

Lusitano Power Blueprint

Off-Grid Energy Systems — Research Report

Lusitano Retreat · Norte Portugal (Vieira do Minho / Gerês area) Prepared: 9 June 2026 ·
Scope: 21-day build sprint (Sep 2026) base camp + future retreat backbone **Status:** Research only —
 nothing purchased. Prices gathered June 2026 from PT/ES retail and comparison sites.

1. Executive Summary

- The 21-day build sprint base camp (crew 5–10, daily video production, 24/7 fridge) needs \approx **3.4 kWh/day** including system losses — verified load-by-load, not guessed.
- September sun in our exact area delivers **4.62 kWh per installed kWp per day** (PVGIS, lat 41.62 / lon -8.14, 34° tilt). The solar maths comfortably works — clouds, not sun, are the design constraint.
- Three system levels are costed: **Level A "Survival Kit" (€700–1,200)**, **Level B "Solar Island" (€2,100–3,500) ★ recommended for the sprint**, **Level C "Retreat Backbone" (€6,000–12,000)**.
- **Level B is the seed of Level C** — the same 48V architecture grows by adding panels and battery racks. Nothing bought for September is discarded.
- Key price levers found: Tongwei 440 W panels at **€79.90** (ES supplier shipping to PT), Pylontech US5000 4.8 kWh at **€923 cash-and-carry at Obramat PT** (near Braga), Bluetti AC180 at **€479 on promo**, used OLX panels at **€0.08–0.15/W**.
- **Battery-tool-first policy:** cordless covers \sim 90% of sprint tasks; corded saws run on afternoon solar surplus (Level B) or the generator. The generator shrinks from a daily necessity (Level A, \sim 35 h/sprint, €55–70 fuel) to a grinder-and-storm tool (Level B, \sim 5–10 h, €10–25).
- **Portuguese fire law (DL 82/2021, art. 69.º) governs the generator:** on days rated 'muito elevado' or 'máximo' rural-fire danger, machinery without a spark arrestor is banned and a 6 kg extinguisher must sit beside anything that runs. September regularly hits those ratings.
- **The 700 W rule (DL 15/2022, art. 11.º n.º 5):** up to 700 W with no grid injection = zero paperwork. Above 700 W — any retreat-scale system, even fully off-grid — registration is still expected (free comunicação prévia + administrative CPE email to DGEG) and the installation must be executed/signed by a certified installer or técnico responsável (art. 84.º).

Bottom line: buy Level B before the sprint (\approx €2,100–2,700 budget route), keep a €379–639 inverter generator as the corded-tool and storm backstop, and let the same hardware grow into the retreat's permanent grid.

2. Daily Load Budget (verified)

Table A — Base camp essentials

#	Device	Watts (draw)	Hours/day	Wh/day
1	Tool battery charging — 8× 18V 5Ah (90 Wh/pack, ~110 Wh from wall incl. charger efficiency)	200–470 W (2× dual-bay)	~4 h spread	880
2	LED lighting — 2× 30 W floods + festoon strings + kitchen + 10 headlamps	~90 W peak	4–5 h	420
3	Compressor fridge 50–75 L (Dometic CFX class), 24/7 September heat	45–60 W @ ~35% duty	24 h	700
4	Phones ×9	10–20 W	overnight	200
5	Laptops ×2 (video edit 3–4 h + admin)	35–90 W	4–6 h	250
6	Content kit — drone, GoPro, mirrorless, mics	60–100 W bursts	—	220
7	4G router, 24/7	8 W	24 h	190
8	BT speaker + misc USB	10–25 W	4 h	100
9	12V water pump (Shurflo class)	60 W	0.5 h	30
	Subtotal			≈ 2,990 Wh
	+ ~12% inverter/distribution/battery round-trip losses			≈ 3.4 kWh/day design target

Realistic envelope: **2.4 kWh** (lean day, 6 packs) → **3.9 kWh** (heavy day, 10 packs + extra editing).

Watch-outs: - Starlink Mini instead of 4G adds **+0.6–0.9 kWh/day** at 24/7 — power-cycle it or stay on 4G. - Peak framing days: 4 heavy tool users can burn **12–16 pack charges (~1.8 kWh)**. Fine on Level B's surplus; breaks Level A.

