WINDExchange Summit

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Suzanne Tegen: If everyone could find their seats, we're going to begin with that review program. So I'm Suzanne Tegen and I'm with the National Renewable Energy Lab and I'm really excited for this next panel. It's called Moving Markets Forward. It's called moving market forward to emphasize that even when the economy is struggling or when there's a lot of uncertainty in policy and in the wind market in general, we need to be there to provide certainty to the people who ask those questions to the stakeholder, to the people who don't know about wind in the general public, to the policy makers.

We still get questions like do we have to put up a gas plant for every wind farm that goes in and don't wind - doesn't wind kill birds and I heard that that's actually really bad for the environment - things like that. You know, wind turbine syndrome - we've all heard of that kind of thing. So this panel was put together to answer questions in those realms and we have some of the nation's experts on all of those issues right here on the panel.

So I will introduce each one of them but after (Stacy) and (Michael) and (Steve) talk about some of the issues that I just talked about, (Kevin)'s going to follow up with the kind of developer customer perspective on purchasing renewable energy.

And the point again of this panel is to give you answers to questions that you get from people and also to give you references so that you can say, you know, I'm telling you the truth but here's somebody who actually did the study, you know. Go to this website or here's this report. And we will be able

to take a few questions - clarifying questions after each speaker and then if we can have that time at the end for a little discussion, that would be great.

So without further ado I'm going to introduce Stacy Tellinghuisen and she is a senior energy and water policy analyst for Western Resource Advocate which is a nonprofit conservation organization that protects water, land and air in the west. (Stacy) works on both sides of the energy water nexus researching the impact of energy development on water resources and the energy impact of new and existing water supply.

She's published numerous reports on the subject and has testified before the utilities and regulators on water savings associated with clean energy choices. Prior to joining WRA Stacy worked on water issues for the California Sustainability Alliance and the city of Moab, Utah and taught national history to (unintelligible) in parts throughout California and Utah.

She received her masters of environmental science and management from UC Santa Barbara and did her undergraduate work at Carlton College. Please help me welcome Stacy.

Stacy Tellinghuisen: Thanks everybody for sticking around after lunch for that - their lunch session. I'm going to talk about the energy water nexus today. I'll focus mostly on the water embedded in energy and how we can use water as a tool to help promote clean energy. I would also put a plug in here at the Mandalay Bay. I was looking out my hotel room window last night and appreciating the wave pool which I think is probably an apt example of the energy water nexus. So hopefully everybody gets a chance to investigate that more later.

Most of my talk today will focus on the Western United States but I would say the recent energy water issues around the nation over the past decade or so -

here's just a few of the newspaper headlines that we've seen. In 2004 there was a severe draught in the southwest. Well for the last ten years or 15 years we've seen increased severe draught in the southwest. 2008 we saw some power plants in the southeast affected by draught and water scarcity.

In Texas in 2011 and 2012 the state of Texas saw their worst one year draught on record and impacts on their energy sector and I'll talk a little bit more in detail about some of those impacts. And then in 2012 we saw water scarcity and water shortages affecting the energy sector around the country.

So again I'll focus really primarily on how water is embedded, how water's used for energy and I would just say at the outset I think that there's a couple of reasons to be talking about the water benefits of clean energy. I think one of them is that water is an issue that I think crosses political boundaries. So where climate change can be a politically sensitive topic to discuss, I think what we've found is that we can talk about water with folks that aren't interested in climate change and it helps us to sort of cross that political divide.

So I would say from the outside that's one of the reasons why we have been talking about the water benefits over the years. I think the other reason is that - at least in the interior west and I think in many other parts of the country we're really looking at a zero sum gain when it comes to water resources. The Colorado River basin - Colorado River is perhaps the most important water supply in the interior west. It supports around 30 million people including 90% of the water that comes to Las Vegas and supports several million acres of irrigated agriculture.

This graph here - the yellow line is average running water supply in the basin and the red line is average ten year running water use in the basin and you can

see some time in the last few years those two lines really crossed. So it means that any new water demand in the region has to be met by an existing user. So any new power plant that goes in is more likely than not going to have to acquire water from an existing water user. And likewise if we see power plants retire, that brings up water that can meet agricultural and municipal demands or environmental needs.

And I think this is really the story that we're seeing in other basins around the west as well. So how much water do energy supplies (unintelligible) use. This is a graph and I'll walk through the details but it just compares the water use by technology and by field source for several of our sort of common energy sources and these are really western focus numbers. On the Y axis is consumptive use and gallons per megawatt hour of electricity and then on the X is all the different types of technologies or major technologies.

These are color coded. The gray is coal. Red is oil or gas and then on the far right hand side of the axis we have some of the renewables. So a typical western coal plant would use between 500 and 600 gallons of water per megawatt hour of electricity produced. A combined cycle gas plant would consume about a third as much water per megawatt hour produced.

Looking at some emerging technologies - IDCC coal plants are a little bit more water efficient than a conventional pulverized coal plant. But tracking (unintelligible) source typically adds an energy penalty and if you were to retrofit an existing pulverized coal plant with carbon capturing storage, you could potentially see water use triple on site. So I think that's an important consideration when looking at how we're going to deal with carbon in the future.

Looking at the renewable (unintelligible) is really variable. A typical solar thermal plant depends on the cooling technology that's deployed. If it's a dry cool plant it has pretty low water use. A wet cool plant would have higher water use comparable to a conventional coal or a nuclear plant. And I should add actually that a conventional coal plant can also use dry cooling and that reduces their water needs significantly.

But perhaps what's significant also is that energy efficiency, wind and solar PD use no water. They don't serve on the ground at all. This is a map of our region that this illustrates where water is used for power generation in the region. And the circles on this map are estimated water use by power plant and the larger circles reflect larger amounts of water.

So for example the palavered nuclear plant in Arizona consumes around 65,000 acre feet of water per year. It's the big purple spot in Arizona. Several of the big coal units in the four corners area - Navajo, San Juan and the four corners generating stations have up until really recently consumed around 25,000 acre feet of water per year.

Water use in these states that are shown here is a small percentage of the total water that's used in the region but I would argue that it's not inconsequential. And I can tell you for the five southwestern states of Arizona, New Mexico, Colorado, Utah and Nevada the water use in those states is about equal to the water consumed by the city of Denver, Phoenix and Albuquerque combined so again not inconsequential.

I think the other big thing that we're starting to recognize is that water intensive power plants are also vulnerable in times of draught. Nettle did a study a few years ago looking at a model scenario of how draught might affect the power sector and I'll run through sort of their topline conclusions in this

modeling scenario. It's on the electricity generated at coal plants in the region declines in a draught scenario. Gas plants which are more water efficient increase their output, not surprising the hydraulic centers in decrease and there was no change in the energy generated at renewable facilities.

This led to a second tier of impact in the power sector. The first is that energy not served or energy demands that were not met either through voluntary curtailment or non-voluntary curtailment in the model scenario - that increased. Prices increased and carbon dioxide emissions increased.

There's a couple of caveats I think from their study. The first is that the actual impacts of the draught really depend on a host of factors. In the interior west it certainly depends on water rights more than anything else probably but I think one of the more important conclusions from their analysis was that technology choices can really act as a head against the risk of draught particularly over the long term.

That was a model scenario. Texas in 2011 we saw a real life scenario of what happens when water scarcity impacts the power sector. 2011 Texas saw their worst one year draught on record. Increased temperatures lead to record electricity demands during the summer heat wave. They had really low water levels at a number of their power plants. 11,000 megawatts of electricity generation had record low water levels. (Unintelligible) said they were concerned about 3000 megawatts of generation that was at risk if the draught didn't end.

And in the end if they had some sort of unusual rain storms that relieved draught conditions and they only curtailed one small 24 megawatt power plant. But they did bring online a couple of gas plants - 470 megawatts worth - and the state also curtailed 1200 senior agricultural water rights. Those senior

agricultural water users I think today are still in court with the state because they were curtailed out of priority and I think last I heard was that they were winning their case. And then a secondary impact again was that electricity prices skyrocketed in the state.

So knowing going forward that we're likely to have increased water scarcity particularly in the southwest whether it's just because of municipal growth and demand growth and also because of climate change impacts on our water supplies. I think it's important today that we consider in our long-term investments how to make sure that those energy investments are robust and resilient in the face of draught. And I think there's a few different ways that we can insure that those investments are resilient.

The first is through public utility commission planning efforts and I have some examples from utilities around the southwest that are incorporating water into their planning. Prior to 2009 there were no utilities in the interior west that were incorporating water into their long term planning. That's changed over just the last five years. I think that's an important change but I think there's more that we can do.

So today utilities in Colorado, Arizona and New Mexico all include information on how much water they expect to use over the planning horizon for their resource portfolios and for individual resources. There's a couple utilities - Arizona and utilities here in Nevada - that actually put a value on water. I think that's a really challenging step to take because it's difficult to estimate what the value of water is today much less looking out 20 or 30 or 40 years into the future with expected scarcity.

And then I think the third piece that some utilities are doing is really evaluating the risk of draught and the only example we have of that is PNM in

New Mexico. There are a couple of other venues where I think water issues are really important in the energy decision making and I'll just highlight the last one that I have on here and that's in air quality regulations. And I think we have a real opportunity and EPA forthcoming regulations for greenhouse gas emissions from existing power plants through their 111B process.

I think that that's an opportunity where we can find some real (unintelligible) to both promote renewable energy and to the extent that we are expanding the renewable energy sector also save water (unintelligible). And that's I think a venue that in my experience we've seen pretty limited engagement. We've seen lots of engagement from I would say the coal sector and a fair amount of engagement from the environmental sector but some of the other industries that I think stand to benefit have had in my view sort of more limited engagement. I think that's a real opportunity here.

Just a couple of examples. I think Arizona public service probably is the gold standard for information. In their resource plans they report water use for the current fleet of resources and looking forward at different resource plan options - how much water those different options are likely to have. This is a graphic from their - I think it was their 2009 resource plan where they looked at four future scenarios.

And then I'll focus on the last back here. They look at what happens with different carbon prices or what happens with different gas prices or the existence of the PCC? How does that change our operations and how does that affect our water resources?

And then I mentioned earlier in terms of additional information that PNM includes a risk scenario or a draught scenario and their resource planning - I think it's a fairly limited example. I think there's again opportunities for doing

a broader example and I think one step that utilities could take to incorporate draught and planning into their resource plans is to include a qualitative discussion of how a resource or a portfolio mitigates service of draught. Again it's difficult to quantify that but I think it (unintelligible) purchase that towards that.

On the bright side what we are seeing in the interior west is that our water use for the power sector has actually declined in recent years. So (unintelligible) some research does sort of evaluate and try to quantify how much water's used for energy, how is that changing and what we've found is that water use really peaked in 2007 or 2008 and there's a few different reasons for that. Part certainly is the economy and demand - overall demand. Part of it is also due to clean energy policies and we've tried to quantify what those water savings were and to attribute them to some of these different clean energy policies.

And the biggest water savings that we saw was in 2006 with the retirement of the Mojave Coal Plant here in Nevada but every year we've also seen incremental water savings from renewable energy investments and energy efficiency investments and this really goes to 2010. We had some new research that includes 2011 and the trend continued. And I would just say that the bar that quantifies the water savings from renewable energy is almost entirely due to water savings from wind.

So I'll stop there and leave some time for questions but just to summarize, I think looking forward we - most projections show us having less water available in the interior west. And so in order to meet electricity and water demands going forward I think we have to recognize the risk and the potential impacts of draught and we need to make no regret decisions today and that I think really includes water efficient and carbon efficient technologies and energy supplies.

And then the third piece is that I think our energy sector along with our water sector need to really engage to create flexible water management strategies that perform well in the case of draught.

We have also a few reports. I know (Steve) had a box of reports that he was hoping to not carry home and I have a stack as well up here including a couple of these reports. Every drop counts which really takes a closer more in-depth evaluation of some of the public utility commission statutes around the region and how they incorporate water. And then I also have a couple of just examples of maps of different states from around the region and how much water's used by power plants in those states and these are just in the southwest and I'm happy to send these also in a PDF file. But I'll stop there and answer any questions that folks may have.

Suzanne Tegen: I think sometimes people forget that we can use this when we're talking about wind as a huge plus and of course in the west but also now everywhere in the country we're having water shortage issues. So people everywhere are beginning to see that this is actually - fresh water is really and ground water are really big problems. Next we're going to hear from (Michael Milligan) who's going to talk to us about transmission and grid integration.

He - Michael came to NREL's wind energy program in 1992 and is now principal researcher in the transmission and grid integration group. He's worked on numerous operational and planning issues related to integration of wind and solar energy into the power system. He's published more than 140 technical reports and in fact this is an old bio so probably 150 by now. (Unintelligible) in both sectors.

He participates on the leadership team for the North American Electric Reliability Corporation's variable generation task force. That sounds pretty good actually. I should have asked for five more minutes because you have a pretty amazing bio. So please stay there. Stay there. So he co-chairs the Probabilistic Method Working Group. The international agency tasks 25 design and operation of power systems with large amounts of wind energy.

(Michael) has provided testimony at public utility commission hearings and served on the wind taskforce for the governor's - Western Governors Association clean and diverse energy project and among several current projects is an evaluation of the operating reserve impact of the proposed energy imbalance market in the western interconnection.

So as you can hear Michael is very well qualified to talk to us today about all of these things. Welcome Michael.

(Michael Milligan): Thank you (Suzanne). When (Suzanne) and I were talking about, you know, topics that you might be interested in hearing, we kind of landed on some of the - what I call the FAQ's - the frequently asked questions about wind integration. And then we've got some recent work that I also want to mention.

So a lot of what I'm going to talk about came from this fairly old now power energy magazine. This is a publication of the IEEE Power and Energy Society and this is the article but I doubt that anybody can read this but I have the link. Are we distributing these slides somehow? So you'll get this link. You could actually get free an IEEE article and this is rare for IEEE to let you get something for free so enjoy it while you can.

