

**2012 Market Report on Wind Technologies in Distributed Applications**  
**August 21, 2013**

Coordinator: Welcome and thank you all for holding. I'd like to inform participants that your lines are in a listen only for the duration of today's conference call. If you should need the operator's assistance, please press star then 0. Today's conference is also being recorded. If anyone has any objections, you may disconnect.

I would now like to turn the call over to your host, Suzanne Tegen. You may begin.

Suzanne Tegen: Thank you. Hi, everyone, and welcome to our monthly Wind Powering America Webinar. Thank you for joining us. I'm Suzanne Tegen from NREL and I'm filling in for Ian Baring-Gould for this webinar.

As always, we're grateful to the Department of Energy's Wind and Water Power Technology Program for supporting our monthly webinar series. And as you heard last month, Jonathan Bartlett who was our main point of contact for Wind Powering America there left the Department of Energy and his boss Patrick Gilman is now our interim point of contact and Patrick's information will be up on the slide at the end of this presentation if anybody has questions.

I'll remind everybody that questions are again through type Q&A system. So if you look up at the top of your screen, you'll see a little Q&A button to ask questions. You can just click on that little Q&A and a box will come up and you can ask questions that way. We'll be doing the questions for all of the presentations at the end of the hour so please type in your questions there and we'll get to them at the end.

Today we have three great speakers on the very important topic of distributed wind energy. We'll hear from Alice Orrell and Heather Rhoads-Weaver on the 2012 Market Report on Wind Technologies in Distributed Applications and then from Jennifer Jenkins on the Industry Market Assessment.

So I'll read all three of their bios right now and then we'll go through their presentations in order.

So Alice Orrell works for the Pacific Northwest National Lab as an energy analyst where she provides renewable energy assessments and wind power project development support for the Department of Defense clients. She also performs distributed wind market research and analysis for the Department of Energy. Alice is a member of Women of Wind Energy and is currently original governor in the Society of Women Engineers. She's a professional engineer in the State of Washington and has a BSME from—excuse me— from the University of Vermont and an MBA from the University of Washington.

Heather Rhoads-Weaver is the founder and principal of eFormative Options. She specializes in policy and market analysis, development consulting and stakeholder communications to support the formation and growth and community and distributed renewables and energy efficiency endeavors. She is the Distributed Wind Energy Association's elected Board Secretary and was elected to receive the 2013 Distinguished Service in Community Wind Award also named the Women of Wind Energy's 2012 Mentor of the Year and awarded Wing Powering America's 2006 Small Wind Advocate of the Year.

Heather serves as AWEA's first Small Wind advocate and was founder of the Northwest Sustainable Energy for Economic Development and the Global Energy Concepts, the National Wind Coordinating Committee on and also

Iowa Citizens Action Network. She holds an MS from the University of Northern Iowa and BA from Wesleyan University. eFormative led the development of the DOE-funded Distributed Wind Policy Comparison Tool and Guidebook.

And we also have Jennifer Jenkins. Jennifer has been the Executive Director of the Distributed Wind Energy Association or DWEA since its inception in July of 2010. She has nearly ten years of experience in the wind industry including her tenure at Southwest Windpower in their Government Affairs Department.

In this role, she provided continuous outreach to advocates of renewable energy, non-profit trade associations, business owners, foundations and governments to build support for residential wind. She was an integral part of the team that successfully worked towards the passage of legislation which gives every taxpaying American a 30% credit off the purchase of any small wind system they install on their property.

DWEA, well, let's probably hear a little bit more about DWEA but we'll add that it has nearly 10—excuse me—100 active members and 6 working committees and I'm sure we'll hear more from Jennifer. She earned her Bachelor of Science in Environmental Science with an emphasis on policy and public administration from Northern Arizona University.

So as you can hear, we have really talented speakers here who've won numerous awards and are studying exactly this topic and researching so without further ado, I will turn this over to Alice to talk about the 2012 Market Report on Wind Technologies in Distributed Applications. Alice.

Alice Orrell: Hi. Thanks, Susan. Hi everyone. This is Alice Orrell. In 2012, 175 megawatts from about 3800 turbines were installed in the distributed applications representing more than \$410 million in investments. I'm going to introduce the concept of distributive wind, give some background on the reports and then present some highlights from the report.

Heather will then present some more detailed information and wrap up the presentation for us.

First, let's start with the definition of distributed wind. Distributed wind is defined in terms of technology application based on the wind project's location relative to end use and power distribution infrastructure rather than on technology side or project side.

Distributed wind systems are connected either on the customer side of the meter to meet the onsite load or directly to the local grid to support grid operations or to offset large loads nearby. So while the distributed wind project can use any type or size of turbine—sorry, the slides just switched on me. Sorry. Okay.

So distributed wind project can use any type or size of turbine. Distributed wind is not a wholesale power generated at large wind farms and sent via transition lines to substations for subsequent distribution to load (unintelligible) end users.

