WIND FOR SCHOOLS PROJECT OVERVIEW WEBINAR

November 16, 2011

Coordinator: Welcome and thank you for standing by. At this time all participants will be in a listen only mode for the duration of today's call. I'd like to inform all parties the call is being recorded. If you have any objections, you may disconnect at this time.

I'd now like to turn the call over to Charles Newcomb with NREL. Thank you. You may begin.

Charles Newcomb: Thanks very much. Good afternoon and good morning to those of you that are on the West Coast or further west then that for this month's installment for the Wind Powering America monthly webinars.

We've got a little update with Wind for Schools project today. We've brought together four speakers for you to describe it from their perspective. We've got Karin Wadsack from - or Karin. I'm sorry Karin - from Arizona, Dennis Scanlin from North Carolina, Michael, I should say - Arquin, out of Minnesota and Becky Lamb out of Virginia.

So we're representing a few time zones here which is nice. And as we launch into this topic, I want to give you a little bit of a background on the Wind for Schools program.

It was conceived a number of years back with the Department of Energy and NREL and Wind Powering America when we kind of realized that wind energy is not going to happen so much in the cities. It's really going to happen in rural America.

And these rural areas have a lot to gain from wind energy in general. And one of the, you know, there are many avenues to sharing the benefits that wind energy has and many of the directions for those benefits were being handled by the industry.

But one that hadn't yet been covered was the educational aspect. And in a lot of these rural towns and communities, it's important to recognize that the school often is the heart of the community. It's where the rotary club meets. It's where the - many of the social functions happen. It's - it is the heart of the community in so many fashions.

And if you're fortunate enough to visit one of these schools for a school board meeting or be there to present with them, it's a really - a heartwarming experience because it's what this country's about. It's a neat thing.

So recognizing that there was a direction that needed to be addressed, we thought, and there is real value in addressing that side, the next question was, well how do we get to that? It's a pretty big country. There're a lot of schools out there. What's the most efficient way to deliver this message and deliver the information and deliver the education?

So part of that involved rallying up partners such as Need and KidWind and others, stakeholders that have been in the wind working groups around the states over time. And part of it meant discovering or inventing or reinventing a delivery mechanism perhaps going through the educational institutions at the graduate and undergraduate levels.

So what was modeled was the industrial application centers going back, if you remember your energy efficiency approach, there were a few industrial assessment centers around the country and in that form, we modeled or we

fashioned something called the Wind Application Center which was at - often land grant institutions but not necessarily exclusively at those institutions.

And through this path, we figured that would be a good delivery mechanism for, A, tapping into the budding and rising engineering and project management and financial management and lawyers and other folks that might be involved in developing wind projects, so getting to those folks early so they would seamlessly join the workforce for the wind - the growing wind industry.

But also engaging the K12s because wind energy is tangible. It's something when you go outside of the school you can actually feel it on your face, you can see a blade spinning. It was dynamic. It's mechanical so it touches the hearts and minds of the farmers and the kids who are - who have dirt under their fingernails.

It's a really neat thing. And so to that end, Wind for Schools was born. And we had a few objectives. One was to engage these stakeholders on the educational side with the concept that wind energy had a lot to offer their areas.

The other one was to engage the schoolteachers because by bringing in the educational perspective and the wind energy into that educational perspective, it was a way to bring science and technology alive. And so many other mathematics and all the sciences alive which was very exciting.

And then again, as I mentioned, bringing it to bear for the undergraduate and graduate students who would be moving into the work force. So this next slide here shows sort of the - here's the perspective of the various people that were in this constellation of stakeholders.

Over on the left hand side - and if I can get my little glowing red dot to join me - so here's where we are over at NREL and here's our friends at DOE. And together we can see this notion of the Wind Application Center.

In the center of this solar system, if you will, is the notion of the K12 as the host school. And there're a whole lot of people that encircle this project. The delivery mechanism, again, was the Wind Application Center and they coordinate directly with the school administration and the teachers.

And we also had state facilitators in certain states where the universities hadn't been involved heavily at the ground level. These state facilitators typically came out of the wind working groups.

The Wind Application Center does a variety of activities including developing the project, delivering the curricula to the school, coordinating with utilities, finding the sources of funds, et cetera.

And they've been pretty successful. We've got eleven states that are now operating. We had an original six that ran for a few years and we've added five in the last couple of years. And these orange dots represent these K12. Not all of these are under the Wind for Schools program directly. But many of them are. There're over 75 or 80 that are up and running now.

So to that end, with that brief introduction, hopefully that's enough to give you the context of who's going to be your speaker today or your speakers. Karin comes to us from Arizona. She's out of the Institute - sorry, switching over in my world her - oh dear, I've lost your bio Karin, so here I'm going to fly blind.

But Karin comes out of Northern Arizona University where she manages the program for us. And what's exciting about Karin's approach is that she's very flexible as many of the Wind Application Center leaders are in discovering how do I address this funding question? Because these projects are not inexpensive and they're not millions of dollars.

They're $15,000 to $20,000 typically. But the question is how do you find on the ground funding to get the projects on the ground? And each state has a different way of doing it. Each application center has different challenges.

There're geographic challenges. Some are quite disbursed and low population density areas. Others have a lot of opportunities nearby. And I think Karin's story is particularly interesting because of the wealth of approaches that she's discovered across just a few as well as her new perhaps bread and butter approach which I think is exciting.

So Karin, with that somewhat unofficial bio - I apologize for losing your bio so quickly. I had it ten minutes ago. Take it away please.

(Karin Wadsack): That was an excellent seat of your pants introduction. Thank you Charles.

Charles Newcomb: Okay.

(Karin Wadsack): Our program at the Northern Arizona University is funded in part by, of course, NREL and DOE. We have some funding for our program staff that we have raised from other sources including state grants.

But as Charles mentioned, the installation - the small wind turbine installations that go at the K through 12 schools that are clearly keystone to

this program, are not inexpensive and are not funded by the OE or any of the program support sources.

