WIND FOR SCHOOLS WEBINAR

May 12, 2011

Coordinator: Welcome and thank you for standing by. At this time all participants are in a listen-only mode. During the question and answer session please press Star 1 on your touch-tone phone.

Today's conference is being recorded. If you have any objections you may disconnect at this time. Now I will turn the meeting over to Mr. Charles Newcomb. Sir, you may begin.

Charles Newcomb: Thank you very much. Good afternoon everyone. I'm not sure where people are necessarily calling in from so it's hard to say what the salutation is but hello.

We've got a lineup today of a few great speakers from our various Wind Application Centers around the country.

And we're excited to have the opportunity to share with you the concept of the Wind for Schools Program that's the DOE, Department of Energy National Renewable Energy Laboratory program right now that is sort of in it's - it's in an evolutionary process of moving a little bit to the private sector. So we're excited to see that change as we go forward.

But a brief introduction to the Wind for Schools program for those of you that have may not be familiar with it before we move on to our presenters. But I do want to make a brief so that we can hear from them more.

There's a few tenants to the program the first being that rural America is where a lot of our wind generation is going to be happening.

I think we all accept that, understand that it's not going to be in downtown Chicago. It's going to be out in Nebraska or Kansas or that Dakotas or Alaska and that as we see this there's sort of a two-pronged approach.

There's what's happening in the industry then there's what's happening at the edges of the market at the community level as the technology moves closer to people that is a fascinating dynamic environment where that technology meets the people.

And one of the dear to the hearts and minds of the people in the communities is the schools. So that's a pretty logical location if you have a program that's focused on deployment and you're interested in getting more of the technology out.

The schools would be where you might want to first focus your attention because that's where you can affect the community at the heart, you can get students and our young future engineers, scientists, lawyers, bankers, construction workers -- you name it excited about the promise of the technology.

And if you're able to do projects at schools you will discover that the schools are easy for people to rally around. If they understand the benefits to the school, the benefits to the community there's very little inappropriate push back to that project. So it's a fun place to start it.

It's also a great way as I mentioned earlier to engage, our program is a great way to engage the school teachers and the students and get them thinking about curricula and training them up about the facts as opposed to perhaps misconceptions about wind energy and what promise it holds.

And further it's a way to engage and equip the older students that are near matriculation time and ready to enter the workforce or go on for advanced education about the industry itself.

And so by fine tuning curricula for juniors and seniors it's a way to prep them and get them thinking about how they may play a role in the industry.

The next slide -- and I guess I have control of it -- the next slide will show you a little bit about the future that we see.

This came out of report a few years back that we believe that the 20% vision, the ability to reap 20% of our required energy from this sector does mean that we need a lot of people working in this space. And workforce development is critical to that, realizing that future.

And the Wind Application Centers are a piece of that puzzle as how to bring that in.

The - we do have a rich network when we think about how we activate these Wind Application Centers and how they interact with the various stakeholders in the world, the utilities the manufacturers, the state energy offices and in some cases the rural development, United States Department of Agriculture Offices, they're going after those sorts of funding opportunities.

And it's a fascinating way to get students involved with the nuts and bolts of putting in projects.

So even when these projects may be smaller and the residential scale machine they're very much in parallel with the nuts - the various nuts and bolts and

may be smaller nuts and bolts than - that are involved with getting in larger projects.

So we're excited to be part of that future. We're excited to be part of that presence for sure.

Our first year of results were that we are active or our first few years of results that we're active in 11 states. We have Wind Application Centers around in a few states and Wind for Schools projects and more.

There's about 70 students apparently involved at least at the time of generating this presentation. And it's a big number that are at that technical end of the engineering and technical side of the equation of course to be backed up by plenty of others in the workforce.

We've got over 200 students already graduated. And after taking these undergraduate level classes and 60 turbines, et cetera. You guys can read the slide. But it's an exciting future.

So with that very brief, hopefully brief enough introduction I want to bring in our first speaker Jerry Hudgins. Jerry is out of Nebraska. He's the Director of the Wind Application center up in Nebraska. And that center is particularly well known for its leadership and developing curricula around these projects.

Jerry received his PhD from intellectual engineering from Texas Tech all the way back to 1985, last century as most of us I suppose would.

Jerry is a fellow of the Institute for Electrical and Electronics Engineers and has been published in many, many papers -- over 120 of them on semiconductor devices, power electronics -- you name it.

And Jerry has been the Chair of the Electrical Engineering Department at the University of Nebraska since 2004. And he's currently the director of that Nebraska Wind Application Center as I mentioned and the Interim Director of the Nebraska Center for Energy Sciences Research.

So Jerry with that brief introduction take it away. A couple housekeeping things actually before I give it to you Jerry.

Jerry Hudgins: Sure, sure.

Charles Newcomb: One is that as was mentioned the presentation, the Webinar will be recorded in entirety and thus will be available for later dissemination and review.

If you've missed something don't worry too much because it will be out that there are and we'll be able to grab it again.

When it's been posted on our site at Wind Powering America we'll be sure to distribute that notification to not just the folks on the line but to the broader audience.

All right Jerry that's you. Take it away please.

Jerry Hudgins: Okay thank you Charles. It's a pleasure to be participating today. I'll tell you what, I think we actually have the other piece of the presentation up right now. Can we swap those two?

Woman: You can actually probably swap it yourself though. There you go.

Jerry Hudgins: Let's see. There we go. Perfect, perfect. Thanks.

Okay, well good afternoon everyone or at least it's afternoon here in the Central Time Zone. What I want to do when we - with this first piece is talk about the various activities that the Wind Application Centers are involved in.

And so it's not meant to suggest that the Nebraska Wind Application Center is the only entity that does all these sort of activities and interactions with various constituencies but just to give you a flavor of what's going on and the breasts that occurs at these various locations around the country.

In our application center I sort of - I share the load with an Associate Director, Joel Jacobs has a Masters Degree in Electrical Engineering. And he works with me for the last four years now doing various projects out at the center of course one of those being the Wind for Schools program which we'll talk about. But we also have other faculty that are involved in the application center.

We have three full-time faculty here, Dr. Dean Patterson you can see. So we cover various aspects of the technology from electric machines and drives.

Dr. Asgarpoor, Sohrab Asgarpoor is in the Power Systems area, and Dr. (Way Chu) is involved in distributed generation systems much of that dealing with wind turbines and issues related to grid interconnections with these systems.

We obviously are very active in the Wind for Schools program. And that's a big part of what we do at the Wind Application Center here.

And as Charles mentioned the Wind Application Centers have various roles to play in the Wind for Schools program. One of those is interacting with a state

facilitator which helps organize interactions with the various schools around the state, also in our case certainly helps with these schools acquiring funding for the projects.

We do some assessment. And this means that looking at site locations and doing wind resource assessments and so forth.

We interface with the school representatives, the local utility people, other contractors that may be involved in various parts of the project as we do installations.

And we coordinate working with the procurement of the materials of various sorts, particularly the turbines and the towers and so forth and work with some of the local dealers and installers in the state. In we've only done a little bit of that.

We offer that opportunity to the schools that we've dealt with. Only a couple of schools have taken advantage of that, expect to see more of that in the future.

And I know that my fellow presenters are going to talk about that maybe in some more detail.

We also are involved with installations of met towers. We've put in a couple of mets at university owned property at some of the research labs in a couple of places in the state.

We've also worked with some private developers in some local communities to install these towers to do some initial resource assessment and help them

with some of these small wind projects. And you can see a couple of those. These are - most of these are in the South East part of the state.

We've also done some analysis for larger projects just trying to get sort of a back of the envelope design set up for group and private land owners in Southeast Nebraska that worked out at about 4 megawatt kind of facility.

And then we worked with the Homestead National Market Monument in Southeast Nebraska in Beatrice that's about a 300 kilowatt for powering their facilities there.

And most recently we worked on a design for the Winnebago Reservation which is up in the Northeast corner of the state up in the - a little bit into South Dakota looking at a design there on some reservation land.

We also get involved in various educational activities, particularly curriculum development.

We've being in electrical engineering of course that's - we start there and expand out from there. So we have some technical courses in electrical engineering that include majors and non-majors. These would be engineering folks.

And then we have an energy science minor that's available to students across the entire institution. And we have participated in development of some of that course material particularly related to some of the renewable energy pieces and the wind energy topics.

