2016 U.S. Department of Energy Collegiate Wind Competition
October 15, 2014

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 conference. This call is being recorded. If you have any objections you may disconnect at this time. I would now like to turn the call over to Brie Van Cleve. Ma'am you may begin.

Brie Van Cleve: Thank you very much, welcome everyone. My name is Brie Van Cleve I'm at the Department of Energy in the Wind and Water Power Technologies Office. Welcome to the monthly WINDExchange webinar and today the topic is the Collegiate Wind Competition and we have a couple fabulous speakers who experienced the competition last year in the inaugural year who have agreed to talk with us today and I just wanted to introduce a few things about the competition and then I'll hand it over to Ian Baring-Gould who is a part of the Competition Organizing team.

Tessa, will you change it over to the slides? I should mention that all the participants are in listen-only mode. If you would like to ask questions please do. There's a Q&A box at the top of your screen and you can type questions in there for any of the speakers at any time during the presentations. And then we'll have questions at the end of the presentations and we'll be happy to answer them.

The Department of Energy was excited to launch this competition. The Wind and Water Power Technologies Office focuses on accelerating the deployment of wind power technologies in a couple different ways to improve performance, lower cost, focusing on lowering the cost of energy and also reducing barriers to deployment of wind technologies. Barriers insuring that we have adequately trained and well-qualified workers to take us into the next generation of the wind energy workforce. As wind becomes a larger part of

the nation's clean energy mix the need for skilled individuals to support the growing industry will also increase.

Recently the National Renewable Energy Laboratory found that at least 70% of industry members surveyed in a recent study that they conducted in 2012 reported some difficulty finding qualified applicants for a variety of different wind related positions including wind technicians, engineers, scientists, construction managers, regulators, project designers and so with that in mind the Department of Energy launched the Collegiate Wind Competition. It's an interdisciplinary challenge centered around turbine design, construction performance and marketing of the particular design. It's designed to attract undergraduate students into key wind industry professions such as the ones I mentioned and introduced the wind industries market challenges to those students and also to provide them with hands-on experience with wind technology.

The competition takes place over an academic year and culminates in a multi-day three contest competition and the first event was held in May of last year and the next event will be held in the spring of 2016. The first event, the inaugural competition, took place at the AWEA Wind Power Conference and Exposition in Las Vegas, Nevada. It's the largest wind industry event of the year and it was a great opportunity to have it at that location. Over 150 students from 10 different universities across the country competed and there were diverse turbine designs. There were horizontal and vertical axis turbine designs.

The photos below—hopefully you can see them—show some of the variety of turbine designs. We were fortunate enough to be sponsored by some prominent members of the industry, General Electric, Vestus, AWEA also and

Blattner Energy and we were very fortunate to have their sponsorship and grateful for their participation in the event schedule as well.

I'd like to hand it over at this point to Ian Baring-Gould who is my partner in crime in this. Ian is—his title is Technology Deployment Manager for Wind and Water Power at the National Renewable Energy laboratory. Ian's work (unintelligible) focuses on applications, engineering for renewable energy technology, assistance in renewable energy uses and also educational and outreach for renewable energy technologies primarily wind. He's focusing on assisting organizations to deploy wind technologies and addressing barriers to the implementation of wind energy through programs like the Department of Energy WINDExchange project. And he, as I mentioned, is the lead at (ENRAIL) for the College Wind Competition. Ian?

Ian Baring-Gould: Great, thank you Brie. So I'm going to talk a little bit more about the competition and our guiding principles and provide some examples primarily based on the last year competition with the understanding that we have—we've done a notice of intent to seek proposals for the upcoming competition and that's the root of this webinar today is to kind of introduce people to the c competition and so I can provide a little bit of information in regards to what we're expecting for the Collegiate Wind Competition 2016, but without getting into too many details because of that pending request for proposal. But the guiding principles of this competition are relatively straightforward.

We're trying to provide students with real world experience in regards to the wind energy space and that's why we've broken up the competition into three primary areas. One is clearly a strong technology area. The second one is the turbine creation. The second one is the business plan. And then the third one is kind of engaging in public acceptance and the deployment of the technologies and as we look at the wind industry and talk to representatives in the wind

industry it is very clear that the wind industry, like lots of other industries nowadays, really requires kind of that skillset to be able to implement the business effectively. So we're really trying to do that with the development of the competition moving it forward and I'll talk a little bit more about that later.