And on the graph that Charles showed that had all the different dollar signs and technical support, et cetera, flying all different directions, you could see that typically the schools tap into a number of different sources to be able to pay for their wind turbine installations.

And in many of the original Wind for Schools states, those were funded in part by the state energy office, in part by utilities and potentially in part by other local community leaders that were interested in working with their schools.

In Arizona, I think we have a number of different circumstances that make us a little bit different from Kansas or South Dakota. First of all it's not the windiest state in the country and so an installation of a wind turbine is something that some schools are skeptical about.

Second of all, I think because of changes in the economy and changes in funding for schools and our state energy office, just the way it's structured, we don't have a lot of support for installations from school boards themselves or from our state energy office.

But we have managed to tap into several different models I would say for funding installations at schools. And so I'm going to walk briefly through four different installations that we have in the ground and explain how we were able to fund each of these.

And the first of these is at Ponderosa High School here in Flagstaff. And this installation, as you can see from the photos here, is not a sky stream 2.4

kilowatt generator. It's a little air breeze off grid wind turbine and it's powering the greenhouse at the Ponderosa High School.

And this school came to us and said, "We've built a greenhouse. It's not attached to our electricity grid. And we have decided that it would be really nice if we had some light bulbs and a water pump and some automatic window louvers in there but it's certainly not worth the expense of attaching it to the grid."

And they're here in town. The school is in an accommodation school so it is structured primarily for students who have no other options anymore in the other public high schools and are interested in graduating and potentially going on for technical careers.

And so it's an interesting case for us to be able to work with the school and install this solar and wind off grid system where they can see all of the parts of the system and the students that are working in the greenhouse can see something that could potentially be part of their future.

And so we work together with the Electrical Engineering Department at Northern Arizona University and in the photo in the lower right, the electrical engineer - or the upper right - the electrical engineer and professors actually working with someone else to install their wind turbine.

(Allison Kipler), in electrical engineering, took her junior level design class and they worked together with the design class to put together a proposal to our utility to fund this ins- part of this installation.

The students in the design class designed the installation. They worked with the school facilitators or school administrators - excuse me - and went over to

the school and actually performed direct education about solar and wind with the students and then they helped to perform the installation.

And so primarily the electrical engineering professor and I worked with Arizona Public Service Company, our utility, and the professor obtained a leadership grant which ru- it's an opportunity we have through our university and was able to fund most of the components of this installation through that grant.

In addition, the installers that you see in the upper middle photo are from a company called (Permethius) Renewables here in town and they were paid for the installation but they donated a large portion of their work.

On top of that we had some funding that our program received from Next Era Energy Resources which I'll talk about in another case. And we were able to allocate some of that funding just to cover the final cost on this project.

And so we really cobbled together a number of different sources primarily from the utility and the leadership grant but also from donation from the installers. The turbine itself was donated by Southwestern Power which is here in town and then we just topped off the remainder of the cost of the installation with some funding that I had from a wind developer.

The next case I wanted to talk about deals directly with that wind developer relationship. And I should mention that in all of these installations that we've been working on, building relationships with the individuals who are essentially able to give us money or controlling the money has really been essential in explaining to them what it is our program can offer.

And that we are on the ground and we're able to manage the installation and then also spend a lot of time in the classroom and really advance win energy education. I think that's been critical in engaging those folks and really getting them motivated about helping us to make these installations financially possible.

So here at the Williams Elementary and Middle School, we worked with Next Era Energy Resources. And I learned that Next Era was coming to Arizona and developing a wind farm about 20 miles north of Williams and was in a meeting with some folks from Next Era and just approached them afterwards, spoke to them and said, "We have the Wind for Schools program. We work in classrooms. And if you're interested we'd love to work with you on supporting wind energy education in a school."

And they said that'd be great. We'd like to work with you in a place that's near to this wind farm but it's not critical to us. We'd just like to just (partner) your program. It sounds fantastic.

And so we asked them to donate to our program through the university some of the money that would cover the installation and, in addition, some of our program staff time, and in addition, a teacher's workshop and materials for teachers at the school. And they did.

And so over the course of the year, we had the installers come out and do a site visit. They came out and did the foundation and put up the turbine as you can see here. And so we were able to fund this entire installation through a donation from Next Era.

We also have managed to work with Next Era to fund two other sky stream turbine installations at two other schools across the state. And so we installed one of those at the (Worm) School in - north of Phoenix last Friday.

And now we're going out to do a site visit for the third one in early December in Seligman out about 80 miles west of Flagstaff. And so through that partnership with the developer we've really been able to not only put in these installations but do an enormous amount of work directly with the teachers, with the students in the classroom and we have been able to fund a lot of Northern Arizona University student time to assist with this program because obviously I don't do it all myself, so.

With the St. Michael Indian School, which is up near Window Rock, we worked with the - we've been working with the school for some time as an educational partner. The University has been going to the school and doing a lot of environmental education and climate change education with the teachers for a long time.

So there's been a relationship there. And there was a facilities manager there who was really interested in sustainability projects and our program was able to have a conversation with him about renewable energy installations and then approach the managers of a fund called the Renewable Energy Investment Fund.

And this fund is similar to the - there are fee programs within state EPAs and other states where if there is an industrial installation or company or utility that violates some environmental law there's a fee structure by which funding is available to different types of environmental projects.

Something similar happened in Arizona establishing this Renewal Energy Investment Fund which is targeted at renewable installations in locations such as schools that are primarily impacting Native American populations.

And so we obtained a commitment for the fund for $100,000 worth of renewable energy installations at the school and we're able to install this wind turbine on a 55 foot tower in addition to solar water heating and solar (photoble taic).

And so this installation was completed about a month or so ago and the Renewable Energy Investment Fund managers are very pleased with it and are interested in funding additional work at the school. They've done some energy efficiency work at the school before and they're also now committing to work with us on funding.

We're talking about three separate wind turbine installations that they're interested in funding including one at a technical school here that would have two different types of wind turbines so that the technical students could be doing education using two different turbines.

