

Niue Natural Grid & Energy Unlimited.

Energy independence for Niue

An Overview.

Objectives of this document.

This document is an overview of **IslandPower** and the **Niue Natural Grid** project. Its objectives are to inform readers of what will be required to deliver a Resilient, Renewable, Energy System for the island of Niue. Below are some of the issues that we address:

- **Where we are now**
- **Explain what the Niue Natural Grid is**
 - What is involved
 - Where and how it will start
 - The importance of resilience
- **Explain who IslandPower is**
 - What they do
 - How they do it
- **Explain who IslandPower's partners are**
- **Explain the Development Alliance**
 - What they do
 - How they do it
 - How they get paid
- **How the community gets involved**
- **What the benefits are to Niue**
- **What the possible downside are**

CONTENTS

p4 Prologue:

p4 Introduction: Energy First

p5 Introduction: Niue Natural Grid

p6 Introduction: Grid in a box

p7 Section one:

p8 Section one: Where we are now

p13 Section two:

p14 Section two: Niue Natural Grid

p18 Section three:

p19 Section three: Social independence

p21 Section four:

p22 Section four: Financial independence

p24 Section five:

p25 Section five: Next Steps

p28 Section six:

p29 Section six: Frequently Asked Questions



Energy Independence.

How Niue Natural Grid delivers Resilience.

Energy independence and resilience for Niue protects against and responds to potentially devastating natural and man-made disasters.



Cyclones.



Black Outs.



Heatwaves.



Not all extreme events are predictable – but disruption may be minimised by the right design and preparation

Introduction: Energy First

Place, People and Power

Energy in all its forms is central to sustainable development of local communities of place.

Since residence requires local energy use in one form or another utility bills are often required as proof of residence.

IslandPower's “Energy First” approach to climate finance and sustainable development is founded on local energy users of Niue Natural Grid infrastructure with the aim of energy independence and resilience.



Introduction: about the Niue Natural Grid.

Niue Natural Grid is Energy Independence

We aim to ensure that Niue has sustainable renewable energy all day, every day releasing Niue from its current reliance on high cost diesel fuelled power generation.

The crucial needs for reliable water supply and air conditioning rely on the capacity of the grid to deliver and maintain a stable electricity supply.

Climate change and unexpected weather events can have a big effect on the demands on the existing electrical grid. Cyclones, freakishly hot days, extended periods of rain require a resilient grid responsive to demand, with capacity equal to the task.

The resilient, renewable energy system which mobilises Niue natural power, thermal and biological resources as efficiently as possible will be the “Niue Natural Grid”

Niue Natural Grid is Social Independence.

We hear the needs of the people of Niue. We see the costs and uses of Niue electricity, fuel, food and water. Armed with this information we design flexible energy solutions with Niue current needs and future desires in mind.

A network of renewable Niue “Village Power” microgrids will be rolled out using technology such as solar, wind, battery storage and ocean cooling.

The capacity of Niue Power’s skilled energy managers to operate and maintain village microgrids with the support of village energy user communities is crucial.

The organic Niue network of mutual agreements between village energy users, service provider alliances led by Niue Power and investors will be “Niue Energy Unlimited”

Niue Natural Grid is Financial Independence

All infrastructure requires development finance during design and construction and long term funding once operational.

We will convene village Development Alliances between Niue utility service providers and the finance and technology partners who will receive an energy-based return on development investment.

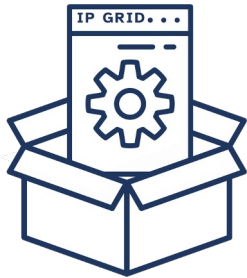
Once development is complete Niue Power will provide and oversee energy services to village Energy Treasury user groups which allocate surplus energy value net of operating costs.

The long term funding of stable, secure flows of renewable energy from the Niue Natural Grid provides a store of value perfect for long term, careful investors such as Niue residents, pensioners and diaspora: a “Niue Natural Equity”.

Introduction - how to build a “Natural Grid in a Box.”

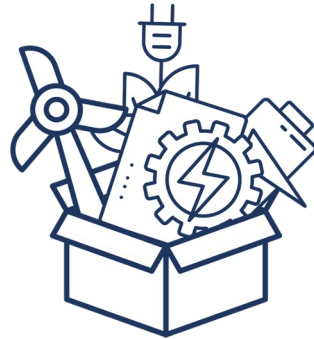
As with any process there are Stages to the development. We will start off small, one village at a time, to ensure that we get it right.

Stage 1. (map)



Working with Niue’s villages, Niue’s Ministry and Government, Churches, businesses and Niue Power we will identify a number of villages to install a pilot site. These sites will be the first to be fully functioning and will be monitored for the energy they use.

Stage 2. (design)



We will undertake energy mapping and development of an energy ledger with local community, energy users, government, academia and network operators. We assess existing and future energy needs. Designing in the need for communication and transportation.

Stage 3. (build)



Our **Capital Partners** with **Original Equipment Manufactures (OEMs)**, **Niue Power** and local **Development Partners** to install the energy network for the community. The design of the energy network that enables flexibility and resilience; growing with demand.

Stage 4. (operate)



The operational phase of the project uses our local **Operational Partners** to maintain the system. Energy savings are returned to the local community. Throughout this period we will analyse energy demand.