Table B — Corded tools (separate budget — generator or big inverter only)

Tool	Watts	Trigger time/day	Wh/day	Note
Angle grinder 230 mm	2,000–2,200	20–40 min	700–1,500	sustained load, sags 3 kW HF inverters
Circular saw	1,400	20–30 min	500–700	universal motor, starts fine
Mitre saw station	1,800	30–60 min	900–1,800	start spike ~3 kW+
Heavy build day adds			+2.1–4.0 kWh	

Total with corded tools: **~5.5–7.4 kWh/day** — this is why corded stations never run from a small power station.

3. September Solar Resource — Norte Portugal (PVGIS-verified)

PVGIS v5.2 (SARAH2), lat 41.62 / lon -8.14 (Vieira do Minho area), 1 kWp crystalline Si, 14% system loss, optimal fixed tilt **34°**:

Month	Plane-of-array irradiation	Delivered energy
September	6.07 kWh/m²/day	4.62 kWh/kWp/day
July (peak)	6.83	5.10
October	4.21	3.33
December (worst)	2.86	2.38

- Portable panels laid flat-ish, dusty, occasionally shaded: derate to **~3.5–4.0 kWh/kWp/day**.
 - A cloudy Atlantic-front day yields **20–35% of normal**, and September can string 2–3 together.
 - **Sizing:** $3.4 \text{ kWh} \div 4.6 = 0.75 \text{ kWp}$ bare minimum (clear sky only). With cloudy-day margin and a no-generator ambition: **1.2–1.8 kWp + ≥5 kWh storage** → exactly Level B.
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4. Three System Levels

Level A — "Survival Kit" (~€500–800 core, +€250–400 generator)

Component	Spec	Cost
Power station	1 kWh / 1,800 W LiFePO4 (Bluetti AC180 ~€479–650; EcoFlow DELTA 2 ~€549–699)	€550–700
Panels	2× used 410 W residential (OLX €50–70/ea) or 220 W folding	€120–250
Petrol generator	2 kW inverter suitcase (ITCPower €379 / Genergy €639)	+€250–640

- **Balance:** harvests 1.3–1.6 kWh/day vs 3.0+ kWh demand → **daily deficit 1.5–2 kWh** → generator 1.5–2 h *every day*.
- **Can run:** lights, comms, content kit, 3–4 tool packs/day, fridge if generator tops up daily.
- **Cannot:** corded tools; a 10-pack charging day.
- **Verdict:** weekend-crew kit. Over 21 days it means ~30–40 L petrol (≈ €55–70) and constant rationing. Only if cash-gated.

Level B — "Solar Island" (~€2,100–3,500) ★ RECOMMENDED FOR THE SPRINT

Component	Spec	Cost
PV	4× 450 W new (~€80/panel, €0.13–0.18/W) = 1.8 kWp , DIY timber/pallet ground mount + ballast	€280 + €150
Battery	48V 5.12 kWh rack LiFePO4 (budget EG4-class €650–900; Pylontech US5000 €923 at Obramat PT)	€700–1,150
Inverter	3 kW 48V all-in-one MPPT inverter-charger (Growatt SPF 3000TL class €400–550; Victron route +€900)	€400–550
BOS	Fusing, SPD, earth rod, RCD board, cabling	€250
Total		€2,100–2,700 budget / ~€3,500 Victron-grade

- **Balance:** 1.8 kWp × 4.6 ≈ **7.5–8 kWh/day** harvest vs 3.4 kWh demand → battery full by noon, big afternoon surplus. Cloudy day still gives 1.8–2.5 kWh (fridge + comms + lights + a few packs).
Autonomy ≈ 1.5 days full ops / 2.5 days essentials.
- **Can run:** the entire camp incl. 16-pack days, **plus mitre and circular saw directly on afternoon sun.**
- **Marginal:** 230 mm grinder (2.2 kW sustained) — keep it on the generator.
- **Generator role shrinks to ~5–10 h total** over 21 days: €10–25 fuel.

Level C — "Retreat Backbone" (~€6,000–12,000)

Component	Spec	Cost
PV	10–12× 450 W = 4.5–5.4 kWp , galvanized ground mount	€700–1,000 + €600–900 mount
Battery	2–3× 5.12 kWh racks = 10–15 kWh	€1,400–3,000
Inverter	5–6 kW 48V (Growatt SPF 5000 ES €941; Deye hybrid €1,100–1,400; Victron MP-II 48/5000 ~€1,300)	€650–1,400
Install	DIY build + certified electrician sign-off (do at least the sign-off — insurance)	€0–2,500
Total		€6,000–7,500 DIY / €10,000–12,000 Victron + pro

- September **20–24 kWh/day**; even December averages ~12 kWh/day — year-round retreat base load covered.
- Runs grinder + mitre simultaneously, washing machine (cold cycle), 2–3 fridges/freezers, hot-tub **circulation** pumps (heating stays wood-fired — never resistive-electric off-grid), opportunistic 2.3 kW EV granny-charging on sunny afternoons.
- **Path:** Level B is the seed — same 48V architecture; add panels + racks, upgrade inverter. Nothing thrown away.

