**IEEE1547 and Distributed Wind in the New Wind Vision**

**December 5, 2013**

Coordinator: Good afternoon and thank you all for holding. Your lines have been placed on a listen only mode until the question and answer portion of today's conference. I would like to remind all parties the call is now being recorded, if you have any objections please disconnect at this time. And I would now like to turn the call over to Aaron Godwin, thank you Sir, you may begin.

Aaron Godwin: Thank you. I'd like to thank everybody for joining today, we're hopeful we'll get a few more people as we get started, but I wanted to go ahead and start on time.

My name is Aaron Godwin, I'm the Vice Chair of the ASES Wind Division and I'm not going to say too much today other than to thank you all for joining. We will have a basic format today where we'll have—we have two speakers, so we're going to break up and each speaker will be running 15 to 20 minutes, and then we'll have time for questions.

We're going to go ahead and hold questions until after they are done with their presentations. We should have plenty of time and then I'm also going to be hoping to get some input from you the listeners as to our next topics coming up in future webinars or general focus things we should be focusing on as a division.

We have basically two speakers today, we have Alice and Robert. Alice works for PNNL as an energy analyst and she's going to be talking about the next stages of—actually I want to try to make sure here, Alice is talking about the

next stages for the NREL—actually, wait a minute. I apologize, I'm mixing up my notes here.

I'm going to go ahead and just hand it over to Alice, and then Robert will be joining in after Alice's presentation. So Alice if you want to go ahead and start your presentation.

Alice Orrell: Sure. Can you hear me?

Aaron Godwin: Yes. Somehow I got my notes mixed up here.

Alice Orrell: Okay.

Aaron Godwin: Alice will be talking about the distributed wind and DOE's vision.

Alice Orrell: Right.

Aaron Godwin: So thank you Alice.

Alice Orrell: Sure. Okay, hi this is Alice Orrell. Robert asked me to join on this webinar to present on DOE's current wind vision efforts, and talk about how distributed wind is being addressed in the vision. So I'll also take advantage of this opportunity to get some feedback from the audience on a couple of things as well.

So let me start with some background. This new vision effort is revisiting the findings of the 2008 20% wind energy by 2030 report to develop a renewed vision for U.S. wind power research, development and deployment. The original objective of the 20% report was to determine if 20% by 2030 was even possible. "Is there sufficient wind resource, do we have the technology,

can the industry scare up and can the grid accommodate this?" And the answer was, "Yes, 20% is possible and the incremental cost is modest."

So why is the DOE revisiting this? There are some new circumstances and conditions they want to consider, shifts in technology, shifts in markets, shifts in policy. And there's new uncertainty in the marketplace, so DOE wants to have a clear and shared vision for the wind power industry to be published to coincide with AWEA's Wind Power conference in May. So we're on a fairly aggressive time schedule as this was kicked off just last—at last year's Wind Power conference.

I should note now that the 20% by 2030 report did not provide any separate projections for distributed wind deployment because the modeling efforts did not segregate distributed wind applications. Therefore distributed wind applications were an inherent part of the land-based deployment estimates in the 20% wind energy scenario. And there will also not be specific distributed wind modeling and projections in this vision either. And I'll touch on that more as we go along.

So wind vision has three main objectives covered in three main chapters, the state of industry, "What has changed since 2008," impacts and benefits, this will include environmental impacts such as greenhouse gas emissions, water use, and then economic development or workforce impacts, and energy diversity and risk reduction among others. And then roadmap, "What are the actions needed to achieve decisions?"

The vision will look at different time horizons and will cover land-based offshore and distributed winds. But as I noted, distributed wind will be included on a more qualitative level.

In the State of the Industry Chapter we will have installation history to fix other numbers taken from the 2012 Distributed Wind Market Report, and the issues unique to distributed wind will be described throughout the report, similar to how offshore will be treated as well. But there will be no specific distributed wind scenario modeling in this decision.

Because this is a joint effort between DOE and the industry, the project has a very formal structure. There's a Senior Peer Review Group led by José Zayas, the Wind and Water Program Director. The Senior Peer Review Group participants include developers, both land-based and offshore, turbine manufacturers, NGO's, utilities, environmental groups and other industry stakeholders.

The core team with contract support is responsible for the overall project management and putting the final report together. And then there are task forces that each cover different subjects.

I'm the Distributive Wind Task Force Lead and I've pulled together a cross-section, a representative group of individuals to be on the Distributive Wind Task Force with me including independent consultants and representatives from AWEA, SAWEA, ITAC, NREL and DOE.

Other task forces include wind plant technology, manufacturing and logistics, O&M, performance and reliability, transmission and integration, product development, citing and permitting, scenario modeling, market data and analysis and offshore.

The Task Force and others have committed to help develop this division as it is in the best interest of the industry. And individuals outside of the Task

Force may be utilized to support tasks and/or peer review the Task Force's materials.

So I'd like to take advantage of this opportunity to get some feedback from this audience. So let's take a step back. "What is distributed winds?" We have defined distributed winds as—distributed wind energy systems are connected either physically or virtually on the customer side of the meter to serve the on-site load, or directly to the local distribution or micro-grid to support grid operations or offset large loads nearby.

Because the definition is based on a wind project's location relative to end use and power distribution infrastructure rather than on technology size or project size, the distributive wind market includes wind turbines and projects of many sizes.

Distributed wind systems serve electricity users and remote locations as well as those in urban and rural areas needing or wanting to produce part, or all, of their electricity needs. Distributed wind systems are used for households, schools, farms, industrial facilities and municipalities among other applications.

While DOE has been classifying turbines used in distributing applications of small, those through 100 kilowatts in size, mid-size, 101 kilowatts to 1 megawatt in size, and utility scale, greater than 1 megawatt in size.

So while a distributed wind project can use any size or type of turbine, distributed wind is not wholesale power generated at large wind farms and sent via transmission lines to sub-stations for subsequent distribution to loads and distant end users. And we consider the local grid or the distribution grid to

be a distribution line with an interconnected electric load, so not just any low voltage line.

So this slide shows some of the key messages that will be included in the State of the Industry Chapter and highlight some of the issues that are unique to distributed wind. The issues that make it so distributed wind can't just be always lumped in with all land-based development. So distributed wind projects are in all 50 states, Puerto Rico and the U.S. Virgin Islands.

This is significant because some states, such as those in the Southeast, do not have any large wind farms, but they do have some distributed wind projects. And primarily installed where people live and work, distributed wind projects often serve ambassadors of wind in that they help introduce wind to communities and can often be the public's first exposure to wind turbines.

Another point is distributed wind systems compete with retail electricity rates, not wholesale power prices. So that's another difference we want to distinguish.