We have a lot of student projects that we supervise at various levels from undergraduate research projects to individual projects for course credit.

And we have senior design projects that are in the engineering program. And we have summer interns and some part-time people that are working during the school year. And of course we have the traditional research projects that you'd think of with the group.

Now specifically in the Wind for Schools we've done in Nebraska so far we've done about 15 installations over the past three years or just over three years now. And there's a list there. And those are spread across the state.

We - a couple of these are associated with the community colleges. But most of these are all high schools in rural locations around the state. And as Charles mentioned part of this is - intent is to - for rural economic development. So we think that's where we need to be.

We plan on nine additional installations this coming year. And again these are scattered around the state from the southeast part of the state of the way up into the northwest corner of the state. So we do a lot of traveling around.

We also as part of the Wind for Schools program are interested in curricular development in the high schools. And so we are interested in working with teachers, science teachers, environmental or earth science teachers and so forth and trying to help them get trained up in particulars of wind energy and the associated activities that go along with that.

And we've worked with some individual teachers at various schools. And most recently we finished a large teacher training session with the need program which is the National Energy Education development project and had a formal curriculum training session for a full day.

And one of the things that we did is - as an activity of the wind application center is we added, piggybacked a half day after the (need) training where we dealt with very specific information about the turbine that we used in the Wind for Schools program, the Skystream turbine and gave the teachers a chance to, you know, touch and feel and kick the tires on one of those turbines and talk about specifics of the - of an installation, troubleshooting, operation and maintenance of that turbine and so forth.

The street participation from the WAC, we've as of last year we've had four undergraduate and five graduate students that were typically involved with installations. We had quite a few undergraduates and graduate students working on the design of wind farms and resource assessment. And this was particularly true for this project at Winnebago Reservation.

And we have three undergraduates and 14 graduate students working on the other projects. And those are all research projects working through faculty that are associated with the Wind Application Center.

This year we have 500 to 600 graduates working with us on installations. We have them available at various times during the summer as we're doing installations and planning for those.

We'll have some undergrads and graduate students doing projects in the fall when school starts up again and continuing work on the research projects as well -- so a little more focused on the academic activities.

Just to give you an idea of the kind of curriculum that we work on, we have a very specific course that deals with wind energy systems and electrical engineering.

But it's a broad enough course that we actually have quite a few other folks involved in that. We get the mechanical engineers that often take this class and a few civil engineers that take this class as well.

And this is offered as a senior elective course as well as a graduate course. So we'll have a mixture of senior and graduate, beginning graduate students in those courses working together on that.

And we have related curriculum that deal with different aspects of the technology for wind energy systems from power engineering courses, power electronics courses, electric machines and control systems.

Specifically the topics that we cover in the wind energy systems we cover pretty broad topics. We sort of base this course out a text that's been around for a while that's very good in this area on (bimanual). And you can see the list of topics there on the right where we talk about beginnings of basically resource analysis, a little bit on aerodynamics.

And then we move into some areas that are not covered quite in - there's quite a depth in that topic again being an electrical engineering course.

We focus quite a bit in the EE side of things so we spend a bit of time on generator technology and then the power electronics. So we talk about the devices that are used and the converter topologies that are typically used in these systems.

And then we get back into citing issues or for now looking at sort of the - and the large-scale wind farm applications, environmental aspects and some technical considerations, integration into the power grid.

And then we do a little bit on the economics and sort of the business side of things and look at some of the public policy issues related to things like net metering and renewable portfolio standards et cetera, on that.

We use some of the software that was developed by NREL for use in these activities like the JEDI models looking at jobs and economic impact there.

And we finish up, usually finish up with a sort of an ancillary topic which is on wave energy which I call the other wind energy source.

Just a quick note back on this energy science is minor. This is a program that we began in the fall of 2008 which is open to all majors at the University of Nebraska.

And there are three required courses in that minor program. And then there's an additional three classes, nine classes credit required at a higher level which tend to be closer to a student's major.

We - the three introductory required classes, two of those faculty in the Wind Application Center help develop modules to go in there related to wind energy. And so students will see wind energy pop up in a couple of those places.

In addition the Wind Application Center cosponsored a technical meeting, a symposium held back in the summer of 2009. It was very specific on power electronics and machines and wind systems, wind energy systems, had a nice turnout of about 100 folks for that.

Some of the student projects that we've been involved with or supervised from the Wind Application Center looking at integration of photovoltaic

arrays and small wind turbines, data logging issues, telemetry, communication systems and so forth, different kinds of power converter designs, again looking sometimes at PV systems but also the wind turbine and hybrid systems of PV and wind for various applications whether it's DC grid or back to AC power, some - a few projects on wind resource assessments, citing issues also projects related to small turbine installations, grid connection issues and then some of the component issues besides the power converters such as looking at wind generator designs.

So you can see some of the projects there that we did just recently about four months ago in the wind energy class.

This is the kind of work that students do. So this is all output from the students that we get. And this is the kind of reporting that we put together for the wind resource analysis assessing the site, looking at environmental impact and making the determination of citing and so forth.

Real quickly just hit a couple of research projects that are going on. So this is a little bit of a higher level of specifically related to wind energy doing - looking at simulation with power systems and looking at uncertainty and modeling and reliability issues and trying to do things like optimize maintenance strategies for - and this is generally applied for large-scale wind farm applications, have a project that's ongoing looking at wind turbine diagnostics where we're looking at electrical signals to look at mechanical wear and bearings and actually in blades and so forth in wind turbines, had some projects on power converter designs associated with wind energy systems, looking at energy storage issues and power converter to control the power flow between these energy storage systems and the grid, looking at generator designs and so forth.

We've looked at materials issues so we go down all the way into things like ultra-capacitors or materials for energy storage components, power semiconductor materials all the way up to more of a systems level. We did a project looking at hydrogen production from excess wind energy during off-peak hours.

And this last slide on the research project just sort of gives a summary of that -- maybe a little bit hard to read. I think if you download the file later can go through this.

One of the things that I wanted to point out in particular was - it is sort of right here in the middle. One of the activities that we get involved in and through the application center is looking at the economic opportunities for rural communities.

And so we did a project where we partnered with some faculty in the business school looking at opportunities for small wind in rural communities. And there are some interesting results from doing that as well as the - what you think of as the more technical aspects and engineering program.

I believe we have - let's see, got a question here. It's a question about how many students in the wind energy systems course? And that's typically about 15 undergraduates and about eight or nine, ten graduate students. And that's been pretty consistent for the last three years.

Charles Newcomb: Thank you Jerry. Jerry also brings up another point that he was answering a question. It may not be - for some better last Webinar savvy it's important to notice that across the top of your window is a few drops - well sort of pull down or selectable buttons. And one of them is a Q&A button that should be just above where the presentation window is.

And if you click on that you can ask questions of the presenter. We encourage you to ask questions while you're thinking of them and they come up so that you don't lose them. And then the presenter will take the time to answer them when they can take a breather like Jerry just did.

Also what may not be clear that I'd like to make clear is the structure of this Webinar and kind of wanted to wait until we stabilize on our attendance.

We've - we have a couple objectives for the Webinar. One is understanding that this is an ASES Webinar and we are likely to have small wind installers.

We wanted to communicate that we care. No we want to - it's more than that. We wanted to communicate that we take the small wind energy very seriously and we see it as an integral part of the industry and so far that it is a very clear on-ramp for rural America to get their hands on a piece of equipment to see - to come up and touch a piece of equipment and know that it's in their backyard and providing power and value to their lives.

So the small wind industry is really important and we want to paint the role that the Wind Application Centers serve in being part of the community through the Wind for Schools projects, being part of the educational track as people move into the industry that there is a way into the industry, it's not just knowing somebody but there's actually courses you can take.

And so we've selected these three speakers because on one hand they have similar approaches and they have similar curricula at the university and college level or university level, but on the other hand they have unique challenges.

So we've got Jerry Hudgins from Nebraska who you've just heard from. We've got Ruth Douglas Miller from Kansas and we've got Kat, or Katherine if you will, Kat Keith out of Alaska which has her own set of unique challenges mostly that you can't get from A to B very easily sometimes.

And so the notion is that we want to present - we're having these presenters describe the program first and then midway through Kat's presentation you'll discover that there's a little bit of a shift as they begin to talk about that project.