The second bullet point is to recognize innovative collegiate educational programs. And so having the competition in association with WE as wind power working with the wind energy foundation to make it happen. It is recognizing the universities that are at the forefront of training the future wind employees. Whether they be in business or engineering or otherwise. Clearly we're interested in a safe and fair competition for the participants with a very positive experience for everybody who takes part in it and we'll have two leaders of teams talking a little bit later to give kind of their feedback in regards to the competition and how they felt it was good for their students.

We're really looking to create opportunities for the competitors and the schools to engage with industry. Another reason it's held in conjunction with the wind power conference so that we can really get that engagement and then we're also looking through this competition—both the event and then what the universities do over the next couple of years in prepping for the competition to really start engaging and interesting students at the K-12 level clearly primarily in secondary school to have interests in higher education as well as have interest in the wind industry going forward.

To start off just quickly with just some photos of the event. We'll talk more about it, but it kind of gives you a sense of the kind of environment that we're trying to hold with areas where the students can work and interact. Open for most of it to the public so that people from the conference as well as outside can come and spend time talking to the students and engaging and then clearly

we have public as well as behind the doors presentations of the materials that I'll talk a little bit more about as we go forward.

To give people an idea of the kind of basic timeline of the competition we're starting kind of in the fall with the release of an RFP to identify the teams and we're looking at 10 teams again this round who want to take part in the competition. The RFP goes out, the proposals come back and area reviewed and the new announce the teams in kind of in the early mid-winter. We release the rules and rights document at about the same time. There's a couple of months as the universities are put under contract and that really takes us through the first academic year. So that first academic year is kind of developing the concept and understanding developing the team that is going to participate and really getting all the stuff in order to do the more detailed activity in the second year.

So we have a kickoff meeting at the end of the summer where we bring the representatives from each of the teams together to kind of talk through the competition, review the rules and regs, answer questions, make sure we're all headed in the right direction and then the real work starts for the team in the second academic year with a couple of deliverables upfront. Draft, business and technical plans and then the competition happens in the—kind of early—or sorry, mid-spring looking at that May timeframe in that area. So before school gets out. So you have the first academic year to kind of prep and develop everything and then the real work happens in that second academic year where it's really focused on the development of the business plans, which lead into the identification of the technology that's going to be used, followed by the understanding of how you would implement that technology going forward.

The event itself—and this is the 2014 event to give you an idea of what it looks like, but the event takes place over a three day period with the first day really dedicated to practice in the tunnel so that everybody gets a chance to deploy their turbine in the tunnel and make sure that things are working to the extent possible and then the real work happens in the second and third days as we—you can probably see here in the schedule the second day is really focused on the technology, both with a review of the technology—of the technical reports for the turbines and then the testing of the turbines in the wind tunnel and so very technology focused. And then the third day is focused around the business side. So behind—or at least at this point—in the 2014 context behind the doors, reviews the business plans, public pitches of those business plans to the wider community and then presentations here on market issues.

We're looking for something slightly different in the FY-16 event, but it will be similar to this in kind of concept. It does allow the teams to not have to be at the event for the whole—or the members of the teams not to be at the event for the whole time because it can be a busy time of year for students and so we've segmented it this way so that parts of the team that are more technology based can come for a couple of days and then leave. The business and market side can come for that final day, but clearly if all of the team is available for the whole three day period that is what we would hope would happen.

The experience we hope to be quite beneficial and a combination of meeting with representatives in the industry and government. Chances for the people on the teams to engage with each other in these kind of bullpen areas, but also the ability to kind of do on the ground engineering work—no pun intended—to make sure your turbines work and so this kind of combination of industry and industry facing kind of collegiate dialogue between the teams as well as

on the ground problem solving are all things that are required in the wind industry and therefore trying to model it here with the competition.