Expert markets for small wind turbines are growing and may continue to grow to support either developing countries or those countries with strong polices, which in turn, will help increase our domestic manufacturing base.

And then other topics we'll be covering include industry trends, performance, policies and incentives, refurbished turbines, certifications and standards, citing and permitting and some other issues too.

This slide shows some of the preliminary ideas we've been working on to be included in the Road Map Chapter. But what is needed to achieve the vision, what steps need to be taken now and in the future? While we have lots of

ideas, this slide is still pretty rough, this list is still pretty rough. We have starts on the what's, but not always the how's or the who's.

The first idea centers around the issue that most distributed wind installations are in low to moderate resources, not higher wind regimes. So we need to improve our understanding of these resources and optimize technology designs to be better for these wind resources.

We want to continue efforts of standards and certifications, particularly for mid-sized turbines. There's a trend of larger turbines being used in distributed applications, but there's kind of a gap when it comes to mid-sized turbine certifications and standards. So that's something we're thinking about.

Supporting—continued support of the domestic manufacturing base is needed so U.S. based manufacturers can continue to grow in both the domestic and international markets. There's always room for improving the permitting processes at the state and local levels. And by continuing with collaboration, engagement and public education and outreach efforts.

I mentioned in the beginning that I was looking for some feedback, and I'm totally open to feedback on any of those road map activities, or anything you've seen so far. We've also started considering the terminology and classifications and definition, how we define distributed wind. Should we be modifying this? There's some thoughts going around.

Historically, and in the 2012 Distributed Wind Market Report and so far for the purposes of the vision, we've been using—we've said turbines are classified by rated capacity. So wind turbines used in distributed applications are defined as small, as I mentioned before, up to 100 kilowatts in size, mid-size and utility scale.

However, does it make more sense to modify the terminology and classification system to use small, medium and large, rather than small, mid-sized and utility scale? And—or does it make sense to classify turbines by rotor swept area rather than rated capacity?

So this approach with the rotors swept area and the small, medium, large would be more consistent with the demarcations in existing and emerging international and U.S. based turbine certification standards and definitions. But on the flip side, the ITC and Treasury Department language is specifically tied to defining small wind as a 100 kilowatts and less. So is that a concern?

Also it was brought to my attention earlier this morning that, you know, rotor diameter sizes are increasing for large turbines, will they also start increasing for small turbines as well? Is it safe to make lines in the sand based on rotor swept area, because—if rotor diameters are increasing?

So there are currently competing steps of classifications and terminology already being used depending on what part of the industry you're in. For example, the engineering perspective might focus on swept area, the consumers and public might just focus on size of turbine or application types. So can we, or should we, all come together and be consistent? That's one issue for discussion.

And also as I mentioned, there will be no specific distributed wind modeling in this decision, but DOE is planning on producing a separate standalone wind vision next year. The distributed wind vision will built on the modeling efforts Robert and his team at NREL have started. And the road map actions we put in this vision will feed directly into the distributed wind vision. So we do have

to be sensitive to what we say now, because it will follow us into this next distributed wind vision.

You're probably wondering why there will be a separate later distributed wind vision, why aren't we just including it in this vision? Two main reasons, first we haven't had modeling capability to segregate distributed wind. Robert and his team at NREL are in the process of developing a distributed wind specific model. And second, DOE thinks distributed wind warrants its own vision, similar to how each sector has its own DOE Funded Market Report now. Each sector, you know, also needs its own detailed analysis and road map.

So that's what I have for now. After Robert gives his presentation I'd love to hear your questions and feedback.

Aaron Godwin: Actually I think it would be good to do the questions now for your section, and we can do a group question session for both presentations at the end. But I think opening up now will—the ideas are fresh in people's minds is a good thing.

Alice Orrell: Okay.

Aaron Godwin: So go ahead and anybody that has any questions, speak up.

Coordinator: On the audio portion if you would like to ask a question, please press star 1 on your touchtone phone. You will be prompted to record your name. Then please unmute your phone and record your name clearly when prompted. One moment please for the first question.

Our first question today is from (Heather).

(Heather): Hi there. Can you hear me?

Alice Orrell: Hi.

(Heather): So, you know, we've heard some people on this definition also suggesting a category of micro to sort of match what is happening in the U.K. And I'm curious what other people might think about that and sort of the old breakdown we had of off-grid and on-grid. I've heard some feedback that that line is kind of fuzzy now, because everything can be sort of standalone with the way technology is evolving and can go either or.

So I'm wondering if micro is a better way to break out those kind of real small systems that can be used off-grid, or if people have feedback on that as well? Thanks.

Aaron Godwin: Hi (Heather), it's Aaron here. I—in general terms I would love to see DOE and NREL lead a unified reclassification of the entire—to me it does not make any sense the way we break this stuff down.

If you look at, you know, residential or even small farm or through that classification, you really only go up to about 20kW in most systems, and the technology changes everything from, you know, tower type to gear boxes to all those things really change. So this kind of arbitrary line at a 100kW has never made sense to me. In fact if you went out and tried to buy turbines in those size ranges you'd find it difficult.

So I think looking both at the way the turbines are used and the way the technology—where the technology breaks are, and what's actually available to market would make more sense.

I actually like the idea of maybe a smaller classification of these—like these true residential, you know, machines like probably be in the sub-10kW range, or whatever, makes more sense. And then stepping up into the, you know, whatever we want to call the next step up is, you know, the distributed generation projects in the—whenever we decide 10 to whatever kW range.

And then what used to be called the utility scale stuff and should also probably encompass the refurbish market and the, you know, probably 60kW to almost—probably you can get up into 1.5 because we're really actually seeing that being a break right now, at least in our section is kind of that mid-size—the industry, the parks, the schools are really running in that size range of 65 to, you know, the 1-1/2 megawatt range.

But I don't know what people think about that, and that's probably another call. But I think it should certainly be put on the radar.

Alice Orrell: Okay. Thanks.

Coordinator: I'm sorry, I'm showing no further questions at this time.

Aaron Godwin: I've got—yes, it's the size classification thing, and I think the other thing on the distributed generation breakout, I understand why they are not doing it, but I think it definitely needs to be highlighted that that is a very significant portion of the success of reaching, you know, the long-term benchmark goals that distributed generation needs to play a large role. And I think as policy makers look at those—look at these reports, that tends to guide what support comes (unintelligible).

So in that context these reports really are important, otherwise, you know, you have just the PTC or something like that, and it's really not supporting these

other markets. So I think, you know, by stressing that clarification is really, really important. Does that make sense?

Alice Orrell: Yes, I think so.

Robert: You know, this is Robert. And as far as the sizes or various classifications to break things up, it's a real arbitrary target in that, you know, you talk about gear boxes being a part of a transition and, you know, they're building 5 megawatt direct drive turbines now. So who knows what we're going to see in three years or five years.

