

Expanding Australia's Renewable Resource



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Executive Summary

With one of the most consistent and constant winds in the world, Western Australia is one of the best areas to utilize wind turbines to harness the energy of this natural resource. In order to overcome the drought that Australia has been facing the past few years our group, Expanding Australia's Renewable Resources (EARR), has put together a plan to provide farmers with cheap electricity for expansion of irrigation practices, or allowing landowners to increase revenue on their operation by leasing ground to Verve Energy for wind turbines.

This project will also include a very educational internship for a University of Idaho student. The intern will help promote GE Energy's turbine in Western Australia while helping Verve Energy, one of Western Australia's energy providers, to establish test sites and public relations between landowners and Verve Energy. Funding for this project will come mainly from GE Energy and the remainder will come from Verve Energy. The total estimated cost for our project is around \$340,000 for the five years that we plan to implement the project.

Problem

Australia has one of the world's most constant winds called the Fremantle Doctor. Located in Western Australia, this cooling sea breeze often blows between 17 and 23 mph, and is frequently used for recreational activities such as kite flying and yacht racing (Velux). There are a few wind farms that are currently taking advantage of this natural resource, but in our opinion not enough people are utilizing this "free" energy.

Since over 90% of Australia's electricity is generated from fossil fuels, electricity is quite expensive. The average cost for electricity is over 10.36 cents per kilowatt hour in Western Australia compared to 6.7 cents per kilowatt hour in Sydney, Australia. (Technology) Electricity here in the Pacific Northwest is running about 4.7 cents per kWh. Australia could benefit well by utilizing a cheaper source of electricity, similar to how we used hydro-electric power here in the Pacific Northwest. We plan on utilizing windmill technology to harness the Fremantle Doctor and create the cheaper source of electricity.

Background

Windmills can be traced back to as early as the 7th century AD when they were used in Persia (now Iraq) for irrigation and grain mill purposes. Poul la Cour, originally a meteorologist, was the inventor of the modern electricity producing wind turbine in the late 1890's. (Danish) (Windmill).

A wind turbine is "a machine that captures the energy of the wind and transfers the motion to an electric generator shaft." (What's) At 12 mph, a wind turbine of 10-kW can generate about 10,000 kWh annually which is enough to power the average home. Turbines can revolve between 15 – 50 rotations per minute depending on wind speed. They are quiet machines that allow for farming to continue beneath them while serving the dual purpose of generating electricity. (Frequently)

Since these wind turbines are a very large investment, test sites need to be established and monitored. Typically a test center, much like a weather center, is constructed at about the same height as the wind turbine and these test centers are then

located throughout the projected wind farm area. The test centers collect data on wind speed, the density of the air, and direction of wind speed for at least one year in order to establish accurate values. These tests are then used to see if a wind farm is economically possible and assists with the designing the optimal placement for wind turbines. (National)

Goal

Our team of University of Idaho's faculty, working under the program called Expanding Australia's Renewable Resources, EARR, will be focusing on the use of wind as an alternative energy source. This will help farmers decrease electricity costs in Australia, provide energy for both household and irrigation uses and provide added income for farmers that lease their land to energy



companies. EARR is a direct extension of the International Extension Programs here at the University of Idaho. The International Extension Program is a program designed to extend agricultural knowledge, skills, and curriculum to other countries.

The EARR program will help to establish strong relationships between the US based wind turbine company and the electrical supplier in Australia. Eventually wind turbines on land will encourage the Australians to expand the use of wind turbines into the Indian Ocean, allowing for a more sustainable source of energy.

Primary Objective

EARR's primary objective for this development project is to create a cheaper source of energy and a potential increase in revenue for land owners, particularly Australian farmers. The project will also help to decrease the economic impact of drought on Australian farmers by providing a cheaper source of energy. Since electricity is more expensive in Western Australia compared to the eastern side it is not economically feasible to drill wells to irrigate their land while faced with a drought. This alternative source of energy will provide a cheap source of electricity and a possible opportunity for some producers to sell back extra energy not already consumed for farm production; thus increasing their outputs and revenue.

Our plan will also educate farmers on the opportunity to lease land to an energy company for wind turbines, which will allow Australian farmers to increase their income, without disrupting their lifestyle too much.

