

U.S. Department of Energy Collegiate Wind Competition Informational Webinar
October 18, 2016

AMBER PASSMORE: Good afternoon. I'm Amber Passmore. I am the U.S. Department of Energy's Collegiate Wind Competition Manager, and I would like to thank you for joining us today. The purpose of today's webinar is to share information on the upcoming Requests for Proposals, as you will probably sometimes here called RFPs, for participation in the 2018 Collegiate Wind Competition. I'll go ahead and give you a quick overview here of the agenda.

We're going to talk a little bit about the Collegiate Wind Competition and why it's important and a priority for the Department of Energy; the history of the Collegiate Wind Competition, kind of how we got to where we got today; and then we're going to talk a little bit about the competition tunnels, which are very much an integral part of competition itself, and we have some neat updates for you on that. We'll also have some guest speakers to talk a little bit about their experiences with the CWC. We'll have Tom Nordenholz from Cal Maritime and Karin Wadsack from Northern Arizona University to just kind of give us some information on how their teams have performed in the past and how they've progressed to still be a part of the competition today.

We'll talk about what the partnership between the teams and the organizers will look like. We've got a large team of people who work on this, and there are a lot of moving pieces; so we just want to talk a little bit about how that works. We'll talk about the schedule for selecting teams. And then finally, we'll talk about the 2018 event timeline.

You are welcome to ask questions during the webinar. If you want to ask us anything, you are all muted so you will need to type them into the question and answer box in your control bar at any time; and we'll address those toward the end of the webinar.

We'll go ahead and get started. I'll talk a little bit about the Collegiate Wind Competition. For those of you who are new, the U.S. Department of Energy Collegiate Wind Competition challenges teams of undergraduate students to design and build a model wind turbine based on market research and siting considerations, develop a business plan to market their products, and test their turbines against a set of performance criteria.

We pride ourselves a lot on all of these pieces that make up the competition, and it's important to DOE that we have a multidisciplinary competition. So we have engineers, business majors, marketing majors, we've got communications background, policy background, social science background, because they all have an impact in the wind industry; and we want them all to play a part. So we strive to make a well-rounded competition.

Also, we intertwine academic coursework with the hands-on learning, which is great for everyone involved who can actually be using our coursework to enhance their projects. It provides a real-world experience as students prepare to enter the workforce, which we'll talk a little bit more here in a minute. It introduces next generation workforce to industry. We've got a great opportunity with the Collegiate Wind Competition when we partner with OEF, and we have the students connect in a very unique way at the conference to talk to industry and engage industry. And so that's a very important piece for the competition.

We also partner with K-12 programs to encourage entrance into higher academia. For example, this past competition in 2016 in New Orleans at AWEA Windpower Conference, we partnered with KidWind; and it was a great opportunity for our collegiate students to collaborate with K-12 students and kind of work together, which was a really great opportunity for the students and for everybody that got to witness it. It was a really, really neat part of the competition.

I'm actually going to hand it over to Suzanne Tegen, who is going to talk to you a little bit more about why the competition is so important to the Department of Energy.

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SUZANNE TEGEN: Thanks, Amber.

Hello, everybody, this is Suzanne Tegen from NREL. These next few slides are about the windpower workforce and why the competition is so important to the future of the United States workforce in wind energy. On this slide, it's showing results from a study that we performed at NREL in 2012 that showed that in order to get to a place where 20% of the nation's electricity will come from windpower by 2030, we'll need to add more education and training programs in wind energy. So that's what the report showed.

There will be many occupations needed, including what's out there now – like scientists, educators, different types of engineers, technical workers, trade workers, project managers, business marketers. So we have a plethora of jobs available in the wind industry now, and we're going to need more training and more education to increase those numbers for our future winds workforce.

And over on the right, you see a screenshot of the Department of Energy Wind Career Map; and you can find that just by going into your search engine and typing in "Wind Career Map," where you can see different professions, the education or training that's needed to get there, and then a few sample career pathways. So those little black dots, when you're in the tool you click on them; and they'll show you an occupation. And then you'll be able to kind of expand those and get some information on what types of jobs those are and how maybe somebody got to be an environmental scientist in wind or got to be a wind resource assessor or something like that.

