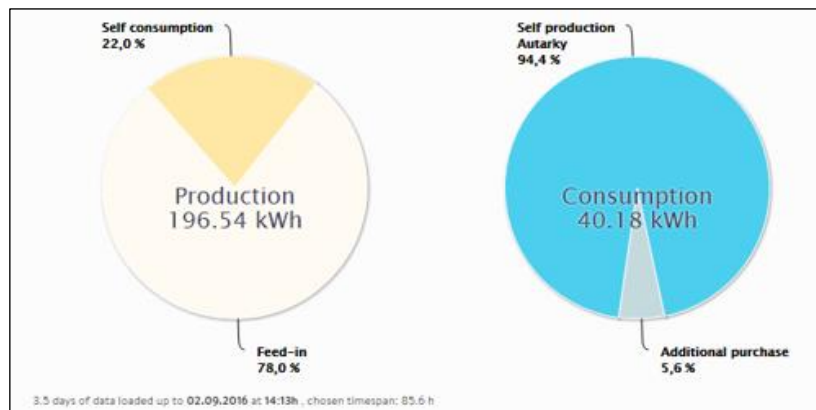


## TN030 – sonnenBatterie – Metering Discrepancies

In some situations, it may be noticed that power flow values (kWh) recorded by the sonnen app/ Portal may differ to values presented by the metering and billing of a utility or energy retailer. The discrepancy in the recorded kWh values are however to be expected, is not uncommon and is able to be explained as a result of one or a combination of the following factors:



### 1. Time intervals:

The mechanism used to measure kWh blocks of energy is a calculation based on energy consumed over time. The process of measuring energy flow is to record instantaneous values periodically and then calculate the average difference between any two measurements. For example:

*If a load is running at 2,500W and this value is recorded at 12.00hrs and then again at 12:15 the amount of energy consumed over the 15-minute period would be a constant 2,500W or 0.625kWh (if this load was contact for 1 hour it would be 2.5kWh's).*

*However, if the load were to fluctuate within this time period it would not change the value. For instance, at 12.05 a 5,000W load may be added but then turned off again at 12:10, because the reading at 12:00 and 12:15 were the same the recording would have noted no change and the 'extra' consumption would go un-recorded. Likewise, if the load at 12:00 was 2,500W and then it was recorded at 7,500W at 12:15 the average of the two values would be taken as the consumption for this timed period (5,000W for the 15-minute period = 1.25kWh).*

The reason therefore that a utility meter and the sonnen metered value will be different is that the sonnenBatterie meter records a measurement reading for the purposes of calculating kWh power flow every 1 minute, whereas utility meters time stamp can range between 15 to 30 minutes. Therefore, in the example given above the sonnen system would have noted and recorded the 5,000W load coming on at 12.05 which was turned off at 12:10 and accumulated this 'extra' into the total for that period.

It is worth also noting that the sonnen metering takes 1 second data sets for the purpose of charge / discharge commands due to the rapid and dynamic nature of changing loads & solar PV production.

### 2. Measurement inaccuracies:

The process of recording a kW or kWh value is based on a calculation rather than an actual measurement. A kW is calculated based on the multiple of voltage and current (Amps), for instance, an appliance running at 240Vac drawing a 10A load would be consuming energy at a rate of 2.4kW (2,400W's). If this appliance was to run constantly for 30 minutes, then it would have drawn 1.2kWh's (2.4kW's if it ran for the full hour).

The process of recording energy flow therefore relies on the accuracy of the internal measurement devices within the meter. The Carlo Gavazzi energy meters used as part of the sonnenBatterie systems comprise of a combination of a class 1 meter

(to EN62053-21) and a class 0.5 current transformer. In terms of measurement accuracy, the voltage recording has a tolerance of  $\pm 1.25$  to  $\pm 2.0\%$  and in terms of current  $\pm 0.75$  to  $\pm 1.25$ . Given that these are  $\pm$  values that actual range could be up to 4.0% for voltage and 2.5% for current. The following can give an example of the measurement discrepancy that these tolerances can create:

*1.25% variation in voltage would equal a 240Vac value reading between 237Vac to 246Vac*

*2.0% variation in current would equal a 10A value reading between 9.8A to 10.2A*

*These variations can therefore result in an instantaneous value ranging from 2,332W to 2,509W*

*If such a load were to run for 1 hour then there could be a variation of 0.177kWh, over a 90-day billing period this could result in a variation of 382kWh's (this is at the most extreme)!*

It's also worth noting that as this variation can be more significant in situations where the grid voltage is higher than the 240Vac nominal.

The compound effect of these tolerances from both the sonnen meter and the utility meter need to be considered. Some utility meters can be as much as  $\pm 5\%$  inaccurate for both voltage and current. In comparison the metering used by sonnen is one of the most accurate of its type on the market.

### **3. Measurement locations:**

The physical location of the point of metering can also impact the amount of energy that is being recorded. For instance, the network / utility meter will be connected at the grid-connection point or point of supply from the network to the property. This metering point in some circumstances can be a distance from the main switch board at the property which can also sometimes be separate from the sub-board where the sonnenBatterie has been connected. Given that between the two points of metering there will be a series of cable connections with different resistivity as well as a range of appliances and loads drawing from the supply the measured voltages can be significantly different between both points.

Likewise, if the sonnenBatterie has been installed and connected close to a Solar PV connection point then when the Solar PV system is feeding energy back into the domestic wiring the measured voltage will be higher (To be able to supply energy into a grid-connected property the Solar PV inverter and/or sonnenBatterie system has to raise up the voltage of it's supply to a level higher than the grid voltage to be able to create a negative bias and allow energy to flow against or in the opposite direction of the normal flow of power).

As previously explained the recorded voltage level can have a significant effect on the kWh measurement being recorded. In some circumstances the recorded voltage at the point of grid supply / connection can be 10 to 15V lower than the recorded value of the sonnenBatterie.

In conclusion it is unfortunate that discrepancies do and will exist as this can cause a lot of confusion.

What it is worth noting is that neither measurement is necessarily wrong, both readings will be correct but just different. The values will be not be the same due to the different mechanisms used to record each of the fluctuating power flow values. The power flow readings are also being taken from different points of the property / points of connection which make the readings differ too.

If there are any further questions or concerns regarding the metering and power flow recording of the sonnenBatterie system, then please either contact a sonnen sales representative of the sonnen AU team on +61 137 666.

Yours faithfully,



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