

WORKFORCE DEVELOPMENT IN WIND TECHNOLOGIES WEBINAR

January 19, 2011

Coordinator: At this time all participants are in listen only mode. And now I'd like to introduce your host for today's conference, Mr. Ian Baring-Gould, you may - Technical Director for Wind Powering America. Sir you may begin.

Ian Baring-Gould: Hello everybody and thank you again for joining our series of Wind Powering America Webinars. In this instance -- for this month -- we're focusing on workforce development. And we have a great panel in front of us to talk about the kind of work that the Department of Energy is doing. Programs the Department of Energy is doing in the wind-powering - or in the workforce development areas.

But first to kind of set the stage I wanted to talk a little bit about why the Department of Energy is so focused on activities in workforce development. And a lot of this draws out of the 20% Wind Energy by 2030 report that I'm sure most of you are familiar with. But it really shows the kind of challenge that the wind industry has as it looks forwards.

The top map shows basically where we are now. It's a little bit dated but -- at the end of last year -- but it shows us at about 2% of a annual electrical energy production from wind technologies. And then going down to 20% and as we can see it's a huge step in the amount of energy that we expect to be generated from wind.

But of course, to implement all of that wind technology, it requires a very advanced workforce. And so the - one of the challenges that was clearly identified in the 20% by 2030 report was the need to drastically improve and

expand the workforce development activities that are available to people in the United States so that U.S. industry can capture the market as we go forwards to 20%.

And that drove the Department of Energy to look at a number of different programs, a couple of which we are going to be talking about today. So to start off the presentation we're going to look at two of the 20% FOAs -- which were Funding Opportunities -- so these are grants that were provided by The Department of Energy to look at specific issues in workforce development. And then I'll talk briefly at the end about the Wind for Schools program which is another major effort from The Department of Energy.

I want to remind everybody that we're going to do - hold questions and answers to the end of the session. And as we've done in all of the sessions so far, encourage people to type in questions and then we'll field those questions to the specific presenter at the end of the conference.

So quickly to give us an overview of the activities that the Golden Field Office is doing with these grants, I'd like to introduce (Debbie) -- who's the project officer for the wind program working in the workforce development area -- to give us a quick overview. (Debbie)?

(Debbie): Okay, yes. What we do here at the Golden Colorado Field Office is we assist The Department of Energy Headquarters' Energy Efficiency and Renewable Energy program and managing financial assistance awards. And what we do is we provide procurement support in developing the funding opportunity announcements. We then conduct the merit reviews and negotiate the technical aspects of awards. And then we do the project management as far as tracking the financial and technical status of the projects and providing technical assistance.

For this particular one we were looking for innovative approaches and partnerships that retrain skilled, unemployed workers as well as provide new graduates. The boards that we made were primarily the end of 2009 and 2010 -- is when they got started. Most of these projects are one to two year projects, so some of them will be coming to completion the end of 2011.

We funded sixteen 20% FOA workforce development projects for a total of about \$4 million. And we have another \$3-1/2 million of congressionally directed project funding for FY8, 9 and 10 which also includes some workforce development work.

These projects - the results that are expected are in a variety of areas. There are a lot of them that are establishing wind turbine technician training programs. Some of them have purchased equipment to enhance existing wind energy training programs. We're funding some graduate fellowships. There's a lot of wind energy curriculum development, some at the university level -- power engineering courses -- some you'll hear from some of it today.

We have some course work focused specifically on offshore wind energy. There's a lot of community college wind energy technician training program curriculum development. There's been some professional development short courses as well as military veteran training. There's wind energy safety certification. And also some distance learning -- online delivery and career outreach DVD's that are - have come out of these projects.

We're also funding some outreach to community colleges and high schools and establishing collaborative partners with industry in other organizations as part of this. And in the future we're hoping to do, is to make some of this

information a little more accessible, somewhere on the Wind Powering America Web site.

So that's basically what we're doing and we have two speakers here today to talk about what they're doing in curriculum development and with their training programs. I think Michelle was going to start this off with information on what Lakeshore Technical College is doing.

Ian Baring-Gould: Yes exactly, thank you (Debbie) for that quick overview. So again if people have questions about the more general program of the 20% by 2030 workforce development grants for (Debbie) please let us know and (Debbie) will field those at the end of the call today.

So without further ado I would like to get to our first duo of speakers from Lakeshore Technical College. And we're going to be hearing from Doug and Michelle. Doug is the Dean of Agricultural Apprenticeship and Trade and Industry Programs at Lakeshore. He - an important point about Lakeshore is that it's the first Wisconsin technical school to have an approved training program for wind technicians, which is very important and very unique.

Doug comes with over 20 years of technical experience in college administration, especially looking at new programs and national accreditation, and fiscal management and things in - of that nature, excuse me.

