



ENERGY STUDY · OFF-GRID SOLAR

Café and homestay (sample)

Solar ESS surveyed every appliance in the existing house and the upcoming building. Part 1 shows how much energy each building uses, why the two should share one system, and the ideal worry-free size. Part 2 compares the solutions two at a time in three matches. Part 3 gives the string design, price and full bill of materials of each solution. All prices have been removed from this published sample.

66.1 kWh

used per day, whole site

48.0 kWh

used at night, from battery

16.4 kW

design peak (70% of all-on)

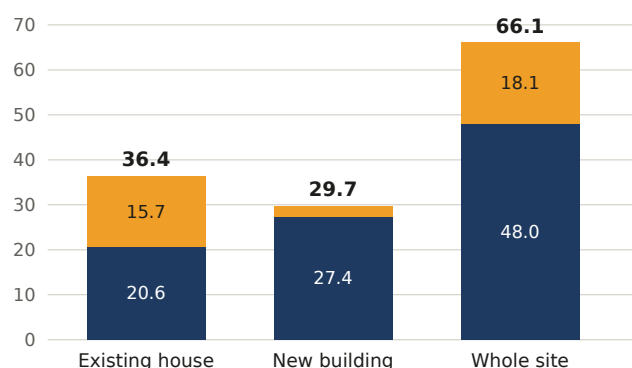
78 kWhsolar needed per day, with
15% losses

Part 1 · The existing house and the new building

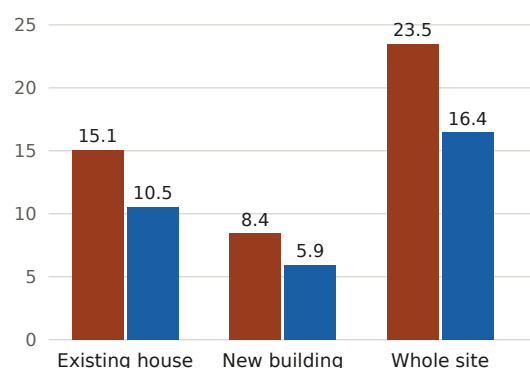
	Existing house	New building	Whole site
Energy per day	36.4 kWh	29.7 kWh	66.1 kWh
of which at night (18:00-06:00)	20.6 kWh (57%)	27.4 kWh (92%)	48.0 kWh
Everything switched on	15.1 kW	8.4 kW	23.5 kW
Design peak (70%)	10.5 kW	5.9 kW	16.4 kW
Energy per month	1,091 kWh	891 kWh	1,982 kWh

Figure 1 · Energy use and power demand by building

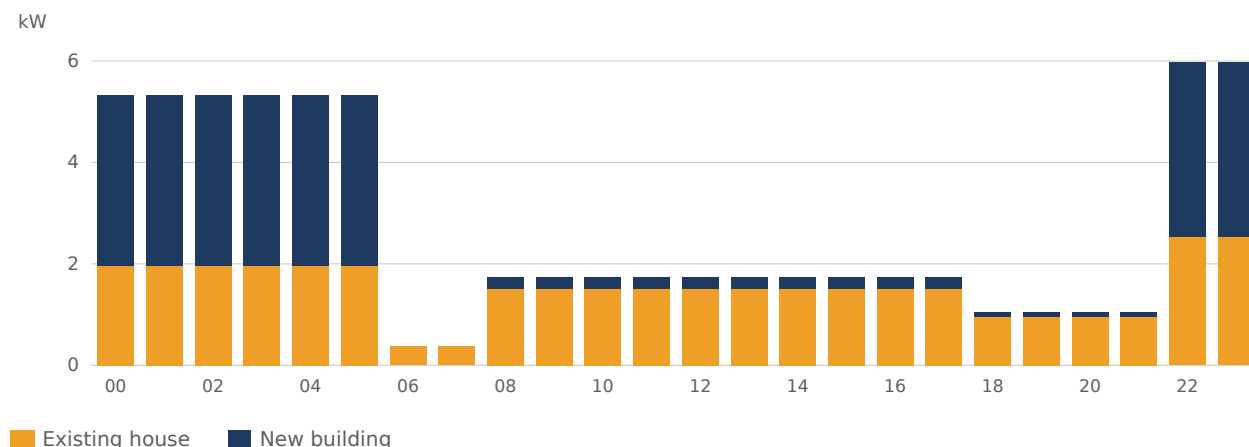
Energy per day (kWh)



Power (kW)



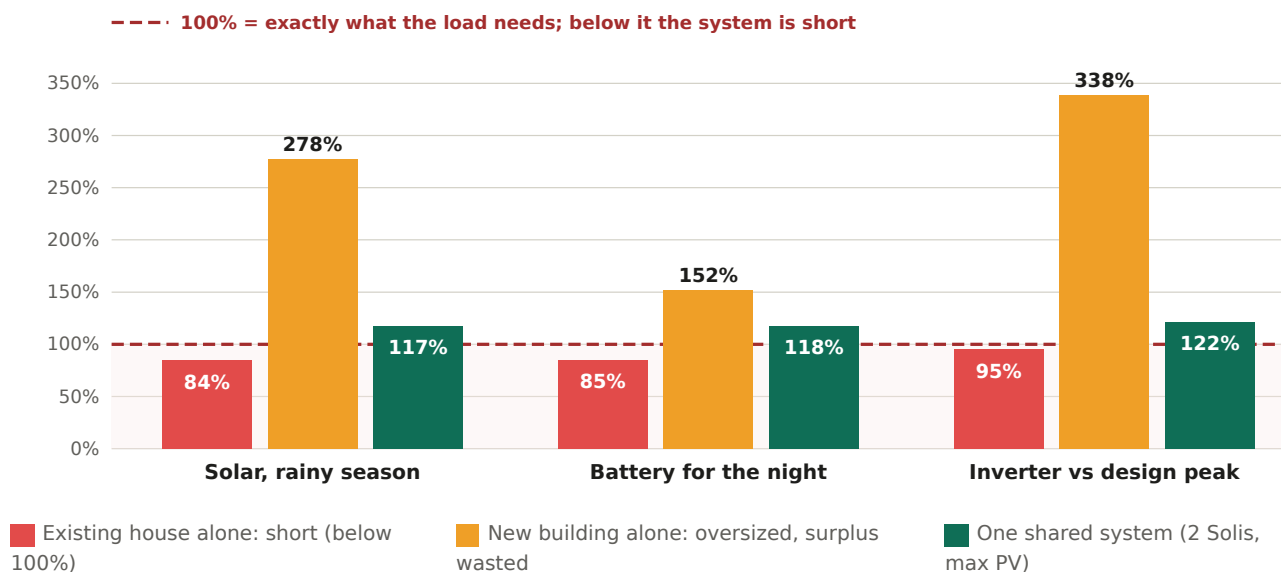
■ Daytime (06:00-18:00) ■ Night (18:00-06:00) ■ Everything on ■ Design peak (70%)

