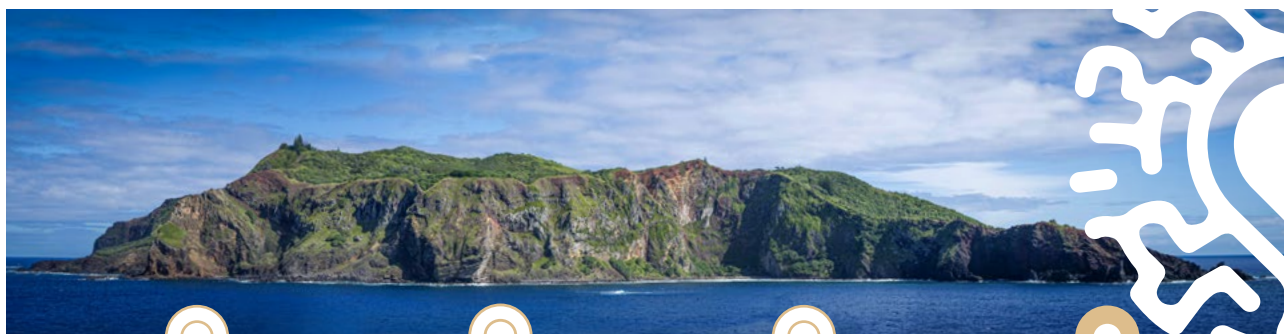
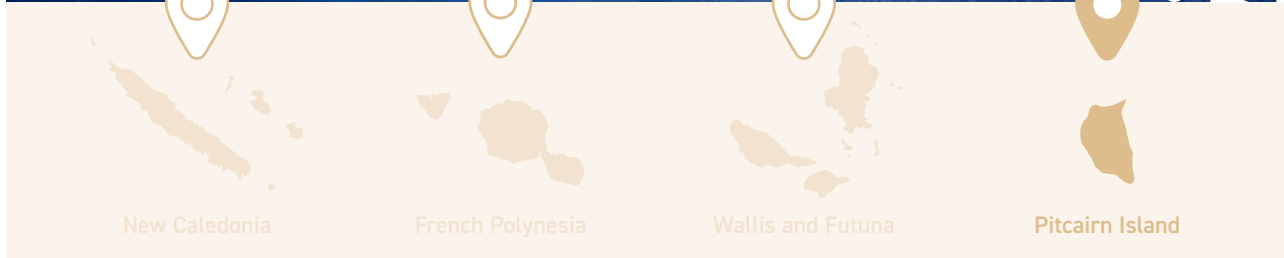




# SUPPLY AND INSTALLATION OF A HYBRID PHOTOVOLTAIC SOLAR POWER SYSTEM ON PITCAIRN

New Caledonia      French Polynesia      Wallis and Futuna      Pitcairn Island

**BUDGET :** EUR 429,000 (XPF 51.2 million)      **ACTION TIME PERIOD :** September 2019 - September 2024

**PARTNERS :**   

## BRIEF SUMMARY

The supply and installation of a hybrid photovoltaic solar power system on Pitcairn forms part of an energy transition initiative aimed at reducing the island's dependence on diesel.

Despite the logistical and budget challenges, the project has increased solar power generation capacity and improved grid stability, delivering a more reliable and uninterrupted supply of power.

It has also helped build local capacity through technical training in managing and maintaining the microgrid.

However, further improvements are needed, particularly to optimise energy storage and modernise the grid, so as to secure the system's long-term sustainability and maximise its environmental and economic impact.





## BACKGROUND

The Pitcairn Islands are the only British Overseas Territory in the Pacific Ocean and are comprised of four islands (Pitcairn, Henderson, Ducie and Oeno) with a total land area of 47 km<sup>2</sup>. They are located approximately 500 km from French Polynesia's easternmost airport, which is on Mangareva in the Gambier Islands.

These islands are only accessible by boat and only Pitcairn Island is inhabited on a permanent basis. With a population of around 40, it is the least populated political entity in the world. The vast majority of inhabitants are descendants of the Bounty mutineers and their Tahitian wives.

Until Brexit, Pitcairn was an Overseas Territory associated with the European Union (EU) and thus a beneficiary of the European Development Fund (EDF). Despite the United Kingdom's withdrawal from the EU, funding from the 11<sup>th</sup> EDF that had been allocated to the territory under the PROTEGE project was maintained.

However, cooperation with other European Pacific territories is difficult due to Pitcairn's isolation. To support its energy development, the Pitcairn Islands applied to the European Union for a budget allocation from the 11<sup>th</sup> Regional EDF for the supply and installation of a hybrid photovoltaic solar power system. The goal of this initiative is to reduce the territory's dependence on fossil fuels, thereby achieving its energy transition objectives.