So lastly, I wanted to talk quickly about the installation we have at the university here which went up last week and is on a 70 foot tower. This equipment was donated by Southwest Wind Power. We put in a grant to our student run green fund which is a fund that each student on campus pays $5 a semester into this fund and it's just part of their tuition and fees.

Students have a committee and they manage the fund and any student can apply to the fund but the idea is that (prior tucts) are aimed at sustainability initiatives on campus. And so we had a student apply to the fund to cover the

remaining costs of installing this turbine on campus above and beyond the original equipment donated by Southwest Wind Power.

And we worked with our facility services department. They donated a lot of work to make this happen but they subbed out the work to a local electric company - (Shawn) Electric - which did - was paid for some of their work, again, donated some of their work.

The design was donated by a design firm out of Tucson and because of all these elements and the fact that it's a university construction project, it took a really long time to get it done and it went up last week but we also managed to capitalize on a lot of donations and partnerships throughout the course of the installation.

And so those are briefly four different ways that we've managed to make installations happen. And each of them has advantages and I would say certainly tapping into the wind developers is something that allows us to put in a little bit of a padding margin where we can also have some staff time covered by the donation and some funding to turn around and contribute equipment and support over the long term to our school partners. And with that, I'd be happy to take any questions.

Charles Newcomb: Well, actually we're - if it's okay with you, Karin, we're going to leave questions until the end.

(Karin Wadsack): Yes, yes.

Charles Newcomb: And now that things are stable and we have nice stable attendee list, we will jump into how Q&A happens. Up towards the - thank you very much Karin first of all.

(Karin Wadsack): You are welcome.

Charles Newcomb: For that very nice presentation. Up in the top left of your window, there's a couple of pull down menus and one of them is a Q&A. And in there you can launch a little window which allows you to post questions and we can look at those questions and we'll be asking them of the presenters at the conclusion of the Webinar if that's all right with folks.

Okay, so moving on - thank you very much Karin - we're going to move on to Dennis Scanlin on the other side of the country. Dennis is out of the Appalachian State University up in the hills of North Carolina, a beautiful area of the country.

He's a professor at the technology department of ASU and the coordinator of the Appropriate Technology Program. Dennis has been involved with wind and small wind for many years and under his watch, they created something called the Beach Mountain Test Site which is pretty high in the mountains.

It's about a mile high so it's got interesting air density that's equivalent to - nearly equivalent to what we see here at the National Wind Technology Center near Boulder.

But they have some pretty strong winds there and Dennis has worked hard over the years to establish it and keep it going and they've got a number of turbines and are tested at any given time. And it acts as a really fantastic dynamic platform for his graduate and under graduate students who are testing the turbines and getting real hands-on experience.

Dennis also has administered an (anamomet) alone program for North Carolina and has a nice stable of very, very bright and fun grad students and under grads that are - that work in this program. So Dennis with that introduction.

Dennis Scanlin: Okay Charles, thanks a lot. It's good to be with everybody. I've asked our state facilitator, (Jessica Hokes) to join us as well and she may make a few comments hopefully during this presentation. Can you hear me okay?

Charles Newcomb: We can hear you just fine Dennis.

Dennis Scanlin: Okay. Well, as Charles mentioned, I've been working with the Wind Powering America program for most of the last ten years here in North Carolina on a variety of wind related projects.

And in 2008, I got started with the Wind for Schools program when a fellow named (Russ Levins), who was the father of another - well, a father of a guy who worked at Southern Alliance for Clean Energy and they were our regional wind energy coordinators here in the Southeastern part of the United States, as (Brandon Levins).

And (Brandon) told his father about the Wind for Schools program that the Department of Energy was developing and (Russ Levins), his father, got interested. He was working for a USDA program called the Resource Conservation and Development Council and put together a proposal to the Appalachian Regional Commission for a Wind for Schools inspired project that would focus just in one county in Western North Carolina.

And that project was funded and Appalachian State agreed to help out with that project and throughout 2009 we organized a variety of workshops

educating teachers and students about wind energy and also during that time, three wind turbines were installed at schools throughout Madison County.

And during this time, the Wind for Schools program put out another RFP for proposals and I wrote one and we were funded here in North Carolina to develop a statewide program. And that began in 2010 and over the last year we've been working that trying to highlight that program throughout the state and describe it to people and try to raise money for turbines.

So that's sort of a quick overview. The RC&D councils were really, you know, a key element of our success raising money for these projects. They were established by the US Department of Agriculture more the 50 years ago to empower rural people to help themselves and work in a variety of different program areas that are listed here.

And they also - one thing they do a lot of is write grant proposals and put together collaborative projects. So they were really key to start working with. They knew a lot of people and they were able to help raise money to support the purchase and construction of wind turbines.

So the program that we conceived here began with, first of all trying to identify the windy schools in North Carolina and we did this by combining this state wind map developed by the True Winds Organization with a database of schools throughout the state and we put a limit of ten miles per hour, 30 meters.

So any school that on their property had according to the North Carolina wind map, 10 miles an hour or higher average annual wind speed on the school property we included them in this database of windy schools. There are 178

schools and we contacted all them with information about the Wind for Schools program.

Now we started getting responses and inquiries from the schools. We start developing email lists and also we're working with teacher organizations throughout the state to try to really spread the word about this new statewide Wind for Schools program.

And we developed an application process and Web site links describing the Wind for Schools program. (Jessica), at this point in time came on board and began fundraising work to raise money to purchase and install wind turbines.

We developed and then conducted some introductory Webinars which we advertised for anybody who is interested. We kind of described the Wind for Schools program and we started to organize some workshops with Need and with KidWind and organized and put on several workshops.

And then we started by that time collecting applications. This was sort of in the spring of last year and throughout the summer and we started doing site visits to schools and answering questions, visiting the school boards, town councils and so on to answer questions about the program.

And throughout this process we were also collecting and distributing curriculum materials. So here's the North Carolina State wind map and this is the wind power class map state and then we combined this database - actually we used the 30 meter wind speed map but combined it with our database of schools in North Carolina and identified any school that had ten miles an hour higher average annual wind speeds at the site on a school property.