Because another value that we'd like to communicate to the ASIS community is that there are people out there like Jerry, Ruth and Kat who have installed a lot of these projects not unlike yourselves or your friends. Then they've come across the same barriers as you.

But on one hand they may have learned something unique because they're a university and may look different than an original individual trying to put a project in. And other way is they encountered the exact same barriers and they may have a different way of going about them or you may know that you're not alone in your struggles because everybody has a hard time with permitting.

So Jerry, thank you very much for that presentation. And we asked Jerry to provide a deeper presentation on application centers and on the curricular basis and research and that sort of thing.

And you'll see you later presentation on this in the next few speakers because we wanted to also focus on projects to a degree.

Our next speaker is Ruth Douglas Miller of the great state of Kansas. And Ruth the word is out today that Ruth was - became public today that Ruth was one of the latest Kansas State University professors to be selected as among the top 150 scientists in the history of Kansas which I don't know, I think that's a big deal.

And I think it's a very exciting to have people like that of that stature in our community. We're blessed to have people like Jerry and Ruth and Kat helping us out.

Ruth is an associate professor of electrical and computer engineering at K State. And her focus has been to a large degree which we're thankful for on harnessing wind and solar power have worked specifically as focusing of course on where do you put these turbines, where do you built them and how and when wind and solar technologies can be most efficiently incorporated into the power grid.

Ruth directs the K States Wind Applications Center and leads the state's Wind for Schools program. And this program is helping K-12 schools like the other programs across Kansas to install these small turbines and educate students.

Now by the end of 2010 the program as you'll see has placed quite a few turbines as well and is looking forward to the upcoming year.

And they're working in - on an arm as you'll see with Colby Community College to set up a new test facility which is a project developed in - with the support of Department of Energy and National Renewable Energy Laboratory under the expert guidance of Tony Jimenez. If you haven't met Tony I encourage you to look him up.

So without further ado Ruth the stage is yours.

Ruth Douglas: Thanks Charles. So as Charles just told you I'm the Director of the Kansas WAC. And I'll talk a little bit about the academics and case state research side of things initially here.

A lot of what we're doing is similar to what goes on up in Nebraska so I'll go kind of lightly.

I've had three graduate student assistants. I don't have the privilege that Jerry has of being able to keep any of them. They keep running off and getting jobs.

Mark Hopkins helped us get started and he now works for Kansas City Power & Light which has about 300 megawatts of wind on its portfolio and he gets to look after some of that.

(Anita Joes) went to go work for Black & Veatch. And I think she'll move around a little bit. And what she's doing right now I think is actually fossil fuel plant design. But she obviously also is interested in getting into renewables.

And then (Colin Terilia) I have this year who is doing inverter design when he's not writing USDA RBEG grants.

Kansas like Nebraska has a facilitator as well as a WAC director. Our facilitator is (Dan Nagingast), at the Kansas Rural Center. And he is about to abandon us and change jobs a little bit.

So well be in the hunt for a new one which is for those of you who aren't familiar with the way the WACs have been going, most of the quote older WACs, the six of us have had to find new facilitators.

So education side like Nebraska we are housed in the electrical engineering department. And our electrical department has a very strong power specialty option. So we have most of the same power classes that Jerry has.

And I teach a single class of three credits in wind and solar energy system design using the same (Man law) book that Jerry is.

And I had 15 students the first year I had that class and then that's being 30 students each in 2009, 2010.

We don't have a capstone design, a single capstone design experience. But this class can serve as that experience for those students who wish it to. So we - I have a fairly major design project required.

And the students enrolled have been about half undergrads and half grads. And they have been all over the place in terms of majors.

If you don't understand my abbreviations, ME is mechanical, IE is industrial, RK is architectural and Bioag is bio-agricultural, essentially farming. And all of these students are interested in renewable energy aspects of their specific programs.

The class is also offered by distance. That means they tape me when I lecture and half of the students last semester were off-campus, most all master students.

We do wind cite assessment. We do how turbines operate. And one of the projects that students can choose from is Wind for School site review and also working on the communications of those Wind for Schools turbines with us in collecting their data.

And because I still have Wind for Schools project, when I don't have a class I offer a one credit class in the spring which I use as a source of slaves to help review applications and otherwise handle the Wind for Schools project.

They also put on displays at our open house which is typically towards the end of April. The entire community and folks who are out of town all come to see what engineering means, what engineering has to offer. It's meant mainly as a recruiting tool. And there's nothing that really helps recruit more than a spinning wind turbine. And so we do several things there. We did a Kid Winds contest to this year.

Besides the teaching there are four other faculty at least involved in my department in various research activities. One of those is simulating a micro grid, say a town or even a factory and then examining what happens when you lose the grid.

And right now I assume you all know that turbines have to stop producing if they use that 60 hertz signal. And one of the things we're studying is how can you change that? Can you make the system stable? Can you control load enough to allow that to continue to operate?

And we've got a project looking at low-level turbulence effects on small wind turbines with the end goal of producing a - an easy to use piece of software where you can enter I've got these trees at this height in these buildings at

these geometry. And it would say put the turbine here. And if you do this is the kind of turbulence you can expect. So it's what we're looking for.

I already said (Colin)'s working on design of a 20 kilowatt inverter. But it's not just any inverter. Hopefully it will also be able to correct power factor up to some significant percent of its power rating. And it could do that even when the wind wasn't blowing. So it would be of value to particularly to the rural electric co-ops.

Then we have some studies of monitoring detection health, turbine health failures, failure prediction on for turbines that we've just had installed right near campus as part of another DOE grant.

And the high plains small wind test center that Charles mentioned where we'll be testing - we have space at least initially for four turbines to the new OES standard. And that is as Charles said, that's funded by NREL.

And then I've got a research project with more DOE funding to develop laboratory exercises specifically in power electronics, power controllers, power trackers and inverters to go into the wind applications class.

For turbines for the Wind for Schools project, these kids, they're ninth graders this year. They were eighth graders last year when they wrote the proposal. So that's their turbine and they're real pleased with themselves.

We've had 28 schools applied over the past three years and queries from many others. I have 13 turbines up and three of them are ill. We think one is actually a grid problem.

One turbine is waiting installed, just trying to figure out where to put it. And then we're working currently on four more and plan to release a request for proposals this week with support from our largest IOU in state to sort of open-ended how many turbines can we do in four years.

So that's where Kansas is at the moment and a little bit of the comparison with the way things go at Nebraska.

We as Jerry mentioned we also have Met towers. One of those is at the turbine facility near campus where we're measuring and monitoring. And we have done teacher training and have one kid wind teacher training workshop coming up in June.

And I should check.

Charles Newcomb: Thank you for checking. We can leave that question for the end if you want or feel free to answer it now.

Ruth Douglas: I think I'll leave (Curt)'s but Kat's ask when will the lab be set up? And the intent is to be able to offer these exercises in the fall. So this summer I have some guinea pigs who are going to test them out. And we hope we'll be putting the labs into the class this fall.

Charles Newcomb: Ruth you mentioned briefly this high (pladence) test center. Then we may have an illusion to the small (end) certification effort from - for folks that are on the line it's smallwindcertification.org, one word -- sort of one word, one word and with a .net.

If you are unfamiliar with the SWCC program and its role I think that's - I - pretty much sums it all right Ruth, that what it's for, why it's there and who's doing it and your...

Ruth Douglas: Yes that's pretty much it. NREL's supporting four and there are many other test centers that aren't supported. But the idea is man let's get these things tested and certified as quickly as possible.

Charles Newcomb: It's critical for our industry for sure to get a handle on the good, bad and the ugly and so that states that are incentivizing small wind products know what to incentivize. And so they're not holding hands with a piece of equipment that isn't reliable, productive, repeatable -- those sorts of things.

Ruth Douglas: Right.

Charles Newcomb: So we very much appreciate your participation in the program, important.

Any other questions? They're not really popping up that much so I'm going to put another leader out there.

There's a - it would be interesting to take a quick poll of the audience if you guys can find that Q&A button up there and click on that.

And in your question if you might - wouldn't do us - wouldn't mind doing us a favor of asking the question which is who are you and why are you on the call and what are you looking for? And then that'll lead our discussion at the backend which I think will be interesting a little bit.

Thank you Ruth very much. We appreciate it and we're looking forward to the next segment of your presentation following Kat.