So it's a complex picture that's going to change, and in some ways no matter what we do it's going to be fairly arbitrary. And I can certainly see the value of not classifying one kilowatt and 100 kilowatt in the same group. There is a huge range of, you know, installation and permitting and cost issues covered by that.

So I mean it's an interesting conversation and I think it's probably one that's worthy of a whole call. And a group sitting down and trying to figure out what the value is that we can capture in setting these different parameters or different categories out.

Aaron Godwin: I think for me, where I come down—and a gear box is just one of those criteria that you could look at. What I really look at is, you know, I'm a fairly practical person and if we look at how these projects or these funding programs that have been adopted by states, which kind of arbitrarily adopt the language that the national leaders use, or international folks, we've seen these arbitrary lines drawn in the sand and projects that really should be funded by a program are not because they don't qualify.

So I think that's one way you can look at that, you know, is how the project is used, you know, obviously the overall technology, kind of the general budget range of, you know, "Are we supporting residential programs, are we supporting, you know, Not for Profits, you know, schools, hospitals, parks, you know, that to me—those are almost more important lines in the sand than the, you know, the absolute kW range.

And I think, you know, looking at it from the sense of, "Who's going to use this information, who's going to use these demarcations as ways to kind of reign in programs and, you know—that we're hoping are going to come back." So I think that's what I would like to focus on.

I think we can probably—I think you're right, we probably—maybe we have our first topic for our next webinar, because this topic is, ever since I've been involved in this, it's always been out there. So maybe I'll go ahead and write that down as one of our possible future topics to discuss. But I do want to come back.

We don't have any more questions for Alice. We will have another opportunity at the end of the call where we'll do our overall general questions and answers. But I want to go ahead and give Robert a chance to get started with his presentation. So does anybody have any other calls, or questions for Alice at this time, or can we go ahead and let Robert start?

Coordinator: I do have one other question from (Heather).

(Heather): We can go on. I just—I wanted her to go back to the road map, but we can do that after Robert does his talk.

Aaron Godwin: Okay. Yes, we'll go ahead and do that then, and just you'll be first in line.

(Heather): Sounds good.

Aaron Godwin: So without further ado, we have Robert here who's going to talking about the work that NREL has been doing in these areas. So go ahead Robert.

Robert: Okay, first of all, I assume everybody can hear me okay? Am I coming across loud and clear?

Aaron Godwin: Yes.

Alice Orrell: Yes.

Robert: Okay great. So the topic is about the future of IEEE-1547 and it's sort of an octopus topic in that it will pull in a bunch of other stuff a little bit too. So let's see, how do I get this to—I've got it. There we go.

First a little background. In the 90's when people first were getting to be more and more people trying to get PV systems hooked up onto the grid. There was really no set standard and individual utilities were writing their own. And you know, small wind has the same issue, because in a lot of cases they were using the same inverters.

And there was a lot of resistance from utilities to hooking generation into their distribution system. And so DOE funded an effort by IEEE to write a standard that hopefully would become widely adopted and ease the burdens of the utilities and the inverter manufacturers. The standard also covers induction generator wind turbines too, but the biggest impact was on the inverter folks.

So it was one of the early stabs at really doing a consensus based involving stakeholders from—of all sorts from utilities to inverter manufacturers, state energy agencies, et cetera.

And it was focused on a lot of the utilities concerns about protecting the power quality and safety and one of the founding—one of the basic principles in developing it was that distributed generation was a tiny participant in the power, and therefore really wasn't—they weren't concerned about keeping them online.

It also provided one of the base pieces that then resulted in UL developing inverter standards. And in fact went on to become used not just in the United States, but internationally as well.

Now it had a huge impact because it really—it freed the inverter manufacturers, between that and the UL standard that was developed alongside with it, it freed them to work to one standard as far as developing ways to deal with the safety concerns of anti-islanding, which we'll talk about a little later. And it also, because there was now a standard, made it harder for utilities to block.

It wasn't such a big deal for them, they had a set of rules, they were developing standard interconnection contracts because they had—didn't have to go through long documents to define all the technical things. They could just refer to IEEE-1547 and UL—I forget now, but anyway. And it became really a key foundation piece for developing the hugely expanded distributed generation industry we have today.

So back to the context here. When they were writing this, again, that—DG is not a significant factor in the grid. So really they were concerned about not having DG create a problem. Prime focus anti-islanding.

In other words, when there's an issue, say a tree falls across the power line and the power crew goes out there. They know where to go to disconnect power to the utility side of that break, and they expect that the downstream side of that break is going to be de-energized, and they want to make sure that it is de-energized. And so that was one of the prime things that was addressed in the standard.

They didn't want vault right through or power quality support, in fact they were not allowed. Basically if there's a problem, distributed generation needs to go away and stay away until the grid is back up and stable.

Now since that time the situation has changed very, very dramatically. Distributed generation is—while it's not hugely significant in many areas of the U.S., it is in some. In Germany it's huge, I mean with solar alone they're hitting 34% sometimes on a nice sunny day.

And the Germans realized that they had set themselves up for a real problem, because they have 50 hertz systems there and so at 49.—I forget, I think it's 6 hertz, all PV inverters installed would disconnect.

So it's very typical if you have a power disruption of some kind, say a power plant goes down, a large power plant, and you have a temporary imbalance between the generation going into the grid and the load to have frequency drop a little bit. And then things stabilize back out and recover.

However, if you drop below 49.6 hertz right at that time, and they—you could lose huge amounts of solar input and it would cascade the effect out and could result in just really a cascading blackout that was large.

So they actually are pretty close to complete with a software upgrade to all installed inverters, half-a-billion dollars, half a mill. I'm sorry, I put the wrong number up there. It's actually half-a-billion dollars, it's $500 million to do that software upgrade.

The hardware is all fine, inverters are capable of being much more flexible, but the software controls were designed to meet the rules of the existing IEEE-1547.

So having the Germans be ahead of us a little bit allows us to say, "Damn, what do we do to avoid this problem?" And IEEE-1547 was not due for a new addition until, I think, 2018, but that's being pushed up. And in fact, California is leading that by updating their—I think it's Title 21, which covers the same—which covers some of the same issues, a part of it does.

And so inverters will—distributed generation inverters will now have to be able to provide some support to the grid. And that raises a whole realm of new issues. "Will they do that automatously?" In other words, "Will it be programmed into the devices that they will stay online and try and help correct the problem if there's an over voltage or under voltage or over frequency or under frequency, or a power factor issue?"

And if they do that, what sort of stability issues are going to be created by that. And are our modeling capabilities good enough to know what to do about that?

