Final Technical Report

Project Title: **Renewable Energy Certificate Program**
DOE Award Number: **DE-EE0003539**
Project Period: **6/01/10 to 5/31/2012**
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Date of Report: **May 27, 2012**

Acknowledgment, Disclaimer and Proprietary Data Notice

Acknowledgment: This report is based upon work supported by the U. S. Department of Energy under Award No. DE-EE0003539.

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Proprietary Data Notice: There is no patentable material or protected data in the report.

Table of Contents

List of Acronyms

DC	District of Columbia
DOE	Department of Energy
M.A.	Master of Arts
MBA	Master of Business Administration
M.Ed.	Master of Education
Mslts	Master in Strategic Leadership towards Sustainability
P.E.	Professional Engineer

List of Tables

List of Appendices

Presentation, Building Business and Policy Understanding for the Wind Industry: Renewable Energy Business Program, Wind Powering America webinar

Presentation: Beyond the Technical: Transactional Support for Renewable Energy in Developing Countries, hosted by The Aspen Institute

Presentation: Beyond the Technical: Human Capacity Development, hosted by The Aspen Institute

Executive Summary

To assist in workforce development for the wind industry, Saint Francis University's School of Business developed an educational program that focused on the business aspects of renewable energy, particularly wind. The program consists of four classes, all entirely online, taught by "live" professors with experience in the industry. The four classes are:

1. Introduction to Wind Energy
2. Wind Energy Project Planning and Financing
3. Project Cost and Risk Management
4. Renewable Energy Applications

These classes were developed and later refined with the assistance of industry to ensure that they were meeting the needs of employers. DOE funded an initial series of courses that allowed us to further polish the classes based on student feedback and test the format. Students from across the United States and many other countries participated in the classes.

Our conclusion is that the classes are highly valued by students. The satisfaction surveys showed uniformly high ratings for each course. Surveys also showed that students prefer "synchronous" or "live" classes to "asynchronous" classes. The online nature of the classes, combined with their being recorded for later viewing, made them more convenient for busy professionals. We believe this greater convenience accounts for the high participation of women. By the fourth course, 50 percent of the students were female.

The series requires advertising to be commercially successful. Given domestic turmoil in the renewable energy industry due to market uncertainty, we have begun looking internationally for students. The classes are slowly growing.

Articulation agreements with other institutions of higher education would significantly improve the program's attractiveness. As a certificate program, it is attractive to non-academic students. As an academic program, its attractiveness is limited to current students of Saint Francis University unless students are assured that their credits earned can be transferred to the school of their choice.

Introduction

The Renewable Energy Certificate project, also called the Renewable Energy Business Certificate, is to help with workforce development in the wind industry. In addition to needs for technical understanding, there is a critical need for business and policy understanding on the part of a wide variety of stakeholders. Employers in the wind industry need employees who understand the unique financial aspects of renewable energy and renewable energy policy. For the industry to advance, we need the government officials and regulators responsible for preparing the legislation and rules impacting the industry, and enforcing them, to understand the impacts they have on the industry and how to protect the public while promoting this clean energy source. This program is to meet that basic need.

The United States faces serious challenges surrounding energy supply and energy consumption. The problem will continue to escalate as China, India and other developing countries add increased pressure on demand for fuel. In addition, the world faces considerable challenges surrounding environmental degradation and climate change.

Given these circumstances, it is clear that wind energy (along with other renewable technologies) will and must continue to grow. Both at the federal and state levels legislators have enacted or are considering mandates that will require that as much as 15-20 percent of all new energy sources come from wind technologies. It is evident that wind energy is the leading alternative technology that will be used to supplement existing electric power generation. Wind power is the fastest growing of the renewable technologies.

One of the barriers to wind energy development is a workforce, in industry, government, and utility regulation that does not understand the technology or the business and policy aspects of it. Saint Francis University met with employers in the wind industry to ascertain what they needed their employees to understand. When this program began, we organized a Curriculum Development Committee comprised of a state public utility commission, a lender, wind energy equipment manufacturers, utilities, and renewable energy project developers and operators. The committee helped us to ensure that our curriculum met their needs as employers.

The program has potential applications with business students looking to enter the renewable energy industry, engineers wishing for career advancement, and government agencies looking for their employees to have a greater understanding of the business and policy aspects of renewable energy and what is necessary for a project to be feasible. The program attracted all of these as well as students from the non-profit sector and from around the world. One of our students was from the Philippines. He and his employer, Coastal Renewable Energy Technology Center, were so impressed with what he was learning that we formed a partnership. At this point we realized the program has great potential in facilitating the adoption of renewable energy in developing countries. By increasing comfort with and knowledge about renewable energy amongst government officials, we reduce transaction costs for developers and increase successful private investment.