And these are all the schools. And so we definitely contacted all those schools about the program, encouraged them to submit an application. We collected about ten applications or so fairly quickly and started to do follow up work and school visits and weren't real successful raising a lot of money at first but then over the - we got lucky on a couple of grants and were able to raise money for actually eight turbines.

There're four we put up in the mountains with money from - that came from a grant that (Jessica) wrote. And then some other money from another RC&D program in Eastern North Carolina that (Jessica) and (Russ Levins) introduced us to.

And so these are the projects that are - actually these are the first three that were done in Madison County here. I don't know if you can see my - I guess you can't see my pointer here but these are the first three in this area right here that were done in Madison County and then these four are being installed right now. The foundations are in for most of them.

And then over on the coast we have three schools here at the coast and then we're also working with a community college developing a wind training facility.

So we have - in Western North Carolina, we have Avery County High School, Allegheny High School, (Watega) High School and Wilkes High School and then Eastern North Carolina we have those schools listed. And this college in the (albamore) project is slightly different project but related to our work with the RC&D there.

Another part of our work is to do photo simulations to show them what it would look like at the school as best as we can determine so we do that. And

this describes the funding we were able to receive. We got $10,000 from a Gear Up program which was a program designed to work with youths who are in trouble or having trouble.

We participated in a rural - North Carolina rural center grant with the (Albomar) RC&D program on the coast. And this was a $200,000 program basically to do some workforce development and also to introduce wind energy in the area and to set up and establish a wind training facility at the College of the (Albomar) which is a community college. And that also funded (3 A) Wind for School turbine installations.

And then (Jessica Hokes) wrote a proposal to the North Carolina green business fund and received $100,000 to fund four projects in Western North Carolina.

And of them are going (new) right now. And (Jessica), if you want to join us at this point in time if that's possible and talk about some of your experiences raising the money.

(Jessica Hokes): Sure. Can you hear me?

Man: Yes.

(Jessica Hokes): Okay great. Yes, at this time last year we had no money and our goal was to install at least three a year so we kind of had a $60,000 goal. And initially we were real hopeful that just contacting the utilities, members of the Wind Working Group, the State Energy Office and developers that that wouldn't be too hard to raise.

But it's a really difficult time to be asking for money right now. And North Carolina is facing some challenges with wind energy too even though there's a huge potential, there's actually not a lot of large scale projects going on right now.

In the mountains, we have the wind but we have the (ridge) law that restricts vertical structures above 3000 to protect (fuscias). Off shore we - a federal panel that was mapping North Carolina's ocean waters recently eliminated two-thirds of offshore areas that were being considered.

And then onshore, there was - this past (over) year, we had been hopeful for a 300 megawatt desert wind energy project but they have not secured a tower purchase, a (remit was duked). If they don't get that by the end of the year, they won't get the 30% federal tax incentive and that project probably will not happen.

So we didn't have developers to go ask money for and Southwest Wind Towers in Arizona - so we're also paying for shipping costs. We haven't received any donations from them but we're also paying higher shipping costs so that was a little bit discouraging and if we had just one turbine to raise money for then it - cobbling up money from small grants would've been a little bit more promising.

But since we had, you know, over $60,000 to raise we were really - wanted to go after a larger grant. And - (as) Dennis said, I work for Mountain Valleys RC&D. There're about ten RC&Ds - Resource Conservation and Development across North Carolina and we - each council serves the local counties. We serve eight counties.

And through that network, that's the way that RC&Ds have looked at - always looked at each other's projects to get ideas and inspiration - (Albomar) RC&D common saw the Wind for Schools project in Madison County and knew that they had a good wind resource.

It also happened that their chairman of their council was the school facilitator - state facil- was the facilities manager at the schools. So that was one way we were going to look at chal- overcoming the challenge of trying to be effective at sites that were eight hours away from where we were.

So we partnered with (Albomar) RC&D and they got - last March they received the (rural) center grant but that grant was part of a larger project that was going to do workforce training and they had funding for four sky stream turbines at schools.

And so they consulted with us on which schools had expressed an interest through ASU on really wanting this to be a part of their curriculum and they did end up going along with the schools that had submitted the letters of support so that was good.

But we were also kind of in a position where everything was on their time schedule so, you know, even though they got the funding in March, they're going in right now but at least they're going in. That's just one of the things about, you know, kind of handing over the project to another RC&D. But it's still been a good relationship.

And then I got the funding with the NC Green Business Fund Grant which was stimulus money that was - it was workforce development as well. And all of these grants - the ARC grant, the NC Green Business Fund Grant and the Rural Center Grant are all targeted at lower income counties.

So even though like in Wilmington, North Carolina, they have a school that really (unintelligible). They've got a great wind resource. We haven't been able to include them in the grants because we're really trying to bring these opportunities to the lower income counties and get the grants that we're going after.

But the Rural Center Grant, that's something that is offered on a yearly basis. The Stimulus Grant was just a one-time deal so it's good that you always wonder, well, where will the funding come from next year?

And then you - and then when you submit the grant it - you know, we were fortunate to have two come through so we were able to install eight when our goal was three but we didn't know that until kind of early in the summer, we found out that we would have this money to do all those. So everything has worked out but it hasn't been without its challenges. Dennis, do you want to take it back over?

Dennis Scanlin: Yes, (Jess), thanks a lot. So just to finish up, I want to show you some pictures of some of the projects we've done, some of the workshops with teachers and also on the bottom some of the big student groups (similar) to our Beach Mountain small wind turbine facility to tour that.

And we've also - these are two of the graduate students here - (Dave) and (Sebastian) who work a lot with the students and the Wind for Schools program to kind of explain the program to others and also describe wind technology.

Here're some more teacher photos and this is (Joe Rand) from KidWind who's just terrific and he led a workshop here for us recently. And this is our

headquarters here, as a small office. We have four workstations there and this is where our folks plan these projects and communicate with people and provide technical assistance to those who are interested.

