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COMMITTEE ON ENERGY & NATURAL RESOURCES

UNITED STATES SENATE

FIELD HEARING TO CONSIDER RENEWABLE ENERGY PRODUCTION, STRATEGIES, AND TECHNOLOGIES WITH REGARD TO RURAL COMMUNITIES

Saturday, August 22, 2009

Chena Hot Springs, Alaska

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Saturday, August 22, 2009

U.S. Senate
Committee on Energy and
Natural Resources
Chena Hot Springs, Alaska

The Committee met, pursuant to notice, at 10:22 a.m. at Chena Hot Springs Resort, Milepost 56.5, Chena Hot Springs Road, Hon. Lisa Murkowski, presiding.

OPENING STATEMENT OF HON. LISA MURKOWSKI, U.S. SENATOR FROM ALASKA

Senator Murkowski: All right. Good morning. We will call to order this hearing, this field hearing of the Senate Energy and Natural Resources Committee. The hearing this morning is concerning the potential importance of renewable energy power sources to meet our nation's energy needs.

It's wonderful to be here at Chena Hot Springs. It's wonderful to be outside, even if we are in a tent, but being here on a Saturday morning on a glorious Interior day is terrific.

What we are -- what we will focus on today is the important of renewable energy power sources, as I say, to meet our nation's energy needs, what types of technology we should be working to foster, what financial assistance may be needed from Congress to make these differing types of energy expand nationwide. And, of course, particular interest at this hearing is the use of renewable energy in high-cost rural areas.

Before I move further into my opening comments, I want to recognize a few individuals. First, my -- where'd he go -- my colleague, Senator Stevens, has joined us here this weekend. Senator Stevens has long been a leader in advancing energy issues in this state, and I'm delighted

that he is with us today. We have Representative Paul Seaton from Homer who is with us. We also have Representative John Harris -- actually Speaker John Harris has joined us. And as others come into the room, I'll hopefully be able to acknowledge them as well.

We know that renewable energy has been a topic, a very popular topic, in recent years in Congress. Back in 2005 we passed the Energy Policy Act. We provided in that act a host of research and development grants and tax aid for renewables. Then in 2007, in the Energy Independence and Security Act, we went even further, providing more aid for geothermal and for ocean energy projects, and earlier this year we extended the renewable tax credits for a number of years. This winter the Obama Administration suggested that this country should be spending $15 billion a year to expand renewable energy production.

We know that we've got a long ways to go to when it comes to furthering the use of renewal energy. Petroleum last year accounted for 39 percent of our total energy needs, natural gas accounted for 23 percent, coal 22 percent, and nuclear power at 8 percent. All renewables together accounted for just 7 percent of our nation's total energy production, and what we think of as new renewable, which is the wind, the solar, the geothermal, and new forms of biomass, this is just at about 3 percent. So we've got

a long ways to go.

But it is a real improvement in the past five years. Since 2003 we've seen wind energy generation has tripled, up above 1 percent of total energy generation. Biomass still leads all renewables, accounting for 53 percent of renewable energy with hydropower in second place at 36 percent. Wind and geothermal are holding in there at about 5 percent, solar electricity accounts for 1 percent of renewable energy, and ocean marine energy development is barely a rounding error at this point in time.

But as Alaskans we know that renewable energy offers great potential in this state, where we see -- particularly during the winter, our electricity from diesel generation costing about -- an average of about 65 cents per kilowatt hour. I was in Newtok yesterday. They're sitting at about 85 cents a kilowatt hour. Given those prices, anything that supports free fuel may produce real cost savings, if the capital construction costs can be financed and can be controlled.

About 40 percent of the state might benefit from geothermal energy, either shallow vent geothermal, or the future enhanced geothermal systems that are now under study.

Right now about 24 percent of our state's total electricity comes from hydropower. There's about 28 hydro

projects that are currently producing electricity statewide. But we've got about another 250 projects that are already identified sites for hydroelectric generation from lake taps to water diversion from streams and rivers.

We lead the nation here in Alaska in the amount of power that we could gain from ocean marine hydrokinetic projects, using the waves, using the currents to produce our power. Just the state's southern coast theoretically could produce 1,250 terawatts of power a year. This is 300 times more power than Alaskans use each year.

We also lead the nation here in Alaska in traditional per capita biomass. Alaskans are burning about 100,000 cords of firewood each year for space heat. The state is already burning 8 million gallons of fish oil a year down in Kodiak to power boilers to dry fish meal, and using some of that for electricity generation.

We generate 650,000 tons of garbage a year, which Fairbanks is already planning to convert into energy. Anchorage is underway on generating 2.5 megawatts of electricity from methane gas produced by the Anchorage landfill. This is enough to power 2,500 homes. And none of these forms of biomass take into account the 9.5 million acres of timber lands in the Tongass National Forest in the Southeast, or the lands and timber lands in the Chugach National Forest down in Southcentral.

We all know about our enormous wind potential here in the state. Kotzebue has 17 wind turbines that are currently producing about 8 percent of the community's power. There's more wind turbines already erected in dozens of villages in rural Alaska. And most of southern and western Alaska possess the best wind potential in the whole country. We've got the Fire Island wind farm that's on the threshold of construction in Anchorage, there are good wind sites south of Fairbanks, and AVEC, the Alaska Village Electric Co-op hopes to install more than 50 turbines in 36 rural villages, as -- got to find money, it's always about the money. But the plan is out there.

And all of these sites, particularly the large geothermal sites in the Aleutians and the hydro sites, offer the possibility of using renewable energy to generate hydrogen fuel or ammonia fuel that hopefully, someday, we could export, like we export our oil today, to fuel Alaska's economy of the future.

Now, hearing is meant to focus on the renewables, to look at what the development can mean for the state, and especially to look at the very innovative ways that technology can be used to generate renewable energy and energy efficiencies that will ultimately lower consumers' costs.

And, you know, I mentioned the high prices that we're

paying. When we think about what happened last year when Alaska as a state -- actually the country as a whole, but more particularly the remote villages just got nailed with the high prices of fuel, and, you know, we don't have a lot of margin for air there.

We've got congressional hearings back in Washington DC. Some of you have had an opportunity to speak to them. The congressional hearings are a little bit different breed than what you may have experienced if you have gone down to Juneau. Congressional hearings almost never permit unlimited verbal testimony, although someone can submit written testimony for the hearing record. And I'll give you the address later if you would like submit some testimony if what you hear today prompts something that you would like to submit.

Today at the hearing we've got two panels of witnesses intended to provide a host of information. The witnesses will cover an overview of renewables, their need and potential, and what the federal government should be doing to increase their energy generation. I expect we're going to hear some innovative suggestions. I hope we will get some innovative suggestions for the technology in the future, and perhaps better information than what we get in Washington for how renewables can be harnessed to generate the power while we're producing less carbon.

We have a court reporter here today, and everything that is said will be part of the record to be taken back to DC, and this testimony from the hearing will be made available to other senators on the Energy Committee hearing. So the good ideas that are presented today will be reviewed and studied by the Senate members and staff. So I'm hopeful that this hearing will be a useful springboard to advance renewable energy development, both here in Alaska and nationwide.

So hopefully, we're counting on it being a good sounding board to hear what we in Congress should be doing when it comes to both a policy and a financial aid standpoint to help renewable energy development.

The sites today -- when I spoke with Senator Jeff Bingaman, who is the chairman of the Energy Committee, and indicated that we wanted to hold this field hearing at the Chena Energy Fair, we indicated that this was the perfect place to do it. Chena is the first site in the country, first site in the country, to sport a working low-temperature geothermal power plant. As you know, the plant is powering the PA system here this afternoon and everything else from the ice museum's chiller system to the greenhouse fans and lights.

And then later this afternoon I will be participating, as I'm sure many of you will, in the christening of the

first truly mobile, self-contained geothermal power plant. It's been built here, and it's awaiting field testing in Florida.

The innovations here at Chena that have been developed by Bernie Karl, who will be one of our witnesses on the second panel, and those who have helped him, are truly an inspiration a host of renewable projects that are under consideration throughout the state. Whether it's the Fire Island wind project or Mount Spurr or Naknek, Manley Hot Springs, Atukan, the geothermal projects. Whether it's the hydro projects that we're talking about, Lake Chakachamna, Susitna, the Grant Lake hydropower near Dillingham, we've got Thayer Creek down in Angoon. There's so much out there.

So I'm hopeful that with this hearing and what we gather today, we're going to be moving towards the day when there are the resources at the federal, state, and local level to make these projects proceed. Later this afternoon at the energy fair, I'll talk a little bit more about what the federal aid is and what's out there and available to further renewables. But right now I would like to hear from our witnesses about what more we should be doing to spur our renewable power generation, where we should be focusing those limited resources.

So today, this morning, we have on our first panel

Mr. Brian Hirsch. He's the senior project leader in Alaska for the U.S. Department of Energy's National Renewable Energy Lab. We also have a gentleman that is familiar to so many in the energy world, Steve Haagenson, who's the director of the Alaska Energy Authority. We have Gwen Holdman. Gwen has taken me around Chena here numerous occasions explaining all the wonders of what goes on. Gwen is now the director of the Alaska Center for Energy and Power at the University of Alaska Fairbanks. And we also have Chris Rose. Chris has truly been a leader in renewable energy. He's the executive director of the Renewable Energy Alaska Project.

So, ladies and gentlemen, it's a pleasure to welcome you here today. And without further adieu, why don't we start with you, Mr. Hirsch, and just go down the line. We'd ask you to try to limit your comments to about five minutes. Your full written statement will be included as part of the record. So if you want to summarize or add on anything, we'd certainly appreciate it. But welcome to you.

STATEMENT OF DR. BRIAN HIRSCH, SENIOR PROJECT LEADER, U.S. DEPARTMENT OF ENERGY'S NATIONAL RENEWABLE ENERGY LAB

Dr. Hirsch: Thank you, Senator. Thanks for the opportunity to discuss renewable energy technology and development, especially as it pertains to rural energy in Alaska, and the U.S. Department of Energy's involvement in these issues.

As you stated, I am Brian Hirsch, on assignment here in Alaska with the National Renewable Energy Laboratory, which is the U.S. Department of Energy's primary National Laboratory for research and development on energy efficiency and renewable energy issues.

In recent years DOE and NREL has been called upon to provide on location technical assistance and support to state and local entities, especially in locations like Alaska where there's high costs, complexities, and challenges around logistics and rugged climates.

We face many challenges here in providing energy for the state and the nation. And my testimony here will look primarily at what we've been able to accomplish, and challenges and opportunities for the future.

Alaska's well known for our substantial fossil fuel resources. We are less well known for our renewable energy opportunities, but they are equally abundant. And we believe that with proper development, they can support

vibrant communities, help the environment, and a prosperous future. And we need look no further than Chena Hot Springs, as you mentioned.

And the U.S. Department of Energy has been involved very much with everything from the very initial wells and development of the lowest temperature electricity producing geothermal systems here, as well as the mobile geothermal system that will be unveiled today, and an experimental 3,000 foot well that is also looking at enhanced geothermal production that may have broader application throughout Alaska and the country.

As you mentioned, the -- Alaska has substantial tidal and wave potential. The Electric Power and Research Institute estimates that Alaska has 80 percent of tidal and 50 percent of wave potential for the entire country. And just harvesting a small portion of that would more than meet Alaska's needs and allow us to export and support energy needs in the Lower 48 and elsewhere and become a renewable energy exporting state, as well as a fossil fuel exporting state.

Challenges associated with that have to do with converting the energy, delivering it shore, and where it's needed, and storing it for the time of year. Because of our extreme seasonality, Alaska is the most challenged of any state in the country on these issues. And these are

the areas of our focus.

So, for example, we've been partnering with the Denali Commission on an emerging energy technology grant program that both the National Renewable Energy Laboratory and the National Energy Technology Laboratory combined establishing the Arctic Energy Office is on review committee, and we are targeting experimental technologies that really have most potential benefit for Alaska around these storage and delivery issues.

Alaska has considerable wind resources, as you mentioned. The U.S. Department of Energy has a cost share with the state of Alaska on an anemometer loan program that can measure the wind resources, and high-resolution wind maps to identify and pinpoint where those wind resources are. And we've identified over 100 communities, primarily on the coastal areas, that have commercially developable wind resource, or cost effective wind resource.

And we are -- we've -- over the past several years, through congressionally directed projects, we have supported initiatives around in Kotzebue, on Saint Paul Island, in Selawik and other areas with the utilities in those communities. DOE's and NREL's early support of these projects help to answer important questions about wind turbine performance in cold weather, constructing foundations in permafrost, and integrating wind power into

local electric grids.

