A Wind Powered Western

ENVS 471

As Proposed by

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Acknowledgements

Western Washington University's Clean Energy Team would like to thank the efforts of students, staff, and faculty for supporting the continual education and funding of sustainable programs here on campus. A major contributor to our endeavours this quarter was the research and preliminary work which was conducted by the team tackling this project preceding us, and we would like to acknowledge their efforts here. We also would like to thank all the colleges, universities, project planners, and industry professionals who provided valuable information that helped us develop our renewable energy plan.

Executive Summary

Western Washington University has declared its intention to operate as a carbon neutral campus by 2005. To make this happen investing in renewable energy would be our best chance at achieving this carbon neutral goal. Given the characteristics of Washington's Northwest region, which Western thrives in, we propose that investing in wind power is the most viable option. This is due mainly to wind technologies speed in investment return, and the relative production rates which they boast. Our main focus for this project is to investigate ways to finance a utility scale installation of wind turbines and the marginal costs associated.

Overview

Current Sustainable Action

In 2005 Western students voted to approve a quarterly fee to invest in the purchasing of Recreational Energy Credits (RECs). Currently Western purchase $50,000 RECs a year. RECs, and this system as a whole, has some major inherent flaws. RECs purpose is to encourage the production of renewable energy y supporting the industry involved. Since RECs only encourage such production it is unknown how much renewable energy is actually distributed as a consequence of them. In light of this downfall of WWUs current renewable action, it has been found that investment in direct renewable energy production will provide our university the energy security we need.

Opportunity for Wind

Studies have shown that wind power is more efficient per kilowatt hour than solar power over their respective lifetime. Washington State has an abundance of this untapped

resource on the eastern side of the cascade mountain range, as is apparent in the many case studies which were analyzed. There are however, many different locations available to construct a wind farm that would be of productive value. Locations that we looked into include Sehome Hill, WWU campus, Eastern Washington, and Bellingham Bay. We concluded that installing a wind farm in Eastern Washington is the best option in relation to maximum production of power, and quickest return of investment. Wind power can also offset hydroelectric power use, which is modernly understood to not be a renewable energy source.

Statement of Need

Western's 2010 Climate Action Plan, in response to a Washington State law passed in 2009, commits Western to a position of carbon neutrality by the year 2050. With Western's current action this goal is realistically unattainable. Western needs an efficient and productive way to offset their carbon based energy consumption. Our research has found that wind-based energy production entails the quickest investment return schedule and will fulfill our goal to become carbon neutral.

Project Description

Objective

In order to reach Western's neutrality goal on campus, we propose to install a wind farm in Eastern Washington to completely offset our coal-based energy consumption. The potential details of such an installation are as follows.

Specifications

- 8 wind turbines (2.0 megawatt each) would provide enough energy to offset all electricity consumed on campus
- Projected budget is currently estimated at $24 - $32 million.
- Industry estimation of project cost, with expected variability included
- Development would include cooperation with private developers, Installers, policy makers, WA state department officials, landowners, and Puget Sound Energy in order to connect to local grid.
- Leased land could be payed with royalty payment or percentage of gross earnings
- Royalty = $5,000 to $8,000
- 3-5% of gross earnings

Calculations

- 2.0 megawatt turbine produces 2.0 megawatts of electricity at full capacity

- Not always running at full capacity; needs wind speeds of 30 to 55 mph to do so
- Industry average capacity factor: 25%
- Annual energy production of a 2 MW turbine:

  2 MW x 25% x 365 days x 24 hours = 4,380 megawatts/year

- Western's current electricity usage: 36,000 MW/year
- In order to completely offset all electricity usage we would need:

  36,000 MW / 4,380 MW = 8 (2 MW) wind turbines

- Projected cost of turbine = $3 -$4 million
- Estimated cost of project:

  8 turbines x $3/$4 million = $28 - $32 million

Methods

Case Studies

Whitman College (WA)

- Project owned and operates under Florida Power and Light Company (FPL)
- There are 70 wind turbines on Whitman property
- Whitman leases the land on wind farm to FPL
- Receives royalty payment about $100,000 per year
- While Whitman leases the land and receives royalties for the electricity generated, the electricity is owned by FPL and is sold to the BPA.

Luther College (Iowa)

- Installed a single 1.6 MW wind turbine near campus
- Produces 3.6 million kW per year
- Currently powers about 27% of electricity on campus
- Project costed $3.2 million
- Estimated 13 year payback
- Funds included:
  - $500,000 grant from US Department of Agriculture
  - $928,000 guaranteed loan under their Rural Energy for America Program
  - $971,249 grant from US Treasury Department
  - Recipient of 476c tax credit for renewable energy; adds $500,000 per year to projects bottom line

WWU REC Center

- Students pay $99 per quarter on REC Center
- Mandatory in tuition
- Initial cost was $20 million and portion contributed by students
- This technique could be employed again!
- We have done this before successfully!