And for the purposes of this report and analysis, the local grid or the distribution grid we're defining that as distribution lines was interconnected electric loads so not just a low voltage line.

So next slide. As I mentioned, distributed wind is used on or near where it is generated and it is not just about small scale wind. As I said, it could be any size, turbine or array. Distributed wind is used by houses, schools, farms, industrial facilities, municipalities and you can find distributed winds in all 50 states and Puerto Rico and the US Virgin Islands and this is significant because not all states particularly those in the southeast have large utility-scale projects but all states have some type of distributed wind.

And a large portion of turbines on a unit basis installed in the U.S. are for distributed applications and, you know, distributed wind's nothing new. It's been used for thousands of years to pump water and grind grain.

So a lot of people have asked, "Hey, why distributed winds?" Well one of the benefits is that it does help owners reduce utility bills and hedge against possible rising electricity rates. Coupled with energy storage, it can provide grid resilience and emergency preparedness making your local grid more robust and it is a homegrown industry and we'll get into that some more and its growth over recent years has contributed to the domestic economy.

And oftentimes, distributed wind project can be the public's first exposures to wind energy so while distributed wind may not contribute on the gigawatt level, these projects can go a long way with increasing public (unintelligible) wind in addition to those other benefits discussed.

So this is the first year we've done this report with this expanded scope. In the previous reports only covered small wind and this report covers small wind turbine which are defined as turbines up to a 100 kilowatts of size. Mid-sized turbines over a 100 kilowatt to a megawatt and utility-scale turbine which are greater than a megawatt in size.

So this new expanded scope, you know, better matches the two expanded standard definition that I described upfront and DUE uses to explain distributed wind.

This report was prepared for Department of Energy by (PIO) and eFormative Options with Heather, Matt Gagne, Kurt Sahl, Boyd Pro and Ruth Baranowski and also contributions from Larry Flowers at American Wind Energy Association and Jennifer Jenkins at Distributed Wind Energy Association.

The data we're using report comes from a lot of different sources. We use the AWEA database. We use data that eFormative Options have been tracking for year. We also looked at sources such as US Treasuries Section 1603 payment, USDA Rural Energy for America Program Grants. We looked at news publications and press releases. We queries the agencies to ask them what kind of projects were they helping to fund in their state with, you know, through energy offices and incentive program. And we also got a lot of information directly from manufacturers and suppliers.

So this next slide shows the big picture overview. At the end of 2012, US wind turbines in distributed application reached a 10-year cumulative installed capacity of more than 812 megawatts from about 69,000 units across all 50 states, Puerto Rico and the US Virgin Islands.

As you can see, this is a capacity graph that we're talking in megawatts here and distributed projects using the utility-scale turbines contribute a lot in terms of capacity—those are the green bars—and each year is divided into small, mid and utility and then the orange is the cumulative growth.

So just to warn you, this report has a lot of numbers in it. You know, this is the first year of report with this expanded scope so we're slicing and dicing to

stay in a lot different ways but we're still working on the whats and the whys and the hows behind all of these trends and information and we plan to expand our level of analysis going forward with future reports.

So this is capacity. This next slide shows the cumulative number of installations on a unit basis. So distributed wind installations comprise more than, you know, 68% of all wind turbines installed in the US on a unit basis over the past decade.

And so on the last slide, they pointed out that utility-scale turbines contributed a lot to the capacity installed but this slide shows that on a unit basis, there's been more small wind turbines installed over the last ten years at least.

However, this could be reversing. While this is the first year of the report, we did look also closely at 2011 data to provide a year-to-year comparison and overall installed capacity increased by 62% in 2012 from 2011 but the overall number of units installed decreased. So the number of small scale unit decreased with a number of mid-size and utility-scale units increased so lowering the number of units that is upping the capacity increased.

So as I mentioned before, in 2012, there was 175 megawatts deployed with about 3800 turbines with \$10 million of investments. That's it. And you see that at least from 2011 to 2012, the number of small turbines installed has decreased. So we'll have to see what happens in the future years if this is a new trend or a temporary change.

In addition, we looked at turbine type and size trends. The average turbine size used in distributed application has increased, you know, pulled up by those larger turbines being used in distributed application so that's the orange bar on the chart pulling the overall average close to 50 kilowatt in size.

We also see that the use of refurbished turbines have increased. That's the green bar in the chart. And imports—the blue bar—represents almost half of the 2012 sales in terms of capacity—so in terms of megawatts. This graph slide—a quicker overview and Heather will present some more detail on types of turbines used and imports versus domestic manufacturing as well.

This map shows the distributed wind installations in 2012 by state. As you can see, some states had no inflations in 2012 but the next set of slides will show you the cumulative (costly) growth over the past ten years.

Animated shows start in 2003 with 30 megawatts. It's not playing. Okay. I'll do that. In 2004, 2005, everything is getting greener—2006, '07, '08, '09, '10, '11, up to '12—so up to 812 megawatts I showed in the first slide and you can see that every state have some level of distributed wind in their states.