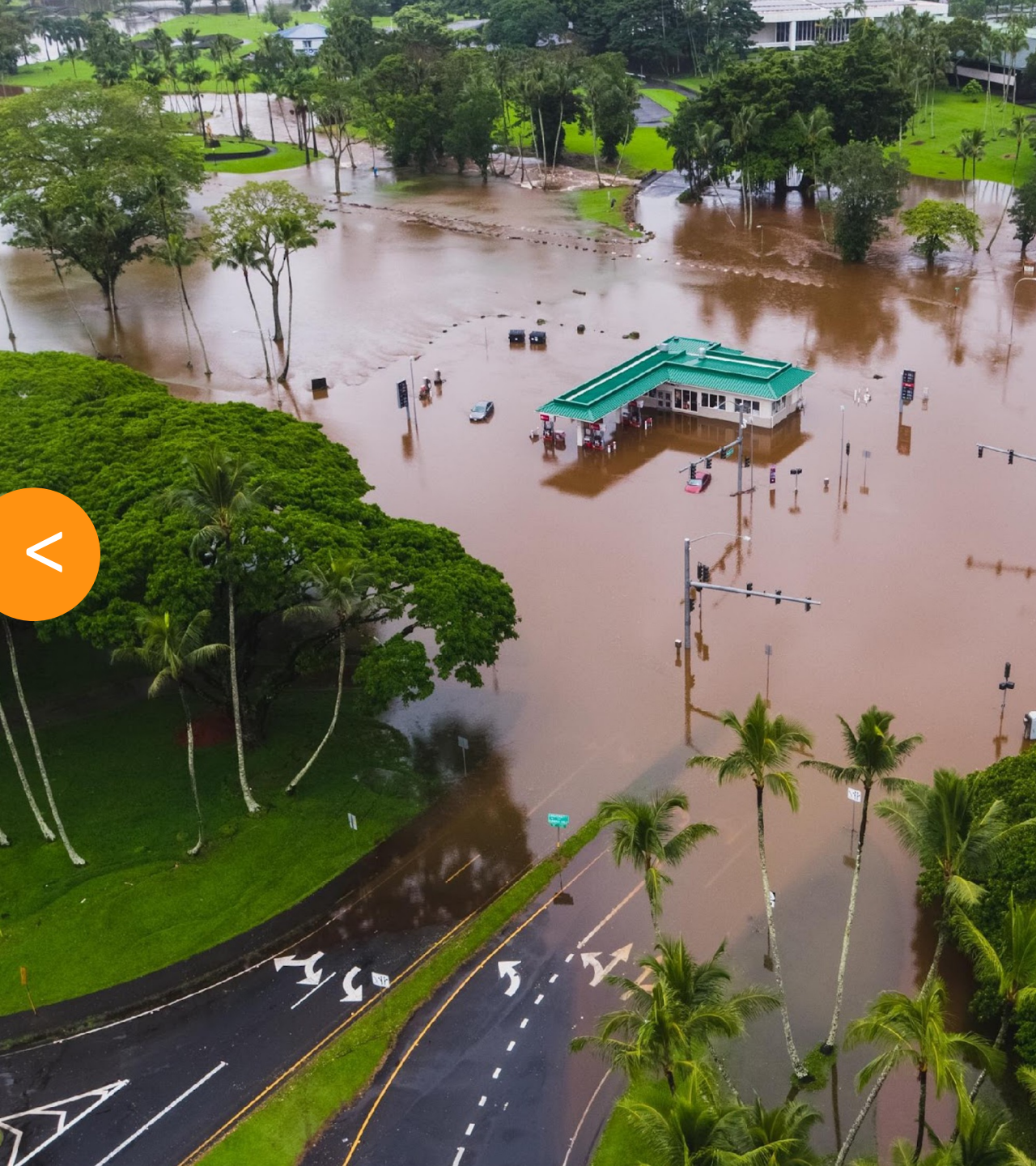
1 Section one: Where we are now – need for stability

Niue is in a unique position to achieve or even exceed its renewable goals with the right strategy and application. In order to achieve this we must address both the causes of blackouts and the cost of energy.

Firstly, there are several causes of Niue blackouts and shutdowns ranging from planned maintenance to internal breakdowns; from weather events e.g., storms, unusually high or low ambient temperatures to surges in demand overloading the power station's capacity to react. Introduction of renewables has increased Niue's cost of both energy production and capacity.

More important than identifying the cause is to identify precisely the vulnerable points in the system and the effects of their failure on Niue

In this section, we'll take a look at some of the main things that break down and lead to unplanned shutdowns, regardless of the initial cause, as well as how we may address them.





Power cuts

When the power goes off everything stops from pumping water to charging your phone. The impact of power outages can be dramatic when communications and technology such as computers or TVs fail and costly when loss of refrigeration results in spoilt food.

The more renewables introduced onto the grid, the more unstable the grid gets. Wherever grids transition to renewable energy, costs of integration often exceed cost savings from renewable energy production. This excludes any climate change gases.

The Niue Natural Grid initiative enables Niue to leapfrog issues that blight most grid managers through a localised rather than centralised system. The central power plant will not be redundant – quite the opposite – it will be integral to Niue’s energy stability and resilience.



Water supply

Loss of water is an existential threat in tropical climates. Not only must you contend with the interruption to your daily life but you must also take into account the time that it takes for the service to be restored.

Let’s not forget that the loss of water has a big impact on Niue residents and businesses, posing a critical health and safety risk from sanitation to basic survival.

Working with the Director of Utilities, we will address the issues of water loss and water storage with the outcome being water resilience.

At its core water resource resilience will enable the island of Niue to lower its energy consumption whilst increasing water storage capacity and improving access.





Temperature

Temperature control is essential to modern living. Tourists expect air conditioning in tropical locations along with chilled food and drinks and hot showers. As a consequence, temperature control is often the biggest energy drain in a grid consuming up to 70% of electricity.

Temperature control is an expensive necessity which impacts heavily on Niue's economy.

To address 70% of Niue energy demand with unstable renewables from large centralised solar farms requires a lot of land area which are inappropriate or unavailable in Niue.

The Niue Natural Grid approach is to work back from the desired outcome of cooling and identified the best combination of technologies to deliver cooling at the least possible carbon fuel cost to Niue.



Food

Food is expensive to store in tropical environments. Refrigeration controls can be sensitive and subject to failure if there is a blackout. That's why a stable energy supply minimises the risk of refrigerator failure and spoiled food.

Later on in this document we outline how Natural Grid development will result in excess energy. This valuable resource can be directed towards projects supporting Niue fishing and agriculture.

By way of example Cold Stores (big freezers) and fish processing have large energy demands which would cause the grid to crash. The Niue Natural Grid will direct excess energy generated to the priorities of keeping the lights on and chillers working. Any excess may then be used for powering fishing vessels or transport to distribute produce.



Communications

Full resilience means ensuring that Niue's telecommunication and data services can run independently of the grid using renewable energy.

Working with Niue Telecom, each location will aim to become self sufficient in energy. Although energy demand by communications is light the spare capacity necessary for resilience across 14 locations is a useful local resource.

But it doesn't stop there. Niue also requires a domestic data centre. The introduction of small scale self sufficient data centres distributed throughout the island will not only add system resilience to Niue but also enable Niue to control crucial data.

Integration of a resilient, renewable telecommunications and data network with a natural grid energy network potentially enables coverage in parts of the island not currently served.



Transport

Diesel and petrol is expensive to ship in and there is no guarantee that the supply vessel will arrive on time or that the fuel price will be stable. Reliance on costly fuel supply chains represents perhaps Niue's greatest vulnerability.