This article looked at some of the sort of prevalent myths and I'm going to step through some of them. I don't have time for all eleven of them today but I

do know how to count and so when you see the numbers going from one to three to eight, it's because I'm trying to anchor them to the discussion in the paper. And the other thing I want to point out about this paper is this is not NREL sitting around trying to pick up this stuff through our collaboration with the international managing agency.

These questions and the answers came from sort of the international quorum. So we've got a number of the coauthors here from Europe, Ireland and so forth.

We can actually manage a lot of instantaneous wind penetration. This graph is from Ireland. Ireland - I think I mentioned this morning - is limiting the instantaneous wind penetration to 50%. And they're doing that because of concerns over the rate of change frequency - in other words system stability. It is not that going over 50% will cause a problem. It's that they don't know if there will be a problem so they're operating somewhat conservatively.

Ireland is a true island system - say that three times fast right after lunch. It's a true island system. They do have some interconnection with Great Britain but that interconnection has been out of service for a couple of years. They also have a pump storage plant. It also has been out of service so at the time this graph was generated there was no interconnection with anybody else, true island system with no storage - no pump storage. So they've been able to do this.

I'll just (unintelligible) Colorado. I think I also mentioned this this morning. I wanted to prove that I wasn't making this up so I brought some graphs from that (Piesco) sent to me. These are old based on - what is it - a 2011 record. They have exceeded that and they've hit just over 60% instantaneous penetration on a fairly small balancing area.

And so the number on question in this paper that we've dealt with is can the grid operators deal with continually changing output of wind generation. These graphs are from Denmark from nearly ten years ago now and if you look carefully, you've got two versions of the same graph. If you look carefully over on the right hand side you'll see that the wind energy actually exceeded the load for a short period of time. How do you do that? Denmark is connected to the Nordic system on the northwest side and they're connected with Europe on the east.

And so they've got large and energy markets as I mentioned this morning. Big and fast will make them a lot easier to integrate with - big balancing area and fast markets. They don't have particularly fast markets in Europe but they're big ones.

So the other thing I want to point out is that Portugal hit a 90% instantaneous penetration of wind. You know, Portugal's not the largest country in Europe but they also don't have the business transmission system. They're sort of at the end of this long link loosely connected with fame and so this is a pretty remarkable achievement. They do have a lot of hydro in Portugal and some of the frequency was supported by the Spanish system but nevertheless that's a pretty important thing.

I remember going to a utility function name somewhere in the southwest a year or two ago and the chief engineer was telling me how it's impossible to get more than about 5% electricity from wind at any given moment and I happen to have a few of these graphs in my back pocket. So it sort of changed the rest of the conversation so that was interesting.

I heard the other question, you know, the wind can start and stop on a moment's notice, you know. One minute it's blowing like crazy. Our wind turbines are spinning and a second later they've all stopped. Well that's not really the case. That could be true for a single turbine but this is an example from Texas. This is actually several years old now - I think from 2007 or 8 - and what they - let me see if I can point it out here.

This graph in the upper left - it's a little hard to see but if you see a bunch of squiggles here, each one of those squiggles is a separate wind plant and what you can see is here's a red one that we emphasize. This is a pretty drastic drop over a pretty short time period. Just for frame of reference this is eleven o'clock. This is 11:30. So within half an hour less than that we had a 170 megawatt drop of wind energy. That's pretty exciting.

But if you take a look at what happened across all of Urcot, you have this thing unfolding over 2 1/2 hours and it was a 1500 megawatt drop. Now 1500 megawatts isn't bad. That's a lot but in the context of the Urcot load and - I don't know - several years ago they were probably peaking around 45,000 megawatts. A 1000 megawatt drop - 1500 megawatt drop over a couple of hours is less than the variability and load.

So this was not as big of a deal. Of course there were some other things going on in the system that made this a little bit more exciting. And then finally the bottom picture is a satellite image of the storm that was producing all of the stuff that you see here. What happened was these wind turbines were tripping off not because the wind died down but because the wind was kicking up and the turbines shut off to protect themselves.

The point of including the satellite picture is you can see the dust blowing from states right in here. This is I think from when Logic provided us with

this. And we know that this can be forecasted if the time Urcot detected the grid operator was not utilizing the wind forecast. It's kind of early in the game for them. They hadn't figured out that they needed it. This is one of the things that convinced them that maybe we ought to start forecasting the wind.

So does the wind stop blowing everywhere ten times? No. You might have individual turbines or even individual wind plants as 100 megawatts or so - maybe 200 megawatts - you get a pretty steep decline. But over a large region things are not going to stop that quickly.

Question number seven - don't you need to backup wind and don't you actually burn more fossil fuel - I'm going to come back to that in a couple of minutes - because of these backup requirements. Well it turns out that we've been sort of "backing up generation" for decades long before wind ever came along and we call it contingency reserves and we've got rules for how you set up your contingency reserves.

There's some component that has to be standing or synchronized to the grid. Another part of it does not have to be synchronized to the grid and the idea is that they continue to reserve protecting you in cases like unit outage and the unit outage industrial plant can trip offline faster than I can snap my fingers. So if you contrast that to wind, wind is not big enough nor is it fast enough to constitute the contingency.

So what about the variability of power system? Well wind can vary. This is actually sort of a stylized picture of the demand for electricity and this covers one day. You can see - and this is not the scale but it's not uncommon for the nighttime demand to be roughly half of the daytime demand. It depends on the system but you've got this pretty well-known up-ramp in the morning so you've got your generation stack. Forget about wind for a second.

You've got your coal, gas - whatever plants you have. You set them up so that they're available for ramp up during this morning load pickup when everybody wakes up, goes to work and so forth. You've got a secondary (unintelligible) probably winter. It could be summer. People go home and turn on either the air conditioner or the lights or whatever you have but the point is there's a lot of variability already in the power system and then you start taking a look at a smaller time slice.

So well there's this trend in the morning. There's another similar downward trend in the evening. So I've got a bunch of plants that are ramping up. They're increasing their outputs so I can meet this. And then you start looking at even a smaller timeframe. We call that the regulation timeframe. I talked about that a little bit this morning. This is really a sneaky way to get one presentation to be really long.

So regulation and this is - this is the real short term, you know, second to second minute to minute kind of stuff that every power system has to deal with. So what happens when you add wind on this system? When you add wind on this system, you get more of the same. You know, the shape of the net load may not be exactly the same as this shape is but you're going to have the same kinds of things going on. You need more regulation. You might need to chase the load up a little bit faster.

If the wind happens to be dying down at the same time the load is picking up, you might have a little bit more of an exciting ramp to follow but we can do that. I'll come back to this issue of fuel usage and emissions because we did a really detailed study that I'll come back to that in a couple of minutes.

Storage is a question that comes up over and over and over again. I love storage but storage hasn't shown itself to be generally cost effective. It may be cost effective in some niches but one of the interesting things about forecast - about storage is that you have to be able to forecast when you need it. When is a good time to be charging my battery in my pump storage? When do I release it? If I release it too early, it may be that I missed an even bigger opportunity to release it an hour or two later but by that time the storage is empty.

We've been using storage for decades in the power system. It's called fuel storage. You keep the coal on the pile. You keep the gas in the pipeline or in the storage facility. You keep the water behind the dam. Those are all forms of storage. Those aren't electricity storage but they are other forms of storage and we know how to use them. And so in my mind the jargon from storage has to get over the hurdle of what's cost effective. If it's cost effective then let's use it. If it isn't cost effective, let's go find the storage that is cost effective.

We have 60,000 megawatts and change of wind energy in the US and nobody has added the storage to go along with the wind. Now in some cases where I'm from - Colorado - we have 300 megawatts of pump storage that was already there. It was actually built for the coal plant back in the 60's because the coal plants like to run it flat out but what do you do if you build a - a nuclear plant's likely to do the same thing, right.

You have this flat output 24/7 but then people go to sleep at night and they curtail their usage of lights and televisions or whatever else they have on. What do you do with all that extra energy at night? Oh, let's build a pump storage plant. We can pump the water up the hill at night. We'll bring it back during the day.

This part on the right is based on some data that we got from Minnesota. It's a couple of years old but I think it nicely illustrates toward the issue of wind integration. So this red represents demand for electricity. You're going to have that with or without wind, right, demand for electricity. The green down here represents a pretty high penetration of wind energy. I don't remember exactly. I think this is about 25% on an annual basis electricity from wind and the blue is what we call the net load.

In other words if I could make full use of all the wind energy without curtailing any of it, what would the rest of the system have to do? What would my gas and coal and whatever else plants have to do? Well what they'd have to do is they've have to follow this blue trade. And this is part of the challenge of our system operation. You can see for example that in a world with no wind despite this minimum valley here in the red - I don't know - somewhere around 10,000 megawatts. So that means that I could have a bunch of basic generations and I only need to turn it down to 10,000 megawatts and it's very cool. But now I add all this wind.

Where's the minimum valley in the blue? It's over here - what - 5000 megawatts give or take. And so what that means is that I've got - to make full use of this lid, I've got to turn down the (unintelligible) generators now down to 5000 megawatts, not ten and that can be a challenge in some areas.

So this whole concept of integration has led to the concept of integration (unintelligible) has been around for probably ten years. And I wanted to talk a little bit about some of the work that we've done looking at sources of integration cost that have nothing to do with wind whatsoever.

The first one is contingence users and I've got a lot of graphs here and again that's just to prove that I'm not making this stuff up but I'm not going to go

through the graphs in detail. A contingency reserve - so in a power system some sort of cool footprint - there's a rule that says you must have a certain number of megawatts contingency reserve and that level of reserve is typically reciprocated by the size of the largest generator on your system.

Suppose I've got a 300 megawatt gas burner. It's the largest unit on the system so my total contingency reserve is 300 megawatts. Now I share that with the other neighbors in my power pool. So Excel might share some of that with Western Area Power, might share that with Blackfield - whoever it is. So I'm not - I don't have to cover all of that. I'm in an area where we share that.

Well now some other entity comes along and they build a 500 megawatt plant. Guess what happens. My contingency reserve obligation goes up because that's the (unintelligible) 20% or 25% of the entire contingency reserve. It used to be 25% of 300. Now it's 25% of 500. That's a real cost. I've got to provide some additional cost because somebody else built a generator that I now have to cover (unintelligible).

So a contingency reserve can impose a cost from one player to another on the system. We never really worry about that. A conventional generator - gas or coal - can also impose a cost. In this example this is - this turns out it was from a coal plant that's in the Midwest. We've seen the same exact behavior from gas plants.

We've got two plants. In the upper chart you've got a plant that does a pretty good job of following what we call the agency automatic generation control. So we've got a computer that is sending out a signal every four seconds to some subset of the power plant saying I want you to move up. I want you to move down. Move up. Move down.

And so we can see here the signals in green and the plant responses in red. So it's not perfect but it's pretty good. And by the way, most of these plants were selling regulation into the (Michael) market. Plant number two (unintelligible). You send it a signal. It says, you know, stay flat and the plant keeps wandering up north - keeps going up. And then you say okay now (unintelligible) going up already. It'll keep going up. The signal says we want you to drop down. The plant keeps wandering north.

And so this - this plant actually imposes a 31 megawatt regulation burden on the system which would be an integration cost especially, you know, we don't often look at the integration cost among the source.

And then the final one - I do want to take you through these graphs because I think this is kind of interesting. This is a simplistic power system that we put together to illustrate this particular issue. So we start out in the good old days before there was any wind energy where we have a coal plant in gray, black - whatever. We've got natural gas in dark blue and some sort of combined or simple cycle gas (unintelligible) on top.

So you can see the daily load's going up and down and the coal unit's running flat. It likes to do that. Gas units moving around a little bit, the kicker moving around a little bit and so forth. Well now you introduce width so that takes us to the middle town - the one that's in green. And so what happens? Well you can see if you compared the dispatch of the natural gas units of the natural gas that is taken offline here for a while. You can also see that the natural gas is ramping faster in places like this.

You can see that now the coal plant has also got a ramp. It used to be able to just mind its own business and stay at flat output all day, all night but now this pesky wind has shown up and the coal plant has to cycle around. This is the

source of integration cost and people say look, you're bringing this wind into the system. It's imposing a cost on somebody else and so somehow that cost ought to be paid for - pay the coal, pay the gas, pay whomever it is. It's changing its output. They're cycling more and there's a cost of that because units are not as efficient when they're moving around.

And then finally the last example down at the bottom - this is an unnamed technology that is a new base load technology - not necessarily renewable. It could be too cheap to meter. It's base load. It comes in. It's got a very, very low variable cost so it always wins the dispatch, right, because it's cheapest and we've dispatched cheapest first so we can minimize the cost of operating the power grid. So sorry, there's no wind in this case.

So we start out with the good old days and now we introduce this new (unintelligible) meter. Well so what happens? This comes in at the bottom of the dispatch staff the cheapest. We want to run it all the time. What happens with the coal units? Well the coal units start cycling. They have a lower capacity factor. They have lower efficiency so now they're ramping up, they're ramping down. They don't like that.

And so the point is that if you have any new generation technology that comes in underneath somebody else on the dispatch stack, they're going to impose an integration cost up above and we never ever have thought about that until wind came along. There's the full report. There's a link here and I think I've got it. There it is. So if you get home late tonight and you need to go to sleep and read a paper, this would help you do that.

But we looked at a number of different aspects of integration cost. The issues integration cost is around. It's not going to be settled. We think that it makes sense. If you're going to charge integration cost to one entity, you should do it

to everybody and there are ways of calculating whether or not you're imposing a cost or not imposing a cost. We know how to do that but it's time consuming and it's pretty confrontational.

Do I have another half an hour? No, okay. Let me quickly go through the western wind and solar study phase two. Phase one came out a number of years ago and we found that these coal plants were doing things that their owners did not like them to do and people said well you can't possibly run a coal plant like that and if you did it would fall apart at the increasing operation of maintenance.

