



Solar Energy for Sustainable Solution

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Phase Imbalance Assessment & Inverter Capacity Review

Hybrid inverter feasibility check against the Solis S6-EH3P20K-H (20 kW, three-phase)

Site / device: SolisCloud Inverter ID -

Report date: 30 September 2026

Data snapshot: 30/09/2026 09:02:58 (UTC+07:00)

Prepared by: Krisda Dhiradityakul

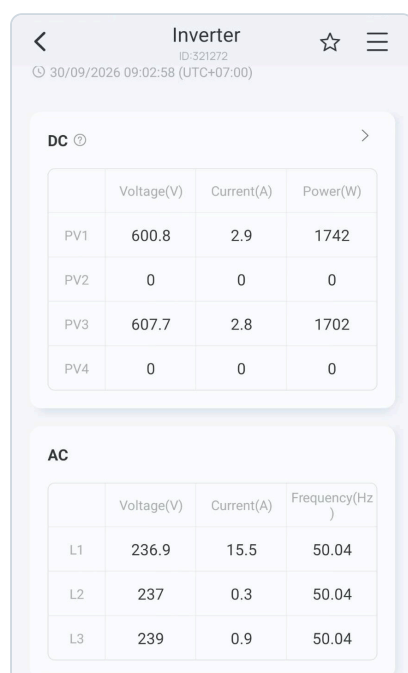
1. Executive Summary

The monitoring data shows a severe phase imbalance: **about 93% of the inverter's AC output is on Phase L1** (15.5 A), while L2 and L3 carry only 0.3 A and 0.9 A. This is far above the 50% level first observed.

The Solis S6-EH3P20K-H supports unbalanced three-phase output, but only up to **40% of rated power per phase (8 kW)**^[1]. Its maximum AC output current is 30.4 A per phase^[2], which is about **7.0 kW at 230 V**. At present, L1 draws about 3.7 kW, roughly half of that ceiling, so the inverter is operating within its limits.

Verdict: FEASIBLE WITH CONDITIONS. The 20 kW Solis hybrid can serve this load structure if the **peak load on L1 stays below about 7 kW**. This is critical in backup (off-grid) mode, where no grid is available to cover the excess. With the current wiring, however, only about 35–40% of the inverter's 20 kW capacity can be used. **Rebalancing the distribution board is strongly recommended.**

2. Observed Data



Phase	Voltage (V)	Current (A)	Power* (kW)	Share
L1	236.9	15.5	3.67	92.8%
L2	237.0	0.3	0.07	1.8%
L3	239.0	0.9	0.22	5.4%
Total		16.7	3.96	100%

PV input	Voltage (V)	Current (A)	Power (W)
PV1	600.8	2.9	1,742
PV2	0	0	0 (unused)
PV3	607.7	2.8	1,702
PV4	0	0	0 (unused)
Total PV			3,444

* $V \times I$, assuming a power factor of about 1. Frequency is stable at 50.04 Hz and all phase voltages are healthy (236.9–239 V).