Is a coordinator for the wind diesel activities in the state of Alaska through the Wind Diesel Application Center, the Wind Application Diesel - sorry, the Wind Diesel Application Center is the center for excellence in this technology and was established between - partnership between the Alaska Center for Energy and Power, NREL and the Alaska Energy Authority.

And there Kat provides the technical assistance to this - to the wind diesel stakeholders which are the utilities and the communities and the permeating officials et cetera.

And she promotes education and training opportunities and works to identify both the near and long term research priorities for the center.

Katherine has also worked to promote wind (1G) projects that are sustainable for rural Alaska including projects rural Alaska including projects at sites such as the (Ridge) Center Hot Springs and the (Copsview) Electrical Association.

Those of you who are not from Alaska -- and I'm guessing there's a few of you -- Alaska has unique challenges in that it has a great number of very small mini grids that are burning very expensive, fossil fuels, typically in the form of diesel or some variant. And it's critical to get a better control on the cost of energy up there.

Kat is a graduate of the University of Alaska Fairbanks, an inter-disciplinary degree in renewable energy engineering.

And her current research topics include among others energy storage systems, high penetration wind diesel systems, waste heat, recovery power generation and alternative fuel transportation.

She is an adjunct facility - sorry, faculty of the teaching courses per the One Year Occupational Endorsement Certificate program at the Renewable Energy (Dimetsu) Campus.

So Kat without further ado please take the stage.

Do we have you Kat?

Katherine Keith: Great, thanks Charles.

Charles Newcomb: Thank you so much. There you are. It's a long way from Alaska so...

((Crosstalk))

Charles Newcomb: just a few minutes for the electronics to make it down here.

Katherine Keith: That's right I apologize for the delay.

Charles Newcomb: And you have to give us a quick word about your Ironman competition that you - or challenge you just did.

Katherine Keith: Oh sure, absolutely. Well like all of us in Alaska we like challenges apparently. So I just completed the St. George Ironman on Saturday. And it was 93 degrees so for us up here hadn't ridden outside all year yet and so got to go ride outside for the first time just about a day before the race.

And it was definitely tough. I felt like I deserved that medal when I crossed the finish line. So it's pretty neat. Those things are very inspiring if you've never seen finishers.

It's amazing the people that enter into these things with various disabilities and various challenges and everybody's there to, you know, just go through it. And so they're a pretty amazing thing.

I'd highly recommend it. Anybody can finish an Ironman. Okay.

Charles Newcomb: I would beg to differ actually. I'm lucky if I can make it down the stairs sometimes.

Katherine Keith: I double dog dare you.

So Charles gave a good introduction of the Wind Diesel Application Center. Our center's been around for three years. And as he mentioned it was started when the three entities, our state energy office NREL and our newly formed Alaska Center for Energy and Power up here at UAF determined that there is a large increase in the number of wind diesel installations across the state due to state funding that was becoming available over the past two years.

And so many systems being installed we needed to make sure that the systems that were being installed were effectively stabilizing the cost of energy which as we all know is going through the roof. And up here are some communities are paying over $10 or $12 to get diesel which equates to over a $1 per kilowatt hour.

In these situations wind energy really becomes affordable whereas in some other parts of the country which has cheaper energy alternatives it's a little bit more of a gray line.

So within the Wind Diesel Application Center we focus on three areas similar to the way the other WACs are set up where we've got a research and development focus, our technical support and then of course our education piece.

And we recently became a Wind for School state just about six months ago. So as you'll notice our research capacity and our course offerings are not going to be as expensive as other amazing WACs that have been doing this for a little while. So I hope in a couple years we'll be at the place where both Kansas and Nebraska are right now.

So we've been recently awarded a Department of Energy (EP) Score Award. And for those not familiar with (EP) Score it allows us to build up research capacity at the university.

And so our focus was on isolated communities and installed - being able to better understand and better develop sustainable wind diesel system not just in the state of Alaska but internationally as well.

We're certainly recognizing that there's millions of people out there with - running on diesel power plants similar to what we are doing in Alaska. And so this technology is really needed. So we're trying to develop this knowledge base.

So we have divided our research into four main tasks. The first is to develop this Alaska wind energy knowledge network. Then we have roughly five faculty members that are working throughout the various campuses of our university on this project.

We've got one EE, two MEs and two economists which also help us with other social science aspects of project development so this first one is really focusing on just collecting data.

I think we'll all agree that sometimes data is not the easiest thing to acquire and yet it's really needed to prove out the bank ability of these projects.

Whether or not it's successful or not we really - it comes down to numbers. And we don't yet have these numbers on our installations up here to show the public benefit.

So the second task -- and this tends to be my interest as an engineer where we're focusing on technical areas as the (unintelligible) to high penetration of wind.

And I'm excited to hear about all the other power electronics research that the other universities are doing because I think there's a lot of overlap here.

This is a picture by the way of a (Cocanock) which is a new system that was just installed earlier this year where they have been successfully running without their diesels on for any extended period of time. So that's - it's going to be an exciting system to watch.

So within this task one of the projects we're working on is the installation of a wind diesel hybrid test bed. This is similar to the unit that's been installed at NREL over the years for their Village Power Program.

So this is going to be commissioned in June of this year in Anchorage. And we'll have a lot of graduate students being able to work on this project in the fall up in Fairbanks.

And the main focus is to analyze the various components and their ability to run it in a (loft) configuration.

We also have many communities here that are trying to electrify their villages which causes a lot of overlap with, you know, the “smart grid.” And initiatives that are going on in the lower 48 but for us up here with (stove) oil being so expensive, running on electric heat makes a lot of sense for us.

And so we’ve been working to develop the control technology to be able to do this in a way that also allows for power quality stabilization. And the modeling component is important as well as the others have highlighted.

One aspect that’s a little bit unique to us up here is the cold climate. And while there our various cold climate recommendations, there’s still a lot of manufacturers that don’t quite understand fully what it takes to make a system work up here.

Even just a couple - oh about a month ago we lost two turbines on the northwest coast of Alaska. Two integrities totally were destroyed due to harsh climate conditions and icing buildup. So it’s a big issue up here which isn’t something to be aware of for small wind turbine installers.

And then lastly the social economic and policy challenges. As I think we all learned in developing these projects at the schools we know that technically we can get the project to work. There’s no (unintelligible). We all know how to develop a project.

But it takes a lot of aspects all lined up in a row when the planets are aligned up in one way and the stars this way in order to actually make a project

successful. And so we're trying to get a better grip on what that means for our rural communities.

Now similar to what Jerry's done in Nebraska we did have a consortium or our Wind Diesel Summit when we first got (Wydac) going back in 2009 to allow these stakeholders tell us how our research at the university needed to line up with industry needs.

And then to follow-up on that we've recently had our wind diesel workshop up here in Alaska, an international workshop which was hosted by (Wydac) as well.

So that brings us to our Wind for Schools program and the education piece of (Wydac).

So what we have currently is our - we focus very heavily on the curricula development in our schools. So while the turbine installation is a very important part of the program of course we all need the education piece to go along with that.

And we found that to be a very big challenge to find the right mix of materials that our teachers would use and that the students were receptive to.

So we've been coming up with all sorts of different ideas. And lots of those ideas haven't worked. But we're coming up with a few that are and I hope to get to share a couple of days.

We do have an organization, a private school in Seward, Alaska which is going to be offering a wind tech training program.

And this is going to be offered in parallel with our existing diesel operators course so that the existing people diesel operators in the power plants in rural communities they'll also be able to be wind techs and be able to climb towers when needed.

There's a one year program or an occupational endorsement certificate in renewable energy. This is all 100 or 200 level courses. But we just graduated about ten students from this program last week. And so that was a fairly exciting day.

And we have isolated courses that are like sustainable energy, power electronics courses that have a wind element. But we don't yet have a wind energy course. And we hope to be offering a series of wind diesel short courses over the summer of 2012.

We have over this spring we had about 12 undergrads involved Wind for Schools program and about four graduate students. And the graduate students were mostly working on the research while the undergrads they were helping with site assessments and the community outreach and involved in installations where they were able to.

Another aspect of the program which is slightly different was the focus on the school ages of a 16 to 24. And this is partly due to the funding source which was the Denali Commission. But with this funding we're able to go into four hub communities of (Costaview), Dellingham, Nome and (Bessel) and offer this one credit course in wind energy.