The competition is judged. Each of the different events of the competition that kind of go in these three areas that we've talked about are judged by experts within the industry. And so this, again, is for the 2014 competition, but it gives you an idea of the kind of caliber of the people that are coming in and judging the different elements of the competition and that will clearly hold through into the 2016 event. We work to insure the teams have very valuable experience as part of the competition, but that they get real world experience in regards to the reviews of their business plans, the technical reviews of the technology that they've developed and then in this case the market issues are looked at by very senior people within the industry and we expect that that will happen again in this next year.

The wind tunnel that the turbines are tested in is state of the art wind turbine. It is not research quality wind turbine, but it's designed to be moved to be able to install it in a—wherever the event is going to take place and each team's turbine will be installed in the wind tunnel in public view and tested, which is a fabulous experience for all of the teams. It's a fairly large wind tunnel—four feet by four feet, which gives us a pretty good cross section so the turbines can be rather large, clearly not huge, but rather large, which makes it a good competition. And as Brie said we can test both vertical and horizontal wind turbines so we don't kind of limit the type of turbine technologies that the students want to develop.

In regards to recognition and feedback clearly the—most of the recognition and feedback and hopefully we'll hear from the two universities is in regards to what the students get out of it throughout the academic year and then also being as part of the competition engaging with industry and things of that

nature, but the winning teams do receive recognition both in physical and then virtual form and then also the winning team's turbine is installed here for temporary display at the Department of Energy (Forestal) facility.

And so up in the upper right-hand corner you can see that dedication where we had a number of people from Penn State University down as with the lead of the Wind Program here at the Department of Energy and then the Deputy Assistant Secretary for Energy Efficiency and Renewable Energies. So it's a pretty big event and great to have your university showcased in the lobby of the Department of Energy, which is a nice experience.

Looking specifically at the 2016 competition—as I mentioned the special notice was released in September letting everybody know that there would be a request for proposal. That request for proposal to take part in the 16 event is expected late this—later this month and will be released through the federal business opportunities website, which is, which has been the standard. The event is planned for May of 2016. So a year and a half out and at this point we're expecting it—or working to have it, again, at the (AWIA) wind power conference. So that is the plan and that is taking place in New Orleans, Louisiana. So that should be a fun event and we'll finalize that as we go forward.

The theme of this year's competition is a little bit different. Last year it was to charge small electronic devices. In this case we've opened up that concept to power any kind of off grid application—whether that be water pumping or lighting or water dissemination or sterilization for medical equipment or anything of that nature. And so it's not just charging your phone, but it's doing productive use in an off grid setting. And so more information about the theme will be released in the RFP, but that is the general direction that we're going.

For more information we have the website for the competition and then news, including the release of the RFP, will be pushed out through the WINDExchange e-newsletter and so that would be a good place to sign-up for it, in which case you'll know as soon as the RFP goes out.

So how to get involved for universities that are out there—certainly read the notice of intent and then start forming your teams and thinking about what you would want to do. Certainly going back and reviewing the 2014 team portfolios, which are available on the website as well as the rules and regs document for the 2014 event because although the 16 event will be different it will follow a lot of the same themes out of 14. So that will give you a really good sense of the details of the event. And then lastly keep an eye out for the RFP.

We're also very much interested in industry and other organizations taking part and so if you're an industry representative and have strong engagements with your universities making sure that they know the competition is happening and teaming up with them to submit a proposal—certainly engaging with (AWIA), (D-WIA) and the Wind Energy Foundation who provide great support to this event over the last number of years and we expect going forward. Through talking with them if you don't have a university in your area, but want to be engaged contacting these organizations or contacting us to let us know that you have interest and then we'll pair you up with the university that seems to make sense or at least let you know which universities are part of the competition so that you can reach out to them and then we have two contacts here.

Clearly, Brie from the Department of Energy side and then (Julie Jones) from the National Renewable Energy Laboratory who is our point for this project.

So without further ado I'd like to hand it off to the two teams to give a little bit of feedback about their event and how they experienced it. So turning it back to you Brie to introduce the UMASS experience by David.