Our Beach Mountain facility is a very unique program. It's a 5000 foot mountain. It' a high class five, low class six wind site. And we've tested and play around with wind turbines up there. And have installed quite a few over the years. We do workshops up there.

And finally, this is our current team of installing a new (Birdy) Excel 48 volt turbine - Excel 1. And most of these guys are either graduate students or recent graduates of our program. So that's all I have.

Charles Newcomb: Dennis, thanks very much and thanks for your team for sure. I love that photograph. Okay so Michael is up next - Michael Arquin with KidWind. Michael comes to us by way of - as a former science teacher who at one point got frustrated with the lack of really terrific durable classroom kits and so took it upon himself to figure out it was, what, something like $1000 or something like that Michael, back in the day. That - in today's dollars is $700.

And (Michael), since that day where it came to him that he could actually make a difference by providing not just kids but also curricular elements, has been providing pretty terrific and exciting value for many years now across hundreds and hundreds of districts across the country. So (Michael), with that into, it's all yours.

(Michael Arquin): Thank you Charles and thanks to Wind Powering America to let me give a little talk here. So I'm Mike Arquin. I'm the director of KidWind and as Charles was saying, this kind of came out of - I was a middle school teacher

for a number of years and a lot of what you see here came about - came out of some work I'd done with my students about yes, now going on eight years ago.

So it was kind of, you know, I'd been doing a bunch in the classroom, got a bunch of kids excited about doing stuff with very simple homemade wind turbines and now KidWind is 20 employees strong, sitting in St. Paul and all we do is just geek out on how to get kids and teachers excited about wind energy through a number of different methods.

And so I'll just talk kind of quick about those methods we use. And we have been working with Need, with Wind for Schools and just lots of other - anybody who's interested in doing stuff with students or teachers related to wind, we kind of want to get ex- you know, involved with.

So just kind of some of the ways we connect with teachers and students and then the public. We do a lot of just public outreach too. We have - we originally started developing educational kits, just cheap ways to get kids to, like, make blades and put them on two-foot tall PVC turbines that, you know, might cause $5 or $10 to put together.

That's kind of what they did for a long time. And then we started to develop some curriculum and do teacher training where we'd get 20 or 30 teachers in the room and let them learn about wind energy but learn about it through kinds of hands-on activities that are not getting lectured to, that can kind of engage with some sort of science, technology, engineering mathematics around the wind turbines.

Recently we've developed a comprehensive 6 through 12 curriculum called the Wind Wise which is designed for all sorts of fields related to wind energy.

Biology has bird and bat stuff. It has engineering. It has energy. It has meteorology. It has kind of how do wind farms make money?

It's kind of designed as a high school comprehensive look at the field. That's free to download. That was funded by New York State Energy Research Development Authority. It's free to download. You know, everything here we usually give away through some funding from NREL but lots of other kind of, like, Karin was talking about.

We have funding from just massive amounts of little areas that keep us going so that's kind of how this keeps going. And recently, the KidWind challenge is a student designed competition where kids build two to four foot tall turbines and put them in wind tunnels and we kind of blow really fast wind at them and see how well they perform.

So I'll show you some of these things. The Wind Wise curriculum is on our Web site. You can see it there - kidwind.org. It is fairly comprehensive. It's - it might be called a little high end. I'm not saying it's for all students but it's definitely - digs into kind of 15 big questions we have about wind energy, you know, to help student and teachers address it.

And all these lessons are free to download at KidWind. Just go under free curriculum and you can download these and check them out. We're releasing the second addition. This first version was funded by New York State so it has a lot of New York State kind of centric data in it.

NREL was kind enough to give us a little bit of money to make it - nationalize the documents. So that nationalized document will be released on January of next year, so kind of in a month and an half or so.

So feel free to take a look at that. Those are resources that are free for anybody to kind of use and share with anybody. We use a lot of that curriculum in teacher training events. So last year, you know, or even through this year, you know, we've done workshops in 20 states. We've been to Chili.

We did a massive five day training in Ireland with our trainers. So we just do a lot of - we believe strongly in not so much Webinars but people-ars, where people actually sit together in a room and do stuff.

So we, you know, average 75 or so - 80, you know, workshops a year, 20 teachers, 1500 teachers trained. You know, we have a fairly broad impact. Over the last eight years or our existence, we've calculated we trained over 7000 teachers who impact somewhere in the order of 300,000 to 400,000 students a year.

Who does the training? When we first started out, it was just us, you know, me and one other person. But now we have a network of trainers and how they kind of grow into being our trainers is we do a weeklong summer training where we get very in depth, 8 to 8, like every day.

We go to installations. We go to where they make turbines. We talk to wind engineers but we also learn how to teach teachers about this subject matter. And the picture on this slide is from a wind center training we did in Ireland.

It's funny, Ire- the Irish Wind Energy Association has - we've been - they're going better then we are in the U.S. They contacted us and wanted to do training. So we sent some people over there and now they've already done two or three wind senators training and they're running all over like crazy doing really interesting things in Ireland.

The last wind senator training was in CSU in Fort Collins. We had - you can see a picture there of 30 teachers that showed up and were there for the week just learning about how to teach about wind energy and we went to (Vestis). We saw where they make turbine blades as (Vestis).

We went to NREL for training, you know, and we did all sorts of things like that. In 2012, this will be offered again. It's going to be in Maine actually this year. And so if you keep - if you have interest in getting kind of gurus in your state who know how to do stuff, keep looking at the KidWind site to see when the application process opens for that.

KidWind Challenge was born in - with some New York State funding in 2009. We're in our third year and you can see in this picture, basically kids build turbines and we stick them in this - I'm going to try to do the red dot thing here - this big wind tunnel here is hooked to some data apparatus that tells the power and energy coming off little mini turbines, you know.

And they might make, you know, ten jewels in a minute of output or something like that but it allows them to really engineer and get into building their own turbines. And it's been very popular. We started just with a few in New York.

But in 2012, we'll probably be in te- you know, eight to ten states and we have some interest in trying to make it a national level of challenge. It's very wide open, covers lots of stem activities.

