PROPOSAL
Renewable Energy Solution
for Haiti
February 27th 2010

Courtesy of Bergey Windpower Co

Pay It Forward Project
P.O. Box 903
Ashburn, VA 20146
EIN 20-4810720

Contents

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P.O. Box 903
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1 Pay It Forward Project (PIFP) Initial Assessment

Haiti is located in the Caribbean Sea and occupies the western part of the island of Hispaniola which it shares with the Dominican Republic to the East. The population of Haiti is approximately 9.6 million, of which 3.3 million live in Port Au Prince, the location of the devastating earthquake on January 12, 2010. Eighty percent of the population live in poverty. The average income in Haiti is $560 per annum with 78% living on less than $2.00 USD a day. Subsequent to the catastrophic earthquake, there are approximately 2 million people left homeless (one fifth of the population), over 200,000 are believed to be dead, 250,000 need medical attention and a third of the country's population are affected by the disaster. The Haitian government is functioning with limited capacity and means, with the majority of government ministries destroyed. It is vital to get aid to Haiti now, but a continued effort must be maintained before the spring, when agricultural planting must commence (March/April). Agriculture represents approximately 30% of the national annual GDP and employs 66% of the population (6 million people). With 37% of the produce grown in Haiti locally consumed it is vital the agriculture industry is maintained. With infrastructure in tatters, aftershocks rocking the country and constantly hampering the aid effort, moral and motivation are low, with so much grief. It is vital that by spring, pressure is alleviated and plans are in place to ensure the country can start the essential agriculture industries. If this does not happen we could be looking at a disaster with far greater catastrophic consequences.

Sources, CIA World Factbook https://www.cia.gov/library/publications/the-world-factbook/geos/ha.html

In much of Haiti, electricity and running potable water do not exist. Conditions are harsh and with the recent disaster, life has become very difficult, with homes destroyed and families broken up with the loss of loved ones. We strongly believe in order to help Haitians resume their lives, it is vital to introduce Renewable Energy Solutions as pillars that will enable the construction of a solid foundation leading to sustainable development and education.

2 PIFP Program Goal and Objectives

The objective of the project is to provide electricity from renewable energy to the Internally Displaced People (IDPs) of Haiti. The goal of the project is to improve facilities and start to return the community to some form of normalcy of life that promotes education for the children, supports healthcare and improves family and social interaction in the IDP camps and isolated communities of Haiti.

Pay It Forward Project
P.O. Box 903
Ashburn, VA 20146
EIN 20-4810720

The supply will comprise of 3 phases:

PIFP Renewable Energy Solution (RES)

With Pay It Forward Project's self contained Renewable Energy Solution (RES) this can be made possible. We propose to design, build, install, construct and commission a self contained Renewable Energy Solution (RES) that fits into one 20ft container for shipping to communities in need. This solution comprises of a Wind Turbine, Solar panels and Generator together with storage batteries that can provide continuous electricity.

The supply will be divided into three phases:

The Three Steps

Phase I

Provide electricity for up to 100 shelters (85kW hrs per month), PIFP initial goal is to utilized 2 turbines to be able to provide basic electrical needs to up to 100 families living in shelter units.

With sunset at 1730, this will provide 50 families with much needed light, giving some solace in the long dark evenings.

Initially supplying up to 100 families will benefit directly from this renewable energy solution proposed. The electrification will bring light to a dark world. It will give children and families a chance to interact in the evenings, to socialize and to rebuild their devastated lives. The television will provide a source of entertainment and information and double as a meeting point creating social interaction with families and new friends. During the day the television will help contribute to developing the education of the children and provide relief in a torn world.

Phase II

Provide electricity to local schools such that children can continue their education, link to the outside world in term with computer facilities and internet. School locations can also be used as Vocational Centers after school hours where classes such as sewing, computer and others can also be taught.

Enabling education and a return to normal life, even after one or two months after the disaster, is vital. This will invigorate and motivate the children into recognising that direct progress is underway. This motivation will be passed directly onto the parents and family who will be able to spend the day carrying out vital chores and not have to worry about their children. The children in turn will motivate their parents once they can see the children happy once again.