Brie Van Cleve: Thank you. Thank you, Ian. I'm happy to turn it over to David Willis. David, is an Assistant Professor of Mechanical Engineering at the University of Massachusetts, Lowell whose interests are in aerodynamics and engineering a vacation. He works on projects ranging from parachutes to bio-inspired flight and computer controlled manufacturing in the undergraduate classroom and as, I think, no—I'm not sure that Ian mentioned, but David led a team to win third place at the 2014 Collegiate Wind Competition. So David, thank you for being with us and go ahead.

David Willis: Great, thank you very much. Hopefully you can all see my slides that are up on the screen. I'm going to be going by page number since I'm using a Mac here and it doesn't play friendly with the web meeting, but as you heard my name is David Willis. I'm an Assistant Professor of Mechanical Engineering up here at UMASS, Lowell. And basically what I want to do today on Slide 2 here is give you all a quick description of the UMASS Lowell entry to begin with so you get a general sense of what we built, what we did. I'll talk a little bit about the academic support and strategy that we took towards the Collegiate Wind Competition in 2014. I'll talk a bit about setting up the team and then just quickly at the end the timeline and major milestones and the reflections on the competition.

So on Slide 3 here you've got a basic picture of what our team came up with and the reason I'm showing this at the beginning is so that you've got a sense of where we went as I talk about how we did it. So on the left-hand side basically what you can see here is we tackled the problem of portable electronic device charging by looking at it from a—essentially a human

centered design perspective. Realizing that people don't want to stand outside in the wind and the rain for too long while charging their cell phones or while charging their devices.

We felt that that was probably the big problem in terms of human centered design. And the students came up with this really nice solution to the problem, which really involved charging stations that were driven by wind turbines. So the charging station as well as the battery packs inside of the charging station were powered—or charged by the wind. And then a user would come along and essentially exchange a battery from their cellphone case into the charging station and during which time the students decided that they would offer up an advertisement and charge for the advertising so that the user got a free charge for their phone making wind very compelling and attractive and a fast technology for charging your phone.

So that was the basic concept that the students came up with. What did they end up building? So on Slide 4 you can see that the students designed and built the full-on phone case with a removable battery from it. And they used 3D printing for that on.

On Slide 5 you can see that they essentially came up with the kiosk design and did a preliminary prototype of how that might look. They also did a branding guide as part of their business plan to basically give the team an identity and a brand and in this case it was called Go Juice. As you can see from all the stuff on the slides the branding is quite popular.

On Slide 6 you can see that one of the tasks that we did was we actually went through and built a prototype turbine of the full-scale turbine for the charging station. And we felt that was really important for the students to see a process of building a real turbine kind of emulating real technology. So the students

got to do CNC machining to build molds for the wind turbine blades. They manufactured the blades out of composite materials. In this case it was fiberglass materials and they did vacuum bagging and they got a basic sense of what the real wind industry uses for blade components as well as generator selection and other things like that.

So if we move onto Slide 7 you can see the prototype wind turbine there and I'm not sure if my movies are working or not, but on this particular picture here you can see the wind turbine spinning up and this was the actual full-scale wind turbine that the students built. And to them the students really valued the experience of building the full-scale turbine.

So if we move on to Slide 8 you can see we also built a scale model of the wind turbine for testing. And one of the really fortunate parts for us is that we had a wind tunnel on site that could be used for doing a lot of the student testing of the wind turbine. So we were able to get quite a lot of data out of our wind turbine. We were able to actually test it prior to the competition. That was a huge advantage for us in terms of understanding how our turbine was going to perform and what it was going to do for the most part.

So how did we get there? So in terms of slides we're on Slide 9. Basically we setup an academic support system as it were for the competition. So on Slide 10 what you can see is that we devoted quite a few faculty to the project and different faculty had different levels of commitment to it. In Mechanical Engineering we had three faculty involved, in Plastics Engineering, which is a unique program that we've luckily got, we had one very active junior faculty. We had a faculty member in Electrical Engineering and two faculty members from Business Management Entrepreneurship. And this kind of founded out the faculty team in terms of supporting the students and what they might see.

On Slide 11 you can see that in the fall semester of the competition—or leading up to the competition we offered an Aero Wind Engineering course. IT was on our books already, but we redesigned the course to essentially make it a project based wind turbine course. Prior to this it was predominately electro based course with a small kind of paper-based project. So this was a real turn around in terms of curriculum development for us of getting students doing actual hands on development of ideas, brainstorming, coming up with wind turbine concepts, analyzing the actual project that they were going to build and move forward with.