Saint Francis University is offering the program as a certificate and for academic credit. We have been advertising it through Facebook, LinkedIn, and Google. Since the conclusion of the four

classes offered through this contract we have begun a new series. The second class of that series concludes June 12. The program has been included in one bid to USAID (still open) and is looking for opportunities to be included in more.

We have approached some universities about developing articulation agreements but this is a slow process that takes years to conclude. This approach is important, however, because there are many potential applicants who want Renewable Energy MBAs but are not interested in moving to the (quite rural) area of Saint Francis University to complete the remainder of their studies. Articulation agreements would allow them to take these renewable energy courses and then conclude their studies at the school of their choice, without concern about whether or not the school would accept the credits.

Background

As the sectors responsible for planning, financing, and deploying renewable energy projects grow, the demand for individuals trained with the technical and business acumen to deliver them will naturally increase. To fulfill this need and help the US Department of Energy meet goals for wind power, Saint Francis University began an online renewable energy certificate program at the graduate level as part of the MBA educational program.

While the certificate program is not a terminal degree in itself, it offers an MBA focus with a renewable energy emphasis. The courses may be applied as electives within the MBA program. (In addition, senior undergraduate students will be able to use these courses as electives or core substitutes in their degree programs.) The certificate program centers on the business aspects of renewable energy technologies, but it is supplemented with a focus on the technical, ethical, economic, and social impacts of renewable energy.

The MBA framework for the certificate program draws on the strengths of the University. Socially responsible MBA curricula have been available at Saint Francis for many years. Since 1990, the University has offered a traditional MBA. It has proven to be a great success for the institution and most notably its students.

Across the country (as well as internationally) there are a very limited number of institutions of higher learning that offer any curriculum focused on the business and policy aspects of renewable energy. By entering this comparatively untapped renewable energy educational market, Saint Francis University positioned itself to be a leader in what may ultimately be the most relevant issue of the coming century.

The program meets the present and future needs for existing and aspiring wind and other renewable energy professionals. Indeed, the course of study provides them with the business acumen necessary to grow the wind and other renewable energy industries as a means for resolving the economic, environmental, and energy related socio-political challenges of the future.

It provides policy makers with the financial and policy understanding to develop and enforce policies and regulations that enable renewable energy while protecting the public and being fiscally responsible. This is imperative if we are to develop, domestically and internationally, environments that are conducive to renewable energy investments and treat all energy sources fairly.

Graduates of the program have the capacity to integrate knowledge in the social, environmental, and economic aspects of sustainable energy sources. Throughout the coursework, they examine renewable energy technologies and consider the following questions regarding their application:
1. What are the real economics of each of these new technologies?
2. Which of these technologies hold the most promise for long-term sustainability?
3. How well will the new technologies integrate with the mature existing energy providers?
4. What environmental spillover costs and spillover benefits are associated with each of the technologies?

5. What ethical/moral issues surround the development and deployment of these technologies?
6. What are the social consequences of these technologies?
7. What cultural impacts will these emerging technologies have?
8. What will be the global impact of these technologies?
9. How will these new technologies advance civilization from a political, economic, cultural and sociological perspective?

Personnel:

The program is managed by Gwendolyn S. Andersen. Gwendolyn Andersen holds a Master's degree in International Development: Appropriate Electrification Technology and an MBA in Finance. Ms. Andersen has worked in energy efficiency and renewable energy since 1991. Her work has included designing new institutional means of sustainable rural electrification, developing guidelines for retrofitting diesel gensets with renewable energy technologies, and training in the installation and maintenance of photovoltaic systems. Her expertise is in the policy, finance, and institutional aspects of renewable energy with particular focus on solar, wind, and micro-hydro. She leads the Renewable Energy Center at Saint Francis University. Ms. Andersen also teaches Renewable Energy Applications.

Robert Low is the faculty liaison. Mr. Low was a utility executive with Pennsylvania Electric Company (Penelec) for thirty years. He currently is a visiting assistant professor of management at Saint Francis University. Mr. Low earned his M.Ed. at Penn State and his M.A. at Saint Francis.