Level comparison

	Level A	Level B ★	Level C
Cost	€700–1,200 w/ genny	€2,100–3,500	€6,000–12,000
Covers 3.4 kWh/day camp	Only with daily genny	Yes, with margin	Trivially
Corded tools	Generator only	Saws on sun, grinder on genny	All on inverter
Generator hours / 21 days	~35 h	~5–10 h	~0
Future value	Resells / scout kit	Becomes Level C core	The retreat's grid

5. Component Price Guide (June 2026, PT/EU)

C = confirmed on retailer/comparator page · E = estimated from market context.

5.1 Portable power stations

Model	Capacity / output	Price EUR	Source	
Bluetti AC180	1,152 Wh / 1,800 W	€479–650	idealo.es; PT stock Decathlon/Rádio Popular/Leroy Merlin	C
EcoFlow Delta 2	1,024 Wh / 1,800 W	€600–899	KuantoKusta PT (Castro Electrónica €599.99)	C
EcoFlow Delta 2 Max	2,048 Wh / 2,400 W	€1,079–1,399	ecoflow.com.pt, ferramentas.pt	C
Bluetti AC200L	2,048 Wh / 2,400 W	€1,099–1,499	idealo.es	C
Jackery Explorer 1000 v2	1,070 Wh / 1,500 W	€529 promo (RRP €799)	eu.jackery.com	C
Jackery Explorer 2000 v2	2,042 Wh / 2,200 W	€1,099–1,149 promo	eu.jackery.com	C

Bluetti AC180 at ~€479 is the strongest €/Wh in the 1 kWh class. Promo prices churn monthly — buy on promo, never RRP.

5.2 Solar panels — rigid mono 400–485 W

Model	Power	Price	Source	
Tongwei TW	485 W	€69.90	elalmacenfotovoltaico.com (ES → ships to PT)	C
Tongwei TW promo	440 W	€79.90	same	C
Tongwei Fullblack	435 W	€78.90	same	C
LONGi Half-Cut	450 W	€189.90	same	C
Jinko Tiger N-type	410 W	€199.90	same	C
PT shops generic	410–450 W	€100–200	Castro Electrónica, C&M Pura Solar, Leroy Merlin PT	E

Working figure: **€0.16–0.45/W new**; a 4.4 kW array for ~€800 via the ES promo stock is the single biggest cost lever (watch per-panel freight).

Folding portable: EcoFlow 220 W bifacial €349 (C); Bluetti MP200 €300–499 (E). Folding costs 4–6× more per watt — rigid for fixed arrays, folding only for mobility.

5.3 LiFePO4 batteries

Model	Spec	Price	Source	
Generic drop-in	12V 100Ah (1.28 kWh)	€200–300	batteryempire.pt, lxbattery.pt	C
Green Cell / Kronobat	12V 200Ah (2.56 kWh)	€350–450	batteryempire.pt	C
Eco-Worthy / Redodo	12V 280–300Ah (3.6–3.8 kWh)	€410–450	EU (ES) warehouses	C
LiTime	24V 100Ah (2.56 kWh)	€479.99	litime.es	C
Pylontech US5000	48V 4.8 kWh rack	€923 w/ IVA	Obramat PT (cash-and-carry near Braga) ; also Leroy Merlin PT	C

Working figure: **€110–190/kWh**. Pylontech rack = best for 48V, 10-yr warranty, stocked in PT big-box stores — no freight risk.