**Figure 2 · When each building uses power: average load by hour (kW, indicative)**

The existing house is a **daytime building** (café and kitchen) with short heavy peaks: kettles, coffee machine, hair dryers. The new building is a **night building**: 92% of its energy goes on guest-room air-conditioners after dark, so it depends on the battery.

Why not two separate systems?

Check	Existing house alone	New building alone
	Deye 10 kW · 2 LVTOPSUN · 20 × 580 W	2 Solis 10 kW · 3 IntelliHome · 48 × 650 W
Solar, rainy season vs need	35 / 42 kWh -16%	95 / 34 kWh +178%
Battery vs night use	18.4 / 21.6 kWh -15%	43.2 / 28.4 kWh +52%
Inverter vs design peak	10 / 10.5 kW -5%	20 / 5.9 kW +238%
Verdict	Undersized	Oversized

Figure 3 · Why not separate systems: what each system provides, as % of what its load needs



Separated, the two systems fail in opposite directions. The existing house is about 16% short of solar in the rainy season and 15% short of battery at night, so the generator would run often. The new building has about 178% more solar than it needs and over three times the inverter power, and that surplus is lost because there is no grid to sell it to. **One shared system** lets the surplus of the new building cover the gap of the old house. The target for the whole site: about **76 kWh of solar per day**, 49 kWh of usable battery at night, and 16.4 kW of inverter power.

PART 1 · CONCLUSION

The ideal size: best hybrid system, sufficient battery, full backup

If budget were not the limit, this is the system we would size for the owner: the best hybrid system for the site, with enough battery for every night and backup at every level. Every check sits in the green, so nobody has to watch the battery, stagger the kettle and coffee machine, or worry about a long rainy spell. It is the yardstick for the solutions in part 2.

45.4 kWp

20 existing + 52 new panels, 9 strings of 8

30 kW

3 × Solis 10 kW, 1-phase

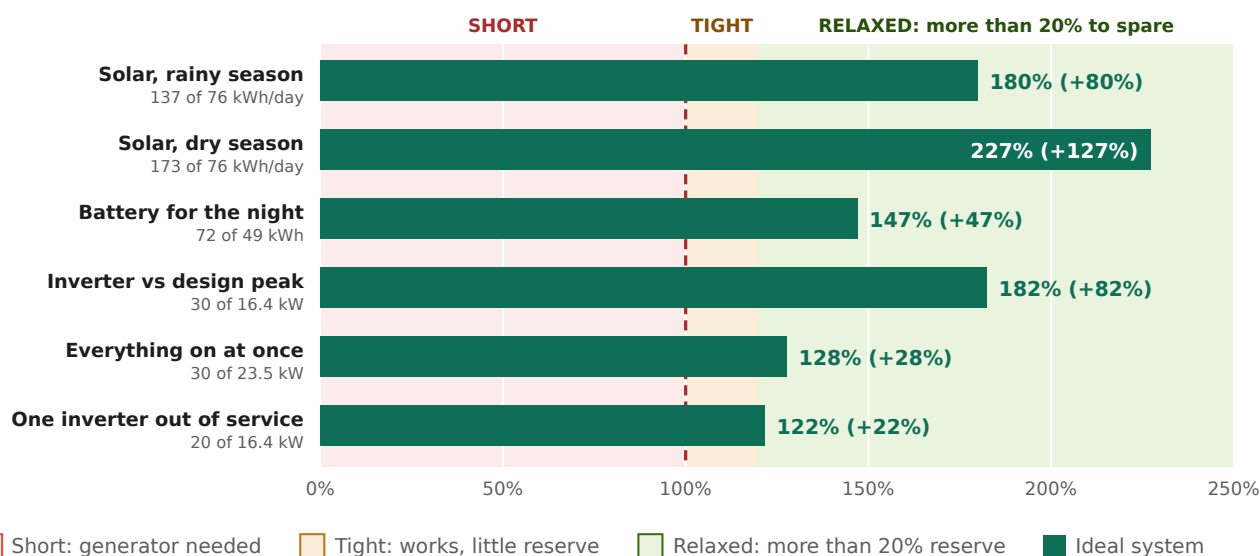
80 kWh

5 × IntelliHome 16 kWh, 10-yr warranty

Price on request

net after —
refund · —

Figure 4 · Ideal system: every margin in the green (what it provides as % of what the site needs; 100% = exactly enough)



- **Solar, 45.4 kWp:** 137 kWh/day even on a rainy-season day, 80% more than the site uses; the battery is full by late morning on most days.
- **Battery, 80 kWh:** 72 kWh usable against 49 kWh of night use, so there is still about 23 kWh at dawn after a heavy night, and the batteries age slowly at shallow cycles.
- **Inverters, 3 × 10 kW:** everything can run at once (23.5 kW), and with one inverter out of service the other two still carry the design peak.



- **Backup at three levels:** (1) battery reserve: about 23 kWh still in the battery at dawn; (2) inverter reserve: three inverters where two carry the design peak (N+1); (3) generator backup: the generator connects through the automatic transfer switch to the hybrid inverters' generator input, so it charges the batteries and carries the load only in a long run of cloudy days.
- **Best hybrid:** Solis hybrid inverters and IntelliHome batteries from one brand, all new, managed and monitored in one app, with 10-year warranties on inverters and batteries; the batteries are IP66 outdoor-rated and self-heating.