And then it also talks about how you can move into the wind industry and how you can move around within the wind industry if you want to be promoted and things like that, the types of things you need to do for that.

And here we have a screenshot; this river is a metaphor for the wind energy workforce and how we get to our future highly qualified workforce, which is kind of the pool there at the end. We start, of course, by involving kids when they're really young, with K-12 education; and then the Collegiate Wind Competition of course comes in at the college and university level. But we have many different ways of kind of flowing into this highly qualified workforce that we need to get to if we want to have 20% wind. And another scenario points out getting to 35% wind energy in this country by 2050.

And what you see over on the left there is how the Collegiate Wind Competition contributes to this highly qualified workforce. So we have students and professor and university involvement in the Collegiate Wind Competition, where students are introduced to wind careers; and opportunities and new educational programs will be developed in wind energy. And from that, we'll have increased wind energy deployment with innovative technologies that all of these students will be developing. And of course it will be deployed appropriately and more sustainably as we move into the future.

This slide just shows a few photos from the actual event last year. We are co-located with the American Wind Energy Association WINDPOWER Conference, which is the largest windpower conference in the country. And so students, as you can see, have real opportunities here to network with industry, as do professors; so this is a great networking opportunity for you to be able to talk to the engineers and scientists and marketers that are out there already participating in the wind industry. It's a very unique opportunity for students.

ELISE DeGEORGE: Hi, this is Elise DeGeorge, also a CWC organizer here at NREL. I'm going to talk a little bit about the CWC history. The competition began in 2014 – well, we had the first competition in 2014; we started planning it a year or so before that. We were able to get 10 universities at AWEA WINDPOWER which, in 2014, took place in Las Vegas. There were four components of the 2014 competition. Teams built turbines that we tested in our newly-built wind tunnels; they wrote design reports, business plans, and also had a competition around market issues.

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Their challenge was to design and build a light-weight, transportable wind turbine to power small electronic devices. We were able to invite all of the teams that competed in 2014 to come here to the National Wind Technology Center in Boulder, Colorado, to re-compete with an opportunity also to develop a new design report; and we introduced a siting challenge at that time, and we emphasized analytical modeling and validation with electronic and turbine controls.

Just last year, just this past May, we held another larger competition, also at AWEA WINDPOWER, which took place in New Orleans. We similarly had turbine testing, technical design; we had a business plan component; and a little bit different from other years was we pulled out deployment as a separate contest within the competition. We did other fun things, like People's Choice Awards, and we had a bonus challenge awarding the most visually appealing load. And their challenge was to design and build turbines to power for off-grid applications.

Again, we're re-inviting those 2015 teams to re-compete again here at the NWTC here in Colorado; that will take place in April. And if prospecting teams are interested to come and view the happenings here in April, you are welcome to do so. We'll just have to limit the numbers, likely two people from schools that are not competing. The elements will be around testing and design, and we'll also be introducing a siting challenge. We will not be having a business plan contest in this technical challenge in April. We're introducing (inaudible) to the turbine testing contest to add some distinction from the previous year.

So for the 2018 competition, for which the RFP is soon to be released, we're challenging teams to design a full-scale wind turbine for a high-contribution renewable scenario, with the opportunity to operate in off-grid or on-grid systems in an islanded mode to provide reliable and continuous service to an undefined load.

We're challenging teams to build a scaled version for testing in CWC wind tunnels; and, similar to 2016, teams will need to determine the market opportunity of their turbine design. So we'll be asking teams to submit a formal business plan, which they will present in front of a panel of experts. There will be developing a design report also to be presented in front of a panel of judges, panel experts.

We're going to run the wind tunnels and test your wind tunnels. We'll hear a little more about the wind tunnel a little later in the presentation, and we're also going to be interjecting a lot of other fun and educational opportunities, bonus challenges, and People's Choice Awards and similar.

This is just a snapshot. This is what we did – this is the schedule from the 2016 event. It will be different in 2018, but it does give you a sense for how activities occur concurrently and the different types of things that will be going on in a given day.

