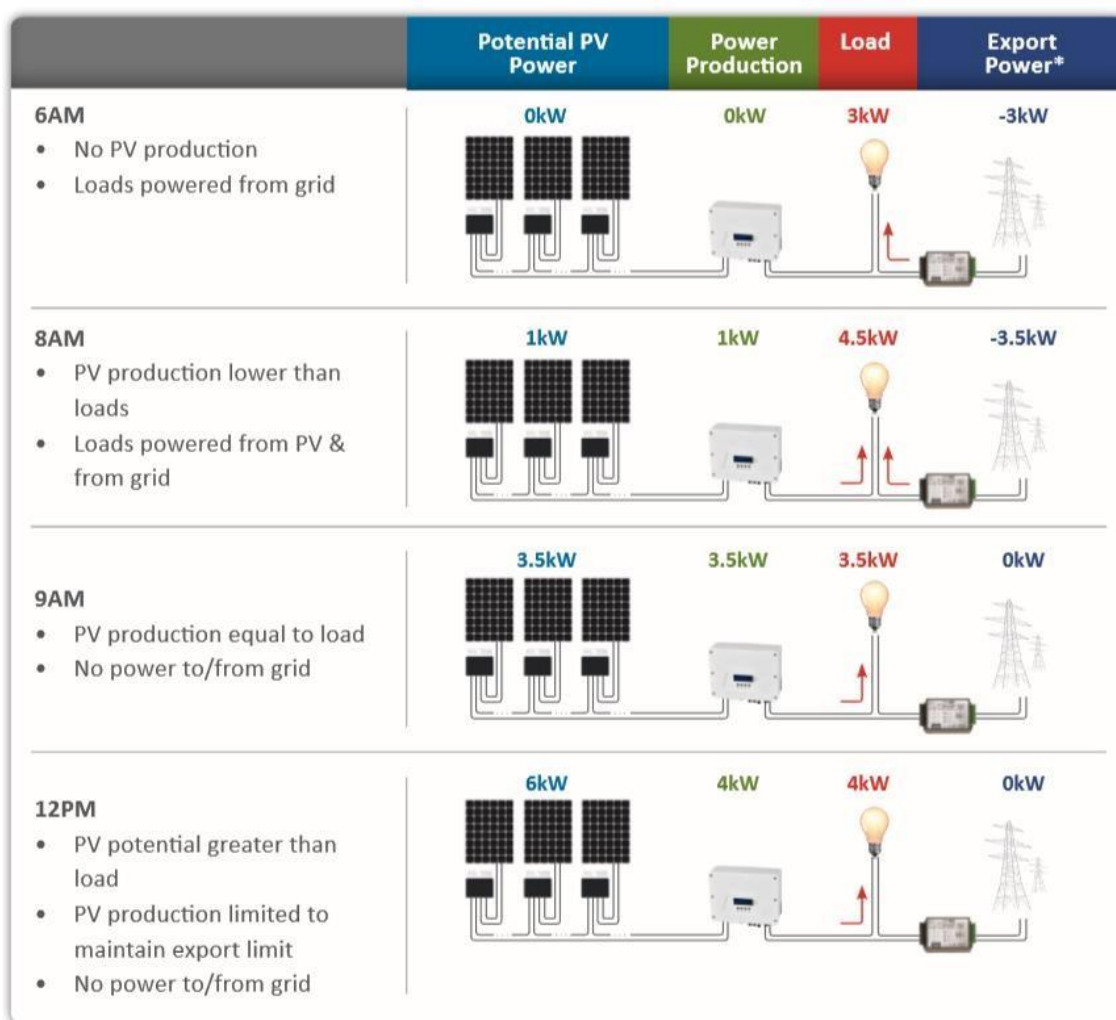


G100 Witness Testing Feed-In Limitation (Export Limitation) Application note UK only

Before carrying out Witness testing please, confirm you have installed a SolarEdge Energy Meter with Modbus connection - PN SE-WND-3Y400-MB-K2 with Firmware - 3.2251 – 3.2273 or 3.24xx and above for LCD screen inverters, and 4.6.1 for SetApp (minimum) and that you have configured the CT/Power loss option in the inverter/CCG menu.

For compliance with DNO, requirements please use the “Feed-in Limitation Note for DNO’s” which explains simply the system operation, connection, and specifications.