Daniel F. Ancona III has more than 35 years experience in the energy, energy efficiency and environmental policy fields managing research, development, technology assessment, deployment, and policy analysis in over 25 countries. His experience is focused on wind energy systems and applications, and includes integrating all types of renewable electric power technologies with conventional fossil-fueled power plants. He has broad policy experience in program planning, management, and execution, both government and private sector programs in the United States and international renewable energy projects in Eastern Europe, Asia, South America, and Continental Europe. Mr. Ancona was one of the pioneers who launched and directed the Federal Wind Energy Program beginning in 1977 at U.S. Department of Energy. After leaving Federal service in 1998, he joined Princeton Energy Resources International and managed commercial wind energy projects. He led a team for ABB Inc. on a major feasibility study for the first utility scale wind power plant in Russia and later managed development of Russian wind energy business framework for the International Finance Corporation of World Bank. He currently serves on the Virginia State Advisory Board for Air Pollution - climate change strategic planning. Mr. Ancona teaches Introduction to Wind Energy and Wind Energy Project Planning and Financing.

The original professor for Project Cost and Risk Management was John Miko. Dr. Miko is an award winning professor with experience teaching online and extensive professional experience in finance. After the first class we decided to use a professor with more experience in the alternative energy industry. Kerly Acosta, P.E, is a mechanical engineer and holds a Master's degree in Strategic Leadership towards Sustainability from the Blekinge Institute of Technology in Sweden (Mslts). Ms. Acosta is a professor at the British Columbia Institute of Technology.

Prior to her teaching career, Ms. Acosta spent nine years in industry, developing energy technologies. She has worked on alternatively fueled vehicles, fuel cells, and photovoltaics. Ms. Acosta teaches Project Cost and Risk Management.

Results and Discussion

Grant funds from US DOE paid for tuition costs for 20 students for each of the four courses. The University provided an in-kind contribution for course development and program management costs. Once the inaugural class successfully completed the certificate courses, the University began charging full price so that the program will be self-sustaining. The initial series allowed us to "test" the courses and use the student feedback to improve them.

Saint Francis University put together a curriculum development committee to provide guidance on the courses we developed. The Curriculum Development Committee includes representatives from turbine manufacturers, wind farm developers, utilities, engineering firms, lenders, and regulators.

Saint Francis University communicated the opportunity to participate in these classes through announcements on LinkedIn groups and in public meetings. LinkedIn was chosen because it is used by professionals looking for career advancement. There are other social media available, but the professional focus of LinkedIn made it more appropriate.

We rapidly received over 40 applications and ceased advertising the opportunity. We eliminated all of those without undergraduate degrees and then worked to select applicants that would represent a wide variety of the market with no more than two students from any one organization. The final selection included engineers, students from the District of Colombia Energy Office, a student from the Pennsylvania USDA, a regulator, and students from non-profits. We had a student from the Philippines, Portugal, Sri Lanka, and Mexico, as well as a student who began in Korea, moved to Ethiopia, and then moved back to the United States. By the end of the fourth course, fifty percent of the students were female.

In order to evaluate the learning taking place we had a pre-course knowledge survey and a post-course knowledge survey. All four classes showed increases in scores, indicating learning took place.

To evaluate the professors we had an anonymous survey. The results for each class are as follows:

Results of Student Feedback Survey after Wind I

1. Appropriateness of the material – pertinence to your needs

   Scale of 1-10 with 1 = "not pertinent to my needs" and 10 = "pertinent to my needs, I am using it at work now"

   Average rating of 8.27 with 36.4% stating they are currently using it in their work

2. Difficulty of the material

   0% - too hard

   0% - too easy

   72.7% just right

3. Value of the course to you

   Scale of 1-10 with 1 = "no value" and 10 = "extremely valuable"

   Average rating of 8.45 with 45.5% choosing "extremely valuable"

4. Was the amount of homework

   18.2% - too much

   36.4% - about right given how much we learned from it

   0% - too little

5. Knowledge of the professor

   Scale of 1-10 with 1 = "least" and 10 = "exceptional"

   Average rating of 9.73 with 72.7% choosing "exceptional"

6. Professor's teaching ability

   Scale of 1-10 with 1 = "least" and 10 = "exceptional"

   Average rating of 9.09 with 45.5% choosing "exceptional"

7. Would you recommend this program to a friend or employer?

   72.7% - yes

   0% - no

Results of Student Feedback Survey after Wind II

1. Appropriateness of the material – pertinence to your needs

   Scale of 1-10 with 1 = "not pertinent to my needs" and 10 = "pertinent to my needs, I am using it at work now"

   Average rating of 8.17 with 33.3% stating they are currently using it in their work

2. Difficulty of the material

   0% - too hard

0% - too easy
100% just right

3. Value of the course to you
   Scale of 1-10 with 1 = "no value" and 10 = "extremely valuable"
   Average rating of 8.42 with 50% choosing "extremely valuable"

4. Was the amount of homework
   0% - too much
   91.7% - about right given how much we learned from it
   0% - too little

