The system is centered on palm-inspired tensegrity structures, each featuring custom-made monocrystalline photovoltaic (PV) "leaves." The use of monocrystalline silicon represents a reliable and proven solar technology, aligning with the competition's requirement for commercially available PV cells with a minimum 25-year operational lifespan. This excludes the use of emerging technologies such as organic photovoltaics (OPV) or perovskite cells for the core 75 kW mini-grid, though custom panel configurations using monocrystalline silicon are permissible.

A key technical innovation lies in the biomimetic design of the PV "leaves." Their sloped geometry not only evokes the form of palm foliage but also serves dual functional purposes: optimizing solar exposure and channeling rainwater into concealed reservoirs. While optimal solar efficiency in Fiji's Southern Hemisphere location typically calls for north-facing panels tilted at approximately 19 degrees, the competition brief explicitly allows for deviation from this standard to accommodate aesthetic or multifunctional design intents. To address energy yield variations caused by non-uniform panel orientation, the system could incorporate inverter technologies with multiple maximum power point trackers (MPPTs), enhancing energy harvesting across differing angles.

In addition to energy generation, the Solar Leaf design integrates sustainable water harvesting. Rainfall captured by the sloped PV surfaces is directed into integrated reservoirs, offering a practical and low-tech method of supporting Marou Village's freshwater needs—particularly critical during extended dry seasons, when existing water storage has proven insufficient. While this approach meets the baseline requirement for water capture, the design also leaves room for expanded or more innovative rainwater strategies as the project evolves.

Designed for longevity and community ownership, the system emphasizes constructability, modularity, and ease of maintenance. The tensegrity structure's modular format has the potential to simplify local assembly and long-term upkeep, especially if designed with local materials, skills, and logistical realities in mind. Accessibility to PV panels, reservoirs, power electronics, and energy storage systems must be prioritized to ensure straightforward maintenance over a projected service life exceeding 30 years.

Resilience is a core requirement. While detailed structural calculations are not expected at the concept stage, the system must be conceived with realistic assumptions about environmental stresses, including exposure to Category 5 cyclones and salt-laden coastal winds. Considerations for corrosion resistance, minimal use of vulnerable moving parts, and robust anchoring systems should inform material selection and detailing. The competition organizers will support winning teams with advanced engineering consultation during the pilot project phase to ensure the design meets all required performance standards.