Parts List & Overview

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A DIY solar repeater can be built for roughly $90 - $140 using commodity parts (with the solar-capable Heltec V4; a stripped-down V3 build can come in lower). This build creates a weatherproof, autonomous LoRa mesh repeater powered entirely by solar with enough battery reserve to ride through multiple cloudy days. Prices below are approximate and parts-dependent, as of 2026-06-08; component prices drift over time, and totals exclude shipping.

Full Parts List

Component	Recommended Option	Cost	Notes
LoRa node	Heltec V3 *or* Heltec V4	V3 ~$20 - $35; V4 ~$45 - $50	Heltec V4 (~$45-50) added a built-in solar charge input and is preferred for solar builds; the older V3 (~$20-35) lacks it and needs an external charge controller. Prices as of 2026-06-08.
Alternative node	RAK WisBlock (RAK4631 + RAK19007)	~$31 - $35	RAK4631 core (~$21-23) + RAK19007 base (~$9.99) ≈ $31-35 combined (as of 2026-06-08). Lower power draw; more expensive than a bare Heltec V3 but the nRF52840 runs cooler.
Antenna	5 dBi fiberglass omni	$12 - $20	RAK 5.8 dBi fiberglass is a community favourite at ~$30 - $40 (prices as of 2026-06-08). Budget fiberglass omni gain figures are often marketing-inflated; treat quoted dBi as nominal and do not assume the full gain in link/EIRP calculations.

Component	Recommended Option	Cost	Notes
Coax pigtail	SMA pigtail, 15 - 30cm	$3 - $5	Match connector type to your node (SMA or RP-SMA). Note: RP-SMA is not more weather-resistant than SMA - they share the same body and thread, only pin polarity differs.
Solar panel	6W 6V monocrystalline	$15 - $20	A 6V panel matches the CN3791 6V variant directly; a TP4056 will also accept ~6V but is a linear (non-MPPT) charger, so the CN3791 is strongly preferred for solar. Commodity pricing as of 2026-06-08.
Battery	Samsung INR18650-35E 18650, ~3500mAh	~$10	Counterfeit and re-wrapped 18650 cells are common on open marketplaces - buy from a reputable battery vendor and avoid suspiciously cheap or overstated-capacity cells. Use a protected cell or pair with a BMS.
Charge controller	CN3791 MPPT module	$3 - $5	More efficient than TP4056; better for variable solar; supports 6V input (the CN3791 6V variant is matched to a 6V panel)
Inline fuse + holder	1 - 3 A inline fuse, sized to wiring	~$2	Place on the battery positive lead to protect against short-circuit fire. Reference the wiring order in the Assembly Guide.
Enclosure	Zulkit IP65 150×100×70mm	$12	Hinged lid; 2 cable glands included
Cable glands	PG7 (thin cables, ~3-6.5mm) or PG9 (coax, ~4-8mm)	$3 - $5	For antenna pigtail and solar wires entering enclosure
Mounting hardware	U-bolt + hose clamps or pole mount	$5 - $8	Stainless steel preferred for outdoor longevity
Desiccant	Silica gel packs 5g	$2	Place inside enclosure; replace or regenerate annually (regenerate indicating silica gel at ~120 °C for 2-3 hours)

Component	Recommended Option	Cost	Notes
Sealant & misc	Silicone sealant, zip ties, heat shrink	$5	Seal cable glands and any penetrations

Total estimated cost: ~$90 - $140 for a V4 solar build (as of 2026-06-08), depending on component choices. A bare-bones V3 build can come in lower. The total is the sum of the line-item ranges above and is traceable to them; it excludes shipping.

Power Budget

Before building, verify the solar panel and battery are adequately sized for your location and expected traffic. The figures below are board- and config-dependent estimates (ESP32 with a screen draws more; nRF52/sleep configs draw less) - measure your own device for an accurate budget.

Parameter	Value	Notes
Average current draw	20 - 40 mA	Typical repeater with moderate traffic; board- and config-dependent
Daily energy use	~2.22 Wh/day (low-traffic)	25mA × 3.7V × 24h. This assumes the low end of the 20-40 mA range; at 40 mA daily use rises to ~3.55 Wh/day. Treat 2.22 Wh/day as a best-case low-traffic figure.
6W panel, 2.5 peak sun hours, 70% efficiency	10.5 Wh/day	~4.7× margin over low-traffic consumption - but this assumes the panel is clear and producing. For year-round North Dakota, multi-day snow cover and overcast strings can drop harvest near zero; size the battery for 5-7 days of no solar and use more than one cell.
Single 3500mAh 18650 capacity	12.95 Wh	3500mAh × 3.7V; covers ~5.8 days with no solar at low traffic. A single cell is marginal for harsh winters - prefer a multi-cell pack.

Build Overview

The build has four main stages:

1. **Flash firmware** - flash MeshCore Repeater variant onto the node before sealing it in the enclosure
2. **Wire the power system** - solar panel → charge controller → battery → node, with an inline fuse on the battery positive lead. When wiring an MPPT-style controller, connect the

battery to the controller *before* the solar panel so the controller can detect the system voltage.
3. **Weatherproof the enclosure** - cable glands, sealant, desiccant
4. **Mount and aim** - antenna orientation, solar panel angle

See the Assembly Guide page for step-by-step wiring and mounting details.

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