At the same - sort of the same time we started to see these articles saying well, you know, if you put wind on the system, you're going to increase emissions because the coal plants are going to be cycling. When they cycle they burn more fuel per megawatt hour. And so oh my gosh, it's going to be even worse when you have wind on the system.

We didn't think so and we put together what's probably the most ambitious detailed study of this probably in the world and we have detailed information that we developed with a number of partners, detailed information on key rates for all the plants in the western interconnection, detailed information on emissions rates, detailed information on operation and maintenance cost caused by cycling, by deep cycles, by shallow cycles - you name it. And here's what we came up with for emission.

So we had a couple of different scenarios with wind and solar on the system but we found that the carbon (unintelligible) that would be reduced by roughly 29 to 34% depending on your scenario and if you'd like to count in billing accounts, there's your number. Knocks would go down from between 170, 200 to 30 million pounds and the (unintelligible) maybe at 140 million. Now

that's without considering any of the cycle impacts and the efficiencies that you would take.

So then we went through and said well okay, what's the impact on carbon? We couldn't really find much of an impact on carbon. In other words you're going to reduce 30% of the carbon and then when you - then you take back some of that because of efficiencies. There really wasn't much that got taken back, right. So very little impact in the cycling. So we're left with about 29 to about 34% carbon reduction.

I'm not sure I can fully explain this. My colleague (Debbie Lew) who ran the study who's no longer at NREL could explain this better than I could. It turns out this is sort of an accident of the place of the heat or the emissions curve that you're on but actually all that cycling did approve knock. Who knew?

And then finally SO2 - here you do see a little bit of a giveback. So we reduce by 80 to 140 million pounds but then when you factor in the inefficiencies, you've got to subtract three to four million off of these numbers. So it's not - there's not that big of an impact of all things considered.

And last thing - I'll close with this - we have a pretty large and pretty detailed study on (unintelligible) as an active power control. I have a website here. There's many, many reports. We're looking at incentives and market structures - how we can do that - unattended consequences with production tax credit which is based on energy only. We think there's some cases where wind turbine flexibility can be useful in the power system.

We're looking at inertial response. We're looking at primary frequency response. We're looking at automatic generation control. So and we're doing a lot of simulations on this great old wind turbine from Western House from

Hawaii so we have lots of really cool controls testing and so we're running that right now. So I encourage you to take a look at that for any information you'd like and I'll close here.

(Suzanne Tegen): And in the interest of time I think we will - we will move on. And I don't - I was only in one of the regional breakout sessions yesterday but ours was a great session. We were talking about the Midwest and the great lakes and one of the things we talked about was the wind wildlife issues and also human health issues - the questions that come up from people in the general public and from stakeholders and the policy makers need to deal with.

And we thought well wouldn't it be great if we could point to lots of sources that talk about not just the impacts from wind energy but the impacts from all sorts of energies on humans and on avian wildlife and other wildlife. So we gave (Steve Clemmer) a really impossible task of talking about lots of different subjects in a very short time period. So sorry about that (Steve) but I know you're up for it.

(Steve) is Director of Energy Research for the Union of Concerned Scientists Climate and Energy Program. He conducts research on the economic and environmental benefits of implementing renewable energy technologies and polices at the state and national level. He also directs UCS's research on coal, natural gas and nuclear power on solutions to reduce carbon emissions and water use in the electricity sector.

So before joining UCS (Steve) is the energy policy coordinator for the Wisconsin Energy Office from 1991 to 1997. He holds an MS in energy analysis and policy from the University of Wisconsin Madison and a BA in political science and history from (unintelligible) college in Minnesota. So welcome (Steve).

(Steve Clemmer): Thank you (Suzanne). So on this particular topic I think it is very broad so I'm not going to be able to talk about everything but I'll try to touch on the highlights.

But the way that we think about this at UCS is really that if you're not choosing wind power, you're choosing something else and, you know, we want people to know kind of the bigger picture of what those choices mean. And the real challenge around it has to do with wind power could be in your local community and those impacts might be local whereas the choices you're making could be having impacts in other states in the broader region nationally or even globally. So trying to think about that and think about what those choices mean.

So you're probably all aware of what our electricity mix is in the US but the main competitors to win really are coal, natural gas and nuclear which comprise about 85% of the country's electricity - a little bit more. And, you know, obviously the mix of resources varied regionally and the amount of wins - there's about 4%. You've heard that and it's growing rapidly. And certainly, you know, wind is going to replace these different resources in one way or the other. Wind also will have to compete with other renewable energy sources. I'm not actually going to talk about that today in the interest of time.

But so it really does come down to a choice and I'm going to start out with talking about coal which for one I have a little bit more information on that I've done more research on coal but also it also has probably the biggest impact of any energy source as well so let's start with that.

So coal air plant solution - coal plant's a major source of FO2 not mercury, particulate matter, air toxic. These contribute to a number of health effects and

environmental impacts related to acid rain, smog, premature death, asthma attack. Mercury affects brain development and can cause brain damage and birth defects in children and pregnant women. There's been some studies that have tried to quantify the cost of this and the studies that are included here really only narrowly look at some of these impacts. They don't cover all of them.

But on the order of 60 to $102 billion per year health cost just from air pollution. Fortunately there's efforts underway to reduce those impacts through regulation of plants. The cross state air pollution rule which targets FO2 and knock. The Supreme Court just ruled last week - you might have heard about it - that to reinstate that rule they overturned the district court's decision. That plus the mercury and air toxic rule that has already been passed and implemented would avoid tens of thousands of premature deaths, hundreds of thousands of asthma attacks and has significant health benefits in very modest costs. So those are good ways to help address this issue.

Obviously coal plants are the most carbon intensive fuel and they're a huge contributor to climate change. The electric power sector in 2011 was responsible for about a third of all US global warming emissions. And as you can see on the right, coal was about 80% of that total from the power sector. Over the past couple of years coal has declined a little bit and that web from natural gas is increasing and I'll talk a little bit more about that later.

So global warming also has impact on human health. People often don't think about it that way but there's been a lot of research on this by UCS and others. The ITTC is coming out with their assessment report pretty soon which will be talking about some of these issues but health is impacted from extreme heat especially on elderly populations and people with existing illnesses and respiratory illness.

It can also contribute to increased - a reduction in air quality from - because that's closely linked to temperature. Pollen and allergens and sector born (unintelligible) could also increase under climate change. The World Health Organization - World Health Organization a few years ago identified that already something on the order of 166,000 people are dying prematurely already. That can be attributed to climate related impacts.

The coal also has impact on fuel cycle impact across the rest of the fuel cycle including transportation. The amount of coal that was used in 2008 is equivalent to about 104,000 mile train that would circle the earth about four times. Talk about land use. 70% of the US coal is transported by rail roughly speaking and about 44% of the total tonnage in the US comes from transporting coal - significant impact.

There's also impacts from rail and fatalities and injuries that are pretty significant. And then finally the significant emissions that come from transporting coal via rail, barge and other methods.

Coal mining also has very significant impacts in areas where that's happening. Since 2003 there's been about 320 deaths just related to accidents in coal mines in the US, hundreds of black lung deaths per year. The (unintelligible) is also an issue in places particularly with underground mining. Methane leakage, asset mine drainage has also been a huge problem that's polluted thousands of miles of streams both in the eastern and western parts of the country.

And then I just wanted to highlight one particular type of mining - mountain top removal mining in West Virginia which is a very destructive practice as you can see from this picture here. These steps might be a little bit outdated

but roughly speaking somewhere on the order of 2000 miles of streams have been buried with the debris from the tops of the mountains that have to be put somewhere. And one estimate suggests that another 1.4 million acres of forest could be destroyed by 20/20 due to mountaintop and local mining.

And the debris that does get put into streams and does have significant environmental impacts on water quality and various other things - some very toxic things that are included in that debris.

Coal waste is another huge problem. In 2008 the estimate from UTA is that there was about 136 million tons of coal ash generated every year and we've seen some pretty nasty things result from impact from this. And you may remember a few years ago in Kingston at a TVA plant their coal impoundment waste pond ruptured and spilled a billion gallons of waste into the Emery River. The estimated cleanup cost of that was somewhere around the order of a billion dollars.

In Kentucky back in 2000 306 million gallons of coal sludge from mining operations leaked into creeks and that was equivalent to more than 30 times the size of the liquid that resulted from the Exxon valve leak to put that into perspective. The picture at the bottom shows a 2.8 billion gallon coal flurry pond that exists about 400 yards above an elementary school in Marshfield and there is significant concerns about that rupturing and leakage and so forth that could come out of that.

You've probably also heard recently - more recently this year of the accident that happened in West Virginia with the chemical that was used for coal washing and spilling into the Elk River which affected water quality throughout the area as well as around the region.

So natural gas is also obviously a main competitor for wind and is usually on the mark in cases wind is displacing natural gas. And certainly natural gas is much lower air pollution, water use and waste and coal but it does produce CO2 emissions even though they're about half as much as coal. We've done some research and some modeling that says transitioning from a coal-based electricity system to natural gas would be incompatible with meeting the country's climate goals. Eventually we would need to reduce CO2 emissions from natural gas which would involve things like carbon capture and storage which are very expensive and haven't been demonstrated extensively.

Methane leakage is also a huge issue with natural gas you guys have probably been hearing about. Methane leakage is about - methane is about 34 times more potent than trapping heat in CO2 over a 100 year period and about 85 times more potent over a 20 year period so it's a big issue.

And even if methane emissions were zero though we'd still have a problem with natural gas just from the CO2 emissions but some studies have shown that even if Methane leakage rates were somewhere around the order of 2 to 3% of the natural gas that's produced that that could negate the benefits of natural gas over coal. So we're talking about pretty small numbers given the potency of methane.

You've also probably heard about peoples' water lighting on fire from methane leaking into ground water supplies which there's some limited studies that have been done on this but methane is leaking throughout the whole supply system for natural gas. Our pipeline systems are very old and outdated. It's leaking from drilling of gas - the distribution of it - and some of that has found its way into drinking water supplies.

Explosions have also been an issue. there's been some really interesting studies in some urban areas like Boston and Washington, DC that have actually been measuring methane leakage - going around the city and measuring it where there's some incredibly large concentrations of it that are at risk of explosions and you've definitely heard some examples about that in the news over the past few years.

And then clearly another big area obviously of environmental impact is fracking and fracking has a whole host of environmental issues associated with it and water is obviously a big one - water use and water quality. EPA has estimated that about 70 to 140 billion gallons of water were used to frack about 35,000 wells. I think they're a couple of years old. Each well uses about 3 to 12 million gallons and that water is injected with chemicals and sand.

The amount of chemicals per well is around the order of 15,000 to 60,000 gallons and EPA has tracked somewhere around the order of 1000 chemicals that are used in this process and many of the chemicals are harmless but there's also, you know, dozens if not hundreds of them that are harmless and toxic and can find their way both into ground water as well as surface water.

The water that is used in the process - a lot of it stays underground but the flow back that comes up has to be disposed of. And so if you can picture both the supply of water used for fracking, most of it's distributed in trucks and that creates a huge amount of truck traffic back and forth but the waste water also has to be taken and disposed of (unintelligible) for our treatment facility. So natural gas clearly also has its own set of issues.

Nuclear is another technology that may not be directly competing with wind right now but as a low carbon energy source it certainly will be in the future and obviously there's major safety and security issues related to nuclear. My

colleagues at UCS just recently - they wrote a book that was released about the (unintelligible) after which contaminated land and resulted in 160,000 people or so that had to be evacuated. The cleanup cost of that is around the order of $125 billion.

It resulted in essentially shutting down all of Japan's nuclear plants and causing Germany to stave out their nuclear fleet over the next decade but certainly the public health and environmental impact of that were tremendous and still probably will be continuing for years to come.

Waste disposal is a huge issue. There's currently about 65,000 metric tons of suspended fuel assemblies that are piled up at US nuclear plants and over 70% of those assemblies are kept in cooling pools at the plant. There's actually about five times as much nuclear material in those cooling pools that are in the reactor cores themselves. It represents a huge safety and security risk as well as a major environmental risk from an accident or a terrorist attack - those types of things so another big issue.

USC is encouraging to move some of that into dry cast storage until we have a national solution for that because the casts that you see at the bottom there are much safer than keeping it on site in the cold. Uranium mining obviously is another issue for nuclear and as (Stacy) had alluded to, it's also a very big water user along with coal plants.

I'm looking at the time. Alright, I'll try to speed up but now I'm at wind because now we have to choose between wind and these other technologies so I just wanted to put that into context. But clearly wind doesn't have many of these impacts which is a huge benefit to it but it does have its own set of issues related to land use, wildlife sighting, noise, shadow flicker, visual.

We've heard people talk about this at various points during the day and at the tabletop discussion.

These are impacts that clearly need to be addressed and mitigated to the extent possible. I'm going to - in the interest of time I'm just going to focus in on two of these and so first to talk about land use impact. The 20% Wind Vision study that was done a few years ago identified that roughly about 1 to 2% of US land area would be required to achieve that but that included all of the areas in between the wind servings that are available and compatible for other uses such as farming and ranching and other activities.

The footprints of the turbines are really on the order of about 2 to 5% which for the Wind Vision study was roughly about the size of Rhode Island. If the wind turbines are - if you decide that you don't want them anymore, unlike fossil fuels and nuclear you can actually take them down, restore the land and you probably wouldn't notice much of a difference. So the impacts are temporary. They're not permanent.

And studies by NREL and (Ian) show some of these maps earlier. the wind potential is enormous even if you include major environmental exclusions for many of these factors which most of the modeling that NREL's done on this over the years and this has improved over time but include major solutions on the order of 30% of the country is excluded for environmental and other reasons. So we're taking - those efforts are taking those things into account.