Secondary Objective

Aside from educating farmers to utilize a more sustainable source of energy, we will have a twelve month overseas internship opportunity to University of Idaho students. Students will promote the use of GE Energy wind turbines in Australia. Internships will be available to University of Idaho juniors and seniors in the following areas: Department of Agricultural and Extension Education, Department of Economic and Rural Sociology, and the Department of Biological and Agricultural Engineering. Our program will help to establish relations between Verve Energy, an Australian company and GE Energy, a US based company.

Implementation

During year one EARR faculty will travel to Atlanta, GA where the corporate office of GE Energy is to meet with head GE Energy officials to set their budget and goals for this project. EARR faculty will also travel to Australia to meet with Verve Energy to discuss their goals and implementation for this project. While in Australia, EARR will view and evaluate Verve Energy's training program, test plots, and facilities. Verve Energy chose the test sites and have them in place. Also, we will tour the local area and view irrigation systems to gather general costs and determine how much wind energy we need to generate in order to make the transition to wind power cost effective for the producer. During this initial visit room and board arrangements will be made for the internship program.

For year two, EARR interns will coordinate with land owners and set up test sites. They will evaluate the measure of potential energy that future wind turbines could produce at these sites. Verve Energy will be responsible for overseeing these calculations and offering lease rates, or the choice of trading electricity for the use of their land, therefore reducing the cost of wells and operating irrigation systems in the area. Using the statistics from the test plots, Verve Energy will consult with GE Energy to establish which models of wind turbines would be more efficient for the test sites.

Year three through five, EARR interns will oversee the construction and placement of wind turbines on newly leased plots as well as coordinate with land owners and set up new test sites. GE Energy will install the physical structure of the wind turbines. Verve Energy will install the electrical components of the wind turbine systems. Yearly evaluations will measure added income to the farmer either from increased yields

because of irrigation or income from land lease to Verve Energy. EARR and GE Energy will travel annually to Verve Energy corporate office to observe expenses and revenues generative.

EARR will choose interns in spring semesters and require them to complete a one credit, half semester course on Australian culture. Verve Energy will evaluate the cost saving to producers in the areas where test plots were placed.

Partnership

Verve Energy, established in April of 2006, is the number one electricity provider in Western Australia. As part of the Western Australia government reorganization, Verve Energy was created when Western Power split into four sectors. By using wind, bio- and solar energy, Verve Energy is pioneering the way for using sustainable energy in Western Australia. (Verve)

As a leading supplier of world power generation, GE Energy provides sustainable energy solutions for wind, solar, and bio-gas resources. Worldwide, they operate in more than 120 countries, excluding Western Australia. GE Energy is provider of onshore and offshore wind turbines ranging in size from 1.5 to 3.6 MW. (GE)

Funding

Funding will come primarily from GE Energy and Verve Energy. As the primary funding source GE Energy will provide: UI tuition, air travel, room and board, faculty pay while planning the trip, faculty compensation while on the trip and half the internship stipend. Verve Energy will provide for other half of internship stipend and land travel for

participants. The companies will also provide their own literature to promote their projects, utilizing the information gathered from EARR.

Economically the farmers, Verve Energy, and GE Energy will all benefit from the EARR project. Farmers will lease out land to Verve who will generate power off of the wind turbines. Farmers will receive either direct electrical compensation from Verve or revenue from the land lease. Verve Energy will purchase wind turbines from GE Energy. On the following page we have a detailed breakdown of our costs for the project.

Costs

Year 1

<u>Australia:</u>			
Air Travel:	\$2,000 / Person / Roundtrip	EARR Faculty (4)	\$8,000.00
Misc. Travel Exp.	\$1,000 / Person	EARR Faculty (4)	\$4,000.00
<u>Atlanta, Georgia:</u>			
Air Travel:	\$500 / Person / Roundtrip	EARR Faculty (4)	\$2,000.00
Misc. Travel Exp.	\$250 / Person / Roundtrip	EARR Faculty (4)	\$1,000.00
Faculty Pay	\$1200 / Faculty	EARR Faculty (4)	\$4,800.00
Faculty Compensation	\$1800 / Faculty	EARR Faculty (4)	\$7,200.00
Total per Year			\$27,000.00

