U.S. Offshore Wind Industry Update
July 16, 2014

Coordinator: Welcome and thank you for standing by. At this time all participants are in a listen-only mode. Today's conference is being recorded. If you have any objections, you may disconnect at this time. Now I would like to turn your call over to Mrs. Suzanne Tegen. Thank you, Mrs. Tegen. You may begin.

Suzanne Tegen: Thank you and welcome everybody to our monthly wind exchange webinar. I'm Suzanne Tegen and I manage the wind and water deployment market acceleration and deployment team here at NREL and we're happy that you've joined us. Our topic today is offshore wind. We have a market update and we'll touch on the state of the potential projects in offshore waters in the U.S.

We also have Patrick Gilman from the Department of Energy who will fill us in on DOE's three offshore wind demonstration projects. And as usual after the presenters have given their slides, we'll do Q&A. Just as a reminder to everybody when you do want to ask a question and you can do that any time, you'll do it by going to the Q&A bar there at the top of your screen and you click on that and you can type in your question and send it in. And we will be answering questions at the end.

Coordinator: Excuse me one moment please. Mrs. Tegen's line is disconnected.

Suzanne Tegen: And our first speaker is Fara Courtney. She is the founding CEO of the U.S. Offshore Wind Collaborative and is currently consulting on public policy and strategic partnership building. She has extensive public and private sector experience in clean energy and ocean policy and she's been a recognized leader in promoting the U.S. offshore wind industry since 2004.

Fara was regional manager for the Massachusetts coastal zone management program and principle of Good Harbor Consulting in (unintelligible) for 13 years and there she focused on regulatory analysis, strategic planning, convening and innovation at the intersection of environmental and economic opportunities.

Fara holds a master's in science education from Boston University and a bachelor's degree from Cornell. So Fara if you're ready, take it away.

Fara Courtney: Thank you very much. Okay, good afternoon everyone. I appreciate the opportunity to speak with you about offshore wind at this important crossroads for the industry at this time. I'm going to be talking about some general context to sort of introduce much more detailed presentations by my fellow speakers.

The offshore wind industry in this country really started with the proposal of the cape wind project 15 years ago and in that—the subsequent time we've been laying important foundational infrastructure in terms of policy research in citing and understanding technology and building business models. And as you'll be hearing in the next presentations, we're really at a point to start seeing steel in the water.

Because the U.S. has been a little bit behind the rest of the globe in this industry, it's important to take a look—my slides—I'm sorry. My slides are not advancing here. Can I get some help? There we go. I'm sorry.

It's important to look at the—to understand what's happening here we have to look at the industry in context to get a sense of the opportunity and the evolution over time. So as you can see from this slide, the focus of attention has been in Europe. Over 2000 offshore turbines have been installed with the

capacity of over 7000 megawatts fully grid connected and this is across eleven countries including demonstration sites and encompassing 73 wind farms. And that's important because it demonstrates tremendous experience in understanding the siting and construction issues over many different contexts and sites.

Asia is also getting into the game. China and Japan have aggressive targets for offshore wind and have installed demonstration projects. In the U.S. we do have one grid connected floating prototype that's a one inch—one eighth scale 23 total machine floating machine in Maine—the alternative. We have one fully permitted commercial scale project which is Cape Wind in Massachusetts and two three megawatt permitted projects in Rhode Island and New Jersey—the first theme Block Island to be developed by deep water and the second—Fisherman's Energy.

And it's important to note that those two demonstration projects are in state waters, which provides more streamlined permitting process. But just to look at just some of the reasons why the U.S. has possibly been slower than the European leaders—there are some major differences in context. First of all the major driver of climate change and energy security in Europe is not shared to the same extent in the U.S.

We suffer from a bit of climate change ambivalence although that is improving certainly with the president's climate change agenda. However the driver of energy security which was very important ten years ago when we were looking at oil supplies from the Mid-East has lessened due to natural gas and new domestic oil reserve.

In Europe there are mandated national targets and shared EU targets. We don't—we do not share that structure. We do not have a national renewable

energy policy and the market is driven by state incentives which you'll be hearing about in much more detail.

Europe has very heavy subsidies and revenue guarantees while in the U.S. we suffer from short term policy support with a come and go PTC and ITC which is particularly problematic for offshore wind with its very long development lead time.

Also in Europe the leasing process is directly tied to guaranteed markets based on national targets and here the leasing process which is controlled for projects primarily in federal waters by the federal government is disconnected from the market push which is at the state level. So cooperation between the states and the federal government are very important but there are two different entities who are in charge of those two very important parts of the industry.

