



TROUBLESHOOTING GUIDE

CT AND SMART METER – HYBRID INVERTERS



ES, EM, ET

Introduction

- This guide will describe how to troubleshoot issues that arise with the incorrect installation of the current transformers (CT)
- Typical installation errors can be due to:
 1. Incorrect placement of the CT's
 2. CT's installed in the incorrect „DIRECTION“
 3. The voltage sense cables do not correspond to the phases to which the CT's are connected to
 4. Communication cable
- To determine which of the three situations is the root cause of incorrect inverter operation it is necessary to analyse the graphs on the SEMS portal

Incorrect Placement of CT's or Smart Meter OFFLINE

- A typical installation error is when the CT's are placed at the AC output of the inverter or in the incorrect location
- This will cause the „Load“ and „Meter“ graph on the SEMS to display incorrectly
- This will confuse and cause the battery to charge and discharge in unusual patterns
- Issues arising from the communication cable between the inverter and the smart meter can also lead to unusual behaviour

Key Indicators

- Analyse SEMS graph on the PV plant home page
- There is an issue with the CT's or the smart meter if you see the following:
 1. The load graph mirrors the output of the PV
 2. The load graph is double the output of the PV or is zero
 3. Negative load is shown on the graph particularly during the nighttime
- This will confuse and cause the battery to charge and discharge in unusual patterns
- The load graph is calculated by the following equation:

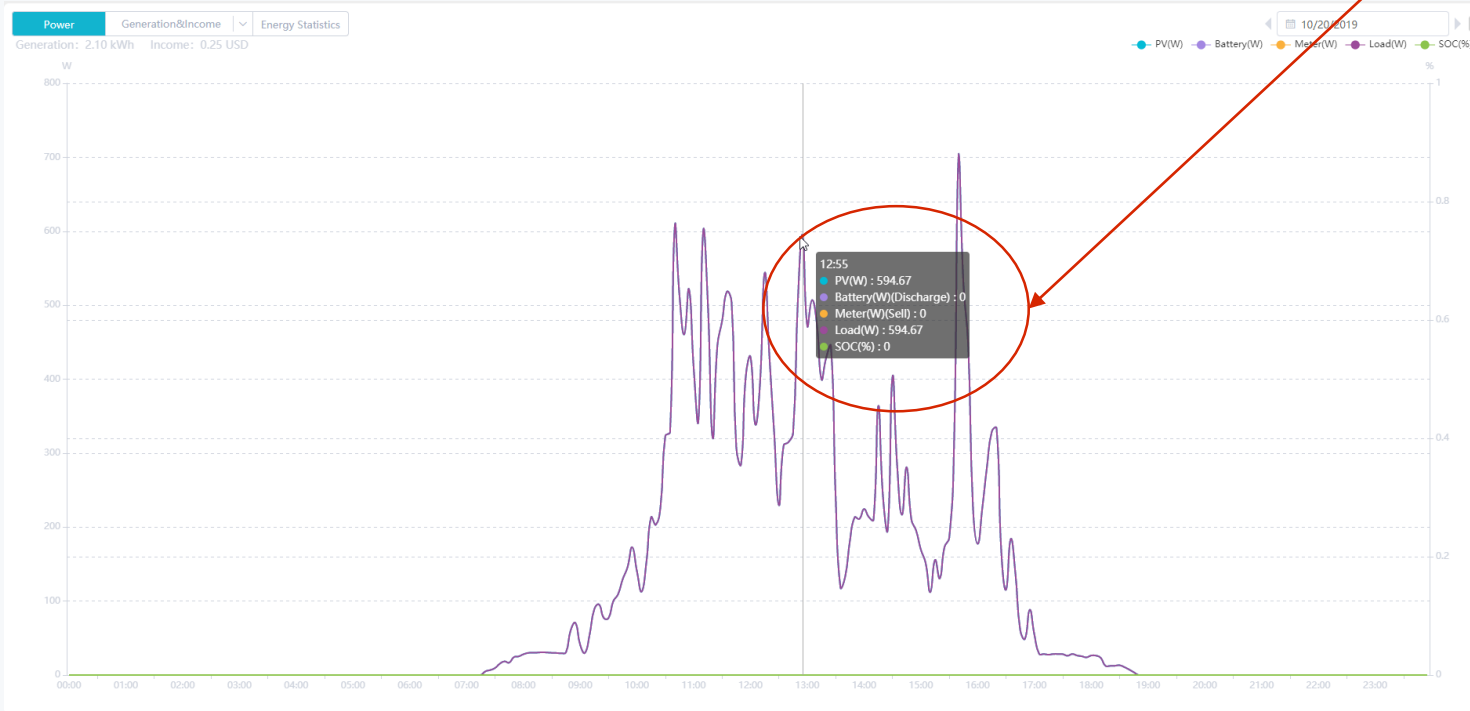
$$\text{LOAD} = \text{PV} - \text{Meter} + \text{Battery}$$