But imagine the difference from an electric powered or hydrogen fuelled car or boat. Now the energy you use to "fill her up" is generated by the Niue Natural Grid.

So, now 'tourist dollars' entering Niue and spent on charging/fuelling transport remains in Niue rather than leaving the island, thereby enhancing Niue's economic independence.

Further in the future surplus renewable energy generation could enable Niue to develop domestic fishing fleet in order to benefit from the sustainable natural wealth of Niue's Blue Pacific domain.



Balancing the Grid

Experience to date is that introduction of new renewable grid supply increases energy demand and imbalances. Because renewables are difficult to manage – the wind doesn't blow, the sun doesn't shine at night or is obscured by cloud cover – then the need for grid balancing limits energy production.

This has an adverse effect on the grid, limiting Niue Power's ability to anticipate energy demand with energy production and impacting their ability to keep the lights on.

So the perverse outcome is that introduction of renewables can increase both diesel generation and use of battery storage to balance the system increasing the cost of grid operation.



Sustainable Growth

Energy availability and cost is a limiting factor everywhere for economic growth. Nowhere is this truer than a remote location like Niue at the end of long and costly supply chains.

Energy systems are designed to address current demand, with limited flexibility and spare capacity needed for resilience.

So mismatched power generation, transition and distribution equipment to provide the additional capacity. This often results in limited supply. Conventional project finance is short-term and transactional lacking long term sustainability.

IslandPower's development finance grows flows of natural Niue energy to form the basis of long term sustainable funding.



SECTION ONE: WHERE WE ARE NOW



www.island-power.net



Where we are now – stabilisation

We have seen in this section the importance of energy in supporting day to day life on Niue. Whether that is keeping the lights on in your home or pumping water to the hotels on the island. Without reliable power, services cease to operate which in turn means that more money has to be spent to rectify the problem. Resources that could be directed to services and infrastructure that benefit Niue.

A lot of excellent work has been done on Niue managing the grid and analysing energy usage and available resources. All of which will feed into Niue Natural Grid mapping and analysis of the grid, which we describe in Section four.

Our first priority is to stabilize the grid to limit black/brown outs. Once achieved we can then look at the potential of expanding the energy supply to provide for services like Electric Vehicles or additional air cooling. All of which are designed around the energy resources available in each village.



2 Section two: Niue Natural Grid

Much excellent work and research has created the basis of a Niue electricity grid capable of accommodating the growing needs of Niue.

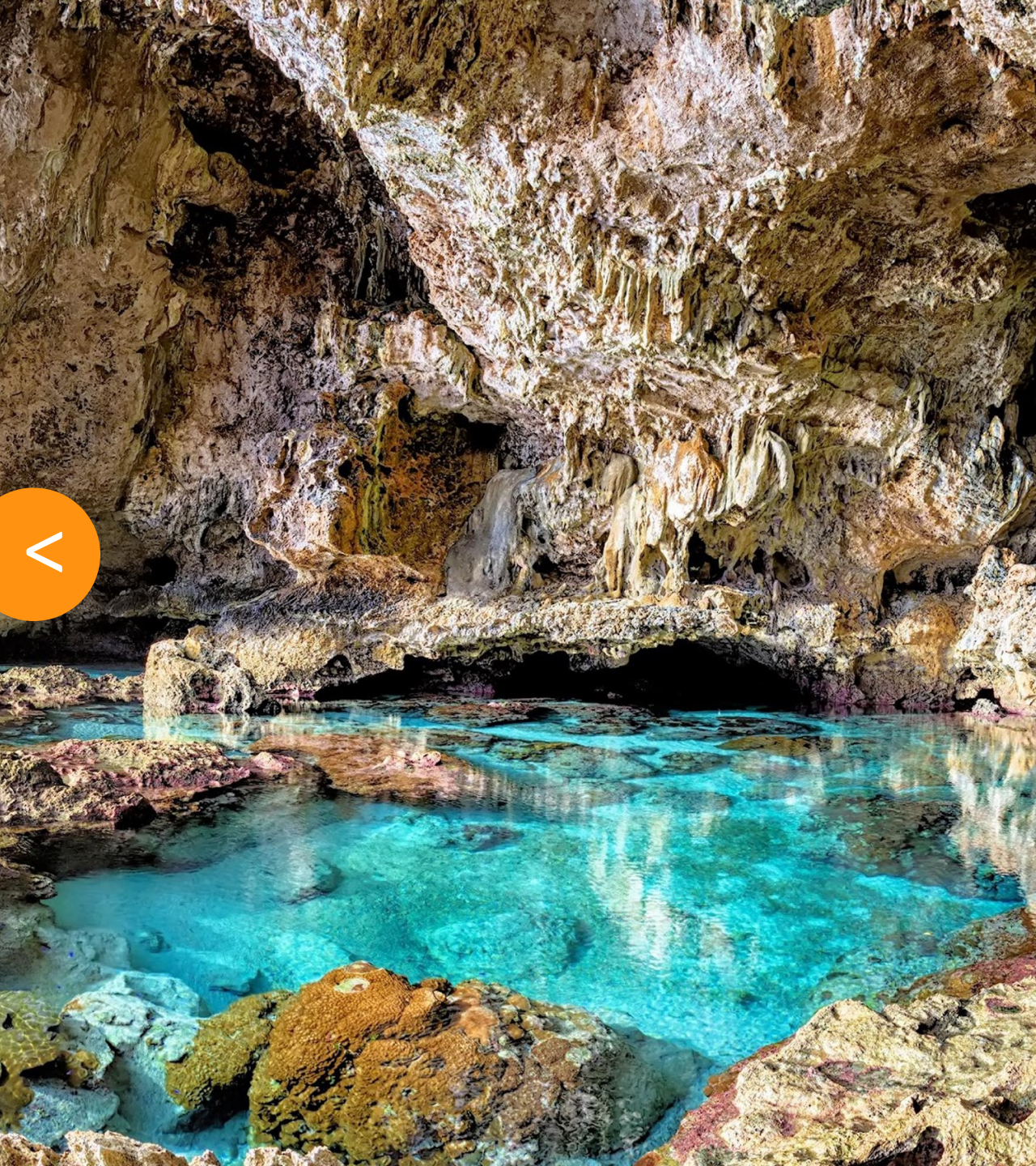
On this foundation we will examine with the people of Niue the composition of future sustainable Niue energy demand and the design of a flexible and resilient system capable of adapting to future events and demands without increased cost and complexity.