Pay It Forward Project
P.O. Box 903
Ashburn, VA 20146
EIN 20-4810720

Phase III

Provide electricity to remote Healthcare units to allow for the storage of vital vaccinations and medicines, provide facilities for sterilisation units and a center for rural health in the evenings. Basic healthcare is taken for granted in the develop world, but in remote areas, even the basic needs are rarely satisfied. By providing an existing facility with power will allow the difficult task of ferrying cool boxes with medicine to a village for distribution a thing of the past. Instead small refrigeration units and sterilisation boxes will be provided to ensure that vaccinations and minor equipment is available for emergencies. It will also allow these Healthcare units to operate into the night, allowing them to provide classes on hygiene, disease prevention and a multitude of healthcare related issues the will in term improve the communities ability to regain basic healthcare.

These three small steps will provide vital links to the otherwise distant world, stimulating education, improving support for basic healthcare and essential living conditions to a community struggling to get over the devastating events of this January.

The costs:

PIFP will need $25,000 for the implementation of each turbine with a total of 4 requested for this proposal.

The need to motivate and educate these communities on how to develop economic independence is our target. This can only come when moral and life starts to be lifted and it is often the simplest things that can make a difference. We do not hand out money, but rather seek out communities that aspire to change their circumstances and utilize their human creativity to strive towards economic independence and freedom.

3 Wind Energy Technical Background

Due to the nature of renewable energy and the variability of wind and sun it is proposed to provide an energy solution that will combine these two sources of energy into one solution that will ensure continued supply of electricity. This will be augmented with a small generator, in the event of no wind or sun hours. The objective with the funding will be to design and build, a complete self contained RES, ship it to Haiti and deploy in a selected community, chosen based on their immediate needs and

Pay It Forward Project
P.O. Box 903
Ashburn, VA 20146
EIN 20-4810720

their desire and willingness to participate in this project and, ultimately, Pay It Forward to others in need.

A wind energy converter or Wind Turbine Generator (WTG) transforms the kinetic energy of the wind into mechanical or electrical energy that can be harnessed for practical use. Mechanical energy is most commonly used for pumping water in rural or remote locations- the "farm windmill" still seen in many rural area is a mechanical wind pump - but it can also be used for many other purposes (grinding grain, sawing, etc.). Wind electric turbines generate electricity for homes and businesses and for sale to utilities. The small wind turbine proposed here, will, subject to available wind, deliver in the range of 80-200kW hrs of electricity per month.

Solar Energy panels convert the sunlight rays into electricity. Sunlight intensity is measured in equivalent full sun hours. One hour of maximum radiation, or 100% sunshine received by a solar panel equals one equivalent full sun hour. Even though the sun may be above the horizon for 14 hours a day in some areas of the world, this may only result in six hours of equivalent full sun. There are two main reasons for this. One is reflection due to a high angle of the sun in relationship to your solar array. The second is also due to the high angle and the amount of the earth's atmosphere the light is passing through. When the sun is straight overhead the light is passing through the least amount of atmosphere. Early or late in the day, the sunlight is passing through much more of the atmosphere, due to its position in the sky. Sun tracking devices are available and can help reduce reflectance, but cannot help with the increased atmosphere in the sun's path. Because of these factors the most productive hours of sunlight are from 9:00 a.m. to 3:00 p.m. around solar noon (solar south). Before and after these times power is being produced, but at much reduced levels. When we size solar panels for a solar power system, we take these equivalent full sun hour figures per day and average them over the given period of sun hours.

A supplementary gas (petrol) generator will augment the supply of electricity in the event of no wind or useful sun hours. Special storage batteries will be located in a permanent secure waterproof building together with all the necessary control equipment. Two local engineer will be selected, trained and remain responsible for the planned maintenance and supervision of the equipment. The wind turbine requires servicing every 8-12 months and the solar panels, cleaned regularly. The generator likewise, requires regular servicing.