- **PV** should always be a positive number
- **Meter:**
 - Negative value = buying energy from the grid
 - Positive value = selling energy to the grid
- **Battery:**
 - Negative value = battery is charging
 - Positive value = battery is discharging

Scenario 1 – Load graph mirrors PV Graph

- Disconnect battery from the Inverter
- $\text{Load} = \text{LOAD} = \text{PV} - \text{Meter} + \text{Battery} = 594.67 \text{ W} - 0 \text{ W} + 0 \text{ W} = 596.67 \text{ W}$
- This indicates that the smart meter is NOT online

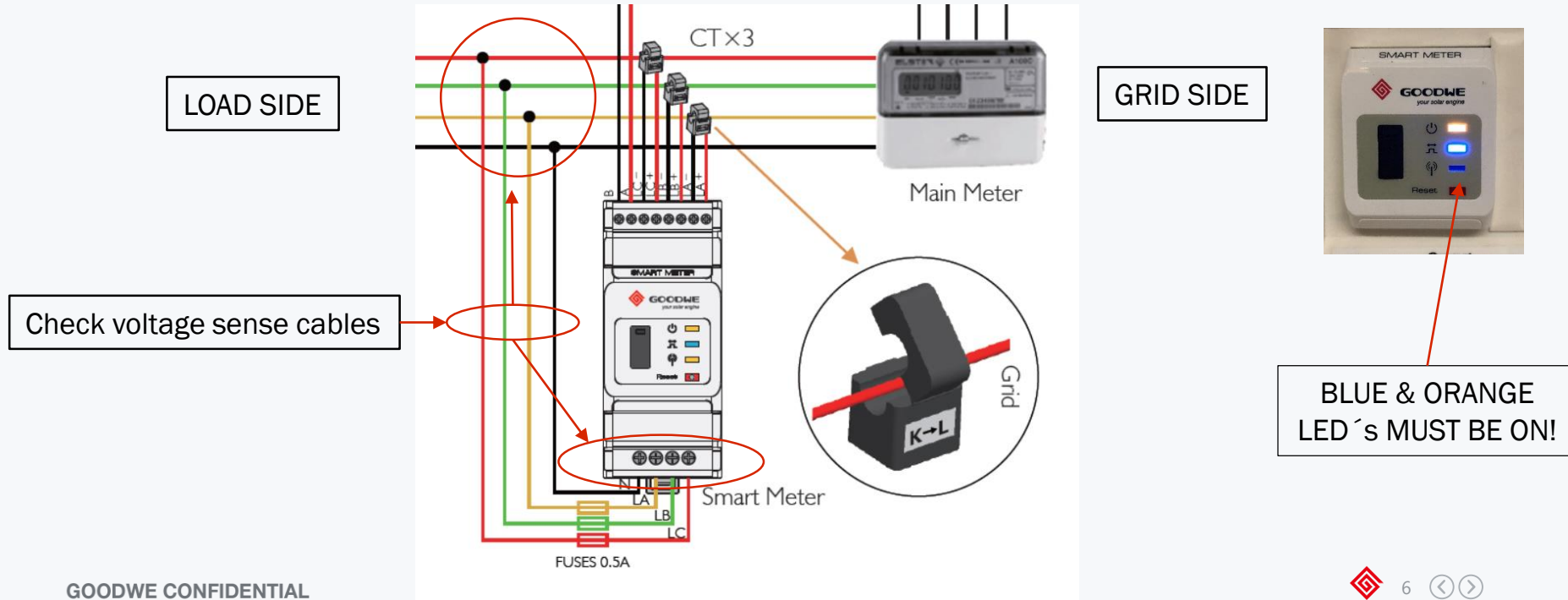
PV: 594.67 W
Load: 596.67 W



BLUE & ORANGE
LED's MUST BE ON!

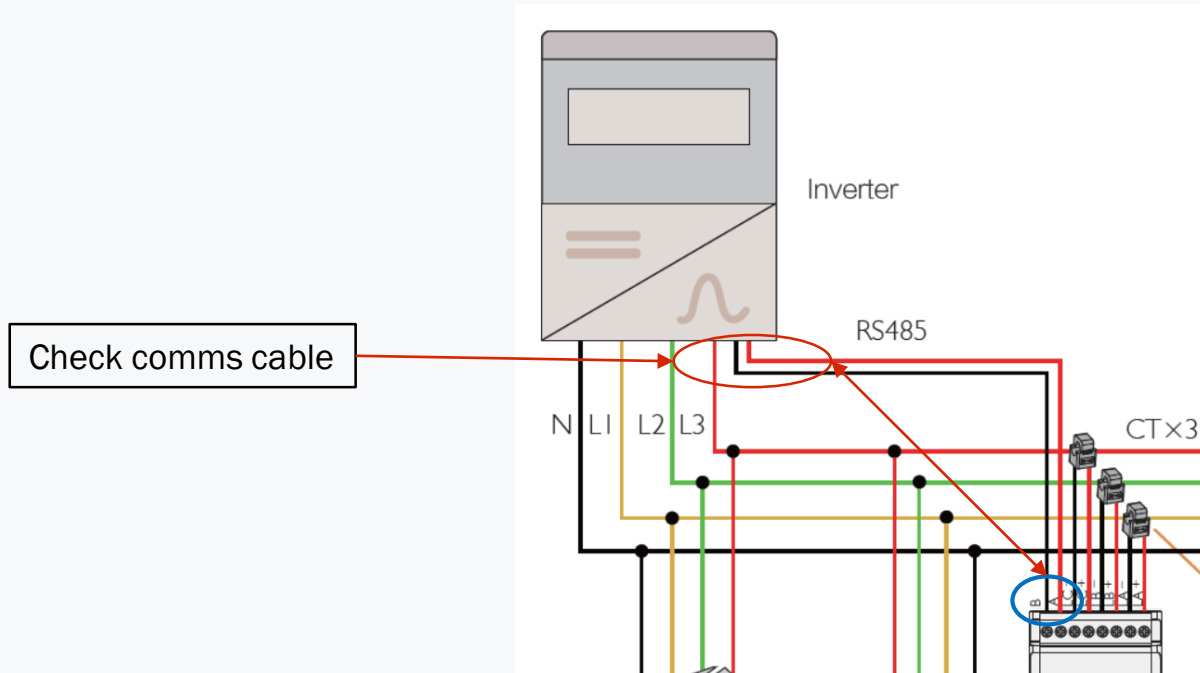
Scenario 1 – Load graph mirrors PV Graph

- Check whether ORANGE & BLUE LED are illuminated
- Orange LED indicates whether there is power to the meter via the voltage sense terminal
- Check voltage sense cables