And we just had one in Dellingham last - a couple weeks ago and surprisingly the class filled up. I was so surprised that there were this many people in Dellingham that wanted to learn about wind energy.

But it was a really big success. We took down a couple sky streams and did some repairs and put them back up again and everybody should be impressed with the number of hardhats we were able to acquire, so some pictures of these younger adults really interested in this and wanting to further their education.

So same thing at the Mat-Su campus, we were able to get a turbine installed about a month ago at the Mat-Su College.

So this is our college wind turbine on a 40 foot (flipped up) tower. So we'll be able to - they invest - they purchased a (gin) pole at the college so we'll be able to raise and lower it as many times as students want just to get some hands on experience.

And obviously that's what - the point of this program is to have some equipment out there which students can get their hands-ons and get excited about.

And so when I mentioned that the education component was really critical here we found that the Kid Wind Challenge was a really great way to do so.

We had a Kid Wind Challenge throughout March and February and March where we went to 13 different communities and we had over 100 teams participate in our Kid Wind Challenge.

Now I know other states have been doing a Kid Wind Challenge and I should describe this challenge a little bit.

This is something that the company Kid Wind has been doing for the past two years. They started in New York. And it's a design competition where middle and high school students can come up with wind turbine designs and they're tested in the same tunnel for power output and energy output over 60 seconds. And they're judged according to a variety of criteria. And so the kids were very excited about this.

But most interestingly a lot of champion teachers came out of this. So these are teachers that wouldn't necessarily have gotten engaged in the program or wanted to install a wind turbine but they are teachers that are willing to really go through extra effort in order to help bring a good program to their students.

So I would - I'm assuming roughly half of our teachers are serious about applying to the program. And we have our application process in the fall.

So here's a picture of the Haines high school kids. And Haines is a community when you talk about Alaska's remote logistics where you either have to drive about 15 hours from Anchorage or you have to fly and then you have to take a ferry or you fly to Juneau and then take another airplane into Haines. So it's definitely not an easy to get to kind of place.

Same thing with (Tusumena) here. Their middle school had first place prize winners.

So that brings us now specifically to the turbine installations. We've installed four of them since 2009. Two of them are about a hour north of Anchorage. Then we have one in Juneau and one in Sitka. And both of those are in Southeast Alaska.

Now in this year we plan on having three more installed later this summer including one in Nome, one in Anchorage and then one in Kodiak Island which is notorious of course for their big bears.

All of these installations have been the Skystream 3.7. We are considering putting in that Skystream 600 at the (Baggatch) installation in Anchorage to get some experience in our state with their new turbine.

We'll see by the time we actually have all the funding compiled for (Baggatch) if that's the turbine and that we go with. But of course we're a little bit nervous about doing so.

So as Ruth mentioned there are - these are going out next week. What we've been doing in our state is requiring a letter of interest in the early fall saying that teachers are interested along with certain signatures from administry - certain people from administration at the school.

And then we work - we have our students work with them over the fall and winter to develop a more complete application and funding package.

And we've had a tremendous amount of interest, in fact far more interest that we've been able to maintain. And so part of our challenge right now within our own program is understanding how to manage the interest in a way that doesn't burn us out and not allow us to provide good technical assistance to the schools that we have committed to.

So for us in Alaska we do have four primary ways that people can get engaged in the program, the most standard being of course having the Skystream which - and I'm just looking at the Small Wind Certification Web site.

It looks like there are a few, I think I saw someplace that there are going to be five more turbines that had received their certification. So it'll be interesting to see how that changes the way our schools are interested in having turbines.

But in our state we've really only been supporting this particular configuration or we have had a lot of interest in vertical axis wind turbines up here due to migratory birds and concerns similar to that.

But we've as a program decided that we couldn't necessarily support those schools due to the lack of at least evidence in Alaska but they've been a good option.

So we're nervous about having less confidence in some of these newer turbines up here especially with our icing. So that's one option.

We have a lot of wind turbines already in the state that are in villages such as the North Wind 100. We have roughly 30 of these. North Wind 100 is officially involved as a partner in the Wind for Schools program.

What we're trying to do is get the data from the existing North Wind 100s in a format that's user-friendly for the schools such as their public view system so that we can use those turbines in conjunction with perhaps a smaller wind turbine so that we have greater beta packages available for the students.

We do have many schools that are interested that just simply don't have the wind class to justify a turbine. So we work with them on looking at anemometers or simply a weather station. And we really encourage those schools to look at our Kid Wind Challenge.

So I do have a map of Alaska here for those of you who might not be too familiar with what's going on up here.

You can see all along the West Coast we have our Class VI, Class VII wind resources. For our schools we've been suggesting that they have a, simply a Class II as dictated by the 15 meter wind map.

So that's at this point kind of the best that we've been able to do although we have our anemometers up here for our state will - might consider doing this a little bit differently.

Now most of our interest for the Wind for Schools program has been along the southeast, Juneau and South. But there's also a lot of schools in the Northwest that are interested. And of course those are areas which do have good wind resources.

So Charles did ask that we talk a little bit about the challenges so far with installing these turbines in schools and in rural communities.

And certainly there's been a - numerous challenges. And I was laughing a little bit to myself earlier when I was talking about the Ironman because, you know, the Ironman on the day it seemed like the most horrible thing. But now I talk about it and it's like oh there is no problems, you know, I got the medal. What else matters?

And it was similar too in thinking about all these different installations. There were a tremendous amount of problems with every single installation where we were pulling our hair out not knowing what to do and really frustrated.

But now when I look back at them I'm having a hard time remembering what all these different challenges were because now there's a turbine up and it's a successful project. So it's probably a good note then for taking good records.

But there were challenges that stuck out a little bit above other items. And one of the things we've dealt with up here was miscommunication about the program. And this has a lot to do with our really spread out state.

So there's only a few of us and we're based in acreage. And we'd be reaching out to these rural communities all over. And we'd talked with one person in the community.

That person talks to another person. That person would talk to another person. It's like the old telephone game.

So the person at the very end of the line who had authority to make a decision would say no, this is a really bad program because we're having to pay somebody $50,000. And things would be really distorted.

So we've had that challenge that we have to make sure that we're having really good clear communication somehow with all the members in the community with with greater community meetings and greater more informative Web site, you know, and presence and brochures and these sorts of things.

And every community is so much different, the people that you need to approach for approval on projects is different in every community.

So it's really required a lot of sensitivity on our part to understand the way different school systems work, different bureaucracies work and different, you know, city councils work. So that's been a real learning process for us.

We've learned also that the application process needs to be flexible where we originally thought hey, we are going to have one application process with these deadline dates and these people need to sign and this is our way to manage having lots of schools interested.

But that turned out not to be very successful because every situation was so entirely unique that no - there wasn't one whole process which was why we backed up and simply requested a letter of interest.

We had many challenges with, you know, educating the various permitting agencies within each community. And I know that was a question that was asked. But I'll touch on it a little bit here.

And this is one of the primary reasons I feel for the Wind for Schools program and one of the primary benefits is that it allows us through the guise of a great educational school program, it allows us to push on these agencies a little bit that might not otherwise be so receptive to a program.

With many of our - oh I shouldn't say many, with two of our turbines this was the very first interconnection that they've ever done. So it was a learning curve for both parties.

One of the utilities was very against and has been quite against having a turbine installed and just making it difficult.

And we've had a utility that has been completely supportive and has offered to pay, you know, $5000 towards the turbine.

So there's a lot of variation. But we're finding whether it's with the utility or with the municipality this is something that they're simply not familiar with. We don't have a lot of these small residential systems here.

One of the struggles we deal with here is power quality. Many of our utilities the average load is about 100 kW. So in their regulations they only want to allow less than 2% install capacity of the average load which means you can have, you know, two Skystreams and that's it in that community. So it's fairly restrictive in that sense.

So we're constantly having to be on our best behavior and making sure we're respecting their reasons for being concerned about small wind in the community but also about trying to be factual with what really are the concerns there. They're maybe not so (accurate) sometimes.

So the site visits for us that kind of an obvious one. And O&M which ends up being very expensive, shipping for one of the turbines say to the Sitka site was roughly $2500. So it's very costly even to ship the equipment up here.