Just to follow that with—again to look at the different contexts between our very new offshore sector and our very well established and successful land based sector. Offshore is new. We're learning there is tremendous opportunity for innovation but at this stage as was the case with land based we have higher costs of developments resulting in higher costs of electricity which is a problem particularly when offshore is compared to land based wind opportunities.

The policy and regulatory context for offshore and land based land is different again because of the location of offshore wind farms on the outer continental shelf which are all public lands under federal control under the Bureau of Ocean Energy Management. There are no opportunities for small scale private development on private lands. We don't have the benefit of those connections that were so important in the beginning of the land based sector.

The maritime dimension adds many new challenges. Construction offshore is very complex and difficult and we are fortunate to be able to borrow from offshore oil and gas expertise but there is much to learn. Also the ocean environment is really a new frontier so from a siting perspective we are really exploring new interactions and needing to learn new mitigation techniques as we go.

The characteristics of offshore wind are also different. They're some of the strongest winds in the U.S. are located offshore very approximate to load centers. It creates a real opportunity. And in addition the particular characteristics are of offshore wind create availability during times of peak load and that those resources are available on the right side of transmission (unintelligible) in other words transmission coming in from the east coast from the east into congested areas provides significant and very valuable congestion relief.

Offshore wind construction requires the development of whole new infrastructure which is a challenge but is also a great opportunity for repurposing underutilized maritime infrastructure and coastal port areas and creation of maritime oriented jobs. And again the cost drivers and the opportunities for innovation are different in the offshore sector particularly at this early stage of development.

Just to look a little bit more closely at some of those differences and cost drivers—most of the action with offshore wind in terms of innovation and challenge is happening below—on and below the surface of the water. One slide I neglected to include was the variety of foundation designs that are currently being utilized. What's illustrated here is the next generation of floating turbines which are now currently being tested in a variety of

configurations but that variety offers opportunity for innovation and cost reduction and are applied in a variety of different C bed conditions.

You'll see that the cost share for offshore wind versus onshore is very different and again that reflects the complexities of operations and construction offshore, offshore transmission and the expense of foundations and installation of foundations.

So looking at this new industry and this—what really is the launch phase. Even though we've been talking for offshore wind for 15 years, we're really entering a critical launch phase where we'll be getting steel in the water and there are a number of challenges that we will be undertaking and the first will be the continued testing of a brand new leasing and permitting regime. Each new lease option and each phase of permitting we're learning from. The challenge is incorporating those lessons learned and moving that evolution forward to a much more efficient system.

We're also testing new market mechanisms and incentives and our next speaker will be talking about them in detail. So we're developing both a regulatory platform and the market platform and these first projects will be critically important. We also need to development shore side infrastructure to support these first projects. Things will happen differently at the early stages. As we develop the infrastructure for the initial projects we also need to look ahead to what an efficient configuration will be for industrial scaled development.

All the experience to date has occurred in Europe and that's a tremendous benefit to us. We need to learn and adapt that for American U.S. conditions and we have to build domestic capabilities and that will be important to do in these first projects because there's a real premium in seeing U.S. domestic

employment and supply chain participation. That will have to happen slowly but we need to focus on it early.

Initiating the supply chain for the first projects without chain and string of projects going forward is a challenge and doing it right—these first projects are essential to get right because the opportunity to build confidence within the industry and in the industry in the U.S. and among the public is really important in the next few years.

So just to look a little bit more closely at a couple of these major areas of importance for these first projects—port facilities. As I said, this is a real opportunity. We do have port facilities that are underutilized. DOE has done some in depth analysis of our national port infrastructure, the opportunities for providing support for offshore wind on a regional basis and the cost that will be incurred and the opportunities are great.

There are also the need for smaller ports to provide operation and maintenance platforms. So there is opportunity to be shared among many states and this is going to occur on a regional basis. The investment that's required to develop staging ports can only be supported in the anticipation of a flow of projects over time and that means that there will not be a specific port developed for each project and we need to be smart about how we move that supply chain development along.

And the states are investing in these. This is the new Bedford—proposed new Bedford commerce terminal. It's a $100 million investment that we hope to see being used by the Cape Wind project in short order. Similar investments are occurring in New Jersey and all the states are assessing their ability to participate in various levels in this infrastructure development.

Construction offshore is very complex. Offshore wind turbines and foundations are very complex and large structures and there's a requirement for special vessels for installation. We currently have no special use vessels in this country because we have no industry so we will be importing to a large extent in most cases and again we would love to see domestic production of vessels and that will come when the industry scales up and we have a pipeline of projects to support that kind of investment.