Results of Student Feedback Survey after Project Cost and Risk Management

1. Appropriateness of the material – pertinence to your needs
   Scale of 1-10 with 1 = "not pertinent to my needs" and 10 = "pertinent to my needs, I am using it at work now"
   Average rating of 9.22 with 66.7% stating they are currently using it in their work

2. Difficulty of the material
   8.3% - too hard
   0% - too easy
   91.7% just right

3. Value of the course to you
   Scale of 1-10 with 1 = "no value" and 10 = "extremely valuable"
   Average rating of 9.5 with 75% choosing "extremely valuable"

4. Was the amount of homework
   42.7% - too much
   58.3% - about right given how much we learned from it
   0% - too little

5. Knowledge of the professor
   Scale of 1-10 with 1 = "least" and 10 = "exceptional"
   Average rating of 9.5 with 58.3% choosing "exceptional"

6. Professor's teaching ability
   Scale of 1-10 with 1 = "least" and 10 = "exceptional"
   Average rating of 8.67 with 16.7% choosing "exceptional"

7. Would you recommend this program to a friend or employer?

100% - yes
0% - no

Results of Student Feedback Survey after Renewable Energy Applications

1. Appropriateness of the material – pertinence to your needs
   Scale of 1-10 with 1 = "not pertinent to my needs" and 10 = "pertinent to my needs, I am using it at work now"
   Average rating of 8.42 with 41.7% stating they are currently using it in their work

2. Difficulty of the material
   8.3% - too hard
   8.3% - too easy
   83.3% just right

3. Value of the course to you
   Scale of 1-10 with 1 = "no value" and 10 = "extremely valuable"
   Average rating of 9.08 with 50% choosing "extremely valuable"

4. Was the amount of homework
   8.3% - too much
   83.3% - about right given how much we learned from it
   0% - too little
   8.3% - "other"

5. Knowledge of the professor
   Scale of 1-10 with 1 = "least" and 10 = "exceptional"
   Average rating of 9.67 with 75% choosing "exceptional"

6. Professor's teaching ability
   Scale of 1-10 with 1 = "least" and 10 = "exceptional"
   Average rating of 9.58 with 66.7% choosing "exceptional"

7. Would you recommend this program to a friend or employer?
   91.7% - yes
   8.3% - "other"

The feedback for the first wind course was exceptionally positive but the appropriate level of homework remained an issue. By the fourth course we seem to have gotten the homework to the correct level with 83.3% saying that it was about right given how much they learned from it.

Although the student satisfaction for Project Cost and Risk Management was high, it was the

judgment of the professor, John Miko, and the program director, Gwen Andersen, that the next course should be taught by someone with more renewable energy knowledge.

All of the courses were taught "synchronously" aka "live" with the exception of Project Cost and Risk Management. With this course we experimented with "asynchronous" classes that the students could watch whenever convenient for them. Dr. Miko responded to emails within 24 hours and homework assignments within a week. Survey results indicated that students greatly preferred the live classes and thus all future classes will be synchronous.

Accomplishments

The program met its objectives. The program developed and delivered four online courses on renewable energy, with a focus on business and policy, to 20 students each. The program continues, with its second series underway now, indicating it is on its way to self-sufficiency.

Survey results (above) indicate exceptional satisfaction from students with the program.

The Renewable Energy Center has made two public presentations about the program. The first, to present lessons learned, was on February 15, 2012, as part of the DOE Wind Powering America 2012 webinar series. This program was titled, Recent Workforce Development Activities. It can be downloaded at http://www.windpoweringamerica.gov/filter_detail.asp?itemid=3392. This presentation focused on domestic, academic audiences. Please see Appendix A.

The Renewable Energy Center arranged a second presentation at The Aspen Institute in Washington DC for the international development community on May 15, 2012. This presentation was titled, Beyond the Technical: Transactional Support for Renewable Energy in Developing Countries. The presentation began with a talk by Robert Blenker, Vice President of Renewable Energy for WRB Enterprises, a developer that focuses on the Caribbean. Mr. Blenker explained the necessity of government officials who understand what makes a project attractive and reasonable and how the lack of this understanding increases transaction costs and in some instances kills economically and socially desirable projects. Please see Appendix B. The Renewable Energy Center then presented this program and how it addressed those knowledge gaps. Attendees included US government agencies operating internationally and development contractors. Please see Appendix C. The program has already been included on two bids to USAID.

The program has developed a partnership with Coastal Renewable Energy Technology Center, a non-profit in the Philippines. One of their employees was in our first class and he, and his employer, were so taken with the program that we developed an agreement to offer the classes to Filipinos through CRETC's classroom, freeing the students from technological concerns.

