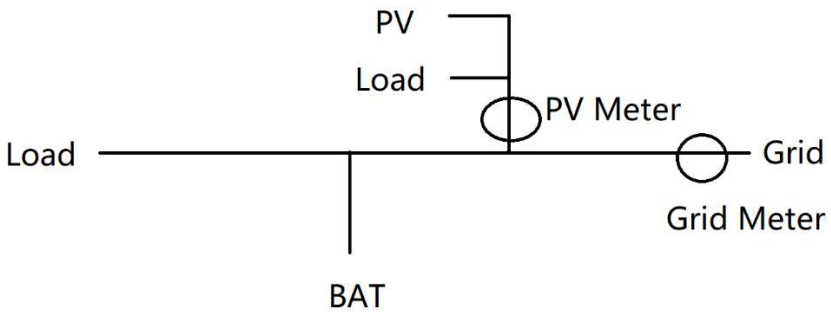


Fault 3: load reading abnormal (grid consumption exceeding Load at night)

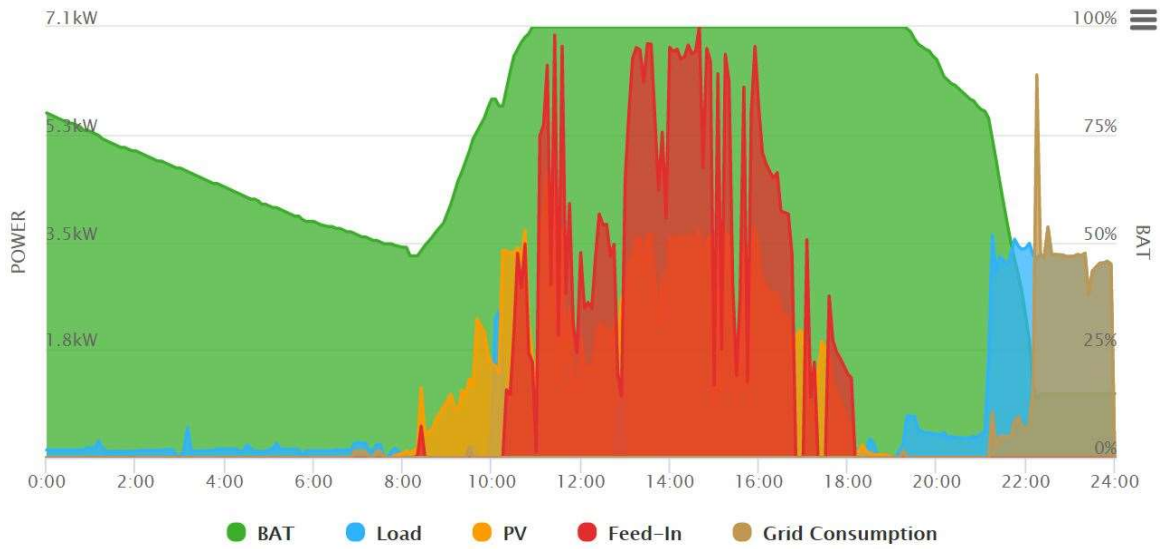


1. Battery can charge and discharge properly, which means the Grid meter is wiring correctly.
2. Load and Grid consumption values do not match after the battery has been emptied at night. It is presumed that the problem with the load reading may be due to a negative reading of the PV meter at night.

It is presumed that the wiring on site may have looked like this.



Fault 4: Feed-in value higher than PV



1. PV curve is a Bell-curve, which means the PV meter is installed correctly

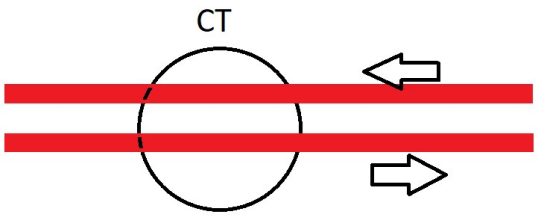
2. Battery is charging and discharging normally, which means the Grid meter is installed correctly

3. Feed-in is greater than PV during the day, resulting in Load not being displayed (negative value)

The problem here is that we have some “phantom” generation. Generation from some source, likely PV, is not being measured because it has not been clamped or metered by the installer.