A complicating factor in this area is the Jones Act which requires that—requires foreign—prohibits foreign flag vessels from transporting materials between U.S. ports but also between points in the U.S. In other words when a turbine is constructed in the—on the outer continental shelf in the U.S. that turbine becomes a point. So if we are using foreign flag vessels, we need to construct the construction strategy in such a way that support vessels are moving materials between the land based operation and the construction vessel.

This is going to be a huge challenge and it's one that we'll be testing out very shortly. The first two projected installations are the Cape Wind project. This is a barge that has been—the RD McDonald is a barge that's been purpose built by Week's Marine in New Jersey to specifically for—excuse me—for the Cape Wind project. The Cape Wind project is in fairly shallow water and it meets the requirements for this—this vessel meets the requirements for construction here.

On the other hand the Block Island deep water project is using the wind carrier—Norwegian wind carrier (Fred Olsen) so they will be dealing with the challenges of remaining Jones Act compliant while using a foreign flag vessel and this vessel will not be coming into port. It will be operating completely offshore and we are going to learn a lot from that first experience.

And just briefly the area of cable connection is also very complex and requires specialized vessels for the installation of the cable and again support vessels in a variety of configurations. These provide opportunities for existing U.S. vessels as well as construction opportunities as the industry evolves.

And just looking ahead beyond our first launch phase we need to keep in mind the longer term priorities of driving costs down and again looking to the priorities that identified in the UK. They seek greater opportunities for driving down the cost. These are the areas that they're targeting. We need to be looking at all of them as we move forward in subsequent phases and I think really the most important is the long term policy stability which reduces financing risks and allows us to accommodate the long development timeframes for offshore wind but we need to be looking at all these areas moving forward.

And with that I will turn this over to Michael Ernst for the next presentation.

Suzanne Tegen: Great. Thank you so much Fara and I'll just introduce Michael here and then he can take it over. Michael has 30 years of energy experience as an environmental attorney for a state agency, the law firm, an independent transmission company and now a senior consultant for a national engineering and environmental consulting firm.

As director of regulatory affairs for the Tetra Tech Energy Program he supports siting and permitting for various proposed onshore and offshore wind farms as well as interconnection cables in the Atlantic Ocean. He also supports transmission development such as the C Link submarine cable from Boston to New Hampshire and underground HBDC connections to the grid.

He helps lead policy analysis for the DOE funded annual offshore wind market analysis and supply chain studies and the DOE vision report. He's an active member of the offshore wind development coalition and also he AWIA offshore wind working group. He has his JD from Northeastern University School of Law in Boston and a BS from Davidson College in Davidson, North Carolina. Michael?

Michael Ernst: Thank you Suzanne and thank you Fara for a great introduction. I'm just looking for my controls here to move the slides along but as Suzanne explained, I'm part of a large team led by navigate consulting to actually explore the offshore wind market and evaluate the supply chain in the market and we are in the process of continuing to produce annual reports since 2012 assessing the industry overall and the incentives and the challenges to overcome—to develop the industry.

Still—let's see—here. There we go, alright. Let's see. I'm sorry. I'm still having trouble getting the first slide out here. Thank you. This is a summary of the report overall and the next slide shows an outline of the policy sections. The report itself is detailed. I've got several slides to run through here but the report itself will provide more detail and we can get into more detail in the questions and answers. This is the basis for the federal and state policies that have been developed which Fara introduced—the various environmental concerns, the state environmental goals including the renewable portfolio standards which also drive onshore wind development but are critical for developing and encouraging offshore wind at a higher average price.

Various federal laws and the policies that we're exploring at a federal level are primarily the tax credits—reduction in investment tax credits, accelerated depreciation deduction of various grants and loan guarantees including important guarantees from DOE and the new EPA regulation of fossil

emissions that have been upheld by the U.S. Supreme Court and will continue by continuing to lead to the retirement of more fossil fuel generation open the door for more renewables including offshore wind.

But as Fara noted—with the stale mate in Washington and the expiration of the production and investment tax credits, states are becoming even more important in driving all renewables and especially offshore wind through renewable credits and specific ocean credits and preserving the RPS programs and long-term contracts.

This is again outlined from our report of the key sections that we explore. For DOE the next speaker—Patrick Gilman—will be discussing in more detail the DOE program and the advanced technology program and pilot projects that are funded by DOE and then the tax credits here. And the Bureau of Ocean Energy Management is the federal agency responsible for leasing on the outer continental shelf the areas for development of offshore wind as well as they also lease the areas for development of oil and gas offshore. And we'll discuss that competitive option process shortly.