**"The Pitcairn islands are one of the most isolated and remote island groups in the world"**

## ISSUES AND OBJECTIVES

When the project began, Pitcairn Island relied entirely on diesel generators for its electricity supply. Power was only available between 6 a.m. and 10 p.m., except for essential infrastructure such as the health centre, satellite station and the homes of patients relying on ventilators, where the power supply was uninterrupted. This heavy dependence on diesel generated high costs and a large carbon footprint, with fuel consumption estimated at 75,000 litres per year.

Pitcairn's electricity consumption is estimated to be 150,000 kWh per year, or 400 kWh per day. This is spread across households (61%) and public infrastructure (39%), including government buildings, the health centre, the church and the school. The main source of electricity consumption is domestic refrigeration, with some families owning up to six or seven refrigerators and freezers.

The PROTEGE-funded project initially aimed to cut diesel use by 95%, or the equivalent of 75,000 (sic) litres a year, by installing a hybrid solar/diesel system. This system would provide the Adamstown community with reliable, affordable, clean electricity and boost the island's energy self-sufficiency.

The objective of this renewable energy project was to progressively replace fossil fuel with solar power and ensure that every household and government building on the island was connected to the grid.

Thanks to this new system, the Adamstown community and Pitcairn's authorities would have access to reliable, affordable, sustainable energy and the Pitcairn Islands would become less dependent on fossil-fuel-powered generators.





## OUTCOMES

🌿 The European Union had already funded a feasibility study on renewable energy for the Pitcairn Islands in 2017, through OCTA Innovation.

When PROTEGE was established, it included plans for a field visit to assess the Pitcairn community's energy requirements in greater detail. However, the COVID-19 pandemic meant that this visit could not take place, as the Pitcairn Islands were closed and solutions had to be found to do the work remotely.

A coordination working group was set up, comprised of the PROTEGE project manager, an engineer from the Pacific Community (SPC) and local experts from Pitcairn.

SPC then launched a Request for Proposals (RFP), leading to the Korean company OEI being contracted to design a study. The company was selected to help the SPC and Pitcairn teams finalise the Terms of Reference, a particularly technical document rendered all the more complex by the island's isolation and the pandemic.

To compensate for the lack of an on-site visit, SPC acquired satellite images via New Caledonia company BlueCham, providing OEI with a detailed view of the terrain and allowing for more precise analysis and design.

## 🌿 Initial study on the design of a hybrid photovoltaic solar power system for the Pitcairn Islands

The study was conducted using advanced simulations (Homer Pro) to optimise solar power generation and storage capacity while accounting for local constraints such as weather conditions, energy demand and seasonal variations.

The system that was chosen comprised a 134 kW photovoltaic power station, a 1594 kWh battery storage system capable of supplying electricity for three days without sunshine, and a backup diesel generator (Caterpillar 120 kW - 50 Hz) to ensure power stability when needed.

The simulations forecast that annual electricity demand would increase from 150,000 kWh to 193,800 kWh as power is made available around the clock. The proposed hybrid system would cover 96.2% of energy requirements from solar power, limiting diesel-fuelled generation to just 3.8%.

A number of upgrades are required to optimise the grid. These include installing an automated control system for efficient management with minimal human intervention, modernising the electrical grid to avoid energy losses and ensure stable distribution, and incorporating a LED lighting system to improve overall energy efficiency.

The study also pointed to the need to consider various logistical constraints, such as the complexity of transporting equipment to this extremely remote island, the need to train local operators to maintain and manage the system to ensure the project's long-term sustainability, and the need to improve grid stability to avoid brownouts at its extremities.

All parties approved the final design and an international RFP was launched in 2021 for Phase 2: design and installation of the solar power system.



## Lack of viable proposals, leading to discussions with Pitcairn authorities

The RFP to supply, install and deploy a hybrid solar power system on Pitcairn Island was unsuccessful. The proposals received far exceeded the allocated budget and no co-funding was available from either the Pitcairn or British authorities to cover the difference.

During the review process, a monitoring committee, composed of teams from SPC and the Pitcairn authorities, noted that any negotiation on the budget would be impossible, as the bids were too far above the project's available funding.

In an effort to break this stalemate, discussions began with the Pitcairn authorities to explore alternative solutions that would allow the project to go ahead under acceptable conditions. One option considered was to directly allocate a grant to the local authorities so that they could procure the necessary equipment themselves and expand the existing infrastructure by adding compatible equipment.