Pay It Forward Project
P.O. Box 903
Ashburn, VA 20146
EIN 20-4810720

The ability to generate electricity is measured in watts. Watts are very small units, so the terms kilowatt (kW, 1,000 watts), megawatt (MW, 1 million watts), and gigawatt (GW, 1 billion watts) are most commonly used to describe the capacity of generating units like wind turbines or other power plants.

Electricity production and consumption are most commonly measured in kilowatt-hours (kWh). A kilowatt-hour means one kilowatt (1,000 watts) of electricity produced or consumed for one hour. One 50-watt light bulb left on for 20 hours consumes one kilowatt-hour of electricity (50 watts x 20 hours = 1,000 watt-hours = 1 kilowatt-hour).

4 The PIFP Renewable Energy Solution (RES)

The Renewable Energy Generating Solution will be packaged into a standard 20ft container. This container will be pre fitted out with the batteries to store electricity, inverters to regulate the output voltage of the wind and solar converters and all the controls required to operate the RES. The solar panels, wind turbine and wind turbine tower will be placed inside the container, together with consumables and electrical equipment and tools. The whole unit will then be sent to the Dominican Republic or Haiti depending on availability. At site the turbine, tower and the solar panels will be erected in a few days.

By carrying out the container pre wiring installation at base prior to shipment, PIFP can minimize the time spent on site carrying out engineering work and thus ensure rapid deployment. In this way, PIFP can focus on the needs of the people rather than spending time sourcing materials and carrying out engineering tasks.

The following pictures give the reader the general idea of the overall size and procedure required to install the turbine. The pictures do not show the solar panels, which will be mounted on the tower, high enough to be out or prying hands.

The turbine, solar panels and generator, together with controls, are supplied from one U.S. manufacturer to keep things simple. The company selected is Bergey Windpower Company (BWC) who are one of the world's leading suppliers of small wind turbines. BWC has 30 years experience, installations in all 50 U.S. States and more than 100 countries, with an international network of 500 dealers. BWC has been a member of the American Wind Energy Association (AWEA) since 1978 and is also a member of numerous state renewable energy associations.

Pay It Forward Project
P.O. Box 903
Ashburn, VA 20146
EIN 20-4810720

Figure 1: 1.2kW Bergey Wind turbine is brought down to earth in 2 minutes.
This can be viewed on http://www.youtube.com/watch?v=sXntmY7B_f4