When you have a complex system, maybe you've got a feeder that's got a couple of hundred inverters of various sizes, everything from, you know, 1/2 a megawatt to 2 or 3 kilowatts. And you know, some of them are hooked up for PV systems, some of them wind systems, some of them for fuel cells.

How does that system respond dynamically if you have a tree limb fall across the wires and cause a voltage sag and a frequency change? And then all the inverters that are impacted, start trying to correct it at the same time, will they over correct? And how do we control that?

Or another approach that's being talked about is, will it be set up so the utility can send out a signal that says, "Okay, everybody give me 10% boost in voltage support, or 20%," and therefore they can have some control of it.

These issues typically go five or six power cycles, so you're talking about less than a second. And the inverters can respond that fast, but there are all kinds of time delays built into the system both by distance, and transitioning through transformers and things like that.

And then ancillary services like voltage support, frequency support, power factor support, are for the most part not priced into the system today. And we'll talk more about that, but that's getting to be a key issue, because storage is becoming more important and more demand, and the technology is getting to be there to have that.

And a big part of what storage provides is ancillary services. And how do you price those things that have, up till now, have not been priced at all? And changing that pricing structure will have huge impacts on what gets brought online and how it's financed and...

Okay, so there are currently all kinds of nice little boundaries, you know, that are clear and well defined. You know, you have a plus or minus 10 volt window that the inverters or other devices can operate in. You have plus or minus 1/2 a hertz of variation or something in that range. And if you go outside those boundaries, just disconnect.

Now that we're saying in the future we're going to need to have support for the utility and that these inverters and other devices need to stay around, "What kind of limits?" I mean you can't continue to operate if you go too far outside of the boundaries, the equipment just can't do that.

So where do they start providing support, and where do they give up and disconnect and the system has to go down? And that creates a whole new set of questions for, "How do you test the equipment?"

If you now have a range at which you don't—the equipment do anything except its normal operation and then a range outside that when it provides support, and then a range outside that where it drops off, do you create a testing regime that's now 100 times more expensive than what you have now, which is already very expensive? How do you come up with a way to test equipment and all the huge variation in ranges of what you're going to be able to with it?

And again, the standards will need to be developed for what it's supposed to do. Excuse me, getting a little horse here. And then the test protocols.

Now, the other issue, one of the—and if you'll recall, one of the prime purposes of the existing IEEE standard is to prevent islanding. In other words, prevent energizing disconnected sections of the grid.

That's been worked out, it's expensive and takes a lot of engineering effort, because everyone patents their approach and you have to either come up with a new one, or you have to purchase the intellectual—the use of the intellectual property of someone who has an approach.

But it depends on certain characteristics. For instance, one of the approaches is they try and push the voltage. And if it's out of the bounds of where it's supposed to be going. And if you're hooked to a nice stiff grid, you can't push it. And if you're hooked to an island in a situation where you've got some generation and some loads and they're sort of balanced, then you can push it. And they use that to detect.

That might not work anymore if you have a bunch of devices in the system, this islanded system, that are providing support when things start to get out of balance a little bit. So you can't detect that weakness because you've strengthened the system essentially.

So perhaps whole new approaches will need to be developed. One of the things they've talked about is having a carrier signal from the utility so that if the connection to the utilities is broken that carrier signal goes away and the inverters can tell that they're no longer hooked to the utility.

Now one of the things that's driving the urgency of doing this is California has mandated a whole lot of storage by 2020. And, you know, it seems surprising to me, but 2020 is actually not very far away. And given the time it takes to have a new set of rules developed and equipment tested to those rules and—that's a pretty fast timeline. And in order to get that amount of storage installed, they need to be ramping up pretty quick.

And again, as I said earlier, storage is primarily a grid support function, and therefore you've got to have not only the rules for supporting the grid, otherwise you don't get the value out of the system. Or—and you need to have a lot of pricing mechanisms worked out. And California is doing that, they're utility regulatory body is set out some proposed rules for valuing support.

And the storage that they're talking about is going to be a mix of everything from, you know, utility sub-station sized storage units to home units, you know, with someone's PV or wind or whatever.

So this is going to have a huge impact because the storage industry is going to become real in that there will be a lot of real commercial application. Up till now it's been nascent, I think would be the best way to say. It's happening, but it's not mainstream, and this will be a big step toward mainstream.

The other interesting thing that it will do is it's going to drive the capabilities for micro-grid technology, because one of the things that's really needed for really good micro-technology systems is going to be storage and having the contributors to the micro-grid be able to support grid stability.

So is this is a significant change that's going to happen? And it's my opinion that it's a very significant change. Really the development of 1547 was one of the key foundation pieces that gave us the distributed energy industry that we have today. Otherwise we'd still have inverter manufacturers having to design 20 different models to fit different utilities requirements and, you know, UL standards that had to test all of those, et cetera.

I think that the—if done well, and I expect it will be, the next edition of 1547 will really provide a key piece in making our transition to this bi-directional

distributed grid network that many folks are talking about, as the future for utilities.

Now, utilities are having various reactions to this because, you know, they've been doing the same thing for 100, 120, 130 years. And basically their financial model involves selling kilowatt hours, and in some cases, demand for larger customers. But it doesn't provide any income from other things that the utilities provide. I mean they keep the grid stable, and that's necessary.

And as distributed generation comes along and gets to be very significant, and micro-grids, and et cetera, providing bulk power is not going to be the primary function of the utility. And their financial model no longer works.

Now some utilities are responding to this by going, "Gosh, we need to create some new financial models and figure out how to charge for the value that we offer, and the essential services that we perform and are going to keep performing in the future."

Some are not—are more on the line of, "Oh my God, we've got to kill net metering, because it's going to put us out of business." And of course, there's a lot in between.

This is being driven by technology development, so I don't think anybody is going to be able to kill it. I'm not really worried about that, but utilities are going to need to work out new financial models and net metering is not a panacea for the future, it's got to be more nuanced than that. It will be interesting to see how it all works out.

Let's see. Okay, I think that's it actually.

Aaron Godwin: Okay, thank you Robert. Let's go ahead and take some questions. Does anybody have any questions for Robert? Again, we'll come back to Alice after and do group questions after we handle Robert's questions. Do we have any questions?

Coordinator: I'm showing no questions at this time Sir.

Aaron Godwin: All right, well I've got a couple. First would be a statement that—for our projects one of the things we've seen on distributed generation is we have projects that lose probably 20% of their savings on an annual basis from being forced to disconnect from the grid, and for no fault of their own, it's a grid weakness. Typically it's low voltage. They're forced to disconnect and they get no financial compensation for that.

So they might be off for, you know, once they cycle off they're off for, you know, 10 to 15 minutes just by reset times. So that would be a nice thing to be considered in this, is that there needs to be some sort of, "If we have to obey the rules so should the utilities, and there should be, you know, the value of the project being on the grid is actually good for the grid, or can be good for the grid." So I think that plays into that.