This graph presents another way to look at the installed capacity by states. We script all distributed wind applications for 2003 through 2011 together as the red bar and then broken up the 2012 inflations by turbine size. You can see while Texas and Minnesota our cumulative leaders, they had little capacity addition, relatively speaking in 2012 compared to Iowa, California and Massachusetts.

This next graph shows the range of reported cost along with the capacity weighted average cost reached turbine size. In general, you can see larger turbines have a lower per kilowatt average costs and Heather will present some more detailed breakout of these costs in subsequent slides. So right now, we've broken out newly manufactured small turbines, refurbished small turbines, mid-size turbines and utility-scale turbines.

And we've also indicated, yes, what is our sample size for gathering this data. So you could see like in the mid-size turbines, we don't have many projects for cost data there.

Distributed wind projects used a variety of federal state and utility incentive. This graph captures like kind of a snapshot of what's happened in 2012 of (unintelligible) states that received different types of funding. We captured USDA grants, state and local funding in Section 1603. We also marked the number of awards given in each state.

So if you look at Iowa and Nevada, you can see that they had a lot of funding but they also had a large number of awards given out so the money was spread out over different projects.

As you compare that to your Massachusetts or Vermont or Texas—Texas in particular—it looks like only had a couple of awards but those few projects got a big chunk of the Section 1603 Treasury Grants so it didn't go to as many projects there.

More information about policies and incentives can be found at the [windpolicytool.org](http://windpolicytool.org) that with respect to the Distributed Wind Policy Comparison Tool that Suzanne mentioned in the intro and also the policy tool will be covered in an upcoming Wind Powering America webinar in September.

So now, I'm going to turn over the presentation to Heather who will discuss manufacturing and the domestic supply chain and dives a little deeper into the different sectors of a small, mid-size and utility-scale turbines in distributed applications.

Heather Rhoads-Weaver: Great. Thanks, Alice. Now, let's advance the slide here. Okay.

Great. So this graphic—you can look at it in more detail in the report—it shows the variety of turbine models that were sold in the US in 2012. The widest variety is in the small turbines especially under 20 kilowatts. And then you can see that there's a large cluster of refurbished models around a 100 kilowatt size range and also when you get under the mid-size and utility-scale turbines, there's quite a few more that are imported than are manufactured here in the US.

But when you're looking at the US manufacturing base, there are 14 different states that have US manufacturers offering 38 of the models that were sold in 2012 and then 9 of the top 10 models on a unit basis were manufactured in the U.S. And that was all distributed applications. It's a pretty good indication that we're installing a lot of the equipment that's installed here is made right here in the US.

And then, we looked at tower types and hub heights. The most common, of course, is a self-supporting tubular towers but on a small turbines, some lattice and guyed monopole towers are also still pretty popular but then, when you're looking at different types of designs like vertical assets and rooftop installations, even though there might be a wide variety of other types of models offered, they represent less than 3% of distributed wind capacity—so a pretty small segment of the market.

And looking at tower heights, they do range from 30 meters in general up to 80 meters for the most part but in the utility-scale, we are seeing distributed projects installed even on 100-meter towers getting up into the higher wind speeds. And we are seeing an increase when we've compared 2011 to 2012 the average hub height even in a mid-size sector increased a bit from an average of about 53 meters up to 60 meters in 2012.

So looking a little bit more at the US manufacturing base, US manufactures, supplied the bulk of small wind turbines sales and also, they have a high level of domestic content for their parts so they're using a lot of US supply chain vendors and we documented more than three dozen facilities across 17 states that support the distributed wind industry.

You can also see here that the export market has been even a larger component of sales for US manufacturers than what is sold and installed domestically and this is for small turbine sales.

I'm looking at the top suppliers in the US Southwest Wind Power which is unfortunately no longer in business but the most popular design of their company is now being manufactured by another company here in the US. Bergey Windpower is a longstanding company based on Oklahoma and Northern Wind Power in Vermont—the photo here at the bottom right—is one of their installations which is a dairy that has cow power from methane as well as wind power which is helping to produce more than 4 million gallons of milk each year.

So that's an exciting application for a small wind turbine right on site there. We are seeing some imports also increasing—Endurance and Sonkyo from Spain in the small wind sector.

In the mid-size, Gamesa which also does offer some utility-scale turbine as well. PowerWind and Aeronautica based on the US are the top suppliers where they were in 2012. We'll see how that might shake out this coming year. And on the utility-scale side for distributed wind is pretty similar to wind farms with GE, Goldwind and Vestas.

And again, looking at the small turbine sector in a little more detail, we've broken it down into the off-grid under 1 kilowatt size range—1 to 10 which is typically residential—and then 11 to a 100. You can see here the new trend of refurbished turbines in that 11 to 100 kilowatt size segment is really helping that size of small wind turbine increase. Well, that's part of the story for 2012 that we're seeing larger turbines even within the small wind sector.