Michelle is the Coordinator of Next Generation Energy at Lakeshore and provides oversight of a number of different grants from DOE, Department of Labor and other organizations. She also does a lot of sustainability work at the college. Prior to her time at Lakeshore she was an Environmental Scientist through a consulting company in Michigan. And then was a student assistant at the Michigan Department of Natural Resources and Environment.

So without further ado it'd be great to hear these two about the - from these two about the great programs that they're doing at Lakeshore.

Michelle Seppala Gibbs: Okay well I guess we will get started and once again my name's Michelle and we are going to kind of take you through just a quick overview of what we're doing at Lakeshore Technical College.

You should be seeing a picture of our four turbines that we have on campus. We have our number 1 turbine which is the fastest. That should - that one arrived in about 2004 and it was installed and it is - and it produces about 65 kilowatts of power each - is the amount that it generates.

Number 2 is our Entegrity and that one was installed in about 2010 and that one is a 50kW. The number 3 is our Endurance and that was also installed in 2010 and that is another 50kW. And number 4 is our tiny one, that's our Proven and that is a 2.5 kilowatt turbine.

Doug Lindsey: So the is number 1, the Vestas at the install. We'd made arrangements - we'd originally sent people out to the old (PETE) Program, it's now known as the National Partners in (unintelligible) Technology Education and we had an apprentice instructor Jenny Heinzen and Steve Power go out to NREL labs and get really excited about wind.

Found out - found some local Wisconsin funding -- Focus on Energy funding -- to help support the installation of this turbine. Looked at the market and could not find a market for wind technicians in 2002-2003. And so put this up strictly as a demonstration and to offset some of the college's electrical power.

The next unit we got really excited about being able - this is the Vestas still. And we - 2004 we had a student climb - wanted to climb the turbine. We arranged that, we did a course, provided her with more electrical code than she'd ever need and climber safety and moved forward that way. It hit the AP wire, the phones started ringing, people said, "You're training students" and we said, "No, we're not yet". And they said, "Well you have to be".

This is Jenny on the right and Velvet Sommers, the student at that time, the sole climber in 2004. We had a very strong electrical-mechanical program designed primarily for automation, industrial networking, machine repair. And initially started to - we bootlegged the program, if you will, through our system with 12 credits of pure wind courses which - we basically made it a track. And - well we did the 18 month program approval process so that today we have a stand alone wind separate from electrical-mechanical.

Michelle Gibbs And next we're going to kind of move on to just a brief listing of our partnerships that we have within our program -- our wind program. The first one on the list is the AACC. I will actually be attending a meeting next week to discuss emerging green jobs and preparing the future workforce.

The AACC recently created a Web site for SEED -- which is the Sustainable Education and Economic Development -- which is kind of like a share point for all community colleges to share some of their green programming and stuff. So it's a really neat thing that they've recently developed.

ASHE is another one of them and we are a signatory for the American College and University President's Climate Commitment. The next one on the list is AWEA, which is the American Wind and Energy Association. And they have recently just named a new program called their Seal of Approval program, which is really a list of standards for wind programs all across the country to

make it more uniform. And Doug and myself and our instructors are reviewing their standards and the - we're hoping to become a part of that in the next few months or so.

And obviously our partnership with the DOE is huge and it's based on our grant that we have with them, which we're really grateful for because a lot of things have come out from this grant. We have been able to really start working with a lot of our other Wisconsin Technical College Systems -- the WTCs -- and we are pulling together our alignments for our wind program and some of our other programs as well. But we have recently just gifted our Intro to Wind program and this resulted in the sharing with four other programs in a shared program agreement.

The construction of our rescue tower which you'll see some pictures of in a few other - in a couple other slides, is our local match for the grant. Another point is that we have grown because of our grants and the whole incorporation of industry standards and materials into our curriculum. And this has recently led to a change. We originally started with a 12 credit of pure wind courses and now we have moved up to 17. And this has been approved by our industry advisory committee.

Doug Lindsey So you can see the rest of the list in front of you. ENSA is a safety access and rescue provider. They helped us step up our game remarkably. And we're doing those certifications with students at this time. They leave with an ENSA card if they complete their program.

Focus on Energy had funding in all four turbines. Well - I'll talk about MagDrive a bit later we've got a link to them. They were instrumental in this last of the Proven install because they have an intelligent control. And we're getting about 50% more electric off that - from that magnet machine.

MREA, if you're in the area, knows that Midwestern Noble Energy and the summit -- the energy fair every June. We've been blessed to have them as a local resource and good training site. NC3 is a group you may not know about. We've got a link at the end of them, it's the National Coalition of Certification Centers.