And because of these early and sustained efforts, Alaska is now widely recognized as a world leader in wind-diesel technology. And we are working closely with the University of Alaska Fairbanks, Alaska Center for Energy and Power to help establish what's called the Wind-Diesel Application Center. And I suspect you may hear a little bit more about that on this panel later. There's also several community scale wind energy projects now operating or under construction throughout the state as a result of some of these early efforts.

DOE's Tribal Energy Program is quite actively fostering solutions as well. For example, one of the projects we thought of is a comprehensive biomass effort in the village of Fort Yukon with the Council of Athabascan Tribal Governments. And that project is looking at everything from forest management and local business development to diesel fuel substitution for district heating, and eventually electricity production. Which, electricity production is really a challenge still. Heating is a lot easier to do, and so really the cutting edge of the technology is using biomass for these combined heat and power units. And so that's another area of focus that once we figure that out will be widely transferrable to other parts of the state, and likely the nation.

Other Tribal Energy Program successes include photovoltaic or solar electric system installations in Arctic Village, the furthest north tribally owned tracking array in the world -- solar tracking array in the world in Venetie Village and Lime Village. I was personally involved in some of the installations prior to my work here at NREL in Arctic Village and Venetie installations. And DOE was a fundamental and important partner in both installation and some of the monitoring and distribution of the information and performance from those systems.

Like early wind projects, installing solar panels in far northern regions, we've been able to answer questions about how well the solar panels perform in cold weather. And what we've found, among other things, is that cold weather actually improves performance of the solar panels because there's less resistance in the panel itself. We haven't quite figured out how to get the solar panels to produce energy in the dark yet. We're working on that one. I think that's way out there in the future. But what we realize more so, seriously, is that obviously solar panels are not going to be a year-round solution. But for up to eight months a year, they substantially improve the energy portfolio in many of the rural areas.

In-stream hydrokinetic is another very promising technology. And also in my former life prior to working at

NREL, I was involved in the installation of the first in-stream hydrokinetic turbine in the country on the Yukon River in the Village of Ruby. And there is an exact replica of the turbine, I noticed, out here for people to observe at the Energy Fair here today. And so that was with the Yukon River Intertribal Watershed Council Consortium of 70 tribes and the First Nations in Alaska and Canada, along with the Ruby Tribal Council and the City of Ruby. And there is tremendous potential of taping of power and moving water in Alaska's streams and rivers.

The Alaska SeaLife Center in Seward is researching the use of ocean water as a heat source for heat pumps. And this is another exciting and innovative project that has wide-scale potential for replication throughout the country -- throughout the state and country in coastal areas.

And emerging opportunity that probably is not widely recognized is improved energy efficiency with marine vessels. Alaska produces over 50 percent of the nation's sea food, and is highly dependent on long-distance shipping for harvesting, importing and exporting, which adds significant costs to all goods that come from outside. And some new diesel engines, modern controls, and operational strategies such as replacing hydraulics with electric motors

have the potential to save between 10 and 40 percent of existing fuel. And there's so many goods that come here from outside that we don't quite realize the hidden costs of some of that improved energy efficiency.

Along those lines we're also looking at electric vehicles, in particular in the rural areas, for things such as four-wheelers and snow machines. There's also an effort on designing sight and culturally appropriate housing. There's a project that the Cold Climate Housing Research is doing -- Cold Climate Housing Research Center, excuse me, is doing through their Northern Shelters Program that is in Anaktuvuk Pass. And that is combining traditional Inupiat design principles with modern technologies to create a low-cost, net zero energy home that is also -- the process at least is widely applicable to elsewhere.

My testimony is primarily focused on rural areas, but DOE and NREL have also been active in Railbelt with our regional integrated resource planning effort and looking at some of those projects that you mentioned earlier, Senator, the Fire Island wind project and Mount Spur geothermal and Lake Chakachamma and Susitna hydro projects. We're also working with developers and industry in Cook Inlet and Kachemak Bay looking at some tidal resource potential for the large urban areas of Alaska.

So as we prepare for energy efficiency and renewable

energy driven economic transition, we're also looking at work force development issues, and trying to nurture green jobs wherever possible. Also looking at smart grids which have tremendous potential in Alaska because the grid is of a size that we can actually manage. Some of the issues down in the Lower 48 are so large that it's very difficult to even run projects and say if that's going to actually have a real impact in a large scale, where here in Alaska from island communities to just small remote areas, there's much more of an opportunity to do so.

Finally, I would just draw your attention to DOE's activities involving the administration of the American Recovery and Reinvestment Act. There's $18 million of Weatherization Systems Program, $28 million of the State Energy Program, $14 million of the Energy Efficiency and Conservation Block Grant Program, as well as another $12 million that's directly going to Tribal and -- Tribes and Native Corporations through the Energy Efficiency and Conservation Block Grant Program, totalling over $72 million that DOE in distributing to the state and trying to work in partnership with the state to effectively use that money, or at least deliver it to them, and then it's up to them. And we're very happy with how that's playing out.

So I thank you very much for this opportunity to discuss DOE's and NREL's activities in the state, and I

welcome any questions you have.

[The prepared statement of Dr. Hirsch follows:]

[COMMITTEE INSERT]

Senator Murkowski: Thank you, Dr. Hirsch. Mr. Haagenson. You might -- maybe you want to move that mic stand. There you go.

Mr. Haagenson: This should work.

Senator Murkowski: Welcome.

STATEMENT OF STEVE HAAGENSON, DIRECTOR, ALASKA ENERGY AUTHORITY

Mr. Haagenson: Thanks, Senator. Senator Murkowski and the Democratic Staff, thanks for the opportunity to talk to you today about this interesting topic of energy. It seems to be taking up a lot of time and a lot of interest because it's really our survival.

But my name is Steven Haagenson, and I'm the executive director of the Alaska Energy Authority, and also the statewide energy coordinator. I was appointed about a year and a half ago to look at energy and come up with an energy plan for Alaska. And as I look at Alaska, I found that we're -- in knowledge, we're truly blessed in Alaska. And along with that blessing comes a little bit of a curse. And the curse we have, which makes us different than most every other state, are our long distances and our low usage. A small population that can -- and the long distance to deliver energy can make almost any project uneconomic, and it can really stress out a lot of the economics throughout the whole industry.

So as we looked at that, we came up with a plan that would actually address that. So we went out in Alaska and we asked them three questions. We went out to about 28 communities in Alaska, and we said, what resources do you know of that are available to make energy in your backyard

because you eat, sleep, play, hunt, and fish here? And the second question is, what don't you want us to use? And the third question would be, why not? And those three questions gave us a lot of information it -- from Alaskans that know more about it than we would from -- as a state perspective.

And then also -- and then we said, okay, let's determine how much energy they need. Because you need -- before you start planning a power plant or any source of energy, you need to know what your need is. So we went through and identified the amount of energy that was consumed across Alaska in each community and put it into a database. The database also put it into perspective of what it would cost to make those resources, if they were available to them, and make energy out of them.

And in January 2009, we issued a report called Alaska Energy, A First Step Towards Energy Independence, and it's being used across Alaska today. Many communities are looking at it and using it as a resource to kind of say, well, this -- I know I have this available now, so now how can I make it real? As we look at the study also, we went through and we developed a map. And the map of our community so we can see what resources are available in each community. And it's nice to see that there's wood in this area, but remember the curse of distance. If it's

more than 20 miles away, you may not be able to afford to get it there.

So we looked very specifically at every community and said, what's in their backyard? And we have a map of that. And we found out, a little bit to my surprise, that there are some places that only have one resource. If you looking the lower Yukon in the -- down in the YK Delta, they may only have wind. There is no other resource for them to use. If you look up in the upper Yukon, they may only have wood. And so -- and there's some of the places that have many blessings, many different resources.

But when we start thinking about what would you do if you only had wind and we're trying to replace our electricity, our heat, and our transportation fuels? And so we said, well, let's use -- obviously use a wind turbine. So how can we make elec- -- we can make electricity very typical today. There's some challenges on how much you can penetrate into the system with wind-diesel coordination. So we wanted to jump past that and go to 100 percent wind.

As we deployed the wind, that makes a lot of sense, when the wind is blowing, you make lots of extra energy. And then we thought of -- you know, naturally I thought of Chena Hot Springs, and we've made an artificial geothermal. The rest of the energy would go into a big tank. And we're

looking at storage medium right now. The tank would basically store hot water. That way when the wind -- now you have a source of hot water to heat your community, and you would have a source of hot water to possibly, if you wanted to, to use an ORC or a Chena Chiller to make electricity when the wind isn't blowing.

And the question is, what's the economics of that? We hired a consultant to actually go through that, look at the efficiencies, look at the economics, look at cost of that, and we are working on developing that technology right now. It's in the letter. We're looking at every community in Alaska to see what resources they have and how we can deploy them.

We also came up with a -- we started listening to Alaskans, and we've been talking to Alaskans about what they really want. And a lot of them are just saying, tell me what you can do now. This is not about 10 to 20 years from now. It's very tempting to get up and -- you know, and come up with a plan out there and do a -- come up with a great plan. I guess my analogy is if a person comes to you and they're starving, you give them a few corn seeds and say here, plant these, and by the time they grow, then you eat that, and then you'll be fine forever. And that works great as long as you can survive until they grow.

So that's, I think, the situation that Alaska is in

right now. We need to have an immediate plan, a short-term plan, a mid-term plan, and a long-term plan. And we're developing that. And we're also adding a stretch goal or an aiming stake at coal to say where do we want to be in the 20- to 30- to 40-year plan. And that simply put is to be 100 percent renewable for all of our electric and all of our heat and all of our transportation. It sounds like a lofty goal, but it's a stretch goal. I think Alaska has the resources to do it, if we have the courage to go down that path.

With this plan, what we'll do is develop a resource map for each community based on the resources available to them. And it will be given to the community so they can see if that's what they want to -- if they -- you know, because at the end of the day, they need to own this. This is not about coming up with a great plan -- and we've had many brilliant plans in the past for energy. This is about Alaskans owning the plan and wanting to go down the path.

At the end of the day, the best plan will fail of you don't have ownership across the state. So our next step is to go out to Alaska and say, here's what we see from our perspective from what we know about your resources in your backyard, then we can deploy it, and we'd like -- this is what we see, so what you -- what do you want us to do in the plan, then we'll make it theirs.

So let's look at the -- let's talk about what these steps r. We have the immediate plan, and what can we do in the immediate? Right now the immediate stuff is really energy conservation and the efficiency increases, both supply and demand side. There's a lot of things we can do on the efficiency side. But energy efficiency and conservation are two different things, and, you know, I'm going to take some of the resources end of it.

Energy efficiency is something you can -- it will happen whether we think about it or not. If you buy your energy efficient refrigerator and you plug it in and you're using it, you don't have to think about saving energy. It's just going to save energy. If you get compact fluorescents, you're going to save energy. If you decide -- if you walk out of here and decide to turn the lights off, right, that's a choice. And when -- in Alaska when it gets 40, 50, 60 below, people make different choices then when it's 60 above. And so you can't really rely on that. So that's a choice. We have education needs that have to be done, and make sure they're using energy wisely. And then we'll figure out ways to use it more efficiently, and then we'll go down the path.

As you see, the short-term solutions are really what we're doing today. There's just way more of it. It's wind-diesel applications, it's using wood that's available,

it's using the small hydrokinetic devices we can install. There's a lot of things we can do today that are pretty much proven, mature technologies. If you get into the mid-term, then you start getting more risk in the technology. When you get farther out, you get into the -- it's artificial geothermal. You get into storage conversion technologies that's risk; it's going to come up. So it gets fuzzier.

We're going to try to give an aiming state goal so people can go down the path to understand what their long-term future will look like in Alaska. This report, and I'm scared to say this, but it's -- hopefully we'll have this -- we have a lot of work to do between now and then, but we're hoping to have these out by the end of November so we can get it to Alaskans and let people work on it and soak on it and own it. This report will also have a concept in there for financing the plan. Because just showing them a path doesn't help them. We need to come up with methods that will allow them to go down the path and make it real.

And the other thing that we have is to mitigate risk. We need to mitigate the risk because -- like gaining knowledge. Right now we have questions like how fast do willows grow? If you're going to use willows as a resource, you better know it's sustainable. Is the land available? Can you -- and it may be great to have a

forest. In some places if you don't have access to land, you're sunk. So all the different technologies, you have to understand what you're going to rely on, how it can move forward, and we'll be developing that as best we can. But that's when you -- as you move into the future, we'll get more information to answer those questions and identify an effective path you want to continue down.

So remember that the aiming state concept -- I'm a hunter, you know, so we're going to aim our -- so we're going to start studying this rifle end. We're going to get it on the paper first, and we're going to analyze the bull's eye later on, but the first step is today is a start. And I think we can study this to death. And I'm not a studier, I'd rather sit there and do something. But I think we need to make -- look at our money use wisely and spend it correctly, because we don't have unlimited money. We need to very carefully focus our mission, get it about right, in the right quadrant or so, and move down that path to success.

