

SunCycle™

Closed-circuit solar thermal energy recirculation and conversion system with Peltier cell electricity generation

“Solar Heat. Endless Power.”

Technology

This invention presents a closed-circuit solar thermal energy recirculation and conversion system designed to optimise solar heat absorption and transform it into usable electrical energy using Peltier cells. Unlike traditional solar thermal or photovoltaic systems, this hybrid solution merges solar thermal collection, thermoelectric energy conversion, and energy storage into a single, integrated, and efficient platform. Using a vertically oriented array of black-painted PVC pipes and thermally conductive materials, the system captures solar radiation, circulates heat via pumps to a thermal reservoir, and converts that heat into direct current (DC) electricity through a bank of Peltier cells. An onboard energy management system stores the electricity in a 12V battery or directs it for immediate use in household or off-grid applications.

Market need

The rising cost of electricity, the environmental impact of fossil fuels, and increasing energy insecurity, especially in developing and off-grid regions, have significantly boosted the demand for low-cost, renewable, and reliable energy solutions. However, existing systems face various limitations, including low efficiency in converting solar thermal energy into electricity, intermittent energy availability due to dependence on weather and daylight, and poor integration between thermal systems and electricity generation or storage. This invention addresses these challenges by recirculating thermal energy for continuous operation and using Peltier cells to efficiently convert wasted thermal gradients into usable electrical energy.



Features

- Rechargeable battery integration for surplus DC electricity storage.
- Lightweight and modular design using low-cost, corrosion-resistant materials.
- Thermal reservoir for heat storage with integrated Peltier cells for thermoelectric conversion.
- Dual circulation pumps for heat transfer and recirculation.



Benefits

- Continuous electricity generation beyond daylight hours via thermal recirculation.
- Suitable for rural or remote installations.
- Lower operational cost with minimal maintenance needs.
- Reduced reliance on fossil fuels, supporting carbon reduction targets.



Industry

Energy

Potential applications

- Off-grid power generation: provides electricity for remote or rural areas without access to the main grid.
- Residential renewable energy systems: supplements household power with a compact, hybrid solar–thermal–electric setup.
- Industrial heat recovery: converts excess or waste heat from industrial processes into usable electricity.
- Sustainable building integration: supports eco-friendly building designs with renewable power and thermal management.
- Emergency and mobile power units: offer reliable electricity for disaster relief, field operations, or mobile labs.
- Agricultural and rural infrastructure: powers irrigation systems, sensors, and small-scale machinery using stored solar energy.

Creator

Prof Lukas Snyman

Stage of development

Prototype

Intellectual property

Patent Protection

Desired relationship

Co-development, Investors