It terms of wildlife, you know, the research that - the great research that was done by NWTC looking at impacts of bird deaths across wind facilities in the US identified roughly speaking about four per megawatt per year at most facilities. You know, some facilities are higher than that but the impacts are small - much smaller than other human causes which you can see in this graph

from a study by the National Academy of Sciences that looked at how it compares to things like building caps, high tension lines, cell towers, communication towers and so forth. All cause much larger impact on bird populations and wind power.

The main causes of these impacts are collisions, habitat loss. Neural trauma is also an issue for bats but we're not entirely clear how much that's causing the problem but that's also an issue. Most of the studies have shown that there's no - the species level populations are population level impact. But clearly, you know, in local communities and in some project and locations, you know, we definitely needed appropriate siting and mitigations to reduce these impacts.

Thankfully there's great research underway by AWWI but that's wind energy collaborative (unintelligible) collaborative, Fish and Wildlife Service industry. Tremendous amount of research going into this. I would question whether something similar like this is happening with fossil fuels and nuclear power. Are they doing this kind of study with all of those fuel cycle impacts I mentioned earlier and what impacts they have on wildlife and aging species?

The other factor too that we put out a paper recently with AWI and my colleague (Peter Filmhaus) that really draws attention to the fact that the much bigger threat to wildlife is really climate change. And some studies have suggested on the order of 20 to 30% of the world's plant and animal species - kind of a non-marine species - are at risk of extinction by 2050.

And so there's really an imperative about - and tradeoffs that are involved of accepting some local impact in exchange for the much bigger benefits of reducing climate change and mitigating the effects of climate change over time which would have much greater benefits to wildlife than the impacts that individual projects are going to have.

Quickly just go through - a lot of these benefits of wind have been demonstrated. Obviously the Wind Vision study will be coming out. I can't talk about that so I'll talk about the 80% by 2050 NREL study from a few years ago in which wind played a huge role as you can see from that graph of, you know, 23% by 2030, 37% by 2050 - much bigger than the other technologies. The overall reduction in CO2 emissions is on the order of 80% based on the other 20% wind study that the amount for wind was roughly equivalent to a percentage so I would expect that to be about the same and 50% water savings.

The study also looked at, you know, the fact that there also is transmission lines that are needed. So that does have a land use impact. It does have environmental impacts that have to be considered when you're talking about these benefits.

So I could stop if you want me to. I haven't talked about resiliency but I can - I have a report that I brought with me to talk about that topic if you...

Woman: (Unintelligible).

(Steve Clemmer): Okay, sure. Well the report that we - it's called power failure. I brought it with me. It was released last month. What we're really trying to do is draw attention to the fact that our electricity system is vulnerable to climate change. We're already seeing the impact of extreme weather and its impact on the grid and these are only going to get worse because of climate change and here are some examples of some of those problems.

The other part about the report is that we identify ways that renewables including wind but other technologies as well can make the system more

resilient to the impact of climate change, you know, while in addition to mitigating the long-term problem. Lower water risk - as (Stacy) was talking about - is one aspect of that to help protect it against heat and draught. Smaller distributed systems in which case if extreme weather does take out a facility it's not going to have the impact that it would if it took a cold air nuclear plant out.

You can see that picture at the top from Atlantic City, New Jersey. That particular project - when Hurricane Sandy came over it, it shut down because the winds were so high but it didn't damage the facility and the facility was available to produce electricity after it passed whereas several coal and nuclear plants and some gas plants in the region were shut down for days an even weeks because of the impact.

But once again, you know, any - wind in particular but any sort of electricity that connects it to the grid that needs to secure the power to consumers. If the grid goes down, it's not going to be able to provide power. So investments in transmission are definitely needed to not only harden the system and make it more resilient to climate change but also to help integrate low carbon solutions like wind. So that's basically it. I'll stop there.

(Suzanne Tegen): Thank you very much. Thanks for bringing us into kind of the bigger picture and helping us remember the bigger picture and that this is about, you know, people who are affected every day - kids getting asthma and older people having to suffer consequences from this kind of thing.

And even if politicians can't agree on what to do about these things, there are people who can purchase - who can purchase clean energy and want to purchase clean energy and there are big corporations who want to do that - purchase renewable energy. Ikea wants to get into the business of owning

renewable energy. Google and Facebook are getting on board. So there are positive messages here I think and this was, you know, some of these photos were so impactful.

So I appreciate that (Steve). I know we asked you to talk about a lot of things. So (Kevin Rackstraw) is up next and he is Cofounder and Vice President of Customer Solutions for Customer First Renewables, LLC - a renewable energy integrator that works with large end users to buy power from our own utility scale renewable energy project.

(Kevin) has over 20 years of experience in the win industry working as a developer most of that time. He previously worked for Clipper Wind Power for eight years while leading the company's wind development in Eastern US and Canada. He ran OE's international program for six years from 1992 to 98 and served on the OE board from 2003 to 2006. So please help me welcome (Kevin).

(Kevin Rackstraw): Thank you (Suzanne). I'm used to concaving my presentations but I haven't dealt with negative minutes before so I have to think about that for a minute.

So what I'm going to talk about is entities that are beginning to skip the utilities and go directly to suppliers of energy - renewables in particular. And our company was set up - Customer First Renewables was set up to help them do that. We work with very large end users - usually people with, you know, at least 10, 20, 30 megawatts of usage - renewable equivalent usage. We help them either buy electricity attributes from the project or invest in projects.

I'm going to skip a few pages here. I think that a lot of what's done in the market currently has been, you know, direct sales. People that want to buy

green, they can buy renewable energy certificates. They can buy short term purchase green power from the utility. Sometimes it's part of the tear-up - I mean a formal tear-up. Sometimes it's part of another type of program and then some are doing onsite generation as well. But typically that doesn't really cut it for a lot of the customers at least that we're talking to that have big sustainability programs. They have big brand names, big profiles. So to them the recs a green light as we call them. They're not really satisfying.

The short term green power doesn't allow them to take advantage of the head value of renewables, particularly wind and then onsite generation just - it can't get big enough. It can't - for these companies it really can't solve their issues because there's like, you know, Wal-Mart putting up a single turbine (unintelligible) panels on your, you know, two of the stored for marketing value but not really solving the problem.

So what we're seeing is an evolution from rack to both PTA and direct investments. And I was going to talk about some of these in particular but I'll skip through the details of this. But what we're seeing is some really big brand names taking leadership in this. I'm sure you heard about Google's deal. These are mostly wind deals. Facebook, Apple has done some very big solar projects in some places that are surprising and I'll talk about that for a minute.

Some of these projects are done in deregulated spaces where we tend to work because there's a robust market where we can firm and shape the wind relatively easily. It's just much easier to incorporate the factors that we need to make a deal work for a customer but some of these customers are doing projects in Iowa - places like Iowa to regulate and market Apple's project in North Carolina to regulated market. All of these have, you know, franchise utilities and monopoly utilities but they have enough scale that they can go to

a Mid-American energy or whoever and get them to accept, you know, say this is what we want to do and then get them to do that.

Google's projects for the most part are not - they're not real direct delivery projects which we tend to do - in other words where the buyer takes the power. They are - they sell the power into the grid. They take the revenues from that sale and then they offset their bill. Unfortunately for some of these projects that hasn't worked very well because they started building it at a time when natural gas prices were going down and so the sales from the grid are much below where they expected to be. So a lot of these projects are under water but they're in it for the long haul.

They sort of knew that was a risk and they're willing to accept that. Sometimes the boards aren't very happy about that but anyway, that's another matter. Universities I think are also a big leader here. They don't have quite the footprint or the, you know, the scale that corporate purchasers do, the industrial or tax purchasers like Google but they're doing some really interesting things.

They started out in 2001 - Carnegie Melon did one of the first if not the first big rec deal that was 5% of their megawatt hours. That's evolved over time. There's still a lot of big rec purchases by universities but they're also actually in some cases building projects. (Unintelligible) New Hampshire has a landfill project that supplies up to about 85% of their energy. They're also selling some of those recs.

Other universities - again some doing onsite, some doing these relatively close to their sites and then some like Ohio State or Oklahoma State are doing projects that are buying power from remote areas.

And I - Oklahoma State is really interesting because that's a regulated market and because of their scale and I'm sure political connections and all they got - and the threat of using co-gen which would have cut the kilowatt and megawatt hours that the utility could have sold them. They were able to get a regulated monopoly utility to sell them their power at a cost that really worked for them.

This is just more details on specific projects. You can take a look at this when you get the slide. Government purchases - the fed certainly are doing a lot led by DOD at the moment. They have a 25% real energy goal. About a gigawatt is what they're expecting. They're anticipating spending up to $7 billion over the period - the entire period of their purchases which is somewhere, you know, 20 to 25 years - 27 year contract for some regions or 26 years I guess.

But these are - they're not using their own capital. These are mostly PPA but there are some onsite projects that they are using their own capital for but for the most part this is using third party capital so it doesn't become a budgeting issue so much for them.

They're just using annual operating funds even though they're appropriated annually which really complicates financing are subject to annual appropriation. They still are getting them done so it's really innovative stuff and there's a lot of plans. There's relatively little that's happened relatively speaking but there's a lot of interesting stuff that can happen over the next few years.

The state of Maryland is sort of setting one of the standards for states. They now have wind and solar PPA's totaling about 80 megawatts so those are the direct purchases where they take delivery of that power.

What we've found is across a whole variety of sectors and vertical segments of marketing. There's a tremendous amount of interest and I could have had 50 of these up there probably because pretty much everyone I talk to - there is interest. There's just sometimes an inability to execute a long term contract. That's our biggest issue of getting people to think long term about electricity. For most people it's a month to month consent. You know, they don't budget or they budget for it but it doesn't go into their capital plan. It doesn't go into sort of their long term planning.

It's just a number that goes up and down and they feel that they really don't have much control over it. Well as a renewable they now do have control but it takes a long time. In some cases we're about to announce the PPA for 52 megawatts of three significant institutions and it took them two years to get sort of over the hump and to the point where we could actually sign a PPA. A lot of education goes on.

So one quick note about this bar - it's a little hard to see but you see the green there as a result of an RSP that we ran recently. The green bars are the PPA prices from the project. The blue is what we call other costs. So it's transmission or what we call basis in a market like TJM, capacity charges and etcetera. And when you look at this and you plot it, you think that the best project in the green - the lowest PPA prices are going to be the deal that you select but some people do that. But they fail to take into account what it costs the customer.

They'll deliver it all the way to the customer. Considering everything that's mixed in, it's often not that choice. So in fact you find one over here on the right - our second - our number two competitor here is very far over the right in terms of the PPA price but if you look down below this little blue - below the line - that's because there's so much capacity credit for that project based

on where it is that it actually drops the PPA price down and became very, very competitive.

Challenges - the main thing that companies deal with is the long term concept - the one that I talked about earlier - but organizational bandwidth. A lot of people don't have energy teams or (unintelligible) to deal with this stuff. It's just the person that buys electricity. It's usually one person in their facility's group and they don't have a lot of sophisticated help in doing that. So it's hard for them to sort of take it to the step and take it long term. Companies like ours can sort of be their outsourced resource that can do the analysis for them, help them figure out the best option and then help them execute.

That which doesn't fit inside their core - they're just not energy business reach for the most part. Project complexity's an issue. Uncertainty of outcomes as we're thinking long term what's going to happen to power prices (unintelligible) prices. It gets a little messy so it's the uncertainty that creates issues. But what we always say to them is well by not signing onto a long term renewable power PPA, you're actually subjecting yourself to uncertainty. That's what it is. Your month to month and your year to year is going to be subject to all these prices.

So and then there's this (unintelligible) getting them up to speed on all the issues that you guys have talked about takes a lot of time. Should I wrap up at this moment? Okay.

I wanted to just give a little bit about sort of what we think is next. I think that the direct purchases by big brand names is going to lead to very rapid main framing. So it's within deregulated and regulated markets. Utilities are carrying it from the Oklahoma state and other folks. They're going to have to be responsive to the need - to the desire of very large buyers who want

renewables and they don't want it through the typical green (unintelligible). They want to capture the value from it. They want that price tag ripped and they're going to force the model to change so that utility's going to have to adapt.

Right now these are all very individualized customized kind of deals. We're going to move towards standardization. That'll help it become more mainstream. And then I think these direct purchases are going to start getting connected to DSM and smart grid and great kinds of considerations so you're not just thinking about the supply. We actually as a company try not to get involved in the DSM side because that just makes it a lot more complicated kind of decision so I think we're going to have to bring those altogether so that they can capture the most value from the renewables and their DSM efforts. That's it.

(Suzanne Tegen): Thanks (Kevin). So I know we ate into the break a little bit here - a little bit. We got a late start. Thanks also to those of you on the phone who have hung with us. I know that that's hard to do. Are there any pressing questions for the panel? I know you guys want to get to your break but I guess I would suggest that if you do have questions, you can come on up during the break and we will take a decreased break - maybe five or six minutes instead - five minutes. Okay so thank you again to our panel and thanks to all of you.

((Crosstalk))

Suzanne Tegen: Don't forget the handouts from UCS one door over and also the handouts from (Stacy) up here.

((Crosstalk))

Man: I just want to remind people that up on the side of the wall we do have elements that can go into the Wind Vision. So if you have ideas (unintelligible) we should be including - we should be including in the Wind Vision, please go ahead and mark them up on the wall. Speak now - especially for this group which is always good at speaking.

((Crosstalk))

Man: Great. We're about ready to start up so could we get the RFC leads to please come up here?

((Crosstalk))

(Patrick Gilman): No, we'll call you up in the right order. Great, could everybody grab a seat or we're just going to start talking anyway. (Unintelligible). So (Patrick) will be here in a second. He had a quick thing he had to deal with but hopefully we'll see him back here in a few minutes so I'm going to step in quickly.