So I'll be available for any questions at your convenience.

[The prepared statement of Mr. Haagenson follows:]

[COMMITTEE INSERT]

Senator Murkowski: Thank you, Steve. Let's next go to Gwen Holdmann. Welcome.

STATEMENT OF GWEN HOLDMANN, DIRECTOR, ALASKA CENTER FOR ENERGY AND POWER, UNIVERSITY OF ALASKA, FAIRBANKS

Ms. Holdmann: Thank you, Senator Murkowski and the virtual members of the committee. I appreciate the opportunity to appear before you today.

Senator Murkowski, I'd like to thank you personally for all that you have done to increase focus on renewable energy resources and the use of those resources to develop energy projects in the state and across the country. You've put a lot of work into this, and it is appreciated and valued. So thank you very much.

I'd like to shift the focus a little bit about how we talk about energy. Energy is often discussed as a means to an end, but in actuality, energy is really a tool that we need to obtain the goods and services that we need in our lives every day. Stably priced energy such as what can be achieved from renewable energy projects are needed so that current and future Alaskans and Americans can benefit from high-paying jobs, and so that we can continue to develop our economy, and to build wealth for individual residents and for our state and country as a whole.

Chena Hot Springs is a perfect example. Because it has the geothermal power plant out here, Bernie and Connie Karl know exactly what their energy costs are today. But also what they're going to be 10 and 20 years from now.

Those stable prices allow them to build a business plan based on that certainty, and that provides a lot of value to them in terms of moving forward into that future.

Alaskans are the highest per capita energy users in the country, in a country that is the highest per capita user of energy in the world. That should give us pause for thought. On average we use more energy per individual resident here than anywhere else in the world. There are a lot of reasons for this, and this does not mean that we are necessarily more wasteful than other people. But the point is is that we need a lot of energy. The cost of those energies are not necessarily born equally by all of Alaska's residents. Each region has particular challenges associated with it.

Because we're talking about renewables today, I'll focus on the rural communities, and we are currently on a path right now to spend over $4 billion dollars in diesel fuel alone -- that's not all energy costs; that's just diesel fuel -- in rural Alaska in the next 20 years. That's a big number, and virtually all of those dollars would go to interests based outside of our state. But with those kinds of big numbers can also come big opportunities.

The high-cost of energy in Alaska, and particularly rural Alaska, make emerging technologies like distributed wind, biomass, geothermal, and tidal energy economic to

deploy today. However, many of those technologies are more complex and expensive to install and operate than traditional diesel systems. Is the role of applied energy research like that conducted through the Alaska Center for Energy and Power at the University of Alaska to try and address the technical challenges associated with energy projects in order to bring the costs down and make renewable energy projects economic to install and reliable to operate.

All energy projects are not created equal. And we must be prudent in our investment and new technologies as Mr. Haagenson just mentioned. To this end, the university is working on improving the efficiency of diesel engines, testing advanced energy storage and control systems, and a variety of other renewable energy technologies.

We're also looking at the resources to make sure that projects that we're developing are sustainable in the long term. We're working with Bernie right here at Chena Hot Springs to monitor the reservoir, and to continue to work with him to develop strategies to tweak production and injection of the hot water that makes this place work. We're also looking at growing willows as a biomass crop and what that would take, and doing research needed to deploy in-river hydrokinetic turbines as part of our energy mix.

Many of the proposed solutions we are working on are

also more broadly relevant to achieving the U.S. goals for increasing renewables as a component of our national energy portfolio. For example, a major challenge in dealing with the high penetration of renewables is that a high amount of renewables on our grids, in particular wind, on our electric grid infrastructure. Our grids were not designed for fluctuating power sources, and that has become a challenge not only in Alaska, but other parts of the country.

For this reason, Alaska has the opportunity to serve as a model and as a proving ground for the country, and I hope that the Senate will recognize that role that Alaska can potentially play. As an example, we've been working with Kodiak Electric Association on modeling the integration of hydropower wind and diesel on their electric grid. Kodiak has a goal of 95 percent of their electric power being produced by renewable resources in the very near future. And they are really on track to achieve that with the first megawatt-scale wind turbine federal thing installed in the state of Alaska.

When we think about this 95 percent renewables, which is also something that Chena has achieved here, is a very lofty goal when you consider that, as you mentioned, Senator, that in the country only 8 percent of our power generation is from renewable resources. We have been

working with them to determine how to reach this objective through the use of both short- and long-term energy storage. Achieving those kinds of high penetration is not a simple technical task, and it does require some additional infrastructure to make that happen.

The work we're doing at Kodiak right now is very relevant to much -- the much larger national grid as certain parts of the country are quickly ramping up installed wind power, too. The limited grid at Kodiak affords an opportunity to optimize and prove really high-powered models developed by Sandia National Lab for the much more complex grid in the Lower 48 and verify those so that we can be doing the same types of things in the rest of the country. At a later time, testing new energy storage options on the Kodiak grid to achieve that grid stability will also be relevant to stabilizing the national grid. At the University of Alaska, we've been testing the next generation of batter technologies to meet the needs of both in Alaska and throughout the country.

The U.S. also needs to rethink Alaska's role in the context of future global energy needs. Alaska is an exporting state, energy exporting state. Today we export our fossil energy resources, and those will be critical to Alaska's future for a long time. However, we must also begin to consider how we can develop our stranded energy

sources, both fossil and renewable, to meet growing international demand for energy.

There are ways to export energy other than through electric power and through natural gas pipeline. And that's through the value added processing of products and raw materials. This presents a very real opportunity for the U.S. to reshape and rethink how Alaska fits into the global energy picture in a world that will become increasingly hungry for cheap and stable energy prices. This is not just an economic issue, this is also an issue of national security. As we ship more and more of the processing of raw materials we use every day off shore to nations with cheaper energy than our own, we become increasingly vulnerable to political upheaval and instability in other regions.

We believe that it is our position that a long-range strategy needs to be developed for optimally using Alaska's energy resources for the benefit of both the state and the nation. Thank you for your time. We recognize our future energy solutions will include a mix of renewable resources and fossil fuels. Alaska is a critical asset to furthering a national agenda of providing affordable and stable energy for the country, and we believe the energy research program such as the university have a key role to play in shaping that future.

We ask you to continue to press for funding for these critical research programs so that we can develop more economically viable projects and continue to improve the ones that have already been built. And we would like to ask you to also keep in mind that Alaska's particular needs sometimes differ from those of the rest of the country, and while we have a role to play, there can also be challenges for us to fit into some of the funding opportunities that are out there when we're looking at the specific issues that are needed to be addressed up here in Alaska. Thank you for your time.

[The prepared statement of Ms. Holdmann follows:]

[COMMITTEE INSERT]

Senator Murkowski: Thank you, Gwen. Chris Rose, welcome.

STATEMENT OF CHRIS ROSE, EXECUTIVE DIRECTOR, RENEWABLE ENERGY ALASKA PROJECT

Mr. Rose: Thank you, Senator Murkowski. And thank you, members of the committee. I appreciate the opportunity to speak here today. For the record, my name is Chris Rose. I'm the executive director of the Renewable Energy Alaska Project. REAP is a coalition of 67 organizations around the state, and also around the country that share the goal of increasing the production of renewable energy in the state and promoting energy efficiency.

We are composed of almost 20 utilities, over 20 businesses and developers of renewable energy, four or five environmental groups, consumer groups, Alaska Native organizations, and we also have ten local state and federal agencies that act as advisory members so that we can have their input at our board meetings and in the work we do. We're an education and advocacy group. We do things like put on forums, renewable energy fairs, conferences, put together, along with the Alaska Energy Authority the Renewable Energy Atlas of Alaska, which we have now printed and distributed almost 25,000 of over the last three years. So those are the kinds of things we do, and we really focus on statewide issues, and so I appreciate the opportunity to talk about the federal issues, but just keep in mind that

we really focused a lot on the state things that are happening here.

As many of the other members, the other witnesses have stated, we have some of the best renewable energy resources in the world, and you said that yourself, Senator. You went through the list. We do have some of the, and fortunately or not we've had so much oil and gas in this state that we've, I think, ignored our renewable energy resources up until relatively recently. They've just been in the background, because we haven't necessarily needed them, although we have been using our hydro resources for quite some time.

We do have this huge opportunity now to seize, both here in the state and also at a national level. And the way that we frame this issue of renewable energy when we're out there talking to people is in terms of risk management. Because there are lots of risks, and continuing on the status quo. The first one is already hitting us, and that's price. Worldwide energy demand is expected to double by the year 2050 and quadruple by the year 2100.

We're looking at places like India and China where everybody wants to drive a car, everybody wants to have the same kind of lifestyle that we have. If everybody in China used the same amount of oil per capita as Americans, Chinese today would use every drop of oil that's produced,

and there would not be anything for the Europeans or the Americans or anybody else.

And so we're facing a future where worldwide demand for energy is increasing quite rapidly. At the same time, the fossil fuels that we have really built our civilization on are a finite resource. And so they're diminishing, so price is going to go up. It's going to trend up, and that's a real risk if we don't diversify our portfolio and put in flat price renewable energy resources, and that's, I think, what Gwen and other people are talking about, is we can predict the price of these renewable energy resources, and that is a huge boon for investors and for the business community.

Of course, another big risk is climate change. I included in the testimony that I -- the written testimony, a small article that I pulled off the Internet just two days ago about some research that's just been done here in Fairbanks, the University of Alaska Fairbanks, about ocean acidification, which I think is probably the biggest concern we have right now in terms of the short term. Right now we're looking at a situation where pteropods and other small creatures are unable to form shells because of the increasing carbonic acid concentrations in the ocean. And, of course, that could really impact our fishing industry.

But the biggest insurance companies in the world see this and an economic issue. They're the ones who are paying for these climactic events that are occurring around this -- around the world. And so another driver, and that's what's driving us toward carbon regulation, which is going to cause the price of fossil fuels to go even higher.

I think that one of the biggest risks is that this is $150 billion a year business right now, and most of that business is happening elsewhere, not in the United States. It's expected to quadruple by the year 2015. We have this huge opportunity here to be a part of that clean energy revolution. A lot of people are looking at this as the next industrial revolution, and, in fact, it has to be, because energy is the lifeblood of any economy. We can't do anything, we can't grow food, we can't transport ourselves, we can run businesses without energy. So we're talking heat transportation and electricity.

And as Gwen and others have pointed out, we've got this testing bed in rural Alaska, whether we recognize it or not. When you can produce hydrokinetic energy, for instance, at 50 cents a kilowatt hour, which is demonstration technology, that's not going to really save anybody money in the Lower 48. That saves people money today in Alaska. So this is the perfect place to be testing these kinds of things that are relatively

expensive, with 90 percent of the tidal and 50 percent of the wave energy and all this geothermal and wind, we should be leaders in this technology.

There's two billion people on the planet right now with no electricity. That's almost a third of the world. That's a huge market. All those people wanted electricity yesterday. And if we can perfect these technologies like wind-diesel hybrid systems and hydrokinetics and solar, we can then be exporting that technology around the world. So we have this huge opportunity that we see.

Solar, for instance, is one thing that's really exciting for me. It really hasn't taken off in Alaska because it doesn't follow our load. We don't use a lot of air conditioning, we don't have a lot of lighting in the summer, and yet, when plug-in hybrids come in next year, I'll be buying one of those cars, I'll be putting solar panels on my house, and I'll be running my car off of solar. And so when you start applying solar to transportation, all of a sudden the whole game changes in terms of how we might be able to use that.

So with hydro, solar, all these other opportunities up here, we clearly have a huge opportunity for Alaska. I just want to hit a few federal policies, and like I said, we're not -- we're not concentrated on those, but there are a few federal policies that are important to mention right

now.

There's a Renewable Electricity Standard that's in front of Congress. One thing that the REAP board has talked about quite extensively at one of our board meetings is the definition of hydro. Right now -- and I know you've been working very hard on this, Senator -- I think the Lower 48 sees hydro as something that has been kind of past its life, and also is a -- can be of concern to fish. And, of course, we're concerned about fish up here, too. But we have many, many hydro projects or possibilities up here that the Lower 48 doesn't have. And so if there's an RES and a renewable electricity credit market, we want to make sure that our hydro projects get those RECs.

Also, regarding RECs, we want to make sure that any policy that is formed at the federal level for renewable electricity as standard does not squash inadvertently the voluntary REC market. Because the voluntary REC market right now is really helping renewable energy grow. And so we want to make sure there's no double counting, and that if there's voluntary RECs out there, that they're not used for compliance. We also want to make sure that if there are RECs that are sold before an RES is actually instituted, that the -- those RECs vest in the purchaser and not the entity that produced the power. Because otherwise if we don't do that, it can inadvertently squash

that voluntary REC market.