So on Slide 12 you can see that in the spring semester what we did was we looked at the senior capstone design as a way to support the project. The students were broke into smaller design teams with specific components assigned and the advisors were assigned to those teams so that the workload was manageable for each advisors as well as each student group.

We found it more difficult in the electrical engineering and the management side to setup capstones because the departmental structure for capstone is a little different at UMASS Lowell for those two departments and that was one of the challenging things we found was if there wasn't a strong academic support or capstone involvement or credit based the students had a little harder time finding the time and committing the time to the project. So it certainly does help to try and integrate the project into your curriculum.

So if we go onto Slide 14, how did we setup our team? We started early trying to solicit members for the team. We went out there and kind of advertised for it and tried to select the students who were interested in wind energy. We got them all to write a paragraph about why they wanted to be part of the competition. We looked at the GPAs as one of our metrics, but over time what

we found was some of the best—highest achievers on the team didn't necessarily have the highest GPAs every time.

So that's something that's kind of interesting. Some of the motivated wind driven students were really the ones that kind of carried the project a long way. And Electrical and Engineering Business Entrepreneurship kind of did local recruiting for their components.

On Slide 15 you can kind of see the breakdown of the team. I'm not going to go into all the details, but the team had a distinct structure. It's a relatively big team. As you saw there's quite a lot of work to do and there's a big team of faculty advisors. So it certainly was a lot of fun interfacing and getting a lot of interdisciplinary work done.

On Slide 16 I've just put in a picture here with the various team members names in case anyone is interested. On Slide 17—so I'm going to quickly talk about the timeline and the major milestones that we saw. So Slide 18—basically in August we started forming the student team. It sounds like the schedule might permit something earlier for 2016, I'm not sure. By September we were really kind of starting into our user group and empathy studies to understand how the user would need a wind turbine based charging system for portable electronics.

Mid to late October we were starting to down select concepts. By the time early November cam we were just starting our first design cycle and one of the challenges for us was we started approaching finals time and projects being due. So that design cycle obviously was part of the busyness of the end of the semester.

The end of December was the first portfolio being due and one of the things there was obviously the earlier you get your stuff from your students in December the easier things will be. January through March we did our second design cycle, build and test prototypes finding that the January break and the March break time periods were super productive. Mid-April we put in our final portfolio.

I put an ouch there just because the students had left a little less time than they should have probably for finishing off their final portfolio. And then late April we were shipping stuff off to Las Vegas for the competition, prepping up our presentation, prepping the students. I've got an ouch there for the shipping process.

So thinking through and planning the shipping process is definitely worthwhile. Especially figuring out how you're going to ship larger wind turbine components to the competition if you're going to ship them. And then early May was the competition, which leads me into my last slide.

Slide number 20, which basically is a couple of reflections on the collegiate wind competition 2014. So it was held in Las Vegas as you heard earlier from Ian and from our perspective it was an awesome event. It was exceptionally delivered. So I think the delivery of the event was amazing.

I've been to quite a few different student competitions ranging from (AIWAA) design build fly all the way through to formula (SAE) and walking into the competition room where the wind tunnels were setup and the chairs were setup for the presentations and all of the prep and all of the delivery as just amazing. The branding of the competition—I know I certainly got goose bumps walking in and kind of realizing that this was the big stage and Collegiate Wind Competition was going to be a big deal.

It was great at the competition to kind of interface and see all the teams kind of prepping and getting ready for their different components. It was awesome to bring wind students to a (AIWAA) wind power. That was a huge experience for them. It was great to use the wind tunnels and seeing the event setup. The tests—testing the turbines obviously was a little nerve-racking at times for the competition entrants. The students were obviously nervous and excited, but it was a lot of fun to see the turbines spinning in the wind tunnel.

To present and defend the concept was obviously nerve-racking for the students, but it is great experience for them in terms of presentations. So most people, I believe, have presentations as part of the capstone requirement. These are a great opportunity for those requirements to be met. And then to go to Las Vegas and do well was priceless.