In 2016, we held the event over three days. It started on the Monday, the day before AWEA WINDPOWER opened its doors. We allowed teams to come in and set up their bullpens and really show their collegiate colors. And then we kicked everybody off with a rules and logistics meeting and a welcome reception with some inspiring speakers. The official start day was the second day, where we had everybody meet; and we kicked off the day of turbine testing concurrently with the behind-closed-doors engineering design and business plan judging sessions. Each of the teams were given designated timeslots for the tunnel, as well as for the behind-closed-doors testing; and we also allowed for tunnel testing makeups as needed.

On Day 3, which last year was on Wednesday, we introduced a new contest where we had teams go up and do public pitches of their deployment plan. This was a facilitated activity, where they went on a stage that was on the AWEA show floor; and so the AWEA public was able to attend alongside all the other teams to see each team's deployment pitch. Concurrently, we finished up the engineering design and business plan judging; and then when those concluded, we had some inspirational speakers and then we had an awards ceremony.

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So a lot of activities are occurring concurrently, where it allows the teams to go out onto the show floor and meet industry. We had of course, as mentioned earlier, the People's Choice Awards and the Bonus Challenges. So that's all going alongside, but these show the main components of the 2016 event. And essentially, the time frame will be the same and many of the contests will be the same in 2018; and you'll see all those details in the Requests for Proposals that will be out shortly.

Turning over to Jason Roadman, who is going to talk about the competition wind tunnels.

JASON ROADMAN: Hi, this is Jason Roadman. I'm a Test Engineer here at the National Wind Technology Center, another organizer of the competition here, one of the folks that end up spending most of my time running the tunnel during the competition.

What you see on the left there are some pictures from previous competitions. We have two purpose-built tunnels, four testing turbines of this size that are specified in the rules. Basically, it was a tradeoff on how big of turbines can we test in a tunnel that is small enough that we can transport around and still have the power to run the tunnel at reasonable speeds at these conference venues.

That equates to a tunnel that is roughly 19-foot long, with a 4-foot by 4-foot test section. It's a little bit shorter than you would ideally like, but we built two of them for competition logistics reasons, one practice tunnel and one competition tunnel. These tunnels got trucked to both of the competition locations, both in 2014 and 2016; and they are housed here at the NWTC in their off-time.

They are capable of speeds roughly up to 13 meters a second at sea level, and we use them to test the turbines in a variety of different challenges, including their power curve; power performance; their ability to control both rotor speed and power; how low of wind speeds can turbines cut in; how safe are the turbines in terms of can you stop the turbine when you are told to stop the turbine or when you disconnect from the grid; and can they survive extreme wind speeds.

Students have been getting better and better, so we too need to get better and better. So just a sneak peek; there will be more challenges in 2018. I don't think we'll get as far as the NASA Ames tunnel you see there on the right, but we're going to try and get as far as we can.

ELISE DeGEORGE: Great, thank you, Jason. We have the opportunity to hear from a couple of the CWC alumni principal investigators. I'll start off with Karin Wadsack from Northern Arizona University.

KARIN WADSACK: Thank you.

I wanted to talk specifically today about some of the experience that our students had participating in the event, but really in terms of how that benefitted them professionally. The students who were able to attend the competition in New Orleans this past May really got a lot out of that networking opportunity. I think it was Corey or someone mentioned earlier, they were able to go out on the show floor of the big conference and have a professional interaction with people who were decades into their wind energy career. And they reported that it was really valuable for them to be in that position and to be able to be taken seriously as professionals, and then to have people from the show floor come over and speak with them about their turbine design and ask them questions and really engage in the collegiate-level competition as well.

Some of the students throughout the course of the entire year became much more interested in working in the wind industry or working in renewable broadly. And I think that gets to the point Suzanne made earlier when she was talking about the opportunity to shift your career within the wind industry or to learn different skills that might take you from the wind industry to other aspects of the rest of your career. And we have students now who graduated from NAU in 2014 or 2015 or 2016, who participated in this competition, who are working at renewable energy companies, including NextEra or Flattener or a

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number of our smaller design firms or electric utilities, using the skills that they gained while they were involved in our competition.