The Clean Renewable Energy Bonds have been a really fantastic program. Kodiak Electric, which has been mentioned here several times, used those bonds. They're one of the first entities in Alaska to really use those successfully. That program should be expanded, and maybe more various types of projects could be included in that program.

I just had a meeting with John Goll, who's the regional director of MMS the other day, and we were talking about a forum maybe later in the fall about the new MMS leasing program. That's something we really have to look at very closely, because any offshore wind industry, hydrokinetic industry that's going to be evolving offshore could really be hurt if this program is not setup correctly.

And right now I think MMS is in a difficult position to figure out how to actually evaluate those resources. Because for one thing we don't have a lot of baseline information about what the resources are, and I think there might be an inherent conflict in extracting revenue through those leases, and at the same time having policies like the Federal Product Tax Credit that are actually rewarding and incentivizing renewable energy. So there's a little tension

there between those two, and especially with hydrokinetics and offshore wind which are NASA industries. We really want to make them get off the ground and grow. We don't want to hold them back, but we're really pleased overall that FREC and MMS have resolved the jurisdictional conflict over that issue.

20 percent wind. DOE has had a 20 percent wind goal now for about two years. There's a very extensive report. As Brian Hirsch pointed out, NREL's been working on this. The Wind Powering America program, which is part of NREL has been working -- we've been working very closely with them over the years. And that's a very important program to educate people about wind.

There's no doubt technologically and physically that we can do 20 percent wind by 2030 in this country. But there's going to be a lot more transmission, there's going to be a lot more education that's going to have to precede that, and so we're really looking at DOE's goal of 20 percent wind as a doable goal. And we would like to see as many resources put into that as possible, because that is the most mature and commercially viable of all the new renewable energy resources past hydro. 42 percent of all installed new electrical capacity in the United States last year was wind. So it's a very, very fast-growing industry.

On the issue of job training, research and

development, there's a lot to do there. We're going to have to prepare all our workers, and we're going to have to really be leaders in this. The things that Gwen's doing at the Alaska Center of Energy and Power could really have world ramifications if we can provide -- if we can get better storage, if we can really work on these wind-diesel hybrid systems, if we can perfect hydrokinetics. We have this opportunity here in Alaska to help not only the United States, but also the world.

I guess I would just close with the discussion of vision, and that is -- and on the state level working on the same thing, which is we need an overall vision and policy about where we're going. Without that vision and where we're going in 100 years, we're not going to be able to draw the road map to see how we're going to get there. But the fact is that we're probably going to run out of fossil fuels sometime in the next 100 years, or at least they're going to become so expensive it's going to be difficult to use them.

And so where are we going to go? How are we going to get to a place where we are 100 percent renewable like Steve Haagenson says? We -- and it's the econ- -- it's the economies and it's the cultures and the societies in this world that see that like Iceland, like Brazil and other places that have that vision that are going to be the most

economically competitive, and the ones that are going to prosper. And so we're really hoping that Congress can look 50, 60, 70 years down the road for United States and say, how are we going to get there? Because we have tremendous renewable energy resources in this country, and especially in Alaska.

I think it's crazy in some ways in Alaska that we're looking at exporting this natural gas that we have that for Alaskans could last 1,000 years. But if we pipe it to Chicago, we'll run out of it in the same time the Chicagoans run out of it. And so we got to think about ways that we're going to be able to preserve some of our resources here in Alaska and the United States, our fossil reserves, and at the same time really push hard on the renewables. And we really do appreciate all the work that you've been doing on this, Senator Murkowski. Thank you very much. And thank you for the opportunity to testify.

[The prepared statement of Mr. Rose follows:]

[COMMITTEE INSERT]

Senator Murkowski: Thank you. Thank all of you for your testimony this morning. It's been very interesting, good discussion, and I think a very important part of our committee records. So I thank you for that. I've got several questions that I'm going to ask of you, and probably submit a lot more to you as your homework, and we'll include that as part of the record, but in the interest of moving through the panel to the second panel today, I'll let you off the hot seat on some of it.

I want to acknowledge a few of our state leaders that have joined us since the initial introduction. We've got Senator Therriault in the back. I see Senator Bob -- or excuse me, Representative Bob Herron back there as well. Representative Dahlstrom, Representative Charisse Millett. I think that's all that I've seen. Who else? Representative John Coghill. So welcome to all of you, and thank you for your leadership on energy interests. And Representative Jay Ramras is in the back as well, so pleased to have you all here. Who else am I missing.

Audience Member: Senator Thomas -- I mean, Paskvan. Senator Paskvan.

Senator Murkowski: Senator Paskvan right back there. Okay. Who else is back there. Thank you for joining us, and for your leadership at the state level on these issues. I know that there has been more than a few energy field

trips this summer for our legislators, and I think that that's a very important part of what we're doing here at the state.

I want to ask a question. We're here at Chena Hot Springs, where you have one guy, basically, with a vision and a plan and a sense of energy that made good things happen, and he got a little bit of help from a DOE grant at the outset. But a lot of this was shoestring stuff and just really believing in the potential of what we have here.

So much of what happens from a policy perspective back in Washington DC is we've got a tendency, through our policies, inadvertent or not, to pick winners and losers when it comes to energy and how we advance it. And, Chris, you suggested that, you know, wind is one that we've seen real advances, and we can meet that goal. Well, I think part of that is because we've really put those federal dollars and those grant opportunities towards wind. But they look at geothermal, for instance. And when I say they, I mean the Department of Energy and others at the federal government. They look at geothermal and say, well, that's a mature technology. And as a mature technology, you don't fit into these nice, neat opportunities where you can get these emergency -- excuse me, emerging energy technology grants.

And so you've got something going on here at Chena Hot Springs that what we're dealing with is not mature technology, it is a completely different process. And it would qualify as emerging, but we've decided that we're going to go with those more proven technologies. Well, Steve, I think you mentioned that in your assessment statewide of what potential is out there, we got a lot of everything throughout the whole state, but in some areas you just have wind, or you just have biomass. And so through our initiatives and how we direct grant funding, to a certain extent, we're kind of defining what's going to be good and what's going to be bad, and it may not be what works best in the YK Delta. It may not be what works best in Southeast.

So help me out a little, and I'll start with you, Mr. Hirsch, when we're talking about how we advance, meaningfully advance some of these more cutting edge energy vision -- visioning things, how do we do it so that it's more than just a pilot project that gets a little bit of funding and you get some interest, but it doesn't have any follow through in terms of the funding to really put this in the ground and make a difference?

Dr. Hirsch: Well, thank you. It's a really excellent point, and a very incitful question to add. It's something I personally have been wrestling with for many years, and

it's primarily our developer and the contractor prior to my recent appointment here at NREL. And something I mentioned briefly earlier as far as some of the projects I've been working on that are very small scale. And there's several approaches, I think. From the government perspective, what seems to make sense is nobody wants to fund a looser. And so there is a challenge about putting a lot of money into something that doesn't work very well. And we all know that anytime even you fund a grant, there's a risk that they're not going to perform the way it's presented. And so what I've seen happening, what I've actually personally been promoting a lot is this sense of this emerging energy technologies.

My sense of it in Alaska, more than almost anywhere else, has these challenges that we -- that are more difficult, and that we can benefit most greatly from. Around, for example, this tidal and wave energy. We have so much energy that we don't quite know how to handle it even if we were to get it. And so I think what we need to do is have a multi-tiered approach. Understandably, for example, the Alaska Renewable Energy Fund at state level that ADA is overseeing excellently. That's really for commercial, off-the-shelf proven technology. And that's the focus on reducing power costs with things that we know.

At the same time, and what several of us have been

pushing for, Chris Rose, all of us really, have been identifying this need for this emerging energy technologies fund where it's -- and there, you know, pretty strict definition where the concept makes a lot of sense. It's something that's three to five years out roughly for developing this technology to the point where it could become commercial. It's proving grounds.

And so Denali Commission has taken the first step in funding some of their own money, putting their skin in the game to develop that -- to essentially gamble on high risk, but potentially very high payoff-type projects. And looking at some of the energy storage issues around anhydrous ammonia that you mentioned in your initial discussion, as well as energy storage around wind to really increase the high-penetration rates.

And then we're working on a state level -- or many people are working on a state level mirror image of this emerging energy technologies fund for -- similar to the Renewable Energy Fund that the state is doing to -- and it's probably not going to be as much money, and it will have very targeted projects. It's a -- this could be a game changer. And that's, I think, really what we're looking for at this stage. And at the same time, we have to, I think, believe, to some degree, in the American history of innovation and really -- what I've seen is a

real opening of peoples' ideas. It used to be you talked about solar thermal in Alaska, and people laughed you out of the room. And now they're serious about this heat pump in Seward, and Chena Hot Springs here is distributing vacuum tubes with solar thermal that a few years ago you would be –- you wouldn't be taken seriously.

So a lot of it has to do with hearings, such as what you're holding here and the attention from the national level and the real education that policy makers -- I've seen an incredible increase of policy makers' understanding of these issues. And so everybody who's getting involved really ought to be commended. And I think together we're working through those solutions, but they're absolutely difficulties. So thank you.

Senator Murkowski: Well, and I appreciate your perspective on that. I will, I guess, ask for your encouragement within the administration. As you know, back in 2007, we were successful in including within the Energy Independence and Security Act a provision that allows for the authorization of renewable energy deployment grants here in Alaska where the federal government kicks in and helps with matching funds there for construction of some of these projects. And authorization is good. It's absolutely important, it's necessary, but we'd sure like to make sure that there is support within the president's

budget to allow for the funding to go forward.

Because I think all of you have discussed, in one way or a shape or a form that the vision is good, but we've got to have the financial aid, whether it's at the state, local, or federal level to help facilitate. And so we appreciate your encouragement. I don't know whether you can speak for Secretary Chu, but if you can and you can give me the affirmative answer now, I'd really appreciate it.

Dr. Hirsch: I'd only do that once, and then that would be over.

Senator Murkowski: Yeah, yeah, yeah. Okay. We don't want to put you in that.....

Dr. Hirsch: Just very briefly there, you mentioned this geothermal situation, for example, where it wasn't viewed as a mature technology. Just this year there's been a new understanding of that, and there has been a recent solicitation on what they call enhanced geothermal systems where there was exactly that issue where they realized all of the technologies around geothermal are not mature. And there has been new funding for that. Similarly with hydropower where it's been recognized as mature. And just this month, I believe, there was a solicitation that came out on upgrading hydropower facilities that already exist. So there's a beginning recognition of what you're talking

about, but more of this discussion will absolutely help.

Senator Murkowski: I want to ask a question, and I'll throw it out to any of you. When we talk about the technologies that are out there, whether it's for wind or solar panels or anything else that we might be doing, we recognize that our climate up here, our environment adds some difficulties or some challenges. Steve, you mentioned the fact that the solar panels actually enhance the energy efficiency if it's cold. That's something that I didn't know.

How much more of a challenge is it operating in an Arctic environment when we're talking about our renewable energy sources? I know that, for instance, with the wind turbines, what we have up north has to be a little bit different than what they're utilizing down there in California. How unique is our market in terms of the technologies, and how much more do we have to refine them in order for them to really -- to work well here?

Mr. Haagenson: Senator, I think Alaska's always different, right?

Senator Murkowski: Always different.

Mr. Haagenson: And that's the.....

Senator Murkowski: And we tell everybody, but they don't believe it, so they come up here.

Mr. Haagenson: So starting at that point, I think we

do have some different challenges up here. I think one of the things we -- like right now we have a lot of energy, right? In the wintertime we don't. Like Chris mentioned, they don't peak at the same times we need them. So I think that one of the things that we need to look at is storage, right. And if we can solve this problem in storing energy for a day for tidal, for a month for wind, or for a year for solar or hydrokinetic or something like, if we can solve that problem, we can deploy it anyplace in the world. Because this is one of the toughest environments to operate in.

Senator Murkowski: You actually mentioned in your comments that -- I think you said we are working on developing that storage technology now. Who -- can you give me a little more detail on that?

Mr. Haagenson: Yes, I can. We've hired a consultant, WH Pacific, to actually take that concept and make it real and find out if we have any operating deficiencies, the storage, the size it would take, the costing effort. HMS is helping us come up with a cost estimate. And then we'll deploy that out to every community, you know, in our big model. And so we'll see it as part of the costs, to see what the best operating options would be.