To test the system, you must temporarily limit the system to a value, which complies with the following equation: $(\text{Export limit} + \text{current building loads}) \leq \text{Available PV power at time of testing}$



* Minus sign indicates power is purchased from the grid

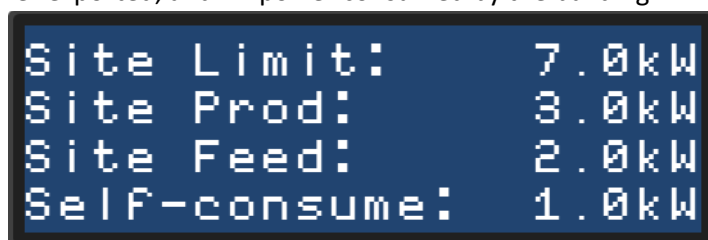
e.g. if the PV system is currently generating around 6kW then set the export limit to 3kW and have 3kW of load you can control.

For the tests to work this equation must be true for the whole time you are testing. If the PV production falls off due to cloud cover then you will not see the correct results and may have to set a lower export limit.

To show that the system will produce more than the export limit set you must have loads energised in the building. This means the system will then show it is feeding the building loads on top of the export limit set.

Site Limit

Main system function can be seen by scrolling through the screen of the Inverter/Communication Gateway or on your mobile while using the SetApp. This displays the set export limit, power produced by PV, power exported, and PV power consumed by the building.



Site Limit:	7.0kW
Site Prod:	3.0kW
Site Feed:	2.0kW
Self-consume:	1.0kW

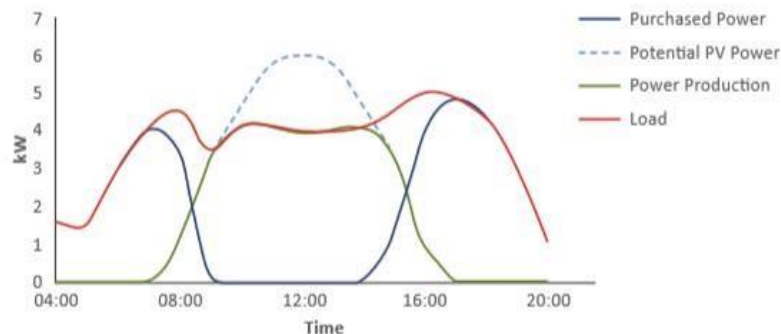
Correct System Installation

With the PV system isolated (and no other on-site generation connected), the LED's on the SolarEdge Energy Meter should be flashing Green – denoting import of power. If they are flashing, red then the CT's are the wrong way round or incorrectly wired (check phase rotation as well as CT cable polarity). CT's should be fitted to the main feed to the building *before* any loads and with their arrows pointing towards the grid. Do not coil excess CT cable.

With the PV system on and producing more energy than the building is using, the LED's should show red - denoting export of energy.

While viewing the main screen on the Inverter, CG, or SetApp isolate your chosen load to reduce building consumption. If the CT's are fitted in the correct orientation then the 'Self-consume' reading will reduce an amount equal to the size of the load.

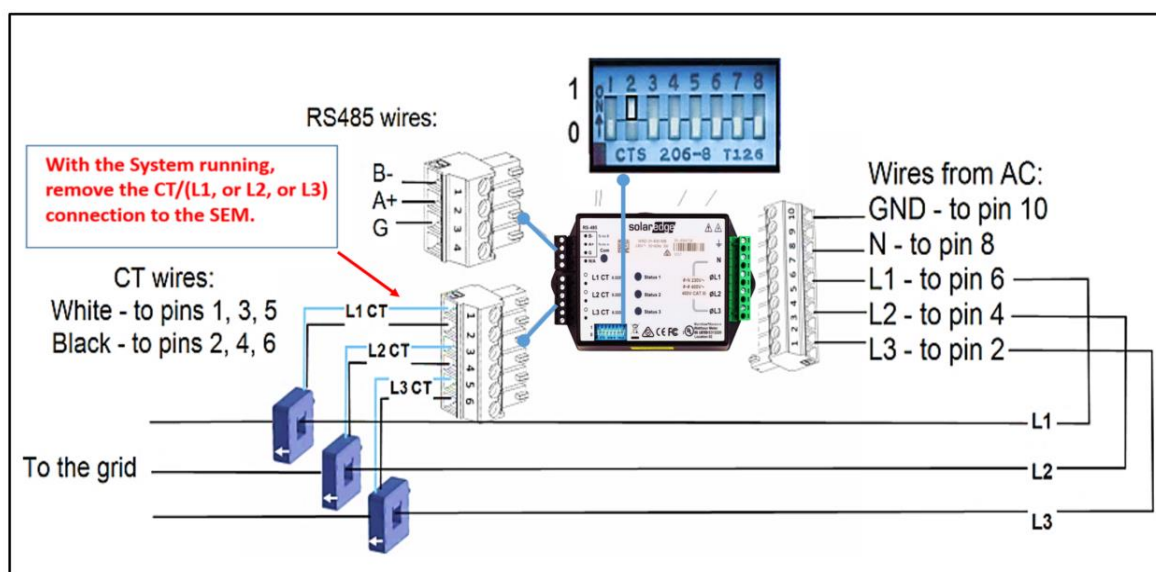
The overall behavior of the example system throughout the day can be seen in the following chart:



Fail Safe testing

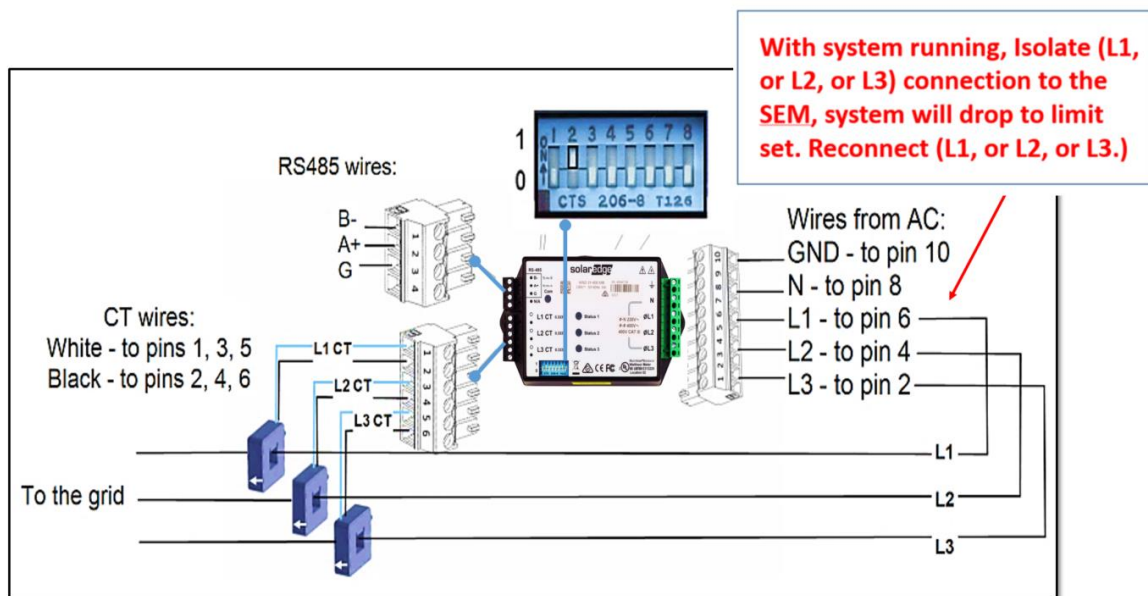
SolarEdge Energy Meter (K2) connected to Commercial Gateway

- With system running, turn off power to the CG, system will drop to limit set. Reapply power to CG.
- With system running, turn off power to the SEM, system will drop to limit set. Reapply power to Meter.
- With system running, remove RS485 connection to the SEM, system will drop to limit set. Reconnect RS485 to Meter.
- With system running, remove RS485-2 connection to the CG, system will drop to limit set. Reconnect RS485-2 to CG.
- With system running, remove RS485-1 connection to the CG, system will drop to limit set. Reconnect RS485-1 to CCG.
- With system running, remove RS485 connection to an inverter, system continues as normal – disconnected inverter will not output more than its share of the export limit (e.g. if the limit is 9kWp and there are 3 inverters, it will drop to 3kWp. Reconnect RS485 to inverter.



- Single/three Phase - With system running, remove CT/L1 connection to the SEM, system will drop to limit set. Reconnect CT/L1.
- Three Phase only -With system running, remove CT/L2 connection to the SEM, system will drop to limit set. Reconnect CT/L2.