And I think one thing worth highlighting about participating in the competition is that I think one of the hardest things for the students that they don't anticipate up front is that they are going to be interacting with students from another part of the University, both the business students interacting with engineers and engineering students interacting with business students, and other folks in interacting with the project organizers, like myself, and the other faculty involved. And that learning how to communicate and work with people who come from a different academic training or a different mindset is actually one of the biggest challenges for them throughout the course of the event. And I think I would identify that as one of the most valuable experiences professionally, obviously in addition to getting to participate in a hands-on project. But that learning how to work with different types of people and how to communicate better and how to be a more professionally-prepared individual when they leave the University is one of the biggest benefits of this competition for our students.

Just to speak a little bit more about the places that those students are today, I had a conversation with my co-PI yesterday about this; and while there are a number of students that are not working specifically in the wind industry or in renewables, we talked through where they are today. And I think there are a lot of students at Northern Arizona University – and this is the case in probably many other of the universities that participated, where they are getting a business degree or an engineering degree. They don't necessarily want to work in the wind industry, but they want to be better prepared for working in their chosen field, maybe close to home or they have a geographic constraint or something else.

And we felt strongly that the students who were from Northern Arizona or from the Phoenix area and really wanted to get a job in the geographic area of their choosing were more competitive as a result of being a part of this competition and their experience at the event than they would have been when they came to us at the beginning of their senior year. And so overall, I found this to be something that's really excellent professional preparation for our students. And we survey them before and after the entire year and partway through, and they all found it to be an incredibly valuable experience and also really fun.

Thank you.

ELISE DeGEORGE: Thank you so much, Karin.

Tom Nordenholz, are you able to join the call?

TOM NORDENHOLZ: Yes, can you hear me?

ELISE DeGEORGE: Yes, we can. Okay, Bethany is going to switch your slides over. You can speak through those.

Okay, Tom Nordenholz is the Principal Investigator for the Cal Maritime Team. He's also been involved with the competition from the inaugural year in 2014. Thank you, Tom, for sharing your thoughts. We have your slide up.

TOM NORDENHOLZ: Yes, I can't see them; so I can't see what you're showing.

So we're a very small school on the West Coast, public university. We're in the Cal State system. And as you can see, we only have six majors at our school. We're pretty technical. We have some pretty good engineering programs, and a lot of it comes from the very practical side of engineering. As you can see, there's a ship in the background; that's a ship that the Navy lets us use to train some of our students who end up going to work on ships. And we're right on the San Francisco Bay; that's where we're standing there.

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Basically, this program has impacted three of our six majors. Mechanical Engineering, our engineers are all mechanical and they're mostly seniors, some juniors. And the seniors have been working on using this as their senior design project as well. And then also the business students are in our International Business and Logistics Program, and each year there's been a policy piece. The first year it was like a presentation on wind industry issues; and the second year, it was the deployment part of our business plan, which had to do with like siting and permitting and environmental review, and all that kind of stuff. So we've engaged our global studies and maritime affairs students on that piece of it. So we've got a pretty broad group of students working on this on a very small campus, with three of our six majors involved.

If you'd just switch to the next slide?

A couple of things about us – we actually built our own wind tunnel a couple of years ago, and that's what it looks like. And as you can see, students built it on weekends. It kind of became a design project in and of itself. And that really enabled us to be able to compete because we didn't have a tunnel this big on our campus. We had a kind of a small one that we use in our fluids lab. So that was a big breakthrough for us. We did it for I want to say about \$2,000. As you can see, it's all made out of wood. Mostly the cost was in the fan and then the motor to drive the fan and the VFT to drive the motor.

Here are some students who you're seeing. What you can't see in this photo is we have a whole bunch of people that they're talking to, including administrators on our campus – this was last spring about a month before the competition – and you can't really see, but their turbine is in the tunnel and they've got a bunch of blades on the table and some electronic equipment lying around, and they're explaining how the turbine works to a bunch of people on the campus.

If you flip to the next slide, it shows our turbine looking through the tunnel. So they had a lot of fun with their design. This one was a variable pitch that they did; we were all really proud of it.

And I think that's about all I have to say. As far as careers, I think with Cal Maritime, one of the things about us is that our schedule is a little earlier. We get out a little earlier than some of the other schools, and we're still trying to figure out how to leverage – a lot of our senior students have jobs by the time the competition is occurring. So we're trying to figure out – so basically what I get is a lot of students that are interested in going into renewables, particularly when wind is a big part of California.