We're really excited about this next phase of (unintelligible) and the launching of the regional resource center is something that has been a project that we have been working on for quite a few years - a few false starts for those who might remember but success so far. And so we have the RFC leads here and what we've asked them to do is provide a brief introduction to their organization, their challenges.

Again as I mentioned this morning, part of the goal here is to have the family - the stakeholders in the room here to listen to what all the different RFC's are planning on doing, have the RFC's listen to each other because it's a great group of people that we want to engage not only between themselves but with

all of you. (Patrick) you've wondered in. Do you want to hop up here? Or we'll start off and then we'll go, okay.

So we're great to hear what each one of them are doing and then share the experiences and be able for each one of you to come up and talk to them, not necessarily right after this session but once the session goes down and over the next couple of days.

Okay so we're going to start off with the northwest RFC, yes. We'll start off at one coast and then we'll hop around. But (Rachel) from Renewable Northwest talking about the activities that they're planning on doing up in their region. So thank you.

(Rachel Shimshak): The (unintelligible) we're starting to collapse. Hi everybody. I'm (Rachel Shimshak). I'm the executive director of Renewable Northwest. We're a regional advocacy organization. We promote solar wind and geothermal in Oregon, Washington, Idaho and Montana and for the purposes of this activity we are also including Wyoming since we do work productively with PhysiCore. PhysiCore is a fixed state utility and they've bled into Wyoming and so Oregon will be working with them also.

We have connected with a couple of other regional organizations - one regional organization and several state organizations to put this team together. So renewable northwest is the lead dog and we are an organization of businesses and nonprofits. We are connecting with northwest (unintelligible) which is an organization also working in the northwest focusing primarily on distributed resources and also with the Department of Energy to talk about and be active on offshore.

Among and between us we have a tremendous amount of experience and we have lots of members and we've had a lot of success. Our - the amount of wind in the Northwest so far is 7600 megawatts and for a relatively small load that's a lot of megawatts.

We are also connecting with the Washington and Montana Departments of Commerce and Boise State University. So those organizations are going to constitute a steering committee and the steering committee is going to chart the course for this center.

We - each of the three leaders - regional northwest, northwest (unintelligible) and the Oregon Department of Energy also have advisement groups working with them and so we hope to expand our network across the region and really penetrate and get a lot of information across.

We have a history of renewables in the northwest. I was saying yesterday that we are in a very dry desert-like place but forget about that for a second and think about a lot of water because it is the hydro system that really characterizes the Northwest. It was a great investment by the way by the federal government. Thank you very much. We're still paying you back.

It has resulted in power rates for customers of the hydro system that are three cents a kilowatt hour or less and that creates both an opportunity and a challenge. We have a lot of energy intensive businesses who came to the northwest in order to capture that chief energy and they are now the opponents in our regulatory pursuit. So we have the positive clean air benefits of the hydro system. We have low rates and we have some strong voices that we have to deal with in this.

Just like pretty much everybody else I think, we have been very effective at energy efficiency and distributed resources and load is not going very much and we face the same kind of low gas prices that everybody else is facing at the moment. We have also been very successful in having utilities meet the targets established in the renewable portfolio standards that three out of the four states have.

So this is again a success but it also provides a challenge because none of us ever anticipated that the renewable standards would be a ceiling. We wanted them to be a floor but indeed they had become a ceiling. So we wanted just below past that and we have a really good idea about how to do that. I'll get to that in a minute.

Through this connection we want to build our network. So I talked about the many participants for each of the different issue areas. We want to disseminate critical and accurate and fact based information just like the panel before us was talking about. All of the information exists out there and an earlier speaker today and another element that (Alia) said, you know, if you have the facts you should argue the facts. If you have the law you should argue the law and we have them both. Our opponents have neither and they just pound the table but so far they're winning and we need to do a better job putting the facts and the law out there for people.

We through this collaboration want to be able to identify issues and solve problems and we want to make sure that we have continued success that land based renewables, that distributed wind and that offshore wind all play a role in our future energy situation.

This is a - Mr. (Dave Wolf) who is my partner in this. He's our administrative director for Renewable Northwest located halfway back there. Raise your

hand (Dave). (Dave) - he keeps a map and a spreadsheet of all of the wind projects in the region and this is one of the pieces of information that we'll make available through a website that will collect all of the fact sheets and economic development activity and the booklets and all of the information that again the previous panel put forward that we can use and make a one stop shopping spot for anybody looking for information on wind.

But anyways we have a shitload of projects. You can see that they are clustered in areas - certain areas and of course there's transmission in these areas but we have more to do to make sure that we expand transmission to be able to get to some of the wind rich areas in the region.

So the three things that the land based campaign is going to work on is to develop and disseminate information largely in the integrated resource planning process. And the big opportunity that we have in the northwest is we have 2500 megawatts of coal plants that are already designated to retire. There are another couple solid ones that are at risk that we'd like to push over the edge but we need the appropriate information in the process to make sure that the planners are looking at the actual cost of the resources and integration and to internalize the externalities associated with fossil fuels so that we actually get the right outcome at the end.

The risk is that we replace one fossil fuel with another and we'd like to avoid that. We also have to make sure that when planning transmission and all of the features that go with transmission that we evolve as a region. We are a very vulcanized region. We have 23 balancing areas. This is not an efficient way to go about business. We're very good about cooperating on everything else except for transmission so we want to cooperate and collaborate and we want to be able to again introduce information from all of the rest of you who have met with success and shows that it can be done. It's not that scary.

So we'd like to make some market advances in the northwest and finally we won't be anywhere if we don't solve some of these habitat and wildlife issues that you've heard about otherwise today and we're making progress on that. Northwest was one of the first places to establish some wind guidelines and we want to build on that for the future.

The issues for distributed wind are zoning is just a mess. Every county's got a different kind of thing going and inadvertently some of them have constraints against doing distributed wind so we want to be able to identify windy places and work with them on standardizing zoning that will be permissive and responsible.

Everybody always needs a good financing model and there are some options out there and we want to get the best of them and make sure that we provide that technical assistance to those who are interested in developing these projects so not every single person has to reinvent the wheel.

And finally the east has been a much more active place for offshore wind and you may wonder what was the west coast. And the west coast has a lot of shoreline but in the northwest it drops off very quickly. It gets deep right after the, you know, like three miles out it's really deep and so you've got to think about how to do the transmission cables so it gets the power that's generated offshore onshore and you got to figure out how to avoid all of the fisher people and all of the other habitat and wildlife that is in the ocean. And so we're just starting out on that.

We have some things I hope we can learn from the folks on the east coast and there is one project and the Oregon Department of Energy is tackling that with just the first level of information and activities to try to put that in line after,

you know, with all the others to make as much progress as land based land has made over the last ten years.

We hope at the end of this that the decision makers in our region will rely on this resource center for their information because we want to put together the best stuff and we want them to have access to it. We want to make sure that transmission and siting improve as a consequence of this wind resource center and that we are ready as a region to deploy the next generation of wind resources, offshore, distributed and land based because we want to be able to keep the air clean and we really want to be able to build on our renewable edge in the northwest. Thank you.

(Patrick Gilman): Thanks (Rachel). Next up we have (Lisa Daniels) from Wind Stream to talk about the Midwest resources.

(Lisa Daniels): Hello there. Thank you. Okay so we have put together the Midwest Wind Resource Center. We have some partners in this effort. The Iowa Wind Energy Association is one of our partners and they have been around since 2007. They have a - that's the wrong color it looks like. This has not been tested here.

So they have an advisory committee with the industry. They also have articles of incorporation and a robust membership in Iowa with the industry. And I'm also introducing (Mike Prior) Executive Director of the Iowa Wind Energy Association as of April this year so that is one of our partners. The other partner in Iowa is (Tom Wind) and Windustry have worked for a number of years together on different efforts and (Tom) runs a business consultancy on wind energy and he's worked with a number of utilities in various capacities.

He is an engineer so he will most likely get most of our technical questions and help interpret some of our more technical issues. And he has worked in Iowa in the Midwest for well over 37 years. Wait a minute - 37 different community wind projects. He is also one of the few people in this room that is also a wind developer and has a few actual projects that are up and spinning on, you know, under his belt.

So he sees problems and sees issues from a lot of different perspectives. And so we will be working very closely with wind. Windustry is a nonprofit. We're based in Minneapolis. We've been around since - officially since 2003 but doing this work since about 1995 where we've been working to grow the market for wind energy and grow the understanding of wind energy for many, many years. And most of our work is very openly available and publicly accessible on the internet or through different channels and we will be - we will be continuing that.

(Dan Turner) is in the room and he is one of our lead analysts - senior analysts. We also have a network - a huge network of volunteers that we work with and we will continue to tap into that huge network of volunteers on a regular basis.

Our region includes eleven states or officially 10 ½ states. We meet with the renewable northwest area at Montana and we're dividing that state but working together to divide that state. So we go from eastern Montana, North Dakota, South Dakota, Minnesota, Iowa, Missouri, Illinois, Indiana, Ohio, Michigan and Wisconsin.

It's a broad region and it has a huge amount of potential capacity because of its wind - its natural wind resource and we have - we have a huge amount of diversity in terms of policy and political will if you - or lack of political will in

some states but so we're going to do a whole lot of sharing across state boundaries and across different regional areas. And it's, you know, some of the states have robust and ambitious RPS's and some states have none but they still have wind energy.

So we have a whole lot of different and unique different scenarios in each state and we're planning to use the diversity to our advantage. We'll be, you know, we see that there are - there are challenges that are, you know, that run across all of the states and there are challenges that are unique in certain pockets but we'll be addressing some of the usual like citing and permitting, the, you know, the RPS - weak RPS's versus strong RPS's - all kinds of different political situations and political scenarios.

And we really see that there are a whole lot of regional efforts going on in the area and we will engage them. There's a coalition called re-amp that is a campaign that's been going on for a good dozen years. There's also things like the Midwest Governors Association. There's also (unintelligible) and different things like that that we can put to our advantage. So we will be taking a look at the whole picture.

Also transmission is one of those things that has been addressed and has been identified as a top issue for the region and will be continued - we will continue to work on that along with Wind on the Wires which has a very deep presence in most of the space in this region. So we see that as something that will continue and continue to grow.

We have a whole lot of opportunities. We see that there are states - Minnesota and Iowa have been leaders in the wind energy development for a number of years for the nation. We'll use those strengths to take and to share the experiences with other states and other states have - are doing really well with

exporting energy such as North Dakota and so we'll build on some of those things even though they're not necessarily exporting wind energy to the extent that we would like to see.

They are - they are of the understanding of what it means to be an energy exporting state. So we hope to engage some of that background and experience and have some parallels and some crossover into the wind energy area.

And also we also have a hugely important experience in Iowa where they don't have an RPS but they are a national leader in the amount of wind energy that is developed in that state. And that's due on a voluntary basis through the - largely through Mid-American but through some other supporting polices. And we see that that is an important example for some of the other states in our region as well.

One of the little known pieces of information that we just wanted to share was that the - and some of this came out in what (Ryan Wiser) was talking about this morning that four of the states in our region are top leaders - international leaders in terms of the in-state generation being a percentage of the electricity of that state. So we see that as an important aspect about how we go forward and how to use that as a way to get the rest of those other states on board and up to speed and moving forward with more wind energy generation within their state.

These are our four key partners that are leading this project but I will say that in each and every state in our region we have partnering organizations that we will be convening and forming an advisory board with them and we will be identifying and prioritizing the activities that make - that writes to the top with these people on our advisory board for the region.

So we intend, you know, that we are the core four people but there are - there is at least one partnering organization from every state that we will be very much in touch with and very much involved with working on this project.

(Patrick Gilman): Thanks (Lisa). Next up we have (Sarah Wright) from the Utah Clean Energy Alliance to talk about the four corner state resources.

(Sarah Wright): Well good afternoon. It's a pleasure to be here and as you can see, we're covering the four corner states and Nevada. And we will - so Utah Clean Energy is the lead and Utah Clean Energy is a 501 - can you hear me - is a 501 C3 nonprofit organization and our mission is pretty simple - to stop energy waste, create clean energy and to build a smart energy teacher.

So we work on efficiency and all renewables a lot in the policy and regulatory arena with two fabulous partners. We're working with (unintelligible) West Energy Alliance and (Sarah) if you want to stand up. So energy - (unintelligible) Energy Alliance is a nonprofit trade association that represents the nation's leading in companies in the renewable energy industry. And they bring this together with nongovernmental partners, organizations in the west of Arizona, Colorado, Nevada, New Mexico, Utah and Wyoming. So you can see we have good overlap.

And then we also get to partner with the Institute for Sustainable Energy Solutions at Northern Arizona University and I think (Carl)'s here in the back and (Tom) - I don't know if (Tom) is still here in the back as well. So they work to - they work to inform policy makers, the public and future leaders through research, outreach efforts with a range of the energy industry and government partners. So I'm really excited about this new partnership and all

of our partners have been involved with the dealing with the product program for years so we're excited to keep it going here.

So the state of our region - you can see that back in 2002 Colorado was a big leader with 61 megawatts and now in 2012 Colorado is still the big leader with over 2300 megawatts. New Mexico is the next with close to 800 megawatts and the rest of the region we have less than 300 or less than 326 megawatts.

So but the difference is we have huge wind capacity and so Utah right now based on these numbers, although I don't know if they've been reflected - if they've been changed to reflect how this might change with the lower wind speed technologies but none of us have developed more than 2 ½% of our wind with Colorado only at 0.6, Nevada at 0.02. So we've got a lot of potential in our region.

So when we were putting together this proposal, we started to think about what are the barriers. And one we noticed is lack of institutional knowledge. You educate different stakeholders and policy makers and regulators and then they leave. There's limited forms - there are limited forms in our region to get accurate wind information and there's also a need for improved coordination and information sharing.