Figure 1 — SolisCloud live data, Inverter ID -

3. Issue Identification

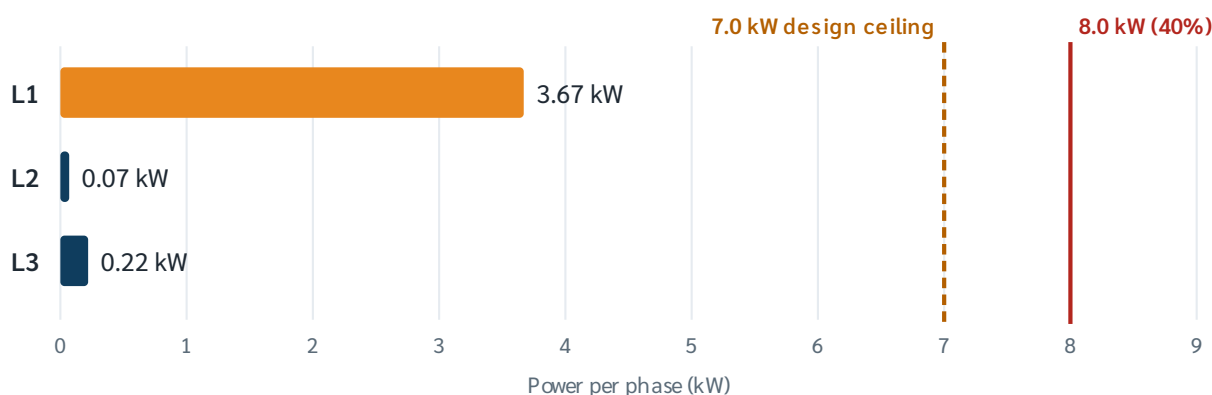
- **Severe current imbalance.** L1 carries 15.5 A, against an average of 5.6 A across the three phases. That is a **178% deviation from the average**, and L1 carries 52 times the current on L2.
- **The inverter follows the load on each phase.** Unbalanced output is working as designed: the inverter delivers most of its power to L1, where the load is.
- **High neutral current.** With this pattern, the calculated neutral current is **about 14.9 A**, nearly equal to the L1 current. The neutral conductor must be sized for full phase current.
- **Battery likely supplementing PV.** AC output (about 3.96 kW) exceeds PV input (3.44 kW) at 09:03, which suggests the battery is discharging about 0.5 kW to meet the L1-heavy morning load.
- **Snapshot limitation.** These values show inverter output only, at one moment. If L1 also imports from the grid, the true L1 load is higher. Peak-load data is needed to confirm.

4. Inverter Capacity Check — Solis S6-EH3P20K-H

Parameter	Specification	Site value	Status
Rated AC output power	20 kW / 20 kVA ^[2]	3.96 kW	OK (20%)
Max. power per phase (unbalanced)	40% = 8.0 kW ^{[1][4]}	L1 3.67 kW	OK (46%)
Max. AC output current per phase	30.4 A (≈7.0 kW @230 V) ^[2]	L1 15.5 A	OK (51%)
Practical L1 planning ceiling	≈ 7.0 kW	Headroom ≈ 3.3 kW	Watch peaks
Unbalanced / half-wave loads	Grid & backup port ^[3]	Single-phase heavy	Supported
Surge (backup)	200% for 10 s ^[3]	Motor / compressor starts	Supported
PV inputs	4 MPPT, 200–850 V, 20 A, 9 kW each ^[2]	2 used, ~600 V, 2.9 A	OK; 2 spare
Parallel expansion	Up to 6 units ^[3]	—	Option

Note: the 8 kW per-phase figure in the brochure is higher than what the 30.4 A current limit allows at Thai phase voltages (about 7.0 kW). This report therefore uses **7.0 kW** as the safe design ceiling for L1. For comparison, the smaller S6-EH3P(5-10)K-H models allow 50% per phase^[5], which is only 5 kW on a 10 kW unit, so the 20 kW model is the better choice for a single-phase-heavy site.

Figure 2 — Load per phase vs. inverter per-phase limit



L1 is at about 52% of the design ceiling. L2 and L3 are almost idle, so about two-thirds of the inverter's phase capacity is unused.

5. Analysis by Operating Mode

L1 peak load	On-grid mode	Backup / outage mode
≤ 6 kW	Feasible	Feasible, comfortable margin
6 – 7 kW	Feasible	Marginal, little headroom for starts
7 – 8 kW	Feasible (grid covers the excess)	Risk of overload alarm or shut down
> 8 kW	Feasible but grid-dependent	Not feasible

On-grid: The inverter supplies L1 up to its per-phase limit, and the grid covers the rest. Operation is safe, but self-consumption of solar energy is capped by the L1 limit. Surplus PV at midday can only go to battery charging, to export on L2/L3, or to curtailment if zero-export is active.