Funding

A wide range of funding opportunities are available for such an endeavour based upon multiple criteria. These include the sustainability impact of the project, and the funding required.

State Funds

1. WA Department of Commerce sponsored, Energy Efficiency and Solar Grant. - $25 million to be allocated in years 2016/2017.
2. WHFSC sustainable Energy Program. Loan options up to $1 million, with rolling acceptance.

Federal Funds

1. Renewable Energy Production Tax Credit. - Expected $830 thousand for both 2016 and 2017, totalling a total return of $1.6 million, a considerable portion of the projected budget.
2. Renewable Energy Sales Tax Exemption. - 75% of all sales tax for all renewable energy technology and related machinery purchased in the 2016/2017, with expectation to be renewed for the following two year period. Could save considerable costs on the university's investment.

These are only but a few choices available to Western when considering such a project, and the amount of money in each fund varies.

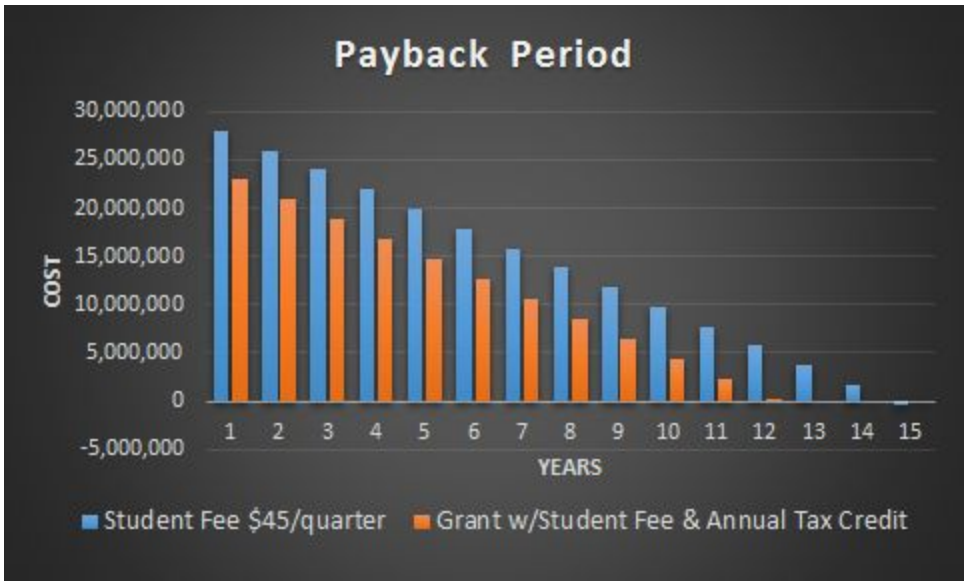
Internal Investment

Considering the forward development of this project, students here at Western have the unique opportunity to participate in one of Western's biggest projects dedicated to renewable energy. Initiating a $10 - $50 quarterly fee can significantly contribute to the project's upfront costs. Such a fee amount would fluctuate based on on multiple variables, including the amount of grants or loans acquired from national or state funds, and interest of the student body. Currently, there is a study being done to determine how much students are willing to pay for such a project, and this information could help us significantly to estimate the potential payback period.

There is a multitude of potential educational investment to be realized in the implementation of such a facility, especially as it relates to sustainability studies and energy management studies. Since Western will be producing its own electricity, we will be spending less on our energy budget. The extra cost savings could be spent on implementing more renewable energy projects, hopefully to continue reducing costs and creating a more sustainable campus. University courses on the project could be conducted, field trips and research around the site could be conducted, and names of those who donated their time and effort could be recognized. Not only will students feel more connected with the project, but the future benefits can give students a recognizable feeling of accomplishment, and significance.

Payback Period

Determining the payback period of this project will take further investigation of the total amount of loans, grants, and student fees acquired. We made some assumptions to give a better picture of how long this project would take to payback. We assumed that students would pay a $45 fee every quarter and looked at how long it would take for this fee to completely payback the project. We then compared it to a $5 million grant combined with the student fee and a $50,000 annual tax credit.



Based on these estimates, it would take about 15 years to payoff this entire project with just student fees alone; and about 12 years with the grant, annual tax credit, and student fee.

Proposal

We propose to install 8 (2 MW) wind turbines in Eastern Washington in order to offset Western's total electricity usage. Financing this project may take a combination of state or federal grants, loans, or tax credits and a conscious decision by students to pay a quarterly fee. By investing in a wind farm, Western will achieve a carbon neutrality by 2050.

Final Statement

Investing in Wind energy will help Western Washington University accomplish its goals. Not only can this installation make Western the first Washington carbon neutral University, but it can also help eliminate financial costs in other sectors on campus. A university wind farm would provide students an opportunity to visit and learn about renewable energy and what goes into making and sustaining these projects. By investing in wind power, our project can help Western become a leading sustainable university.

Thank you for your time and consideration on the matter, and we as a research team hope that you found this information both convincing, and valuable to the university as a whole.