Originally started by Snap-on just two years ago, bringing in industry vendors, like High Torque for - as an example of hydraulic torque, and a number of colleges working in energy -- whether it be nuclear, electrical, or wind -- in providing specific torque training. I use their instruction and video and Web based materials so that A, people don't get injured while they're doing it and B, more or less maintenance warranty tech support problems for those companies. And it's really a neat partnership, I encourage you to take a look at the number of colleges that are out there.

New North is our 18 county regional development authority. We actually have fairly strong manufacturing capability and about eight manufacturing firms connected to wind now. We do the AWEA, North American Wind Power Show, so forth. Renew Wisconsin is a local Wisconsin non-profit, policy lobby, advocacy group. The Wind Alliance is a - quite a strong group that's university oriented.

We Energies has -- that's our local utility -- and they have significant dollars in three of the four turbines. WORKS, a group that's just been formed and includes four of the major universities and two technical colleges and a number of industry partners now. Having a research base, WPSC -- the Public Service Commission -- we've been very active with some policy and advocacy issues. And Michelle mentioned the tech college system and our outreach across multiple colleges with them.

Michelle Seppala Gibbs: And now we're just going to kind of briefly go through some of the images of our students working on different turbines, doing some different maintenance activities. You can see that they're actually up in the turbine in a couple of the photos.

Doug Lindsey: We had the blades off and the gear box out and so the picture you saw across Lake Winnebago, that's a turbine we service for a private land owner.

Michelle Seppala Gibbs: And coming up there should be pictures of our rescue tower that we're - that was just recently constructed. That was, as mentioned before, our match for our DOE grant. And this is something that is just brand new, it's not really a piece of equipment that you can just purchase. It's actually something that we kind of had fabricated by an engineering company. So it's really pretty cool. We have a tower base section and then we've put a platform on it and we're going to use that for high-angle rescue and safety training in our program.

Doug Lindsey: As those load, the other pieces you'll see here, these are - this was a downed GE 1.5 out of New York and the insurance carrier bought it and gifted it to us with a condition that we go get it. So we brought in the router hog, the nacelle, the base tower that you saw and one blade to save our shipping costs. The next installation that's coming will be our outdoor wind lab, for lack of a better term.

Now what that's going to allow us - you see Lake Michigan there in the background in this slide. We're about a mile and a 1/2 off the lake and hence the Lakeshore. What we're going to do with the nacelle and the router hub and the blades hub is to mount that on a cradle about 12 feet off the ground. So OSHA's coming through with all kinds of confined space issues. This - still

haven't identified in the cell currently. And so that becomes a whole another training component.

We'd actually been very fortunate to connect early on with the regional and federal OSHA. Currently there are only four people trained for an accident investigation that can enter into nacelle currently and they'd like to double that.

Michelle Seppala Gibbs: Sorry the next slide just taking little bit to load. But some of the main areas that we are looking for our students are going to be in the areas of Wisconsin wind, Great Lakes Wind and U.S. and offshore as well. So we're kind of keeping an eye on those things that - developing just like everyone else.

But overall we think the job market looks pretty positive, just depending on how some regulations go in the near future. But we're thinking positive for that. The next slide here is a picture off of the Focus on Energy Web site and that is - as you can see there's a bright green section right on the Lakeshore and that's almost exactly where we are. Those signify about 14 to 15 mile per hour winds and so that's exactly where our campus is. So our students really get some of the best wind in the state over here. So that's a really neat thing for them to have.

Doug Lindsey: We have three commercial wind farms currently installed in the region and about 10 or 11 waiting for decisions by the new state administration. What - early on we decided that we couldn't sit on the sidelines. And so it's - advocacy is a tough spot for public community college -- technical colleges -- to be in. But historically these were township ordinances and everybody went their own way. We worked very hard with a number of people to develop

statewide sitting and that's - that statute's been approved, it's been written, been out for public hearings and so forth and due to take place March 1.

With the administration change here in November -- and now with them taking seat in January -- means that that's all in question right now in terms of setbacks and noise, line of sight, payments, those issues. But we have our fingers crossed because it really holds those next 10 or 11 wind farm projects kind of in the balance.

Oh, I wanted to highlight some of these links that - for the partnerships we talked about before. The Bureau of Labor's done a really nice piece with the - bringing the wind energy site, very detailed. If you're looking for the careers in wind, if you're looking for salary information, if you're looking for training backgrounds, it's a great Web site.

DOL's just come out with the wind turbine technician job process. Think apprenticeship, think three years of the occupational training, the kinds of procedures they need to do and the number of hours on the job with those procedures as well as related technical college or school training.

MagDrive's the group I mentioned. And they've done a very innovative intelligent control that kind of dampens the gust ability of our local wind -- the rise and fall on small pointed magnet machines -- and dampens that. And actually overall increases the output because the machines' uptime is so significant.