There's a lot of inaccurate and outdated information. (Michael Milligan) went through a lot of the myths that are still pervasive and market uncertainty. With RTS's filling up there are less venues to drive renewables, especially if we don't have accurate information out of the (unintelligible). So our goal is to break through these barriers and we're going to start with a regional needs assessment.

So we have an idea and (Sarah) works closely with the industry on what we need to do but we will start with a regional needs assessment which will use a survey tool but we'll also use one on one conversations and some state based meetings to really find out what are the needs of our region. We will take the state wind working group, join them together, solicit more partners and put together a regional wind working group.

And one of the things I'm really excited about is collaborating between all the RRC's and sharing information so that not - we're not recreating the wheel. I think that's the right analogy.

So we are going to do targeted outreach and education and NAU is going to help quite a bit with this and help us structure it and know what sort of information they need. Wind ordinances - we still have improvements there. Wind benefits, jobs, economic benefits, land issues. For instance in Utah we have a really high percentage of CLM land which is slowing down some developments in our area as well as military airspace issues.

Of course there's always wildlife issues, wilderness scenic lands in our beautiful five state region. Water conservation is a big one and I want to thank (Stacy) - she's still here - for her work and that issue. Utah is warming at a rate twice the national - I mean twice the global average and that's been happening for the last 40 years. We're very prone to draught. The water is a huge issue.

And then emission reduction not just with greenhouse gas emissions but also with regional haze. We have a lot of national parks and the regional haze rules and if we need to start bringing the benefits - the emissions benefits of wind energy to these discussions.

And then a big part that Utah Clean Energy has been involved with is really informing utility regulatory decisions. When technologies are changing, integration issues are changing, capacity values, capacity credit - those issues that we need to get satisfactory information. We've been able to use some of (Michael)'s great work to actually influence utility decisions and drive wind development and we need to do more of that because wind - utility regulators make decisions based on outdated data. It has a big effect.

So for instance in PacifiCore IRP - if they don't - if they use outdated wind cost information, if they use bad capacity information, they may not select it in their IRP. That doesn't just impact the IRP. It also impacts how they calculate costs for qualifying facilities. So one bad decision can change a lot of - can really put the detrimental factor for wind development.

We're excited about the imaging and balance market. We're excited to figure out how that's going to change the integration cost for wind and we'll make sure that we get all of that information. We'll be partnering a lot with Renewable Northwest because PacifiCore is our utility. We're part of that six state region and then Nevada and we're all owned by Berkshire Hathaway. They just came to Mid-American Energy Holdings Company to Berkshire Hathaway Energy.

And I really liked some of the press that they had about it and I wanted to say - read one statement. It said our name reflects the benefits we gain from Berkshire Hathaway's ownership, particularly our ability to reinvest in our business and take the long view of our customers' needs. And so if we can bring in good analysis, good data to really help them take the long view and drive more renewables, that would be a win.

So we are developing a website - fourcornerswind.org. It's under construction - not available yet but we hope you'll visit it. So we - also we hope you'll get involved. We want you - if you're in our region - to join the regional wing working group. And I forgot to introduce (Megan). (Megan) can stand. (Megan) is the program manager for the Wind Resource Center. You can send her an email. I'll have her contact information or grab her.

We want your ideas. We want your feedback. We want your suggestions. We hope that you'll participate in upcoming meetings, presentations, webinars. We hope to share webinars and information that the other RRC's are doing with our group and vice versa and we're looking forward to working with all of you going forward so thank you.

(Patrick Gilman): Thanks (Sarah). And next up to talk about the Northeast Wind Resource Center we have (Val Stori) in the Clean Energy Group and (Deborah Donovan) from Sustainable Energy Advantage.

(Val Stori): Sorry. I'm going paperless here. Can you hear me alright? Okay, great. First of all I'd like to thank the Department of Energy and NREL for giving us the regional resource center award and also thank the 30 stakeholders - 30 plus stakeholders who sent in letters supporting our work for various sites. It should be they have been awarded this opportunity to run the Northeast Wind Regional Resource Center and we have two excellent partners.

(Deborah Donovan) from Sustainable Energy Advantage will be speaking right after me to introduce the land based portion of our work but we are also working with (Paul Williams) at the main ocean and wind industry initiative and (Paul) if you want to introduce yourself - raise your hand. Great, thank you.

For those of you that are unfamiliar with the Clean Energy Group we are an advocacy based nonprofit organization out of Montpelier, Vermont. We work in the US and globally. We work to promote innovative clean energy technologies and we do that by promoting innovative policy and finance tools to promote clean energy.

We work pretty much like a think tank. We produced a lot of reports on opportunities and barriers and emerging markets and also on finance tools. We also work with public clean energy funds, finance institutions and private companies as well and we advance clean energy markets and project deployment by creating networks of US and international funders and policy makers.

Our specialty really is working one on one with states and on a regional basis with states. And so to that end for our offshore wind work - I should back up a second. The Clean Energy Group is going to run the offshore wind focus initiative of the regional resource center and Sustainable Energy Advantage will be running the land based portion and (Deborah) will speak to that.

We sort of serve on the offshore wind portion of the resource center because we believe that offshore wind presents the greatest potential to bring renewable energy technology to scale and to quickly meet the low demands in the northeast. We're going to be resource constrained pretty quickly and offshore wind has huge potential and we think it can be scaled quickly. NREL itself has identified over 600 gigawatts of energy generation potential on offshore wind on the Northeast Atlantic Coast along.

We have experience working in offshore wind. We began the offshore wind accelerator project about three years ago and the purpose of that project was to share fact based information amongst a very wide range of stakeholders from

industry to states to developers in the private sector and to increase cooperation amongst the states, the federal government and the private sector.

We produced various reports including one on the regional procurement through a buyer's network. Despite the success of OF as you are all probably well aware there are many challenges and barriers to scaling up offshore wind. I think two days ago we saw a judge overturn the 26th legal challenge against state winds. Hopefully it'll be the last but who knows but that's just one of the barriers that the offshore wind sector faces.

Other barriers are high cost, the lack of experienced developers and experienced investors in this space. There are social challenges. There are political barriers. In Maine and New Jersey for example we see governors that seem to be opposed to offshore wind. That's probably because of their political aspirations. And there also seems to be a discontent between the intent of office of wind legislation and the actual implementation of (unintelligible) legislation.

So our proposal to DOE was a little bit different and quite a bit different than what we have proposed to do for onshore wind. For offshore wind our goal is really to work with our states. It's a state program manager that DEG knows best and works with and has a working relationship with and so we hope to work with them one on one and also on a regional level to bring this industry to scale.

The challenges that I just mentioned and the barriers should be more manageable with increased collaboration amongst the states in cooperation with the federal government and other stakeholders. So we have proposed the following goals and objectives for offshore wind.

Those are to provide more and better information and insure that there's access to fact based experience. And one of the ways that we want to do this is to connect the space with your team's expertise. So we want to bring over the European experience to the states and have the states understand that experience and expertise in construction and installation of offshore wind can really help to reduce costs. So there's the opportunity there for information (unintelligible) and mitigating the extent of offshore wind.

Another thing that we have proposed to do - another goal is to coordinate more standardized approaches to policy amongst the states. We have a fragmented approach if you look at offshore wind as a region. So there is precedence for this and all of these states have worked together for example on (unintelligible) and now they are talking about regional procurement for natural gas and (unintelligible). So there is precedence for working as a region.

Our work is going to be led by the state. We were going to have - we will have states represented on a steering committee and it's really the steering committee that will buy our work and there will be 15 to 18 representatives. About six of those will be states. These are the state partners that have agreed to serve on the steering committee for your information. And moving quickly along.

So we have a proposed work plan which we will run by the states and the steering committee and would love to get your feedback on as well. These are just some of the ideas that we've put forward. We can't do everything but we propose to host webinars, write short papers on identified areas of common interest, to write reports and short papers on how to finance offshore wind. We've already developed a couple of short papers on cost reduction strategies that we've shared privately with the states and as I mentioned before, to

coordinate the transfer of the European experience through an EU advisory committee. Let me jump ahead a couple of slides.

This is so far the proposed EU advisory committee. These are folks and companies, organizations who have already agreed to serve on this committee and guide the states. So let me just back up. Another proposed piece of the work plan is coordinated state action to amplify existing efforts and again these are all possible actions. Procurement - (unintelligible) procurement of offshore wind power, cost of reduction, supply chain development, joint financing of projects, creation of EU US project development team, maybe creating a (unintelligible) process and again increasing outreach opportunities.

Lastly we would like this to be an Atlantic shore based effort so we are also working in collaboration with the Southeast Coastal Wind Coalition who's running the southern wind resource center and together we've identified three areas for collaboration as you see up here. That's our contact information. I'll let (Deborah) speak to the land based portion of our work. Thank you.

(Deborah Donovan): Hello and thank you everyone for being here and hanging in there with this program. So I'm just going to take a couple of minutes to talk about how we're going to - for the northeast wind resource center - how we're going to approach the land based wind program.

Here's a little bit about my firm - Sustainable Energy Advantage. We're a small consultancy based in Framingham, Massachusetts. Many of you have probably worked with my colleague (Bob Gray) who started the firm and our experience with education and outreach around wind siting issues goes back about ten years with the New England Wind Forum and the New England Wind Energy Education Project which was a part of - part of our consulting work and in partnership with NREL.

And here are just a few of the other things that we do at the firm and our main focus is renewable energy issues in the northeast. So really quickly the lay of the land or in the northeast states there's some very strong state policies and some pretty good resources - particularly offshore wind but land based as well. There's a strong need for more megawatts to come into the system because we've got a lot of fossil fuels to retire in the next several years in the near term - very near term - that's creating a real impotence for some increased planning (unintelligible) planning and cooperation among the states.

We have a wholesale market that's regional based and most of the states in our region have competitive deregulated markets so that does color a bit about what happened in terms of planning since nobody says IRP and (unintelligible).

So unfortunately we're dealing with very densely populated areas of our coast and rig lines and you heard a little bit about what the fighting challenges are from (Megan) today during lunch in terms of the deteriorating dialogue where the opponents are have had the floor right now on their debate.

The demand for renewable energy in the northeast is driven by some state RCS programs and some greenhouse gas reduction goals and some other factors (unintelligible) that very high reliance on natural gas that's creating some issues about reliability and we had a very close call this past winter that would have been actual (unintelligible) if it hadn't been for the spinning wind capacity operating last winter.

We have transmission constraints both for natural gas and electricity and the states are pushing for regional solutions. I talked a little bit about this yesterday in one of our breakout sessions but they're looking at cooperating

long term contracts for class one eligible RCS resources which would be mostly wind and also procurement of natural gas and hydro from the north.

And here are some of the priorities that we're going to focus on for the land based wind program and we will be using the same steering committee model to help guide us as we turn this into a detailed work plan in the timeline for a broad-based partner network that brings credible, selling and objective information to our stakeholder community that would be focused on technical and scientific studies, best practices and analyses around a lot of the issues that we've been talking about all day today and that are certainly relevant in New England.

And then creating a delivery mechanism that can get in time to the right folks and the local decision makers, the constituency and the media as well the information that they need to make appropriate decisions about wind siting. We've got six New England states, New York and we'll be coordinating with Pennsylvania where possible in our work plan.

We'll build on the experience of the New England wind forum and the New England wind energy education project where we were holding webinars and workshops and conferences and we actually have a mailing list of over 1000 interested stakeholders. We'll be working with our steering committee that will not just include our state partners but other participants from a broad range of stakeholder groups - representative stakeholder groups and working in a consultation and research model to deploy our activities through a partner network using a lot of web based materials and web based tools.

The challenges as you heard today - just the misinformation, the emotionally charged environment, the litigation - it's created an environment that's very costly and despite with long delays for developers they're very discouraged

right now and then there's a lot of reaction at the local and state level by increasingly, you know, adding increasingly strict rules and regulations for siting and zoning.

Just to give you a quick snapshot of what we're looking at here this map is really just illustrative and about what was in the ISO queue for new capacity additions coming in in the pipeline. I would have to say there's some things waiting in the wings and there's some things that have some attrition that's occurred here and what this doesn't include is the 1000 megawatt deep water wind one project that would be 30 miles off of the New England coast.

And so we're definitely going to have a lot of challenges as a convener of this in terms of our role as an educator and maintaining objectivity so that we have the perception of being legitimate incredible and sort of threading that needle between, you know, being an advocate - a debunker of incorrect information but acceptable to stakeholders as a reliable source of information (unintelligible). And I'll just skip this slide right here.

It sort of ties together what's happening with the development pipeline and what's going on in the policy environment but thank you and I look forward to working with all of the different resource centers and the rest of you as we get this off the ground and make this as strong of an effort as we can.

(Patrick): Alright, next up we have (Chris Rose) from the Renewable Energy Alaska Project who's going to be talking about the Island Grid Wind Resource Center which is sort of a virtual region.

(Chris Rose): Thanks (Patrick). As he said, we are a virtual region and we decided at the beginning that we were going to have to do something like this in order to

touch all of the islands and island grids that are in North America and the territory. So a little bit of background on us.

Renewable Energy Alaska Project based in Anchorage was founded by myself about ten years ago. We're an education and advocacy group nonprofit that has a coalition now of about 85 organizations around the state including utility companies, independent properties, there's a native corporation, NGO and all of the other energy stakeholders really in the state. Both the federal and the state agencies participate in the work that we do.

And we have a really strong history of advocacy in the legislature. We've been able to create a couple of strong programs including our renewable energy fund and our emerging energy technology fund and we've been responsible for about $850 million worth of direct appropriations in clean energy since 2008 including 70 million this year in the year where we had a $2 billion deficit.

Iowa Institute that's based in Rockland, Maine - they have a longer history than us - more than 30 years, 50 employees - excuse me - 40 employees and ten fellows, a really strong history as well as a successful network building and they work on all aspects of (unintelligible) so we thought they were a great partner for a number of reasons. They also created the New England Energy - the New England Island Energy Network.