Here's a brief summary of all the DOE activities that Patrick will discuss next, more details on the tax credits and deductions. The investment tax credit is particularly important for offshore wind because of the long lead time so it's even more important than the production tax credit. So cape wind and deep water wind both are eligible for the production tax credit because they've invested 5% of the cost of their projects prior to the end of last year.

(Unintelligible) also provides very detailed guidance to move the process to developers to help move the process along and to meet the specific regulatory requirements that they have established and leasing conditions that they've established. This is a summary of the overall lease process which begins with

state task forces. Typically at least two dozen representatives of state and federal agencies participate in these task forces including representatives of Native American tribes that are interested to explore the initial constraints and competing uses and identify the area to be developed.

And then the (unintelligible) process works through the lease process and the site assessment plan for installing facilities to study the wind in greater detail at the site and the water conditions and ultimately the construction and operations plan for construction of the wind farm that will require an environmental impact statement.

This is a list of the federal approvals typically required for each offshore wind farm. Here's a list of the typical state and local approvals that will depend on the individual state that you're working with and the—which really primary to the onshore interconnection—the submarine cable that brings the power onshore crossing sensitive coastal areas and interconnecting to substations on shore which also require local approvals.

These are the major environmental issues that we have to address and the bird and bats studies focus on the migratory threat and endangered species. These shipping routes offshore are critical obstacles to be avoided and one challenge here is that the industry is now reevaluating the current shipping routes and access to ports led by the coastguard because they recognize that we're looking to install offshore wind farms from 25 to 30 years or longer and they need to make sure that the current routes are going to be adequate in the near future.

So this is an important study that's underway and continues. It's not completed yet which complicates final siting but is an important factor. Commercial fishing is one of the major competing uses offshore that is always explored at

great depth. Specific task forces actually have been created in states Massachusetts and Rhode Island with a fisherman to have working session to figure out exactly where the sensitive areas are, which are to be avoided and then the marine mammals are one of the most sensitive of the endangered species that are evaluated and their migratory routes and their feeding areas.

And each lease that is issued now actually has two to three pages of conditions to protect the mammals from vessels—form the survey vessels and the construction vessels that will be operating to service the offshore wind farms. Military practice area is another very significant area depending on the state that's involved but firing—active firing ranges have to be avoided and many other areas are used for amphibious military practice and airborne practice areas and in that case the developer has to negotiate with the Department of Defense to schedule surveyed and construction activity.

The other key issue I would like to mention here is the sensitive viewpoints. This is certainly a key issue for the Cape Wind project off Cape Code which is only—begins only five miles offshore. So one of the many key lessons we've all learned from Cape Wind is to develop further offshore where there's much less of an impact or beyond 20 miles—generally no visual impact—and that's an issue that has been an important factor and we do photo simulations of offshore wind farms for each of the proposed areas so that people on shore can see what the facilities are likely to look like.

This page gives an updated status of the competitive option process for the leases in several states—the most active states so far. So in Rhode Island deep water wind has already won the option there for up to 3500 megawatts of offshore wind and which they are beginning to explore to develop in phases of probably in the range of 500 megawatts at a time because they need to first sell that power before they can begin developing the projects.

Virginia is the second lease that was held and Dominion won that area for over 2000 megawatts of capacity and again they're beginning to look at a first phase of about 500 megawatts. They also have a pilot project that Patrick will be discussing later funded by DOE.

Maryland is the next live option coming up August 19th. Two areas—850 to 1450 megawatts—many constraints and 16 bidders are qualified to bid on those two areas. An important attraction in Maryland is that they have ocean renewable energy credits for 200 megawatts. They're finalizing those regulations but that's an important guarantee to help finance the Maryland project and one reason it's so attractive to bidders.

Massachusetts will be having a sale this winter for four areas, each available for up to or over 1000 megawatts and I'll show you a map on that shortly. New Jersey is also identified up to 3000 megawatts of total capacity. NREL is exploring or recommending two to three lease areas for option there. They've been developing their ocean rec since 2011 and so far have rejected two proposals by Fisherman's Energy for a pilot project—a 30 megawatt project for OREX but that process is continuing actively and Fisherman's is appealing the latest rejection.

Finally New York also will be having an auction process. The call for information has been announced and they will be proceeding with the sell process during the winter for a site just outside New York Harbor and then they're looking at additional areas further offshore.