And these roughly 4000 turbines represent about \$100 million in investment and the export market was also very strong in 2012 primarily for the feed-in tariffs in Europe but also for telecom and wind diesel. And the majority of these turbines are still being installed at homes, farms and just for individual use.

So looking at the costs breakdown a little closer, I always had a lot of request to break down this data. So we're showing it for under 1 kilowatt turbines which is a very large variety of reported cost and sometimes that's due to different types of tower designs but also the methodologies for estimating, you know, everything that's included in the installed cost.

Then, the 1 to 10 kilowatt size range has a smaller role bracket but in general, these are all grid-connected turbines. And then looking at the 11 to 49 kilowatt size range, that's a little lower per kilowatt installed. And then 50 to 100 kilowatt is getting under \$5 a watt.

We wanted to compare 2011 to 2012 in terms of cost and we also broke out the refurbished turbines to see how that is bringing the cost down and, of course, refurbished turbines may cost less upfront but overtime, the operations and maintenance may be just, you know, making up the difference so that's something to keep in mind. We're only looking at installed cost here. And you can see that between 2011 and 2012, it looks like there was a decrease and

also that the US manufactured small wind turbines are in general lower than the imported turbines and this is on a capacity-weighted basis.

And looking a little more at the mid-size sector, the photos here show a couple of refurbished turbines at Case Western University in Ohio. That's a Nordex and a Vestas. And on the bottom left is a Vergnet turbine at a housing development in Rhode Island that's a sort of a non-profit community-based installation.

So we are seeing a growth as well in the mid-size sector, quite a bit from 2011 to 2012. And I believe this is one of the first years that the mid-size sectors actually exceeded the small wind sector on a capacity basis. So we're definitely seeing growth and the majority of these projects are owned by schools, non-profits and governments so they're using power for onsite use.

Again, breaking it down a little bit from 2011 to 2012 and looking at smaller individual mid-size projects compared to those that might have multiple turbines and we are seeing some economies of scale with the larger projects as well as a little bit of decrease between 2011 and 2012. And you can see the overall baseline of this is under \$3 a watt compared to the \$5 a watt I showed earlier for small turbines.

Again, as Alice mentioned, we do have a fairly small sample size here and this is something that we would like to build more data up for next years' report.

And moving on to the utilities scale sector, up on the top, here this is a community college in Illinois using 1.65 Vestas turbine and on the lower left, this is one of two Clipper turbines 2.5 megawatts each in Minnesota.

So this sector of distributed wind grew the most of all three sectors and it was up 80% in 2012 over the previous year. Iowa was the big leader in terms of capacity installed. We saw a lot of applications on farms, industrial facilities, waste water treatment plants and even utility supply. So these were again, primarily installed near large loads in some cases not directly onsite. We have an example in Iowa of a large ethanol plant where this was connected to the same distribution line even though it wasn't onsite so that's still counted towards our definition.

So about 2/3 of the utility-scale distributed wind installations were providing power for onsite use and the other third was connected into distribution lines with other customers on there.

And again, looking at the cost breakdown for 2011 versus 2012 for utility-scale, these costs are definitely in line with the economies of scale trends that are being seen for smaller projects and especially if you look here generally under about 2.50 a watt for these types of projects and not a lot of change from 2011 but also you don't really see a ton of savings from just having a few multiple turbines on the site so this is again, something that we'd like to dig into a little deeper in next year's report.

Okay. Wrapping up—and Jennifer is going to get into some of the outlook and a little bit more detail—but our report did that the certification is certainly showing a maturing of the industry and helping to ensure more consumer confidence. We're seeing a lot more refurbished turbines installed and that's something to keep an eye on, on how that plays out over time.

Also, the incentives and policy environment is going to be a big impact in the years ahead. I think Alice mentioned with the 1603 program ending, that had a big impact in 2012 with the ITC for larger projects have a start construction

date of end of this year and, but for smaller turbines, it's on (unintelligible) until 2016. So we'll see a few more years of that continuing and if that policy is expanded, that will certainly help boost the market as well.

We are seeing some new financing models being rolled out this year—third-party PPAs and leasing arrangements. So that's expected to boost things in the year ahead and then we will be looking to track data on as many aspects including jobs and O&M and other things that we weren't able to get into a lot of details here.

And with that, here's the two links for more information and a couple more good photos out of our photo library. I wanted to encourage you all to submit more photos. That's a great way to really highlight the variety of applications out there for distributed wind and, again, I wanted to thank the co-authors of the report especially Larry Flowers and (Ruth Baranowski), I believe, on the line today as well, Matt Gagne, Kurt Sahl, Boyd Pro. And we had dozens of companies and agencies that provided data and quite a few expert reviewers that helped us as well.

So if you'd like to sign up to get updates on future research, if you go to this link here on the photo library right here, then it will take you to see a yellow box and you can subscribe to updates about this research in the future.