So we're developing that. We're looking at one other thing. I was talking to a friend of mine at the Cold

Climate Housing the other day, and we said we're going to put a heat pump at Weller School. And in my days in Fairbanks, I remember that the ground is about 38 degrees, and you're trying to take it to 38 -- 32 degrees and it's going to stop working. And he said, well, what we want to do is we want to put thermal cells in -- I mean, thermal cells, not the portable tape, but thermal and heat -- solar cells, and we're going to collect, you know, a big slab of concrete in Weller School parking lot, we're going to insulate that slab, and we're going to just take that slab up to about 190 degrees, say, and then in the wintertime, it'll be hot, we'll then put a heat pump on that and take it from 190 down to 32. So and they're thinking they can get a lot of energy out of that slab.

Again, it's a storage technology. So there's a lot of challenges here, but I think -- and I'm going to go back to your first question that -- about the first answer, I think what we need is passion, okay, in Alaska. And if you think about Bernie for a second, I don't know how many of you have had the pleasure of saying no to Bernie.

Senator Murkowski: It doesn't work.

Mr. Haagenson: It doesn't work, right. And so why is that? Because he's passionate. He's the most passionate guy I know. And you tell him no, and he's going to tell you the five reasons why you can't say no. And he's going

to go forward without you. So we need more Alaskans like Bernie. And I'm saying that with a little hesitation. We need more Alaskans with passion like Bernie. Nothing personal, Bernie.

Senator Murkowski: We all understand.

Mr. Haagenson: Thanks. So I mean, that's -- and that's not a question do you have passion, you don't want unbridled passion, but you need to -- now the question is how do you handle risk. And like Dr. Hirsch mentioned, you don't -- you know, you don't want to respond failure. You don't want a bad budget, but the question is how can you fund things like that, and who should fund it until you make the next step? Because a lot of breakthrough technologies need risk. Bernie took risk. He -- you know, he was told many times that won't work, it's too cold. One man told him that over and over again. He went and found a solution, and they're wishing that they would have listened to day one today.

So how do you encourage risk, and how do you -- you know, how do you get people with passion to move the risk forward? And you'll find solutions in Alaska. There are a lot of passionate people in Alaska. There's a lot of creativity across Alaska happening today. How do we get that and share it, share the successes, and then learn from the mistakes and don't repeat them?

So Brian also mentioned Renewable Energy Fund. I'm on record on that -- on those projects as zero failure. Okay. Now, he's -- and I think we can pull it off. But that's not the program designed to look at technology, to look at advanced technologies. It's just designed to deploy technology. ACEP is very good at looking at technology, looking at the risk, evaluating, bringing the issues to the forefront and solving them. And that's really one of Gwen's strong points.

So we need to, as Alaskans, come together and figure out what we really value, how we want to move forward, how are we going -- how we deal with risk, and don't hammer the guy who has a little failure, and encourage him to say well, okay, if that didn't work, tell me another way it will work. So, you know, in my prior life, I was -- I was told I would -- had to make two mistakes a day. And if I wasn't making mistakes, I thought I wasn't doing anything. I think we need to get that attitude in Alaska. Thanks.

Senator Murkowski: Okay, Gwen, you looked you wanted to hop in there.

Ms. Holdmann: I did. I just -- I've just been thinking about the project here at Chena, and maybe -- I'd like to give a little bit of history on the very, very early pre-Chena history of the -- of this low temperature geothermal power plant. And I think that it might be

illustrative in the way this project was brought together in the private sector and how we may be able to shift some of the ways that things are done at a national level in terms of having more collaboration between different fields.

We tend to have stove pipe technologies a little bit. The wind guys are wind guys. They work on wind. The hydrokinetic guys, they work on hydrokinetics. You know, that's also a challenge I've been dealing with at the university. Energy is an interdisciplinary problem, it's a -- and the solutions are going to be interdisciplinary, too. We need to get more kind of cross collaboration between different programs at the national level, and especially I think within the national labs, I'd like to see that happen as well.

The -- to give you a little background on how this Chena chiller came to be is that United Technologies is a very large company. They have a number of different subsidiaries. And what they do from time to time, and this is at the risk of telling this story without representatives from United Technologies here, but they bring different engineers, their top level, brightest guys from different programs together and to kind of think tank sort of circumstances. So guys that really have nothing to do with each other in their areas, don't have anything in

common, to sit down and figure out what they might be able to do together to come up with a new product or a new idea that could ultimately become a marketable product and make the company money.

And so in this case, they took some of their bright guys from Carrier Refrigeration that had this very, you know, standard, off-the-shelf, 100-year-old refrigeration technology, mixed it with a guy that had designed a new turbine for a jet engine, and literally out of that thinking came to say gee, we're actually -- this waste heat recovery, this low-temperature waste heat recovery system using a new turbine design, coupled with the Carrier Refrigeration system. So essentially this is running a refrigeration system in reverse where you're taking -- where you're taking a temperature difference, a hot and a low temperature, and then you're using that to make power rather than electric power to create a temperature difference. Which is what roof power refrigeration system work.

So they got these guys together, they engineered this system, and then in talking about it a little bit more, they realized there's geothermal applications. And that's really how this happened, but it really started from this cross seeding of different technology areas. And I don't see that we're doing that enough in this country. And if

there's ways that we can kind of facilitate that in order to find new solutions, and I think improve all of our systems and the challenges that we have, that would really be something that would be worth taking a look at.

And I should also note that there's a critical juncture in there, too, where DOE stepped in and kind of funded that project here at Chena. And without that, I don't think that there would be a United Technology peer cycle, geothermal, low-temperature power plant today. I don't know if that's true, but it certainly was a critical juncture where that federal funding has now moved us into a commercially available technology that hopefully will benefit a lot of other people.

Senator Murkowski: Your point about kind of the silos that we have within the energy world I think is very apt. And we see that, and it's -- so much of it, unfortunately, is about the funding that comes to you. If you're working wind and you're competing with all of the other energy sources for those dollars. And those federal dollars, unfortunately, are limited, and they're limited at all other levels as well. And so instead of the sharing and the collaboration that you're talking about, and that I absolutely agree must happen in order to facilitate some of the ingenuity that has to go on in order to accomplish some of these difficult tasks, our systems are not set up to

really allow for that.

I've actually had a conversation with Secretary Chu about that. And, you know, he's coming at it from the researcher/scientist point of view, and I think he appreciates the difficulty of it. Our challenge is to do what we can to really help facilitate a greater level of collaboration. Because we don't have it. So maybe rather than starting from the Secretary's position and working on down, we need to force it from the bottom up. And I think you see that, and I appreciate you giving the history and the background on this, because I think it does demonstrate that if you have the passion that Steve talks about and enough people that are willing to think outside the box in terms of the solutions, we can get there. And again, jumping in with the DOE grants at the appropriate time doesn't hurt the situation either.

Chris, I'll let you make a comment, and then we're going to have to move to the next panel.

Mr. Rose: Sure. Just a quick comment that reflects on both of your questions. Because there is -- there are winners and losers that are chosen on the generation side for a number of reasons, and we have unique challenges here, but as Gwen pointed out, we're the highest energy users per capita in the world here. So what we really should be focusing on is energy efficiency. And there are

many reports out there and studies that point out we could reduce our energy load by 20 to 25 percent.

So that's 20 to 25 percent of the future generation we don't have to build. And so the more we can focus on the energy efficiency part up front, the less we have -- generation we have to build. And if we're the highest energy per capita users in the world, we should be leaders in energy efficiency. And if we were looking at ourselves as a business, we would call that waste, and we would say, we're going to make more money because we're going to waste less. And so I think we have to kind of look at ourselves that way and say, we're going to waste less, but we're going to keep all that money in our economy and we're going to let it multiply. Thank you.

Senator Murkowski: I think when you remember and you appreciate that we are the number one consumer, and you also appreciate the extent to which energy costs impact us in this state -- you go outside to the Lower 48 and the average American household spends about 3 to 6 percent of their income on energy costs. And in some of the rural parts of this state, we have families that are spending, you know, close to 47 percent of their income on energy costs.

When you put it in that perspective, we've got an obligation as a state to figure it out, how we're going to

do it here. Because yes, it impacts -- it impacts people all over the country, but there's a huge difference between 3 to 4 percent of your family budget going towards energy costs, and when the price spikes, boy, you deal with it. But when you're paying close to 50 percent of your family income on energy and price spikes, we don't have anywhere to go. So this is an initiative that, again, should consume all of us. It should make us passionate about how we can really make a difference in reducing those costs, working towards an energy efficiency and conservation. But really using the ingenuity that I think makes Alaska wonderfully unique and wonderfully independent and figure out how we can do better by all those who live here.

So with that, I want to thank you for your comments. And if you have additional input that you want to provide for the record, we'd certainly welcome that. And you will be receiving some additional questions from me that if I could have you respond in writing, we will incorporate that as part of the record, as well. So thank you for your time and your leadership on energy issues.

Let's go ahead and invite up the second panel, if we can, please.

Okay. I would like to go ahead and get started with our second panel. We probably have about an hour to move through this second group. I know that we've got a whole

schedule of events after this, and so I want to make sure that we have sufficient time to hear from, again, this distinguished group of individuals. We have on the second panel, Mr. Bernie Karl. Bernie has been mentioned repeatedly this morning. So I'm glad, Bernie, you were here to take all the comments, compliments, and be here to defend yourself if necessary. Bernie Karl is the president of Chena Hot Springs Resort here, and the head of Chena Energy LLC. We also have with us Barbara Donatelli. Barbara is the vice president of CIRI, and is very involved with the Fire Island wind farm. Next to Barbara we have Jim Dodson, who is president of the Fairbanks Economic Development Corporation. We also have Doug Johnson, who is the Alaska project director for the Ocean Renewable Power Company. And the final individual on the panel on the panel rounding us out is Dennis Meiners of the Intelligent Energy Systems. So it's a pleasure to have the five of you with us this morning.

And, Bernie, we will begin with you. And as a thanks to you and to your wife, Connie, for hosting the Renewable Energy Fair, and allowing us to conduct this field hearing at Chena. And we appreciate it a great deal.

STATEMENT OF BERNIE KARL, PRESIDENT, CHENA GEOTHERMAL ENERGY LLC

Mr. Karl: Senator Murkowski, thank you for the opportunity to address both you and the committee on what I believe is probably the most important issue facing the world today: energy. I'd like to -- a special thank you today to Senator Stevens, who's been involved in all of our energy fairs so far, and who has been one of the strongest supporters of renewable energy in the country. And so my thanks to Senator Stevens for being here today, and for all that he's done for the state of Alaska, because it has been tremendous, and without his help there would be a lot of -- a lot of rural Alaska that would not have water, would not have sewer, and would not be looking at renewable energy today.

With that being said, what can we do? Well, I think that Einstein says it best. Einstein says that imagination is more important than knowledge. And I think our problem is, is that we don't teach imagination. We don't teach that to our children to use it. And if you have an imagination, you can imagineer. Without imagination there's no imagineering going on.

And Gwen didn't have it exactly right when she talked about United Technologies, because we were already going to build a power plant, but not with them. We were building

it with Barbara Nichols. And there would have been a power plant built, so she was wrong about that, because it would have been built because I had already signed a contract with them with a handshake. And we already had the $750,000 to do it. And it would have worked on this low-grade temperature, because they were already doing it.

But what happened is United Technologies called us and said, hey, we understand you're going to do this. You heard of us? I said, no, I haven't heard of you. Who are you? Well, we own Sikorsky Helicopter. Well, I know about Sikorsky. We own United -- we own Carrier Refrigeration. I said, well, I've got some of those rascals. We own Otis Elevator. I said, I was on one this morning. Hamilton Sundstrand. I said, well, I went to school for Sundstrand Pumps. Okay, you're calling, how can I help you?

Well, you see, even though you have all of these brilliant people doing brilliant things, sometimes you still need a little imagination to go with it with all this brilliance. So when they called, they said, hey, we got this idea, would you want to be involved in it. Well, I said, we already have a deal going. So no, I don't think we want to be involved. Well, my contract with Barbara Nichols, I was released from it because he said he's an engineer and he also worked for Pratt & Whitney many years ago. And he said, I believe this is a better idea, I

believe you should go with them. I believe this will be better for more people.

And today you're going to find out it will be better for more people. With a portable unit that will be able to go to an oil well and hook up in one hour. There's 250,000 producing oil and gas wells just in Texas alone. One state. Just one state. 150,000 oil wells that are not even producing. They're capped off. If we just took that, we could make 5- to 10,000 megawatts. Not my number. Not my number. Comes from MIT.

If we harness 2 percent of the earth's energy, just 2 percent of it, that's a thousand times more than the world consumes. We talk about solar, we talk about wind, we talk about the money they get. Senator, as you know, the geothermal budget was zeroed out. Zero. With your help and with Senator Steven's help, you were able to get back some money, a small amount. And thank you for that. Thank you for what you've done. But it was zeroed out. It's not like -- it's not like we care about zero. Try that on for size.