You have lots of - we engage with quite a few of people in the wind industry. This year we're doing a lot of partnerships with WOWE is going to help us with getting mentors for coaches for teams. And WOWE is the Women of Wind Energy if you're not familiar with that.

But finding good women mentors for the teams. One of our big goals for the projects is to increase the amount of girls who are interested in these fields and get them engaged. Because a lot of times when you people going off to talk about wind energy, it's all about the - fill in the gears and the turbines and all this kind of stuff.

And we're trying to branch that out to other things like the bird and baths and other fields and things like that just to make sure we're not leaving any behind - anybody behind in the new industry.

Things we're working on - you know, moving forward to the next year, more wind senators training in Maine just to expand our outreach, pushing the KidWind challenge forward, a second edition of Wind Wise. We're going to translate that second edition into Spanish.

We're going to put a lot more video online to help. We've been trying to do this, trying to raise money to do this. We finally have a little bit of money to put more videos on to help teachers who want to execute some of the lessons online and things like that and continue to pursue industry partnerships.

One thing we have, last year we did a work with PBS and a show called (Sy) Girls where the girls basically did a whole half an hour TV show about building and using turbines in the classroom and learning about wind energy. And it was really successful. So PBS has kind of approached us to do more of this kind of stuff to kind of promote this out into the world.

So we have some goals to kind of - just kind of keep it moving in that dimension. And that is the, you know, eight minutes of KidWind but basically if we have anybody online or anybody out there wants to get engaged with

teaching about wind energy from a variety of different angles, whether you're interested in getting, you know, master trainers into your area or doing KidWind challenges or just looking for curriculum, we have quite a long and deep well of resources.

And we're excited to work with anybody who's kind of out there. We do a lot of work with the Wind for Schools like states as much as we can, at least as much as we can afford to kind of do. So thank you very much.

Charles Newcomb: (Michael), thank you. I love the picture of the (antercons). I wish we had (antercons) in this country sometimes. So we're running close to the hour and those of you who have joined us before on Wind Powering America Webinar know that we're a little bit flexible and squishy on the backend of our hour.

So hopefully that's okay with those of you that are still with us. There're still 75 people on the line so that's reasonable. So with that, I'd like to introduce (Rebecca Lamb). (Becky)'s with Need and Need has been around a long time, I think almost as long as NREL.

It was born back in the Carter Administration so it's a pretty interesting energy education group that has deep roots and has really figured out how to work with thousands of constituents around the country to make sure that they have curricula that meets the state and other requirements.

(Becky)'s been with Need officially since 2001 on the staff but I love the story that she's actually a Need kid and not a neat kid but a Need kid that went back and was at the camps as a youngster.

So it's really - it's heartening when you find individuals whose history crosses with our organization all the way back in their history. (Becky) manages the -

some of the major state and national energy education programs including the energy industry's studies program for the US Energy Information Administration and some other state programs.

She comes out of Rutgers University and also did her Masters over in the UK at the University of St. Andrews, so (Becky), you'll have to turn on your English accent for us.

(Rebecca Lamb): I'll try. Thank you Charles.

Okay. Yes, I was a Need kid so I've never really had a real job I like to say. I've always done what I love and I appreciate the opportunity to be able to do that.

A little bit of information about the Need project before I delve into our work with the Wind for Schools program. As an organization, we actually were founded about 32 years ago now by a high school science teacher who really saw a need for energy education in the classroom.

We're a non-profit and we work nationwide and increasingly around the world as well. The two main avenues for the way we provide information is to provide curriculum materials for classrooms and also to provide professional development for teachers.

What we found over the years is that many science teachers, many teachers in schools don't have a large background in energy. Either they're typically as ignorant about energy as the general population, and so we really rely on that professional development we provide in those training sessions that we provide to get them information as consumers but also get them comfortable

so they feel comfortable teaching their students about the topics that are important today.

A little bit about what we are working on with Wind for Schools, we have the Wind for Schools workshops that we've been running in states that are official Wind for Schools states. We also see these workshops - wind workshops happening in other locations where there're grants for funding available for them.

Typical workshops for this type of program is one day with the teachers. A lot of times we'll put them out of the classroom. Sometimes we'll have them on the weekends. And it's a day to use the hands on experiments, to get some background information, to see a turbine if it's nearby and really understand wind not just how it works in the science behind it and the engineering behind it which has become more and more of a focus in education with the (Stem) initiatives, but also wind in a larger context, in understanding wind in our energy portfolio more generally as well, understand how it feeds into our electric grid and operates in coordination with some of the other sources we use.

We've had really good success with these workshops. And I won't go through the data on the slides but we see really high satisfaction rates and the teachers feel really confident in teaching these wind lessons when they leave the workshops.

In addition to the workshops, and this gives us the ability to reach a broader audience then the workshops may on their own, we also do curriculum for schools. The curriculum that we have for wind is part of a portfolio of about 120 different pieces on energy.

All of those pieces, if you want to reference them, or look them up later, are on our Web site. They're all free to download. They're all updated annually. There're a few that are updated every two years for data and statistics and technology changes because we know that energy is a changing industry.

So we hate to see the textbook that says one day there will be wind energy. So the curriculum for the wind sector specifically is broken up into four components. There's a primary, elementary, intermediate and secondary wind curriculum and those are really meant to meet the different needs of those levels.

The materials tend to be hands on. They use some of the KidWind kits and some additional components to teach those hands on lessons. And then there're a lot of social science activities involved too - mock public hearings, we have a lot of math activities in these curricula.

What we find over the years is that while science is a great way to teach about energy, science is just one aspect of the energy picture and the energy world. Now the curriculum that's available, it's pretty flexible. Again, what we find when we talk to teachers is some of them have two weeks to teach all about wind.

Some of them have one or two days to teach about wind. So we want to make sure that we provide every teacher who's interested in teaching about the topic materials and curriculum that fit with their schedule.

There are plenty of teachers who would love to teach two months on the topic but the reality of the classroom schedule and the pressures that they have are that they have one or two class periods to teach about it.

