

RECENT WORKFORCE DEVELOPMENT ACTIVITIES

February 15, 2012

Coordinator: Good afternoon and thank you all for standing by. This is the conference coordinator. All lines will be placed on listen-only for the duration of today's conference call. I would like to remind all participants that this call is being recorded. If you do have any objections, please disconnect at this time.

I would now like to introduce your speaker, Mr. Ian Baring-Gould, the Technical Director of Wind Powering America initiative. You may begin sir. Thank you.

Ian Baring-Gould: Great. Thank you and thanks everybody for joining us again for the next WPA Webinar. This one focused on kind of recent work in the workforce development area, again focusing primarily on work that has been undertaken as part of some grants that were released by the Department of Energy a number of years ago.

They were part of the 20% wind energy request for proposals. And in total the Department of Energy awarded about 15 different grants to different primarily academic institutions to move the ball forwards in regards to workforce development.

And so today we're really pleased to have kind of reports on three of these initiatives that have come out focusing in different areas. So first one focused primarily on professional development for professionals, so people that are already in the wind space.

And then two presentations looking at - from a university perspective look at improving the kind of educational infrastructure for not only people that are

just coming into the wind industry but providing additional training to people who are interested in the wind space and so pretty excited about moving forwards with this.

As is always the case, the recordings of the Webinars are posted on the Wind Powering American Web site. It takes us about a week to get them up there. But all the presentations are recorded. We're going to be doing Q&A at the end of each session because each one is - kind of focuses on a slightly different area so we'll be doing Q&A at the end of each session. And then we'll be having a general Q&A at the end of the Webinar in total.

Just a reminder as you see on your slides here to ask questions, we're going to be doing it digitally as we usually do. Hit the Q&A at the - in the menu at the top of your screen. That'll bring up a little window and you can type questions in there addressing them to specific speakers and then we'll try and get through as many of the questions as we can right after each session and then some at the end.

Ruth is going to have to leave us after her presentation so questions for Ruth try to get those in during her presentation so that we can go to her to answer them.

So without further ado, we're going to move onto our first speaker, Ruth Marsh from DNV Renewables. Ruth has over 15 years of experience in analysis, testing and design experience in the aerospace and the wind technologies.

She actually started in wind back in the 90s working for Kinetic, which is one of the companies that if you've been around for a long time you know the

name but they're basically the forefront of development here in the United States in the wind space. So Ruth comes to us with tons of experience.

She currently manages a wide scope of wind related projects including feasibility studies, lifecycle, engineering, economic analysis, technical due diligence, a whole bunch of stuff for DNV. She's done a lot of work developing economic and optimization models to evaluate turbine designs, reducing energy cost.

She holds a BS in Mechanical Engineering from MIT and then also an MS in Aeronautical Engineering from Stanford University. And she is going to be talking about work that DNV has done in knowledge for professionals. So Ruth, please.

Ruth Marsh: Thank you Ian and good afternoon everybody. I'm delighted to have this opportunity to speak to you all today about DNV's wind energy knowledge groups curriculum for professionals.

And just a little note about DNV. We are an international renewable energy consulting firm that has (operatives) in several places in the U.S. and other parts of the world. I work out of our Seattle office, which is our center of wind related activity.

But just as an overview of this project, over the course of the past two years we have developed a series of short courses covering many aspects of wind project development and operations.

Our efforts have been aimed towards training professionals that are interested in moving into the wind energy sector from some other industry or also recent

graduates of university programs and to college grads or graduate studies but not - maybe not specifically in wind - having background in wind.

And the question is why are we focused on that segment? Well, to meet that DOE goal that Ian referred to of 20% wind by 2020, we need to grow both the short term and the long-term workforce. And university programs, which are certainly necessary and important, they tend to address the longer-term growth of the workforce.

And then there are also a number of community college programs that focus on technician training. And that's also another very important area of education. But we found that there was perhaps a need to provide professionals some sort of quick but effective way to get up to speed on wind energy concept and be useful in their - whether it's consulting work or working for a developer or so forth.

And also that there would be training that's possible to do in conjunction with a full time job that gives them basics from which they can further develop perhaps on their own. But this was also an important educational focus that's needed. And with this kind of training, the professional who's new to wind energy could be more effective.