Enter the **Niue Natural Grid**: an island owned energy grid grown organically from the ground-up; house by house, business by business, village by village.

You may have noticed that we refer to '**energy grid**' not '**electricity grid**'. The reason is that our starting point is with current energy use, such as diesel-fuelled electricity for cooling, to which our network of energy professionals, academics and equipment manufacturers will apply more efficient systems, such as water cooling from the ocean

The outcome is to generate drastic fuel savings which will be available to be shared between service providers, financiers and village energy users as an energy dividend.

Section Two covers the Niue Natural Grid, what it is and how it works. **Let's dive in and take a deeper look.**





Natural Grid

A Natural Grid harnesses the sustainable resources that are found on and around the island to ensure flexible resilient energy is able to be delivered without interruption to the energy users.

It's not about installing one type of technology, like solar panels. It's about looking at a whole solution. For instance, using waste biomass (food waste) to generate electricity and heat. Or ocean water to provide cooling.

The key thing is to ensure that we are planning for the future demand and aspiration of Niue as well as sustainably using local natural resources.

The outcome is a grid that is resilient and that will, over time, produce an energy surplus which can be directed into new forms of technology, such as Electric Vehicles, Hydrogen powered fishing vessels or even a Cold Store for fish.



Niue Energy Unlimited

Niue Natural Grid will be created bottom up from the grassroots, not imposed top-down. It's about involving everyone in ensuring energy needs and wants are met and cultural requirements are observed and honoured. Working with the people of Niue, we seek to identify "quick wins" as the first step on a 'roadmap' for rapid renewable adoption.

A people-centred Natural Grid enables current needs and future wants – freezers, computers, electric vehicles – to be met.

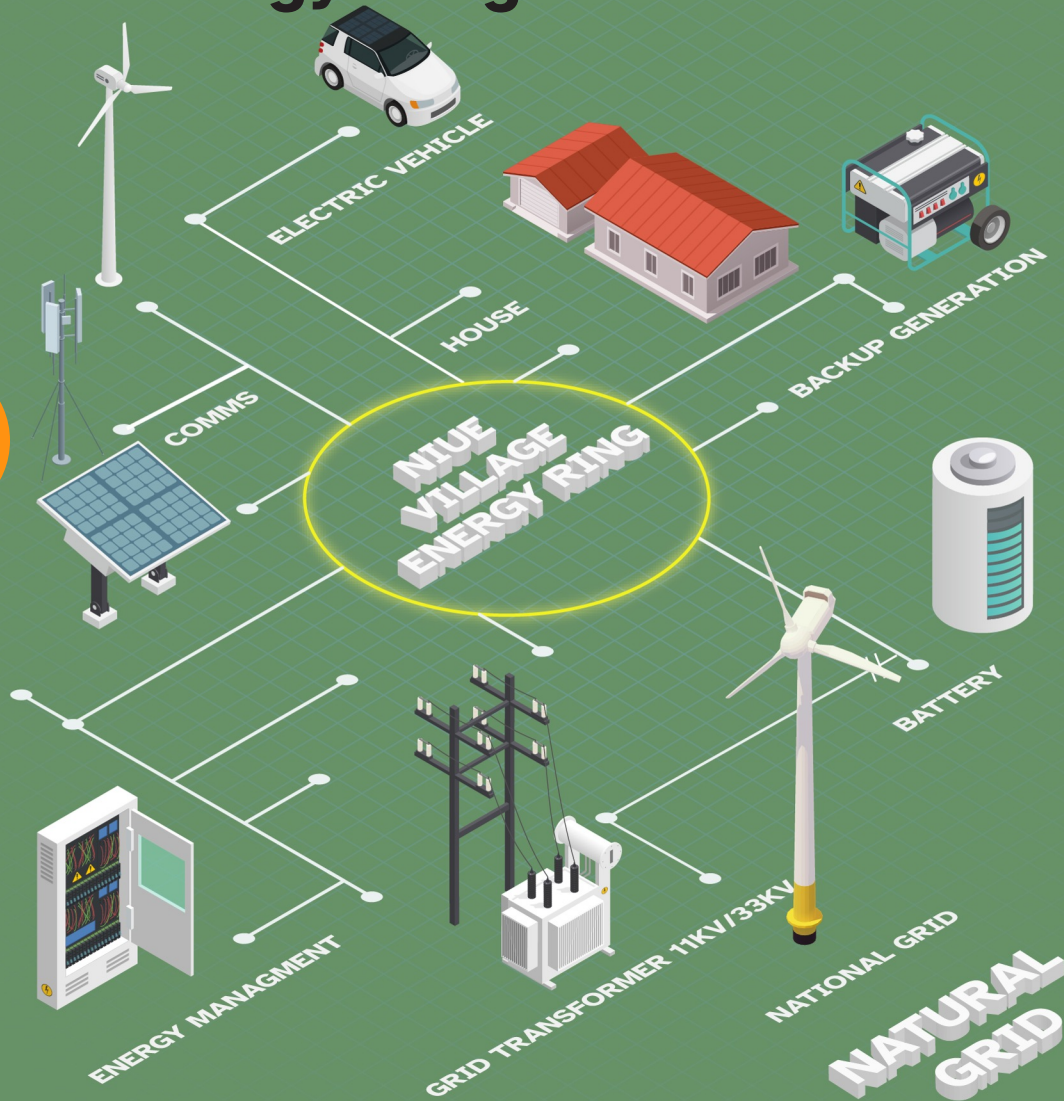
So, how do you play a part?
It's simple: **Join the Club.**

Niue Energy Unlimited will be a network of mutual village associations or user 'clubs' which are additional to the formal village governing bodies which will act as custodians of new infrastructure.



Smart Acceleration

Niue Energy Rings.