These are several of the—many of the states but not including South Carolina and Oregon that are also now moving forward. The RPS standards as we've talked about earlier are critical to helping create the demand for offshore wind

especially on the East Coast where we don't have sufficient land capacity for onshore wind or solar to meet the high renewable requirements.

This is a map of Massachusetts that shows the Cape Wind Project here between Cape Cod up here and Martha's Vineyard in Nantucket. It also shows the Rhode Island wind energy area where the lease is held by Deep Water Wind and here's the Massachusetts area down here. Let me note that this areas used to extend twice as large all this area out here but this area was eliminated as a result of negotiations with the fisherman sensitive scallop territory and sea duck foraging in this area.

What's important to note here is that the average price of the Cape Wind Project is 18.7 cents per kilowatt area plus inflation over years which of course is higher than onshore wind but one of the many key factors here that was critical to the approval of the Cape Wind contract with the local utilities is the fact that as Fara noted the offshore wind blows steadily during hot summer afternoons and it's augmented by the sea breeze.

And what this could result in is the substantial availability based on actual wind measurements during peak demand periods recently that indicate in an independent study that great pairs could save $7 billion from Cape Wind's operation over its lifetime and displacing fossil emissions—oil and gas emissions at peak periods.

This is critical to the overall benefit—cost benefit analysis that helped to approve the contracts and I would just note that Cape Wind is now with the latest federal grant over—reached over half of its financing for the $2.6 billion.

This is an example of the analysis that NREL did to identify the four Massachusetts areas that will be leased. Half of the areas are in shallower water that can be—can use seabed foundations and the other half will require floating foundations that would be developed later after the floating turbines are developed.

I need to wrap up my presentation and so I'm going to skip through these slides here of these individual states and just get to a conclusion. We can discuss any of the other states in greater detail later. Atlantic Wind Connection is the offshore wind backbone cable.

So the renewable portfolio standards are key. Long term power contracts in several states provide the basis for financing in those states and a broad definition for cost benefits is critical to approval by the public utility commissions.

Here's another summary of the benefits of offshore wind and a conclusion summary. I'm just going to skip ahead and encourage you to look at the—lookout for the new report that will be available at the DOE website and the last year's report is already available at the DOE website and I'm happy to take questions during Q&A or even after the webinar after the—if you have questions later if that's the contact information. Thank you.

Suzanne Tegen: Great. Thank you so much Michael. It's a very complex process obviously and it seems like, you know, you can hardly fit it all on a page—all the steps that a developer's going to have to go through and you all are really familiar with that.

I think we're all looking forward to the forthcoming report so thank you for the information on that. Our next speaker is Patrick Gilman from the

Department of Energy. He's the wind deployment manager for the Wind and Water Power Technologies Office. Patrick manages DOE's efforts to address policy siting and permitting issues that affect development and operation of land based and offshore wind farms in the U.S. He was coauthor of the DOE and Department of Interiors National Offshore Wind Strategy and also led the development of the advanced technology demonstration project's initiative and he will be discussing those projects today. Patrick?

Patrick Gilman: Alright, thank you Suzanne. With keeping with the theme of IT adventuring Tessa from NREL will be helping me advance my slides today. And I think at this point we're going to be moving from sort of the good kind of conceptual overviews that Fara and Michael have been giving to talking about something a little bit more concrete and in the case of one of the first stage projects that we worked on actually in a literal sense.

So can every—before I start can everyone see my slide? Suzanne are we good to go there?

Suzanne Tegen: Yes.

Patrick Gilman: Alright so first up—why is DOE looking at offshore wind? I think Fara and Michael did a good job of setting the stage of sort of the market context. I mean the opportunity is huge in the United States. The offshore wind resources is about 4000 gigawatts which obviously, you know, even a fraction of that potential being realized would pose major benefits to the United States particularly in coastal states where the load is focused and where electricity prices tend to be higher.

You know, I think that for the purposes of this presentation I want people to focus on sort of this little yellow box on the right here. What we're trying to

do with the offshore wind demonstration projects is really reduce barriers through the effect of getting projects in the water so that we can learn from them. And, you know, we at DOE feel that we're really in a unique position as a federal research and development agency without a regulatory mandate to push this industry along in a way that nobody else can. So we're endeavoring to do that.

So next slide. As I—as Suzanne mentioned a couple of years ago I took part in this process with DOE and DOI to develop a national offshore wind strategy which had two critical objectives—reducing the cost of energy through technology development and deployment and then reducing deployment timelines and uncertainties. And we've invested, you know, several hundred million dollars in both dedicated funding opportunities like the ones that you see here in these columns of which the advanced technology demonstration project is sort of the crown jewel and the most significant investment at $168 million.