And then the other thing is the smart grid. At least in our area the smart grid development is a big topic of conversation and so Robert can you talk a little about how this could play into that?

Robert: Well yes, that's great. You remember I opened this saying that it is sort of an octopus topic? Because it's also going to include some conversation about communications of all of these things across the grid, and how they're going to be managed and who's going to manage them? Because demand response, storage, ancillary services from PV or wind, all of these things need to be

valued some way and need to be managed, and they can't be managed without some sort of communication.

And so one of the prime things that I'm pretty sure is going to happen in the next few years is there's going to be some kind of a universal standard communications protocol across utility power systems.

And then the relationships between the people who own all these pieces and the utility, both financial and control, are going to have to get worked out. It's a huge project with an enormous number of stakeholders and an enormous number of vested interests. So it's going to be a great challenge.

If it works out as well as the original 1547 it will really set us up for that future, for that next 20 years of really seeing a system that's got all of these features that we're—all of this technology of distributed generation, demand management, storage, and coordination of all that into a system that should be more stable than what we have today. And have less losses and for the most part, be much cleaner.

Now let's see, I'm trying to remember if I addressed the original question. Did I? Hello?

Alice Orrell: I can hear you Robert, but I don't know where Aaron is.

Robert: Okay.

Coordinator: Let me check that line.

Aaron Godwin: Hello.

Coordinator: Okay, it looks like you redialed back in. Your line is now open.

Aaron Godwin: All right. Robert how far did I make it before I dropped out? I'm not sure why.

Robert: Well I was just wondering whether you heard any of my answer and whether I addressed your question. I got to conversing on it and I sort of lost touch with the question. You asked about...

Aaron Godwin: I asked about the smart grid, was the last thing I was talking about.

Robert: Right, that's right. Okay, and you didn't hear any response on that?

Aaron Godwin: I heard the very tail end of it, about all the great opportunities.

Robert: Okay.

Aaron Godwin: But I just wanted to make sure that that got brought up. And then I think, you know, the other big thing for at least our reality on the ground for projects, is that there needs to be a some equity realizing the value that these projects can bring to the grid, not only in peak time generation, and especially for things like solar where they actually can help support the grid and in value and in balancing the grid.

And the fact that there needs to be a level playing field where if a project is forced off the grid because of a grid failure or because of a utility failure, that's basically lost savings from that site.

I mean we don't like to talk about revenue because we're not selling anything, but it is lost savings and, you know, for one of our distributed generation

projects right now we calculate we can lose $20,000 to $50,000 a year in savings where we're being forced off the grid for no fault of our own.

Robert: Yes, well one of the things that will come with these new standards is that instead of being forced off the grid, more than likely in most cases, the facility would be called upon to support the excursion beyond where the grid is supposed to be unless it goes way out.

And so—and then like we—I talked about, what's the value of providing that service? You know, providing power factor correction or compensation or frequent...

Aaron Godwin: Well right now what happens is a lot of our sites, and you know, that metering, you know, true net metering sense, they get a full value offset of what they would have purchased. But if they over-generate, like let's say in a winter month even though they're net metering on an annual basis, they may be only getting two to three cents for power that—even the cost of power is arguably, you know, four to five, six cents. So they're not even getting a fair cost right now.

And then obviously what we're more concerned about is, you know, what we're losing. And especially since a lot of these projects are at the end of the grid, and what's causing them to drop off, is low voltage from the grid. And where clearly, they could help support the end of the grid.

Robert: Yes.

Aaron Godwin: So we'd like to—I guess this is something that I want to make sure stays in the conversation. Of course we would be very happy to participate in those conversations if they wanted some feet on the ground input.

Robert: Yes, yes, and there's—as storage gets to be a bigger player, all of these issues of valuing these support services and all of that stuff, are really going to be in play over the next few years.

Aaron Godwin: Yes.

Robert: I think in the next, you know, four to six years we're going to see a huge change in the whole regulatory and financial picture that will create the foundation for the developments that are going to happen in the next 20 years.

Aaron Godwin: Yes, I think the thing that we've been concerned about here is what we're seeing as the—we're not liking where it's headed, we're seeing it starting to, you know, being charged, you know, customer charge or standby charges increasing through the distributed generation systems without any kind of consideration for the value that they add. So I think that...

Robert: Well what's going to limit that and it's going to put a real squeeze on the utilities. And I have some compassion for the situation there. And—is that as storage becomes mainstream, it's going to be easier and easier to say, "Okay, well you know, I'm generating enough power, I'm just going to go away from the grid and use storage to spread out my production to meet my demand." And that's going to put a real limit on how much charges the utilities can lump on and so they're going to get squeezed.

You know, net metering is not a (unintelligible) financial model for the utilities. I mean it works up to a point. They average in higher cost power all the time. You know, nuclear power plant's power is not cost anywhere near what they sell power for. But they average a certain amount of that in with

lower cost whatever, hydro, coal, whatever they've got, and you know, it all melds in the pot.

And net metering actually fits in that just fine up to the point where it becomes big enough that it's averaging the pot up too much. And then...

Aaron Godwin: We have another question here.

Robert: Good.

Aaron Godwin: From (Tessa). "Is there a timeline for these changes and is there a section that considers grid tied turbines that are not—that do not use inverters?"

Robert: There isn't—I mean basically what's driving it right now is California is doing a rewrite of Title 21, which will cover some of this stuff. So they're sort of going to be out there on their own, and IEEE will kind of get pulled into it on that basis.

And they're just—they haven't set a timeline as far as I know. Officially it's not supposed to happen till 2018, but it's clear that's it's going to happen before that. There's a lot of additional sections that have been added to it to cover various things. But now they need to rewrite the whole thing and I don't have a timeline.

Let see, there was a second part of that question?

Aaron Godwin: Yes, and the next question was actually from—I hope I don't slaughter the name, but Mahda, M-A-H-D-A. The second part of the question was, "Is there a section that considers grid tied turbines—tied turbines that do not use inverters?"

Robert: Yes. Yes, it will cover everything. It's just with—like induction generator machines, you can't provide as much ancillary services like power factor or frequency support, et cetera. What they will do is they'll bring in the same sort of things they used in utility where you have ride through. So they won't force them to disconnect for a time. I mean that would be what I would expect.

Aaron Godwin: Right.

Robert: Right now you're over or under frequency or voltage, why it's like just disconnect. And they realized pretty quick on that they couldn't do that with utility size installations of, you know, 100 megawatts and such. So they have ride through requirements now. And I think that that will transfer over to the smaller distributed. But that will be something that will be covered as well.