So in short we aim to develop short courses that we would want our new hires to take and that was really the driving motivation for this design of our program.

This project is being funded by a grant from the DOE, again as Ian referred to. And our final product includes the curriculum material, company guidelines as well as a certification framework.

As we developed our short courses, we sought input and feedback from several industry partners who have helped to shape the content and the focus of our curriculum. And we've been very appreciative of their input.

So just as an outline of today's talk, I'm going to go over the program goals, what our learning approach has been. I'll give a brief overview of the content of our curriculum and its modular nature followed by a few examples of what it actually looks like.

I'll also discuss the meaning and the purpose of the certification framework and finally review the results of our internal pilot training that we've been able to do.

As we developed our training, we kept in mind a number of questions to help us stay focused on the overall goals. For example, how will this program make a difference is a question we wanted to keep in our mind as we develop it.

By providing a basic background in wind energy topics and practical learning that the trainees could put to use immediately, we feel that this would make training more attractive to industry employers and making them more effective as a new hire or a recent hire in contributing.

Who is the target training group? So alluded to it earlier but the curriculum is aimed at technical or business professionals or again recent graduates with maybe in it the technical, you know, engineering or business or economics degrees who would be - are highly motivated to contribute to the growth of the wind industry.

And we assume that this group is drawn to the wind sector because they're concerned about the environment, climate change and energy security and that those qualities really make for a very engaged and enthusiastic trainee. And we have - this has been born out in our pilot training experiences.

What are the overall objectives of the program? Well we focused on several. First was to design the short courses to cover the basics in enough depth to be useful. Also to develop the curriculum materials to be sufficient for implementation by a knowledgeable instructor and ensure that a trainee who completes all the courses gets a strong boost up the learning curve.

And really the goal is to give them tools to interact with the industry participants to have the vocabulary, to be able to read reports, probably not from a series of short courses be able to do something like an energy assessment. But certainly be able to understand what one is and what the important components of that would be for example.

So our learning approach. The overall format of the course is it's broken into six modules and each of them focuses on a different general topic. The module is designed to be delivered in approximately two to three days, two and a half days, something like that.

And if somebody takes all six of the modules, that would be equivalent to about 15 full days of learning. And then each module - within each module there's something like 12 to 15 subtopics covered.

So the program is designed to encourage active learning through the use of various instructional methods. We are using (the line) on PowerPoint and so each module comes with a slide deck as a starting point. There are also

guidelines that provide more detail and suggestions on how to present the materials, what equipment is needed, et cetera.

The course material includes exercises for training to do during the class on their own or in groups. And we also think it's really important for - in courses to have time to reflect on what's been learned especially when you have these kind of concentrated several day type of courses, you know, just getting lectured at all day.

I think the education experts will say that you retain about 3% if that's the way you're being taught. So you need to have group learning and exercises and ways to get people thinking differently and giving them time for reflection is part of that.

So the pedagogical aspect of this were considered and felt that this was important. And again, this has been born out in our internal training. It's been very successful.

We also have quizzes and Q&A and things like that to test learning at the end. Because the overall course is broken into modules, how it's delivered, how you might deliver it can be quite flexible.

You could - it could be delivered as, you know, one course every two months and then over the course of a year you would complete the six modules. Or maybe you do it all in one intensive three week course. That's a difficult sell for employers. However, we've tried - we've kind of tried both those aspects. And then there's options in between. That was the idea with the design of the curriculum.

And another question is what happens to the curriculum or what happens after the course is developed? All the material that we are - have put together and are finishing up here will be made available for download probably through the Wind Powering America site. I guess I need to talk to Ian about that in detail, but.

What does the curriculum include? As I said, there are six modules covering six basic topics. It's not rocket science here. It's wind energy basics but try to be more - trying to be more than just the wind energy 101 type of courses.

So we first have an introduction module that covers the history of the industry, the market, who the players are and in general the development process and a little bit - a little touching on offshore. I will say that mostly we're focused on onshore because that is still the major focus in the United States when this program was developed for the U.S. market.

The second module is wind resource meteorology and energy assessment. And that would cover things like, you know, the atmospheric processes, driving forces, wind maps, characterizing the terrain, how you measure and collect and process wind data.

And then on the energy assessment side of course looking at power and the wind and the conversion of that to energy, wind flow and how you model that and it's an influence on energy assessment, wake affect, uncertainties, things like that and of course dealing with losses.