SECTION TWO: NIUE NATURAL GRID



Energy Rings

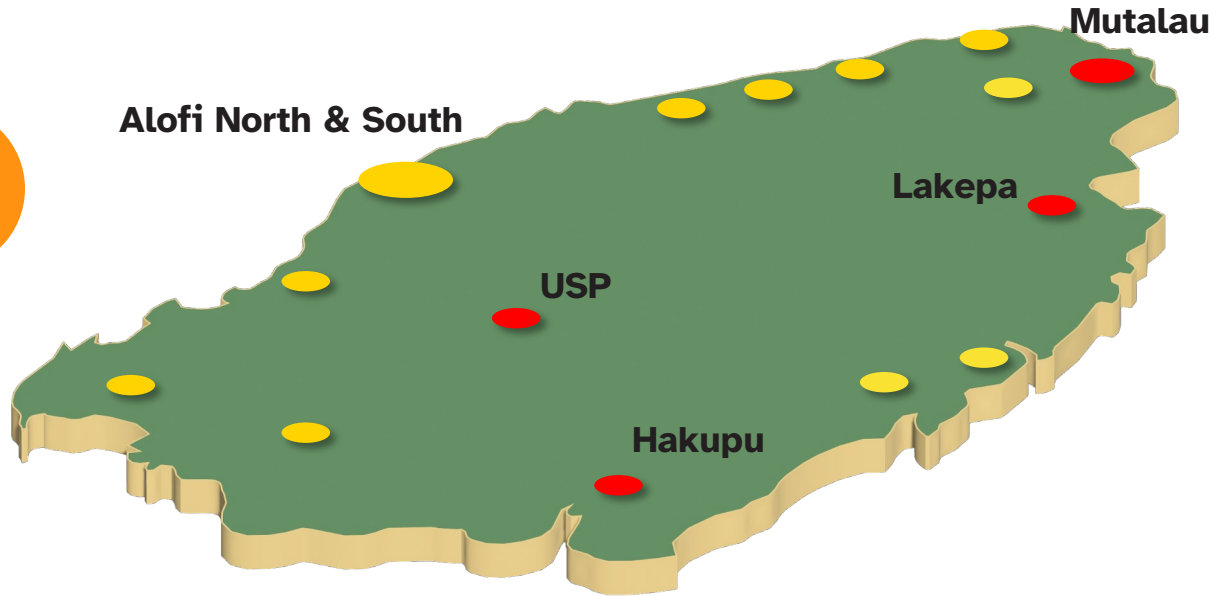
The Niue grid distributes centrally generated electricity throughout the island. When demand or renewable production is high some villages experience brown-outs; the lights dim and electrical items trip.

Village microgrids designed as “Energy Rings” are central to the Natural Grid design. Each village has a transformer where electricity supplied by the main grid is distributed to each home and by placing a village community battery near the transformer we may regulate the amount of renewable energy received from and released to the main grid. This will relieve the voltage pressure and minimise blackouts.

A key tool in the most effective and efficient village energy solution is the use “smart fuses boxes” which reduce wasted power, enhance the life of household equipment and protects against electrical fires.

The more energy produced and shared in Niue the greater the opportunity to introduce new technologies, such as efficient electrical vehicles and fridge freezers. Supporting this will be technology that manages and meters energy production, storage and consumption through a simple shared Energy Ledger database.

First pilot project location.



Pilot projects are a great way of proving and assessing the efficiency and impact on villages and the grid of different proven technologies whilst minimising disruption.



Where to begin?

Is a difficult question to answer. But we do know that we must start somewhere with the electricity grid. There are several things that we must take into account:

- How many people live in the village?
- How much electricity is used?
- Location on the main grid?
- Desire by the village to be a pilot?
- How frequent are blackouts, voltage and frequency issues?
- Is there anyone who isn't connected to the grid?
- What other sources of energy can be used?

We have initially identified a number of villages on the North and East of Niue that would benefit from a Pilot Project.

- Mutalau
- Lakepa
- Hakupu
- University of South Pacific (USP)

As we build out the locations with renewable technologies we will be able to assess the true energy demand. The objective here is to:

- Help the main grid with its load issues
- Prevent blackouts
- Create village renewable networks
- Support renewable generation

Island Energy Networks

Niue's “National” Grid



Niue is at the end of a long, costly and fragile supply chain that isn't resilient. Value flows out of Niue through fossil fuel supply, imported food and rented generation capacity. In the event of catastrophic failure, like a cyclone, power outage or the supply ship not turning up, Niue is highly exposed as a distressed buyer



Niue's “Natural Grid”



The **Natural Grid** maintains value within the island through **Capital** and **Community Partnership** which enable community resilience based on use of Niue natural resources. In the long term surplus energy production could support eg electric vehicles, fishery, cold store and a fishing fleet.



3 Section three: Social independence

Islands by their nature have to be self sufficient, being able to address any issues such as an unexpected climatic event or a delay in important supplies.

All too often this independence comes at a cost for many islands. Whether due to the lack of opportunities with people having to move abroad to seek employment or educational training. Or, a reliance on external third parties to specify and provide support for a majority of Niue's development requirements.

At its core true independence is based on strong cultural, social and environmental ties. The Niue Natural Grid will foster true independence for Niue by literally placing the 'power' back in your hands. Focusing on building social resilience through education, training and job creation.

Eventually these skills can be shared between other islands, creating a network of interdependent Natural Grids, that overtime will attract possible members of Niue's diaspora back. Which in turn will increase Social Independence and help accelerate Niue to total energy independence.

This section touches briefly on two aspect of Social Independence: Employment and Education.



Land Use

Niue's unique culture & heritage is reflected by fragmented intergenerational tribal property rights.

When combined with a Niue diaspora some ten times greater than Niue's population agreements on use and the fruits of use are difficult.

Island Power proposes mutual risk, cost and surplus sharing agreements in respect of both Niue as a place and associated natural energy resources.

We nominate this mutual Niue governance agreement as "Niue Unlimited"



Governance

Niue Unlimited has the following legal design:

- Mutual land use agreements between Niuean people wherever located; and
- Mutual energy use agreements between resident Niue people & businesses.

These agreements are between four stakeholders:

- Niue (State) & Villages as Custodians;
- Land & energy user associations.
- Land & energy investor associations/clubs
- Land & energy development and management service providers

Custodians have veto rights in the public interest. Land/energy users and investors oversee service providers jointly so neither has dominant rights.



Employment

Often islands find it difficult to maintain employment with islanders choosing to seek well paid, long term jobs abroad. This has had a large impact, not only on their populations, but also on the overall economy.

But most people prefer to work within easy reach of family. And many people can only dream of tropical island life.

Here the Niue Natural Grid empowers solutions within a mutual legal framework based firmly on Niue cultural values and heritage..

Local operation and management is essential and will be supported by other disciplines such as education and skills training..