So with that, I'd like to turn it over to Jennifer Jenkins who's going to talk a little more about the industries' perspective on the market.

Jennifer Jenkins: Great. Thanks, ladies and, you know, special thanks to Alice and Heather for pulling this together. I know it was a lot of work and you've done a great job so thank you so much for that.

So there are some great material in the 2012 Market Report which you just heard from Alice and Heather. I want to focus on the industry response specifically in 2013 and then how we take that response as an industry and develop opportunity for the future.

So I think the report did a good job of highlighting the obvious—our manufacturers, our exporting, you know, with losing the 1603 and having reduced state programs like in Ohio and Vermont, Nevada, New Jersey and then, you know, with the competition from solar, it's inevitable that they have to go take advantages of great programs overseas like what we're seeing with the feed-in tariff in the UK.

But what that means is the resources that they've invested in the US market is now being invested in other markets overseas so those resources that we've had historically to build state programs and educate consumers, those resources are gone and that has an impact on our small businesses that don't have the resources to, you know, reinvigorate a US market on our own.

So those small businesses are having to reevaluate their business models. Some of them are diversifying their technology, their offering solar products now and, you know, some of our friends are going out of business so as an industry, you know, we've had to reevaluate and identify next steps.

So when you talk about this year in 2013, you know, it's been more of a, you know, we're reassessing. You know, nobody is arguing about the potential in the North American market. There's plenty of it. What the big discussion is how do we invigorate that market? How do we make good use of the limited resources that we have?

So the big discussion at least amongst DWEA members and some of the manufacturers are going overseas and providing feedback in those small businesses that are, you know, adapting. The feedback is we, you know, we focus on federal, we stay focus on state and we really try to develop markets and provide sales for our industry.

So for federal, we're going to continue to focus on federal policy but also open up federal markets. With state programs, we need to be more strategic with our state initiatives and target states and then, you know, the market development where, you know, as I just mentioned we had those resources from our manufacturers. Well, we need to step in as an industry and work together to educate and grow markets like the residential and commercial and agricultural market.

So in 2014, you know, we're talking about market assessment and looking at the past and dealing with the present, I'd say 2014, you can expect growth in the US market. You know, there's going to be increased federal support. We're already seeing it with the Department of Energy. I think the Department of Agriculture will come through also. You know, the industry has worked together and gone to DC collectively as a whole a number of times now and that's having an impact.

So there are markets that are developing federal markets, emerging military markets specifically, you know, the US has hundreds of small bases and thousands of remote base around the world with a typical fuel logistics, you know, having the industry on the Hill and leaders in the industry on the Hill talking to key agencies and really introducing distributed wind and the benefits, I think that's having an impact and is going to be a market that's going to grow and that the industry should watch specifically for next year.

And then, you know, DWEA works some state policy. We've seen some results this year with Colorado and that (DG) carve-out but moving forward, you know, we are working now to identify 2014 targets. We want to be more collaborative and work with state and regional partners and in doing that, you know, we're hosting the first State Policy Summit October 21 in Chicago. We're inviting most state and regional partners and we're also inviting Solar because we want to have a broader discussion about where are our opportunities to work together as a renewable energy industry, where can we be supportive to our state and regional partners and, you know, as an industry, how can we really work together as collaboratively and collectively with a strategy for 2014 in target states.

So that's the plan. We do have some target states for 2014 that are already being discussed and I encourage you to watch in 2014. New York, of course, is a target state for our industry. We're talking about streamlining permitting there. California is always a target state as well trying to get (SGIP) renewal. Minnesota is a hot topic. That group is dominating our state policy calls this days and it seems like there is going to be some great opportunity to get some incentives in place if we are organized in advance and then, of course, protecting that Colorado (Coop) RPS. We talk about Hawaii and Iowa.

You know, Heather mentioned this as being something to watch in the future. Install and leasing it could and should be a game changer. We're looking at the solar leasing programs that have had a great impact on the solar industry and I think United Wind's new program is an example and should find success for watching that program with hope and anticipation so we can watch that next year and then the final two points they have, I think, are related but there is more an emphasis on product quality and customer satisfaction, you know, and that provides an increased confidence with state programs and hopefully,

we'll be able to find that they're more receptive when discussing distributed wind programs.

And then also, you know, it's never a good thing to see manufacturers exit the market. I know when Southwest Windpower announced their doors were closing, no one was happy about that but there are some manufacturer exits that are good for the market and that goes back to product quality and customer satisfaction and the legitimacy and credibility of our industry. So, you know, when some companies leave then, you know, there's quality technology that's out still out there and endorse and I think we'll find an increase in again, state program confidence and consumer confidence which is, you know, what we need moving forward.

So, you know, with that, I'm happy to provide or expand on the programs I was discussing but I think I'll leave it to the group then open it to questions.

Suzanne Tegen: Great. Thank you so much to all three of you and just as a reminder, if you have a question to ask, you can go up to the Q&A bar or a button at the top of your screen and click on that and you can either ask a question or there's a little icon to be able to raise your hand there as well.