We're like right in the center of where it kind of all began in the 1980s. We're very close to Altamont Pass and the Solano area. And so the students really want to get into wind, but we haven't placed too many of them directly into the wind industry yet. We have them work for companies like PG&E and other energy companies that are doing related – and Siemen's. So they're working for these companies, but they're not directly involved in wind projects yet. So that's something we're still trying to kind of close the deal on – is getting our students really place in the wind industry regularly.

I think that's all I had to say. Were there any other points you wanted me to touch on?

ELISE DeGEORGE: No, that's great, Tom, thank you.

Okay, thanks to both Karin and Tom. We really appreciate you providing your perspectives and input.

On Tom's last note of trying to help the students that participate in the competition land within industry, as part of our CWC path, we're really putting emphasis on growing our alumni group and trying to provide support in that way towards introducing and reintroducing students into wind energy professionals and members of the industry in renewable energy overall. So our intention is for that support to continue to grow over the years. And particularly as our alumni group grows, we'll be kind of working together to help build the wind industry workforce – which is a good segue to my next slide, which is about the partnership between teams and CWC organizers.

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This is once your teams are selected, you really being a close partnership between the teams and the organizers. It's open discussion and information sharing and really trying to make it a comfortable educational experience for all as new schools grow the wind energy education in their own universities and students are really introduced to this multidisciplinary approach to developing their business plans and their design plans and building their turbines.

So I wanted to tell you a little bit about what the partnership looks like. The commitment from the organizers is that we host a full-service collegiate competition at AWEA WINDPOWER. We'll be doing that in 2017. We ensure a fair and unbiased competition environment with industry expert judging. We've really been lucky to be able to get incredible judges, professionals in the industry, who really have been able to provide good insight to the students in a very comfortable manner. I think that the students and the professors and us – we all get a lot out of that partnership

We're able to provide seed funding to each of the teams, in hopes that you can leverage out that funding to get additional funding that you might need to complete your project and attend WINDPOWER. We provide ongoing wind energy educational opportunities and webinars. You'll be part of our alumni group for as long as you want to be and can be. We'll give you opportunities to engage with wind industry professionals and also opportunities to engage with K-12 community.

In 2015, you might have seen on the previous slide pictures of all these kids. They're middle schools and elementary school students, some high school students, that have participated in the National KidWind Challenge that took place alongside the Collegiate Wind Competition under the banner of the Education Pavilion area on the AWEA show floor. It was an incredible opportunity for the collegiate students to share their insights with the K-12 community and vice versa. There was a lot of interchange, and we had activities that paired up the collegiate students with the K-12 community students; and they jointly developed projects. And that was just a fun side activity and really fostered the love of wind energy on both sides of the equation.

So we have that commitment to the teams, and we have expectations from the teams in return to compete in a 2019 CWC in a professional, collegial atmosphere; to have a commitment to renewable energy education at universities and beyond; to commit to leveraging the seed funding for fund raising; a commitment to spreading the CWC message through outreach and local impact. And we really are emphasizing this point, particularly in the years to come. There are many ways you can have local impact. And by spreading the CWC concept, that would be great; but there are a lot of other things we want to encourage to teams that will be competing in years to come.

You can bring wind energy concepts to the classrooms in your region. You could have teacher training around wind energy so that you train the trainers and have a lot of broad impact on wind energy education. You can develop local KidWind challenges. A member of our team, Mike Arquin, who is the founder of KidWind, is offering to support that local development of a KidWind challenge. You can have informative booths about windpower at local public events, do other digital outreach. There are a lot, a lot of things you can do to have impact locally and nationally.

And the last thing, an expectation from the team is to really just enjoy the educational opportunities that will be made available. It could be an incredible experience if you tap into all the opportunities available at the competition and running up to the competition.

We want to tell you a little bit about the solicitation and execution schedule. We issued a special notice on October 4th. Today we're having our informational webinar. We're shooting to release the Request for Proposals by Halloween or that week of Halloween, so stay tuned. There's a link to where that RFP is going to be located on the last slide at FedBizOpps. So that is our intent, to release the RFP in a couple of weeks. We'll allow for technical questions up to three weeks following the RFP release, and then we'll have a deadline for your proposals of seven weeks following the RFP release. And we're committing to select teams 18 weeks following the release of the RFP.