The program has begun its second series with a small contingent of students. Introduction to Wind Energy has eight students. Assuming continued marketing, the program can sustain itself

and grow. With the uncertainty in the US market, companies have been changing their investment plans and we have already lost students due to layoffs and employee redeployments. We have been looking internationally for continued growth as this program is ideal for meeting the needs, particularly in developing countries, for government officials and utility regulators to understand renewable energy in order to develop an enabling environment.

Conclusions

A program of this type, particularly with its focus on the *business* aspects of wind energy, was timely. There are unique aspects to renewable energy in general and wind energy in particular that are insufficiently covered in traditional graduate business programs. There is demand from employers and potential employers for the business and policy understanding that this type of program provides. While there is enough demand for this to be commercially viable, growth has been slow and requires continued outreach and advertising.

The uncertainty in the domestic market has hurt the program but the online nature of the program makes it possible to offer this internationally. We are offering the program through a partner in the Philippines and marketing it through contractors to USAID.

Lessons include

- interactive, "live" online classes can garner significant student satisfaction
- online classes make it easier for women to participate
- synchronous classes are preferred over asynchronous classes
- recording the classes so they can be watched later is vital to accommodate the schedules of busy professionals who must frequently travel

Recommendations

Recommendations fall into three areas: focus on marketing, make knowledge surveys mandatory, and continue developing articulations agreements.

The program should focus on continuing marketing efforts, with both domestic and international audiences. In addition, an attractive option is to develop programs for specific audiences, such as the US Department of Agriculture Energy Officers or Philippine government officials and utility regulators. By targeting specific groups and their needs the program can effectively increase human capacity in targeted groups. This would also allow additional classes to be offered to those groups that need them. For example, programs targeted specifically at government officials and utility regulators could replace Project Cost and Risk Management with a class on renewable energy regulation.

In addition, the quality of the courses and the instructors should continue to be measured with pre- and post-course knowledge surveys to continue to ensure that learning has taken place and anonymous surveys that both request student satisfaction information and suggestions for improvement. The knowledge surveys should be made mandatory. When they are voluntary the response rate is sub-optimal. When they are required for participation in the class, the response

rate is exceptional.

Particularly given the current uncertainty in the marketplace, there is insufficient demand for an MBA in Renewable Energy for every university to have one. Developing articulation agreements would allow many universities to offer such a degree without having to make the investment in developing and maintaining the program.

Appendix A

SAINT FRANCIS UNIVERSITY

Building Business and Policy Understanding for the Wind Industry:

Renewable Energy Business Program

Gwendolyn Andersen
Director, Renewable Energy Center

Thank You

- DOE EERE – Wind & Water Power Program
- Curriculum Development Committee Members
- Students

Curriculum Development Committee

This program was developed with funding from the U.S. Department of Energy and the help of industry and government to meet employer needs. The Curriculum Development Committee includes representatives from turbine manufacturers, wind farm developers, utilities, engineering firms, lenders, and regulators.

Introduction to SFU

3

Purpose

"As the sectors responsible for planning, financing, and deploying renewable energy projects grow, the demand for individuals trained with the technical and business acumen to deliver them will naturally increase. To fulfill this need and help the US Department of Energy meet its goals for wind power, Saint Francis University is proposing an online renewable energy certificate program at the graduate level as **part of the MBA educational program.** Although the certificate program is not a terminal degree in itself, it will offer an MBA focus with a renewable energy emphasis. The courses offered as part of the certificate program may be applied as electives within the MBA program. (In addition, senior undergraduate students will be able to use these courses as electives or core substitutes in their degree programs, plus individuals can take the course for general education and not academic credit.) **The certificate program will center on the business aspects of renewable energy technologies, but it is supplemented with a focus on the science, ethics, economics and social impact of renewable energy.** This certificate program will use wind energy as a "pilot" effort through which broader energy independence goals can be supported."

4

Policy & Regulatory Environment

"I'm in the middle of a complex discussion about solar projects in PA. Wrote a report with renewables cost info. Generated a lot of discussion. I'm working with DEP and the solar trade association to iron this out.

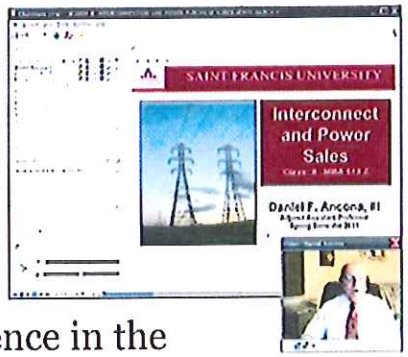
I am extremely grateful for the class series. I would not have understood what the solar developers were talking about without the series. I am just an engineer that costs stuff based on "iron in the ground." Not tax incentives and credits, etc. I did use capacity factor and cost of capital and had to explain those already today. I feel confident about my calculations yet I understand the developer point of view.