5.4 Inverters / chargers

Model	Spec	Price	
Growatt SPF 5000 ES	48V, 5 kW, MPPT 6 kW PV, parallelable	€941 (Veco Solar)	C
Growatt SPF 3000TL HVM	24V, 3 kW, MPPT 50A	€550–750	E
Victron MultiPlus-II 24/3000	2,400 W cont., 70 A charger	€833–916	C
PowMr all-in-one 3 kW	3 kW + 80A MPPT	€230–400	E

5.5 MPPT controllers (for power-station-less DIY 12/24V)

Model	Spec	Price	
Victron SmartSolar 100/20	20 A	€77–149	C
Victron SmartSolar 100/30	30 A	€110–150	C
Victron SmartSolar 100/50	50 A	from €154	C
Epever Tracer AN class	30–40 A	€80–130	E

5.6 Petrol inverter generators (2 kW class)

Model	Power	Price	
ITC Power 2000W	2.0 kW	€379 (pccomponentes.pt)	C
Einhell / Scheppach	2.0 kW	€280–400	E
Zipper ZI-STE2000IV	2.0 kW	~€400	C
Hyundai HY2000Si	2.0 kW	€576–956	C
Genergy Limited 2000i (electric start)	2.0/1.7 kW	€639–799 (Leroy Merlin PT)	C
Honda EU22i	2.2 kW	€1,700–2,220	C (MSRP)

Honda premium is 4–5× the clones. For a build site, one €379–639 clone (+ spare carb kit) beats one EU22i on budget logic.

5.7 Cabling / safety line

Item	Price	
Victron SmartShunt 500A battery monitor	€88–110 (INNPO PT €88.05)	C
MC4 pairs	€1–2/pair multipack; Stäubli €6–10	E
6 mm ² solar cable	€1.0–1.5/m	E
Fuses, DC breakers, isolators	€10–25 each	E
Busbars + lugs	€15–30	E
Whole safety/wiring line (small system)	€150–300	E

5.8 Used market (OLX.pt / CustoJusto.pt)

Item	Typical asking	Evidence
Used rigid panels 220–300 W	€20–50/panel (€0.08–0.15/W)	olx.pt (275 W seen €31; lot of 55 in Benavente)
Used 610 W LONGi	€60	olx.pt (Lousã)
Used 2 kW inverter genny clones	€150–450	custojusto.pt — 22 listings, many pro sellers Braga/Viseu (local to build zone)
Used Honda EU10i	€1,395	custojusto.pt (Barcelos)

Used OLX panels are excellent for non-critical loads (water pumping, shed) — no warranty, test Voc on site before paying.

6. Sprint Operating Strategy

Battery-tool-first policy

18V/40V cordless covers ~90% of sprint tasks (drills, impacts, 125 mm grinder, recip, jigsaw, circular saw). Corded is reserved for *stationary* stations only: mitre bench, 230 mm grinder on granite, thicknesser. Why: no 230V leads across wet ground, silence (neighbour relations + clean audio for daily YouTube content), no fuel faff, instant availability, lower fire risk.

Daily charging rotation

Time	Action
07:00–09:30	Phones done overnight; fridge + router only on battery (~350 Wh night draw)
09:30–17:00	PV window — ALL pack charging happens here , solar feeds chargers directly
13:00	Battery-butler (rotating crew role) swaps pack shift #2; generator hour if needed (lunch masks noise)
12:00–16:00	Surplus window: mitre station, water pump, laptops, drone packs
17:30	Last rotation; chargers off; 2 emergency packs always kept charged
19:00–23:00	Lights + editing, budget ≤800 Wh

Generator discipline

- Fixed window only (13:00–14:00), never overnight, never idling.
- Siting 10 m+ from sleeping area, on a cleared mineral-soil pad.
- Hours + fuel log on a clipboard. 2 kW inverter genny burns ~0.7–1.0 L/h under load; PT petrol ~€1.75/L.
- Level A ≈ €55–70 fuel over the sprint; Level B ≈ €10–25.

🔥 September fire rules (non-negotiable)

The old fixed "período crítico" was replaced by **daily municipal fire-danger ratings** under **DL 82/2021 (SGIFR), art. 69.º** (as amended by DL 56/2023). On days rated *muito elevado* or *máximo*: - Motorised machinery working in rural territory must carry **one 6 kg extinguisher** (two if the machine exceeds 10 t) and **spark/ember retention devices**; equipment whose exhaust lacks a flame trap (tapa-chamas) is **banned outright**. - Agricultural/forest machine work is allowed only **sunset → 11:00** with the safety kit. - Our operational rule: generator pad 3–5 m cleared to mineral soil; **6 kg ABC extinguisher + 20 L backpack sprayer at the power point**; check the **IPMA fire-danger index every morning** — on red days: no generator, no dry grinding/cutting outdoors (wet-cut stone or postpone). - Refuel cold only. **Petrol is never stored indoors (0 L allowed under RT-SCIE)** — proper jerricans in a detached, ventilated shed away from camp; diesel indoors capped at 20 L. - An angle grinder on granite next to dry gorse is the #1 ignition source on site.