Education and Skills

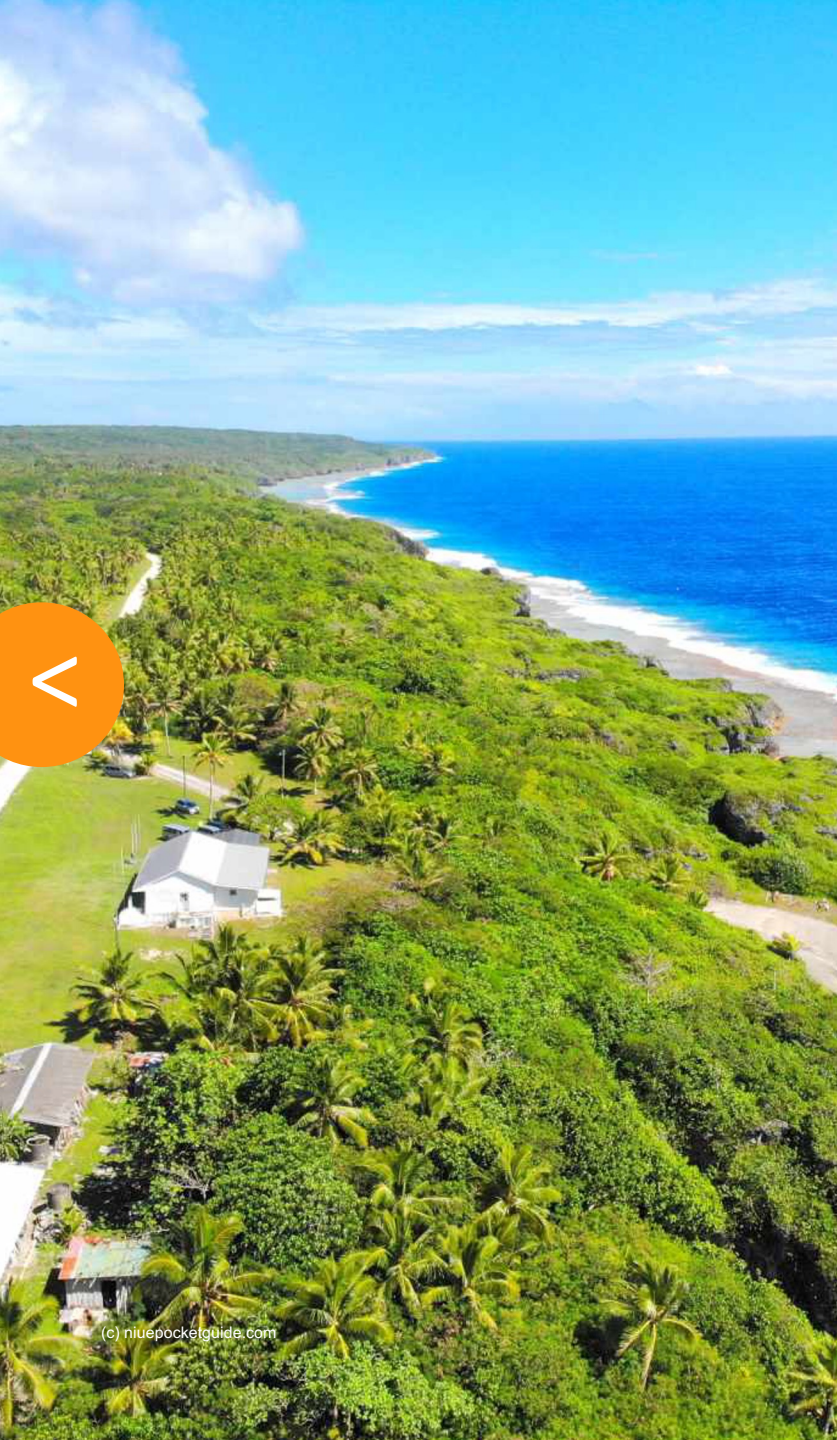
Education and skills training in the management and operation of Niue Natural Grid's infrastructure is essential in ensuring resilience.

That's why our partners, such as wind turbine manufacturers, will provide training for Niue Power wind turbine operators.

We will also be partnering with a local University to support in the delivery of accredited courses relating to renewable energy, sustainability, finance and the Blue Pacific.

Continuing education and skills attainment will support the creation more investment and jobs.

But let's not forget the twenty thousand Niue diaspora abroad with skills and financial resources that they may bring home to Niue.





4 Section four: Financial Independence

Niue is in a unique position to achieve or even exceed its renewable goals with the right strategy and application. But in order to achieve this we firstly need to address both the physical resilience issue of blackouts and the financial resilience issue of high costs.





Energy Treasury

An Energy Treasury is a community user group of energy assets held in common by village councils as custodians.

A village Energy Treasury allocates the value of production and savings through issuing prepay energy credit obligation (ECO) vouchers returnable in payment for energy.

Each village Energy Treasury will allocate energy dividends of ECOs to villagers with an agreed proportion to a central Niue Energy Treasury to support energy projects benefiting the island as a whole.



Mutual Assurance

The key to successful development and operation is to manage risk. Conventional development finance and operational funding share risk poorly and often unfairly.

Niue Energy Unlimited is not an organisation but is simply a networked agreement between people and organisations for mutual sharing risk, cost and surplus from development and operation of the Niue Natural Grid.

Perhaps the most important attribute is the common bond of mutually assured performance by guarantee societies or clubs which build trust by sharing risk fairly.



Accounting

Niue Power currently maintains a central accounting system or ledger system for issuing invoices in NZ\$ to energy users, receiving payments and paying staff and suppliers.

Energy Treasury shared village energy accounting system/ledger administered by Niue Power records energy production, costs and use by villagers.



Climate Finance

Two types of investment: short term, medium risk development finance & long term, low risk funding.

Development - Capital Partnership

- Shared development cost, risk & surplus

Operation - Energy Flow Swaps

- Shared energy production
- Shared energy costs

Operation - Energy Credit Obligations (ECO)

- Prepay credits/vouchers returnable in payment for energy use.



Data

Niue has multiple forms of data that it needs to work with in order to ensure the delivery of services. Often Small Island Developing States (SIDS) require third party external support in the sourcing of data for the purposes of economic and ecological development. All too often this data is not owned by the SIDS that generate it but instead by third-party private companies or agencies that seek to retain the data for their own commercial benefit. This often holds up investment and development.

IslandPower's model ensures that any data generated is owned and shared by Niue under our Nondominium model. Enabling islanders as say in what data they would like to share.



Data Management

There is increased demands by the international community and investors to have accurate, current data across all fields of interests to justify investment.

The collection and management of data can be expensive for a small island nation. IslandPower will provide a full data management and reporting system (Se3 – data system) for the island of Niue. Enabling the island to qualify and evidence data such as reduction in carbon fuel use and water wastage.