So the curricula is pretty flexible in that sense. It's also correlated to their state science standards. Many teachers are very tied to the standards that they have to meet in many cases having to provide proof on a daily or weekly basis that they've met specific standards that students will be testing on.

So that was a priority for us. You'll see on the slide - if I can figure out the pointer - let's see. You'll see on the slide right here we've got a matrix of curriculum and standards and identified where the curriculum that we have and which activity meets those standards.

For many teachers who have taught for many years, it's something they don't need but especially for those new teachers or teachers that are new to an industry and a topic, being able to show that to their bosses and their principals is really important.

In addition to that standard curriculum that we have which is very similar in a lot of ways to solar curriculum we have and curriculum on hydropower that we have in the way it's set up, we worked with the Wind for Schools program to develop a Wind for Schools specific curriculum and that curriculum was also on the Web site.

And that allows schools who have data or who are interested in accessing data from other schools through the Wind for Schools Web site to use that data in the classroom, to really delve into how wind works, where it's windy, why the wind flowing, the power output, all of those types of things with the data they have available.

That was based on a little bit our solar schools program which helps schools around the country with the PV data and output and the curriculum ties in very similar ways to the PV world.

In addition, those two - in addition to those two specific wind curriculums we also have a number of interdisciplinary activities that include or focus on wind. There're math activities, as I mentioned, some social studies activities that focus on town hall hearings and that type of thing.

And then, you know, for the younger kids, or when we have older students working with the younger kids, plays and skits and things like that really bring energy into all aspects of the curriculum.

At Need and I think at KidWind as well, we really feel that teachers and students learn best by doing. We're not an organization that lectures or says that a Power Point is the way to teach a topic. It's very hands on. We train teachers around the country in about 500 workshops a year so we're very engaged with the education community on a hands on basis around the country through our network of teachers.

And we also have some awards that we give out for student work and when students go out into the community and do their teaching and that's how I got involved with energy and energy education. So I think that's a particularly valuable part getting students to become the educators in their community.

So if you've got questions or interest in doing some training or accessing the curriculum, feel free to let me know.

Charles Newcomb: Thank you (Becky) very much.

(Rebecca Lamb): (No problem).

Charles Newcomb: And we'll bring back the lead slide again, talk a little bit about what's coming up. And while we wait for that slide to land, we do have a couple questions. I think this question would be probably of Karin because she had a 70 foot tower in one of her pictures. Karin, can you elaborate a little bit - or would you be comfortable elaborating a bit on the balancing of tower heights with cost and energy capture and improving wind speed and how that's communicated?

(Karin Wadsack): Absolutely. And as I mentioned earlier, typic- you still there?

Charles Newcomb: We're still here.

(Karin Wadsack): Okay sorry. Something weird was going on with my phone. Anyway, as I mentioned earlier, you know, Arizona's not typically a windy state and although you do want to get higher up in order to be able to capture more wind, at the same time, it isn't necessarily a great decision for a school to spend an extra $4000 on a wind turbine to be able to capture a little bit more wind.

And so really we, I think at this point, the typical installation is 45 foot tower. That is the shortest tower that Southwest Wind Power is offering at this time. And the cost, of course, increases as you're going up.

But the difference in cost between a 45 foot tower and a 70 foot tower is somewhere on the order of $4000 plus additional equipment necessary because if you're putting up a 70 foot tower you need to put up - you need to have a crane or a screw jack and a number of other pieces of equipment that you either need to buy or rent.

When you were doing a 45 foot tower you could simply lift it up with a winch on a pick up truck. So, you know, there's a big difference in cost there. In our case we put up a 55 foot tower at St. Michael Indian School because the wind resource did seem to justify the taller tower.

And we had the funding available through a grant. And that school is not simply using renewable energy as a demonstration project. They really are trying to capture as much electricity as possible. And they're in a very windy location.

At the university, we, in an urban setting and getting that turbine up to 70 feet made it so that it would make a huge difference in the capture of wind energy. And even though it is largely a demonstration project, here we wanted to make sure it's a demonstration project in showing that wind works rather then, you know, setting a 45 foot tall tower next to a 60 foot building which would show that wind doesn't work.

So that was more a question of getting the wind turbine up to a height where it would really be something that would compliment the building and would allow us to show that wind energy is working and we had funding through our university Green Fund grant that we go so we were able to justify that decision not on some kind of payback but on the fact that we had raised enough money to pay for the difference in cost.

And that one, I mentioned that Southwestern Power donated equipment. They actually donated equipment for that one with a 45 tower and we paid for the difference to put in the 70 foot.

Charles Newcomb: Thanks Karin very much.

(Karin Wadsack): Sure.

Charles Newcomb: That's a nice explanation and I think it speaks to the point that a lot of these small projects are, in fact, demonstration project and there're few better examples of well when is a demonstration project enough? And what do you need a demonstration project to do then perhaps the botanic gardens in Washington where on one hand it's pretty amazing to have wind turbines right on the National Mall.

There's a Sky Stream there. There's a (Mariha) Wind Spire there because so many people see them, and if you talk with the folks there, they spend - they spin, you know, 70% of the time. And as log as they're spinning that's a good thing.

But that means 30% of the time they're not spinning and you have to explain to people why they're there, that they're there so people can come and touch them and feel them and understand that small wind is accessible.

And what if you're not there to explain that, then now you've got people who walk away thinking that wind doesn't work. And so it's always a delicate balance and all these projects are generally sited so that they spin most of the time but it's not really an immediate payback kind of calculation.

Dennis Scanlin, are you still with us? On mute probably or maybe not. There's a question for Dennis about if, I think Dennis mentioned that some offshore areas had been excluded. And there was a question about which ones and when did that happen. But if Dennis is not on...

(Jessica Hokes): This is (Jessica) and I actually read that. That was in the News and Observer which is the newspaper that comes out of Raleigh. I think that was in today's

or yesterday's paper. And they were excluded because of military operations, bird migration and some - I think something else to do with wildlife.