I encouraged you before to talk about - to take a look at NC3, the colleges that are involved in sharing curriculum. We're developing a shaft alignment piece currently. NCCER is the National Center for Construction Education and Research. These would be non-affiliated, primarily apprentice type training,

skill trades training and construction. They're building four different wind curriculums in kind of sequence. And we've - we're working with them as an SME.

O*Net OnLine has a one step center for wind technicians now, tells you all about the job market. WORKS -- this new group we mentioned -- it started out of Southeast Wisconsin, research - energy research council and now it's just Wisconsin. And if you want to see what Wisconsin Wind Works is doing and the great display we put together and bring about 22 different entities together for the AWEA show, that's out there at Wisconsin Wind Works.

Michelle Seppala Gibbs: And that's all the information that we have time to share but if you have any questions at all our contact information is on this last slide. So feel free to give Doug or myself a call or shoot us over an email, we're always happy to talk about any other questions that you might have. Thanks.

Doug Lindsey: Thank you.

Ian Baring-Gould: Great thank you both. Again, please don't hesitate to put the - put any questions that you might have for Doug and Michele - type those in and we'll get to those at the end of today's session.

Next I'd like to invite Giri to talk about the work that is being undertaken in the wind power education activities conducted at their campus at University of Wisconsin. Giri is currently an Associate Director of the Wisconsin Electric Machines and Power Electronics Consortium -- which is in the Department of Electrical and Computer Engineering at the University of Wisconsin.

Prior to his work there Giri taught electrical engineering at Montana State and got his PhD actually from Madison just a number of years - a good number of

years ago. Prior to that he got his M.S. at California Institute of Technology and a B.E. in Electrical Engineering from the Government College of Technology in India. So Giri, could you tell us a little bit about the university programs that you're developing at University of Wisconsin?

Giri Venkataramanan: Thank you very much for the kind introduction and I'm really happy to participate in this Webinar here and thanks for NREL folks for bringing us together as well as DOE for funding this opportunity for us to develop this work.

And I'll try to give a little snippet of the activities that are going on here, particularly in the education realm within the scope of the DOE programs and catch up on some of the broader activities towards the end of the presentation.

And on the first slide here what is shown here is a picture from 1978 on the left. It was way back when wind was really out of venturesome people getting out and doing something. It was one of the professors in the Electrical Engineering Department built a wind turbine and installed it in the top of one of our research buildings, just next door to the engineering building here. And he ran a simple machine and he was doing park and interface with a variable speed turbine. But really looking ahead of time 30, 40 years ago.

And since his retirement there were other people who came in. There've been continuum of activities that have been going on. And in the picture on the right shows pictures from 2008 which was more recently our activities getting into the education realm. This was a activity for freshmen engineering students that I had an opportunity to work with a bunch of students to just sort of - and introduction to engineering class to try to build a turbine from scratch. Building the alternator, carving the turbines, putting all together in a tower.

And it sort of brings the - particularly the interdisciplinary nature of wind engineering. You can't be an electrical engineer or be a mechanical engineer or a civil engineer or anything like that. It sort of blends all of these technologies together to bring out an opportunity -- a field of study that's just emerging. And important as this workforce development opportunities can be over emphasized from this perspective because of the interdisciplinary nature of it.

And this scale is a kick start on the most modern activities. Contemporary act really beyond that and we responded to the DOE funding opportunity by developing a curriculum grant here. And I'm pressing the button to move ahead - there.

This is just an idea of the work that was going on before we started this grant - - PhD, Masters Theses work on different turbine technologies from our students. This is publications in the technical realm and the - in the wind energy, electrical engineering conferences and what not where we've been working. And our students -- the graduate students, the PhD and Master students -- working on that.

So we saw that this funding opportunity was - will give us a momentum building up to develop a graduate education program to prepare students to work in the wind industry. Not in the implementation but more in the product development, research, looking ahead 10, 20 years ahead of time.

And so we put together a proposal to expand on the established research strength into a strong education program. The main thing was to further the eventful education activities and to develop an integrated curriculum that ranges from wind resource forecasting, through the wind integration into the electrical utilities. And then we'll have them supported by electric courses

across campus that focus on economics and policy issues related to that. So we will expand the spectrum of different specializations that students will need to know to work in the wind industry.

And going to Slide number 5 the curriculum aspects we - our proposal included development of five specific courses. One on wind turbine electric generators and controls, and the other one on power electronic converters that are used in turbines and then also looking into the utility interconnection aspect.

And then the fourth one is to expand our pilot offering on the small wind turbine construction, that includes some of the designing aspects where students get hands-on work on these things in hardware -- particularly emphasizing the interdisciplinary nature of the thing - of the what's in a turbine -- so that they get a perspective even though they are mechanical engineers, they will be able to see what the electrical aspects are. Even though they are electrical engineers they will be able to see what the turbine aspects are. On a very - it's a small scale but also brings everything together.