Scenario 1 – Load graph mirrors PV Graph

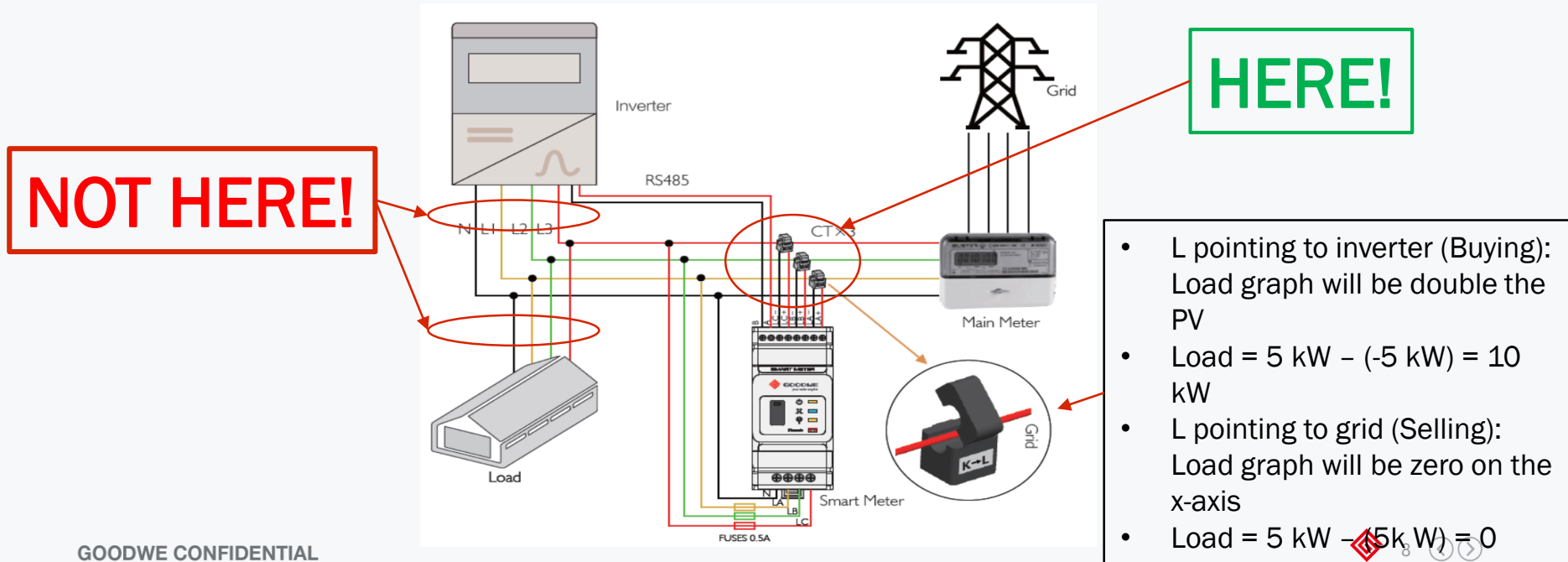
- BLUE LED indicates whether there is communication between the inverter and smart meter
- Check comms cable



BLUE & ORANGE
LED 's MUST BE ON!

Scenario 2 – Load graph is double the PV Graph or is showing zero

- If both ORANGE AND BLUE LEDS are illuminated then it indicates incorrect CT placement
- Meter graph showing zero on the x-axis indicates that the CT's have been installed at AC output of the inverter
- CT's must be installed after the REVENUE/MAIN meter, **ALWAYS BEFORE THE LOADS! L and ARROW POINTING TO GRID!!!!**



- L pointing to inverter (Buying): Load graph will be double the PV
- Load = 5 kW - (-5 kW) = 10 kW
- L pointing to grid (Selling): Load graph will be zero on the x-axis
- Load = 5 kW - ~~5~~5 kW = 0

Scenario 2 – Load graph is double the PV Graph or is showing zero

- If both ORANGE AND BLUE LEDS are illuminated then it indicates incorrect CT placement



WRONG DIRECTION!