Aaron Godwin: Now is there any play in the—there's a new generation, especially in the solar inverter range where they're making inverters that have a ability to basically stay on the grid with a portion of their power.

If you look at like the new SMA inverters where they have basically 20 amps or 40 amps available that can stay on as long as the Sun's out, regardless of what happens with the grid. I don't know if you've heard about those or not, or used them?

Robert: Yes. You're talking about able to operate island.

Aaron Godwin: Right.

Robert: Yes, that's...

Aaron Godwin: And we've seen over the last three years that there seems to be a mass, obviously for obvious reasons, but a mass of movement into those to avoid battery based systems.

Robert: Right, yes. Yes, there will be—that will—I don't know that UL has standards for that now, and that's probably one of the things that's holding that off. I'm not familiar with the details of it, but I did hear some conversations about that when I was at the (UVIG) workshop.

The other thing that they talked about—I had a point, I forgot what it was though. Well if I remember I'll bring it back up.

Aaron Godwin: All right. Do we have any other questions out in the field?

Coordinator: I have one question. (Heather) your line is open.

(Heather): Thank you.

Alice Orrell: Before (Heather)'s question Aaron, I wanted to point out that—at the hour mark, a few more people have joined the call. So because of the confusion of the time advertised. There's more people on the call now.

Aaron Godwin: You are correct. We're up to 24. All right, so for folks that have joined the call, there was some confusion on timing for the webinar. The webinar will be available through the ASES Web site. I will go ahead and have (Karen) or somebody else send out a link to that for the folks that missed it. Because the information on both topics was actually very good, excellent information.

So to folks I want to make sure if you've missed the actual talks, to follow up on the slides. And of course we can forward any emails that—questions that folks have.

But before we do that, if we can go ahead and get any more questions from folks out there. I think (Heather) you've got one for Alice, and do you have one for Robert as well?

(Heather): I do have one for Robert. And this is pretty concise so hopefully you can answer it quickly. So we've been looking for recent studies around power quality. And we understand that most inverters for small wind turbines due to the IEEE standards and UL, really produce premium quality power, which is better than what the utility often has at the customer site.

So do you know of any studies that we can use to confirm this, or publications, that kind of thing, that we can cite for that example?

Robert: I can give you a very concise answer, "No." I don't happen to know of any specifically.

(Heather): Is that something that would be worth documenting to show that there's some value here?

Aaron Godwin: I completely agree with that. Again, we're forced off the grid a lot on our systems when we're providing premium quality power that would have actually helped the grid sustain. But it's a really key point, not only is it the lost revenues for the sites, but it's just—I think it's bad for the grid.

(Heather): Yes, maybe you can capture that Aaron, so there's some kind of data or (unintelligible).

Aaron Godwin: Well any of the larger systems have—we do capture full data streams of what caused the fault, and obviously the systems themselves and the larger systems, we're monitoring continually at, you know, some second level power quality.

(Heather): Yes.

Aaron Godwin: But we know what is leading to the power issue, what's, you know, what the preceding event is, what's happening during the event all the way through. And that would be through—NREL would certainly have access to countless—I mean at their own facilities they would have access to that kind of data that would support that argument.

And again, the irony is that by the utility rules they themselves are breaking their own rules when they're forcing us off the grid because they've not met their own requirements.

Robert: Yes.

(Heather): Right. I think it's just an anecdotal statement and we're trying to crystallize it into, you know, something that we can point to and say, "This is a fact."

Aaron Godwin: Yes, I think again, if you looked at like the Boulder installation that you know, NREL could easily—or DOE could easily capture that data from many, many, many sources.

And again, if you met the—if you—when you put one of these systems online the first thing you have to do for the larger systems is you have to have the usual witness test with the utility where you actually have to go through and

simulate all these failures that could potentially happen. Which is actually quite hard on the system in general, so it's another problem we have.

But anyways, we simulate all these failures, and then of course the system disconnected every one of them. So that information is there and it's actually in the standard itself. So if they're meeting a standard, they've already proven by the fact that they're meeting standard that they've got—have a quality power.

Robert: Yes and...

Aaron Godwin: It's a matter of getting someone to believe that.

Robert: And it's a complex picture, because power quality consists of, you know, power factor and distortion and (unintelligible).

Aaron Godwin: We literally have to demonstrate, you know, we have to demonstrate harmonics, we have to demonstrate the power factor, we have to demonstrate phase imbalance, we have to demonstrate high and low voltage per phase and per, you know, for the entire system. All those things. And that's in the standard, and we have to actually demonstrate success in that, in meeting those standards.

And what I'm talking about is typically for a home solar system they just assume it's there, but for a wind based system, let's say you know, a 500kW or something like that, you've got to physically do a witness test to prove all of that in the field regardless of whether you've met the standard or not on paper form with the equipment you use.

Robert: Yes.

Aaron Godwin: So it's—the information is there and that's kind of one of the ironies again, I think what (Heather) is talking about is nobody is really listening to that.

Robert: Well it's not so much that they're not listening to it, it's that the financial model is not set up to capture that.

(Heather): Right.

Robert: And...

Aaron Godwin: I guess that's—the fear is that the—right now the, at least the trends we've seen, and this is again anecdotally, but the trends we've seen is to increase the price or cost for distributed generation systems to be on the grid. Actually to, you know, to make up their financial, which gives no credit for the benefit that those systems bring to the grid. So we've seen it all one-sided so far in the conversations.

Robert: Yes.

Aaron Godwin: We're going to increase your customer charge, or have a special customer charge if you have a distributed generation system. But for instance, in my own home, you know, I have the potential to actually over-generate if I wanted to. I can produce 100% of my electric usage. I pay a customer charge for the privilege of having them be backed up, which obviously has value.

But I also have the ability—actually if I put my full system on I could actually be supporting the grid. And that's true of, you know, we have another system where we're actually forced to take it off the grid, because we have the potential to over-generate.

So it's a fairly common issue or potential I guess, I don't think it's opportunity and it just seems like right now the conversations are, how can they increase the charges associated with distributed generation projects instead of having some kind of—like when you're forced off the grid the utility would have to send us a check, which would be nice.

Robert: The other thing I—might be Minnesota I'm not sure, or Wisconsin, but there's one state where the utilities has put in that they want to add some charges on the net metering and—or tweak with the net metering standard.

And the PUC said, "Okay, well you're going to have to do a study of what value these net metering systems bring." And they spelled out what they're going to have to do. And they're really going to have to look to see what value. I mean maybe they're underpaying at net metering rates.

Aaron Godwin: No, and again, that's one of the things we've brought up before too, is that the—right now they're allowed to basically select the value that they give power, and this is true in the—you know, most states have an annual balance net metering law, which in reality and in practice is a billing cycle or monthly net metering law.