And the last one looking into -- excuse me -- looking into wind forecasting offered by the Atmospheric and Oceanic Sciences Department within the university. In fact one of the PhD scholars from the - from that program runs a small business in town, Weather Underground, which supplies wind forecasting information to several of the utilities and other people interested in the wind sitting arena of the business. So that's been a good compliment to this - other activities focused to the electrical system.

And moving on the next slide, this is focusing on the small turbine generator. There are two slides in here the first one is number 6 and 7. The first one is just a picture of the installed turbine. It is actually installed in the west

Madison Agricultural Research Station that belongs to the Agricultural School where they have experimental farm.

So it's the location where we can - we've installed this turbine, installed a tower, a foundation and we have a very small power distribution system that takes the energy from the turbine and feeds it into a little tool shed that's available within the experimental research station.

It's about three miles from campus and our students travel there two or three times a semester. And the small turbine is installed at the location at the end of the semester. This course is being offered for the second time in this present form this semester. And what you see in Slide number 7 is the - a new braided design that was done by the students and built and tested at the site this past semester. This coming semester we'll be focusing on actually the redesign of the alternator for that, that students will be designing and constructing as well.

And then in Slide number 7 - I'm sorry number 8, it just gives you a curriculum of what we've done in the power electronics -- the wind tower course. This course ran during the fall semester of 2010. It had about 20 people enrolled in the class and about half a dozen of them were off campus. They were receiving the information through DVDs or video download from the Internet.

And it focused on different variable speed, constant speed turbine technologies, utility integration, power electronics aspects, which is shown in red in the slide of the homework assignments. And it was very well received by the students and it's a - it's new curriculum development material that went along with that.

And then on Slide number 9 is a - the Wind and Weather Forecasting for Scientists and Engineers course. That ran in a pilot last fall as well, had six students in the course and we will be reporting on the syllabus and all the information in the coming quarter.

And then on Slide number 10, which is - I'm waiting for it to upload here, and that is the course that is running this semester. It is a graduate level course on utility wind integration. It is offered by Professor (Barney Lesutra) who is a - works with BPA and WAPA and other electrical utility integration groups. And Dr. (Scott Green) who's a consultant for the wind industry.

Both of them together are offering this course on modeling and simulation and studies related to wind integration. It ran - it met for the first time yesterday, have about eight students registered in the class This will be new syllabus that will be developed and homework exercises, et cetera, that will be coming with this course.

And then the Slide number 12 it shows broader initiatives that we will be working on, which is integration with the Energy Analysis and Policy program that's on campus. That is well established looking into different aspects of utility choices available, market opportunities, things like that.

So we're making those electives available for engineering students so they can get a certificate in Energy Analysis and Policy as they get a Masters in Electrical Engineering. And also there's a Master of Engineering in Sustainability that's under discussion on campus right now. That will be completely distance education program available for practicing engineers as well.

And we've offered - we've developed ad hoc seminars that have come and gone over the past semester on a monthly -- weekly basis at times -- depending on speaker availability. And then we've also had discussion with video outreach of these seminars to offer at our other campuses -- UW-Milwaukee as well as Marquette University in Milwaukee as well -- under the Wisconsin Energy Research Consortium that was mentioned in the previous presentation.

And then we also hosted a guest lecturer from -- (Dr. Mangieri) -- from the National Renewable Energy Lab last semester that was offered through WebEx for our students. That was also well received by our students. And so although this is sort of given us a focus on the education program, what we've also seen in terms of workforce opportunity - we move to Slide number 13, is that we've getting steady inquiry (sic) from employers for M.S. and PhD level graduate as well as student interns to work during summer as well as during semesters.

And we're unable to keep up with the demand in this area. And there are OEM suppliers in the Milwaukee like (ADD) and S&C Electric that are - that have looking for interns, we are constantly feeding email requests and phone calls from them. And American Superconductor -- which is a wind manufacturer -- they're located in Madison and Milwaukee. Two of our graduate students are employed there as part-time interns now and we've had two students work in the last summer and they're focusing on a couple more in the coming summer.

And Vestas has opened a new Madison office, it's sort of a little slow now due to certain - uncertainties of their business. But the Madison office where they employed two or three of our recent graduates is - they're in full force -- there is no uncertainty in their group -- although there is broader things that are

going on globally. And (unintelligible) started a new Milwaukee operation last fall, and they're also another prospective employer that we are having discussions with for getting opportunities for our students as they graduate.