Conclusion: the dream system, beyond today's budget. At about — net, the ideal system is more than the project can afford now, so we keep it as the dream: the picture of a site that never worries about power. The solutions in part 2 are what we can afford. They cost — to — less by giving up part of this margin: one inverter fewer (20 kW, heavy loads staggered) and one battery fewer, and for the cheapest ones, less solar. Each match shows where the margin moves from green to amber or red, and every one of them can grow towards the dream later by adding an inverter, a battery or panels, without replacing anything.



PART 2 · MATCH 1

Match 1 · Sufficiency: 2 Deye 1-phase + 4 batteries vs Deye 20 kW 3-phase + 3 batteries

Both solutions keep Deye equipment. The first keeps the existing Deye 10 kW and adds one new Deye in parallel with 4 Deye SE-F16 batteries, sized just to cover the site (sufficiency). The second replaces it with one Deye 20 kW three-phase inverter and 3 batteries, plus 200 m of CV 25 mm² cable to distribute three phases and about — of extra CV 35 mm² AC cable for the three-phase inverter output and main feeder. Every string has 8 panels; the 4 existing panels left over after two strings of 8 join 4 new panels in a mixed string.

	2 Deye 1-phase + 4 Deye batteries	Deye 20 kW 3-phase + 3 Deye batteries
Inverters	2 × Deye 10 kW 1-phase (existing + 1 new)	1 × Deye 20 kW 3-phase (new)
Battery	4 × Deye SE-F16 16 kWh (64 kWh)	3 × Deye SE-F16 16 kWh (48 kWh)
Battery location	Indoor only (IP21)	Indoor only (IP21)
Solar	24.6 kWp : 20 existing + 20 new panels	19.4 kWp : 20 existing + 12 new panels
Output	1-phase, 20 kW	3-phase, about 6.7 kW per phase
Solar, rainy season	73 kWh/day -3%	55 kWh/day -28%
Solar, dry season	93 kWh/day +22%	69 kWh/day -9%
Battery for the night	57.6 kWh usable +18%	43.2 kWh usable -12%
Inverter vs design peak	20 kW +22%	20 kW +22%
Everything on at once (23.5 kW)	Stagger heavy loads	Stagger heavy loads
One inverter fails	10 kW left	Site off until repaired
Warranty: inverter / battery	5 yrs / 5 yrs (10 when registered)	5 yrs / 5 yrs (10 when registered)
Total incl. VAT	—	—
Refund	—	—
Net cost (THB)	—	—
Price per kWp	—	—

Price chart removed from this published sample. Ask us for a quotation.

Winner: 2 Deye 1-phase. For — more it gives 5.2 kWp more solar (the Deye 20 kW has only 2 MPPTs, so it takes just 4 strings), 16 kWh more battery (+18% at night instead of -12%), and keeps 10 kW running if one inverter fails, where the single 20 kW unit switches the whole site off. It is about 3% short on the darkest rainy days and +22% in the dry season; the Deye 20 kW is short all year (-28% rainy, -9% dry). Choose the 20 kW only if three-phase power is needed.



PART 2 · MATCH 2

Match 2 · Warranty: 2 Deye + 4 Deye batteries vs 2 Solis + 4 Solis batteries (10-year warranty)

Same size on both sides: two 10 kW single-phase inverters, 64 kWh of battery and 24.6 kWp of solar. The Deye solution re-uses the existing Deye inverter — (refund for the LVTOPSUN batteries). The Solis solution is all new: two Solis 10 kW and 4 IntelliHome batteries; the existing Deye inverter and batteries are returned for —

	2 Deye 1-phase + 4 Deye batteries	2 Solis + 4 Solis batteries
Inverters	2 × Deye 10 kW 1-phase (existing + 1 new)	2 × Solis 10 kW 1-phase (both new)
Battery	4 × Deye SE-F16 16 kWh (64 kWh)	4 × Solis IntelliHome 16 kWh (64 kWh)
Battery location	Indoor only (IP21)	Indoor or outdoor (IP66), self-heating
Solar	24.6 kWp: 20 existing + 20 new panels	24.6 kWp: 20 existing + 20 new panels
Output	1-phase, 20 kW	1-phase, 20 kW
Solar, rainy season	73 kWh/day -3%	73 kWh/day -3%
Solar, dry season	93 kWh/day +22%	93 kWh/day +22%
Battery for the night	57.6 kWh usable +18%	57.6 kWh usable +18%
Inverter vs design peak	20 kW +22%	20 kW +22%
Everything on at once (23.5 kW)	Stagger heavy loads	Stagger heavy loads
One inverter fails	10 kW left	10 kW left
Warranty: inverter / battery	5 yrs / 5 yrs (10 when registered)	10 yrs / 10 yrs
Total incl. VAT	—	—
Refund	—	—
Net cost (THB)	—	—
Price per kWp	—	—

Price chart removed from this published sample. Ask us for a quotation.

Same energy, different ownership. Both give identical solar and battery margins (+18% at night). Deye costs — less, because it re-uses the existing inverter. Solis adds a **10-year warranty** on inverters and batteries (Deye 5 years), IP66 outdoor-rated self-heating batteries that do not need the battery room, and an all-new single-brand system. **Winner on price: Deye. Winner on long-term risk: Solis.** Over 10 years, one out-of-warranty inverter or battery repair would roughly equal the price gap.



PART 2 · MATCH 3

Match 3 · Maximum PV: 2 Solis + 4 Solis batteries at 24.6 kWp vs at its 160% limit (29.8 kWp)

Each Solis 10 kW accepts up to 160% of its rating in PV (16 kWp). With strings of 8, the maximum is 3 strings per inverter: Solis no. 1 takes the 20 existing panels and 4 new; Solis no. 2 takes 24 new, so the pair reaches 29.8 kWp (149% of rating). One more string would exceed the limit.