Year 2

Air Travel:	\$2,000 / Person / Roundtrip	EARR Faculty (4)	\$8,000.00
Misc. Travel Exp.	\$1,000 / Person	EARR Faculty (4)	\$4,000.00
Air Travel:	\$2,000 / Person / Roundtrip	Interns (4)	\$8,000.00
Stipend:	\$1,500 / Person / Month	Interns (4) for 1 year	\$36,000.00
Apartment:	\$85 / Apartment / Month	2 Apartments	\$1,020.00
Tuition (U of I):	\$2,200 / Intern	Interns (4)	\$8,800.00

Faculty Pay	\$1500 / Faculty	EARR Faculty (4)	\$6,000.00
Faculty Comp	\$1800 / Faculty	EARR Faculty (4)	\$7,200.00
Total per Year			\$79,020.00

Year 3

Air Travel:	\$2,000 / Person / Roundtrip	EARR Faculty (4)	\$8,000.00
Misc. Travel Exp.	\$1,000 / Person	EARR Faculty (4)	\$4,000.00
Air Travel:	\$2,000 / Person / Roundtrip	Interns (4)	\$8,000.00
Stipend:	\$1,500 / Person / Month	Interns (4) for 1 year	\$36,000.00
Apartment:	\$85 / Apartment / Month	2 Apartments	\$1,020.00
Tuition (U of I):	\$2,200 / Intern	Interns (4)	\$8,800.00
Faculty Pay	\$1500 / Faculty	EARR Faculty (4)	\$6,000.00
Faculty Comp	\$1800 / Faculty	EARR Faculty (4)	\$7,200.00
Total per Year			\$79,020.00

Year 4

Air Travel:	\$2,000 / Person / Roundtrip	EARR Faculty (4)	\$8,000.00
Misc. Travel Exp.	\$1,000 / Person	EARR Faculty (4)	\$4,000.00
Air Travel:	\$2,000 / Person / Roundtrip	Interns (4)	\$8,000.00
Stipend:	\$1,500 / Person / Month	Interns (4) for 1 year	\$36,000.00
Apartment:	\$85 / Apartment / Month	2 Apartments	\$1,020.00
Tuition (U of I):	\$2,200 / Intern	Interns (4)	\$8,800.00
Faculty Pay	\$1500 / Faculty	EARR Faculty (4)	\$6,000.00
Faculty Comp	\$1800 / Faculty	EARR Faculty (4)	\$7,200.00
Total per Year			\$79,020.00

Year 5

Air Travel:	\$2,000 / Person / Roundtrip	EARR Faculty (4)	\$8,000.00
Misc. Travel Exp.	\$1,000 / Person	EARR Faculty (4)	\$4,000.00
Air Travel:	\$2,000 / Person / Roundtrip	Interns (4)	\$8,000.00
Stipend:	\$1,500 / Person / Month	Interns (4) for 6 months	\$36,000.00
Apartment:	\$85 / Apartment / Month	2 Apartments	\$1,020.00

Tuition (U of I):	\$2,200 / Intern	Interns (4)	\$8,800.00
Faculty Pay	\$1500 / Faculty	EARR Faculty (4)	\$6,000.00
Faculty Comp	\$1800 / Faculty	EARR Faculty (4)	\$7,200.00
		Total per Year	\$79,020.00
		Total Anticipated Expenses	\$343,080.00

Evaluation

Verve Energy will compile and evaluate energy production from the wind turbines to determine if the project is feasible to continue from an electricity producer standpoint. This will be evaluated every three months. Verge Energy will send the information back to EARR and the interns will compile a cost analysis on the farms that have installed the wind turbines. This information will then be available to other farmers that are interested in implementing this program. There will be two breakdowns available; one will determine the payback of utilizing the energy produced for irrigation systems and the second is for the farmer to continue their current management practices, but will have added revenue from leasing the land to the power company. GE Energy will evaluate their use of the interns based off of the sales of GE wind turbines in Australia. If profitable, GE will continue to utilize the interns for the marketing of their turbines.

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