On the third module, wind turbine systems and components, that is going to cover basic rotor design and aerodynamics and concepts like that. Converting the wind power to mechanical power through the rotor and converting that to electricity.

And we touch on the other components, generators, gear boxes, converters, how that's all put together into the turbine system and what the design drivers are. And then of course loads that are an important aspect of that.

In the fourth module on the installation and integration operations side of things, now we're looking at testing of the turbines, how you - the balance of plant; in other words, the installation and construction, transportation issues and foundation - design and foundation load and of course operations and maintenance on the turbines and how they connect to the grid, the electrical side and so forth.

We have a segment on a module for project feasibility considerations and this is where we would go into things like sighting, environmental issues, other - air space issues, community impact, things like that; noise and setback requirements and also GIS methods that are used to help with feasibility studies.

And our last module is focused on project economics, which is a very important part of wind project development looking at revenue and sources of financing.

This module has a lot of case studies to - where we're looking at how the project economics carry through and pro formas and things like that. And the impact of wind resource, how different, you know, sensitivity cases might affect the project economics. Also the impact of turbine technology can have an influence on the project economics. And finally we look at market trends.

So that's just a brief overview of the content of our curriculum. And now I'm going to just show just a few slides of what the curriculum actually looks like,

which is just a very, you know, looks - sort of a looking through the keyhole at an elephant type of view here but just to give you a flavor of it.

So example course material. This would be a slide - now this I know is hideously busy but the reason I put it up here is to show that we're making use also of existing Web sites and other sources of wind industry information and helping trainees learn where to find information, where to get it.

And this slide for example the trainees would - it would turn into an exercise where they're looking up specific information and helping to find out answers to some questions. So we would have a Q&A where they have to go seek information. And again, the idea is to make use of what's already existing and help people gain tools by which they can learn on their own, extend their knowledge.

For each of the presentations we have market module trainer guidelines as well to go along with it. And move on here. Another example of where we're trying to go from theory to practice in our curriculum. So in this example here we're showing the power curve that the blue line is power - actual power of the wind and the red - pink line is the power curve for the actual electrical power that you get out of the machine. And there's a huge difference there.

So there's kind of a theory. And then we build on that and we try to help them understand all the different ways you - why you can't get all of that power that's existing in the wind and where the power goes at each phase. And we also tie that to the - try to tie that into reality in here showing what does a natural power curve look like, why does it look this way, why is there scatter and trying to help increase the understanding there.

So again, I have another - just a slide showing about the guidelines that accompany the training materials. And these are going to provide for the instructor some suggestions on how much time each topic would require and what are - what would be the specific steps in that, you know, in that segment for that subtopic, what the desired outcome may be.

And it's not always - each slide doesn't have desired outcome but there are some there. And then what equipment is required and handouts and things like that. So it's an organized way to give an instructor some guidelines. These are not required to follow but again it's provided as an assistant to the instructor.

So that's just a very brief glimpse of some of the materials as you might expect with six modules and 12 to 15 topics on each one. There's quite a lot of material there in the full program.

Now this program also comes with what we're calling a certification framework. It's not certification in terms of what we think about when we think of wind turbine certification.

But it's a series of steps that we're providing that one could use to evaluate a particular implementation of the curriculum that we're - new developed and a way to evaluate that the implementation is in line with the original intent of the course.

Now the materials are going to be provided online and available for anybody to download and use in whatever way they prefer to use it. So this is not any kind of a requirement. But if somebody wanted to cite that their course - their short courses were sourced as the DOE wind energy knowledge booster for professionals, then they would need to have it audited to show that it was indeed following the curriculum that we developed.

And this certification framework - this would be used to do that. The details of that framework are still being developed but we don't have that complete yet.

And finally I'll wrap up here with just a little description of the pilot training that we've done. We have put the curriculum to the test internally in a couple different ways. We did a one-day - obviously very condensed version. It was essentially our condensed version of our introduction module. And that was received - positively received.

And then we also did a four-week - very intensive four-week course that drew from the material that we had developed for this course and extended in some cases beyond that because some of our international work is also offshore. We had more of that in there.

And that was received also very positively by the trainees. Again, compressing the courses all into one time segment makes it difficult for people who are - also have full time work that they're supposed to be carrying on as well.