So I'm going to leave my email on the slides and if people want to contact me over time if they've got questions certainly feel free to drop me an email.

Brie Van Cleve: Wonderful, thank you—thank you very much David. I appreciate that. Thanks for sharing your perspective. Next I'm pleased to introduce Karin Wadsack. (Karin) serves as the Project Director for Northern Arizona University Institute of Sustainable Energy Solutions. (Unintelligible) a number of research and outreach initiatives including Arizona Wind First Schools. She's also Project Writer Director for NAU's Tribal Clean Energy Resource Center. She has more than 10 years of experience in renewable energy, climate change and environmental policy as well as international development, business and project management.

Outside the university, (Karin) works as a Consulting Scientist on energy projects for an engineering firm, (Pinion Environmental). She also serves on

the board of the Regional Sustainable Economic Initiative and is a Water Commissioner for the city of Flagstaff. She also serves her community as a member of the Technical Advisory Committee on wildlife monitoring for regional wind energy facilities among other roles. (Karin), thank you for being here. Go ahead.

Karin Wadsack: Brie, thank you very much for the great introduction. So I'm going to be showing all of you a lot of photos from our activities in the competition and just reflecting on a lot of different aspects of our experience being part of this competition the first year. And so one of the things I was asked to talk about was highlights and lowlights of participating in the inaugural competition.

And I'll start by saying one of the greatest things about doing something the first item is it's never going to be the first time again. So there were some definitely both internally at the university and I think in the project itself—there's a lot that you learn in the process of project management when you're doing something for the first time and there's always monkey wrenches that you have to sort out. There were some roles that changed and there was a learning curve for us at the university and I think for the team at DOE, which was charged with putting together this amazing competition for the first time and wrangling 10 sets of university faculty members and offices of DOE and different states.

And that brings me to the point of saying, you know, one of the highlights is really this was an absolutely fantastic experience for our students .You know, even in part because of those challenges and monkey wrenches it was a very real world experience and throughout the year all the students got a lot out of working with students from other disciplines and learning from the industries and the representatives from the national laboratories and the government. And for us it was really an enormous honor to take 18 students to this national

competition and to be—I guess the essential part in making that experience happen for those students. They all got a chance to give us feedback on our performance I guess internally at the university throughout the course of the entire competition academic year and also we gave them a chance to give us feedback on the competition event itself. And they all gave rave reviews. They had a blast at the competition.

They really enjoyed the professional challenge, the chance to meet with other students and faculty from the other nine universities and to be able to test themselves in that environment, which is something that David mentioned as well. And they did learn a lot about how things happen—not just in their work on the topic, but in part of being a brand new project that's being put forth by a federal agency.

So internally at the university we had a lot of support for our project and I've got a couple of images here that you can see just showing our project on our website and some of the facilities the students worked in, some website analysis. We worked with our College of Engineering Forestry and Natural Sciences and our college of business to support the project financially so that the students could attend the competition and to support faculty so that they could participate in the project throughout the course of the year as advisors. And we had facilities on campus such as a machine shop that were able to donate materials and time to the student team and an enormous amount of advising as well. So we quantified our total financial and in kind support as around roughly $30,000 in value.

So we had $1250 in actual cash that was donated to our team from outside and then internal financial contributions from different departments and programs that were able to let the students purchase things that they needed for the project or travel etcetera. The students raised their own money for most of

their travel costs to the competition through different mechanisms at our university and I think most universities have undergraduate student travel award.

Our students were able also through the Associated Students organization to write a piece of legislation for student senate that ended up somehow covering a large amount of their travel costs as well. So that's an idea for fundraising and the—as I mentioned the Dean's in the College of Business and the College of Engineering Forestry and Natural Sciences also helped out with the travel to the event.

We had internal project advising from a number of faculty who, as I said, donated a lot of time to the project. So there were in addition to the direct advisors of capstone classes or teams we had two Electrical Engineering professors, three Mechanical Engineering professors, a Business professor and a post-doctoral researcher that all functioned as an as needed advisory board for the students. And we had access here in Flagstaff as a coincidence to the wind tunnel that used to belong to Southwest Wind Power—the small wind company that was based in Flagstaff and that was something that turned out in the end to be very useful, but we had a struggle getting it actually setup and so that is something that I would advise anyone considering this project to make sure that they have lined up before they start—before they put—as they're putting their project together or before they start with the team. And the project definitely required—I'd say more staff time than we initially thought it would.