And so what happens is your—let's say you're at 95% parody for the year, you're over-generating in the winter months for wind and you're under generating in the summer, and so when you over-generate you get a very, very small fraction. We've got sites, you know, where the electric standard rate is 12 or 13 cents a kilowatt hour, but they're only getting 2 cents when they over-generate.

That's a real problem, especially since the utility is certainly paying more than 2 cents for power. So it kind of plays into that. And again, I realize it's a somewhat side conversation from the 1547 and 1741 conversations. But it does play into the conversation.

Robert: Yes, it's part of the octopus.

Aaron Godwin: Yes. Well I don't—you and I are having a great conversation. I want to make sure if there's some other questions out there—are there any other questions any folks have?

(Heather): It my line still up?

Coordinator: I apologize.

Man: (Heather) you're still open I think.

Coordinator: (Heather) your line is now open.

(Heather): Okay. And for anybody else that wants to push—ask a question, I think you press star 1.

Coordinator: It is star 1, yes Ma'am.

(Heather): Okay. So now I was hoping we could go back to Alice's slides on the road map. And while they're getting that pulled up, a similar question that I know someone was looking for a citation or reference on a point that we were making. I guess it's the slide. How on, let me see here. Maybe one more slide back.

Right, about this idea of distributed wind serving as ambassadors, and if other people have example of how that is actually played out, that would be helpful. But then in general, on this slide and the next, hoping for maybe some more compelling arguments or maybe some more exciting statements that could be made about how we can really sell the enthusiasm that we have for distributed wind.

So we went over this kind of quickly, and now especially that there's more people on the call, Alice do you want to just mention again what's going to happen with this road map idea?

Aaron Godwin: And Alice in that context—because this actually meets up to our following action items for the division. Can you reiterate specifically what you're timelines are? Maybe give us a little homework to do here to help you. You know, specifically what areas do you need help in and when do you need it by?

Alice Orrell: Sure. For those that just joined this is Alice Orrell, I'm working on DOE's Wind Division efforts. It's going to be published at the AWEA conference in May. There's three main parts to the division, there's a chapter update, it's the status and the state of the industry. You know, what's changed since DOE's 20% by 2030 report in 2008. And there's an Impacts and Benefits Chapter that talks about wind, you know, impacts and benefits, and then there's this Road Map Chapter, "What do we need to do to achieve this vision, you know, now and in the near future?"

So we're kind of—it's a very structured project and we've gone through different steps with—putting together content for the Chapter 3 statistics and installation trends and FAQs for that chapter.

This Road Map Chapter is more of, "Okay, what do we want to do in the future? What do we need to achieve all of, you know, to achieve this growth in both wind and distributed wind?" So this slide is a little rough, it's just kind of some high level ideas.

Aaron Godwin: That's for the chapter for the—this particular report, but you also said that you're producing a separate report specifically for distributed generation.

Alice Orrell: True.

Aaron Godwin: Is that the same timeline?

Alice Orrell: No, it's not. So for immediately, this month, like next month I'm working on this road map for the current DOE Wind Vision. And then next year we're going to be working on a distributed wind specific vision with DOE. And so these kind of ideas that are in this road map for this large vision that covers land-based, offshore, distributed winds, they will feed into our specific distributed wind vision as well as we'll start working on next year maybe spring or mid-year.

Aaron Godwin: So we can help you set out the outline now, but the specifics would be more likely included in next year's report?

Alice Orrell: Yes, yes. I'm—yes, exactly. We're—it's still debatable how much detail will go into the current vision, but a lot—but then, yes, we'll have the very detailed and specific distributed wind vision in the future. So yes, if there's any generalized comments, I see some questions are popping up in the Question Box Aaron if you want to look at those.

The other issue we've brought up, but I don't know if we want to open up that can of worms right now. It's just talking about definitions and terminology and classification of distributed wind and—are there any changes we want to see to that as well?

Aaron Godwin: Okay, (Heather) did that answer your question?

(Heather): Yes, I think so. I mean I was hoping other people on the call here could speak up with ideas on what they'd like to see, you know, recommending in to DOE to include in this vision of—you know, what are the major barriers and things that DOE funding could help address to grow the industry.

Aaron Godwin: We've got a few questions that are typed in here. "So why isn't financing listed as a key area in the road map?" That's from (Deborah).

Alice Orrell: I am looking at my detailed list and I think that is in there. I just didn't make it into the slides. So yes, that is a good point to bring up and I will—if that's, you know, we have somebody evaluate financing options such as lease models, on-bill, utility financing bonds and other—and group purchasing options, that's in my detailed list, yes. So I will do that.

Aaron Godwin: Yes, I think the overall—I know (Karen) and I have talked about the overall cost/benefit analysis, especially for the smaller projects with something that needed to be looked at. So you know, kind of the whole financial question, not just the financing, but the, you know, cash flows over time conversation.

Alice Orrell: Yes. Well—so to be more specific to answer her question is, "Yes, I've considered that, but no, you're right I didn't put it on that slide." But that helps me hear you guys tell me what things you think are important too. Like, what did I miss? Or what do you think I missed? So thank you for the feedback.

Aaron Godwin: And then I (unintelligible)—(Dale) had asked about, "Can we get a copy of the presentation?" They will be available through the—should be available through the ASES Web site. If you can't find them on there, go ahead and send (Karen) or myself an email.

(Mick) just made a comment that the micro—currently micro turbines is under 1kW, off grid applications like sailboats. So again, try and think about that.

Alice Orrell: Is that—I saw that. Is that a—whose definition is that?

Aaron Godwin: (Mick) can you type in or tell us what—who's definition? I hear the same thing before from micro for these.

Alice Orrell: Because someone just told me U.K. uses 1.5, so I don't know if it's a...

Aaron Godwin: Yes, I think that's—I'm putting down a big star by that because that conversation comes up in almost every single conversation the division is having, including like, you know, "What is the decision supposed to be covering?" So the size clarification issue is I think a really good topic for future—I think more of an open discussion format.

Alice Orrell: Okay.

Aaron Godwin: So I think that would be really good. And I don't know, (Mick) is there a—I don't know if (Mick) is still out there or not, but if he can type in what—if he's heard that is actually in some actual official guidance, or is that just what people are saying? Because I've heard it in the open conversations, but not on a document.

I don't have any more questions typed in, are there any more questions out there? Anybody who's not being heard?

Coordinator: One moment please. I have a question now from (Trudy).

Aaron Godwin: Hi (Trudy).

(Trudy): Hey Aaron, great job on the facilitating, great job on the presentations, they're (unintelligible). So a micro-wind is defined in the (Danish) Wind Energy Standards as five meters (unintelligible) OVS. There's a different way than in Denmark that makes machines that size, are handled in terms of certification requirements.