But in terms of boosting - of achieving the goal of boosting the knowledge, that was the most gratifying part of this pilot training was that we could see that having this kind of training really does increase confidence. It helps people to understand in a more holistic way what's involved in wind project development.

And certainly get the confidence that this six modules when we get them out there and publish that they will be of benefit. And again as I mentioned that the material will by the end of April or in April sometime should be available for download.

And thank you very much. That's the end of my talk.

Ian Baring-Gould: Great. Thank you very much Ruth for giving us a quick overview of that - of the work that you've been doing. We have no formal questions because we're running a little bit late. I will not give you mine. So thank you very much.

And our next speaker is Gwen Andersen. She's the Director of the Renewable Energy Center at Saint Francis Universities. Gwen has 19 years of experience in the renewable energy and energy efficiency field initially working for an environmental think tank out of the University of Maryland as well as her own consulting company.

Gwen has worked - Gwen's work has included investigating the extent to which renewable energy can meet the needs of Southern California and the affect on air quality in the California - Southern California Basin.

She's done a lot of work with state legislators on regulatory measures, has done a fair amount of work internationally looking at renewable energy more generally in the Philippines and Nigeria as well as working with developing countries in developing financial approaches for community and rural exploitation.

In her role as the Director of the Renewable Energy Center at Saint Francis Gwen manages the renewable energy business certificate program which is the primary focus of this discussion trying to expand beyond just engineering but looking at all of the other industries that are required for the renewable energy space.

She also provides lots of information globally in regards to renewable energy and its cost effective utilization as a resource. Gwen holds an MBA in Finance and an MA in International Development Appropriate Electrification Technology.

So Gwen is going to talk about the work that Saint Francis has done specifically looking at the business of renewable energy.

Gwen Andersen: Thank you Ian. The slide that is loading is the DOE - I'm thanking DOE for funding the development of our program and making it possible for us to experiment on an initial series of guinea pigs to test the classes out and learn on them.

In addition to thanking DOE for making it possible, I'd like to thank the curriculum development committee for providing additional feedback. These folks reviewed the materials for each course to make sure that our classes met their needs as employers.

And finally, and one of the students is online, I'd like to thank the students who were generous with their feedback and helped us to improve the classes as we went through them.

Saint Francis University is a rural university halfway between Harrisburg and Pittsburgh. In 2003 the Vice President for Strategic Initiatives, Dick Crawford, decided to see if the Allegheny Ridge near us would make for a good wind farm.

He had the resource measured, talked with landowners and now there are two wind farms there, Babcock and Brown and Duke. I can actually see the turbines from my office. It's 80 megawatts in capacity.

The Renewable Energy Center runs a number of programs intended to help overcome barriers to renewable energy including getting slides to load and an anemometer loan program. This program has already led to another wind farm that will have 34 megawatts of capacity and should be in place by the end of the year.

Again, with DOE funding, we have an undergraduate renewable energy engineering program and the graduate level business program that I'm going to discuss today. Oh, that was much faster. See what happens when you don't have pictures in.

The purpose of the program is to meet the needs for business and policy understanding in the wind industry. In addition to engineering knowledge the wind industry needs individuals trained in planning, financing and deploying renewable energy projects so that everyone doesn't have to learn the hard way but can learn from the experiences of others.

Equipment manufacturers, project developers, lenders and utilities all need this knowledge. But the wind industry also needs government officials at all levels to understand the wind industry, why it has been official and what's needed to secure these benefits.

Not only do people going into the industry need to understand the business and policy aspects to advance their careers, but the industry needs regulators and government officials to get it.

Our students have included engineers of course but also regulators, federal and local government officials, non-profits and people who are looking to be hired into renewable energy.

We had 20 students in our guinea pig series. Three of them credit this program with helping them to get jobs. With only a note on LinkedIn, I had 55 applicants for 20 spaces, most of them with graduate degrees.

I gave a presentation at the USDA meeting in Pittsburgh about the program and their HR department wanted to send ten students. This was just the Pennsylvania USDA.

Key facets of the class is that it focuses on business and policy. While it is online, the classes are live and interactive with a set time, Tuesday nights. Because it's online, the classes are recorded, which is very handy if the students can't make it, which happens when you've got busy working students.