So we do have a number questions and I will start from the top and work our way through them. There's a question from (Steven Top) and is anyone tracking curtailed wind on an annual basis and then he also wrote maybe DOE, maybe AWEA.

I don't think the Department of Energy is tracking this and I'm not sure whether it's AWEA is tracking it. I know there's a lot of interest in tracking this type of thing. Do any of the speakers have an answer?

Alice Orrell: This is Alice. No. I... off the top of my head, I'm not aware of that. Oh no. I think there might—no. I'm not sure. I'm not exactly sure. I'm sorry.

Suzanne Tegen: That's okay. And I'm not sure if there is someone from AWEA on the webinar but if there is and you want to shoot me with email, I'm happy to give the answer whether people are... whether there's somebody there tracking curtailed wind. I know there's a lot of interest in this, I'm just not sure whether somebody's tracking it domestically, you know, for all wind.

Woman: Suzanne, I think...

Suzanne Tegen: Yes.

Woman: Yes, because I think what—if anybody—if there is any information on it, it might be in Lawrence Berkeley National Lab's annual report on Wind Technologies. I know they at least discussed it. I'm not sure to what level of detail they tracked it though.

Woman: Right.

Suzanne Tegen: Okay. We have two questions on distributed wind kind of definition. The first one is why are they called larger projects utility-scale and not merchant scale because utilities... our franchise is that in many cases across the country where it's restructured to limit their services to electricity distribution and transmission versus generation. (I) will just take that one first.

Alice Orrell: Sure. This is Alice. I'm not exactly sure of the history behind that terminology but I know for the report, we are probably going to move towards using the terminologies of large scale to be more in line with small, mid-size and large so the definitions are more parallel.

Suzanne Tegen: Okay. And Alice, you can probably answer this one too. How much capacity that's shown as utility-scale also fits the definition of distributed and this is probably from your, you know, your presentation.

Alice Orrell: Right. So we went through all of the projects installed in 2012 and determine which ones would be defined as distributed and one of the slides that did show that it was 138 megawatts were large scale or utility-scale projects in 2012. So 138 out of 175 megawatts in 2012.

Suzanne Tegen: Okay. Great. A question from (Laura Dakosi). What's the definition of a refurbished turbine?

Woman: Heather, can you address that one?

Heather Rhoads-Weaver: Oh yes. And I did type an answer on that. This is previously used equipment that has been reconditioned in some manner; in some cases completely remanufactured; in some cases, it may be just cleaned up a bit but a lot of these roughly 100 kilowatt turbines were coming out of the California wind farms that are being repowered so they were installed usually in the 1980s or 90s in a larger wind farm application and now, they're being installed in distributed applications.

We saw a lot of this happening in Nevada and some other states around the country as well.

Suzanne Tegen: Great. Thank you. And this is probably for Heather, Alice from (Kerry Novak). Can you describe the customer segments for distributed systems? Are they mostly off-grid or also on grid like load shaving? Are they utility companies, manufacturers, agricultural?

Woman: Yes. The answer is all of the above. We see in private residencies, off-grids, smaller turbines use in off-grids, remote locations either, you know, telecommunications (unintelligible) cabins and we see schools and homeowners and farms and industrial facilities such as the (ferry) or there's a brewery that has a larger turbine at their site.

It's across the board who uses distributed applications and in the report, we do break that down a little bit more in detail per turbine size of whatever the types of owners.

Suzanne Tegen: Okay. Great. Thanks and then also from (Kerry). You also raised your hand virtually so I'd like to give you a chance to follow up in case you had more to that question so operator, so if you can give (Kerry Novak).

Woman: I don't think we're doing that.

Suzanne Tegen: We're not doing that? Okay. So please type out your questions, then in that case if you have a more detailed question. So then, this is a followup to the questions you were asking about tracking the curtailed winds. Let's see. There is an answer that MISO, so the Midwest ISO might be tracking the curtailed winds so presumably maybe somebody could go on their Web site if something like that to the Midwest ISO and find that information. You can also send me an email. I'll look into that because I know a lot of people have questions about that.

Woman: Yes. (Unintelligible). I have that same thought to about... relevant to Pacific Northwest and I'm pretty sure (BPA) tracks that kind of stuff. So it might be the utility or a grid operator that's tracking that kind of information.

Suzanne Tegen: Right. Yes. Also (Charles Nukem) wanted to add a question about the refurbished turbines. He asked, with the significant boost in refurbished sales, will the system for qualifying equipment for the 1603 Treasury Grant Program actually develop? And then he adds that he's aware that DWEA was working hard to ask for the sort of (unintelligible). So, Jennifer, do you know maybe about the DWEA portion that I'm not sure if somebody else wants to answer that about the... whether there was a system for qualifying it the 1603 grant program developed?

Jennifer Jenkins: Yes. And I believe Heather actually was spearheading that. Is that right, Heather?