Backup (grid outage): The per-phase limit is a hard constraint. Any L1 load above about 7 kW that lasts longer than the 10-second surge window^[3] will trip the inverter. It will then lose all three phases, including the lightly loaded L2 and L3.

Economic impact: With the current wiring, the 20 kW inverter works like a 7–8 kW single-phase unit. Balancing the loads would release the full 20 kW for self-consumption and backup without buying any extra equipment.

6. Recommendations

- **Measure real peaks before final sizing.** Export at least 7 days of per-phase data from SolisCloud (Analysis tab) or a CT/energy meter at the main board. Record L1 peak kW, when it occurs, and total site load including grid import^[6].
- **Rebalance the distribution board. This is the priority action.** Move large single-phase circuits (air-conditioners, water heaters, pumps, kitchen equipment) from L1 to L2 and L3. Target: no phase above about 40% of total load, and L1 peak below 6 kW. This is low-cost electrical work and makes the full 20 kW available^[1]^[2].
- **Keep unbalanced output enabled** in the inverter settings. It is the reason the unit can serve this site today^[1]^[3].
- **Design backup circuits within the per-phase limit.** Connect only critical loads to the backup port, spread across all three phases, with no more than about 6–7 kW on any single phase^[2]^[3].
- **Check neutral and protection.** Confirm the neutral conductor is at least the same size as the phase conductors (calculated neutral current is about 14.9 A now and rises with L1 load). Check that breakers and RCDs are rated for the L1 current.
- **Review export / zero-export settings.** Confirm with PEA whether the meter nets across phases. Where imbalance persists, set zero-export control (per-phase or total) deliberately to avoid unexpected export or curtailment.
- **Use the spare MPPTs for future PV.** PV2 and PV4 are unused. Each can take up to 20 A and 9 kW^[2], so the array can be expanded once the loads are balanced and can absorb the extra energy.
- **If balancing is not possible,** consider a second inverter in parallel (up to 6 units supported^[3]), or a dedicated single-phase inverter for the L1 loads. Choose the model based on the measured L1 peak.

7. References

1. Solis — S6-EH3P(12-20)K-H product page (“Supports three-phase unbalanced output, allowing up to 40% of rated inverter power per phase (for single system)”). https://www.solisinverters.com/global/energy_storage_inverters18/S6-EH3P%2812-20%29K-H

2. Solis — Datasheet S6-EH3P(12-20)K-H, V1.1 2024-03 (rated / max. AC output current 30.4 A / 28.9 A; 4 MPPT; 20 A per MPPT; 9 kW per MPPT; MPPT 200–850 V). https://www.solisinverters.com/uploads/file/Solis_datasheet_S6-EH3P%2812-20%29K-H_PRT_V1%2C1_2024_03.pdf
3. Solis — Datasheet S6-EH3P(12-20)K-H, features (“Supports unbalanced and half-wave loads on both the grid and backup port”; “10 second 200% surge power backup overload capability”; max. 6 units in parallel). <https://aurinkosahkotukku.fi/wp-content/uploads/2024/09/S6-Tekniset-tiedot.pdf>
4. Solis — Datasheet S6-EH3P(12-20)K-H, Solarator series (40% per-phase unbalanced output). <https://www.solisinverters.com/dataFile/2c9fafbf90bb8a490190fd423bb12385>
5. Solis — Datasheet S6-EH3P(5-10)K-H (“each phase supports output max. 50% rated inverter power”). <https://www.solisinverters.com/dataFile/40289f9e8abfdab018abc9964a44366>
6. SolisCloud monitoring screenshot, Inverter ID - , 30/09/2026 09:02:58 (UTC+07:00) — site data supplied by Solar ESS.

This assessment is based on a single SolisCloud snapshot at 09:02:58 on 30/09/2026 and on published Solis specifications. The conclusions should be confirmed with at least one week of per-phase load data, and with the installer settings and firm ware of the actual unit, before final design or procurement.

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