In addition, the last series of classes had people from the Philippines, Korea, Ethiopia, Sri Lanka, the Netherlands, Mexico and Portugal as well as across the United States which meant great worldwide networking opportunities.

These are some of the non-engineering things that people in an industry need to understand. There are four courses. The second wind course goes into greater detail. It covers material that is important for all of the renewable energies but it comes from a wind energy perspective.

As you're probably starting to see, there is some overlap between the courses. However, we worked the classes together as a whole. So if one professor goes into an issue in detail, the other professors know that they can use the student's time more effectively by just touching on the issue.

The final class is renewable energy applications. It covers everything but wind. But it's able to go into greater detail on some things like community

impacts and community engagement as well as policy and its impact around the world.

We use (red) screen in this class so that the students can play with different variables and see the impact of those variables on the financial viability of a project.

After every course I sent out an anonymous survey. As you can see, each class scored highly, all above eight out of ten. And with a sizeable number of the students saying that they were already putting the new knowledge to use.

Project cost and risk management is essentially project management for renewable energy. Not everyone at Saint Francis University was certain that this was really needed and in fact not all of the students did need it.

Many had already taken project management classes or felt that they knew what they needed to. However, 66.7% saying that they were using what they were learning in their work today speaks to the value of that class. Again, the responses were really favorable.

These quotes are from a venture capitalist, someone who works for a renewable energy installer, a contractor to DOE and an official from the USDA.

One of the things that we did before each class was to hold an orientation session. This allowed the professor to introduce himself and the students to introduce themselves to each other. It allows us to cover all of the administrivia without taking up class time. Finally, it allowed everyone to discover and work out the technical kinks before the real class started and thus in a less stressful situation.

Given the risk of advertising and given that the audience is disbursed, I'm unsure if there's really enough demand to do this at most schools on their premises. There will be some students who are going to want it intensely but will there be enough students at each individual college who want it in order for it to be sustainable?

This is one of the reasons why I think articulation agreements make sense. Then many schools can offer this as part of their program but without every school going to the expense of developing it themselves.

I'm looking to develop articulation agreements, which is a way for you to meet student interest in these classes without the risk of developing a program and it's a way to funnel our students into your graduate programs. Given the incredible need for this around the world and the convenience of taking it online, this is very appropriate for developing countries.

One of the things that we did is that the professors came from industry and so they had to be taught how to teach and how to make the classes interactive. This picture shows you how the - some of the ways in which we were able to make the classes interactive.

This little icon series shows a tiny little microphone and down here there's another microphone. You can hand the microphone around during the class and the students can speak live and ask their questions or give the answer to their - to questions or they can give presentations. And in most of the classes the students gave presentations.

In this column the students get a pen and they can write in the chat section to each other and to the professors. They can make comments during the class.

They can ask questions during the class. The professor can ask them questions and then do some quick polling. So how many people believe X and then if you do, click on the green arrow and if you don't, click on the red X in this column.

Students can raise their question - raise their hand in this column if they have a question that they want to ask. In addition there's a tool that allows the professor to just open up the entire slide and then all of the students can write on the slide anonymously. One of the nice things about this is that it helps get students over the hump where they're afraid to ask questions because they can do it anonymously.

For number - for this last one, women like convenience. Working dads with young children as one of the students was also appreciate convenience. But I was struck by having 50% women in the class. Yes, it is renewable energy and yes there are more women in renewable energy than there are in other engineering disciplines. But there aren't 50% of women in renewable energy.

This is how people can arrange to take the class. They can sign up directly on our Web site. We can arrange articulation agreements or contracts. For example, we've been included on some bids to USAID. USDA expressed an interest in having some of their employees trained.

In addition, one of the students was from the Philippines and he worked for Coastal Renewable Energy Technology Center. He was so impressed by the class and his employers were so impressed with what he was learning that we have a special arrangement with them to offer these courses in the Philippines through them.

So the students in the Philippines can either take the classes from their home or they can take it from their employer or they can go into Coastal Renewable Energy Technology Centers specially setup classroom and not have to deal with the technology at all.

I hope I've gotten us back on schedule to some extent Ian.

Ian Baring-Gould: Yes you definitely have.

Gwen Andersen: Oh good.