And there are also several DOD suppliers in the area that are entering the renewable energy businesses that are also looking at our students. And so this grant program has given us a good push forward in being able to get a focus for, you know, for graduate program for preparing for the emerging industry that's growing. And we're just not able to keep up with the demand. And we hope that this start will give us a push in the - as the going further.

And I've had a discussion with one of the faculty at be at Madison area technical college here and we're hoping to develop even partnerships with the universities and technical colleges through - in Madison as well as through the Wisconsin Energy Research Consortium that's giving us a new forum on that front.

And that's the end of the presentation. Thank you, we'll be able to get questions towards the end of our presentation. Look forward to discussion further. Thank you.

Ian Baring-Gould: Great, thank you Giri. And as Giri was mentioning, I encourage people to type in any questions that they might have and we'll get to those at the end of the presentation.

There have already been a couple of questions so I'll bring it up now. This whole presentation is being recorded as well as the PowerPoints, all of that will be available on the Wind Powering America Web site. Takes a few days for it to get uploaded but all of them will be there, both the presentation slides themselves as well as the full audio-visual copy of this presentation. So if you

- there are people that you know who would have liked to see this and didn't get the opportunity you can direct them to that Web site in a couple of days, they'll be able to sit down and watch it at their leisure.

I'm going to quickly go through and talk a little bit about the Wind for Schools program. The presentation was originally to be presented by Larry Flowers with Wind Powering America but he just recently moved to the American Wind Energy Association where he's taken a position there, so I'm stepping in to fill in the slides on the Wind for Schools activity.

Wind for Schools is a Department of Energy funded activity and it is one of the major outreach elements that the department does in regards to education development at the university as well as at the K-12 space. The objectives of the Winds for Schools program are listed here but really to engage rural America by offering a kind of a robust potential for looking at wind as an economic development tool for rural areas. Expand education to include wind energy across the nation as well as work to equip college upper classmen in wind energy applications. Focusing not only on the technical - technology development but the actual application of wind energy through installing wind turbines at local schools.

And then in - within each state to establish technical assistance center at the universities -- very similar to the centers that are available out there looking at energy efficiency -- but looking at wind technology and wind application specifically. The approach of the Wind Powering America activity is not working, but I'll go through it anyway. The approach is to engage universities in developing a curricula and bringing in graduate students -- both undergraduate and graduates -- to work in what we're calling a wind application center and I'll talk about that in a minute.

And that focus is really to address a core skill set at universities to do university applications. As part of that work they implement small wind turbines at K-12 schools and this allows the school -- the K-12 school -- to get introduced to wind technology, bring curricula that is developed for the schools into the classroom and use the wind turbine that's now in front of the school as a learning device.

By the students at the universities helping to implement these turbines, they understand exactly what it takes to apply a wind turbine into a community setting which they then take into their private lives once they graduate. And then of course the community learns more about wind technology because there's a small wind turbine spinning at their school.

The real idea is to -- as shown in this bubble diagram that I'll go through -- is to work with the entities to develop this project in installing a turbine at a local school. It brings in the science teacher and the students, the school administration as well as the community into the dialogue, all of which are people we're trying to teach.

As part of the Winds for Schools program we set up a support structure through people at the wind application centers, a state facilitator that works out in the communities, NREL, WPA and the other national laboratories, the Department of Energy, and the state energy offices -- all working to provide technical and monetary support to the program activities.

And then to help facilitate -- other organization's utilities, local companies, wind turbine manufacturers -- who actually work to install the turbine at the school. And under this model all of the facilitation work is funded by The Department of Energy while the actual installation of the turbine at the school is funded by local donations.

The wind application centers -- we currently have 11 of them -- but they're a training and implementation center to educate engineers in wind applications. They develop a curricula, they teach that curricula at the school, they involve the students either at a - in a wind club or something of that nature and they develop that expertise. We also expect that over time -- specifically because we're concentrating on land grant universities -- to get these universities set up as the place to go from a state perspective to understand issues and questions around wind technologies.

In regards to the Wind for Schools program, we also work to develop curricula - or support the development of curricula -- both at the university level as well as the K-12 level -- working with entities that are developing curricula like the NEED project, like Good Wind, Wind Wise, Energy for Educators or out there developing curricula, support their activities and help get that curricula into the local classrooms.

One of the main ways that we do this -- and one of the important aspects of implementing these turbines at schools -- is collecting the data from the turbines and being able to use that data in an academic setting. We're very aware that once a turbine - or as a turbine is being installed in a school it's a very prideful event. The schools and the students are very much interested in that. But as time goes on if the turbine itself doesn't become an active part of school life it just becomes another land post or a piece of lawn art.

And so, by being able to collect the data - and as we see in the picture in the lower left, this is a screen capture from a Web site that is hosted by Idaho National Laboratories, that collects and stores the data from quite a number of the wind turbines that have been installed in the Wind for Schools program. It collects the data from those turbines and makes it available to any school or

university that is interested in accessing that data. And it allows the data to become part of the curricula in an ongoing fashion.

