## **1. Concept Narrative**

Our design, "Bula Sun," draws inspiration from Marou's seafaring heritage and the iTaukei community's values of shared resources and cooperation. The installation features sail-like solar panel arrays that capture both sunlight and rainwater, that will help provide sustainable energy and clean water for the 67 households of the village.

The structure's form references traditional Fijian sailing vessels while incorporating contemporary sustainable technologies. The wave-like support element connects the design to the surrounding ocean environment, creating visual harmony with the coastal landscape. The concrete base grounds the installation and houses the water collection system beneath, with surface grates allowing efficient rainwater capture.

Materially, I prioritized weather-resistant and replaceable components capable of withstanding tropical cyclone conditions. The aluminum structural framework supports high-efficiency solar panels, while stainless steel connections ensure durability in the marine environment. The concrete base provides necessary stability against extreme winds while housing water storage.

By integrating these elements, Bula Sun responds to both cultural and environmental contexts while supporting the communal values central to Marou Village.

## **2. Technical Narrative**

Our design integrates high-efficiency solar photovoltaic technology with an innovative rainwater harvesting system specifically engineered for Marou Village's climate conditions.

The installation utilizes 244 standard 410W solar panels arranged in sail-like configurations, generating a 100kW system capacity. These off-the-shelf panels are mounted on an aluminum framework designed to optimize energy capture throughout the day while creating visual interest through the sail-like silhouette. Importantly, the system can accommodate alternative panel models if needed in the future, ensuring long-term adaptability.

The rainwater collection system channels precipitation through integrated gutters to surface grates on the concrete base. The underground storage reservoir can collect up to 170,700 liters during wet months. This significant capacity helps address Marou's seasonal rainfall variation, with 250-400mm monthly during wet season and 80-150mm during dry season.

System inputs include:

* Solar radiation captured by PV panels
* Rainfall harvested from sail surfaces and base grates

System outputs include:

* 100kW electrical power for community use
* Up to 170,700 liters of filtered water monthly during the wet season

The system is designed to let wind pass through the sails, helping withstand Category 5 cyclone conditions with wind speeds up to 145mph.

## **3. Prototyping and Pilot Implementation Statement**

Our implementation approach prioritizes modularity and community involvement. All components are designed to fit on small boats that can access Marou's shore, addressing the critical logistical challenge of material transport to this remote location. The use of standardized, off-the-shelf components ensures both initial construction feasibility and long-term repairability.

The prototyping process will begin with scaled models tested in controlled environments simulating Marou's climate conditions, particularly focusing on cyclone-force wind resistance. Community input will be integrated from the earliest design refinement stages, with village leaders from various Mataqali clans contributing to aesthetic and functional considerations.

Implementation will follow a phased approach:

1. Site preparation with community labor guided by technical experts
2. Foundation and concrete base construction
3. Assembly of aluminum framework and support structures
4. Installation of water collection systems and storage
5. Mounting of solar panels and electrical infrastructure
6. Testing and commissioning with community participation

## **4. Operations and Maintenance Statement**

The Solar Sails installation is designed for operational simplicity and low-maintenance requirements, essential for a remote location like Marou Village.

Regular maintenance includes:

* Monthly cleaning of solar panels to remove salt spray and debris
* Quarterly inspection of aluminum framework and stainless steel connections
* Seasonal cleaning of water collection grates and filtration systems
* Annual professional inspection of electrical components

Critical to the maintenance strategy is the use of standardized, off-the-shelf components throughout the design. This approach ensures that replacement parts are readily available when needed, avoiding the costly and time-consuming custom fabrication that often plagues remote renewable installations. The system's modular design allows individual components to be replaced without disrupting overall functionality.

## **5. Environmental Impact Assessment**

The Solar Sails installation has been designed with careful consideration of its environmental footprint on Marou Island's sensitive ecosystem. The primary structure occupies minimal ground area, preserving valuable land. It can also be scaled up or down depending on conditions once construction begins. The metals used are non-toxic and do not corrode easily.

Potential environmental impacts include:

* Limited soil disturbance during foundation construction
* Temporary habitat disruption during installation
* Modified rainwater runoff patterns around the concrete base

Mitigation strategies include:

* Designing water overflow systems that mimic natural drainage patterns
* Using non-toxic materials throughout to prevent leaching into groundwater

The design avoids bird strike risks through visible patterns on solar surfaces and strategic spacing between sail elements. Construction methods prioritize minimal site disruption, with components sized for small-boat transport to avoid the need for new access routes.

Long-term benefits include reduced dependence on fossil fuel generators, eliminating associated pollution risks, and decreased pressure on natural freshwater sources. The installation serves as a demonstration of harmonious integration between renewable energy infrastructure and natural island ecosystems.