Thank you and St. Francis for getting the series up and running."
- Yasmin Snowberger, Utility Energy & Conservation Analyst, Pennsylvania Public Utility Commission

5

Key Facets

- Focuses on business and policy
- Online
- Live, interactive classes
- Classes recorded
- Worldwide networking
- Instructors with experience in the industry
- Can be taken as a certificate or for academic credit at graduate or undergraduate level



6

Non-Engineering Needs

- Financial understanding
- Power Purchase Agreements
- Interconnection
- Stakeholder engagement
- Policy impacts and options
- Feasibility in terms of environmental and social issues

7

Introduction to Wind Energy

- Resource potential
- Basic physics & mechanics
- Measuring and evaluating wind
- Project economics
- Environmental issues

8

Wind Energy Project Planning and Financing

- Financial proformas
- Interconnection
- Legislative & regulatory issues
- Project siting
- Stresses policy, financial, and community issues

9

Project Cost and Risk Management

- MS Project
- PMBOK
- Why managers choose the projects they do
- Systematic steps involved in planning a renewable energy project from beginning to decommissioning and how to reduce risk

10

Renewable Energy Applications

- Energy efficiency & conservation
- Overview of rest of RE technologies
- Community engagement
- Basic financial indicators
- Social impacts, positive and negative
- RETScreen to *see* the impacts different factors have on financial viability

11

Results

Appropriateness of the material – pertinence to your needs

Scale of 1-10 with 1 = "not pertinent to my needs" and 10 = "pertinent to my needs, I am using it at work now"

Intro to Wind Energy	Average rating of 8.27 with 36.4% stating they are currently using it in their work now
Wind Energy Project Planning and Financing	Average rating of 8.17 with 33.3% stating they are currently using it in their work now
Project Cost and Risk Management	Average rating of 9.22 with 66.7% stating they are currently using it in their work now
Renewable Energy Applications	Average rating of 8.42 with 41.7% stating they are currently using it in their work now

12

Results

Value of the course to you

Scale of 1-10 with 1 = "no value" and 10 = "extremely valuable"

Intro to Wind Energy	Average rating of 8.45 with 45.5% choosing "extremely valuable"
Wind Energy Project Planning and Financing	Average rating of 8.42 with 50% choosing "extremely valuable"
Project Cost and Risk Management	Average rating of 9.5 with 75% choosing "extremely valuable"
Renewable Energy Applications	Average rating of 9.08 with 50% choosing "extremely valuable"

13

Results

Would you recommend this program to a friend or employer?

Intro to Wind Energy	72.7% - yes, 0% - no
Wind Energy Project Planning and Financing	I didn't ask in this survey
Project Cost and Risk Management	100% - yes, 0% - no
Renewable Energy Applications	91.7% - yes, 8.3% - "other" i.e. they left comments

14

Results

- *The content of the courses and large amount of resources will aid anyone involved with the renewable energy sector.* John Regan
- *its about time someone offers a wind class that can be immediately applied to the real world* steve hogue
- *The knowledge available through Wind II is critical to anyone interested in understanding wind energy domestically or abroad.* Chris Fry
- *Of all my MBA courses, the St. Francis University wind classes were some of the most fascinating and valuable to my profession.* --Virginia McCracken Stump

15

Lessons

- Students want interaction
- Homework levels are tricky
- Live attendance required?
- Takes time to advertise
- Advertising is a gamble
- The audience is dispersed
- The audience is diverse
- Group work?
- Women like convenience

16

How to Sign Up

- www.francis.edu/recertificate.htm
- Articulation agreements
- Contracts
- Special arrangements, as with Coastal Renewable Energy Technology Center

17

Questions?

- Gwendolyn S. Andersen
- 814-472-2873
- gsa001@mail.francis.edu
- www.francis.edu/renewable
- Skype: RenewableEnergyCenter

18

Appendix B

Beyond the Technical

Transactional Support for Renewable Energy in Developing Countries

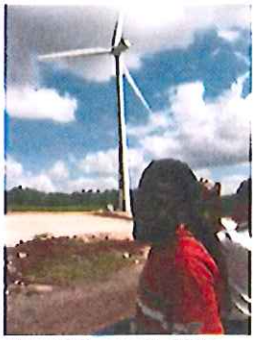
Hosted by

THE ASPEN INSTITUTE

Beyond the Technical: Transactional Support for Renewable Energy in Developing Countries

Robert Blenker
Chief Development Officer, WRB Enterprises

St. Francis University/Aspen Institute
Brown Bag
15 May 2012



Wigton Windfarm, Phase I: Jamaica

Obstacles to RE Development

"Why are there not more RE projects in the LAC?"