7. Legal Notes — Portugal

Confirm specifics with the câmara municipal and a certified electrician before first start-up. This section summarises the framework (verified against the official DL 15/2022 text and DGEG FAQ); it is not legal advice.

Action	Legal requirement	DIY allowed?	Cost of compliance
PV island ≤700 W, no injection	Exempt from all prior control — DL 15/2022, art. 11.º n.º 5 a)	Yes (plug-and-play kits <1.5 kW also self-installable, art. 84.º n.º 2)	€0
PV system >700 W–30 kW, fully off-grid	Registration still expected: free comunicação prévia on the DGEG Portal do Autoconsumo + email to autoconsumo@dgeg.gov.pt for an administrative CPE (DGEG FAQ Q19); installation must be executed by an entidade instaladora or técnico responsável (art. 84.º n.º 1) who signs the termo de responsabilidade	No — installer/técnico required above 700 W (DGEG FAQ Q21: explicit "Não" to self-install)	€0 state fees; técnico sign-off ~€100–300 market rate
230V AC fixed wiring (off-grid, ≤100 kVA)	RTIEBT technical rules (Portaria 949-A/2006); execution/attestation by habilitado profissional; no DGEG certificate gate below 100 kVA	Grey — formally needs the técnico's termo	Included in installer quote
12/24/48V DC-only micro-system	RTIEBT technical rules only	Yes	€0
Run a petrol/diesel generator	Noise: DL 9/2007 (arts. 11.º + 13.º incomodidade). Fire: DL 82/2021 art. 69.º on very-high/max danger days — spark arrestor + 6 kg extinguisher mandatory, flame-trap-less exhausts banned	Yes	~€30 extinguisher + spark-arrestor muffler
Store generator fuel	RT-SCIE (Portaria 1532/2008): petrol indoors o L (prohibited); diesel indoors ≤20 L; fines €275–2,750	Yes — outdoors, detached ventilated shed, proper jerricans	€0
Lithium battery bank	No battery-specific PT permit; storage integrated in a UPAC is declared within the UPAC registration; duty to notify property insurer of increased risk (DL 72/2008, arts. 91.º–94.º)	Yes (as part of compliant install)	€0 + possible small premium uplift
Liability insurance for UPAC ≤30 kW	Not mandatory (DGEG FAQ Q25) — recommended	n/a	Optional ~€50–150/yr

Why do the free paperwork at all? Many off-grid quintas never register and face no checks — there is no meter and no inspection trigger. But AL/tourism licensing, bank finance and insurers *will* eventually ask for it. For a commercial retreat the free comunicação prévia is cheap insurance. Note also: a UPAC ≤1 MW is exempt from municipal urbanistic prior control (termo de responsabilidade + simple communication to the câmara — ADENE guide).

8. Shopping List (Level B, budget route)

#	Item	Qty	Est. cost	Where
1	Tongwei 440–485 W panel	4	€280–320	elalmacenfotovoltaico.com (ES→PT)
2	Pylontech US5000 4.8 kWh 48V	1	€923	Obramat PT (near Braga)
3	Growatt SPF 3000TL-class 48V all-in-one	1	€400–550	vecosolar/autosolar/iberian dealers
4	DIY ground mount (timber/pallet + ballast)	1	€150	site materials + Leroy Merlin
5	Safety/wiring line (fuses, SPD, earth rod, RCD board, cable, MC4)	1	€250	amazon.es + local electrician supply
6	Victron SmartShunt 500A	1	€88	innpo.pt
7	ITCPower 2 kW inverter generator	1	€379	pccomponentes.pt
8	6 kg ABC extinguisher + backpack sprayer	1+1	€60–90	Leroy Merlin / agri store
9	Fuel cans 2× 10 L + funnel	1	€30	Leroy Merlin
	Total		≈ €2,560– 2,790	

Optional Level A bridge (if land closes late): Bluetti AC180 on promo €479 — later becomes the camp's portable/backup unit, money not wasted.