Why do we have serial number 1, serial number number 2? Why do we have the first portable unit here if it's such a mature industry? I say the geothermal is every bit as important, or maybe even more important because you can base load on it. It is the only renewable energy that you

can base load on. But yet it gets the least amount of attention; even to this day it gets the least amount of attention. Shame on us. It's because we're addicted to oil in one arm, and we're addicted to greed that somehow we have convinced people that we can't do it. Well, the word can't is not in my vocabulary. And it shouldn't be in our children's vocabulary.

Webster's got to be an idiot. Webster says that failure is if you don't succeed. And so we have these projects, you give them a grant, and they don't succeed, so you say it's a failure. I say failure is if you don't try. I say failure is if you give up. If you don't give up, you could never be a failure. But yet we teach our children that failure is if you don't succeed. Shame on us.

And I've not heard one person mention hydrogen, or mention carbon. The two most prevalent elements on earth. The good Lord builds everything out of carbon, and builds everything out of hydrogen. The only one that doesn't use it very well right now is man. The only mammal on earth that deliberately destroys his environment and then denies it is us. What is wrong with that picture? Something is wrong with it.

I mean, we should be the world's leaders. Alaska should lead this parade. Why do you want to follow a parade

when you can lead it? With our high energy costs, we should be leading the parade. My wife and I are motivated by huge debt load. That's what motivates us. We have $2 million of our money, and $650,000 that we borrowed. If anybody thinks he's a self-made man, he's a fool. Because all of these people have helped you all through your life, starting with your maker, and then with your parents, and then all these people around us.

United Technologies has been a tremendous partner. The University of Alaska Fairbanks has been a tremendous partner. The food that you see growing here, none of that would be happening without the university. There's a lot of knowledge at the university. Go use your universities. Do I think they should be funded? Absolutely. Do I think we can overstudy stuff? Absolutely. Do I think we need to have projects that are successes? Absolutely. Do I think that the future is the brightest it's ever been in the history of man? Absolutely. There's more opportunity now than there's ever been in the history of man. But it's in reinventing ourselves. It's not as business as usual.

Right now you'll notice when you look around this Energy Fair, not only are there a lot of vendors that have a lot of good ideas, but go look at the LEDs, the light-emitting diodes. These have the same kelvin, they have the same spectrum as your light bulbs. They will reduce your

power costs by -- for lighting by at least 50 percent. And we will guarantee it. We will guarantee it. You look at the new lights in the greenhouse. They're red and blue spectrum, because that's what the plant wants. It's going to cut our lighting load by 90 percent. By 90 percent. We've spent three years of our life looking into it. Now we are importing them. They'll be available for Alaska. I believe that Alaska can cut its lighting load for all of Alaska in the next two years by 50 percent. In two years' time. What can you do now? You do that. And you do it now, not tomorrow, today.

What was the best time to plant a tree, a Chinese proverb? Thirty years ago. What's the best -- second best time? Today. Change your light bulbs. Look at the solar heating out here. Why do we have it here? Because it makes infinite good sense. That's why. And because technology has come that far. It's here today. Change today. Do what you can do today. Remember that if you take just a hug, just a hug from the earth, there is enough energy there to take care of all of our needs. All of our needs. I'm not saying that it is the silver bullet. I'm just saying there's enough there, and there's been very little effort put into it. Thank you for the opportunity.

[The prepared statement of Mr. Karl follows:]

[COMMITTEE INSERT]

Senator Murkowski: Thank you, Bernie. Appreciate your vision and your passion. Barbara Donatelli.

Ms. Donatelli: Yes.

Senator Murkowski: Welcome.

STATEMENT OF BARBARA DONATELLI, VICE PRESIDENT, FIRE ISLAND WIND FARM, COOK INLET REGION INC.

Ms. Donatelli: Thank you very much, Senator Murkowski.

I really appreciate the opportunity to be here today and give an update on the Fire Island Wind Farm. That's currently the largest renewable energy project under development in Alaska, and we're really pleased to be able to be a part of working on bringing this project online.

CIRI and its partner, enXco formed Wind Energy Alaska in 2007 to develop and operate commercial-scale renewable projects in Alaska. The company is developing Alaska's first commercial-scale wind farm on Fire Island three miles west of Anchorage in Cook Inlet. The 36-turbine, 54-megawatt project will product clean renewable electricity, and serve as an anchor to help additional railbelt wind projects to achieve national goals for energy independence and reduction of greenhouse gas emissions. We expect to generate enough power to -- enough power for more than 18,000 homes in Anchorage.

Southcentral Alaska currently relies on natural gas from the Cook Inlet basin for most of its electricity and heating energy. In 2008, Railbelt Utilities, excluding Golden Valley Electric, generated more than 93 percent of their power with natural gas. However, as we all have

heard, the Cook Inlet gas production is in steep decline, down from 205 billion cubic feet in 2005 to 146 billion cubic feet in 2008. An alarming 29 percent drop in only three years. At the same time, price volatility is increasing.

In 2008, natural gas prices fluctuated from a high of $13.32 per million cubic feet in July to a low of $5.38 in December. Fluctuations of this magnitude make planning difficult and have a devastating impact on both residents and businesses. The Fire Island project will generate flat-price renewable power. That will diversify Southcentral Alaska's energy resources to increase reliability, and decrease rate payer's vulnerability to natural gas shortages and price swings.

Developing the Fire Island project has not been without its challenges. A key challenge we still must overcome is securing approval from the FAA to relocate the aviation navigation equipment, commonly referred to as the VOR, off of the island. As it currently stands, FAA restriction necessitated by the VOR will not permit us to build and economically viable project.

On July 15, 2009, Wind Energy Alaska filed new applications with the FAA to expand the proposed Fire Island Wind Farm to a financially viable 36-turbine project. And then just this week, in anticipation of

receiving a notice of presumed hazard, Wind Energy went to Washington DC and delivered a VOR relocation plan. We believe that plan will provide the FAA the data it needs to determine that the potential interference caused by the turbines can be mitigated by relocating the VOR and thereby allowing the project to move forward.

Our plan is to construct an upgraded digital doppler VOR on property at Ted Stevens Anchorage International Airport. Then after FAA certification of the new equipment, the existing Fire Island VOR facility will be decommissioned. Analysis indicates that the VOR can be relocated with no adverse impact to airspace operations, and with the benefits of increased facility security, reduced operation and maintenance costs, and equivalent or improved air navigational services for pilots.

Importantly, Wind Energy Alaska is not asking the FAA to move the VOR. Instead we are asking FAA to enter into a memorandum of agreement that would allow the project to move the VOR with FAA support on an expedited basis. If we can meet this schedule, the Fire Island project will begin delivering power by the third quarter of 2011.

Now, a little bit about rural Alaska energy needs. As we've heard already from many other folks who've testified, currently most rural heat and electricity needs are met with heating fuel and diesel. And these costs have risen

sharply in recent years. Some communities are trying to find ways to reduce their energy costs by improving efficiencies, and by developing renewable energy sources.

Currently the lowest cost renewable energy available today is wind. There are nearly a dozen communities around the state with combination wind-diesel systems displacing diesel fuel burned in those communities. As we've also heard, the energy storage is one of the biggest challenges to renewable energy development. Electricity produced by wind generation must be used pretty much at the same time it's produced. It can't really adjust to changing demand. Consequently, a system is needed to store that excess energy when demand is low, and then to supply extra power when demand is high.

Currently, electricity storage is difficult, inefficient, and expensive. Commercial batteries, for instance, run into the millions of dollars per megawatt capacity. Other hurdles to broader development of rural wind systems include lack of availability of village-scale turbines, lack of availability of spare parts, and lack of a trained work force in many cases.

Unfortunately some of our communities in Alaska lack adequate wind sources necessary for the existing turbine design. Research into low-speed wind turbines could lead to the development of a machine capable of serving

communities that currently don't have sufficient wind resources for wind generation.

There are some potential synergies between the Fire Island wind project and rural renewable energy initiatives. The Fire Island project could include several smaller-scale turbines that could be used to teach Alaskans to install, maintain, and operate wind projects in their own communities.

Finally, some recommendations about what can be done to promote wind development. On the policy side in locations where wind development has proposed potential hazards to aviation and must be approved by the FAA, we believe the current process could be streamlined to help bring projects online on a more timely basis. This could possibly be accomplished through establishing an office within FAA, or assigning a project manager to potential wind development. And that could help navigate the wind developer amongst the various FAA directorates and help, you know, get it through the approval process in a more timely manner. We think that would be area that could -- we could really be a help to not only wind projects in Alaska, but potentially around the country.

On the technology side, research into the development of energy storage systems that really address this intermittent nature of most renewable energy technologies

would be a real boost to not only wind generation, but to other renewable projects. We think the development of work force training centers that support the implementation, operation, and maintenance of renewable energy technology -- technologies would be an important factor as well. And the development of enhancements to existing wind turbine designs to extract more energy at low wind speeds.

So thank you again for allowing us to testify about our project and some of the challenges and -- that we've encountered.

[The prepared statement of Ms. Donatelli follows:]

[COMMITTEE INSERT]

Senator Murkowski: Thank you for hanging in there. It's been a long process.

Ms. Donatelli: It has.

Senator Murkowski: We know that. Next let's go to Jim Dodson. Jim, welcome.

Mr. Dodson: Do I need to move this?

Senator Murkowski: Yes, you do. Actually, if you can just kind of pick it up, it'll probably be easier. We've got a volunteer technician. Thank you.

STATEMENT OF JIM DODSON, PRESIDENT, FAIRBANKS ECONOMIC DEVELOPMENT CORPORATION, MUNICIPAL SOLID WASTE PROJECT PROJECT

Mr. Dodson: Thank you, Senator Murkowski. And thank you for your continued commitment to all Alaskans and Alaska's energy needs.

Alaska is blessed with vast energy resources. Beyond our conventional non-renewable resources of oil, natural gas, and coal, Alaska is also blessed with abundant natural resources -- renewable natural resources in the form of water, wind, geothermal, solar, biomass -- renewable resources that could provide for Alaska's energy needs virtually indefinitely. Unfortunately, these renewable energy resources, most within easy reach of all Alaska communities, have been woefully underexplored and underdeveloped until only recently, while our vast conventional energy resources, particularly oil, have been a boon to state government, but have proven a drain on most Alaska citizens and most Alaska communities.

Alaska is a sparsely populated state, only 680,000 Alaskans. Our communities are spread across an immense state that covers 660,000 square miles. This makes the distribution of goods and services, like heating fuel and electric power, expensive and challenging. Over 50 percent of all Alaska homes are heated with fuel oil. And 67

percent of their energy cost is from -- are from home heating.

The cost of energy is crushing our economy. Many rural Alaska residents are leaving their communities, communities that have existed for hundreds of years are no longer sustainable because of the cost of energy. For Interior and rural Alaskans living in a winter Arctic environment, saving money by simply turning down the thermostat at 40 below, or turning off our lights when the sun only shines a few hours a day is not an option.

Alternative and renewable energy sources can be a part of Alaska's energy solution, but it is not the entire solution. Affordable, reliable, and sustainable alternative energy will take time, research, and investment if we are to achieve America's goal of 25 percent renewables by 2025. 25 percent renewable, 75 percent conventional, but 100 percent affordable.

Fairbanks Economic Development Corporation and the Fairbanks community has promoted energy issues from conservation, to biomass, to energy from municipal waste, to in-state use of natural gas, to hydroelectric power generation, to a biomass/coal to liquids project.

When working on a biomass projects we found that though the resource potential in the Fairbanks community, including woody biomass, crop slash, processed timber

residue, land clearing and fire mitigation materials, and municipal solid waste were substantial. Only municipal solid waste was at a stage where it might be immediately used for energy production. For other biomass resources, questions regarding their true abundance, chemistry, cultivation, reforestation would all have to be answered before they could truly be utilized as a sustainable energy source.

Alaska has vast forest lands. Its forest resource potential is immense. However, Alaska lags far behind other states in accurate, up-to-date forest inventory analysis. Neither the federal government nor the state have adequately invested in the necessary forest inventories. Surveying for forest type and tree species using on-ground techniques is critical for any sustainable use of biomass for energy resource.

Also, just as a birch is different from barley, the energy output of different plant species can be radically different. Understanding the Btu output per volume of individual indigenous and introduced species is critical. We must determine what crops will produce more energy from use than they consume from production and transportation.

When working on a waste-to-energy project, we found that existing commercial technologies were not scaled to be economic for similar communities. Communities such as

Fairbanks, with just less than 100,000 people, and all of rural Alaska, cannot afford the heat and power generated from waste-to-energy projects that are currently -- or equipment that is currently available commercially. Research, development, and testing, demonstration must be continued to allow waste-to-energy projects to become a viable part of the energy solution for a small Arctic communities.