- Cost?: No – near or at grid parity (wind, solar, hydro)
- Reliability?: No – mature technologies
- Challenged?: Absolutely – size, remoteness, geography, country risk, lack of experienced developers and SIZE.

However, for the purposes of today's discussion, there is an area with an even greater set of challenges…..

Obstacles to RE Development

Lack of transactional experience on part of regulators and Governments.

- Justifiable fear of unknown translates into inaction
- Increased transaction time = increased transaction cost

Lack of commercial understanding.

- See above: "Waiver of Sovereign Immunity"
- Unrealistic economic expectations
- Unrealistic ownership expectations
- Result is an un-bankable project

Lack of size/technology appropriate permitting process.

- Risk of "political capture"
- Unnecessary permits ("Concession" for wind, for example)
- Lack of reliable queue process for long-lead time projects

Obstacles to RE Development

Net Result – few projects, and even fewer size-appropriate projects due to increased development and transactional costs which kill the economics.

Solutions?

- Must reduce the "brain damage" and complexity.
- Transactional Support for Governments/Utilities
  - Multilaterals, Aid Organizations, Organic investment
- Matched expertise on both sides of the table
- Professionalization of the developers (happening organically)

Questions?

6

Appendix C

SAINT FRANCIS UNIVERSITY

Beyond the Technical: Human Capacity Development

Renewable Energy Business Program

Gwendolyn Andersen
Director, Renewable Energy Center
Saint Francis University

Thank You

- DOE EERE – Wind & Water Power Program
- Curriculum Development Committee Members
- Students

Curriculum Development Committee

This program was developed with funding from the U.S. Department of Energy and the help of industry and government professionals and educators. The Curriculum Development Committee included representatives from utilities, manufacturers, wind farm developers, utilities engineering firms, lenders and regulators.

Purpose

"As the sectors responsible for planning, financing, and deploying renewable energy projects grow, the demand for individuals trained with the technical and business acumen to deliver them will naturally increase....

The certificate program will center on the business aspects of renewable energy technologies, but it is supplemented with a focus on the science, ethics, economics and social impact of renewable energy.

This certificate program will use wind energy as a "pilot" effort through which broader energy independence goals can be supported."

9

Policy & Regulatory Environment

"I'm in the middle of a complex discussion about solar projects in PA. Wrote a report with renewables cost info. Generated a lot of discussion. I'm working with DEP and the solar trade association to iron this out.

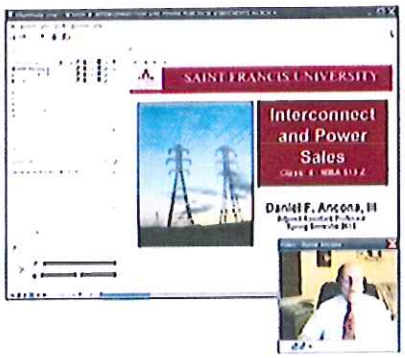
I am extremely grateful for the class series. I would not have understood what the solar developers were talking about without the series. I am just an engineer that costs stuff based on "iron in the ground." Not tax incentives and credits, etc. I did use capacity factor and cost of capital and had to explain those already today. I feel confident about my calculations yet I understand the developer point of view.

Thank you and St. Francis for getting the series up and running."
- Yasmin Snowberger, Utility Energy & Conservation Analyst, Pennsylvania Public Utility Commission

10

Key Facets

- Focuses on business and policy
- Online
- Live, interactive classes
- Classes recorded
- Worldwide networking
- Instructors with experience in the industry



11

Non-Technical Needs

- Financial understanding
- Power Purchase Agreements
- Interconnection Agreements
- Stakeholder engagement
- Policy impacts and options
- Feasibility in terms of environmental and social issues

12

Courses

1. Introduction to Wind Energy
2. Wind Energy Project Planning and Financing
3. Project Cost and Risk Management
4. Renewable Energy Applications

13

1. Introduction to Wind Energy

- Resource potential
- Basic physics & mechanics
- Measuring and evaluating wind
- Project economics
- Environmental issues

14

2. Wind Energy Project Planning and Financing

- Financial proformas
- Interconnection agreements
- Legislative & regulatory issues
- Project siting
- Policies and incentives and impacts on project economics
- Regulations that accelerate or serve as barriers to project development

15

2. Wind Energy Project Planning and Financing

- Wind energy economic analysis models
- Independent Power Producer model
- Community/municipal/cooperative ownership
- Financing mechanisms
- Quantitative assessment and monetizing of effects
- Options for dealing with public opposition