However, given the island's limited resources and significant logistical and technical constraints, in the end, the decision was made that SPC would issue a new RFP but with a reduced scope. This new scope was designed in consultation with SPC's technical specialists (GEM Division) and local technical agents so as to adapt the project to Pitcairn's actual needs and capacity.

## A new RFP for the installation of a hybrid photovoltaic solar power system

A new RFP was issued to select a contractor for the supply and installation of a hybrid photovoltaic solar power system on Pitcairn Island and the related local training. The deadlines were particularly tight as the project was already behind schedule.

The new project involved installing a hybrid solar power system including photovoltaic panels with a minimum capacity of 20 kW, battery storage of at least 60 kWh, a power management system and monitoring interface, as well as connection to the existing electrical grid. Training of local operators was also included, so that they could maintain and operate the system. Additionally, a waste management plan was created, particularly for battery recycling, along with post-installation monitoring and after-sales service to guarantee the system for the long-term.

The successful bid came from the company 6 Star Group Yarnda Gana. They followed a precise implementation schedule that included installing the solar panels and batteries, connecting to the existing grid and incorporating the diesel generators, testing, and the gradual commissioning of the hybrid system, as well as training Pitcairn residents in how to manage and maintain the microgrid themselves.

The work was done between 13 and 29 September 2024, in a close collaboration between the technical team and residents to ensure smooth implementation adapted to local constraints. The Government of the Pitcairn Islands moved 96 solar panels from government buildings to add them to those provided by this project, increasing the solar power system's capacity from 26 kW (funded by this project) to 62.16 kW, thanks to the additional 96 solar panels on government buildings. This improvement has significantly reduced reliance on diesel by substantially increasing renewable energy production. In the six months since the system was installed, the Government of the Pitcairn Island's diesel consumption fell by around 80%.

However, the technical study highlighted several challenges. As the island's electrical equipment is ageing, the cables and grid need to be upgraded to reduce voltage losses. Phase imbalance was also observed, meaning a better distribution of power supply is needed to effectively serve those households on the edges of the grid. Additionally, some resident-owned solar power systems are malfunctioning, particularly the batteries and inverters.

To sustain the system, an ongoing improvement programme was proposed that would include adding more batteries and inverters for greater grid stability. Residents received comprehensive training as well as remote technical support for a period of 12 months to ensure regular monitoring of the microgrid, assist with any malfunctions and produce a quarterly report on the system's performance and the savings generated.

The UK Government has funded a study, which is currently ongoing, to propose upgrades to the cables and grid.





## PROSPECTS AND SUSTAINABILITY

🌱 The project represents a major success in Pitcairn's energy transition. It has significantly increased solar power production, boosting the share of renewable energy in the island's electricity supply. Thanks to this modernisation, the electrical grid has become significantly more reliable, ensuring a more stable and uninterrupted power supply for the community. Additionally, the expected reduction in diesel consumption will lower energy costs, easing the economic burden associated with fuel imports.

At the same time, the project has helped strengthen skills locally, by training residents to manage and maintain the microgrid so that they are more self-sufficient when it comes to operating the system.

Nonetheless, certain structural improvements are still needed to fully optimise the microgrid's impact and ensure its long-term sustainability. In particular, these adjustments will involve optimising the electrical grid, improving energy storage management, and modernising equipment on an ongoing basis to ensure maximum efficiency.



## KEY FIGURES

**-80%**  
drop in diesel consumption  
in the first six months

**150 000 kWh**  
per year = the island's energy  
consumption

**40**  
of the world's most  
isolated inhabitants



## FIRST-HAND ACCOUNT

### SHAWN CHRISTIAN

*Operations Division Manager,  
Government of Pitcairn Islands*



*With the introduction and implementation of solar power on Pitcairn Island, we've seen a remarkable improvement in our energy independence, reducing reliance on expensive fuel shipments and minimizing our environmental impact. The system is both efficient and easy for us to maintain, and it has provided us with a constant and reliable source of energy. Our community enjoys the benefits of modern technology, from lighting our homes to powering communication devices, without the constant worry of running out of power. Not only has this made life more convenient, but it's also aligned with our values of sustainability and self-sufficiency. The micro solar power initiative has allowed our small community to thrive while respecting the delicate ecosystem around us. It's a forward-thinking solution that has brought lasting positive change to our island, and I wholeheartedly recommend it to any community seeking a greener, more reliable energy future.*





Find all the lessons-learned factsheets on Pitcairn  
freely available on our website.



**PROTEGE**  
PACIFIC TERRITORIES REGIONAL PROJECT FOR  
SUSTAINABLE ECOSYSTEM MANAGEMENT

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