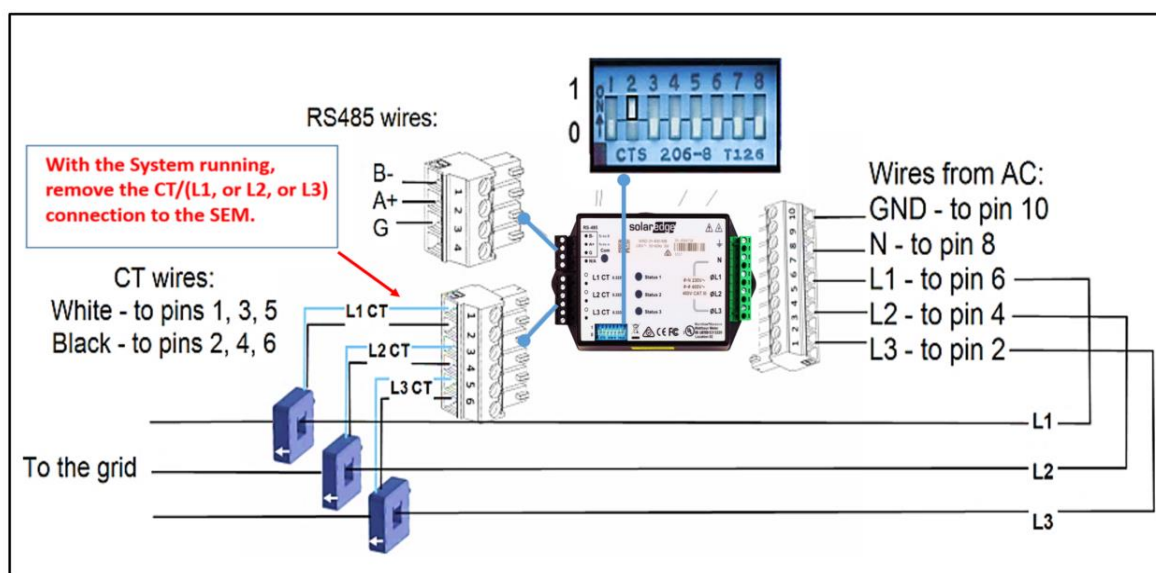
- Three phase only - With system running, remove CT/L3 connection to the SEM, system will drop to limit set. Reconnect CT/L3.



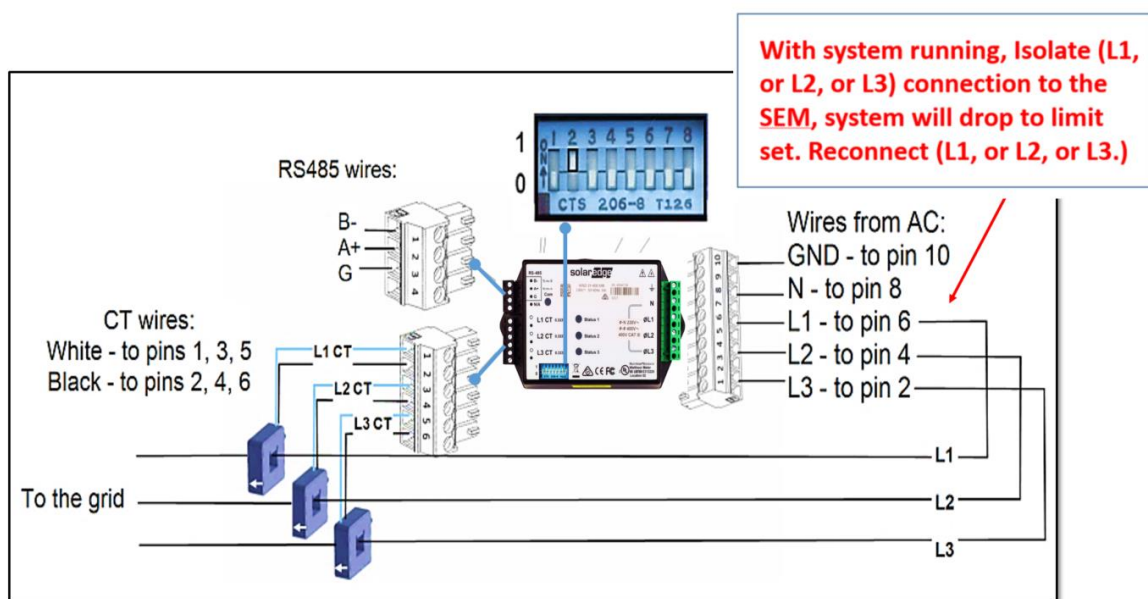
- Single/three Phase - With system running, Isolate L1 connection to the SEM, system will drop to limit set (Same as power failure.) Reconnect L1.
- Three Phase only - With system running, Isolate L2 connection to the SEM, system will drop to limit set. Reconnect L2.
- Three phase only - With system running, Isolate L3 connection to the SEM, system will drop to limit set. Reconnect L3.