I also mentioned (Stephanie) now in the background who is a former Reeve employee who has been consulting with us for several years and she left Reeve and has been helping us facilitate those dates in working group. So those are the folks that will be working together primarily.

We also have other strong partners particularly at the University - the UAF - Alaska Center of Energy and Power which has a great lap up there that's really focused on (unintelligible) University of Maine. We - other national and international organizations I think are very interested. We've already been talking about the applications we've got on a small grid outside of North America and how people might be able to partner with us on that and we're also contemplating putting together an advisory committee of folks that know a lot about these areas of wind energy.

These are the places that we are trying to cover. So it goes all the way from Samoa and Guam and Marianas up through Alaska over to the islands off New England, down to Puerto Rico, the Virgin Islands. There's a lot of ground to cover and we don't have a real fancy map yet. This is basically a map of the world. It shows where we're going to have to try to go.

Alaska itself would be the 20th biggest country on the planet that's the size of the 23 smallest states. So we've got a huge amount of ground to cover but we also have a ton in common. Islands and island grid have a bunch of different aspects of life and concerns and objectives that we think we can share.

This is our focus. We've got three different areas really that we have to work on - first one diesel. A lot of our small villages in Alaska - we have over 200 remote villages that are not connected by either a road or a transmission system and there are other wind diesel communities on islands in the Atlantic. Wind diesel systems are a great opportunity for us to reduce diesel dependence in places that have great wind resources and a lot of those places do. A lot of technical issues associated with wind diesel.

We also have integration of large wind on small grid and the grid that I live in in Anchorage is a great example of an island grid. It's pretty big. It's 600

megawatts of average annual load. It's 600 miles long and there's 500,000 people in it but it's totally disconnected from anything else. We don't sell into Canada. We don't sell into British Columbia or anything like that so we're an islanded grid.

Hawaii and all the islands in Hawaii are pretty big population centers but they're islanded grids as well. And then all the interactions between offshore wind and islanders is something else that we're working to tackle.

So this is a situation we've got today. We've got a lot of these communities that are almost completely dependent on diesel and where we live they're also completely dependent on oil for heat. So a big oil dependent and globally 5% of all oil production right now is going to producing electricity so this is actually a huge market around the world where people are using diesel electricity.

These are some of the concerns and challenges we've got. A lot of this - I mentioned 200 of those communities in Alaska but if you look at a place like Guam - I mean it's remote from most any other place. It's difficult to get stuff in there as a result. It's very expensive in most of these communities. High energy prices but also high transportation cost which leads to high cost of almost everything. Also a lot of stalled populations in a lot of these communities which makes it difficult to get economies of scale. It also makes it difficult to have a really strong force of capable people who are working on these issues.

So a lot of the capacity building and workforce development is part of the plan that we're working on and as I mentioned before technical issues. Of course we have a lot of environmental issues that are associated not only with

wildlife but also just bringing diesel in - diesel spills and so on that we can mitigate through more wind and a lot of extreme weather.

Not only is there actually technical issues but they're some of the ones that we're going to be focusing on. A lot of integration issues, a lot of control systems, energy storage, secondary loads. Almost all of these communities have an airport because it's the only way in and out and so often times that airport is situated really close to the community. So if you want to get a wind - a project close to the community and not spend a lot of money on transmission, you're automatically competing with the radar from that small community's airport.

Project management in these remote areas keep the cost down to combine mobilization on other projects that might be going on let's say that federal agency is conducting, you know, to get a crane in any one of these places to put up a wind turbine is an enormous amount of time, effort and money. So if there's a crane and they're building a school or something else, we want to be able to capture that.

I mentioned the training capacity building and O&M. I mean that's a real big issue for these communities to make sure that these systems - particularly these control systems - actually work really well. And we're anticipating and all the places in the Pacific particularly we're also going to be integrating other resources like solar.

I mentioned the large islanded grid. This is a picture of a large wind farm near Fairbanks that is pretty remote but it's on our islanded grid and it's about 24 megawatts and they're having some challenges. They have been integrating it but as more production - more generation goes online near it, they might have some other integration issues.

This is a poster child for many of the projects in the Alaska area. Kodiak City which is on Kodiak Island now has 99.4% renewable activity. So there's a palpable sense of energy security in that community because it's going to be raining. They have hydro. It's going to be windy. But they're super successful in this project so far. They've got nine megawatts on a relatively small grid. It's a wind, diesel, hydro, battery and soon to be flywheel system so a complicated system but they're making it work.

Our outreach is going to be a lot about relationship building because people are scattered all over the place and we need to get to know each other so that when you pick up the phone, you have some idea who's on the other end of the line. We expect that we'll have at least the original gatherings including the one that happens at the all-state summit but we want to really work closely with the folks in the Pacific - that is Reeve. And then Island Institute will be working more closely with the folks on the east coast.

So there'll be a regional meeting on the east coast, a regional meeting somewhere in the pacific and then the summit every year and hopefully more. We've already begun work on our website. We want to have videos of everybody on the website so people can see who we are so when we meet in person, we'll know who we are.

A lot of the other things that people have been talking about like webinars, whitepapers, working with the media and the policy makers. These are some of the potential impacts and outcomes we're working for. We want to increase wind capacity but we also really want to just optimize the projects we've got. We've got over 22 wind diesel projects in Alaska alone and we know we can optimize those.

Of course that'll reduce fossil fuel imports, reduce pollution in those communities, stabilize energy prices and we really desperately need to diversify our economies in many of these places and as I mentioned before, perhaps we can provide a model for these other places around the world - developing world particularly where 20% of the world has no electricity - provide a model for some of these systems elsewhere.

Ways to be involved - we're looking for as much input from the other RSE's as possible. If you've got an event or something else that you think we'd be interested in either summarizing or coming to, please let us know. Energy (unintelligible) wind champion. Share information with us and please stay in touch. Thank you.

(Patrick Gilman): Thanks very much (Chris). Last but not least we have (Brian O'Hara) from the Southeast Coastal Wind Coalition to talk about the southeast wind regional resources.

(Brian O'Hara): (Patrick) last one. Yes, alright. I'm (Brian O'Hara). I'm with the Southeast and Coastal Wind Coalition along with my colleague (Jen Banks). Can you stand up because your arm isn't - no - stand up. Everyone look at (Jen). So we run the Southeastern Coastal Wind Coalition. I'm going to talk to you about the southeastern wind energy resource center.

First a little bit about the coalition. We are a fairly new organization. We were established basically in 2012 and we - we are a coalition of over 30 industry, utility, university, government and NGO members. And what I think sets us apart in terms of renewable energy advocacy is we are really coming at this from a business perspective.

We work very closely with utilities in the southeast and part of what defined our region initially had a lot to do with the utility regulatory structure. So starting in Virginia and heading south we've got regulated vertically integrated utilities and that really calls for a different approach than the deregulated markets of the northeast.

Our mission is to advance coastal and offshore winds - coastal land based and offshore winds and really focusing on net economic benefits. We are just a part of this southeastern RRC. We have a number of our partners in the room but NC State University - (Mary Housihunt) from Georgia Tech is here, right (Mary)? Where are you? Back in the back. Coastal Carolina University and South Carolina, navigate consulting. I think (Bruce) and his team may not be here but they were here earlier.

Clinton University - home of the DOE funded drive train test facility. James Madison University saw (Remy) and (Blaine) and (John Miles) here earlier and the Florida Energy Systems Consortium which is a consortium of eleven Florida Universities that have various focuses on energy. And what you'll notice here is it's very university heavy and that's very intentional.

We believe that especially in a region like the southeast, university is a really great messenger for this message. You know, I've heard people say people trust information from people they trust and generally people trust universities.

So now before I get into the what we're going to do, I have a little background for you and this requires a soundtrack. So I want to give some context. I want to provide a very quick slideshow of all the utility scale wind projects in the southeast. And if you'll bear with me. We don't have a lot of time so we're

going to move fast. So I'm getting you prepared because I want you to pay attention because this is going to go fast so here we go.

Alright. So 29 megawatts. 29 megawatts in (unintelligible). So you have probably seen this map before. This is a map showing wind deployment by states. This is megawatt in each state. And in stark contrast to the - what was the term - boatload or something like that. In stark contrast to some of the other states there's a very notable blank slate in the southeast and call us crazy or call us brilliant but we have decided that that is going to be our regional resource center area of focus - geographic area of focus and there's a lot of good reasons for that and as you can imagine, there are probably a lot of overlapping issues in these states.

As you can also imagine, when we get to talking about metrics we're going to be big fans of percentage increase and install dates for example. So that's our geographic area and our technology focused area - we sort of bucketed this into high, medium and low priority technology areas. And the three areas that we see as very high priorities for this region are coastal land based wind, wind import which isn't development in this region but it's import of wind into this region. This is a very, very big electricity consuming region - twice the per capita consumption of northeastern markets. And offshore wind - enormous opportunity in the southeast for offshore wind.

We also put a priority on mountain wind and distributed and community wind and currently have a lower priority on wind in the Piedmont area just because the resource is not as good as the other areas. But less we, you know, let's not despair over the fact that there's no wind in here because there is some really interesting stuff going on.

So for example now already we have projects in the region that are under development and one or two that are really actually construction ready and really just waiting on a power purchase agreement. But coming down the pipe - you've seen this map a couple times today. This is a map that shows what areas were not considered viable previously and are now considered viable just by increasing the tower height and that really opens up the southeast.

And we have seen - on the ground we have seen increased interest because of this turbine technology. So that's really exciting. I think (Simon) probably talked about this on his table topic today and (Jessica) covered this earlier and I would encourage this map is buried in an infrastructure and logistics report that really has - make a new report that this will fit mapping in because this is important stuff and our stakeholders in the region - they open their eyes when they see this.

So I won't read all of this. There's obviously a lot of challenges in the southeast but some of them cross these technology boundaries. Some of them are specific. One of the big ones is we only have - there's only one project in the region. So, you know, when you have conversations with your stakeholders and they say well wind is going to make my hair fall out, you can drive an hour and go show them a wind project but we can't do that. You know, there are none close by.

We also have fairly low power prices in the region which, you know, creates - makes the bar a little bit higher in terms of pricing. Since there's not a lot of development the permitting processes are not well defined which sometimes is actually good for land based developers. They like that. And sometimes, you know, it creates a lot of uncertainty.

I said I'm not going to go through all of these but now I am. I put a question mark next to the regulated utilities structure and that's because it can be a challenge but we also see this as a possible - a real opportunity. You know, when you think about what motivates a regulated vertically integrated utility, they like investments that are big upfront capital investments, have long life and relatively low O&M costs.

(Unintelligible) fits that to a T. They just don't have a lot of experience operating with so that's one of the things that we need to get past. Military airspace and radar conflict has been a big issue for land based development - particularly in North Carolina. And just quickly in offshore wind, you know, I think part of the data challenges of offshore wind is just perception of risk. They haven't operated it. They don't understand it.

So it's a procedure. The utilities are very conservative so they'll go to the extreme end of what could happen to kind of build that into their internal mental model.

This is sort of a one diagram description of what we propose to do and I don't expect you to read this but the point is, you know, if you follow this sort of inputs, activities, outputs, outcomes, there's a couple of things that we're adding to inputs in addition to the vast array of DOE and NREL reports that are available inputs as information into outreach activities. And the outreach activities really range from very targeted outreach activities at the top which would be our utility advisory group where we bring together all of the big utilities in the region down to the broadest activities which I'll cover her in a second.

And we also run a couple of conferences and workshops and that's a good venue for bringing all of these people together and kind of sharing - sharing

the outputs. So some of the specifics here and the inputs - we're working on a supply chain asset mapping exercise where we're going to be sort of mapping the (unintelligible) in the region. That's a big part of the story. You saw the map earlier with lots of manufacturing - wind manufacturing.

We also put - we also put in what we're calling directing projects. And basically what we're doing is we're setting aside part of the funding that is involved with it and that increases over the three years for partners that we haven't identified yet. So we know we don't know exactly what we're going to need three years from now so we build in flexibility to not only bring on additional partners but cover areas where our core partners aren't strong right now.

Our specific engagement efforts - like I said - the utility advisory group is incredibly important for us. It's a venue for not only us giving information to utilities but bringing them together to give information to each other which is - it's surprising how little that happens. (Unintelligible) energy outreach. Economic development is a big part of it so we're pulling together an advisory group for that. To the extent that we can we're going to leverage the existing wind working groups in the region.

And then lastly we're going to build out what we're calling a regional resource center affiliates network or an affiliates network. And the idea is we've got eleven states to cover. We have limited resources to do it. there is no way we're going to touch all of those states unless you leverage the organizations that have connections in those states and so we want to build a network to allow us to be a conduit of information to those existing networks and let them help deliver the information to the right stakeholders.

Okay so I'll stop with a - I'll end with a fun fact for the southeast and I'm looking for estimates here but before we do, let me just make sure we're on the same page. So if you're talking about offshore wind - all else being equal - would it be less expensive to develop a fixed foundation offshore wind in shallower water or steeper water. Which is less expensive? I'll just say deeper water is less expensive and shallower water is less expensive. Okay, I think we agree on shallower water.

And in terms of visual impact - I don't need to ask but farther offshore obviously visual impacts are less. So if you look at all of the east coast offshore wind resource potential according to NREL within 50 miles of the coast, what between southeast, mid-Atlantic and northeast base - any guesses on the percentage that is in the southeast? And no cheating for the people that have already seen this presentation. 25, 50, 75. Do I hear 80? 82% -- 82% of the shallow water far offshore wind resource is in the southeast and we have a lot of other fun facts that we like to share that point to the opportunity in that region.

And that's not to say there's not opportunity in the other regions. It's huge along the coast but the southeast is not a well understood area in terms of wind opportunities and we intend to change that so thank you for your time.

(Patrick Gilman): Thanks (Brian) and thanks again to all of our panelists here. We have some time for questions so if folks would like to do that, we'll start out with (Alex).