Data will be managed to ensure both transparency, privacy and security.



5 Section five: The next steps

As the old saying goes “every journey starts with a first step”. To design & build a Niue Natural Grid we must take an organic “whole island” “whole energy” system approach by assessing energy production and use across different modes such as transport (cars or boats), cooking (CNG & LPG) and solar-thermal for hot water.

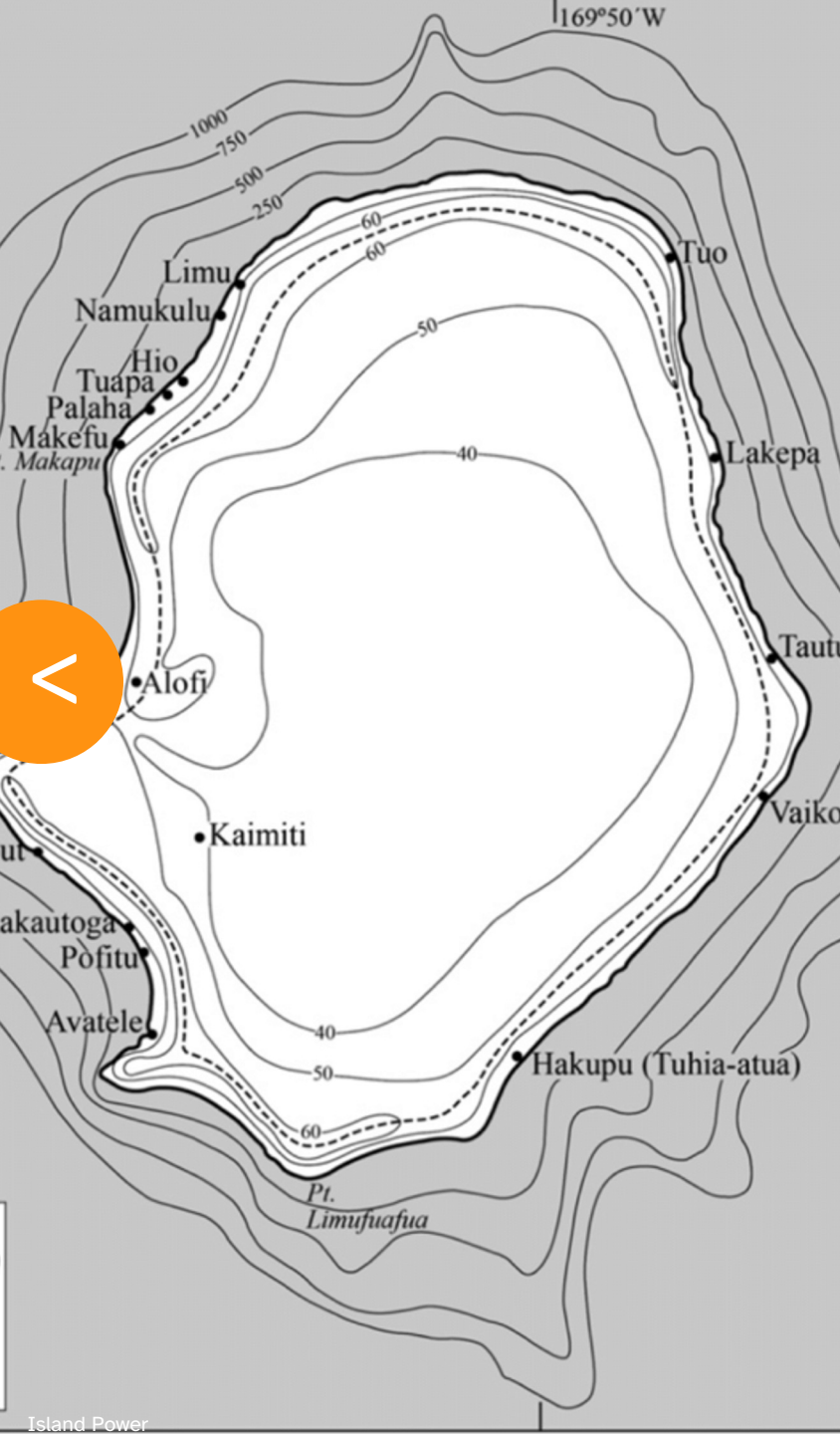
We will review, integrate and build upon numerous previous reports and recommendations in order to avoid duplications and accelerate installation of Niue Resilient, Renewable, Energy Systems..

Having identified sources of energy consumption and physically inspected electrical connections we can then analyse your actual consumption or end use: miles travelled, electricity used. Recording this data in a shared energy ledger database then enables to compare and contrast the energy efficiency of our interventions to increase renewable energy production and to reduce high cost carbon fuel consumption and hence CO2 emissions as an outcome.

Our overarching aim of Niue energy independence and hence resilience extends beyond keeping the lights on to the sustainable operation of critical water and communications services.



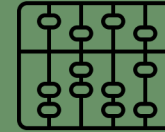
SECTION FIVE: MAPPING AND LEDGER



Energy Mapping

Knowing what energy you use and why you use it is critical in being able to design flexible, durable, resilient energy grids. Also getting to know what you would like to have in the future, such as a bigger fridge freezer a 40" TV or even an Electrical Vehicle will inform how we can design the grid to accommodate future demands.

Energy Mapping allows us to assess all the natural resources on and off the island to see which is the most suitable for energy production. This could be food and farm waste used to produce biogas. Or renewable powered ocean cooling as a means of air conditioning. Electric marine and road transport is a high priority for excess electrical supply.



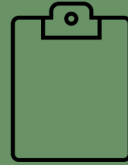
Energy Ledger

“In order to know where you are going, you need to know where you have come from.”

The initial energy ledger is a simple affair – we will monitor & record energy use and analyse available historic data. In order to get an accurate picture of your use we will also monitor voltage and frequency of the residential and business electricity supply. This will enable us to understand the current level of energy losses and waste..

Based on that data smart meters and optimisers will give an accurate view of energy used which will support simple, effective historic billing data which will enable Niue Power to predict periods of high energy demand.





Questionnaire

You will probably have filled out numerous questionnaires and taken part in the Census. The basis of Natural Grid questionnaire is to enable us to tailor make systems based on islanders energy profile. This concerns both the quantity of electricity consumption and the quality and timing of energy use, in particular transport.

Information in respect of property ownership and use is essential to enable us to gain permissions to install solar panel on village roofs or a small community wind turbine.