Charles Newcomb: Okay, thank you for that clarification.

(Jessica Hokes): It was reduced from 10,500 square miles that were being considered to 3600 square miles.

Charles Newcomb: Okay thank you. I don't know if you can - well there's not an easy way. If there's a - if people have an interest in finding that article, they would just Google which newspaper again?

(Jessica Hokes): The News and Observer.

Charles Newcomb: News and Observer. Okay. There's another question about the cost of small wind turbines and let's ask Karin. Are you okay to speak to - because I think Dennis is not with us anymore.

The question is we've seen a bit of a drop in large turbines certainly since 2008, right, in the cost of large turbines on a cost per megawatt or kilowatt basis.

(Karin Wadsack): Right.

Charles Newcomb: Are we seeing a similar trend for small winds?

(Karin Wadsack): We aren't and I don't know if that is unique to the turbine that we - the Sky Stream turbine that we've been using most often in the Wind for Schools program. I think right now the cost has actually gone up because of they obtain ability, if you will, of different materials that are inside of the turbine.

And I don't know if that is also true if you're talking about a (birdy) or other small wind turbines that are used on farms and houses and business across the country.

However, this - that's actually been a challenge for the Wind for Schools program because the installation cost has gone up a little bit and is something, therefore, that you have to do a lot more fundraising for. The last invoice that I'm paying right now for a full Sky Stream installation that included some fancy transformers into the building, et cetera, was $22,250.00 Yes.

Charles Newcomb: Yes, I - and I remember back in the day when a couple kilowatts was less then $10,000.

(Karin Wadsack): Right.

Charles Newcomb: It wasn't all that long ago. Yes. Well, but the good news is that they're a lot more reliable then they were perhaps 15 years ago so that's kind of okay maybe.

(Karin Wadsack): Definitely.

Charles Newcomb: Another question was about capacity factors. And let's ask Michael Arquin this one. Michael, there's - the notion of capacity factor is sometimes a hard one to get across. If you say it's a 20% or 25% capacity factor, does that mean it's operating at what? And how do you describe that to the people? I mean, I think many of the folks on the call understand it but how do you bring that down to ground level so people can understand that?

(Michael Arquin): Well I guess - can you guys hear me? I think so.

Charles Newcomb: We can hear you beautifully, yes.

(Michael Arquin): Yes, sorry. We do have that topic in our advanced - I mean, it's something I don't really get into - we don't get really into until high school and we use it in kind of a math class kind of application to be honest with you.

It's one of those - and you know, as (Becky) was talking about, kind of the important thing to understand is that teachers don't have tons of time, you know, and you're trying to get - to convince them to take something new into the classroom and it may be unfamiliar.

Maybe somewhat challenging for them to learn. So my goal with them a lot of times is to spelling kind of (myth) like that, that wind is intermittent. What does that mean, you know, and what does the capacity factor mean? And we compare - a lot of times we compare the capacity to other power sources.

What does it mean, you know, when you say a nuclear plant or coal and wind and how does this situate within other subject matter as well? But you know, I would say a lot of times I'm not talking capacity to most teachers. I'm just trying to convince them that wind is just another way for you to teach standards you already have to teach.

And mathematics is something you have to teach, so if I can approach it with understanding what, you know, percentage or percentages and things like that, that's great. But once again, I wouldn't say - I do have the occasional 3% to 5% of the teachers who kind of really want to geek out and get into that space.

More then anything, I'm trying to disabuse them of the fact that, you know, the most often things is wind turbines kill birds and then you're trying to walk off the big ones basically and things like that.

Charles Newcomb: Right.

(Michael Arquin): Or wind energy gets too many subsidies, okay. Well, let's talk about who's all getting subsidies and things like that, so.

Charles Newcomb: Right, well we really appreciate that, bringing that down to the ground and the whole (threshold). Well, thank you (Michael). Okay, so again, we want to thank our sponsors, the Department of Energy. Department of Energy is - whenever - just to be clear, when folks say NREL is providing support, it's always coming from the good graces of the Department of Energy.

So thank you to our friends there. And a quick note about some upcoming Webinars. As those of you who are regulars, you know that Wind Powering America has regular monthly Webinars that occur on the third Wednesday of every month at 3:00 Eastern.

They're typically 60 minutes long but often they're 70 or 75 minutes. But we have one exception to this rule, and that's coming up on December 14th. We have a wind power economics Webinar which is a special deal coming in a week ahead of the normally scheduled Webinar.

Part of this - driving this in earlier was because we had some conflicts and we wanted to deliver this specific Webinar early so we've got some of the key authors on the wind energy economics and market status reports, et cetera, presenting.

So that's a very good one to join in if you're curious about how the industry is doing as a whole, what's it trending like and perhaps even what next year might hold.

On December 21st, the following week, so our normally scheduled Webinar is our wind and wildlife interactions, that was originally scheduled to be held today. But we had pushed back because of other scheduling conflicts again.

And then in January, we've got some market accept and activities and what's happening these - what's - sort of what's new and what's changing in that space. That's of critical importance what (Michael) was just describing in terms of sometimes folks hear a buzzword out there and it becomes reality in their minds.

And a lot of times it's about bringing that back down to, okay, what's the science behind that perspective as much as anything else. So again, folks, thanks very much. If we could clap for our four wonderful presenters, you'd all hear us but everybody's on mute. Sorry about that speakers.

But we'll look forward to having you all with us again in three week's time approximately and then again in - on the 21st just before Christmas. (Jonathan), it was nice having you on the call with us. Good to see you out there.

And if anyone has any questions, feel free to shoot us an email. And again, there's our Web site at the bottom - windpoweringamerica.gov. It's - we've recast it a little bit so it's a little bit easier to navigate and although it's a different look and sometimes different things take a little getting used to.

But I think things are now searchable and that's an important element, directly searchable within the site. So have fun poking around in the site and come and visit us sometime. Thanks very much and we'll talk to you soon.

Coordinator: That concludes today's call. Thank you for participating. You may disconnect at this time.

END