So Tessa, can you pull up the RRC map for my presentation? The question for those on the phone - if we still have folks on the phone - is that there are - we counted 41 states covered which means there are some states that are not covered and that's true and that's a function both of sort of resources and the proposals that we received.

We got proposals that covered all 50 states but because of the proposal quality and because of the resources that we had and priorities for using those resources to make sort of the greatest impact - we have this - we ended up with this (unintelligible).

So the question is about sort of DOE's priorities and being focused more on potential than on than sort of current levels of development. I don't know that I would say that that's true. Again, you know, our assessment of the level of impact that our funding would have is only one of those categories, right. So there are states and areas of the country where we received proposals that just were not of a high enough quality to fund.

So I think that's a big part of it. I think the other important point to mention is that, you know, both at the DOE level and then I think (Jose) alluded to this this morning looking at the regional resource network going out into the future. You know, we're committed to supporting the national program and the slate of RRC's that we have currently is not necessarily the one that we will have for all time. So (Larry)?

(Larry): I have two questions - one to (Sarah) about engaging Western Wind Power Administration and then one to (Lisa) about engaging the co-ops in the Midwest. My question - what are we going to do about that?

(Patrick): Can folks in the back hear sir?

(Sarah Wright): So (Larry) - can you hear me? I look forward to working with you to think about a strategy that would work for WAPA and also identifying the issues that are most critical to work on. And we didn't include this in the proposal

but we left our proposal pretty open to figure out what we needed to do so thanks for that idea.

(Larry): (Unintelligible).

(Lisa Daniels): I was just going to - just hang on a second (Larry). I was just going to say that. I was just going to offer and (Sarah) knows as well we work - every day I wake up and I think what do we need to do with Bonneville today and we have many seasoned guests who have worked with the Bonneville Power Administration. The enabling statutes are a little different between the federal agencies but would love to be of help and it would be - it would make us feel good having invested all of this time to be able to share some of what (unintelligible). Thank you (unintelligible).

Lisa Daniels: And every day I wake up and I say what are we going to do with those community co-ops and we have a number of different strategies with that and we also have somebody who's a managing co-op consider an insider or on their side. We have (Tom Wind) on our side.

So we have - we do have a number of different strategies. I will say that we are also working with a network of people throughout the Midwest who are working to get people elected to those rural electrical board and just begin that process. It's not going to happen overnight but we are very much thinking about how to deal with those rural electrical communities.

Woman: Just back to the math here - I'm wondering, you know, with the state wind working groups there were some that were informally created that (unintelligible) you know, organizations in the states that aren't colored in here but they still want to participate. Are there like informal opportunities to (unintelligible).

(Patrick): Yes. I mean I think that, you know, to a large extent the existing avenues that we have for participation in the broader network in terms of the webinars and the tools that we have on the website - those are still going to be available so they're going to be changing I think. But more broadly I think we'd be very interested in exploring ways to best do that.

Woman: We have a question from our webinar audience for (Brian) and they're wondering if you can talk about the involvement with universities.

(Brian): Yes, that's a good question. With the university partners that we've spoken with so far a lot of them have been in those positions for a while. So for example (Mary) at Georgia Tech has been with the Strategic Energy Institute for some time and been involved with NREL.

At Clemson, you know, there's a whole organization built around that drive train test facility. The short answer is I don't see that as - I don't see turnover as a huge problem. I mean in terms of the leadership in those organizations it tends to stay pretty steady and then there's some turnover in staff but frankly I don't see that as a huge problem.

Man: Hi, good afternoon everyone. (Unintelligible) energy. Can you kind of give a general timeline over the next six months to a year on what we can expect from RFC?

Man: Yes and (Ian) you can help fill in here. I might be - the first step we're going to have a kickoff meeting in Colorado in a little less than or about a month and following on that kickoff meeting the RFC's will be delivering to us their sort of stakeholder engagement and implementation plans and (Ian) I don't know

if you want to speak to any of the sort of further out kind of deliverables and discussions that we have in there.

(Ian Baring-Gould): Sure. We have the stakeholder engagement plans about three months - about four months out. We have a business plan that they're supposed to develop again. One of the cordials of the RFC is to be sustainable without DOE funding in another three year timeframe so that happens after about the first year.

We are starting to have metric deliverables. So to anybody who saw the RFC's that there's a lot of metric reporting so that we can document the impact of the activity that the RFC's are having and therefore the DOE program we're having. Those don't start until three months in so we're not expecting the RFC's to start really doing active engagement in outreach. Clearly they can start now but we're not really having them report until the July timeframe so it gives them time to kind of build up the speed.

So again don't expect the same necessarily out of the door although these organizations - as you can see - are actively working in this space already. And so I think (unintelligible) we'll have a transition into more active stuff that is RRC branded but they're all working in the department of reg. Good question.

Man: So I have a question for the panel if there's not, you know, (Brian) mentioned one very specific thing that DOE can do to advance the work of the Southeast RRC. I'm wondering if we could ask the whole panel both in sort of general terms and setting kind of the national infrastructure that sets up the context for your work but also in terms of directly supporting the goals that you have for your regions.

What is it that we can do in the short term and then beyond to help advance what you're doing?

(Chris Rose): One of the questions that I asked (Michael) earlier - (Michael Milligan) - is whether or not he could come up to Alaska and give a presentation like he's given today to some relevant stakeholders. So generally I'm wondering how often or how much we could potentially rely on getting DOE or NREL staff to come to our regions and talk to stakeholders.

Man: Yes and that's a great question. I know that - I think that came up in the vision discussion this morning and, you know, I think that we're open to exploring that. I'm not sure that given, you know, sort of funding restrictions that we'll always be able to send a (Michael Milligan) out to address an issue directly.

I think in some part we see the function of the RRC's as helping us to build that kind of role in providing the expertise at that level but to the extent that it makes sense I think we'd be interested in exploring how to get experts out whether that's in person or virtually or however.

Rachel Shimshak: I can think of two things right out of the shoot. Yesterday in our small group conversation we talked about the challenge that we faced with Public Tower and the same kind of thing. NREL and DOE have a lot of great information and if you could work to engage regularly the national organizations that represent those utilities and, you know, just kind of get them in the groove of asking you to come to their events and present information - we think that would be very helpful.

And Bonneville Power Administration is a big deal in our region and they are a federal agency just like WAPA. And I know that DOE got in a lot of hot water the last time they tried to offer some guidance but it's still worth it. It

would be great to continue to provide positive reinforcement to the good things that they're doing because we have a very inspired leader at the moment and it's always a question for a new leader whether they're going to define the job or the job is going to define them and we want to surround them with love.

Man: Great. Thank you.

Brian O'Hara: I'll just add since we're kind of going down the line I guess. I'll add a couple. We are, you know, in our outreach to utilities, utilities loves expertise. And one of the things that we're doing is in July we're holding a workshop to talk about regional (unintelligible) as a concept and this is something we've been exploring with utilities for a while. You know, we're looking for opportunities to have utilities in the southeast work together because we believe that that is part of a very small part of a longer roadmap that would include, you know, if you look on the offshore side of things a regional demonstration scale project then a regional commercial scale project.

And then you get to the point where if you've established this precedent of regional activity with utilities working together and you look at the size of these utilities, you know, customer bases then you can start to talk about long term really large scale development plans which can give you economies of scale, efficiency and supply chain - all of these things that drive cost which are all of the things that we talked about.

But in groups - in settings like that like the workshop we're having in July, you know, sending the right person from DOE to talk about what's happening at the DOE level so that the utilities hear from them as well as from us. We channel DOE reports all of the time and that's - it's effective but I think when

it's really going to count I think it helps we've got someone from DOE in there and (unintelligible).

Sarah Wright: I get those suggestions and reserve the right to think of other things that we need. I really appreciate all the great technical work that DOE does in the lab to help make our job a lot easier. So that will continue and (unintelligible).

Val Stori: This is a bit larger picture for offshore winds but along those same lines more financial support for floating demonstration projects and the technology itself. I think that's one area where the US could really leapfrog over the European experience and also looking at wind energy areas as a whole and possibly providing or looking at the cost benefits of providing money to do feasibility studies or environmental studies for the area.

Deborah Donovan: I think that these are all really great suggestions and I just want to make more of a generic point that where I think we're headed is that the most respective way to get the kind of information that we want to get out there with as much face time and, you know, being together, you know, physically with folks that are making the decisions. And where we are it really is coming down to, you know, local zoning boards, boards of health, boards of health, boards of selecting and all the (unintelligible) and also the media is having a very big influence on what kind of information is getting into the dialogue.

So I think education and training of those two groups is going to be the thing that right out of the gate is going to be the most effective. And so, you know, I guess I would want to echo that, you know, having the independent technical expert in the room with these folks is, you know, the ideal and I know it's not always going to be possible but I would just reinforce that that is something that would be very effective in the northeast.

Woman: And I have a - one idea is to also keep the channels open so that we can bring feedback back to DOE and NREL on what is needed now. For instance in Minnesota we just went through a whole big process about distributed solar and the value of distributed solar. And we have - we're one of the first states in the nation that has built a regulatory framework around the value of solar on the grid.

Now the next question is is it worthwhile for us to bring up the value of wind in the next legislative session or the next two legislative sessions for distributed wind.

So if DOE can start taking a look or NREL or somebody similar can start taking a look for the process we went through for the value and put that in place and sort of extrapolate that out for distributed wind then we know whether or not how hard to push that in our legislative - next legislative session so that it gets, you know, the kind of political support that it needs, you know.

It's just - it's what's coming down the pipe distributed - it is a distributed value of wind (unintelligible).

(Patrick): And we have to think about those things. Do we have any other questions from the audience?

Man: We have to get a Texas section. That's a pretty important area to our country. Do you have any plans to broaden this effort to include that area?

(Patrick): So I think that, you know, as I mentioned earlier I think we're, you know, this is sort of a pilot for us and we're going to - we're going to see what this flight of RRC's and prove out what it can deliver and prove out the model. I think

we'd be interested certainly in expanding, you know, so that it's truly a nationwide kind of activity. But right now I think we're, you know, committed to supporting the states that aren't covered in terms of sort of the national framework of wind exchange. And to the extent that we can leverage the work that the RRC's are doing in places the RRC's are not going to be covering - we're interested in doing that.

But, you know, in the immediate future I don't see us soliciting for another round like next year or anything like that.

Man: So (Larry) as an example here I've already had conversations with people in all of those states and we'll follow on with what we can do to help support things in moving in the states that are not covered by an RRC. Not that we can do a ton but we're certainly not - they're not covered there and we're not talking to them. That's certainly not the case at all.

Woman: I was going to add one - one other thing and that is, you know, we - sometimes we get so focused on the technical and the political and all that sort of stuff, we forget that the people really like renewables and every single survey I've ever seen on, you know, wind and solar comes out with fabulous results.

And if DOE's would regularly mention that every time - I mean I know there's a lot of partisan bickering but I think all of us need to be reminded that we are trying to deliver what the people want because they want to be able to (unintelligible).

(Patrick): Yes, that's a great comment. I think one thing I'll just mention there and I think it'll be time to close since you all have been sitting here very patiently all day is that we're looking in the next year to start - I think be the first sort of

comprehensive baseline of, you know, quantifying public acceptance and opposition to wind energy across states, you know, looking at both the demographic and the sort of geographic factors associated with that which I think will help us both better focus our investments and be able to tell a much more - sort of a much richer story about the work that we're doing.

So Tessa, I'm going to put you on the spot. Can you bring up the wind exchange site? Is that possible. So a couple of housekeeping items before we close up.

I want to remind everyone that the posters on the wall - really encourage you before you leave the room and wonder out to have some (unintelligible) or whatever to take a look at the questions on there and provide your feedback. Also I strongly encourage you this evening prior to going over to the (Alia) reception or wherever else your plans are going to take you tonight to go check out the welcome reception for the Collegiate Wing Competition which will be down in shoreline A just after this at five.

I've been down there a couple of times and I know some other folks have been peaking their heads in there and there's been a lot of really, really cool stuff going on today with teams practicing with their machines in the wind tunnels. They'll - the teams will all be there available to talk about their technologies. That's something we're really excited about and we hope that you check out both this evening and then over the course of the next couple of days so that the competition goes on.

I wanted to close by talking a little bit more about wind exchange and, you know, we've been - (Jose) opened up and talked a little bit about the framework here that we see for DOE and the stakeholder engagement outreach work going forward.

But this is a new framework for us and it's a new platform and, you know, we've had (Ian) and his team at NREL sort of going through all of the old web infrastructure that we've had for the old WPA site and everything and worked, you know, developing this new framework. And right now there's some stuff in there but, you know, we're very much in beta mode and we're interested in your feedback and this is your homework assignment - to go and think about, you know, the kinds of questions that we discussed to the RRC's up here.

What is it that we can do using the tools that we can provide you both virtually and obviously, you know, we've heard a lot about the need for face time but using the infrastructure that we have here to advance your work out there and make your jobs easier? I want to say that we're committed to being, you know, impactful with these investments. We're in a situation now where we have to show that we're making - making a big difference with the funding that we have and being able to measure that impact.

We're not afraid to experiment. We're not afraid to fail though I'll say when we do we like to fail fast and cheap. But we're, you know, we're open to, you know, trying new things with this. We want to do, you know, develop the tools and a platform that will really help you advance your jobs. With that, you know, I really thank you again for all of your work in this space. We've come a long way and it's something that (Jose) mentioned, you know, we've gotten together from wind is sort of a niche kind of boutique industry in a couple of states to being a player of a major source of utility scale and distributed generation in this country.

Up to 4 1/2% of our nation's electricity but we've got a long way to go if we're going to meet the goals that we've all set out and the vision that (Jose) talked about today. So we really look forward to working with you over the

next, you know, months and years to help make that vision a reality. Thanks all.

((Crosstalk))

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

END