One flight to get to Sitka and back is over $1000. So trying to get there and have a community meeting and do a site assessment and then be back there for the installation itself let alone when there are problems with the communication system it just becomes very, very cost prohibitive.

So we are having to come up with some ways to be creative and work with our dealers to be able to provide support to these schools which doesn't

always come out of our Wind for Schools budget which doesn't necessarily allow for the ability to do a lot of these site visits.

And we have been experiencing some O&M issues. And I'll get into these with a couple sites in specific. But we have had problems with the communications systems. We have had to replace one of the turbines which might have gotten damaged during shipping. And so these are definitely real issues for us.

And the last challenge which was unexpected for us being new to this program was really the amount of delays that could be experienced.

You know, for example, one of these sites, I believe it was the Mat-Su quality site we had purchased about two years ago. And it took a year - we purchased it, it had arrived and it took about a year and a half to get everything else done in order to get it installed.

So it was interesting experience in many of these to understand how long certain things can take.

And so moving forward with other projects I think we're getting better at being able to predict what some of these hurdles might be and certainly push back our expectations of how quickly things need to get done.

But I think it's challenging also not to lose momentum on the side of the teachers and the students who are really geared up and wanting to make things happen.

So our installation in Palmer you can see the mountainous landscape there for Palmer. There's just quite a bit of turbulent wind in Palmer.

But this is our first Wind for Schools turbine and was installed before we were actually a Wind for School state.

And this is one of the turbines which was a first interconnection agreement with that utility. But I do think this is a success story because since then there's been numerous Skystreams that have been installed in the valley connected to this utility. So I think that's definitely the intention of the Wind for Schools program.

The - one of the Mat-Su College, this was installed really about a month ago. It was damaged during shipping. The crate - the shipping entity somehow dragged the crates all over and caused damage to the blades. And we're not entirely sure, they're still doing the diagnostics on exactly what the problem was. But Southwest Wind Power was great and immediately replaced it right away.

This is our primary installer here (Curt Garut) in the red T-shirt there. He's been really great at focusing on the educational piece. And he spends a lot of time with students when we're doing these installations.

So the site in Juneau was a little bit different because this was supported by the Coast Guard. And then the Coast Guard has been a very big Wind for Schools partner in our state and are doing so in other states as well with other Wind for School sites.

So they've partnered with the Juneau School District to allow this opportunity for the school. So the students from the schools come over to look at the Coast Guard's site and they get the data from the turbine. But the electricity, all the

electrons that are actually being produced are flowing through the Coast Guard meter.

So here one of these had a lot of issues with the computer systems. The (Zigbe) continually has to be rebooted. We're having to shut the turbine on and off in order to allow the data collection to operate again.

So we're - this still currently isn't capturing data like should be. And it - we have a system that we use at Idaho National Labs to compile all this data and make it publicly available. And we've been struggling with this.

But Juneau is a good site which tells us that it's overproducing constantly. This would regularly be producing about 3.5 kW. So it's a good site and I can't wait to have some historical data on what the turbine is producing out there.

Now Sitka was a site where we had tremendous hurdles in working with the municipality in acquiring a building permit.

They were requiring wet stamped foundation drawings, wet stamped electrical drawings. There were a lot of fees affiliated with this. They wanted a real geo tech done in order to get the wet stamp foundation drawing. And these things are on the order of thousands of thousands of dollars. It was going to cost us about $6000 to have these things accomplished.

So this took over a period of about eight months we were able to work with the city departments to find ways around this.

And so I think that's one thing moving forward that we'll get better at doing is developing these personal relationships and being respectful and

understanding the city's concerns so that we can address those concerns without it pushing the project back.

Now you can see here in this picture from Sitka that we have been utilizing the Smark T foundations at our sites. But this was very comical because you could see in addition to that they also have the rebar which isn't really necessary. But they were excited to be able to have the students bend all the rebar.

So they put rebar in there anyway just so the students could get their experience with it. And plus there is an extra level of comfort to have such a over engineered foundation design at this site.

Because of course in Alaska here we have changing discontinuous permafrost which causes our foundation costs just to go through the roof.

So here's a picture of beautiful Sitka once the turbine had been erected.

We did have issues too with our state electrical inspector. Even though the utility was the one that was doing all of the electrical work we still had to really work carefully with the state electrical inspector who was watching over our shoulders the whole time to make sure we weren't doing anything inappropriately.

And they even provided us with a cease and desist order to our installer. So there were certain challenges there, none of it which was necessary, but due to the nature of it being the - really the first wind turbine in the community it was something that again people were very nervous about. So again yes, the permitting is always a big challenge.

One thing also with these turbines being at the schools liability has been an issue for us that's come up significantly.

So here we had to determine who really was responsible for this, who at the school. The school's maintenance department has definitely been concerned about how much this is going to cost over the lifetime of the turbine.

Here the Coast Guard donated the turbine to the school. So they, you know, were they responsible for the turbine or was the school?

So we didn't have a memorandum of agreement developed which again took a few months because of course we're at the university here nothing - between the university and the Coast Guard and the state school there it - that was another significant delay.

But in the end like I say you forget about the challenges because you have all these students here that are so excited with their installation and very, very proud. These are some of the Sitka students and our teacher champion there in the bright orange shirt.

So I wanted to throw in a couple of funny slides here. And you talk about logistics in Alaska. You can see this is how were getting around here.

And you see my snow machine in the lower right-hand corner. This is when we were doing a Kid Wind challenge in (Noatech) which required a flight into (Costaview) about 500 miles northwest of Anchorage above the Arctic Circle.

And then it was an 80 mile snow machine ride. And it just blizzarded that day before driving out here. And I got stuck about ten times and dug these big caribou holes along the way.

And but it ended up to be a good thing because that was the second place, you know, the second high school winter.

So it was definitely worth going out there. But things aren't always very simple but it makes things very interesting. And I think it's going to be worth the effort because again, (Noatech), that teacher is very interested in pursuing installation of a turbine this following year.

So a couple challenging's with our upcoming installation, this (Baggatch) has been one which we thought would've been installed about a year and a half ago, maybe a year ago.

We're struggling with the municipality. They want to charge a $3500 fee in order to even apply for a building permit because they are feeling that they have to rezone and do some other things within the municipality of Anchorage.

And really this is one of the first within the municipality that they're dealing with on this - in this - they're going through rezoning of all their codes. So that's been a hurdle. But there is a stellar teacher champion that has been really pushing to get this done and a great student group.

And in Kodiak Island we're trying to put a turbine there. And this is one where the utility has been willing to provide a lot of upfront cash.

However, two residents near the school didn't like it and they provided a very interesting letter in the newspaper talking about how that wind turbine was going to affect special needs children and cause - the noise is going to cause

difficulties with them and it was going to reduce all their property values -- so very similar things that we hear about with opponents of small wind.

And so unfortunately this is one of the challenges with working so remotely we weren't able to address these problems early enough. And so this came up at a board meeting when none of us were aware of it in the program and so they voted down the - their permit.

So we had to move the location and now we're starting from scratch with our assessment. So it's something I think that could've been prevented had we been more involved with the community's needs and more sensitive to what was going on. However being so far away that's always a challenge.

So I think with that I've gotten to peek in at some of Ruth's slides and she's going to tap into a lot of this as well. And so I'd like to finish up here.

There's my contact information and always happy to talk more about this stuff.

So Kat there was a question that Ruth had was if you have to spend ten hours on a- whatever how many hours it was on that snow machine to get to where you're going, how do you take a Kid Wind tunnel with you?

Katherine Keith: So the wind tunnel was on the - a plastic sled that I was dragging behind. You can't really see it but it's dragging - I took it off, but dragging behind the sled.

So that ended up - it should've been a four hour snow machine ride. It took me, I think I left at about 8:00 in the morning and I didn't get there until 5:00 at night.

It took me eight hours just to drive the snow machine. And by that point I was afraid the school was - everyone had left, you know, because I was supposed to be there about 1 o'clock. And that was nightmarish. I was quite cranky about that.

But yes, it would have been easier to fly I think. But everything's so expensive when you're shipping this big wind tunnel around. It's about $300 in luggage to ship the van all around the state each time you fly.

So I thought oh I'm going to save money and go on the snow machine. And well it didn't work out quite like I thought.

Charles Newcomb: Very good.

Katherine Keith: It was pretty crazy.