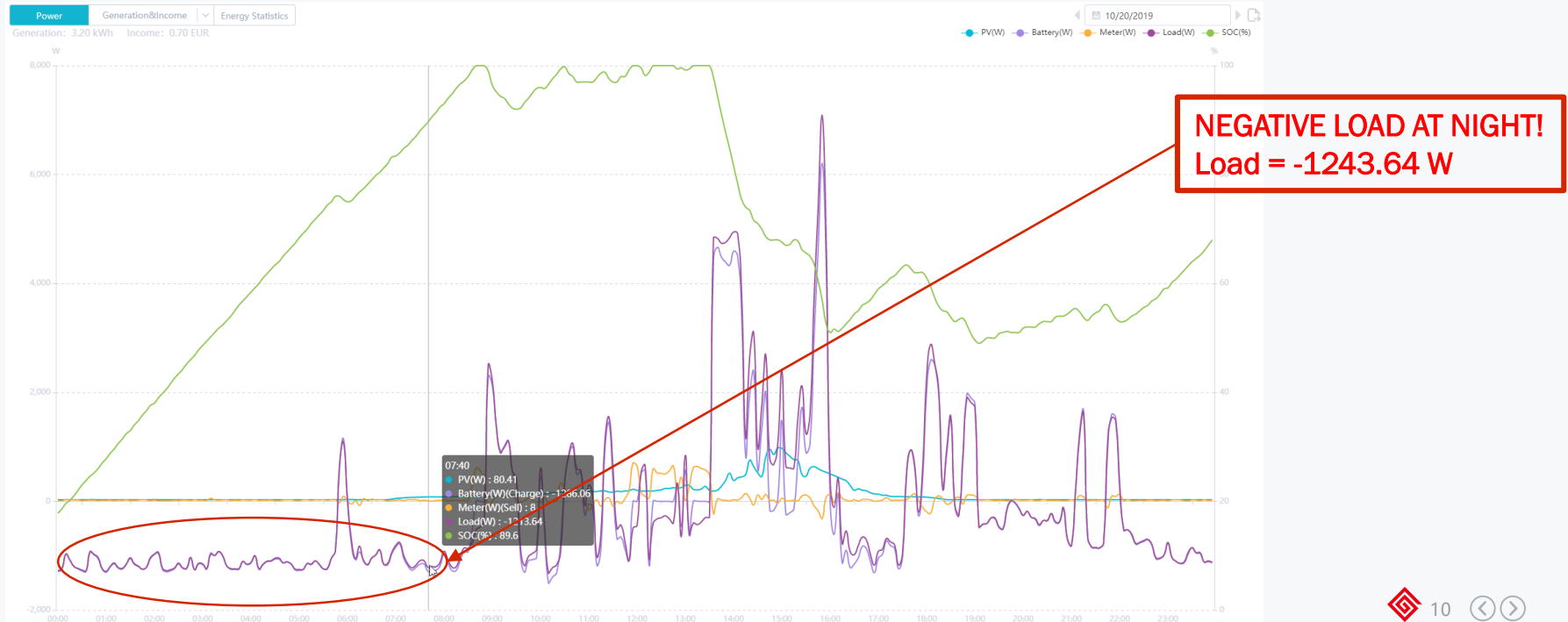


- L pointing to inverter (Buying):
Load graph will be double the PV
- E.g. Load = 5 kW – (-5 kW) = 10 kW

PV = 700.77 W
Meter = - 848.4 W
Battery = 0
Load = 700.77 – (- 848.4) = 1549.17 W