So that the students at the school -- even if the turbine was installed five years ago -- can go to a Web site and see how much energy their turbine generated last night. The teachers can use the data for the last few weeks in their curricula instead of taking some data from 20 years ago or from another site. So it's really an effort to bring the turbine into the classroom on a continual and ongoing basis.

Some great examples from some of our schools. Nebraska state in specific, whose done a number of great programs. But just a quote from a student there, a senior, talking about wanting to get a turbine installed and just going out and making it happen. A clear example of interesting students in the development of wind at a young age and hopefully changing the direction that they take in the future.

Kansas is another one of our states and has a number of great examples. They've implemented 14 schools - or wind turbines at schools across the state. Very active students within the program. And ones that are getting awards for the activities and the research that they're doing in the Work for School space.

Another quick overview of the activities that are happening nationally. This screen shot -- that comes off the Wind Powering America Web site -- provides information on almost all of the activities that are going on across the nation that we know of in regards to wind and education. And certainly a lot of the K-12 installations that you see here are active Wind for Schools sites. We're always looking for more information about programs that are ongoing so if you don't see your school or your program represented here please feel free to contact us and we'll update the Web site as we can.

One thing to mention quickly is that there is an auxiliary program. So currently we're involved - we're active in 11 states funded by The Department of Energy and those projects are ongoing. But we have set up an activity or a program that allows any other state or any other K-12 school to join the Wind for Schools activities, take advantage of the curricula that's developed, access to Web sites, all things of that nature, just so long as the funds for that activity don't come from DOE. So if any self-funded organization wants to become a part of the Wind for Schools activity we've made that available to them. And there's more information about this program, again, on the Wind Powering America Web site.

Certainly some of the challenges that we've faced in this program going forwards, the economics and fundraising, especially in a market that's tight as now in regards to state funding. It's a very difficult environment. But one of the great things about having these programs in 11 different states is that each state is finding ways to obtain funding for primarily the installation of the wind turbines at the host schools.

And being able to share the expertise so that in Idaho they've identified grants that can be obtained from Lowe's hardware and they can pass that information on to everybody within the program. And that allows everybody to access that data - or that funding source. And that goes across the whole spectrum.

Certainly keeping it simple when we're - one of the reasons that we have kind of narrowed down and selected on the Skystream turbine -- for at least initial installations -- is because of the ease of installation, the fact that it's already Internet connected from a data perspective. So trying to keep it simple because as we all know, anybody who has a kids know, that the teachers at

schools don't have a lot of time on their hands. And so being able to keep everything simple and allow them to engage actively is a very beneficial.

Very much engaging in rural utilities. We've put this down there as a challenge but in reality we haven't had a lot of challenges in this regard. A lot of the rural co-ops and rural utilities are very active in their local communities. And when the teacher and the school administrator come talking about wanting to put a wind turbine at the school all of the utilities are very helpful. And generally provide either a strong source of funding for the projects or in kind support -- bringing their bucket trucks and things like that to help install the wind turbines. So very engaging from a utility perspective.

Certainly starting up programs at universities is a complex matter and requires a lot of time. Selecting the candidate schools -- in some cases we've had many more applications for states of schools that are interested in installing wind turbines at their site -- more than the university can do in any given year.

Curricula development is an ongoing process as well as implementing this curricula at the K-12 level, and how we keep in interesting. And then of course, the long term sustainability of the program and the ability to expand it. DOE is great in its support but that only allows us to support, at this point in time, 11 states. And we all know the ups and downs of funding from The Department of Energy.

And although the support right now that we - that the program gets from the Department of Energy is fabulous, we all know that's driven by Congress and other things and so it can't be counted on. So how do we develop a program that can use the funding from The Department of Energy while it's available but can then grow and expand on private funding as part of private-public partnerships as we go into the future?

Lots of testimonials about the program. And I think these speak more than I could say. A quote from Senator John Thune of South Dakota, “Strongly support these types of activities. Wind for School program is an important step in achieving this goal of a green workforce.” From Montana’s governor, “Educating tomorrow’s leaders on the value and importance of this renewable energy resource.” I have a quote from a counselor at a school in Wellington here in Colorado, “Wind for Schools project -- which is an awesome program”. They kind of saw this as a tip of the iceberg as they looked at all types of energy education within the communities.

Installation that was put in in Kansas at a kind of a regional science center where multiple students come in - they have stopping almost daily to ask about the turbine. They have had some 16 to 17,000 students working with it. So amazing impact that we can have even with the implementation of a single turbine.