Ian Baring-Gould: Thank you very much for doing that. Just a - there are no formal questions so both Gwen and Jim are going to be able to stay with us until after the session. So please don't hesitate to put any questions that you might have that come to mind and we'll have Gwen answer questions at the very end. Why don't we move on to Jim and then we can come back to questions if we need to?

Our next speaker is Jim Tinjum. He's the Program Director at Department of Engineering Professional Development at the University of Wisconsin, Madison. Jim has - definitely has a sense of humor if you ever get his bio.

But just to do a quick summarize, most of Jim's background focus is in the consulting, research and teaching of appropriate areas of geotechnical and geoenvironmental engineering, beneficial reuse of industrial byproducts and then in the sustainable energy space with a real focus on wind energy in geothermal both for heating and cooling.

After being what most of us would call a lifer at the University of Madison over 17 years there getting various degrees, he in his own words decided that he couldn't exist on low price student season tickets to football.

And so went off to join the consulting world specifically at RMT, Inc and then CH2M Hill where again in his own words he basically loves sending junior engineers out to the most extreme and horrid places possible while he hung out in his office and made them work harder, which made it perfect for him going into the academia where he can be a professor and get his graduate students to do exactly the same thing.

The work that the University of Wisconsin has done is really trying to take a lot of the more field related expertise in what we now have is a really growing industry and provide wind specific training into these sectors, which is - fits very well with Jim's kind of current understanding his work in the engineering to put disciplines and then focusing on how you educate people in wind but also other types of more traditional engineering spaces into this new economy.

So Jim, could you please talk to us about the programs at Madison?

Jim Tinjum: Yes. Thanks for the introduction Ian. My colleagues and I at the University of Wisconsin are very pleased to share our successes related to our wind energy workforce development grants from the DOE.

As I hope that you will see shortly, we believe we've had a national level impact on the wind industry. And this funding has now allowed us - our outreach efforts to become self-sustaining into the future. I believe I might be waiting for a time gap as my slide advances.

Our directive and objectives within the wind program was to support workforce development specifically to address the technical issues related to wind energy balance of plant design. That is the site civil, geotechnical,

electrical, structural and construction management for wind site development, design and construction.

I would like to say that here at the University of Wisconsin we are pleased to continue a long history of wind energy research and outreach which reaches back to the late 19th Century when researchers were evaluating wind power applications for rural farmers that had very limited access to power.

The research in outreach continues in our engineering professional development, civil engineering, geological engineering and electrical engineering programs.

Now many people are cognizant of the challenges and advances in the mechanical electrical design of wind turbine components including gear boxes, generators, power controls, blades, et cetera. However, we address the challenges of balance a plant design, which includes items such as foundation design where today's foundations can include 30 tons of steel, 400 cubic yards of concrete. Typically it costs between 100 and \$250,000 each.

We also address the engineering necessary for haul roads and crane paths where the largest cranes in the world are used to traverse grounds such as corn fields, prairies, rangeland which can be potentially sensitive to the soil conditions and compaction thereof. We also are training engineers and technicians on lift logistics, collector system design, substation design, et cetera.

Now we have developed with this grant opportunity three separate continuing engineering education short course in this balance of plants and arena. They include electrical balance of plants, site design and construction and a very popular course called wind turbine foundation and power system design where

I believe this content is not taught anywhere in the world that I'm aware of than in this forum.

Several of our courses have been offered multiple times. You know, while we have put in between 1/2 to one year in development time, as I said earlier, these courses are now self-sufficient. And you can find more information about any of these courses and how to enroll at the HTP link shown there, (epd.engr.wis.edu)/breeze. And I didn't come up with the breeze but somebody in our marketing program did.

We've had phenomenal success in these short course deliveries as represented by the nationwide audience that has participated. We had attendees in person from 37 states plus the District of Columbia and Puerto Rico. I am right now in discussion with engineers in Connecticut to bring one of these courses there in October. So I'm hoping some of those non-colored states can - in the Northeast can join in on the - this bandwagon here.

But anyway we - I should note that we offer these courses nationwide including events in this particular suite to - in Madison, Wisconsin; Austin, Texas; and San Jose, California.

Now for the course logistics is I recruit and develop subject matter experts across the country to deliver the technical content. My home department at UW Madison is the Department of Engineering Professional Development.