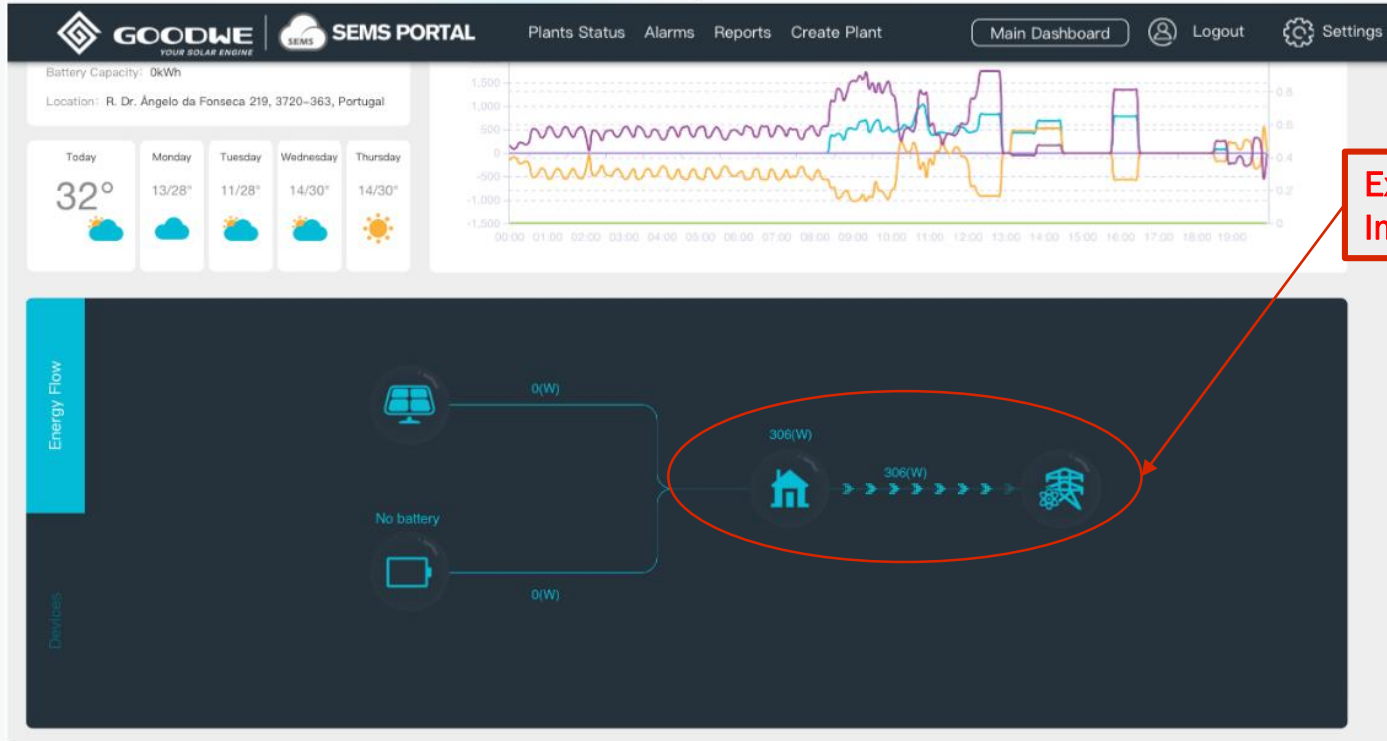
Scenario 3 – Load graph is showing NEGATIVE

- In reality the load graph can never be NEGATIVE – it is either ZERO or greater than Zero
- This Indicates that one or more CT's have been installed in the wrong direction
- Phases must be checked – use data export function on SEMS to determine which phase(s) should be checked



Scenario 3 – Load graph is showing NEGATIVE

- At night the Energy Flow will show power exporting to the GRID – THIS CAN NEVER HAPPEN!



