

The Answer is Blowing in the Wind

The Wind Power Electrification of the Futuna Dispensary



Futuna Island Republic of Vanuatu

Vanuatu Renewable Energy and Power Association
solarsolutions@vanuatu.com.vu

Introduction

Energy services play a fundamental role in human development. They are essential not only for basic human needs like cooking, moving water, and lighting, but also for improving life and helping to alleviate poverty by permitting new productive activities. In fact, there are links between energy and many other sectors including: health, education, nutrition, communications, transportation, economic development (both macro and micro levels) to name but a few.

Even something as basic as lighting is extremely significant in development. In fact, lighting is a primary determinant of the quality of life. In Vanuatu, as well as in most developing countries, rural households spend a significant percentage of their income to pay for their lighting needs. However, these expenses are typically for kerosene and disposable dry-cell batteries. Kerosene is a notoriously inefficient fuel for lighting. It yields very low levels of light and it is expensive to purchase. Primary batteries are the most expensive way to purchase electric power on the planet. Their use is also an environmental nightmare.

Adequate artificial lighting is essential to move beyond subsistence.

Benefits of electric lighting include (but are not limited to):

ECONOMIC

- Extends the productive workday.
- Conserves foreign exchange

SOCIAL

- Improves/enables evening study
- Improves literacy
- Decreases teenage pregnancy
- Decreases alcoholism and other drug abuse
- Stems urban migration

ENVIRONMENTAL

- Reduces greenhouse gas emissions

HEALTH

- Improves indoor air quality
- Reduces fire hazard

In addition to lighting and other domestic uses of electricity, electric power can improve life and help to alleviate poverty by permitting new, productive activities, as mentioned above. Without improved access to electricity, income generating opportunities remain very limited and consequently the prospects for employment remain poor. Schools, health centers, administrations, etc. all have a vital need for electricity to be able to function properly and to serve their respective communities.

However, the majority of the rural population of Vanuatu depends on energy inputs which are largely limited to human (such as gathering and hauling firewood and water), kerosene, batteries (typically disposable, an

environmental and economic nightmare itself), and biomass (firewood, etc.) Ironically, energy resources are plentiful and inexpensive (one might even say free) in Vanuatu if one considers renewable energies such as those from the sun, wind, flowing water, and the earth.

This project will demonstrate the effectiveness of small, de-centralized wind generators to provide electric power to the remote, rural population of Vanuatu.

Background Information – Wind Power

Wind power has been a viable source of energy for much of recent human history. Windmills have been used to grind grain and pump water and are still in use today in many parts of the world. Wind generators (also called wind turbines) produce electricity by spinning a magnet inside a coil of wire, much like the way an automobile alternator produces electricity.

In the 1930's in the United States, wind generators were widely used as an economical source of electricity in rural and farming areas. Today, 16% of Denmark's electricity comes from wind power. In Europe, 13000 Megawatts of wind generated electricity provide 7,000,000 people with their electrical needs. There are over 18,000 Megawatts of wind generated power installed world wide. Wind energy is the fastest growing energy source in the world!

A wind generator's rotor (the blades) changes the lateral kinetic energy of the wind into rotational energy. The rotational energy is then turned into electrical energy by the generator, which is located behind the rotor. The electric power passes through a charge controller and several other monitoring devices and then is stored in batteries until needed.

Why wind power?

- Wind power is inexpensive. It is less expensive than electricity generated by solar power or a generator.
- The energy density in wind is greater than the energy density in sunlight.
- Wind is an abundant and renewable energy resource.
- Wind power has minimal environmental impacts.
- Wind power is reliable.
- Wind power is safe.
- Wind power is clean.

Background Information – Futuna Island and the Futuna Dispensary

Futuna is a small (13 km²) island located in Tafea Province at approximate latitude 19.5 degrees South. It is the easternmost island in Vanuatu. Futuna rises nearly straight out of the ocean to an altitude of more than 600 meters. There is nothing blocking the prevailing winds for a long, long way. As a result of its geographic position, the wind is a constant on Futuna.

Futuna has a population of 695 people in six villages. The entire population of Futuna is served by one health care center, the Futuna Dispensary, the subject of this proposal. The Ihsia school community is made up of 158 students in classes preschool – year 7. There are also six teachers that live on campus with their families, for a total of twenty-seven people in the staff area. Ihsia is a day school. There is currently no electricity available at Ihsia School.

Energy Applications: Health Care

The relationship between health and energy is compelling. The World Health Organization (WHO) states that “Health and energy are interdependent factors which largely determine the progress of rural development...An energy strategy for rural areas will be critical in achieving lasting health improvements...”