	2 Solis + 4 Solis batteries	2 Solis + 4 Solis batteries, maximum PV
Inverters	2 × Solis 10 kW 1-phase (both new)	2 × Solis 10 kW (both new)
Battery	4 × Solis IntelliHome 16 kWh (64 kWh)	4 × Solis IntelliHome 16 kWh (64 kWh)
Battery location	Indoor or outdoor (IP66), self-heating	Indoor or outdoor (IP66), self-heating
Solar	24.6 kWp : 20 existing + 20 new panels	29.8 kWp : 20 existing + 28 new panels
Output	1-phase, 20 kW	1-phase, 20 kW
Solar, rainy season	73 kWh/day -3%	89 kWh/day +17%
Solar, dry season	93 kWh/day +22%	113 kWh/day +48%
Battery for the night	57.6 kWh usable +18%	57.6 kWh usable +18%
Inverter vs design peak	20 kW +22%	20 kW +22%
Everything on at once (23.5 kW)	Stagger heavy loads	Stagger heavy loads
One inverter fails	10 kW left	10 kW left
Warranty: inverter / battery	10 yrs / 10 yrs	10 yrs / 10 yrs
Total incl. VAT	—	—
Refund	—	—
Net cost (THB)	—	—
Price per kWp	—	—

Price chart removed from this published sample. Ask us for a quotation.

Winner: maximum PV. For only — more (8 new panels and mounting, about — per extra kWp) the rainy season moves from -3% to **+17%** and the dry season to **+48%**, so the generator is rarely needed and the batteries are full earlier in the day. This is the cheapest kWp in the whole study.



PART 2 · RESULT

All four solutions side by side

	2 Deye (24.6 kWp)	Deye 20 kW (19.4 kWp)	2 Solis (24.6 kWp)	2 Solis max PV (29.8 kWp)
Solar, rainy season	-3%	-28%	-3%	+17%
Battery at night	+18%	-12%	+18%	+18%
One inverter fails	10 kW left	Site off until repaired	10 kW left	10 kW left
Warranty inv. / batt.	5 / 5-10 yrs	5 / 5-10 yrs	10 / 10 yrs	10 / 10 yrs
Total incl. VAT	—	—	—	—
Net cost (THB)	—	—	—	—
Price per kWp	—	—	—	—

Price charts removed from this published sample. Ask us for a quotation.

Recommendation: 2 Solis + 4 Solis batteries with maximum PV, — net. It is the only solution with a positive margin in every season (+17% rainy, +18% battery), 10-year warranties throughout and outdoor-rated batteries. **Budget choice: 2 Deye, — net,** — less, with a shorter warranty and slightly short on the darkest rainy days; the same 8 extra panels can be added to it later. Both run on 20 kW, so the kettles, coffee machine, hair dryers and toaster should not all run together.



PART 3 · STRING DESIGN, PRICE AND BILL OF MATERIALS

Solution details

Installation is 15% of materials; maintenance 5% of installation per year for 2 years; VAT 7%. The materials total of each bill of materials is the first line of its price table, and the net cost matches parts 2 and 3.

3.1 · 2 Deye 1-phase + 4 Deye SE-F16 (24.6 kWp)

24.6 kWp 20 existing LONGi 580 W + 20 new LONGi 650 W, strings of 8	20 kW 2 × Deye 10 kW 1-phase (existing + 1 new)	64 kWh 4 × Deye SE-F16 16 kWh (64 kWh)	Price on request net cost after — refund
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String design

Inverter / MPPT	Strings × panels	kWp	Voc at 0 °C	Vmp at 70 °C	Vmp at 0 °C	Current	Inverter limits	Result
Existing Deye 10 kW · MPPT 1	1 × 8 4 existing 580 W + 4 new 650 W	4.92	430 V	298 V	364 V	13.2 A	$\leq 500 \text{ V} \cdot \text{MPPT } 150\text{--}425 \text{ V} \cdot \leq 34 \text{ A}$	OK
Existing Deye 10 kW · MPPT 2	1 × 8 existing 580 W	4.64	442 V	306 V	378 V	13.2 A	$\leq 500 \text{ V} \cdot \text{MPPT } 150\text{--}425 \text{ V} \cdot \leq 27 \text{ A}$	OK
Existing Deye 10 kW · MPPT 3	1 × 8 existing 580 W	4.64	442 V	306 V	378 V	13.2 A	$\leq 500 \text{ V} \cdot \text{MPPT } 150\text{--}425 \text{ V} \cdot \leq 27 \text{ A}$	OK
Existing Deye 10 kW: total		14.20					max PV 15 kW	OK
New Deye 10 kW · MPPT 1	1 × 8 new 650 W	5.20	418 V	289 V	349 V	15.9 A	$\leq 500 \text{ V} \cdot \text{MPPT } 150\text{--}425 \text{ V} \cdot \leq 34 \text{ A}$	OK
New Deye 10 kW · MPPT 2	1 × 8 new 650 W	5.20	418 V	289 V	349 V	15.9 A	$\leq 500 \text{ V} \cdot \text{MPPT } 150\text{--}425 \text{ V} \cdot \leq 27 \text{ A}$	OK
New Deye 10 kW: total		10.40					max PV 16 kW	OK

Each string is checked at 0 °C (highest voltage, must stay below the inverter maximum) and at 70 °C cell temperature (lowest voltage, must stay above the MPPT minimum). Every string has 8 panels. Each MPPT takes one string, or two only on the 2-MPPT inverters (Solis 10 kW, Deye 20 kW); two strings on one MPPT are always identical, so they have equal voltage. A mixed string (existing + new panels in series) runs at the current of the existing panels. Full method in appendix A2.



