

Table S1. Solar Energy System Materials

Monocrystalline Solar Panel (330 Wp)	System voltage: 1000V-1500V Number of cells: 60 cells Efficiency of PV modules (module efficiency): 19.96% under Standard Test Conditions (Standard Test Conditions: 1000W/m ² irradiance, 25°C module temperature and AM=1.5 spectrum) Ambient temperature range of PV modules: -20 °C / +40 °C, PV modules operating temperature range: -40°C /+85°C, PV modules relative humidity range: 0% to 95% Diode maximum current rating: 15 Amps Maximum wind load: 2400 Pa Maximum snow load: 5400 Pa Solar panel size: 1670 mm x 1005 mm x 35 mm Solar panel weight: 18.4 kg Rated power voltage: 34.3 V Rated power current: 9.78 Amps Open circuit voltage: 41.54 V Short circuit current: 10.4 Amps
Battery	The energy range: 5.1-12.8 kWh Maximum output current: 25 Amps Rated voltage value: 204 V Operating voltage range: 160-230 V Dimensions: 712x585x298 mm Weight: 91 kg Operating temperature range: -10 °C / +50 °C Battery cell technology: lithium iron phosphate Communication module: CAN/RS 485 Protection class: IP 55 Efficiency: at least 96% Connection types: ON Grid / ON Grid + Backup / OFF Grid Warranty period: 10 years
Inverter (5 kW_e)	Maximum power point tracking: two DC input voltage range: 80-1000V Rated input voltage: 610 V Supply start input voltage: 80 V Maximum usable input current: 12.5 Amps Maximum short-circuit current: 18.75 Amps Maximum PV generator output power: 7.5 kW _p Rated AC output current: (220/230 V) 7.2 Amps Operating frequency value: 50/60 (45-65) Hz Total harmonic distortion rate: Less than 3.5% Power factor (cos ϕ): between 0.7-1 Dimensions: 530x474x165 mm Weight 15.6kg Protection class: IP 66

	<p>Active cooling system: yes</p> <p>Operating temperature range: -25 °C / +60 °C</p> <p>Operating humidity range: 0-100%</p> <p>Maximum altitude range: 3000-4000 m</p> <p>Maximum efficiency: 98.2%</p>
DC Cable	<p>Maximum rated voltage: 1800 VDC</p> <p>Operating temperature range: -40°C to +90°C</p> <p>Maximum conductor temperature: +120° C</p>
AC Cable	<p>Size :17 mm</p> <p>Net weight: 517 kg/km</p> <p>Conductor resistance: maximum 3.08 ohms/km</p> <p>Current carrying capacity: 55 A in soil, 43 A in air</p> <p>Conductor type: copper</p> <p>Maximum operating temperature: +70° C</p> <p>Operating ambient temperature: -20° C to +60° C</p>
Construction	<p>Material: Aluminum</p> <p>Pressure: Resistant to wind, storm, snow load (minimum 5400 Pascal if not specified in the project)</p> <p>Life: 10 years</p> <p>Rust/corrosion resistant: yes</p> <p>All connections are waterproof and shockproof</p>
Connector	<p>Waterproof, UV-insulated, resistant to abrasion, ozone, decay and corrosion, the negative effects of the atmosphere and hydrolysis, natural oils, chemicals and rodents</p> <p>Works with high performance even at high temperatures</p>
Irradiation Sensor	<p>Supply voltage 12 V</p> <p>Measuring range: -25° C to +75° C</p> <p>Sensor dimensions: 140x100x26 mm</p> <p>Protection class: IP20</p> <p>Irradiation sensor device interface: RS422</p>