But also through interagency partnerships with Boehm on things like environmental research and working with them to help them optimize their process which is something that the demonstration projects are also focused on. So next slide.

The goals—the goals of the demonstration projects are sort of two fold in the case of the technology. First is to prove that in the market context of the United States and the technology context of the United States and with the resources that we have here that we can install these innovative offshore wind systems and get back to the point where we are actively competing on a level playing field in terms of the technology and knowhow with what's being done in Europe currently and also to drive down the cost of those innovations by showing—by proving them out in an operational setting and collecting data

and using that to form the basis for a future RND in both the industry and the government level.

The second goal—next slide—is to test—sort of really field test on a small scale the permitting and siting process. So make sure that every, you know, people have a chance to cut their teeth the regulators do on real projects but in a way that's sort of at a small scale so that people both within the regulatory community and then in the public at large can get used to the ideas associated to offshore wind, the benefits that it presents to the country as well as the cost that they might face as a result. Next slide.

So we in 2012 issued this funding opportunity and the way that it's structured is that the initial phase we awarded seven projects of $4 million each to kick start the planning initial engineering, design and permitting work for seven projects and then at the end of that period go through a rigorous down select process which many of you know we just completed and resulted in three further so to go onto construction and operation.

So next slide—phase one selections in FOO. We had a diversity of projects across the country in every significant sort of body of water in the United States—the Gulf of Mexico, the Atlantic coast, the Pacific coast and the Great Lakes representing a wide range of technology types, market conditions and everything from the University of Maine looking at a really, really innovative concrete floating structure to be deployed off of Mohegan Island all the way to fisherman's enter to much more advanced stage project looking at deploying off of the coast of New Jersey off Atlantic City.

So now we've got those projects submitted—their reports to us submitted, their documentation. We've been through this process to select down to three and those three I'll talk about here in a second. Those three are moving on to

the second phase of the process which entails them first getting to, you know, final engineering completion of their (unintelligible) regulatory and interconnection requirements, you know, getting financed, getting PPAs.

In that phase they're getting 6.7 million each and once they've hit those milestones, we'll move to the fabrication, installation and commissioning phase of the projects at which point they'll receive up to and a total of $40 million each to fabricate their systems, deploy them, install them and then for a period of five years once they're commissioned collect data on them in a variety of ways so that we understand better how these projects operate in the U.S. context.

And in those phase two selections as I mentioned there are three projects that are going forward to full demonstration. So next slide Tessa. They're Fisherman's Energy off the Coast of Atlantic City, New Jersey, Dominion Power off the coast of Virginia and Principle Power off the coast of Oregon. And in addition, you know, we felt that two of the other projects—two of the other three that were in the first phase of the initiative or two of the other—yes—two of the other seven total had some really promising results with their technology.

So we chose both Leadco off of the coast of, you know, looking at the coast of Ohio as well as the University of Maine to do additional RND on those phase one technologies to push them further along towards being ready for deployment so next slide.

So first project I want to talk about—Dominion Power. They're about to have projects located in federal waters off the coast of Virginia immediately adjacent to the wind energy area that Boehm has designated. We're looking at two turbines here, six megawatt machines made by Alstom using an

innovative twisted jacket foundation that saves a lot of steel over conventional jacket alternatives.

This is a pretty aggressive project in terms of both the depth that it's operating at and the distance from shore. 23 nautical miles is substantially further than any of the other projects that are currently being considered in the United States. Next slide.

A couple of key things here that I want people to take away—first is that we're really excited about the Alstom machine that's being installed here. They're leveraging a couple of other DOE investments that we've made in the turbine technology that we'll be looking at—feedback and feed forward controlled systems. So literally the turbine will be looking at the wind using Lidar and other sensors looking ahead at the wind coming out it and will be making adjustments in real time to the pitch of the blades in the aw of the machine to reduce the wear and tear that the machine experiences which is really cool.

And it'll be testing some new hurricane ride through capabilities—that's something that's unique to the United States context. In terms of the benefits that it poses for the industry, I think the fact that it's being proposed—that it's being developed by a major utility is a significant advantage for this project that, you know, if utilities tend to be, you know, fairly slow moving, they're not big risk takers but if they get behind something, they get behind it in a big way and I think that the experience that Dominion brings to it will make this project really successful.