Price

Materials and equipment	—
Installation, commissioning and training (15% of materials)	—
Maintenance, years 1–2 — per year)	—
Total before VAT	—
VAT 7%	—
Total incl. VAT	—
Refund for equipment taken out of service	—
Net cost to the owner	—

Bill of materials

Item	Specification	Qty	Unit price	Amount (THB)
1. Inverters				
Hybrid inverter (new)	Deye 10 kW 1-phase, 48 V low-voltage battery, 3 MPPT; same model as the existing unit, for parallel operation	1 pcs	—	—
Hybrid inverter (existing)	Existing Deye 10 kW at the old house, reconnected in parallel; firmware updated to match	1 pcs	existing	-
Inverter enclosure and structure	Weather-protected wall chamber and mounting	1 lot	—	—
Inverter delivery		1 lot	—	—
2. Solar panels				
Solar panels (new)	LONGi LR8-66HVD-650M (Hi-MO X10 Guardian) 650 W, dual-glass bifacial 75%, anti-glare, 15-yr product / 30-yr power warranty	20 pcs	—	—
Solar panels (existing)	20 × LONGi 580 W already installed, all 20 in use (see string design)	20 pcs	existing	-
Panel delivery from Bangkok		1 lot	—	—
Local delivery to site		1 lot	—	—
3. Battery storage				
Lithium battery	Deye SE-F16 16 kWh LiFePO4 51.2 V 314 Ah, native with Deye inverters, indoor (battery room)	4 pcs	—	—
Battery DC breakers	Suntree SM8-250PV DC MCCB 2P 250 A, one per inverter on the common battery bank	2 pcs	—	—
Battery cable	70 mm ² , equal lengths	16 m	—	—
Battery delivery		4 pcs	—	—
4. Roof mounting (new panels)				



L-feet	T-Lock aluminium L-feet with screws and seals	60 pcs	—	—
Rails	T-Lock D-rail 4.8 m	11 pcs	—	—
Mid clamps	T-Lock 30 mm	40 pcs	—	—
End clamps	T-Lock 30 mm	11 pcs	—	—
Grounding clips	T-Lock	20 pcs	—	—
Grounding lugs	T-Lock	4 pcs	—	—
Rail splices	T-Lock	6 pcs	—	—
5. AC distribution, ATS and feeder to the old house				—
Inverter output / generator breakers	CHINT NXM-125S MCCB 2P 100 A 25 kA	2 pcs	—	—
Load circuit breakers	CHINT NXB-63 MCB 2P 63 A (new houses, old house feeder)	4 pcs	—	—
AC surge protection	Suntree SUP1H-40 2P 275 V Type 2	2 pcs	—	—
Automatic transfer switch	Suntree SQ8P-100 ATS 100 A, generator connection point	1 pcs	—	—
AC enclosure	KJL KBSS9004 steel box, waterproof	1 pcs	—	—
Feeder cable to the old house	Yazaki THW 16 mm ² , 2 cores × 50 m	100 m	—	—
Feeder earth conductor	Green/yellow 10 mm ²	50 m	—	—
Feeder conduit	Panasonic IMC 1 in, 3 m lengths	17 length	—	—
Terminals		2 set	—	—
Installation consumables		1 lot	—	—
6. DC combiner (5 strings)				—
DC breakers	Suntree SL7N-63 4P 1000 V 32 A, one per string	5 pcs	—	—
DC surge protection	Suntree SUP2H6-PV 2P 600 V Type 2, one per string	5 pcs	—	—
Terminals		4 set	—	—
DC enclosure	KJL KBSL9001 solar control box, waterproof	1 pcs	—	—
7. Cables				—
PV cable	LINK PV 4 mm ² red/black	200 m	—	—
CV cable	Yazaki CV 0.6/1 kV 1 × 35 mm ²	50 m	—	—
THW cable 25 mm ²	Yazaki copper	100 m	—	—
THW cable 16 mm ²	Yazaki copper	100 m	—	—
Earth cable 10 mm ²	Green/yellow	100 m	—	—
THW cable 6 mm ²	Yazaki copper	20 m	—	—
8. Earthing				—
Ground rods	Copper-clad 5/8 in × 8 ft	3 pcs	—	—



Ground test box	2-way	1 pcs	—	—
Inspection pit	Round	1 pcs	—	—
Exothermic welds	2-way, 35 mm ² to 5/8 in rod	3 pcs	—	—
9. Conduit and wiring				—
EMT conduit 1-1/2 in	Panasonic	1 length	—	—
Waterproof flexible conduit 1-1/2 in		10 m	—	—
IMC conduit 1 in	Panasonic	10 length	—	—
Wireway 4 × 4 in	KJL	2 length	—	—
EMT connectors 1-1/2 in		10 pcs	—	—
Flexible conduit connectors 1-1/2 in		12 pcs	—	—
HDPE conduit 1 in	50 m roll	1 roll	—	—
Total materials and equipment (carried to the price table)				—



3.2 · Deye 20 kW 3-phase + 3 Deye SE-F16 (19.4 kWp)

19.4 kWp 20 existing LONGi 580 W + 12 new LONGi 650 W, strings of 8	20 kW 1 × Deye 20 kW 3-phase (new)	48 kWh 3 × Deye SE-F16 16 kWh (48 kWh)	Price on request net cost after — refund
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String design

Inverter / MPPT	Strings × panels	kWp	Voc at 0 °C	Vmp at 70 °C	Vmp at 0 °C	Current	Inverter limits	Result
Deye 20 kW · MPPT 1	2 × 8 existing 580 W	9.28	442 V	306 V	378 V	26.3 A	≤ 800 V · MPPT 160–650 V · ≤ 36 A	OK
Deye 20 kW · MPPT 2	2 × 8 2 existing 580 W + 6 new 650 W	10.12	424 V	294 V	356 V	26.3 A	≤ 800 V · MPPT 160–650 V · ≤ 36 A	OK
Deye 20 kW: total		19.40					max PV 40 kW	OK

Each string is checked at 0 °C (highest voltage, must stay below the inverter maximum) and at 70 °C cell temperature (lowest voltage, must stay above the MPPT minimum). Every string has 8 panels. Each MPPT takes one string, or two only on the 2-MPPT inverters (Solis 10 kW, Deye 20 kW); two strings on one MPPT are always identical, so they have equal voltage. A mixed string (existing + new panels in series) runs at the current of the existing panels. Full method in appendix A2.