We've been delivering engineering short courses since the 50s and I believe we're one of a - if not the longest running continuing engineering education programs in the nation. So we've been doing this for over 60 years. We're accredited in all 50 states to provide professional development hours for our

attendees to typically include consulting engineers, NGOs, contractors, manufacturers and government officials.

Now I believe that our course attendees learn the real specific technical design content. And not to put anybody off but I try not to teach the fluff in the U rah, rah for the wind energy business. Reach technical content that engineers, technicians, designers can immediately put to use.

Now so for example, we might teach how to scope a field geotechnical investigation, how to report this relevant soils data, which leads directly to an appropriation foundation design, which we will also teach everything from the reinforced concrete design to the sizing.

As an example of some content that was developed in this grant, this particular slide has received a lot of positive response because there's no textbooks out there on foundation design for wind turbines.

DNV does have an older text that hits some of the issues but this was so popular in our course that I was asked to write a paper to a professional trade magazine called GeoStrata, which is an organization within the American Society of Civil Engineers. And this publication is going to be coming out shortly and has a circulation of 20,000 plus.

Related to the structural design is I bring in structural engineering experts to teach how we take wind resource data to design the wind turbine generator tower, which are getting bigger, thicker and taller every day.

Among my instructors are engineering directors from major manufacturers including Vestas and Broadwind, which are major players obviously. Thus we

teach everything from tower design to manufacture to the transportation and erection logistics.

Now as an example of course content is we've not only delivered this orally but we include comprehensive course notebooks with all of the design specifics including our PowerPoint slides, reference materials, design calculation examples, everything that we think would be useful in the industry.

In this slide here you see that I've done a snapshot of some of our content for collector system design. So we will calculate the opacity, the soil condition, electrical losses, everything that's needed to eventually to get to a layout in a one line diagram for collection system design. I believe this content is relevant, up to date and we constantly improve it with every new offering.

Now I may be most pleased with our success in developing and delivering an upper level four credit design plant class in this balance of plants arena. I've had 84 students come through this course of which three - at least, excuse me, at least seven are now working in the wind energy business with many more to come.

Now as an example, one of my recent graduate students recently took a job in California and is designing deep foundations for wind turbine generators. And another one of our graduate students just went back to Puerto Rico and is working for the developer of the first utility scale wind site there in Puerto Rico.

For everybody's benefit, this course is also delivered via distance. But anybody out there with sufficient background can register as a special student at UW and take the course online.

Now where we're going with this is I believe we're delivering a very multifaceted outreach campaign. And I'm pleased with our preliminary successes. But our future includes taking this down a level and bringing to our very popular Camp Badger, which is a week long summer camp for 8th grade students interested in engineering.

And this class is so popular; I believe we add - we teach it six to eight times over the summer. And we have to limit enrollment. Sent 500 students through. And as many of you probably realize is to get students into the (stem) field, you have to be at this level to get them interested because by high school they're almost lost in where they're going.

We're also moving towards a generational program called Grandparents University where grandparents come with their kids in the summer for a day or two and learn about engineering and other things that we do on campus.

Finally where we going partially with some preliminary funding from this is we are taking and moving forward a field level wind turbine generated foundation instrumentation project to supplement and support the design approaches that we teach.

And this is based - purely based on questions and input from our course participants from all those 37 states. You know, what information do they wish that they had that's not out there?

So in our case we're putting in instrumentation on a project shortly for the stress distribution for these large highly eccentric foundations. You know, we've only been building these for about a decade so we do have a lot to learn.

I'm pleased to say that on Sunday my colleagues and I are going down to Illinois to install this foundation instrumentation in partnership with Heartland Community College in Normal, Illinois. They're putting up a 1.6 megawatt turbine and we negotiated with them to install our instrumentation at this project.

So in addition to our outreach to practicing engineering, teaching to university level students, we're doing corollary research to support both of these missions.

Again just showing some of those very unique highly eccentric loading conditions. And not going to talk in detail because many of you - I just want to come across with the concept of what we're doing here on field instrumentation. And in our case this research is going to go directly back into our program and use - and be disseminated directly to the profession.

So with that, I would like to thank the Department of Energy again for supporting our initiatives. We are very pleased that our outreach has positively impacted workforce development and the technical delivery of balance of plant design.