And those requests from Chinese representatives to follow that same guidance and how we think about future IEC standards, and how we work on IEA, recommended practice consumer labeling. So there's a little hook for you to (unintelligible) for your (unintelligible).

Aaron Godwin: Would you have a compilation of all the various standards and who's behind them that are out there so we can enlighten a future conversation? Is there any documents that kind of says who's doing what or who's saying what?

(Trudy): You know, it's really at this point, digesting in my brain. And eventually a lot of stuff that's in my brain will come out in a (unintelligible) report sometime next spring. And I'm sure that that would be publically available. So that, for me anyway, that's the best source that I know of. It's just not publically available in the moment.

Aaron Godwin: Is there a way that we could get something quicker in the sense of, you know, kind of a major entities out there, what they're using as good definitions? And kind of the reasoning behind their definitions?

(Trudy): I would say, "Probably the best thing to do is the next available ASES webinar I'd be happy to talk on that, international standards for small wind."

Aaron Godwin: All right, so we have a possible volunteer for a future webinar.

(Trudy): Volunteer, sucker, whatever word you choose.

Aaron Godwin: All right. I appreciate that. Does anybody else have any other comments or questions, because we're running about five minutes out?

Coordinator: I'm showing no further questions Sir.

Aaron Godwin: All right, thank you so much. Well I'd like to thank everybody for participating and the final thing that is on my duty list is to solicit for future topics that we might want to cover in webinars, also in general Wind Division activities. And so if folks have any ideas have any ideas, needs, desires, dreams, hopes, aspirations, please speak up now. All right, I'm not seeing anything coming up right now, but I know that one—I saw that (Mick) was on the line and (Mike Vergie) was on the line.

And I'm thinking about one of the conversations that (Karen) and I was talking about was the reality of especially the small—the ultra-small wind, which would be like an—I'm trying to come up with definitions here, but in the, you know, residential scale wind trends in the marketplace, is that something that any—either of you guys would be interested in talking about in a future webinar?

So actual installations trends, sales trends, we've seen obviously some major players fall out of the marketplace recently. Seen a lot of foreign competition come into the marketplace and not really gain traction. Either of you interested, or anybody else interested in talking about that?

Coordinator: Sir, I do have another question or comment from (Heather). (Heather) your line is open.

(Heather): Thank you. I think that's a terrific idea Aaron. Hopefully we can get one of them to that. But I did have one last question for Robert, you had talked about the micro-grid and how would you define that in comparison to what (Trudy) mentioned about micro turbine?

Robert: Well I'm—basically what I'm talking about here is parts of the distribution system that could operate autonomously. And they range in everything from a university to a building with combined heat and power, to a residence that's got a solar system and batteries and can operate.

And one of the big pushes right now in the micro-grid area is a lot of military have diesel generators for what they've decided are critical buildings. And they're relooking at all of that to try and say, "Well why don't we make the whole facility able to be islanded in the case of loss of utility." So we have really full functionality.

Aaron Godwin: We're also seeing that in municipalities.

Robert: Yes.

Aaron Godwin: And schools.

Robert: Yes. And the situation is getting to be one where that's a paying proposition. It's not just for security or for resilience. More and more it's, and in many cases, it's possible to make that be financially rewarding. Universities are finding they can save millions of dollars a year in power costs by using combined heat and power systems and their PV and whatever else, wind, whatever else they're able to use. And being able to island, it goes away.

Aaron Godwin: Does the conversation of aggregation, which is something we keep pushing, building to aggregate projects, so you've got schools, parks, municipalities, hospital and community next to each other, maybe industry. Right now under the (unintelligible) they'll have to have their separate projects, the idea that they could all have a single project shared. Does that play into that micro-grid conversation?

Robert: Very much so, yes.

Aaron Godwin: So do you—have you seen any trends in the ability of, you know, rule changes and you know, the public utilities commissions in allowing that to happen?

Robert: Well some states are allowing aggregation, but it's just really a mixed bag. I'm from Oregon and in Oregon a couple of years ago they made it so you can aggregate as long as the same owner owns all the different meters and they're on contiguous pieces of property. So—and they're on the rate structure. So it's pretty limited.

Other places they're allowing real aggregation where you can have unrelated parties aggregate to net meter at a facility that's in common. So I don't—I haven't looked at the details. I don't know how many places are doing more extensive, I just am familiar with Oregon's.

Aaron Godwin: So Alice that might be a bullet for you and your report, because that's obviously going to be a massive in the kind of punch list of things we can do to make it all work. That would certainly be pretty high on our list. We probably could double the number of projects we have if we could do that, or more.

Alice Orrell: Okay, thanks.

Aaron Godwin: The other thing we have, we have a statement/question/request from (Deborah) for webinars is utility scale issue, but webinar update on when the wildlife issues, particularly a golden eagle update, because of the recent settlement that was reached. So I'll go ahead and that will certainly be in the minutes. And that would be a perfect topic for probably (Karen) to do, talk about.

Woman: That would be great.

Aaron Godwin: Does anybody else have any ideas or anything else you want to talk about? We're kind of running down to our time, although I think some folks were thinking this was an hour later, so we'll probably—we'll stay on as long as people want to stay on. But we expect the people will be leaving here in a couple of minutes. So any other comments, or any other ideas or priorities we should be working on?

In general, both of these reports coming out are certainly going to be looked at by policy makers and folks that would be thinking about incentives or ways to incentivize these programs is certainly something we should be looking at as a division, is helping make them as accurate and successful as possible.

I'm not seeing any more comments. Anybody else out there?

Coordinator: I have no questions on the audio portion Sir.

Aaron Godwin: All right. Actually here's somebody, (Keith) is asking email contact info to ask for slides or Web link. It is actually on the invite for the webinar. So you can bounce that back to that email address. And that's also how to get it, is on the invite. Any other questions?

Coordinator: I'm showing no further questions Sir.

Aaron Godwin: All right. Well thank you everybody for attending. Our next—we basically have calls every first Thursday of the months, and switching from webinar to calls every other month.

There is a conversation about changing that to meet people's needs, so folks can feel free to email those requests. But we are looking for future speakers and future topics, and we had good attendance at this webinar, so I appreciate everybody joining, and please join us at our next call, which I'm going to try to guess what date that is. I think it's January 2 or 9 is what we're looking at but watch your emails and you'll certainly see updates about the next calls and the next webinars.

So again, thank you everybody. A special thanks to our two speakers, really, really meaningful topics and well presented, so thank you both.

Robert: You're welcome.

Alice Orrell: Thank you.

Aaron Godwin: Without further ado, everybody have a great evening and any other comments feel free to email. Thank you.

Coordinator: Thank you. And this does conclude today's conference. You may disconnect at this time.