Price

Materials and equipment	—
Installation, commissioning and training (15% of materials)	—
Maintenance, years 1–2 — per year)	—
Total before VAT	—
VAT 7%	—
Total incl. VAT	—
Refund for equipment taken out of service	—
Net cost to the owner	—

Bill of materials

Item	Specification	Qty	Unit price	Amount (THB)
1. Inverter				
Hybrid inverter (new)	Deye SUN-20K-SG05LP3-EU-SM2, 20 kW 3-phase, 48 V low-voltage battery, 2 MPPT, 350 A battery current	1 pcs	—	—
Monitoring	Deye Wi-Fi data logger (supplied with the inverter), DeyeCloud app	1 pcs	existing	—



Inverter enclosure and structure	Weather-protected wall chamber and mounting	1 lot	—	—
Inverter delivery		1 lot	—	—
2. Solar panels				—
Solar panels (new)	LONGi LR8-66HVD-650M (Hi-MO X10 Guardian) 650 W, dual-glass bifacial 75%, anti-glare, 15-yr product / 30-yr power warranty	12 pcs	—	—
Solar panels (existing)	20 × LONGi 580 W already installed, all 20 in use (see string design)	20 pcs	existing	-
Panel delivery from Bangkok		1 lot	—	—
Local delivery to site		1 lot	—	—
3. Battery storage				—
Lithium battery	Deye SE-F16 16 kWh LiFePO4 51.2 V 314 Ah, native with Deye inverters, indoor (battery room)	3 pcs	—	—
Battery main DC breaker	DC MCCB 2P 400 A between the battery busbar and the inverter (price to confirm)	1 pcs	—	—
Battery cable	70 mm ² , 2 per pole to the inverter, equal lengths per battery	20 m	—	—
Battery delivery		3 pcs	—	—
4. Roof mounting (new panels)				—
L-feet	T-Lock aluminium L-feet with screws and seals	36 pcs	—	—
Rails	T-Lock D-rail 4.8 m	7 pcs	—	—
Mid clamps	T-Lock 30 mm	24 pcs	—	—
End clamps	T-Lock 30 mm	7 pcs	—	—
Grounding clips	T-Lock	12 pcs	—	—
Grounding lugs	T-Lock	3 pcs	—	—
Rail splices	T-Lock	3 pcs	—	—
5. AC distribution (3-phase), ATS and feeders				—
Inverter output / generator breakers	CHINT NXM-125S/4300B MCCB 4P 100 A 25 kA	2 pcs	—	—
Load circuit breakers	CHINT NXB-63 MCB 2P 63 A, one per phase group	6 pcs	—	—
AC surge protection	Suntree SUP1H-40 4P 420 V Type 2	1 pcs	—	—
Automatic transfer switch	Suntree SQ8P-100/4P ATS 4P 100 A, generator connection point	1 pcs	—	—
AC enclosure	KJL KBSS9004 steel box, waterproof	1 pcs	—	—
Extra feeder cable	CV 0.6/1 kV 1 × 25 mm ² , 3-phase distribution to the buildings (price to confirm)	200 m	—	—



Extra AC cable 35 mm ²	Yazaki CV 0.6/1 kV 1 × 35 mm ² , 3-phase inverter output and main feeder (extra for the 3-phase system)	74 m	—	—
Feeder cable to the old house	Yazaki THW 16 mm ² , 2 cores × 50 m	100 m	—	—
Feeder earth conductor	Green/yellow 10 mm ²	50 m	—	—
Feeder conduit	Panasonic IMC 1 in, 3 m lengths	17 length	—	—
Terminals		2 set	—	—
Installation consumables		1 lot	—	—
6. DC combiner (4 strings)				—
DC breakers	Suntree SL7N-63 4P 1000 V 32 A, one per string	4 pcs	—	—
DC surge protection	Suntree SUP2H8-PV 2P 800 V Type 2, one per string	4 pcs	—	—
Terminals		4 set	—	—
DC enclosure	KJL KBSL9001 solar control box, waterproof	1 pcs	—	—
7. Cables				—
PV cable	LINK PV 4 mm ² red/black	150 m	—	—
CV cable	Yazaki CV 0.6/1 kV 1 × 35 mm ²	50 m	—	—
THW cable 25 mm ²	Yazaki copper	100 m	—	—
THW cable 16 mm ²	Yazaki copper	100 m	—	—
Earth cable 10 mm ²	Green/yellow	100 m	—	—
THW cable 6 mm ²	Yazaki copper	20 m	—	—
8. Earthing				—
Ground rods	Copper-clad 5/8 in × 8 ft	3 pcs	—	—
Ground test box	2-way	1 pcs	—	—
Inspection pit	Round	1 pcs	—	—
Exothermic welds	2-way, 35 mm ² to 5/8 in rod	3 pcs	—	—
9. Conduit and wiring				—
EMT conduit 1-1/2 in	Panasonic	1 length	—	—
Waterproof flexible conduit 1-1/2 in		10 m	—	—
IMC conduit 1 in	Panasonic	10 length	—	—
Wireway 4 × 4 in	KJL	2 length	—	—
EMT connectors 1-1/2 in		10 pcs	—	—
Flexible conduit connectors 1-1/2 in		12 pcs	—	—
HDPE conduit 1 in	50 m roll	1 roll	—	—
Total materials and equipment (carried to the price table)				—



3.3 · 2 Solis + 4 IntelliHome (24.6 kWp)

24.6 kWp 20 existing LONGi 580 W + 20 new LONGi 650 W, strings of 8	20 kW 2 × Solis 10 kW 1-phase (both new)	64 kWh 4 × Solis IntelliHome 16 kWh (64 kWh)	Price on request net cost after — refund
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String design

Inverter / MPPT	Strings × panels	kWp	Voc at 0 °C	Vmp at 70 °C	Vmp at 0 °C	Current	Inverter limits	Result
Solis 10 kW no. 1 · MPPT 1	2 × 8 existing 580 W	9.28	442 V	306 V	378 V	26.3 A	≤ 500 V · MPPT 90–435 V · ≤ 42 A	OK
Solis 10 kW no. 1 · MPPT 2	1 × 8 4 existing 580 W + 4 new 650 W	4.92	430 V	298 V	364 V	13.2 A	≤ 500 V · MPPT 90–435 V · ≤ 42 A	OK
Solis 10 kW no. 1: total		14.20					max PV 16 kW	OK
Solis 10 kW no. 2 · MPPT 1	2 × 8 new 650 W	10.40	418 V	289 V	349 V	31.7 A	≤ 500 V · MPPT 90–435 V · ≤ 42 A	OK
Solis 10 kW no. 2: total		10.40					max PV 16 kW	OK

Each string is checked at 0 °C (highest voltage, must stay below the inverter maximum) and at 70 °C cell temperature (lowest voltage, must stay above the MPPT minimum). Every string has 8 panels. Each MPPT takes one string, or two only on the 2-MPPT inverters (Solis 10 kW, Deye 20 kW); two strings on one MPPT are always identical, so they have equal voltage. A mixed string (existing + new panels in series) runs at the current of the existing panels. Full method in appendix A2.