Heather Rhoads-Weaver: We are working with USDA currently as an ongoing project to define what could qualify for USDA grants but with the 1603 program closed, that wasn't really a priority focus previously. So, you know, people could be clear 30% of the value and I don't think that was restricted to just the new portion of the equipment but moving forward, I think that's going to be a bigger focus certainly for certifications looking at how, you know, how those projects can be—consumers can be protected more and that the overall cost can be more transparent.

Suzanne Tegen: Okay. Thank you. We're getting more information about this curtailment issue. There is Web site that people can go to which is [www.windpowerexpo.org](http://www.windpowerexpo.org) and then /education/presentation/upload and then /kumar—K-U-M-A-R—dot pdf. And again, you can contact me at the end of the Webinar and we can set that for you again.

Heather Rhoads-Weaver: Well, Suzanne, can I make a comments on that? I'm not sure why this question is actually as relevant to distributed wind because certainly,

distributed wind being used onsite is not being affected by the curtailment issue. That's mostly for large wind farm.

Here in the Northwest, we have a distributed wind project out on the coast, Coastal Community Action Agency. It's a 6-megawatt project and there are sort of...on a very low voltage distribution line out on a peninsula and they've not been asked to curtail their generation whereas some of the larger wind farms in Eastern Washington have been affected by the (BPA) operations. So that's just something to clarify that distributed applications by their nature, the electrons are being used locally. So that's not affected by some of these larger issues.

Suzanne Tegen: Right. Okay. Thanks, Heather. That's a good clarification. So there are—let's see—is it... so this is a question about the report probably. Would it be possible to separate the under 100 kilowatt data in sub-categories? This question, (Paul Basson), would like to see the differences between the 10 KW installs, the 50 and the 100. And I believe there are breakouts of that. Does one of you want to take that?

Woman: We did break out the small turbines in terms of costs. So we look at installed cost. I don't know if you're looking for two different types of breakouts, if there's any other way to break them out. I don't know. Heather, do you have any feedback?

Heather Rhoads-Weaver: Yes. If you want to go to Slide 27, that actually goes the number of megawatts and the number of units and into the segment. Oh I kind of skipped over that but underneath each of the data points there, you'll see that information.

Woman: Yes. And this was obviously an overview of the 2012 Market Report but I think you'll find if you actually look at the report, some of these questions might be answered and certainly the breakdowns are there. So I'd recommend looking at the report.

Woman: Also, the slide before that does break down the turbines a little bit by size too and just in term of the sales.

Suzanne Tegen: There's a question about whether there are existing data on (ABN) impact from small wind turbines from (David Godfrey).

Woman: Right. And we didn't capture that for this report but I know DWEA has been assembling a lot of information especially around the US Fish and Wildlife guidelines and I believe, Jennifer, you have compiled some of those resources on the DWEA Web site. I know there was at least a few studies that look at small turbines and wildlife impacts without showing any serious concerns. So I know there was a wildlife center in Wisconsin that published some of their results and there might be some other data that's more recent out there as well.

Suzanne Tegen: Okay. And kind of staying with this theme of the turbine and turbine-related issues, there's a question about the main issues for the quality of these turbines and what types of services. I assumed they're asking about O&M services need to be performed regularly on the distributed turbines.

Woman: I'm wondering (unintelligible) this question is directed towards refurbished turbine.

Suzanne Tegen: Yes. It just says the quality of the turbine so I think, you know, like every turbine, like the largest turbines as well, the quality of turbines varies but, you know, if one of you wants to take that just for the refurbished turbines, that's

fine too and then what types of services need to be done regularly and this is, you know, we're probably talking scheduled and un-scheduled maintenance.

So for the quality issue for any of the turbine sizes, there are different quality issues, I think. These are like their upper larger turbines. I think it's a... this question could take a while to answer if you want to go through each type of turbine and look at quality issues but in general, there are many turbines out there that work well in the market and you can see some of the evidence of that in the market report. As far as types of services that need to be done regularly, this really depends on the type of turbine and the size of turbine you have.

The larger turbines will have, you know, ball bearings and things like that that needs to be switched sometimes even gearboxes if they have problems. The smaller ones take, you know, annual maintenance maybe once or twice or year. I don't know if people want to add to that.

Heather Rhoads-Weaver: Yes. Suzanne this is Heather. From my perspective, the quality is about power performance, safety, reliability and to a lesser degree acoustics. So a lot of those aspects can be reviewed prior to purchasing a turbine through the Small Wind Certification Council's Web site.

Also the Interstate Turbine Advisory Council is looking at warranty service as another major qualification for eligibility for incentive and their list of unified turbines covers both small and mid-size and I recommend looking at that list to see, you know, if you're considering buying a wind turbine and make sure that they've gone through those kinds of reviews.

Suzanne Tegen: Okay. And then here's a question about what is the share of cumulative and/or installed capacity that can be attributed to the residential and commercial sectors in 2012? Can you track that on the report?