SolarEdge Energy Meter (K2) connected to Inverter

- With system running, turn off power to the SEM, system will drop to limit set. Reapply power to Meter.
- With system running, remove RS485 connection to the SEM, system will drop to limit set. Reconnect RS485 to Meter.
- With system running, remove RS485-1 connection to the SEM, system will drop to limit set. Reconnect RS485-1 to Meter.
- With system running, remove RS485 connection to an inverter, system continues, as normal – disconnected inverter will not output more than its share of the export limit. (e.g. if the limit is 9kWp and there are 3 inverters, it will drop to 3kWp)
Reconnect RS485 to inverter.



- Single/three Phase - With system running, remove CT/L1 connection to the SEM, system will drop to limit set. Reconnect CT/L1.
- Three Phase only - With system running, remove CT/L2 connection to the SEM, system will drop to limit set. Reconnect CT/L2.
- Three phase only - With system running, remove CT/L3 connection to the SEM, system will drop to limit set. Reconnect CT/L3.



- Single/three Phase - With system running, Isolate L1 connection to the SEM, system will drop to limit set (Same as Power failure.) Reconnect L1.
- Three Phase only -With system running, Isolate L2 connection to the SEM, system will drop to limit set. Reconnect L2.
- Three phase only - With system running, Isolate L3 connection to the SEM, system will drop to limit set. Reconnect L3.

G100 Export Limitation Compliance

SolarEdge Energy Meter with Modbus connection - PN SE-WND-3Y400-MB-K2 with Firmware - 3.2251 – 3.2273 or 3.24xx and above for LCD screen inverters, and 4.6.1x for SetApp inverters (Minimum.)

To implement export limitation in a SolarEdge system, a SolarEdge Energy Meter with Modbus communication and current transformers (CT's) measuring active power are used. The meter has an RS485 hardwired connection to a SolarEdge inverter(s) and/or a Communication Gateway (CG) if fitted.

The export limitation is calculated and operated by the inverter/Communication Gateway and does not rely on any additional hardware, other than the aforementioned meter acting as the Power Measurement Unit. Any schematic will therefore not comprise of additional discrete units such as detailed in G100 (Load Control Unit, Interface Unit, Generator Interface Unit, or Control Unit).

The limitation is based on the inverter moving the solar modules' operating points so that the inverter is simply not extracting the energy it does not need from the PV modules. It does not use any load dump such as a water heater and therefore there are no additional harmonics due to the ELS functioning. The inverter harmonics and compliance are stated in the respective G98/G99 certification.

The ELS may be programmed with a site export limit in kW and is set within a password protected menu to prevent system owner override. The limit can also be set to zero, upon which the inverters output relays will open circuit the inverter to give a true zero output. There is also the option to set P(V) limits should the DNO specifically request this to prevent exported power above statutory voltage limits.

The regulation states The ELS must detect an excursion and reduce the export to the Agreed Export Capacity or less within 5 seconds.

Failure Modes – the following detail describes why the SolarEdge ELS is a failsafe scheme

1. As the Energy meter is located at the grid connection point, a power failure would naturally isolate the PV system through standard G98/G99 methods.
2. If the Energy meter itself were to fail, the RS485 communications would be lost and the inverters would permanently reduce to the site export limit, which has been set.
3. If the CG (if fitted) were to lose its power supply/fail then the inverters would permanently reduce to any export limit, which has been set due to communications failure from the unit.
4. If the RS485 communication connections/cable is damaged, then the RS485 signal would be lost and the inverters would permanently reduce to the export limit, which has been set.
5. If an individual inverter fails, then that inverter is bypassed due to a parallel connection and does not affect the operation of other components, which would continue to limit the system to the export limit, which has been set.
6. If the current transformer wiring is removed, or signal is lost, the inverters would permanently reduce to the site export limit, which has been set. Requires meter with PN SE-WND-3Y400-MB-K2 and inverter CPU version 3.2251 – 3.2273 or 3.24xx and above for LCD screen inverters, and 4.6.1x for SetApp inverters or above, and requires the installer to enable the CT loss feature.

For ELS compliance, inverters must utilise CPU version 3.2251 – 3.2273 or 3.24xx and above for LCD screen inverters, and 4.6.1x for SetApp inverters or above.

Herzliya, Israel

Place

May 13 2019

Date



Meir Adest, VP Core Technologies