So it was worth planning accordingly and we were fortunate enough to be able to tap a lot of internal resources and everyone here at the university as very excited about the student team and very enthusiastic in their support so I thought we were really fortunate in that regard.

We structured our team through course work and by recruiting students to get involved. So I think similarly to what David Willis mentioned. We put out notice through faculty members, through advertising groups on campus and through student channels to let students know that this was going to be taking place and to ask them to send us a description of why they wanted to be a part of the team and to identify a faculty member that was willing not necessarily to vogue for them, but at least say that they had some experience working with the student and would recommend that the student have this opportunity. And so you can see some pictures of our—part of our student team here on this screen.

We had in the fall semester 34 business students working on this project, which was in the end far too many, but the way we had set this up was that the business component was managed through our college of business and was incorporated into a course offered in the fall semester on business planning.

And the university's newly hired Entrepreneur in residence who was teaching that class had come onboard and was an intrinsic part of managing our student team and he wanted to incorporate this project as the full project for that course that semester and so he split his class into seven subgroups who each had a part of the business plan and their charge really as to draft the first, I guess, attack at the business plan in the fall semester and then with the goal that in the spring semester we would select a few students out of that group, which ended up being three to really finalize the business plan. And those groups of students had sub-teams within them as I mentioned and student leads.

On the engineering side we had this integrated into the capstone of both mechanical and electrical engineering and so we had an electrical team, a

blades team and a balance the system team and each of those also had leads. And so the teams were structured such that the team leads got together every week, they got together with advisors every week, they got together with their own teams every week and it sounds like a lot of meetings, but it really was important for keeping the project moving along.

Almost all of the students were seniors and there were a couple juniors who were interested, but because it wasn't necessarily a part of their coursework they participated on a minimal level. And I talked a little bit about how we integrated this into the curriculum. I'm showing a couple pictures of students who were just working on the project throughout the course of the year and as I mentioned we put this into our capstone, which is a yearlong here at our university for engineering and then into our business school courses.

We also offered an independent study course in our spring semester for the students who were working on the industry focused topical presentation so that they could really dig into that topic and get a lot of practice for credit giving presentations and so they could spend a lot of time really preparing for that aspect of the competition and our university offers the wind engineering course every other year and it was just happy coincidence that it was offered in the fall of last year.

So a lot of the students took that course and we had an Electrical Engineering professor offer to teach an independent study course in the spring semester to this team simply on control. So we got lucky there and I would say echoing something that David said, but probably more strongly. I think it is a must to integrate this project into curriculum because it holds students accountable and it also provide a mechanism for faculty in terms of advising on the project and that's something, you know, that really helps move it along to success.

Along those lines even despite integrating it into the curriculum and with the deadlines being imposed because of our access to the wind tunnel a lot of testing happened pretty late and we were as prepared as we could have been for the competition in the end, but unlike the folks who had to ship their turbines to Las Vegas we're located very nearby so we were driving over with our turbine and our students were definitely still making changes up until the last possible minute and probably beyond what should have been the last possible minute.

So I think that it is very important to set deadlines early in the year and David kind of alluded to that as well and to make sure that the students are building and testing much earlier than they think that they need to. And to make sure that as a university if you're hosting a team that you are able to purchase materials and help the students to get things done so that they can be prepared earlier than, again, than they think they need to and maybe even earlier than you think they need to. So—let's see.

Lastly, I'll just talk a little bit about the final impacts on the students both positive and negative of being part of this team. I think this was an amazing experience for our students and it was, you know, as I mentioned earlier was an honor for the university to be able to bring these young people to this competition. As David said it was really well delivered and the students got an enormous amount professionally and personally out of the chance to be a part of it.

There were some stresses placed on them by—throughout the course of the year by the fact that they thought the rules were changing in the competition or that, you know, but ultimately if rules didn't change some lack of flexibility would also have been an issue. I think overall the impact on the students was almost wholly positive.