Pay It Forward Project
P.O. Box 903
Ashburn, VA 20146
EIN 20-4810720

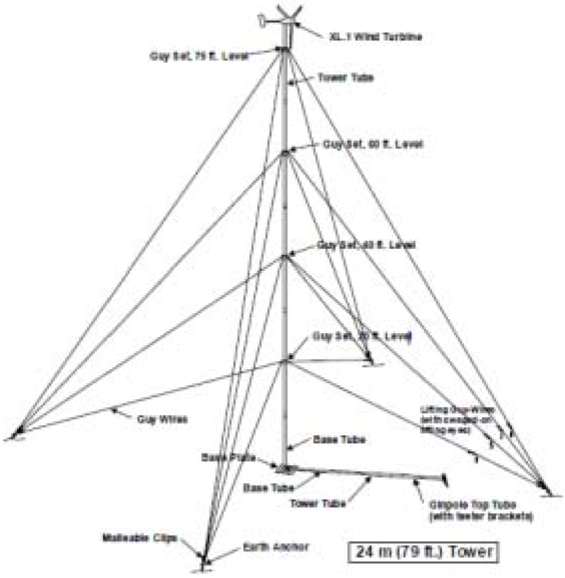

Figure 2: Major Tower components

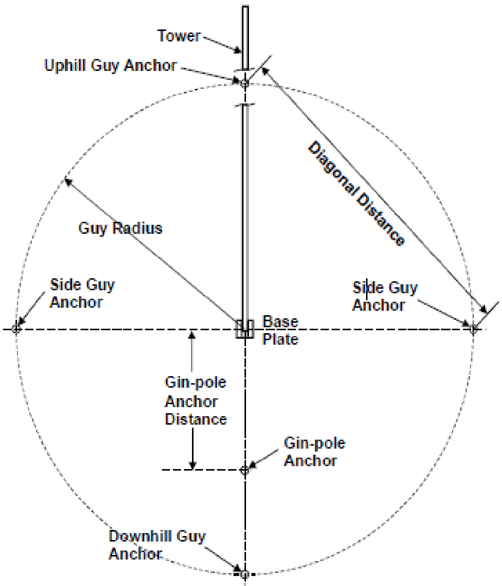

Figure 3: Anchor Layout

Layout Dimensions in Feet

Tower Height	Guy Radius	Diagonal Distance	Gin-pole Anchor Distance
59 ft.	30 ft.	42.4 ft.	20 ft..
78 ft.	40 ft.	56.6 ft.	29 ft..
97 ft.	50 ft.	70.7 ft.	29 ft.
.			
.			

Layout Dimensions in Meters

Tower Height	Guy Radius	Diagonal Distance	Gin-pole Anchor Distance
18 m	9.2 m	12.9 m	6.1 m.
24 m	12.2 m	17.3 m	8.85 m.
29 m	15.3 m	21.6 m	8.85 m

Figure 4: Layout Dimensions required for foundations

Pay It Forward Project
P.O. Box 903
Ashburn, VA 20146
EIN 20-4810720

Figure 5: Tower guy wire attachment to anchors

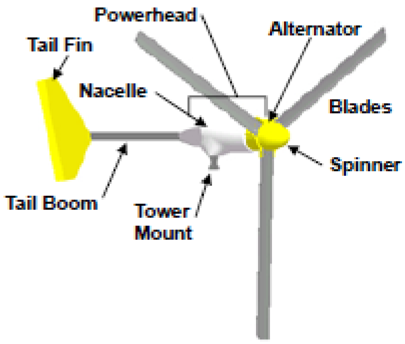

Figure 6: Major Components of the selected WTG (XL1)

To achieve this requires the purchase of one certified small wind turbine, solar panels and an array of storage batteries for the storage of the electricity. Additionally a generator will be purchased.

The wind turbine produces alternating current, and due to the fluctuations in the wind, the current produced varies and is not suitable for running normal electrical devices. This current generated must be put into a form that can be usefully consumed by devices and lights. This is achieved firstly by rectifying the Alternating Current (AC) converting it into Direct Current (DC). This is fed into a Smart Charger (Power Center Figure 7) connected to the battery bank. The Smart Charger is used to protect the batteries from overcharging thus improving the battery life. The solar panels will augment the supply of electricity in times of no wind and the DC they generate is fed directly to the Smart Charger.

The DC voltage from the batteries will be converted into useful AC current with an inverter. AC outlets will be pre installed on the outside of the building housing the equipment, to allow for distribution of the electricity to the local community.

The layout configuration is shown in Figure 7.

