

Unbalanced output: one setting that stops a phase buying from the grid under zero export

Case study · 20 kWp on-grid solar plant, Chiang Rai · Solar ESS Co. Ltd. · 16 October 2026

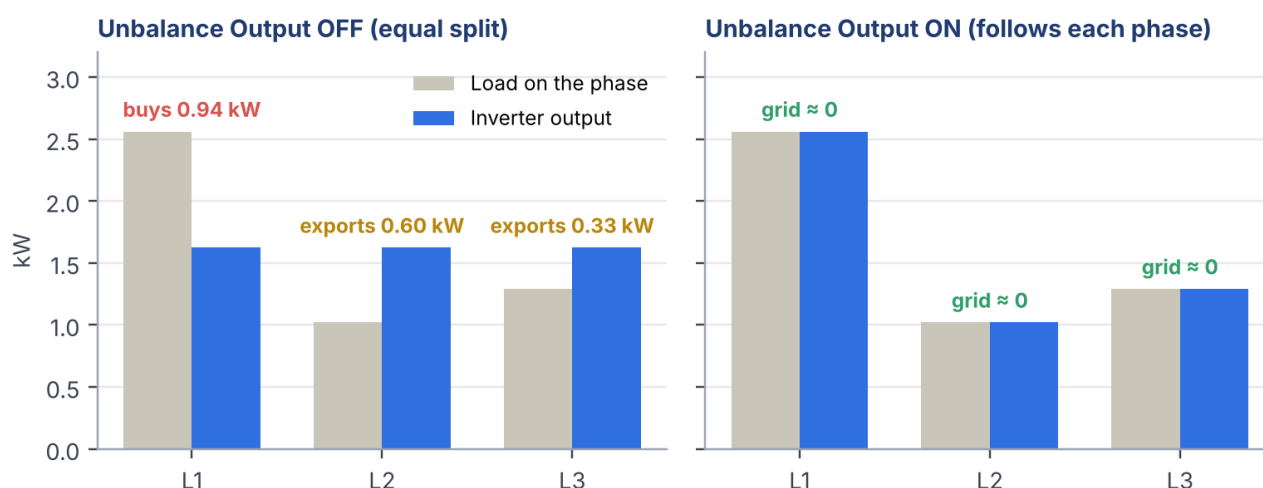
A three-phase plant with export disabled kept buying power on one phase while the inverter was holding its solar output back. The cause was one setting: **Unbalance Output** was off, so the inverter split its power equally across the three phases while the building's load was not equal. After switching it on, the two lighter phases went to 0 W at the grid meter and the heavy phase stopped importing.

Plant: 20 kWp, three-phase hybrid inverter running on-grid with no battery; Storage Mode = Self Use, Allow Export = Disable, Allow Grid Charge = Disable. Readings: inverter and grid meter monitoring, 16 Oct 2026, 10:18–10:19.

What the setting does

OFF (balanced): the inverter puts the same power on L1, L2 and L3 and keeps the *total* at the meter close to zero. When the loads are uneven, the heavy phase still buys from the grid while the light phases push the difference out, unpaid. In our earlier zero-export case study at this site, about 14% of production leaked to the grid this way.

ON (unbalanced): the inverter reads each phase at the meter and gives each phase what its own load needs, up to the inverter's limit per phase.



Same loads, two modes. Loads are the measured per-phase output after the change (meter $\approx$ 0 W); the OFF case is calculated with an equal split of the same total (4.87 kW).

The measurements after switching it on

Phase	Inverter V	Inverter A	Inverter kW (approx.)	Meter A	Meter active power
L1	230.6	11.1	2.56	6.72	0 W
L2	237.3	4.3	1.02	7.72	0 W
L3	235.1	5.5	1.29	14.86	-348 W
Total			4.72 (reported)		-0.35 kW

- **The inverter now gives L1 more than twice the current of L2:** it is following the load per phase.
- **L1 and L2 at 0 W at the meter** is exactly what per-phase zero export should look like. L3's -348 W is regulation lag or a small overshoot while loads switch.
- Export for the day stayed small: 0.32 kWh exported against 0.87 kWh imported by 10:19.

Why the meter shows amps but 0 W. Air conditioners, motors and LED drivers also draw *reactive* current. The inverter runs at power factor 1 and supplies only real power (kW), so the grid still carries the reactive part: current flows, but almost no watts. L3's 14.86 A is about 3.5 kVA but only 0.35 kW. This is normal and is not what a small business or home PEA meter bills.

Before you rely on it: five checks

1. **Confirm the value is in the inverter.** Tap *Read* on the settings page after saving. If the value jumps back or the read fails, the logger is offline or the command was rejected.
2. **Installer access.** On many platforms this setting can be changed only from an installer account with remote control allowed.
3. **Meter and CTs on all three phases.** The setting is only as good as the measurement: meter communicating, one CT per phase, arrow toward the grid, cables undamaged.
4. **Same phase order at inverter and meter.** The inverter corrects *its own* L1 from *the meter's* L1. If L1 and L2 are crossed, it corrects the wrong phase and the behaviour looks random. Measure the three voltages at both ends at the same moment and check they pair up label to label; a phase-rotation tester confirms the sequence. (At this site the inverter's L1 read 6 V below the meter's L1 while delivering 11 A, which is worth checking on the next visit.)
5. **Know the per-phase limit.** Unbalanced output cannot push more than the datasheet's maximum per phase. A load above that is still part-supplied by the grid.

What it does not fix

- **A badly balanced building.** When one phase carries most of the load, moving some large loads (for example air conditioners or pumps) to the lighter phases still helps, and reduces stress on one phase of the inverter.
- **Unused solar on light days.** With export disabled and no battery, the inverter still produces only what the building uses. PEA sell-back, moving loads to midday, or a small battery are the ways to use the rest.

Questions about your own plant? Book a consultation at www.solaress.org.