It was really great real world exposure and the practical experience of working with students of other backgrounds and with real prominent professionals in the wind industry and frankly with a government grant funded contracts project were all experiences that they wouldn't necessarily have gotten out of some other school project or some other capstone experience. And so I think that this opportunity for them really enhanced their education and also made them better prepared professionals for all of these kids that were almost entirely graduating the week that we went to the competition. So I'll stop there and I'm happy to take any questions that might have arisen.

Brie Van Cleve: Thank you (Karin). Thank you very much. That was really a fantastic amount of detail from both you and David. I really appreciate it and we couldn't have covered it like you did. If you—if anyone listening has questions the way to ask them is to go up to the Q and A tab at the—in the upper left side of your screen and type in questions there.

We heard after the competition we had the chance—and during the competition- we had the chance to talk with all of the different principle investigators, all of the staff people involved and graduate school mentors—graduate student mentors that were involved as well as many of the students and we collected quite a bit of feedback from the participating teams and have made some changes to the competition this year, which if you had gone or you do go to the website you'll see some aspects of the 2014 competition that will look a little bit different in the future, but, you know we had great feedback and have made some improvements.

There's one question—will the slides be available for distribution? And yes, they will. The webinar is being recorded. It will be posted up on the website—on the WINDExchange website, which was one of the links provided. I think

it is provided at the last slide and it is usually up in a week. Sometimes it takes two and the slides from the presentation will be posted as well.

Unless there are any other questions I'll close the webinar just a couple of minutes early. I wanted to mention some upcoming webinars that we have. The regular WINDExchange webinar, the next one will be November 19. It's the economic impacts of off-shore wind, market manufacturing and jobs. They're will also be—there's a tentative distributed wind webinar.

It will be scheduled for December 17, the topic is tentative. And then the January 21 WINDExchange webinar will be Wind Turbine Recycling and Repowering and more details will be made available. The November 19 webinar is part of an off-shore wind webinar series. The next one in that series will be December 2 and it will be on transmission planning and interconnection for off-shore wind followed by January 15, design conditions for hurricanes—for the hurricane med-ocean environment.

And before I close it looks like there's one more question. (Karin) and David, could you clarify—did you recruit students over this summer?

Karin Wadsack: We found out that we were going to be having the team in the late spring semester so we were able to let students know to some extent, but we did not do very much recruiting over the summer. For us it's just because a lot of the—the types of students that would be involved in this are not necessarily around at that time.

Brie Van Cleve: And David did you—so for this 2014 event we hope to have the schedule a little bit earlier this year for the 2016 event and so if there is interest in recruiting students over the summer we hope to make that more of a possibility just to give you more time.

Ian Baring-Gould: Yes, and this is Ian. In all likelihood the release of the schools who will participate in 16 would be made in kind of the late winter season—so March timeframe. So there should be a fair amount of time at the end of the spring academic year to identify students to work in regards to the integration into curricula and stuff like that that would then kickoff in the fall semester of next year.

Brie Van Cleve: David, did you want to add anything to that?

Ian Baring-Gould: So another question in regards to how many proposals we received in 14. If I remember correctly we received 17 proposals of which we selected 10 to compete. Again, we look to select 10 this year though that has not been finalized. So we expect more proposals than last year, but in that kind of 20 plus or minus area.

Brie Van Cleve: If there are any last minute questions go ahead now is your chance. I just wanted to say, again, thank you to David Willis and Karin Wadsack for speaking with us today. Your prospective is invaluable and it was wonderful to have you participate. We also were really grateful—so the competition was put on by the Department of Energy together with the National Renewable Energy Laboratory and the Wind and Energy Foundation and we were very grateful for our sponsors of the 2014 event that helped to make it possible. Any final words to add Ian?

Ian Baring-Gould: Lastly, there's a wonderful video that the Department of Energy does—or did on the 2014 competition. You can see the link to the competition website there and then there's a link from there to look at the video. Anybody interested please go ahead and take a look at that because it does a great job of capturing what the event—the event feel..

Brie Van Cleve: And with that thank you very much. Thanks for your participation today and I hope that everybody will participate in the next one. Thank you. Bye-bye.