“Students get excited when they get to do something hands-on”, another quote from a principal at a Wind for Schools site. Senator Ben Nelson from Kansas, “Sets the stage for growing education of future generations.” And then finally a quote from the former governor of Colorado, “Educating today’s young people about renewable energy system prepares them for a wealth of future opportunities.” So I think all of these are clear demonstrations of the level of interest in the program and the level of impact that people see in the program.

And then of course, hearkening back to Larry Flowers and ending with a good quote, “Tell me and I forget, teach me and I remember, involve me and I learn.” And that’s certainly the approach of the Wind for Schools activity at all levels. Getting the university students to get out there and get their hands dirty working on the implementation of a turbine. And then getting those

students at the K-12 schools and the people in the community working actively on the implementation of the turbines so that they understand it and internalize it as part of their community and part of their school.

So just a quick overview of the Wind Powering American DOE Wind for Schools activity. And again encourage people who have interest in this program to hit the Wind for - the Wind Powering America Web site specifically.

So with that as a closing of the Wind for Schools activity, I'd like to open it up to questions that we have. Again, all the presentations will be made available in the Wind Powering America Web site after this.

So jumping to some of the questions. First one, Giri, can you expand a bit more on the economics course including any curriculum. And then describing a little bit about what will be taught in these?

Giri Venkataramanan: Yes, the - their - this department as well as the Department of Applied Economics here at the university had three courses that are established. One is on energy economics that is related to comparing between nuclear energy, coal energy, wind and solar and different options. They're primarily taught by people from the School of Business or Applied Economics. And I can provide a copy of the syllabus or a link to the course Web sit, probably not right at the moment but perhaps later today. I can forward to Ian and then can he post it on to the Web site?

And then the other course is related to public utilities. The course - the School of Business has had - has a - had a Institute for Public Utilities for a long time. And about the same time as this curriculum grant was received, it moved from the School of Business to a new entity called UW Energy Institute. Under the

UW Energy Institute there is this (unintelligible) - I think the Institute for Public Utilities is what it's called. And they've been offering a course in public utilities and - so there is the second course related to that.

And the - in the third course is an independent study - an internship course that the students can participate in, in collaboration with any other faculty in the Energy Analysis and Policy Program. For instance one of the projects that the students did last semester that I was aware of - that Latino students studied -- what would be the impact - or if, given the Wisconsin electric grid as it is, what could be the limits of how much - where they could locate wind farms, where would be the transmission grid marks that will come in -- was one of the studies that students did as an elective for our - as an independent study project under this program.

So there are projects that are like this that are organized through the Energy Analysis and Policy program that are being leveraged with this wind opportunity. I hope that answers the question.

Ian Baring-Gould: Great, thank you. Also invite any other questions that people might have. Again to do that type - or hit on the Q&A section on the top of your live meeting screen and you'll be given a little screen that allows you to answer questions.

Okay it doesn't look like we have any more questions coming in. So why don't I move to the next slide and if people have questions definitely ask them and we can pop back in to this. Do want to point out that this is a monthly Webinar series that we're - that we have here. Happens three o'clock Eastern every third Wednesday of the month.

In February we're going to be talking about the cost of energy, project financing and funding, which should be quite interesting. Give you couple of different perspectives from the utility, from the industry. Utilities and industry and then an overview of where the market is today. March 16 we're going to be talking about small end distributive wind technologies and then April 20 is radar and wind systems.

We do have another question from (Heather Rhodes-Weaver). Can we get dots on the map for schools we know have wind turbines? And the question - and the answer to that is yes. So in regards to the Wind for Schools -- or the national education map that's on the Wind Powering America Web site -- certainly, if there are any projects that anybody knows of out there, whether they're part of Wind for Schools or not, we'd love to have that information and share that with the rest of the community. So please let us know.

Going on to the last slide, just contact information of course. If you have any questions for Wind Powering America either contact myself or representatives from The Department of Energy, (Jesse) and (Michelle). And then certainly there's a lot of information on the Wind Powering America Web site.

And as (Debbie) mentioned in the beginning of this section, we're going to work as the results from all of the grants awards that have gone out through The Department of Energy start bearing fruit and reports and documents are being generated we'll work to get those updated on the Wind for - on the Wind Powering America Web site so people can go there to find out information on any one of these sources.

So not seeing any other questions and now we're two minutes past the hour. So again I'd like to thank everybody, I'd like to thank the speakers in specific for taking the time to talk about their different programs and then thank all of

the people who attended this meeting, hopefully it was helpful. If it wasn't, please let us know. And also if you have ideas for future Webinars or information that you'd like to hear, again please don't hesitate to let one of us know and we'll do what we can to get it on the agenda. So from a windy Colorado, thanks all and have a wonderful afternoon. Goodbye.

Coordinator: This concludes today's conference call you may now disconnect.

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