Understanding what the village / community want collectively from an energy supply is also important: solar energy on Churches to help with air conditioning and dehumidification appears to be a good example.



Type of questions

- Geography
 - Are you near the ocean?
 - Are you near a bore hole or water source?
 - Is it a business property?
- Your property
 - Does it have an electrical supply?
 - How many rooms does it have?
 - How many people live there?
 - Has it had an environmental impact assessment?
 - Type of building?
 - Tenure of land and buildings
- Appliances
 - Washing machine – kW & V
 - Dishwasher – kW & V
 - TV – kW & V
 - Solar Panel – type and kW
 - Fuse board and type



Development Alliance



ELECTRIC VEHICLE CHARGERS

The natural grid could be designed to allow for bi-directional charging of cars from homes or places of work and leisure.



DIESEL AND BIOGAS GENERATORS

Are an important part of the energy mix providing both baseload and long term running.



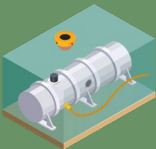
BATTERIES

Our Partners provide a variety of different batteries better suited to long running and tropical environments



WIND TURBINES

Niue has excellent wind resources. The most important thing is to ensure that small scale, flexible wind is available for Niue. These wind turbines can be lowered in the event of a cyclone.



OCEAN COOLING

Could play an important part in reducing overall energy demand on the island by displacing thermal electrical demand – like air conditioning – with cool ocean water cooling.



SOLAR PANELS

Roof and ground mounted solar panels would allow for greater energy diversity. Extending thermal solar panels for water would reduce the need for butane, oil fired or electric heated water.



Training & Employment

The focus of the Niue Natural Grid is to build resilience on Niue. One of the best ways of achieving this is through the development of jobs that will help maintain and operate the equipment on the island.

IslandPower's partners will provide training for the installation, operation and maintenance of the equipment. This means that if the equipment breaks down Niue will have the capacity to make repairs without the need for costly repairs by technicians flown in from Australia or New Zealand.

Each technology has its own required set of knowledge and skills. With a range of global support available from the manufacturers Niue engineers can be trained to a high level of technical engineering capability.



Partners

IslandPower brings together a wide range of skills and technologies. This means that the right energy solution for Niue is found as opposed to providing you with one type of technology.

To achieve this we have a wide range of partners, from installation and commissioning companies through to academia and manufacturers of equipment like batteries and wind turbines. All of whom form the basis of our Development Alliance.

With our focus on resilience and reduction of Climate Change Gases, we are able to work with companies that provide the highest level of services and quality of products.



6 Section six: Frequently Asked Questions

It is important to ask questions and to get answers.

In this section we have pull together a number of questions that are frequently asked by communities. It is not a comprehensive list and we are sure that you will have plenty more. But, it's a start.

The questions have been broken down into three key areas:

- Resilience
- Social independence
- Financial independence

There may be questions that you have and would like answering but that aren't included in this document. If so, feel free to send us an email and we will answer them for you. Marcus@island-power.net



FAQs: Resource Resilience

How will the Natural Grid provide Resource Resilience?

We look at available natural resources on and around Niue and introduce the right combination of technologies to meet energy needs. Forward planning is crucial to diversification of energy generation and storage solutions. This reduces reliance on non-renewable or variable resources.

How are you going to provide renewable solutions for the whole island?

You may recall that we talked about ‘mapping’ the islands resources. This will enable us to find solutions minimising the scale of land use typical of solar farms). When solutions are designed specifically for the end use, such as using ocean water for cooling, we avoid pitfalls face by conventional renewable energy providers..

What sort of Resources are we talking about?

Let’s start with energy. It’s important to ensure that any equipment installed will be resilient to cyclones and failure. A key component of failure is relying on off-island support for things such as fuel or parts. By building up renewable generation capacity, village by village, we can focus on harnessing the natural energy resources. Through specialist training and employment we can develop skills resilience. And by ensuring the lights stay on and are kept on we can ensure economic resource resilience.

FAQs: Social Resilience

How will the Natural Grid provide Social Resilience?

Nothing happens without energy. Stable production of energy provides a source of wealth and security for the Niue population which will underwrite Social Resilience by enabling people to live & work on Niue rather than emigrating for economic reasons..

What is an Energy User Group and why do we need it?

Energy use defines residence and brings villagers together to a common purpose.. Each village energy user group will be able to identify issues and specify solutions which suit their village location and resources. So each village will contribute to the transition to renewable energy; provide feedback to service providers and through the Energy Treasury function allocate surplus as they wish

What type of employment will there be?

Our focus is on “Energy First” for Niue. So we will ensure Niue Power has the skills and education to operate systems and equipment. The production and savings from Niue Natural Grid not only requires diverse skills but also generates economic value to fund skilled employment. The natural outcome will be a resilient network with the greater capacity necessary to attract and sustain more people / tourist to visit Niue and provide a new generation of digitally supported Eco employment.

Who owns Niue Natural Grid?

The Niue Natural Grid is owned by the Niue people in common through villages and the Niue state as Custodian members of a Niue Unlimited mutual agreement between Niue energy users, investors and developer/manager service provider partners.

FAQs: Financial Resilience

How will we be Financial Resilient?

Currently Niue's limited income from tourism and export requires generous financial support from third parties facing increasing difficulties. The Niue Natural Grid reduces the need for support by renewable energy production and shared energy cost reduction.. Once village/island needs are met excess energy may be applied to new forms of economic activity.

Who pays for the equipment?

Niue's energy use is primarily supplied by costly diesel-fuelled generation.. Free and abundant natural resources eg wind, wave and solar enable transition from diesel to renewable generation to be funded from shared fuel savings.

What type of employment will there be?

Our focus is on "Energy First". So Niue Power will receive skills and education necessary for operation of new equipment and technologies.. Although a greater range of skills will be needed the resources financing this employment are an outcome of the investment.

Who will invest in the Niue Natural Grid?

Development finance is by capital partners who invest money or money's worth of goods & services (eg wind turbine use) while long term, low risk investment will be through Energy Credits/Vouchers. Such prepaid Niue energy production will be attractive to Niue diaspora, pension funds and climate finance investors.

Who can I contact if I have more questions?

Feel free to contact Marcus Saul at IslandPower on the following email address: marcus@island-power.net

Final thoughts: “Energy First” = “Niue First”

- **Place, People, Power = independence**

We hope we have demonstrated how a Niue Unlimited network of Niue people can mobilise a natural energy Niue Natural Grid resource network towards Niue energy independence & resilience.



END.



IslandPower