It's also in federal waters which means that Boehm, the folks on the Atlantic and in Virginia will have a chance to trace there to go through that process. Next slide. Next project is Principle Power—wind float specific project off the coast of Oregon looking at installing three to five six megawatt machines

currently playing to seaman's six megawatt machines on a floating semisubmersible platform at a depth of 435 meters so 1500 feet which is really, really impressive. That is substantially deeper than anything that offshore wind is—that anyone else is looking for offshore wind currently at a distance from 16 nautical miles from shore, you know.

And if anyone on the phone knows the coast of Oregon there, this is a really energetic environment. So I few can do it—if we can deploy these machines there, that opens up a huge swath of territory both in terms of the water depth but also the wind and the wave conditions that exist at that site. Next slide.

So a couple of things to focus on here. I think that the floating technology in particular is really, really interesting and presents a huge opportunity for the U.S. to take a technological lead in the offshore wind space. You know, the whole U.S. west coast is deep water offshore wind resource. that's really, really great and this technology could help open that out and, you know, we think that there's real opportunities to advance the cost of energy using floating wind, perhaps even beyond what's possible with fixed bottom wind given for example the fact that you don't need specialized insulation vessels.

You can assemble these things at key side. Tow them out and tow them back in when you have major repairs to be made. A couple of big industry benefits here. This is likely to be—Principal Powers likely to be—Wind Float Oregon is likely to be the first project that's installed in an array and that means a lot for figuring out how to optimize installation operations, figuring out how to optimize cable layouts, figuring out how to optimize O&M strategies as well as, you know, looking at turbine interactions, the wakes there.

It's going to be the first time the Boehm specific region is dealing with offshore winds so we've had a great partnership with them. And again because

this is, you know, represents big opportunity for us to take the technological lead, there's a huge potential manufacturing opportunity for the U.S. Next slide.

Alright finally last but not least the Fisherman's Energy—this project is looking at installing five megawatt machines in state waters off the coast of Atlantic City, New Jersey. This is the project that's furthest along in the queue. They have—for all intents and purposes—their permitting basically finished. Obviously they're facing some issues with respect to their PPA that they are working through. Next slide.

So we think that, you know, this is using a similar foundation to that being used on Dominion so I think that there's some really interesting benefits here looking at the interaction differences and the interaction between the turbines and the foundation there that will help optimize the design of those foundations going forward.

The XCMC Darwin machine that this is planning is a really innovative machine. It's got a much higher tip speed than the other machines that are being used in this funding opportunity which means, you know, all else being equal that the potential for this machine to be lighter and cheaper than the others is pretty high so we're really excited to see that as well as the fact that, you know, this is a great laboratory for testing turbine to turbine interactions so that the effect that one turbine has on the energy production and wear and tear on its fellow turbines down the line.

Fisherman's has a scanning Lidar set up on a building in Atlantic City that can see the entire wind farm area as well as and they're going to be using that to test some really interesting strategies for managing weights so that they don't, you know, cannibalize the energy capture there too much. And I think that

there's—it's also important to note that proximity to Atlantic City and the number of people who can drive from their homes to this major destination and see firsthand what offshore wind represents really can't be underestimated.

This is a place where folks want to see offshore wind. It's three miles offshore. It'll be there. They'll be able to see it. They'll be able to feel it and I think that that's going to represent a huge opportunity for the rest of the industry to gain a foot hold. Next slide.

Alright so two minutes under time. Hopefully we still have some time for questions. We're really excited about these three projects moving forward. We're also really excited about the potential for Leapco and UMA to keep working on their technologies and deliver something of real value to the country and happy to take any questions at this time.

Suzanne Tegen: Great, thank you so much Patrick and we do have a couple of questions and it looks like they're both directed at—well let's see. One of the questions went away. So we do have one question and I think it is directed to you Patrick. Is there any interest ideally to use a different model to advance wind energy in the Southeast—particularly North Carolina—that's not based on the university model because currently the solar market is rapidly accelerating and it's based on a private sector model.

Patrick Gilman: Yes so that's a good question. I think that there's a number of things that we're doing in the Southeast to sort of advance understanding of the opportunity there and push that market along. First we have a southeast regional resource center that's being led by the southeast during coastal wind coalition and with some partners in the North Carolina Solar Center. You know, they're working

really hard to sort of advance the understanding of the state of the opportunity there.

In addition Suzanne and the team at NREL are working on new resources to help folks understand that, you know, the potential in the Southeast is there and its major particularly now that we have low wind speed technology that's being deployed around the country so we're looking at producing new kinds of wind resource maps that better reflect those opportunities so that, you know, when a wind developer goes in there they're literally—the wind resource that they're trying to exploit is literally on the map.

So I think we're pursuing a number of things there and of course always happy to take feedback so happy if the, you know, the questioner wants to follow-up after the meeting.