Pay It Forward Project
P.O. Box 903
Ashburn, VA 20146
EIN 20-4810720

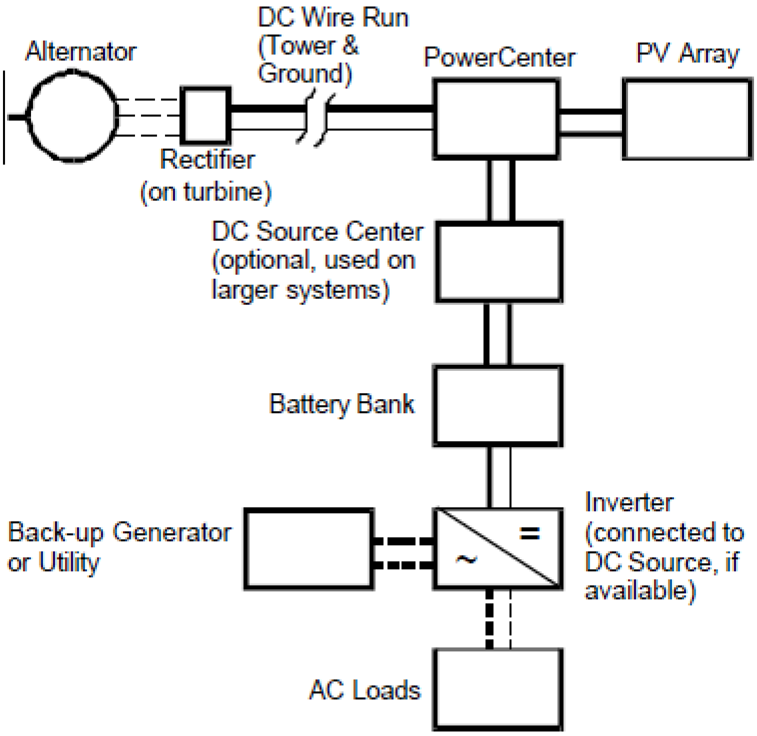

Figure 7: Typical XL1 system configuration

Figure 8: Power center with cover removed and in place

Pay It Forward Project
P.O. Box 903
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EIN 20-4810720

<u>Tools Required:</u>

- 17 mm box end wrench
- 17 mm socket and ~ 12" ratchet drive
- 8 mm socket or wrench
- Pliers
- Crimpers for wiring terminals (U-shaped crimp preferred over straight crimp)
- Thread locking compound (like Locktite 242)
- Tape measure, 12 ft.
- Pencil
- Carpenters level
- Drill with ~ 2 & 2.5 mm or 0.09" dia. drill bit
- (4) M4, 1/8", or 5/32" screws
- Screwdriver

4.1 Electrifying Phases - breakdown

Since the communities being targeted in this project currently have no electricity, it is difficult to forecast what power requirements they would require, since as soon as electricity is provided, it will open up a wealth of opportunities, all of which we take completely for granted in the West. It has thus been decided in the formulation of this project to divide the electrification into three phases:

Phase I – Supply electricity to upto 50 shelters for Internally displaced people comprising of light bulbs, cell phones, radios, flashlights, Polaroid cameras and rechargeable batteries

This starter kit is sized for the output of the RES and will comprise of the following:

- 50 energy saving light bulbs plus 100 spare bulbs
- 5 Mobile phones with charging facility in areas with coverage
- 50 flashlights
- 50 portable radios
- 1 Polaroid Camera
- Rechargeable batteries for all equipment
- 500m of site cabling to the individual residences and school complete with cable ties, plastic conduit and sealing material for underground routing to outlets

Phase II- Supply electricity to small local schools/vocational centers

Phase III- Supply electricity to local Healthcare Units

Pay It Forward Project
P.O. Box 903
Ashburn, VA 20146
EIN 20-4810720

4.2 Energy consumption and system sizing

sizing of the of PIFP RES						
Item		Quantity	Watts	Electrical usage (hrs)	kWhrs	Total kWhr per day
PHASE ONE						
Energy saving bulbs/strip		50	9	6	0.054	2.7
Mobile phone charger		2	4.2	2	0.0084	0.0168
mobile phone		10	0	0	0	0
Flashlights	clockwork	50	0	0	0	0
Portable Radio	clockwork	50	0	0	0	0
Polaroid Cameras		1	0	0	0	0
		0	0	0	0	0
TOTAL					**0.0624**	**2.7168**
PHASE TWO						
Television		1	45	8	0.36	0.36
Sattellite dish		1	10	24	0.24	0.24
Satellite decoder		1	10	8	0.08	0.08
Projector						
TOTAL					**0.68**	**0.68**
PHASE THREE						
Laptop Computer estimate price	RM Education Mobile One 965/T12ER	3	360	5	1.8	5.4
Printer	Epson R800 A3 inkjet	1	20	2	0.04	0.04
TOTAL					**1.84**	**5.44**

Pay It Forward Project
P.O. Box 903
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EIN 20-4810720

5 Legal Restrictions and Good Neighbor Relations

In carrying out this project, permission and permits must be obtained for the erection and supply of electricity to communities from the local authorities. Legislation must be adhered to and any legal matters dealt with prior to arrival in Haiti with the Renewable Energy Solution. The selection of a community, will also take into consideration the neighbors and surroundings such that any impact on environmental issues are kept to a minimum. Any risks identified from our Environmental Impact Assessment (EIA) will be documented, reported, with action taken to minimize risk.