In December of 1958, an ad in the Fairbanks Daily News-Miner read: Coming, Natural Gas for Fairbanks, Nature's Perfect Fuel for Home and Industry. As you know today, more than 50 years later, that fuel source is still coming. With only 680,000 residents, Alaska is not a large enough market to attract private investment in a gas line solely to service Alaska markets. That perfect fuel that could reduce Alaska's energy cost, that should be Alaska's fuel for 75 percent -- be the Alaska fuel for communities use 75 percent of their energy needs, that would contribute to the reduction of Alaska's CO2 footprint, that can eliminate the Fairbanks PM2.5 issue. It is no closer to Fairbanks today or the majority of Alaska communities than it was 50 years ago. Conventional thinking will not solve this problem; simply hoping for private industry to make natural gas available to all Alaskans at an affordable price will not reduce our energy costs, meet EPA air

quality guidelines, or reduce our CO2 emissions. Innovative thinking and bold leadership from our national and state officials is needed to make natural gas available to all Alaskans, and it is needed now.

The first license request to build the Susitna Dam project was submitted to the Federal Regulatory Commission in 1984. That application was dropped within a year when the price of oil dropped and energy was perceived to be cheap.

Hindsight tells us that the decision to drop the Susitna Dam application was wrong; energy produced from crude oil is not cheap, and our 1985 decision not to proceed with the construction of that project has contributed to today's high energy costs, increased CO2 emissions, and possibly global warming. Building Susitna Dam is a long-term project; it is not the answer for today's staggering energy costs, but it is an answer for future clean energy needs, and today is the time to restart the Susitna Dam project.

In 2008, the Fairbanks Economic Development Corporation contracted with Hatch Limited for an engineering and feasibility study on a coal, biomass, and natural gas to liquid facility. That facility would take underutilized, low-value Alaska resources -- biomass and coal –- and produce jet fuel, Arctic-grade home heating

fuel, no-sulfur road diesel. It would provide synthetic-blended liquid fuel for the United States military, firmly anchoring Alaska's military, a full 25 percent of our economy, to Alaska. It could be a base-load consumer for an in-state natural gas pipeline. And according to publications by Dr. Paul Metz of the University of Alaska and the U.S. Department of Energy, there is a strong indication that the CO2 produced in such a facility would be as valuable as a miscible injectant for enhanced oil recovery, sequestered, while at the -- still at the same time allowing for the production of up to 12 billion additional barrels of North Slope crude from existing fields.

Alaska is uniquely positioned to help America -- to help American transition to a new energy future. No other people and no other state in our nation are more reliant on energy for their survival. No other people have more to lose should we fail to succeed than the people of Alaska. No other people have more of a vested interest in seeing that these new and innovative technologies work. No other state has such a wide diversity of renewable, sustainable fuel sources at such a tremendous -- at such an enormous abundance than Alaska. Therefore, no state is better positioned to drive the research on these new technologies than Alaska. If you create it, Alaska can power it. No

other state has such a wide range of temperatures and climatic extremes, is as hard or unforgiving as Alaska. Therefore, Alaska is better positioned to serve as a test bed and proving ground for new energy technologies than Alaska. Alaska tested, Alaska tough resonates for a reason. If you can make it work here, you can make it work anywhere.

It is unfortunate that the national discussion on energy is often dominated by advocates of the extremes -- those who say we can continue on forever with business as usual, or those who say we must chuck conventional energy sources and move wholesale into renewable. Alaska and America need both renewable and conventional energy. The president's goal is 25 percent energy generated from renewable sources by 2025. In Alaska, if we were able to provide rural Alaska with 25 percent renewable energy for free, their energy bill would still be unsustainably expensive. Alaska -- energy is a fundamental component of any economy. 25 percent renewable, 75 percent conventional, but 100 percent affordable. Growing our economy, creating jobs and opportunity for people, that should be our mission. The president's 25/75 target is bold, but it is realistic. And at least in Alaska it is achievable. Together we must begin the journey that will complete our mission. Thank you for your time.

[The prepared statement of Jim Dodson follows:]

[COMMITTEE INSERT]

Senator Murkowski: Thank you, Jim. Appreciate your testimony. Doug Johnson, welcome.

STATEMENT OF DOUG JOHNSON, ALASKA PROJECT DIRECTOR, OCEAN RENEWABLE POWER COMPANY

Mr. Johnson: Good afternoon. And to those of you that aren't Alaskans, welcome to Alaska. Thank you for taking your valuable time to hear our testimony today.

I'm Doug Johnson, the Alaska projects director for Ocean Renewable Power Company. Our company is currently developing two projects here in Alaska and one in Maine. Our project in Maine is a tidal energy project in Western Passage, on the American side of the Bay of Fundy. Our projects here in Alaska are a tidal energy project in Cook Inlet adjacent to Anchorage and a river energy project on the Tanana River about 100 miles from here in the community of Nenana.

My great-grandfather came to Alaska in the gold rush. His cousin was one of the Three Lucky Sweeds that made the original gold strike in Nome. Today, like those pioneers of the past, a new generation here in Alaska is pioneering the development of the renewable energy industry.

Never before has there been a greater opportunity for new sustainable economic development here in Alaska and across our country than today. The transition to low or no carbon renewable energy is inevitable. As the climate data is telling us, it's needed sooner rather than later.

Currently in the arena in marine hydrokinetics, the

Europeans are the world leaders. Fortunately it is still early in the game and we have the opportunity to leap-frog the Europeans using our native innovative abilities. If we don't take advantage of this opportunity, it will be another loss of stature for the United States in the global arena. And, more importantly, a loss of new jobs in a key emerging industry. The world looks to the United States as a leader in innovation, and we have the unique opportunity to demonstrate our leadership once again.

To take advantage of this opportunity, our industry needs your help now. As a fledgling industry here in Alaska we see four key road blocks that government can remove. Without this help, we will not be able to realize the environmental and economic promise of marine renewable energy.

Roadblock number one: Lack of federal agency coordination. Lack of timely coordination amongst the agencies wastes scarce and valuable human and monetary capital, a luxury an emerging industry cannot afford. We need agencies to be well coordinated producing streamlined highly -- high-quality development processes.

Roadblock number two: Technology-stifling impact of baseline data collection requirements for pilot projects. We are spending a million dollars this year in Cook Inlet, with agencies requesting we do the same or more next year

without ever having a device in the water. We believe that in Alaska a year of baseline combined with the substantial available data is adequate with the proviso that we continue extensive monitoring with our devices in the water. This is the best way to assess the potential environmental effects. If we find a serious problem, our devices can be shut down immediately and removed in days.

Roadblock number three: Increased federal and state research role. We need the federal and state agencies to actively partner with us as stewards of the public resource to assist in a more fully -- to assist in more fully characterizing our pilot sites energy resources, physical and environmental and marine life.

Roadblock number four: Lack of continuity between pilot project license and full commercial license. Presently there is no clear pathway to go from a pilot project license to a commercial project license. We propose the development of a clear bridge from successful pilot to a commercial license.

I have included a detailed discussion of each of these points in my written testimony, including our proposed solutions. The time is now, the opportunity is before us, and we in the marine renewable energy industry are ready to move forward. With your help, our country can take the leadership role in this exciting new industry. Thank you

for the time to speak with you today.

[The prepared statement of Doug Johnson follows:]

[COMMITTEE INSERT]

Senator Murkowski: Thank you, Doug. And our final panelist this afternoon is Mr. Dennis Meiners. Welcome.

Mr. Meiners: Thank you, Senator. Can you hear me? Yeah.

Senator Murkowski: We're good.

STATEMENT OF DENNIS MEINERS, INTELLIGENT ENERGY SYSTEMS

Mr. Meiners: Senator, thank you very much for the opportunity to speak with you and the committee today. My name is Dennis Meiners. I'm the CEO of Intelligent Energy Systems, and director of Power Corp. Alaska.

Intelligent Energy Systems is a project coordinator and developer for rural energy projects. We work directly with villages to develop appropriate solutions to solve energy problems. And Power Corp. Alaska is an integrator and advanced control system provider.

But what I'm here to talk to you about is the group -- the Chaninik Wind Group, and our Chaninik projects. I have been working in wind-diesel for the last 15 years, 10 at the Alaska Energy Authority. And when it came to renewables, we were looking at using renewables to decrease dependency on diesel fuel at the Energy Authority.

And I think that there are three truths that are -- or 3.5 truths that are self-evident about rural energy. The first one is that we must -- there's no choice, we must end the dependency on fossil fuels. Two, right now with the current tools we have, we can decrease the use of fossil fuels by 40 to 50 percent in over 100 villages based on wind. And that's not just for electricity, but that's for heating fuel, transportation, and electricity. The third

truth is that village wind heat -- I'll call it village high-penetration wind heat -- is really a pathway to our national energy future.

Now, some people may laugh at that, but we've heard from other panel members that villages are proving grounds for the integration, stability, and management of high levels of renewable energy. And that's the truth. The .5 truth is wow, Bernie, I agree with Bernie.

What we're doing in the Chaninik Group is a group of four villages between Kwigillngok, Kipnuk, Kongiganak, and Tuntutuliak at the mouth of the Kuskokwim River. And they have a very good wind resource there. And their goal was to combine as a group to build wind-diesel systems to make the communities more self-reliant.

We have three projects underway. Each of those projects has about one kilowatt of installed capacity per resident. And we're taking that energy -- that's a lot of wind power in relation to the population and the electric load. In fact, at most times the wind power will provide more energy than is needed to meet the electric load. That excess energy will be stored in thermal storage units in individual homes to decrease heating costs.

One of the first things we did was to do an energy survey to find out how much energy individual homes were using, and where there energy budget was being spent. And

what we realized early on was that although electricity is expensive at about 65 cents a kilowatt hour, the real impact on a household was paying the heating bill. You can have 1,000 square foot house, and they may have a heating bill that's 6- to $8,000 a year for a family that's maybe -- has an income of around $40,000 total. Then when you look at a subsistence lifestyle that requires you to use outboards and snowmachines to go gather your food, and gasoline is expensive, what we see is that probably two-thirds of a home energy budget goes to heating fuel, and maybe 15 percent goes to electricity, and the rest goes to transportation.

So the major problem that we're trying to address is heat, we're -- and when you look at the wind, the wind resources available, and when you need the heat, it's when the wind blows. Most of the wind blows at night in the wintertime, so you need to store it. So we're taking -- we have installed excess wind capacity. We take that excess wind, and we store it in individual thermal devices in homes. These devices are about the size of a Toyo Stove, which is a common heating appliance in rural homes. It contains bricks that heat up to around 1,200 degrees. Those bricks store the heat, and they're used throughout the day.

We estimate that with our current projects we can only

provide for about a 50 percent heating fuel displacement in a quarter of the homes. What we see in the next phase of projects in -- we're looking at a project in Kipnuk where we would like to go to provide three to five kilowatts of installed wind capacity per resident and displace a total of 50 percent of the heating fuel and the fuel used to generate electricity in the entire community.

We have to innovate with wind power. Current wind systems that are going in now have about one-third of a kilowatt of installed capacity of wind per resident. And the energy produced from that -- from those -- from that wind is used to displace fuel at the powerhouse only. And what we see is that that's not a solution. When you install a small amount of wind power, say one or two wind turbines, the economics don't favor a scaled construction effort to drive the individual cost of -- per kilowatt down, and also the systems don't produce enough electricity to make the maintenance operations economic.

If we put in large wind turbines in small communities and we focus on displacing the major portion of fuel, which is used for home heating, that changes the entire economics of renewable energy in rural Alaska. First of all, you're no longer sending dollars out of the community to the fuel companies. You're keeping those heating dollars in the local pockets of the residents. Too, we can sell that

using advanced metering and control systems with grid stability. We can sell that electricity to a resident for at least 50 percent of the cost of the heating fuel. So not only have you reduced the heating cost to the consumer, but you've also increased revenues to the local utility.

So the Chaninik Group was formed with a focus on 100 percent displacement of fossil fuels with renewables. Now that's a long-term goal, but our short-term goal, it's in the church of the here and now. And we're doing hand-to-hand combat with the technologies that we have, and we know that we can get to 40 to 50 percent. Now, if the Chaninik Group is successful, then that model should spread to at least half of the villages in Western Alaska.

And I think that if we look at wind not as supplying electricity, but if we look at the whole energy picture in a community, there's solutions here. Those same solutions apply across the nation. Because if you look at wind –- the wind resources available in the Midwest, there's a lot of excess wind at night. So the same wind heat storage solution is applicable throughout the country. The same backbone, the same control backbone, the same metering backbone that has to go in to manage that wind energy separate than diesel-generated electricity is the same backbone that's needed to provide lower-cost electricity or use renewable types of energy to provide power for plug-in

vehicles.