Heather Rhoads-Weaver: We didn't necessary break out residential and commercial as a sector but I can tell you for a cumulative basis on small wind turbines that we looked at from 2003 to 2012 as a 10-year window and of the 812 megawatts, 130 megawatts were in small turbines so that might get to answering that question.

Mid-size turbines were a 100 megawatts and then utility scale turbines made up the difference at 580 kilowatts—sorry—megawatts.

Suzanne Tegen: Great. Thank you. There's a question here about where to find more information about refurbished turbines. So the market report has a little bit of information. I know at NREL here we've completed the report and our technical report for the Department of Energy on refurbished turbines, it's not published yet but it will be very soon.

So you can look for that. We can put that on the Wind Powering America Web site as well as just in the NREL publication. So maybe check back in a month or two within the NREL publications and you can find it on the Web site.

Heather Rhoads-Weaver: This is Heather. I got this question the other day and I compiled a number of resources that I believe Jennifer is going to put on the DWEA Web site as well but (Mick Saguro) did a really excellent article on this topic a few years back and that's on the RENEW Wisconsin Web site. Windustry also have some good information about choosing a wind turbine and, you know, the considerations are on refurbished equipments.

Suzanne Tegen: Yes. There a lot of questions here about refurbished and we might not get to all of them just because of the time. Here's the questions from (Dan Onkono). Do we have data on turbines in micro-grid applications, for example, applications that can continue to operate if connections to the major grid is lost and the micro-grid needs to control frequency, voltage and usually using diesel generator?

Woman: That's a great idea.

Woman: Yes.

((Crosstalk))

Suzanne Tegen: ...for this report but Alice do you...?

Alice Orrell: Part of the definition of the (unintelligible), you know, whether it's supporting the local or a micro-grid or it's, you know, other customers side behind the meters so we do look at projects that are on a grid but we didn't necessarily go into detail about which was technically a micro-grid and which was just a distribution grid.

I mean one time we did notice and I know it's continuing in 2013 is we're seeing larger turbines installed in more off-grid type applications or micro-grids so an example is Northern Power has a turbine in Hawaii that essentially off-grid with a water pumping station. So that's kind of an interesting new segment of the market to keep an eye on.

Suzanne Tegen: Yes. (Jeff Crock) is adding that Alaska did micro-grid scenarios so Alaska is a good place...

((Crosstalk))

Suzanne Tegen: ...information. Then there's a question from (Jack Derkin). Do we track the percentage of interconnect applications that eventually become installed units, maybe by market small distributed utilities?

Woman: Yes. I was looking at that question. I mean for small projects, you don't have to go through the same interconnect process that you do for large projects. So I'm not sure if it's tracked by small distributed utility by market segment but I know that (unintelligible) quickly annual report wind technologies market report does look at interconnection queue data to see what, you know, how many projects are in the pipeline and then they look at, you know, how many projects are added each year so you can look there for some more information on that.

Suzanne Tegen: Okay. And I think we'll just take one more question. This question is, is there a (unintelligible) in the LCOE cost curve with turbine size increasing—so maybe 1 to 30 kilowatts versus 100 kilowatts. Do many of the distributed installations include... oh, so that's first part of the question. I'll just stop there.

So it's not...

((Crosstalk))

Woman: Go ahead, Alice.

Alice Orrell: So we didn't specifically look at cost of energy. We're looking at installed cost but not the Levelized Cost of Energy of a project over its lifetime.

Suzanne Tegen: Okay.

Woman: For this report but Alice, this was a good lead in for the next month's webinar because with the policy tool, we definitely have listened to that and I will say absolutely the, you know, 50 to 100 kilowatt turbines, on a kilowatt hour basis seem to have a lower, you know, Levelized Cost of Energy so we'll look into that data a little bit more next time but that's a reason why we're starting to see larger turbines in distributed applications for sure.

Suzanne Tegen: Great. And following that—and since we're a few minutes over—I'd like to conclude this very informative webinar by extending our thanks to the panel member and to everybody on the phone for joining us for the webinar.

A recording of this webinar would be made available on the Wind Powering America Web site. It usually takes about seven days or so to get the webinar up there. The upcoming webinars in the Wind Powering America webinar series, Heather—just with talking about, one of them are the Small Wind Standards and Policies, September 18. So that's next month.

And the Offshore Wind Job and Economic Development Model along with results from the Southeast and Great Lakes Regions are on October 16. So that will be the October 1 and as always, we want to thank the Department of Energy for its support of the webinar series and hopefully if you all have questions, you'll be able to—if we can go to the last slide—contact any of us. That's Patrick Gillman, Ian Baring-Gould or myself, Suzanne Tegen. We're happy to talk to you about this.

Thank you for sticking with us. This has been a great webinar and we'll talk to you again next month. Thanks, everyone.

Woman: Thank you.

Woman: Thanks, Suzanne.