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We're shooting to have your contracts negotiated by the end of May at the latest, and we'll have the Rules and Requirements Document by end of July at the very latest. We always shoot to get that as early as we can so you can begin your planning and development of your teams.

So a little bit about the proposal itself. The proposal is 10 pages, not including your title page, table of contents, letters of support, resumes, or NREL required documentation. We will have five criteria; and for reference, we're showing you the criteria that was used for selecting the 2016 teams. We just want to give you a sense for the kinds of things that we're looking for from our incoming team. You will have updated criteria in the RFP.

But in 2016, we've put emphasis on your educational objectives and integration. We wanted you to demonstrate that students are supported in the different contest areas of the competition, really to underscore the interdisciplinary nature of the competition. We want you to demonstrate your understanding of all the elements involved in the competition, to really show that you organize and you can plan the project in order to complete on time and be on task with the different milestones needed throughout the run up to the competition.

We want you to demonstrate a commitment to team diversity, as much as you're able, to cultivate a wind workforce with a diversity of backgrounds and educational training. We want you to demonstrate your institutional support and your commitment to fundraising. And then lastly, we wanted you to demonstrate your ability and willingness to participate in outreach activities. And I went through the outreach activities to cultivate the spirit of the competition in the broader community, but also the other outreach activities that I touched on previously.

And then the event timeline – following the negotiations, winter/spring 2017, we are having, as mentioned earlier, this 2017 Technical Challenge at the National Wind Technology Center from April 20 to 22nd. It overlaps Earth Day, so we're going to have some fun Earth Day activities as well; an opportunity to tour the NREL Campus and the National Wind Technology Center; and also have speakers and educational opportunities.

For prospecting teams or alumni teams, you are more than welcome to join us on site. Get ahold of myself or Amber Passmore; our contact information is on the last slide. We will have to limit the numbers, as I mentioned earlier, just because we have capacity here at the NWCC; but we would love you to join, and we'll share as much information as we can.

We're going to have a Kickoff Meeting for newly-selected teams for the 2018 event in the August time frame. That might be virtual, or it might be in Washington D.C. That's to be determined.

BETHANY STRAW: The first question we have is: "Is the new wind tunnel portable?"

IAN BARING-GOULD: Yes, the new wind tunnel is portable; and we'll be bringing it with us.

BETHANY STRAW: Okay, and then: "How many teams will be selected or do you anticipate will be included for the 2018 competition?"

ELISE DeGEORGE: We anticipate selecting a number similar to previous years. So we anticipate between 10 and 12 teams.

BETHANY STRAW: "When choosing a site or market, is it ill-advised to choose a location where solar is just as feasible as wind?"

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IAN BARING-GOULD: Yes, I think that's completely appropriate. The process of the competition is to design a turbine that would fit in the market; and if the market includes or could include other technologies, that doesn't eliminate wind as a potential solution to that market.

BETHANY STRAW: "In past years, students had one year to write a proposal, but this year students are given until December; is that correct?"

IAN BARING-GOULD: Under the Request for Proposal which was released prior to the 2014 and the 2016 competition, the concept that has to be put in the Request for Proposal, teams were given in the neighborhood of a month. Once the teams have been selected and they know that they're going to compete, at that point in time they have almost a year to develop the technical plan, as well as develop the turbine.

So I think it's important to separate what needs to be done for the Request for Proposal, which has a very limited time; but a Request for Proposal is only intended to give the reviewers an indication of what you are planning to do. It is not supposed to be a final design.

And then for the teams that are selected to compete, they have much more time to develop and improve upon or even change the original proposal that was submitted for the Request for Proposal. So we have to keep those two things very separate.

ELISE DeGEORGE: Yes, that concludes the questions we've received so far. You can ask questions up until the release of the RFP. Following the release of the RFP, we will not be able to answer questions on the content of the RFP itself. So we'll have to make those questions public and everybody concurrently.

We will be posting a transcript of this webinar and the recording within two weeks on the CWC website. The link is shown right here in blue at www.wind.energy.gov/windcompetition. So we'll have all the information there, and please don't hesitate to contact us if you have other questions that we can answer.

That concludes the webinar. Thank you all very much for joining.

IAN BARING-GOULD: Thanks for your interest.