Access to electricity can have a profound effect on health care, for health care providers and patients alike. Some of these applications include:

- Lighting: Electricity offers a quality of light to which liquid fueled lighting cannot compare. Kerosene lighting is most common in non-electrified communities. Kerosene is a known safety hazard and contributes to poor indoor air quality. Electric light greatly improves the quality of:
 - Emergency treatment.
 - Birthing.
 - Maternity care.
 - Surgery.
 - Administrative tasks.
 - Other medical functions.
- Vaccine Refrigeration and Ice Pack Freezing: Immunization programs depend upon reliable refrigeration to preserve vaccines that prevent and/or eradicate dangerous diseases including Tuberculosis, Polio, Tetanus, Diphtheria, Pertussis, Measles, Yellow Fever, and Hepatitis B. The Cold Chain is a system of people and equipment that attempts to keep vaccines at proper temperature as they are distributed from the manufacturer to the point of use. The critical role of the Cold Chain is to maintain refrigeration of vaccines within a specified range of temperatures from point of manufacture to point of use, no matter how remote the point of use. If the vaccines are exposed to temperatures outside of this range, potency is lost and the vaccines are rendered useless. The more remote health centers in the Cold Chain should also have the capability to freeze ice packs so that vaccines can be carried in coolers to surrounding sites. Ice packs are also very useful in the treatment of????.
- Communications: Reliable communications will greatly improve health care services at rural health clinics. Emergency medical treatment is

greatly enhanced with the ability to communicate with other facilities and health care providers in the region. Communications are also essential to routine operation and management functions.

- Medical Appliances: A proper microscope is essential equipment for the diagnosis of malaria and other diseases. Many other medical appliances can improve the services offered by rural health care providers.
- Water delivery and treatment: The provision of clean, potable water is essential for the operation of any health care facility. Renewable energy can be used to pump water as well as to treat it.
- Health Education: Adequate lighting enhances health education activities. Audio-visual equipment such as TV's, video players (VCR or DVD), radios, and the like can make health education more interesting and more fun.
- Income Generation: Health care centers in rural areas are typically under funded. Access to electricity can greatly enhance a health center's ability to generate income. Video theaters and battery charging stations are two examples of IGA's that could take place at health centers.
- Attracting (and keeping) Quality Health Staff: It is difficult to attract and keep qualified health care providers at remote, rural health centers where energy services are non-existent or very limited. This is especially true if the health care provider is accompanied by his/her family.

Project Activities

A 300 watt wind turbine will be installed at the Futuna Dispensary, Futuna Island, by Vanuatu Renewable Energy and Power Association (VANREPA) project staff and dispensary staff and community members. The wind turbine will provide electricity for the dispensary. The dispensary will use the electricity to enhance its ability to deliver health care services, as described in the previous section. Additionally, any surplus power the dispensary produces could be used by the surrounding communities, which could be an income generating activity for the dispensary.

The project will also serve as a demonstration project for the whole country as little is known about generating electricity from the wind in Vanuatu.

Vanuatu Renewable Energy and Power Association will produce a user's manual in English and Bislama. VANREPA will also conduct hands on training sessions for the operation of the system with key project participants. VANREPA will design an appropriate maintenance regimen and produce a maintenance manual in English and Bislama.

VANREPA will visit the Futuna Dispensary six months after installation of the wind generator. This visit will allow VANREPA to survey the users and adjust operation and maintenance procedures as appropriate.

Goals and Objectives

- To enhance the Futuna Dispensary's ability to deliver health care services.
- To raise the dispensary's standing in the community.
- To demonstrate the effectiveness and viability of wind power as an energy resource in Vanuatu.
- To improve the quality of life in the rural areas through rural electrification.
- To build reliance on our own renewable energy resources rather than to rely on expensive, imported fossil fuels (which are both economically and environmentally disastrous) for energy.
- To compliment the global environmental agenda.

Sustainability

These wind turbines are very robust and they require very little maintenance. In my considered opinion, they are one of the few small wind turbines that are able to stand up to the environmental conditions of Vanuatu. The blades are polypropylene, an excellent long-life plastic, and they are painted black to provide UV protection. The turbine can withstand cyclone-force winds. However, in serious weather situations the entire apparatus can be readily disassembled due to the unique tilt up tower. This machine has a life of more than twenty years. The only maintenance required is periodic (annual) lubrication.

Replication Potential

Not only is this project sustainable, it is very easy to replicate it at other schools and communities throughout Vanuatu where there is a wind resource. Therefore, it could have a major impact on a significant percentage of the population in a short period of time.

Beneficiaries

The entire country will benefit from this project through education and awareness raising. The Ihsia school community will benefit directly from improved energy services. Villagers living near the school will also benefit from improved access to electricity.

Benefits to Women

Women are most affected by the lack of energy services. Improved energy services (particularly access to electricity) reduce the burden of daily tasks for

women. Caring for her family is the primary responsibility of women in rural communities. Access to electricity can provide a woman with adequate lighting for her children to study in. It can improve her family's nutrition through refrigeration. It can improve her family's health by providing lighting and vaccine refrigeration in health centers. Electricity can also provide lighting for community centers for meetings, evening classes, and other activities. These are just a few examples of how electricity can improve a woman's life. There are links between improved energy services and many sectors of life including: gender, health, nutrition, education, environment, and enterprise development, to name but a few.

The Wind Electrification of the Futuna Dispensary Project Budget

Materials

300 watt wind turbine, controller, monitor,
400 Ahr deep cycle battery, 9 meter tilt-up tower,
50 meters cable 625,000 vatu

Overseas shipping 35,000 vatu

Installation, monitoring, and training 225,000 vatu

Domestic shipping 12,000 vatu

In-country travel
4 x airfares (vila/futuna/vila) 101,920 vatu

Administrative support 95,000 vatu

Total project Cost 1,093,920 vatu

Community Contribution

Land rights

Labor

Sand

Coral