16

3. Project Cost and Risk Management

- MS Project
- PMBOK
- Systematic steps involved in planning a renewable energy project from beginning to decommissioning and how to reduce risk
- Real property agreements
- Finance agreements
- Engineering, procurement & construction agreements
- Fuel supply (biomass and landfill gas) and O&M agreements
- Power purchase agreements
- Interconnection agreements
- Emissions/environmental attributes trading agreements

17

3. Project Cost and Risk Management

- Parameters for site selection
- Identification and analysis of risk with selection
- Interconnection and net metering technology
- Implementing systems in different cultures
- Procurement strategies for specific renewable technologies
- Major cost components
- Financial risk
- Logistics support
- Risk management process

18

4. Renewable Energy Applications

- Energy efficiency & conservation
- Demand side management
- Overview of rest of RE technologies
- Community engagement
- Financial indicators
- Social impacts, positive and negative
- RETScreen to *see* the impacts different factors have on financial viability
- Mean variance portfolio theory

19

Analysis Tools

- US Department of Energy primer for cost of energy calculation
- National Renewable Energy Laboratory Wind-DS model
- Electric Power Research Institute Technical Assessment Guide
- International Energy Agency multinational wind cash flow model
- RETScreen
- Microsoft Project

20

Understanding By End of Series

- Benefits and difficulties with various RE technologies
- Data driven analysis, modeling, and use of results for energy planning and policymaking
- Impact of various clean energy policies, programs, and initiatives (feed-in tariffs, procurement guidelines, regulations)
- Levelized cost of electricity vs. initial costs
- What is needed for a developer to obtain financing, including in terms of an enabling environment
- What makes a project viable or not
- Vital role of efficiency, conservation, and demand side management

21

Results

Appropriateness of the material – pertinence to your needs

Scale of 1-10 with 1 = "not pertinent to my needs" and 10 = "pertinent to my needs, I am using it at work now"

Intro to Wind Energy	Average rating of 8.27 with 36.4% stating they are currently using it in their work now
Wind Energy Project Planning and Financing	Average rating of 8.17 with 33.3% stating they are currently using it in their work now
Project Cost and Risk Management	Average rating of 9.22 with 66.7% stating they are currently using it in their work now
Renewable Energy Applications	Average rating of 8.42 with 41.7% stating they are currently using it in their work now

22

Results

Value of the course to you

Scale of 1-10 with 1 = "no value" and 10 = "extremely valuable"

Intro to Wind Energy	Average rating of 8.45 with 45.5% choosing "extremely valuable"
Wind Energy Project Planning and Financing	Average rating of 8.42 with 50% choosing "extremely valuable"
Project Cost and Risk Management	Average rating of 9.5 with 75% choosing "extremely valuable"
Renewable Energy Applications	Average rating of 9.08 with 50% choosing "extremely valuable"

23

Results

Would you recommend this program to a friend or employer?

Intro to Wind Energy	72.7% - yes, 0% - no
Wind Energy Project Planning and Financing	I didn't ask in this survey
Project Cost and Risk Management	100% - yes, 0% - no
Renewable Energy Applications	91.7% - yes, 8.3% - "other" i.e. they left comments

24

Results

- *The content of the courses and large amount of resources will aid anyone involved with the renewable energy sector.* John Regan
- *its about time someone offers a wind class that can be immediately applied to the real world* steve hogue
- *The knowledge available through Wind II is critical to anyone interested in understanding wind energy domestically or abroad.* Chris Fry
- *Of all my MBA courses, the St. Francis University wind classes were some of the most fascinating and valuable to my profession.* --Virginia McCracken Stump

25

Aspects Students Particularly Valued

- Interactive
- Live but recorded
- Women like convenience
- Instructors all have industry knowledge
- Special arrangements, as with Coastal Renewable Energy Technology Center

Coastal Renewable Energy Technology Center

26

Questions?

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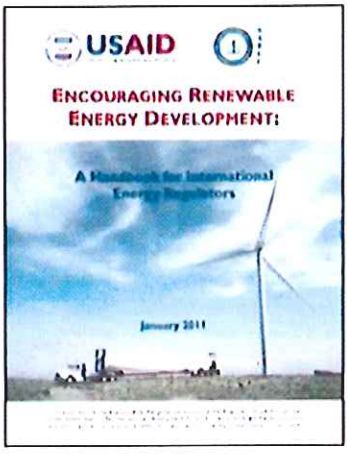
- gsa001@mail.francis.edu
- www.francis.edu/renewable
- Skype: RenewableEnergyCenter

27

Course I'd like to add

Renewable Energy Regulation



28