Price

Materials and equipment	—
Installation, commissioning and training (15% of materials)	—
Maintenance, years 1–2 — per year)	—
Total before VAT	—
VAT 7%	—
Total incl. VAT	—
Refund for equipment taken out of service	—
Net cost to the owner	—

Bill of materials

Item	Specification	Qty	Unit price	Amount (THB)
1. Inverters				—



Hybrid inverter (new)	Solis S6-EH1P10K-L-PLUS (21A), 10 kW 1-phase, 48 V low-voltage battery, 2 MPPT, 10-yr warranty	2 pcs	—	—
Monitoring	Solis S2-WL-ST WiFi stick, SolisCloud app	2 pcs	—	—
Inverter enclosure and structure	Weather-protected wall chamber and mounting	1 lot	—	—
Inverter delivery		1 lot	—	—
2. Solar panels				
Solar panels (new)	LONGi LR8-66HVD-650M (Hi-MO X10 Guardian) 650 W, dual-glass bifacial 75%, anti-glare, 15-yr product / 30-yr power warranty	20 pcs	—	—
Solar panels (existing)	20 × LONGi 580 W already installed, all 20 in use (see string design)	20 pcs	existing	-
Panel delivery from Bangkok		1 lot	—	—
Local delivery to site		1 lot	—	—
3. Battery storage				
Lithium battery	Solis IntelliHome 16 kWh LiFePO4 51.2 V 314 Ah, IP66, self-heating, built-in breaker, 10-yr warranty	4 pcs	—	—
Battery DC breakers	Suntree SM8-250PV DC MCCB 2P 250 A, one per inverter	2 pcs	—	—
Battery cable	70 mm ² , equal lengths	16 m	—	—
Battery delivery		4 pcs	—	—
4. Roof mounting (new panels)				
L-feet	T-Lock aluminium L-feet with screws and seals	60 pcs	—	—
Rails	T-Lock D-rail 4.8 m	11 pcs	—	—
Mid clamps	T-Lock 30 mm	40 pcs	—	—
End clamps	T-Lock 30 mm	11 pcs	—	—
Grounding clips	T-Lock	20 pcs	—	—
Grounding lugs	T-Lock	4 pcs	—	—
Rail splices	T-Lock	6 pcs	—	—
5. AC distribution, ATS and feeder to the old house				
Inverter output / generator breakers	CHINT NXM-125S MCCB 2P 100 A 25 kA	2 pcs	—	—
Load circuit breakers	CHINT NXB-63 MCB 2P 63 A (new houses, old house feeder)	4 pcs	—	—
AC surge protection	Suntree SUP1H-40 2P 275 V Type 2	2 pcs	—	—
Automatic transfer switch	Suntree SQ8P-100 ATS 100 A, generator connection point	1 pcs	—	—
AC enclosure	KJL KBSS9004 steel box, waterproof	1 pcs	—	—



Feeder cable to the old house	Yazaki THW 16 mm ² , 2 cores × 50 m	100 m	—	—
Feeder earth conductor	Green/yellow 10 mm ²	50 m	—	—
Feeder conduit	Panasonic IMC 1 in, 3 m lengths	17 length	—	—
Terminals		2 set	—	—
Installation consumables		1 lot	—	—
6. DC combiner (5 strings)				—
DC breakers	Suntree SL7N-63 4P 1000 V 32 A, one per string	5 pcs	—	—
DC surge protection	Suntree SUP2H6-PV 2P 600 V Type 2, one per string	5 pcs	—	—
Terminals		4 set	—	—
DC enclosure	KJL KBSL9001 solar control box, waterproof	1 pcs	—	—
7. Cables				—
PV cable	LINK PV 4 mm ² red/black	200 m	—	—
CV cable	Yazaki CV 0.6/1 kV 1 × 35 mm ²	50 m	—	—
THW cable 25 mm ²	Yazaki copper	100 m	—	—
THW cable 16 mm ²	Yazaki copper	100 m	—	—
Earth cable 10 mm ²	Green/yellow	100 m	—	—
THW cable 6 mm ²	Yazaki copper	20 m	—	—
8. Earthing				—
Ground rods	Copper-clad 5/8 in × 8 ft	3 pcs	—	—
Ground test box	2-way	1 pcs	—	—
Inspection pit	Round	1 pcs	—	—
Exothermic welds	2-way, 35 mm ² to 5/8 in rod	3 pcs	—	—
9. Conduit and wiring				—
EMT conduit 1-1/2 in	Panasonic	1 length	—	—
Waterproof flexible conduit 1-1/2 in		10 m	—	—
IMC conduit 1 in	Panasonic	10 length	—	—
Wireway 4 × 4 in	KJL	2 length	—	—
EMT connectors 1-1/2 in		10 pcs	—	—
Flexible conduit connectors 1-1/2 in		12 pcs	—	—
HDPE conduit 1 in	50 m roll	1 roll	—	—
Total materials and equipment (carried to the price table)				—



3.4 · 2 Solis + 4 IntelliHome, maximum PV (29.8 kWp)

29.8 kWp 20 existing LONGi 580 W + 28 new LONGi 650 W, strings of 8	20 kW 2 × Solis 10 kW (both new)	64 kWh 4 × Solis IntelliHome 16 kWh (64 kWh)	Price on request net cost after — refund
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String design