It is presumed part of the PV generation is not being recorded by the PV meter.

a. the first possibility is that there are more solar systems on site that are not clamped inside the PV meter (e.g two ac-coupled systems but only one is being measured).
b. the second possibility is that there is a 3-phase PV Inverter but a single phase PV meter is installed => two phases of PV generation are not being metered
c. In some cases, this shows DC-coupled PV but the installer has not connected a meter to measure additional Ac-coupled solar on the same house.
d. There could be two ac-coupled PV systems with two wires passing through the CT, but One wire is reversed….. the result is that the value of one PV output is subtracted from the other!



3. METER TIPS FOR SYSTEM “HEALTH CHECKS”

TIPS: ’Meter information’ Setting – Worth Checking if the data is not making sense!

It is always important to check the meter setting in your ALPHA portal, incorrect settings will also lead to incorrect system operation. Checking these settings is good practice in any “health check”

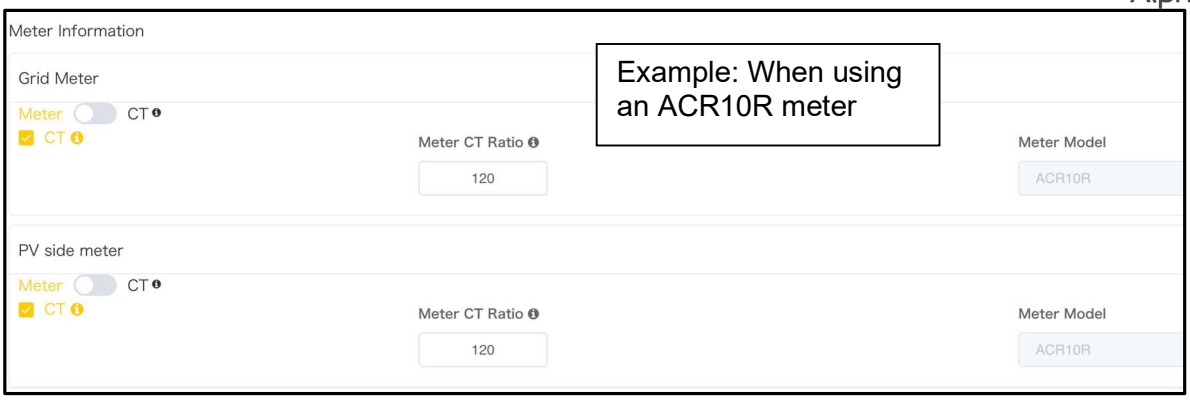
1. If a direct CT is installed with **NO METER**, please directly select "CT"

2. If a meter is installed, please select the item "meter".
   a. When the system mode is selected as DC, only tick "Meter" on the left of the “Grid Meter”.
   b. When the system mode is selected as AC or Hybrid, both tick "Meter" on the left of the “Grid Meter” and “PV side meter”.

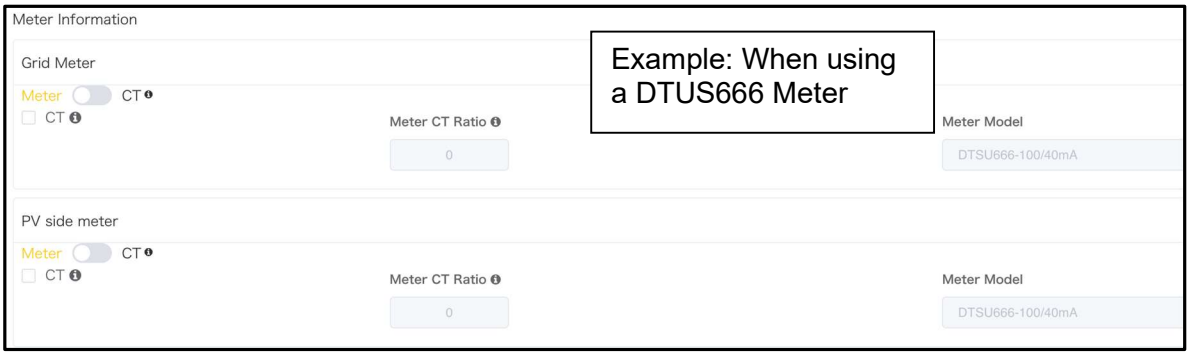
a) If a, ACTR10R CT meter(s) is installed, please select the second point "CT" below the “meter” selector and set the CT ratio as 120.

b) For DTSU666 CT Meter, you do not need to set CT ratio.

TECHNICAL NOTICE



Example: When using an ACR10R meter



Example: When using a DTUS666 Meter