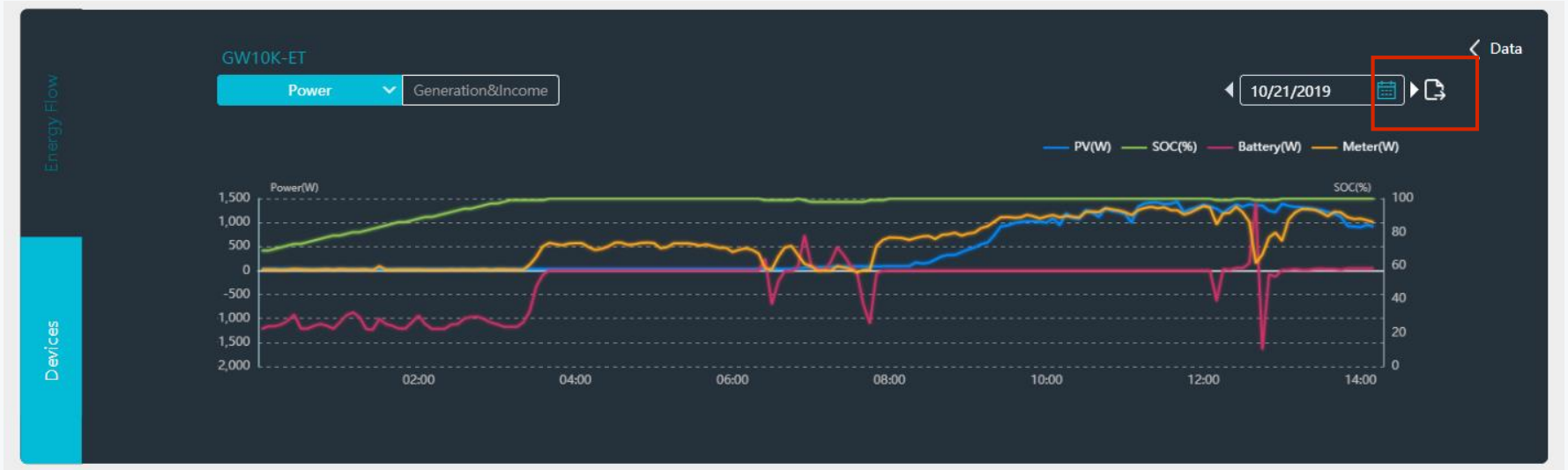
Scenario 3 – Load graph is showing NEGATIVE

- To determine which CT's may be installed incorrectly navigate to the „Devices“ Tab and select „Curve“



Scenario 3 – Load graph is showing NEGATIVE

- Click „Export Data“ ICON



Scenario 3 – Load graph is showing NEGATIVE

- Select time period
- In the „Indicator“ section select: Pmeter Phase 1(W), Pmeter Phase 2(W) and Pmeter Phase 3(W)
- Click on „Generate Data“ and then „Export“

Plant/SN Location Organization

Time Selection:

Output Format: Excel Curve (You can only select the Indicator with no more than 2 units after selecting the curve)

Inverter Selection

Select the inverter you want, please click

> ● PV Anlage Feher

Inverter Clear All

To remove the inverter, click "clear the list"

● PV Anlage Feher

● GW10K-ET

9010KETU191W0018

Indicator Select All Clear All

If you want to see the curve, please select the indicator that does not exceed 2 units

Total Output(kWh)

Pbackup1(W)

Pbackup2(W)

Vbackup2(V)

Ibackup2(A)

Pbackup3(W)

Vbackup3(V)

Ibackup3(A)

Pmeter phase 1(W)

Pmeter phase 2(W)

Pmeter phase 3(W)

Reset Generate Data

GO Time:

Save Template Export

Scenario 3 – Load graph is showing NEGATIVE

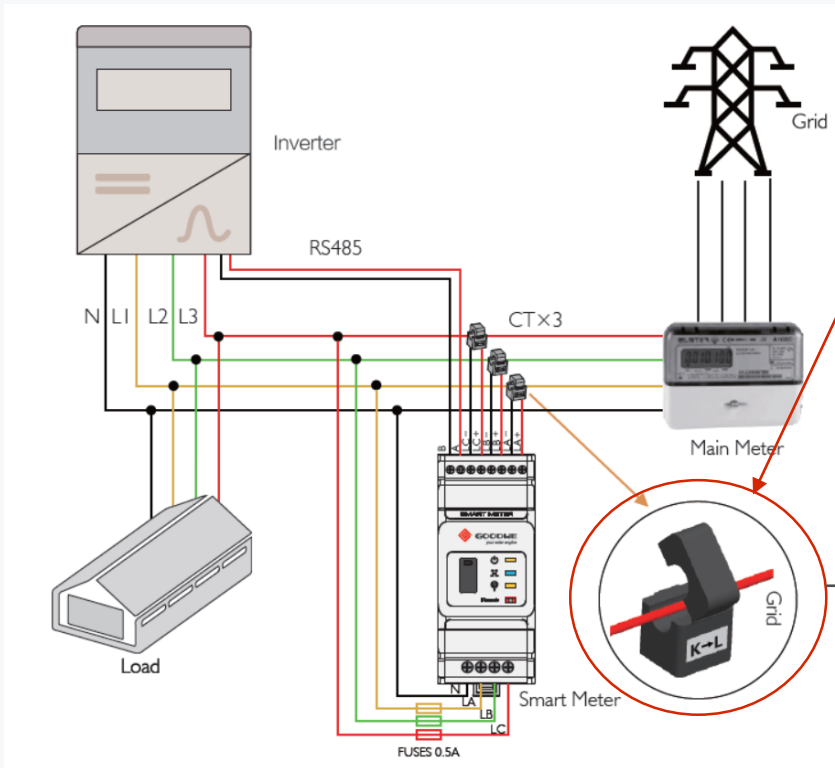
- Open Excel file that is downloaded
- Search for positive values during night time

	A	B	C	D	E
	Plant	PV Anlage Feher			
	SN of Inverter	9010KETU191W0018			
	Time	WorkMode	Pmeter phase 1(W)	Pmeter phase 2(W)	Pmeter phase 3(W)
2	10/21/2019 03:18:33	Normal	-100	112	4
3	10/21/2019 03:19:33	Normal	-102	113	5
4	10/21/2019 03:20:33	Normal	-88	80	17
5	10/21/2019 03:21:33	Normal	-82	88	21
6	10/21/2019 03:22:34	Normal	-83	81	15
7	10/21/2019 03:23:34	Normal	-86	79	18
8	10/21/2019 03:24:34	Normal	-88	81	18
9	10/21/2019 03:25:35	Normal	-86	79	18
0	10/21/2019 03:26:34	Normal	-65	100	40
1	10/21/2019 03:27:34	Normal	63	103	42
2	10/21/2019 03:28:34	Normal	-44	120	57
3	10/21/2019 03:29:34	Normal	3	205	100
4	10/21/2019 03:30:35	Normal	14	203	3
5	10/21/2019 03:31:35	Normal	28	209	21
6	10/21/2019 03:32:35	Normal	32	230	24
7	10/21/2019 03:33:35	Normal	52	250	47
8	10/21/2019 03:34:35	Normal	31	234	30
9	10/21/2019 03:35:35	Normal	73	270	69
0	10/21/2019 03:36:35	Normal	53	250	150

- Positive values mean that the PV plant is exporting power however this is not possible at night time when PV is zero generation

Scenario 3 – Load graph is showing NEGATIVE

- Check direction of CT on the phases
- Check voltage sense cables



- Arrow and L should be pointing towards the GRID
- Each voltage sense cable should be connected to the same phase as the corresponding CT
- E.g LA voltage sense connected to CT that is connected to LA-, LA+

**L POINTING TO
INVERTER -
WRONG DIRECTION!**

THANK YOU FOR YOUR TIME

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