9. Risk Register

Risk	Likelihood	Impact	Mitigation
2–3 consecutive Atlantic cloud days	High (Sep)	Camp rationing	5 kWh storage + generator AC-in auto-charge; essentials-only mode (≈ 1.4 kWh/day)
Generator ignition on high fire-danger days	Low	Catastrophic	§6 fire rules (DL 82/2021 art. 69. ^o); no-generator days on máximo risk; wet-cut stone
Cheap inverter fails mid-sprint	Medium	Tools stop	Buy from dealer with EU warranty; keep AC180/power station as N+1; generator as N+2
Battery theft from unattended site	Medium	€1k+ loss	Locked tool container at night; SmartShunt/inverter app alerts; insurance
ES panel freight damage	Medium	Delays	Order 5 panels for 4 needed (spare); inspect on delivery
Underestimated tool-pack demand (16-pack days)	Medium	Charging queue	Level B surplus absorbs it; charging rotation + battery-butler role
Inverter sag on 230 mm grinder	High (Level B)	Nuisance trips	Grinder lives on the generator by policy
VAT/price drift before Sep 2026	Medium	+10–15% budget	Buy battery + inverter on first land certainty; panels are commodity

10. Maintenance Checklist

Daily (sprint): battery SOC check at 08:00 and 17:30 · generator hours log · cable walk-down (no abrasion, no water) · extinguisher in place. **Weekly:** panel wipe (dust/pollen) · connector torque check · battery terminal inspection · generator oil level · test RCD button. **Monthly (retreat phase):** SmartShunt history review · inverter firmware/app check · earth rod resistance eyeball · fuel rotation (use oldest can first). **Yearly:** electrician visual re-inspection · battery capacity test (full cycle) · generator service (plug, oil, air filter) · lightning/SPD cartridge check.

11. Next Actions

- Decision:** lock Level B budget line (\approx €2,600) into the procurement plan — sits alongside the water Level A line.
- On land certainty:** order Pylontech (Obramat Braga, cash-and-carry) + inverter first — longest-lead, price-drift-prone items.
- Panels:** price freight for 5× Tongwei from elalmacenfotovoltaico.com to the build municipality; fallback = Castro Electrónica PT.
- Generator:** buy ITCPower €379 *or* watch CustoJusto Braga/Viseu pro sellers for a €150–300 used clone; add spark arrestor + extinguisher in the same order.

5. **Electrician + DGEG:** ask RC-Advogados/local contacts for a certified installer/técnico quote (installation + termo de responsabilidade, €100–300) — and file the free comunicação prévia (DGEG portal + administrative-CPE email to autoconsumo@dgeg.gov.pt) once the system address exists. Book the técnico for sprint week 1.
 6. **Crew prep:** add "battery butler" role + charging rotation table to the War-Day system; print the fire-rules card (EN/PT) for the power point.
 7. **Content:** the system build itself is a YouTube episode — "Powering 21 days off-grid for €2,600".
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12. Real-World Reference Setups

1. **Project Kamp (Abrantes, PT)** — Dave Hakkens' documented volunteer build camp; closest like-for-like (same country, volunteer crews, daily video). Their evolution: generator + small solar → ~3–5 kWp PV + LiFePO₄ + Victron island grid.
 2. **Kris Harbour Natural Building (Wales)** — multi-year off-grid self-build on ~2 kWp PV + DIY micro-hydro + 48V bank; validates the cordless-first / stationary-tools-on-inverter split.
 3. **FarOutRide (measured vanlife data)** — logged ≈1.2–1.6 kWh/day for 2 people with compressor fridge, laptops, lights; scaling to 8–10 crew sharing one fridge cross-checks our ~3.0 kWh/day base figure.
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Sources (key)

- PVGIS (EU JRC) — lat 41.62 / lon -8.14, PVcalc API
- ecoflow.com.pt · bluettipower.eu · eu.jackery.com · idealo.es · kuantokusta.pt
- elalmacenfotovoltaico.com (panels, ships to PT) · castroelectronica.pt · leroymerlin.pt
- obramat.pt (Pylontech US5000 €923) · batteryempire.pt · litime.es · redodopower.es
- vecosolar.com / autosolar.es (Growatt) · innpo.pt (Victron)
- pccomponentes.pt (ITCPower) · hondaencasa.com · sorilux.com
- olx.pt / custojusto.pt (used market)
- DL 15/2022 (UPAC/SEN — art. 11.º, 84.º read verbatim from Diário da República PDF) · DGEG FAQ autoconsumo (Q19/Q21/Q25) · ADENE Guia Legislativo Autoconsumo · DL 82/2021 art. 69.º (fire/machinery) · DL 9/2007 (noise) · RT-SCIE Portaria 1532/2008 (fuel storage) · DL 72/2008 arts. 91.º–94.º (insurance disclosure)

Report compiled from three parallel research agents (component prices PT/EU · Portuguese legal framework · load engineering + PVGIS) for the Lusitano Retreat open-build documentation project.