

**ALASKA STATE LEGISLATURE  
SENATE SPECIAL COMMITTEE ON ENERGY**

March 12, 2009

11:05 a.m.

**MEMBERS PRESENT**

Senator Lesil McGuire, Chair  
Senator Lyman Hoffman  
Senator Bill Wielechowski

**MEMBERS ABSENT**

Senator Albert Kookesh  
Senator Bert Stedman

**COMMITTEE CALENDAR**

Alternative Energy Presentations

Richard Peterson, Cook Inlet Coal-to-Liquids Project  
Marvin Yoder, Toshiba 4S Compact Nuclear Generation  
Dominic Lee and Martin Burger, Blue Energy, Turnagain Arm Tidal Project

**PREVIOUS COMMITTEE ACTION**

No previous action to consider

**WITNESS REGISTER**

RICHARD PETERSON

Cook Inlet Coal-to-Liquids (CTL) Project

**POSITION STATEMENT:** Gave presentation on Beluge CTL proposal.

MARVIN YODER

MyiT Solutions, LLC

**POSITION STATEMENT:** Presented the Toshiba 4S compact nuclear generation proposal.

DOMINIC LEE

Little Susitna Construction Company, Inc.

Turnagain Arm Tidal Project

**POSITION STATEMENT:** Commented on his participation in the Turnagain Arm Tidal Project.

MARTIN BURGER, Founder and Director  
Blue Energy Canada, Inc.

**POSITION STATEMENT:** Presented Blue Energy Canada's participation in the Turnagain Arm Tidal Project.

**ACTION NARRATIVE**

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**CHAIR LESIL MCGUIRE** called the Senate Special Committee on Energy meeting to order at 11:05 am. Present at the call to order were Senators Hoffman, Wielechowski and McGuire. She announced that they have three presentations on the agenda. The first is Richard Peterson with a Cook Inlet Beluga Area CTL project; Marvin Yoder, Compact Nuclear Generation; Dominic Lee and Blue Energy, Turnagain Arm Tidal Project.

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CO-CHAIR MCGUIRE said they are continuing the Energy Committee's quest to see what energy projects are out there and what the state can do to help them. She announced that Richard Peterson would give his presentation first.

RICHARD PETERSON, Cook Inlet Coal-to-Liquids (CTL) Project, said the Beluga CTL project came out of looking at GTL for the North Slope. He pointed out that the reason that CTL, BTL (bio-mass-to-liquids and GTL (all from Fischer-Tropsch) are economically justified for the U.S. is because Senator Ted Stevens got \$500 million/year for this particular project in a 2005 transportation bill.

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(Slide 2) One of the reasons this project works for the Cook Inlet is because it will use over 17 million tons/year of coal and is close to a local coal resource. The CTL process also needs a lot of cooling water - eliminating a lot of places throughout the U.S. - and access to an electric grid for the waste heat to be transmitted as energy. In this case they can make 200-400 mgW of waste heat that could be sold.

MR. PETERSON said he started his life out on a CTL project in North Dakota that converts coal into methane-pipeline quality gas. This project could do that also. He said that the mine would employ 1,600 people and provide 7,000 other indirect jobs.

He explained if the amount of energy the project would produce were put into the state's small energy market that would adversely affect Flint Hills and Tesoro, because they are refiners of transportation fuel; so they looked at exporting their product. One of the advantages Cook Inlet has is that it has an export terminal at Drift River that could move products to the Pacific Rim.

MR. PETERSON stated that only two technology providers in the world actually have operating Fischer-Tropsch plants - SASOL and Shell. Neither of those two companies will come to the U.S. and look at a project unless there is an available way to deal with CO<sub>2</sub>. The cap and trade program would cost them a minimum of \$180 million/year. However, with the depleted oil and gas fields in the Cook Inlet they have a way to get rid of some, if not all, of that.

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The other issue is that the transport vessels are massive, and a Fischer-Tropsch reactor is 42 ft. in diameter and 160-180 tall, and is made up of 6000 tons of steel. The reactors are only made in two locations of the world - Korea and Japan. Having those made and transported here would reduce the capital cost of the plant significantly, but building a plant in this particular location is still estimated to cost \$10-12 billion.

He said the plant would have to supply fuel for the local market and the biggest local market in Alaska is jet fuel. It is imported now, but that could be supplemented with their product without impacting the existing refineries.

Lastly, he said that inadequate storage for gas and diesel in the Anchorage area results sometimes in considerably higher prices than people are paying in the Lower 48. They have the ability with their storage to supplement that and potentially lower the price that average citizens pay for gas and diesel at the pump.