The term 'Environmental Impact Assessment' describes a procedure that must be followed for certain types of projects before they can be given development consent.

The procedure is a means of drawing together, in a systematic way, an assessment of a project's likely significant environmental effects. This helps ensure that the importance of predicted effects, and the scope for reducing them, are properly understood by the public and the relevant competent authorities before a decision is made. From PIFP's point of view, the careful preparation of an Environmental Statement (ES) will provide a number of benefits to a project:

- A useful framework within which environmental considerations and design development can interact
- Environmental analysis may indicate ways in which the project can be modified to avoid or mitigate possible adverse effects
- Thorough environmental analysis and provision of comprehensive information allows the consenting authorities to reach a decision more rapidly

The EIA will include statements detailing:

- The materials to be used including a detailed design specification
- The construction methodology
- The equipment to be used
- Contractor details
- The precise location of the development (with exact co-ordinates)
- The precise timetable for the construction works (start/end dates, key milestones)

Ref: Appendix 1

It is normal to provide a complete EIA for commercial developments in the EU and USA. However owing to the nature of the dire situation in Haiti, this requirement is mentioned here in order to make the reader understand the normal procedure. In Haiti, there is no electricity. PIFP will endeavor to not cause adverse affects to the surrounding environment and will approach the relevant government officials to seek suitable permits if required for this project, in order to operate and stay within the laws of Haiti.

Pay It Forward Project
P.O. Box 903
Ashburn, VA 20146
EIN 20-4810720

6 Conclusion

Pay It Forward Project is determined to impart assistance to the families in the communities that it helps to change the circumstances in which they are living today. We empower them to take an active role in the betterment of their quality of life. By providing interest free "good faith" loans and services we are giving them the chance to build self-reliance and the ability to move towards economic independence.

The expansion of our services into renewable energy with the RES is made possible with the funds received from the grant maker. These funds will be administered and overseen by Pay It Forward Project with the utmost diligence, responsibility and trust. We will uphold and honor the spirit in which the grant is bestowed.

Paying it forward is our way of planting seeds around the world, guiding our path towards harvesting peace beyond culture, religion or race. We all play a fundamental role in assuring this happens. Understanding this brings us one step closer to making it a reality.

Denise Bobba & Wendy Farrell - Founders

Peter Flower MSc - (Wind Energy Engineer)

Pay It Forward Project
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7 Appendix 1

SCHEDULE 1 (definition of "environmental statement")

1. Description of the proposed project, including in particular:
   - A description of the physical characteristics of the whole project and the land-use requirements during the construction and operational phases.
   - A description of the main characteristics of the production processes, for instance nature and quantity of the material used.
   - An estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc.) resulting from the operation of the proposed project.
2. An outline of the main alternatives studied by the developer and an indication of the main reasons for his choice, taking into account the environmental effects.
3. A description of the aspects of the environment likely to be significantly affected by the proposed project including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the above factors.
4. A description of the likely significant effects of the proposed project on the environment (which should cover the direct effects and any indirect, secondary, cumulative, short, medium, and long-term, permanent and temporary, positive and negative effects of the project), resulting from:
   - the existence of the project;
   - the use of natural resources;
   - the emission of pollutants, the creation of nuisances and the elimination of waste
   - a description by the developer of the forecasting methods used to assess the effects on the environment.
5. A description of the measures which the developer proposes to take in order to prevent, reduce, remedy or offset any significant adverse effects on the environment.
6. A non-technical summary of the information provided under paragraphs 1 to 5.
7. An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the developer in compiling the required information.