Solar Sizing Re-run, Sept 2026 (600 Wp panels)

This page re-runs the solar sizing from Solar Plus Battery Economic Case (Sezibwa) on three months of live OpenEMS load. It answers one question: is 7 to 8 panels (600 Wp each) still the best PV size for Sezibwa, and does it cut the energy bill in half?

Answer

Yes. With 600 Wp panels:

- 6 panels (3.6 kWp) cut the energy bill by half.
- 7 panels (4.2 kWp) cut it by 55%.
- 8 panels (4.8 kWp) cut it by 58% and give the best 20 year return (highest NPV).

Past about 5 kWp each extra panel adds little. The battery is already full by midday, and without grid export the surplus is wasted.

What changed since August

Input	August model	This re-run
Load data	Modbus logger archive, Mar to Aug 2026	OpenEMS aggregate meter DTSU666 (serial 221123297561), 1 Jul to 28 Sep 2026, 76 days of data
Average load	21.3 kWh/day	25.8 kWh/day
Baseline energy bill	about 374,000 UGX/month	about 454,000 UGX/month
Panel size	kWp only	600 Wp panels

The model code and economics are otherwise unchanged. One correction was made: the daily average now divides by the hours actually covered by data, not the calendar span, so data gaps (for example the site internet outage of 25 to 26 Sep) no longer understate the load.

Cost of an 8 panel install (at cost)

Priced from the Rincol catalogue (August 2026 buy prices), with the railing at 421,000 UGX per 4 panel kit:

Item	Qty	Cost (UGX)
600 Wp mono panel (GS600N-144M) at 320,250	8	2,562,000
Railing kit (4 panels per kit) at 421,000	2	842,000
6 mm2 UV solar cable at 12,000/m	40 m	480,000
PV combiner box (MC4)	1	80,000
DC circuit breaker 20 A	1	25,000
Surge protector (a DC rated one is still to be sourced)	1	35,000
Earthing (rod, clamps, conductor)	1	80,000
MC4 connectors (estimate)	6 pairs	48,000
Labour and transport	1	250,000
Total		**4,402,000**

Panels and railing are 3.4M, and the rest of the balance of system and labour adds about 1.0M. The inverter (3.84M) and battery (5.57M) are already paid for, so these are the only new costs.

Results (600 Wp panels, no grid export, at cost)

Panels	kWp	Saving per month (UGX)	Bill cut	Solar wasted	Cost (UGX)	Simple payback	IRR	NPV at 15% (UGX)
5	3.0	199,406	44%	4%	3.44M	1.4 yr	69%	10.9M
6	3.6	225,904	50%	10%	3.76M	1.4 yr	71%	12.4M
7	4.2	247,923	55%	16%	4.08M	1.4 yr	72%	13.6M
8	**4.8**	**263,462**	**58%**	**22%**	**4.40M**	**1.4 yr**	**71%**	**14.3M**
9	5.4	273,637	60%	28%	5.14M	1.6 yr	63%	14.3M
10	6.0	281,205	62%	33%	5.46M	1.6 yr	61%	14.5M
11	6.6	287,350	63%	38%	5.78M	1.7 yr	59%	14.6M
12	7.2	292,746	64%	42%	6.10M	1.7 yr	56%	14.6M

Cost is built per panel count: panels, one railing kit per 4 panels, and a fixed 40 m of cable, combiner, breaker, surge protector, earthing, connectors and labour. 4 panels is left out because a 4 panel string (about 175 V) is below the inverter's 200 V MPPT minimum. The SRNE ASP48120SH3 has 2 MPPT inputs of up to 9 kW each at 200 to 650 V, so 5 to 14 panels fit on one string.

For a turnkey quote at Rincol selling prices, add roughly 20 to 25% (the August 7 panel quote was 5.02M at sell prices against 4.16M at cost).

Battery only (the existing SRNE, no panels) saves about 34,000 UGX/month (8%) on the model's arbitrage policy.

How to read it

- **Bill cut**: the share of the energy bill (energy charges only, excluding the fixed service charge and VAT) that solar plus the existing battery removes.
- **Solar wasted**: the share of generated solar energy that can't be used or stored, because the battery is full and there is no export.
- **Extra per panel**: saving rises by about 35,000 UGX/month for the 5th panel, but only about 10,000 UGX for the 9th and under 6,000 by the 12th. The 9th panel also needs a third railing kit.
- **NPV at 15%**: the 20 year value after paying the install cost. It climbs to 14.3M at 8 panels and then flattens (14.6M at 12). Panels 9 to 12 add about 1.7M of cost for almost no extra value, and IRR is highest at 7 to 8 panels.

Recommendation

Install **8 panels of 600 Wp (4.8 kWp)** on the existing SRNE inverter and battery, for about 4.4M UGX at cost. That cuts the energy bill by 58% (about 263,000 UGX/month) and pays back in about 1.4 years. 7 panels (4.1M, 55%) is the cheaper option. Going above 8 only makes sense with grid export (net metering) or more battery storage.

Assumptions and caveats

- **Weather** is modelled, not measured: 5.2 peak sun hours, 0.78 performance ratio, and a seeded day to day variation. Measured site irradiance would firm this up.
- **Tariff** is UEDCL Code 10.2 Q3 2026 (off peak 429.7, shoulder 562.1, peak 666.5 UGX/kWh). The Q4 schedule takes effect on 1 Oct and should be checked.
- **Capex** uses August 2026 Rincol catalogue buy prices and the 421,000 railing kit. The catalogue has no DC rated PV surge protector yet (the 35,000 line is the AC one), so budget more for that. Confirm current prices before buying.

- **Load** covers July to September only, so there is no seasonal variation.
- **Battery use**: with solar, the battery is charged from solar and discharged through the shoulder and peak periods. It replaces the current grid arbitrage (off peak charge, 21:30 to 23:30 discharge). A 30% reserve is held for backup.
- **Per phase limit**: the inverter delivers at most 4 kW per phase on battery (see the 27 Sep outage report). Solar does not change that limit.

Reproduce

The model is versioned in the **nfe-modbus-energy-logger** repository under `scripts/solar_sim/` (issue #89, PR #90, in review). From the repo root:

```
python3 scripts/solar_sim/sweep_bom.py scripts/solar_sim/m100_openems.csv
python3 scripts/solar_sim/nfe_solar_model.py scripts/solar_sim/m100_openems.csv
```

`m100_openems.csv` holds the site aggregate energy in 15 minute steps (site totals only, no per customer data).

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