Charles Newcomb: Well your logistical challenges I think put most people's other logistical challenges too pale for sure.

So we have two more presentations to go. And we're running against our - it's not a hard wall but I know that people want to - may have only budgeted a certain amount of time.

So I'm going to take during this brief break here between Kat's presentation and Ruth's next presentation I wanted to make sure that I shared that this Webinar today was part of the ASES Small Wind Division bimonthly Webinar series. And we're very thankful to ASES for hosting this one on Wind for Schools.

The next Webinar is scheduled for July 20 - oh sorry, not July - or July 2011 - - don't have the exact date pinned down yet. But it'll be a presentation from eFormative options and (Heather Rhoads Weaver) and that crowd describing the Power of Policy is the title, A Small Wind Economic Calculator. So that should be good fun.

And ASES, the Small Wind Division will send out a notification with details on the date, time specifics for that call when it happens.

There was another couple of questions. And Ruth as you dive into your next presentation might be worth thinking about these on your way in.

And one was from (Sue) up in Maine asking in addition to the RBEG that - which stands for the Rural Business Economic - no, with the enterprise grant right, RBEG funding of wind turbines and NREL funding for your programmatic needs.

Are there additional funding sources that you could imagine that a non-Wind for Schools state could use to start up and sustain the wind project for affiliate programs? Can you think about that one?

Ruth Douglas: Am I on now?

Charles Newcomb: You're on now.

Ruth Douglas: Okay. For what the - NREL is funding me and a graduate student or Jerry and a graduate student. And it doesn't really go that far.

So what you're looking for is kind of oh, one grad student plus a monthly faculty salary kind of vicinity of things to get started.

And if that support can't be gotten from your university then you're going to be bucking an uphill battle here.

So I would look to try to get a hold of a couple of (TA ships) -- If you are university picture that's the way those things work -- dedicated to let's start some wind and solar classes.

And if you've got a couple of (TA ships) and you get the whole halftime just the class load is lighter and you can put the student to work.

State funding, all of us have tapped our state energy offices to greater or lesser extent, mine less than most. It sort of depends on how friendly your state is to this sort of thing.

And one of the big things ones that Nebraska in particular can take advantage is the fines levied by the EPA on businesses for polluting. And if those fines end up in a - like for clean air type thing, then they can argue that putting up wind turbines is a clean air initiative.

Ours in Kansas those funds aren't easily gotten a hold of. And Nebraska is finding it easier. It just depends on the states.

Charles Newcomb: And that would be the - that'd be a supplemental environmental project or something...

Ruth Douglas: Right.

Charles Newcomb: ...the (SEP)s from EPA?

Ruth Douglas: Yes. And that helps put the turbines up. You should realize that RBEG helps putting turbines up. But what we get from NREL does not fund the installations. They can't because the DOA can't pay for that turbines because then the DOE would own the turbines and they don't want to.

Charles Newcomb: And that was actually another question. It was in this spirit of small wind market development is the Wind for Schools program trying to educate market participants about turbine technology evaluation or helping the market participants/customers choose which turbine is best for them?

Ruth Douglas: The way that goes - I get turbine manufacturers asking me could you put your turbine fourth as an option instead of Skystreams?

And I'll either say are you certified or seeking certification and get a no and then say forget it. Or I get a yes and then I say all right well what generation - how much power can you get out of your turbine?

One that put together a very nice appealing looking appealing package costs the same as the Skystreams is an Air Dolphin. But it produces half the energy.

So the 2000 or so dollars that we expect the school to be able to make in five years from the turbine is a little harder to get by. And I - all I can do is lay that before the school and let them decide.

Charles Newcomb: Well very good. Okay, well thank you Ruth. So we've got 4 minutes to make it through the rest of your slides and rest of Jerry's slides. So I'm not going to push you. I've got time on my schedule to balance a little bit.

And so I encourage you to just take the time you need to go through them. And if whomever's control of the off switch hits the off switch well that's how it goes. Is that all right?

Ruth Douglas: Okay.

Charles Newcomb: Thank you.

Ruth Douglas: Thanks Charles. So I'll try and move a little bit quickly, a lot of these stories or pictures.

What I wanted to do is look at what makes a good school, a utility dealer turbine to make this thing work and then just examples of good and bad.

School champions, a couple of school examples. The previous picture, I'll go back for a minute.

These kids headed out to Iowa with their high school teacher. And what is that, two day's drive out and back again before there was a Wind for Schools.

So this is a teacher who's really interested in getting his kids into wind before I - he even could ask for a turbine. So that was a (unintelligible).

The picture on the left here is kids going to their city council city zoning board, the students asking for the zoning change that they had to get to put a turbine up in Topeka.

And on the right the students are going door to door in their neighborhood, we want to put a little turbine up here, this is what it'll look like, do you mind,

would you sign our petition? That kind of excitement and what comes to me as a proposal really means this is going to work.

Things that don't work, one school, we thought we had everything set, gorgeous site, wonderful city. School has a techs program and could probably - practically put the thing up themselves.

They forgot to ask the zoning board and then they weren't willing to push the zoning. The teacher forgot to ask the administration and nobody knew she'd applied for the grant.

The school had a grant writer write the proposal and then there's no teacher, there's no representative at the school to talk to.

Sometimes schools systems - communication systems just don't work. And when that happens it's going to be worse later.

So even when we get this machine up we're going to be pulling nails to get it to report so that there's data for the students to use. So again that's something to look for as kind of a warning light.

I have dealt with one earnest parent who wanted his school to get a turbine so his kid could use it but there was no teacher in there. And I don't think that makes for a - the turbine won't get used.

And then we had a couple schools that said oh it's only a little guy, well never mind. They were kind of thinking that I was going to find them $400,000 and they could put up a (north wind). And that wasn't going to happen. So Kat was dealing with that too, communications.

Utility champions, this - these guys in the picture are a city municipal utility installing a - I think it's about 8 foot square pad peer 4 foot deep foundation for a 60 foot monopole in the Arkansas River Valley.

They said they would do it. They found out how big it had to be and they kind of said oh, well we promised we'll do it. That's - that kind of help I really want.

In Kansas we expect the utility to help us with the installation. That's one of our major funding things is I want to see the utility providing the concrete, steel, conduit wire and labor for the install.

Westar which is a big IOU, I know at least one if not two linemen who have gone and gotten their own Skystreams because they thought it was so cool.

The Westar folks have come to other cities and said look, this is how it works. We've done six of these so you can do this to the local municipal.

And the Westar people are just begging me to what can we do with it - the school curriculum teaching materials to make it easy, so that, it took a while to get there with Westar. It took them about a year to get them to understand what I was about. But once I did they were really, really helpful.

On the other hand we had one IOU tell me yes, sure, we'll provide the footing and the foundation and all that. And then the person who made the promise retired and had managed to leave no paper trail. We did eventually get the money out of them but it was like pulling teeth.

We're dealing right now with the municipal who's unwilling to connect the turbine to the stadium because it knows it'll back feed most of the time.

Of course it isn't going to generate anything like the amount of energy the stadium needs all together but it doesn't like the idea of the back feeding. So we're talking between utilities to help them understand.

And that's - those are like Kat said those are - you can overcome them if you've got a champion who's willing to push really hard. They're game stoppers if there's no champion willing to try.

Our big dealer champion I have to mention is (Bill Smalley). And he's just loads of fun to work with. He's an older guy. He's done this by himself forever. He knows how to do it. Sometimes he doesn't know how to do it right but he's going to do it his way anyhow.

But he's willing to be flexible to let the students help to let the students within reason reasonably close to the install to have it done while the kids are watching.

And we've got a long term relationship and I can call him and he can call me and we chat about problems. So that's been really good.

On the other hand I have faced from another dealer who was new in this business no you can't help us and no we can't donate our time. And then all right fine, you don't need my advertising either. I'll go use (Bill).

So at least in the lower 48 I guess we are not so spread but it's impossible to pick a dealer that can work with us.

I know Kat's not the only one in Montana. There are no dealers so the WAC is a dealer. And they can be really flexible.

It does mean sometimes doing things less than the standard way that the manufacturer says you should. But none of my turbines have fallen down yet.

So here's a foundation. I think this one had to be 17 feet long -- I forget -- that the kids put together to put into the ground.

And the other picture with the kids watching, they're putting a football helmet sticker on the turbine.