Inverter / MPPT	Strings × panels	kWp	Voc at 0 °C	Vmp at 70 °C	Vmp at 0 °C	Current	Inverter limits	Result
Solis 10 kW no. 1 · MPPT 1	2 × 8 existing 580 W	9.28	442 V	306 V	378 V	26.3 A	≤ 500 V · MPPT 90–435 V · ≤ 42 A	OK
Solis 10 kW no. 1 · MPPT 2	1 × 8 4 existing 580 W + 4 new 650 W	4.92	430 V	298 V	364 V	13.2 A	≤ 500 V · MPPT 90–435 V · ≤ 42 A	OK
Solis 10 kW no. 1: total		14.20					max PV 16 kW	OK
Solis 10 kW no. 2 · MPPT 1	2 × 8 new 650 W	10.40	418 V	289 V	349 V	31.7 A	≤ 500 V · MPPT 90–435 V · ≤ 42 A	OK
Solis 10 kW no. 2 · MPPT 2	1 × 8 new 650 W	5.20	418 V	289 V	349 V	15.9 A	≤ 500 V · MPPT 90–435 V · ≤ 42 A	OK
Solis 10 kW no. 2: total		15.60					max PV 16 kW	OK

Each string is checked at 0 °C (highest voltage, must stay below the inverter maximum) and at 70 °C cell temperature (lowest voltage, must stay above the MPPT minimum). Every string has 8 panels. Each MPPT takes one string, or two only on the 2-MPPT inverters (Solis 10 kW, Deye 20 kW); two strings on one MPPT are always identical, so they have equal voltage. A mixed string (existing + new panels in series) runs at the current of the existing panels. Full method in appendix A2.

Price

Materials and equipment	—
Installation, commissioning and training (15% of materials)	—
Maintenance, years 1–2 — per year)	—
Total before VAT	—
VAT 7%	—
Total incl. VAT	—
Refund for equipment taken out of service	—
Net cost to the owner	—

Bill of materials

Item	Specification	Qty	Unit price	Amount (THB)
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1. Inverters					—
Hybrid inverter (new)	Solis S6-EH1P10K-L-PLUS (21A), 10 kW 1-phase, 48 V low-voltage battery, 2 MPPT, 10-yr warranty	2 pcs	—	—	—
Monitoring	Solis S2-WL-ST WiFi stick, SolisCloud app	2 pcs	—	—	—
Inverter enclosure and structure	Weather-protected wall chamber and mounting	1 lot	—	—	—
Inverter delivery		1 lot	—	—	—
2. Solar panels					—
Solar panels (new)	LONGi LR8-66HVD-650M (Hi-MO X10 Guardian) 650 W, dual-glass bifacial 75%, anti-glare, 15-yr product / 30-yr power warranty	28 pcs	—	—	—
Solar panels (existing)	20 × LONGi 580 W already installed, all 20 in use (see string design)	20 pcs	existing	—	—
Panel delivery from Bangkok		1 lot	—	—	—
Local delivery to site		1 lot	—	—	—
3. Battery storage					—
Lithium battery	Solis IntelliHome 16 kWh LiFePO4 51.2 V 314 Ah, IP66, self-heating, built-in breaker, 10-yr warranty	4 pcs	—	—	—
Battery DC breakers	Suntree SM8-250PV DC MCCB 2P 250 A, one per inverter	2 pcs	—	—	—
Battery cable	70 mm ² , equal lengths	16 m	—	—	—
Battery delivery		4 pcs	—	—	—
4. Roof mounting (new panels)					—
L-feet	T-Lock aluminium L-feet with screws and seals	84 pcs	—	—	—
Rails	T-Lock D-rail 4.8 m	16 pcs	—	—	—
Mid clamps	T-Lock 30 mm	56 pcs	—	—	—
End clamps	T-Lock 30 mm	16 pcs	—	—	—
Grounding clips	T-Lock	28 pcs	—	—	—
Grounding lugs	T-Lock	6 pcs	—	—	—
Rail splices	T-Lock	8 pcs	—	—	—
5. AC distribution, ATS and feeder to the old house					—
Inverter output / generator breakers	CHINT NXM-125S MCCB 2P 100 A 25 kA	2 pcs	—	—	—
Load circuit breakers	CHINT NXB-63 MCB 2P 63 A (new houses, old house feeder)	4 pcs	—	—	—
AC surge protection	Suntree SUP1H-40 2P 275 V Type 2	2 pcs	—	—	—
Automatic transfer switch	Suntree SQ8P-100 ATS 100 A, generator connection point	1 pcs	—	—	—



AC enclosure	KJL KBSS9004 steel box, waterproof	1 pcs	—	—
Feeder cable to the old house	Yazaki THW 16 mm ² , 2 cores × 50 m	100 m	—	—
Feeder earth conductor	Green/yellow 10 mm ²	50 m	—	—
Feeder conduit	Panasonic IMC 1 in, 3 m lengths	17 length	—	—
Terminals		2 set	—	—
Installation consumables		1 lot	—	—
6. DC combiner (6 strings)				—
DC breakers	Suntree SL7N-63 4P 1000 V 32 A, one per string	6 pcs	—	—
DC surge protection	Suntree SUP2H6-PV 2P 600 V Type 2, one per string	6 pcs	—	—
Terminals		4 set	—	—
DC enclosure	KJL KBSL9001 solar control box, waterproof	1 pcs	—	—
7. Cables				—
PV cable	LINK PV 4 mm ² red/black	250 m	—	—
CV cable	Yazaki CV 0.6/1 kV 1 × 35 mm ²	50 m	—	—
THW cable 25 mm ²	Yazaki copper	100 m	—	—
THW cable 16 mm ²	Yazaki copper	100 m	—	—
Earth cable 10 mm ²	Green/yellow	100 m	—	—
THW cable 6 mm ²	Yazaki copper	20 m	—	—
8. Earthing				—
Ground rods	Copper-clad 5/8 in × 8 ft	3 pcs	—	—
Ground test box	2-way	1 pcs	—	—
Inspection pit	Round	1 pcs	—	—
Exothermic welds	2-way, 35 mm ² to 5/8 in rod	3 pcs	—	—
9. Conduit and wiring				—
EMT conduit 1-1/2 in	Panasonic	1 length	—	—
Waterproof flexible conduit 1-1/2 in		10 m	—	—
IMC conduit 1 in	Panasonic	10 length	—	—
Wireway 4 × 4 in	KJL	2 length	—	—
EMT connectors 1-1/2 in		10 pcs	—	—
Flexible conduit connectors 1-1/2 in		12 pcs	—	—
HDPE conduit 1 in	50 m roll	1 roll	—	—
Total materials and equipment (carried to the price table)				—