Suzanne Tegen: Okay, great. The other question is about the EPA process for the three projects and what that process looks like. Does it, you know, look like a regular EPA process or is it different because it's for an offshore wind demonstration project?

Patrick Gilman: So it's different based on, you know, we've got two projects in federal waters and one project in state waters and the project in state waters has already been through an EPA process through the Army Corps of Engineers. DOE is currently working to adopt that, you know, for our purposes that EPA analysis and, you know, provide some—sort of beef up the supporting documentation there.

With respect to the two federal waters projects both—so they're following two different pathways and they're interesting pathways. First Dominion is actually going to be operated—their project is going to be operated on a

research lease that's being applied for by the Virginia Departments of Minds, Minerals and Energy and so that makes the process a little bit different than the commercial leasing process that Principal Power is going through.

But I'll say that the Virginia state taskforce and the Oregon state taskforce that both have, you know, a panel to look at offshore wind issues in those states have both been very active in the projects. Boehm has issued a notice of intent to prepare an environmental assessment for both of those projects and we are actively engaged with them both through the taskforce process and in, you know, as our—as a cooperating agency under EPA and really close coordination with them to make sure that all of the issues that these projects might face and the folks and the, you know, the resources that they might impact are the concerns—those concerns were addressed early in the process and so that everyone's heard.

So we're early along in those processes but we fully anticipate, you know, we've had a great partnership with Boehm and we fully anticipate that those processes will happen in, you know, a responsible and expeditious way and they'll conclude in time for these projects to commission as planned in 2017.

Suzanne Tegen: Great, thank you. We do have a couple more questions here. One—what's the status of the Chesapeake Lake DOE project?

Patrick Gilman: Yes so for those who don't—who aren't familiar—a couple of years ago DOE purchases the Chesapeake light tower as a potential site for what we're calling a reference facility for offshore renewable energy and that would be a facility where we could sort of set as a station for calibrating the kind of, you know, wind resource assessment devices like floating Lidars and things that industry is going to be using—is likely going to be using—because met towers are really expensive and hard to permit.

We are in the process of, you know, doing the structural assessments and planning to see if that facility can support the times of research that we want to have done there, you know. We're finalizing those assessments and we're trying to figure out how we move forward with potential funding for building it out in the next—in the coming years—so stay tuned.

Suzanne Tegen: Okay, great. All three demo projects selected were using direct drive turbines, not geared. Is that intentional? That's another one.

Patrick Gilman: Yes. I mean I think that there are benefits that we think direct derive technology post to—post in terms of reducing the O&M costs for offshore wind. I can't say that it was intentional. You know, all of the projects that we saw if you noticed the—if you look at the trends in Europe, the machines that are on the drawing board—the vast majority of them are direct drive machines.

I mean there's some—I know Vestis is working on a medium stage geared machine but, you know, the folks who are the farthest along with their next generation sort of six megawatt class machines—Alstom and Siemens are both using direct drive technology.

Suzanne Tegen: Great. Okay, we're going to ask one more question and then I'll wrap things up. Are there opportunities for federal agencies such as Department of Defense to purchase power though one of the current project PPAs?

Patrick Gilman: That is a really good question and I'm afraid I don't know the answer to that. I know that, you know, were—now that we're past sort of the competition stage of the funding opportunity we are in a position where we can be a lot more active and a lot more creative in terms of helping them out to get what they

need to have done in terms of power purchase and financing and things like that.

So, you know, I wouldn't say that it's off the table. I don't know that any of the projects are currently pursuing opportunities through DOE but I really don't—I really don't know.

Suzanne Tegen: Okay thank you and thanks everyone for sticking with us. I'd like to thank all of our speakers—Fara and Michael and Patrick. This has been a great webinar. Just a reminder that we have some upcoming webinars. The next one is August 20th on the wind technology's market reports. That'll be an expanded presentation on that from what people might have seen at the summit. This is the actual report that will have come out.

And then in September on monitoring and mitigating strategies for a (unintelligible). October and this one's tentative but this is also on offshore wind projects and updates and then in November we've got the collegiate wind competition which is tentative but we'll likely do that one. So thank you. Special thanks to the Department of Energy for funding these webinars—the wind exchange webinars. If you do have questions, you've got my name there and (Ian)'s as well as (Brie)'s and please reach out to us if you've got questions.

Otherwise everybody have a great rest of your week and we will talk to you next month. Thanks so much.

Coordinator: Thank you for joining today's conference. All participants may disconnect at this time. Standby.