And what's significant here is that these are high school kids who are allowed to come right up to the turbine. Now they have to move away when they pull it up but they had their hands on the install. And that's the way you want things to be.

So you need a turbine that's simple enough that you can do it. It would be a little tough to do it with (North Wind) or an (Intertech) or something.

The other big one that's important for us is data availability. And I should've pulled out a picture from our Web site.

But I've got of our I guess ten functional turbines nine of them - six reliably and nine off and on are sending data to us as well as to Idaho. So that data is available for everybody to see all the time. And that's very important for the education prospect.

Don't turn down any help you can get. The object is to make this thing free. We're not trying to make the dealer rich. We are hoping that he's getting advertising. So a good dealer's going to be excited to do this because then all the people in town will want and they will pay him.

But we get electrician, the trench or the concrete supplier. It's a school so and it's a small school and all the kids in the town go to the school. So there's somebody in town or does these things and they'll donate their time for the school's sake.

The sign there is for (Solomon) and you can't read it but there's a list there of all the people who helped out to put that thing up. So that's the kind of help that you want.

And my last light here is just contact information for me which I'm forever forgetting to put on these things. So if you need it you can get me.

Charles Newcomb: Thank you Ruth very much. That's fantastic. I was going to point out but then I remembered that the parents of the school, I was going to say do you get any volunteers to get on a snowmobile for eight hours?

Ruth Douglas: You could - well this year you could have done that in Kansas but usually you can't. No, people are quite willing to get in a car for eight hours.

Charles Newcomb: Sure, right. No that's (unintelligible). Another question that Jerry had asked was to what degree are you finding that when you're installing these projects that you're working in a community that already has an existing renewable energy ordinance or are they having to be created?

And when they're if they're being created do the WACS or the students help in crafting that language in coming up with a, you know, those (counts) and ordinance or whatever the, you know, the (Tampa) ordinances that are out there from WEA others?

Ruth Douglas: That's all over the place. In Kansas we've been very fortunate that most of my communities are not zoned and there is no ordinance and there's no permitting and you just do it.

When Topeka hit this we are zoned and you can't put the turbine up until you put some explicit mention in the code. That was the first time I had to deal with that. And the school did it all.

Charles Newcomb: So I...

Ruth Douglas: In other cases when that's happened since I have gone to Desire and NREL and Windustry and found samples and then said do you want to see Topeka's ordinance? So anybody who's asking I will go out and find the ordinances.

My students haven't been involved but schools certainly have.

Charles Newcomb: Thanks. Yes I do remember when we put up that 50 kilowatt in Winter, Kansas that it was a $5 building permit and that was it.

Ruth Douglas: Yes that's pretty typical out there. In fact most of them it's nothing.

Charles Newcomb: Right. Well very good. Thank you Ruth again for your expert characterization. Jerry are you still on the phone with us?

Jerry Hudgins: I am here.

Charles Newcomb: You are the sole survivor. Well done. Do you mind carrying on and providing us as fast as you can...

Jerry Hudgins: Yes.

Charles Newcomb: ...about diminishing the value? That's be fantastic. Thank you Jerry.

Jerry Hudgins: We need the other - I can't - let's see, perfect.

Okay here we go. Yes the - just to follow-on from what Kat and Ruth covered, you know, they hit the - pretty much all the process and some of the do's and don'ts. So I've just listed some of the things that we've gone through.

You know, in particular you - it's certainly important to find a champion at the school to participate. And it needs to be somebody in the school, hopefully a teacher, not necessarily just an administrator or a parent, so forth, or a school board member.

I want to jump down here. We were talking about funding, one of the things that I wanted to focus on was, you know, the question about additional funding besides our big grants and so forth. And Ruth mentioned a couple of other options.

One of the things we found was that we had support from the utilities not only in kind but also cash to the project. So that's been helpful. We've also had some pretty good support from our state energy office.

And the other place that I would encourage folks to look is when you have, you know, the university or even a community college working with a local school, if you can locate a company that's medium to large size and you go there and talk to them about this project and getting help from that company to do this because the company is typically so invested in the local community it really is a compelling story.

And we found pretty good support from some of the companies there sort of pass along.

One of the things that I wanted to point out was, you know, for us we don't have quite the logistical problems that occur in Alaska. But I wanted to sort of give everybody a bottom-line figure for what we do, you know, on a costing.

And these projects for these turbines with, you know, discounted costs from the turbine manufacturer or from Southwest Wind can offer discounted pricing for towers and so forth and in-kind donations.

The projects typically cost still around $14,000 to even as high as $17,000 in some cases. But that's what you can expect to have to spend on these projects. And so I just wanted to point that out as we're going through this.

And moving along here with the, you know, we have asked the school districts to really be responsible for working with local contractors to - particularly to do the foundation and some of the electrical work and try to take ownership of that piece of it. And we'll certainly coordinate that. But we found that things just work better.

And again you get more people involved in the community invested in the project and better community support for these things.

The other place that we have an important interface is obviously with the utility which Ruth mentioned already that that's very important particularly when you get out in some of these communities where you have these co-ops.

There may be, you know, some of these locations this may be the first wind turbine that's been installed or - and connected to their piece of the grid. And

so it's very important to start having early conversations with those folks as you move along.

The local dealers and installers we haven't had much interaction. We've offered to do that with the schools. And we kind of leave that up to the schools to decide how they want to manage that.

And we've had a couple of very positive interactions with installers but that hasn't occurred on a regular basis.

But we have encouraged the schools to contact local dealers so that we're, you know, thinking down the road. And when we get - particularly when we get outside the warranty period on the turbine when they may need some maintenance work done they need to know who to contact and have some assistance from those folks.

We have provided maintenance and troubleshooting assistance early on in the projects and will continue to do that. We sort of planned to do that for the next couple years.

But, you know, I'm thinking five years out or, you know, seven years out and so forth. We sort of expect to hand that off to the local dealers.

And certainly we're available to help the schools if they need it but we don't plan to be there on a regular basis and sort of making the rounds, schools to kind of pick that up and be responsible for that.

And finally there's just a summary of the various steps that we go through in dealing with these projects. So I'll kind of wrap it up there because I know

we're running late. So if there's any more questions or for the group or so forth.

Coordinator: Did you wish to go to Q&A sir?

Jerry Hudgins: Yes let's do - go ahead and do that.

Coordinator: Thank you. If you would like to ask a question please press Star then 1 on your touch-tone phone. You will be prompted to record your first and last name. And your phone does need to be unmuted while recording in order for me to hear your name.

If you decide to withdraw your question from the queue please press Star 2.

One moment while parties queue up with questions.

Jerry Hudgins: Can we get Ruth and Kat on with me?

Charles Newcomb: Yes. I think all of the speakers are on simultaneously. I wanted to take this opportunity and first thank our audience for joining us today on this ASIS sponsored Webinar.

And we absolutely appreciate the opportunity to have another stage where we can share what we're doing.

I also wanted to extend a thanks to our speakers who took time out of their busy schedules, clearly of Ironman competitions and snowmobiling around the world and working in the trenches and teaching our students I think is really important endeavor.

So we're most appreciated of your time Kat, Ruth, Jerry specifically. And I wanted to thank everyone for hanging on there. I know that we have gone a little bit over but we're not - it's not so terrible, out of the realm of what may be considered normal.

Do we think we have other questions?

Coordinator: No. We have not had anyone queue up, thank you.

Ruth Douglas: There's one here on the list that (Sue) asked I guess. Are there any states working only on wind and not on WAC? And I guess if they were we wouldn't know about them.

Charles Newcomb: Yes that's true.

Ruth Douglas: I mean every state has somebody working to install wind turbines. But if there's a WAC at a university we know about it.

Charles Newcomb: Well it seems like either you guys were so thorough on your presentations or it's after lunch in some locations and people fallen asleep.

But at any rate I did want to thank the three of you for joining us on this great day here in Colorado. It's pouring rain still sort of. In Kat's part of the world I'm sure it's pouring snow. And we'll leave it at that.

So if the three speakers wouldn't mind hanging on the line just a moment later what we'll plan to do is we will - we'll disconnect from the rest of the group and we'll debrief and go from there.

Coordinator: This does conclude today's conference call. Thank you for your participation. You may disconnect your lines at this time.

One moment for the post conference.

END