And it wouldn't be a presentation without a sunset with turbines on it. So with that, I'll turn it back to you Ian.

Ian Baring-Gould: Great. Thank you so much Jim for the overview of the work that you're doing as well as the nice sunset to go out on. Some quick questions. Jim, how have you offered your course or how would you offer your course to specific clients as in an engineering firm or construction company.

Jim Tinjum: Yes definitely. We have a - what we call custom courses and so we can go into a contract and come to anybody anywhere in the country and deliver this in house. Or they can come to Madison and we deliver to a custom audience here. Not for wind energy but as an example I just recently got a call from the Air Force that wants to come in with only Air Force engineers to take one of my courses that - in another area as an example.

Ian Baring-Gould: And then how long out do you plan these courses? So if someone went to your Web site, would they be able to kind of track down a course that was coming up in the near future?

Jim Tinjum: Typically they're posted about six to eight months in advance of the offering. So as you saw in those brochures is we're having courses in May and September I have a course and then soon we'll have one in October. So go to our Web site and typically six to eight months in advance those are posted.

Ian Baring-Gould: Great. Question for you Gwen. It was a little bit unclear, are the courses you offer online at this point or is the plan to move them online into the near future?

Gwen Andersen: No. All the courses are online. They have - they're live meaning we all meet Tuesday evenings at set periods. But the classes are entirely online.

Ian Baring-Gould: And how often do you run them?

Gwen Andersen: Oh, well we - right now we are running renewable energy applications. We will have project cost and risk management in April. And then we will have Wind 1 and Wind 2 - I'm sorry, that's my short name for them -- at the end of the year.

At this point we're going to be having basically a series every year.

Ian Baring-Gould: So you're...

Gwen Andersen: These classes are ten weeks. So each class is ten weeks in duration plus that orientation session, which means that someone can complete all four courses in one 12 month period.

Ian Baring-Gould: Great. And then as part of the development of this course, did you do any work to try and understand how large the market was for people that would kind of take these courses in this more business focused area?

Gwen Andersen: We talked a lot with companies that need people to have this expertise. So we found out that companies needed it. We didn't research whether students were actively looking for it. Just that employers needed it.

Ian Baring-Gould: And then do you have a sense of how many people are coming to you to take the courses? Are they kind of building up over time?

Gwen Andersen: Yes. It's building up over time.

Ian Baring-Gould: And Jim, kind of a similar question to you. Do you have a sense of how large this market is for people needing to take your course and are you getting a sense just by - based on the number of applications what type of response you're going to have.

Jim Tinjum: Well two things. On the continuing education, we had 300 - over 300 people into our short courses in wind energy. I think the market is going slightly down right now because of the uncertainty in the production tax credit

extension. A lot of people are wary about what's happening. That's going to affect our attendance in the near future.

But if we go back to the university level, our geological engineering, civil engineering programs are busting at the seams and everybody - a lot of those students are coming in. We want to learn about renewable energy and what I can do and engineering seems a natural outlook for a lot of these students. We are literally busting at the seams on the university level.

Gwen Andersen: I'm going to agree with Jim on the impact of the PTC. And I'd also like to comment on the impact to the recession overall. I've had a couple of students not be able to take it because they've lost their jobs or their husband or their wife have lost their jobs and they're barely making it on one income and they can't afford to take the class as well.

And then the uncertainty about the PCT has meant that some students had employer funding and then the employers had to pull back.

Ian Baring-Gould: Great. Thank you. A question probably more for Jim but for both of you and this is from Heather Rhoads-Weaver. And that's are any of the programs connected with the (navsat) certification for small wind installers? And assuming that they kind of are, have you looked at the small wind industry in developing training courses for that?

Jim Tinjum: No we're not associated with that program. However, in my wind (unintelligible) civil design course I do bring in a lecturer or two on small wind so that, you know, the (Walgreen's) and commercial and other facilities of the world have an understanding and smaller consulting firms can get into the game.

Gwen Andersen: As for Saint Francis, we did last year have a hands on course on campus for small wind that qualified for (navsat) credit certification. Not through the small - not through this program though that's an interesting idea.

Ian Baring-Gould: Great. Thank you. We've gone over our time by a little bit and we have no further questions. So again want to thank both of you for your presentations and let everybody else know that we have a number of presentations coming up in...

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