So the Chaninik Group, we see ourselves sort of as the little gnat out there that's annoying the tail that wags the dog. And the big dog is the electric -- the big boys with the big wind turbines and the big oil companies and the -- you know, the major energy suppliers. We need solutions that are applicable for us now. And we're pioneering those. And we think they're going to be valuable for everyone.

And I know this is a national sort of a -- a national issue. And I just want to say that there are a lot of other small companies and small efforts across the country that are helping us. We have partners in South Dakota, North Dakota, North Carolina, Vermont. We're encouraging new -- new wind manufacturers in Arkansas, we're buying software and engine generator controller parts from across the -- from Colorado and Michigan, all across the country. We need the helps of -- we need the help of many, many small businesses to assist our efforts. So this is not just an Alaska effort, this is a -- this is a must for Alaska, but it's also important for the rest of the country.

So thank you, Senator, for the opportunity to speak today.

[The prepared statement of Mr. Meiners follows:]

[COMMITTEE INSERT]

Senator Murkowski: Appreciate your testimony. Dennis, how much are the thermal units if it's in somebody's residence? What does the unit cost right now?

Mr. Meiners: A thermal unit is probably around $2,000. But in rural communities, because the electric system is so -- may not be up to code, some code improvements have to be made, so a typical installation for one of these systems is -- could be 3- to $4,000.

Senator Murkowski: You know, the conversation that we've had with this panel particularly, whether it's geothermal, wind, biomass, ocean tidal, or wind opportunities, wind-diesel, I think we recognize that unless we can be building things to scale to allow for the efficiencies in small communities, wonderful technology is happening all over out there, but if you can't figure out how you make it cost efficient in a village, cost efficient in a smaller community where, you know, we're not hooked into anybody else. And one of the discussions that we haven't had which really gets people a little bit agitated when I bring it up because it's -- it is something that we've got to deal with, if you're not living right where the energy source is, you got to move it to get it to the people, and it's all –- the big issue about transmission, which, on a national scale, is something that, you know, some of my colleagues just don't even want to go there,

because then we're really talking about some controversial issues. But I think it's important to recognize that we're going to have to figure out in this state how we can take a small community like Kipnuk, which, you know, maybe has 350, 450 people there -- 800 in Kipnuk? Okay. So I'm down by half. But still, you've got an 800-person community, and for us to go in and say well, we're going to help you reduce your energy costs, but the cost of doing so is absolutely prohibitive, we haven't helped them out. So getting things to scale.

And the project that you described, Dennis, in how we can really be looking to the whole energy picture and how we reduce those costs is, I think, something that we need to key into with -- particularly in this state. I was in Newtok yesterday, and they're moving that village to another spot on higher ground on Nelson Island. There's four different villages on that island, and the question now is how they tie into one another to utilize some of the energy opportunities that exist out there. But again, this is something that we haven't had much, if any, discussion here in these two panels this morning. But I think, again, we recognize that our geography makes it complicated and difficult, but we've got to be looking to how we deal with the transmission issues as well.

As I mentioned with our first panel, I've got a whole

host of questions that I will ask to each of you in writing and would ask for your cooperation so that we can include them as further part of the record. But I want to just kind of throw out to each of you -- and I'm watching my watch, Bernie; I think we've got about ten minutes before we got to cut it off here so we can move on to your program? Is that about right?

Mr. Karl: You got all the time you want, Senator.

Senator Murkowski: All right. I'm not going to mess with the schedule here. But from your perspectives, whether it's in geothermal or wind or ocean or biomass, how can we, from the federal level, better help to facilitate some of the smaller-scale projects? Because they're not nearly as interesting and intriguing on paper. If you're not supplying power to large regions, large numbers, how can we better help to facilitate that?

You know, Bernie, you have made your -- the Chena Hot Springs here, it's a self-contained unit. And you're doing everything for this little community. But again, when DOE is looking to move grants, you're competing against requests that look pretty good on paper in terms on supplying and meeting the needs. Now, the Fire Island project, you get that pulled together and the ability to offset some of our energy costs, particularly as we see costs rising in the future as we see the reserves coming

out of Cook Inlet dwindling, we've got to be addressing that. How do we better facilitate some of these smaller-scale opportunities? And I throw that out to any one of you.

Mr. Karl: Well --

Senator Murkowski: Bernie, go ahead.

Mr. Karl: -- to start with, Senator, there's a tremendous opportunity right now with the administration and the money that -- I don't know where you're getting it. I guess you're printing it because.....

Senator Murkowski: That's another hearing for another date, I think.

Mr. Karl: But with that being said, right, wrong, or indifferent, the opportunities are tremendous right now. And I think it's in reinventing ourselves, as I stated once before, but in Fairbanks, Alaska, right now with the help, again, of United Technologies, and with the help of Alaska Energy Authority, I can tell you the Alaska Energy Authority has been a tremendous -- a tremendous resource for the state of Alaska. It has tremendously good leadership who gets it, who understands that there has to be an energy policy. And they are helping Chena Power in Fairbanks, Alaska, to build a 500 kW power plant that will be running with no smokestack. It will be the first commercial power plant. It will scaled to work in any

village in Alaska. And I can assure you that any village in Alaska can be self-sufficient for all of its fuel, for all of its energy, and for all of its food in the next ten years if it wants to be. And you can be thankful to United Technologies, and you can be thankful to AEA for believing in the project and not being a hinderance.

But you see, one of the biggest things was, well, you got to get this permit and you got to get that permit. Well, let's work at not having permits.

Senator Murkowski: I think the ocean energy guys would like that. I know that for a fact.

Mr. Karl: But let me tell you -- let me tell you how you work at not having permits. You have to imagine it again. The J. Florida project was going to fail. You want to know why. $1 million for getting the permits, and another year of time. So Quantum Resources said forget it, we didn't buy into that. Mr. Karl, we told you our share was $348,000, now our engineer says another million for permitting, we're not going to do the project.

So what do you do? You come back to Alaska and you tell them okay, we'll do it with no permits. They say, yeah, right. We made it portable. We have no emissions. It's legal height, it's legal width, legal weight for all 50 states. You have to look at what you can do. In Fairbanks, Alaska, we're building a new biomass plant with

no smokestack. I don't need to worry about air permits because I don't have any emissions. I don't need to worry about disposal permits because I'm not going to dispose anything. It's called biomimicry. You mimic what nature does.

The Native populations of Alaska have been doing that for centuries. They've lived off of biomass. They've used their environment for 10,000 years. For 10,000 years they've used their environment. Cold is a wonderful thing if you use it. So is heat, it's a wonderful thing if you use it. Well, what if we combine the two? What if we combine them? We can make a tremendous amount of energy on a Delta-T of just 100 degrees. And with a company like United Technologies to help, it's pretty easy.

Do we need the Department of Energy's help? Absolutely. Absolutely. Because when you're doing all of these so-called experimental things, there's a lot of risk. I've never, ever considered risk. Now, maybe I should. And my wife tells me all the time, she says, you are no philanthropist. And I said, some day I want to be. So -- oh, she's like having a 50,000 pound anchor on the old rear end. But I need her, obviously.

So with that being said, these opportunities right now are real. And it takes -- as Senator Stevens always said, money is going to evaporate for Alaska. We need to work

together. There's going to be less funds. So you need the federal government, you need Alaska Energy Authority, you need the university, you need private sector, you need United Technologies, you need everybody working together as a synergy, as a synergy. And you can get a lot done. You have to be willing to work together and share these ideas.

And I think that is the future for renewable energy. I don't say there's a silver bullet, I say you have to use it all. And storing energy is like a no brainer. The good Lord's been storing energy his whole life. Right? Right in the earth. We store energy all the time. And it's ours to take, but to use it wisely.

Senator Murkowski: I want to ask, too, a little bit more about the permitting issue, because that's where we at the federal level -- you say there's roadblocks out there.

Mr. Johnson: Yes.

Senator Murkowski: And I think it's important for us to understand how we can realistically remove or perhaps soften some of these roadblocks. Because wonderful ideas on paper, but if the government is saying, okay, we got a great energy policy out here, we want to encourage all these renewables, and yet we put these hurdles up in front of you that are either so bureaucratically impossible or so incredibly expensive, we haven't facilitated anything.

Mr. Johnson: Exactly. Thank you, Senator. I have an

idea for you. I think we should be pitching Alaska as the laboratory for our country, the laboratory for developing renewables, and the laboratory for developing a process to facilitate this. We got an amazing innovation here. Just look around us and see what Bernie is doing, look at what Dennis is doing out in Western Alaska, look at what we're trying to do with the hydrokinetics. It's happening. But what we have to be able to do is facilitate the development of it. And yet that policy that's there, the permitting processes that are there, what we need is agency coordination. Because we can unleash the innovation that we have if we can have the agencies work with us and sit at the table and work through this and develop processes that don't.

Senator Murkowski: Do you feel that you do not have that cooperation presently?

Mr. Johnson: We're working toward it, but it's a -- it's challenging because you've got people in, you know, different places in the country physically, and you've got different people in different sort of mind or thought processes or where they're at in terms of their ideas around renewables and how they ought to be developed. So it's policy and developing the coordination between the agencies.

Like, in our instance, it's Federal Energy Regulatory

Commission, or FERC, and the folks at NOAA. You know, trying to get NOAA and NIMS and FERC all working together so that we can get the permit process moving forward in a way that makes sense that we can participate, that doesn't bankrupt us in the process.

Senator Murkowski: From the state perspective, do you feel that there is greater ability working within -- at the state level?

Mr. Johnson: Yeah, the state of Alaska has been fabulous. This Alaska -- our Alaska Energy Authority is a tremendous asset to us here. And virtually everyone that I've met in state government has been tremendously supportive of our efforts. And I know in renewables in general. So the stat's been great to work with.

Senator Murkowski: We've got some issues with it, and I think we heard a little bit of that from the first panel as well. But I know with the Fire Island project, this is something that has been in process for years, and it has been the federal government, which has been the impediment, whether it's the FAA issue. But it is -- it really seems to be that the stumbling blocks are at the federal level, even though we have put in place this huge initiative that we're going to advance renewable energy in a meaningful and significant way. Dennis?

Mr. Meiners: Senator, and on the permitting issue, I

think it's just -- at least from the wind projects, if federal money comes in and you use federal money for a wind project, it spins you in a whole new parallel universe of permitting and agency interest. In these recent renewable energy projects, it was state funded. And I think that there are certain agency representatives who are just not well educated about the impacts or the nonimpacts of these systems, say, on tribal lands or in communities. And so they tend to slow the process down and try to spin it back into that whole permit process. So I think there needs to be a clear dividing line between where the jurisdiction is and where it isn't. And they can say we have no jurisdiction here and be able to do it very quickly. So that would speed things up.

Mr. Johnson: Absolutely.

Mr. Meiners: Because there's a lack of ability to make decisions there, there are new people, so there needs to be some kind of reeducation, perhaps, at that level. Because I have projects -- the projects in the Chaninik area do not require permits. And you go to certain people, and they say, we don't have any jurisdiction here, and other people say, oh, I think we might have jurisdiction here, and so six months later they decide that you don't. So I just think there needs to be maybe some retraining on the permit level.

Senator Murkowski: Well, and certainly from the jurisdiction perspective, as we know, with the offshore energy issues, there's a huge controversy and fight between the FERC and MMS, and literally a process that took years to resolve, and, you know, we're hopeful that, in fact, now it has been resolved and that projects can be moving forward. But again, you've got good substantive projects on the drawing board that can't advance because of federal agency issues that just shouldn't be there in my opinion.

I am going to, again, submit a series of questions to each of you, but I want to thank you for your contribution here at this field hearing. And I think it's been interesting to have a little bit from the various sectors that are making some good things happen within the state. If you don't -- if you're not excited about what our potential is for renewable energy in this state, you haven't woken up yet this morning, because it is real and it is vibrant and it's a terrific thing.

I want to close by reminding, not only the panelists, but any of you who have attended today, that if you have comments, if you wish to submit written testimony on any other Alaska Renewable Energy projects or ideas that you might have, you can submit them to the committee in writing. We will hold the record open for ten days for you to do so. You can send them to the Committee on Energy and

Natural Resources in Washington DC. Or you can e-mail them to Chuck Kleeschulte, who is on my energy staff here. Chuck's e-mail address -- or I can't give it to you because I can't spell his last name. You can get it from Chuck. But you can e-mail him, or you can also send it to my Fairbanks office here. Althea Saint Martin, who is standing up taking the picture there, is located in Fairbanks. Her number here in Fairbanks is 456-0233. She can get them to our committee's Washington staff and get them included in the formal record.

I want to acknowledge and thank the committee staff that have joined us, both down from the Democratic side and the Republican side. They helped to facilitate these field hearings, and their advance work is greatly appreciated. So Mike and Chuck, thank you very much. And with that, we will conclude.

[Whereupon, at 12:46 p.m., the hearing was adjourned.]

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