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(Slide 3) The Beluga coal fields are located on Tyonek properties on the western side of the Cook Inlet, approximately 10-12 miles from the existing Beluga coal fields that are owned by the Chuitna Group and Barrick Gold. The area is considered very rural with gravel roads and no connection to any major transportation artery. The only way to get there is by ferry or airplane.

Hopefully, a road would actually be built down the west side of the Cook Inlet some day to allow people to live there. In fact, the state has purchased a 400-ft. wide right-of-way from the existing road system all the way down to Tyonek to make this happen.

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(Slide 4) He said roughly 1.3 billion tons of coal "has been seen by a drill bit" that are economically mineable. Under current technology, that will make a minimum of 2 billion barrels of finished fuels or put another way, it's almost like finding a 6 billion/barrel oil field.

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(Slide 5) He explained that the Fischer-Tropsch CTL process has three steps. The first step makes syngas out of coal, natural gas or bio-mass. The next step makes a Fischer-Tropsch paraffin long-chain molecule; the third step needs a choice of fuel to make - gasoline, kerosene, jet fuel, naphtha - and those molecules get fractionated into that product - just like in a typical refinery.

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(Slide 6) Pictures of facilities around the world: SASOL Sacunda facility at 150,000 BPD CTL, South African Mossgas facility at 47,000 BPD GTL, Shell Bintulu in Malaysia 15,000 BPD GTL, and CHOREN Freiberg in Germany at 500 BPD BTL.

(Slide 7) At the end of the day you end up with a clear synthetic transportation fluid that looks like and tastes like water; you can even drink it. It's CPA-approved, non-toxic, can be made USFDA approved for food grade; it has zero sulfur and zero aromatics. He just heard at a seminar that Fischer-Tropsch fuels are the fuel of the future for the military.

CHAIR MCGUIRE asked him to expand on that big announcement.

MR. PETERSON said that the military is looking at two pilot programs that will buy a 50/50 mixture of Fischer-Tropsch middle distillate jet fuel and conventional JP8 jet fuel in Alaska and Hawaii. This would mean about 70 million gallons/year for Alaska that really works out to about 35,000 barrels/day, a very small portion of Flint Hills' and Tesoro's total refining capacity.

This same kind of program will be held in Hawaii that is looking at something like 70,000 barrels/day of product. The military has decided that Fischer-Tropsch fuels are going to be its fuel

of the future, but they want industry to produce it - and from domestic feedstock. Then the military will buy it from them.

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CHAIR MCGUIRE asked the bidding process for rights under the pilot project.

MR. PETERSON explained that a competitive RFP will be put out in another month or two. It will look at all sorts of issues: plant location, background and performance history as a producer of this type of product, technology, and so on.

Virtually nobody in the U.S. does this yet. But he has seen some ways in which this program can get done - for example, BP's GTL plant in Nikiski - but unfortunately that uses natural gas as its feedstock, and the military is now required to buy only alternative fuels that have a lower carbon footprint than petroleum-based fuels. So Fischer-Tropsch fuels will have to come from biomass or sequester CO<sub>2</sub> to get below the footprint of a typical crude oil refinery. They have looked at different ways of putting a bio-gasifier at the Nikiski sight and using local dead and dying spruce trees as feedstock or possibly getting biomass from Hawaii.

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MR. PETERSON said it's next to impossible to get an appreciable amount of Alaska biomass for a 10-15 year contract on a firm basis because the trees are either on federal or state land and permits can't be obtained to cut and replant them. He didn't know if it would ever get resolved.

CHAIR MCGUIRE asked if barley or other organic biomass could be used.

MR. PETERSON replied those organics can always be used, but the issue comes down to the transportation costs when the distance exceeds 40-50 miles.

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(Slide 8) showed the advantages of a CTL project in Cook Inlet.

(Slide 9) showed pictures of Fischer-Tropsch reactor and the Drift River Terminal that can be used to export products out to the Pacific Rim.

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(Slide 10) showed price volatility in the market and how hard it is to finance a \$6-8 billion facility.

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(Slide 11) showed the results of the energy credits program.

MR. PETERSON said that Northwest Alaska probably has more coal than the rest of the United States and maybe more than the rest of the world combined. Their initial proposal was to build GTL plants at Prudhoe Bay and gasify the coal into syngas and run products for the next 300-plus years down the Alaska pipeline to Valdez.

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(Slide 13) The biggest obstacle to developing CTL or any energy project in this state is carbon emissions. Several coal owners have mentioned that they will just export their coal to those countries that don't care about emissions.

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(Slide 14) His next big question is if man-made CO<sub>2</sub> is really causing global warming. He was amazed to find out that Alaska has signed an agreement to not debate global warming, but he said we need to be at the forefront of this debate. People say there is no such thing as clean coal technology. "They're just flat misinformed."

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(Slides 15/16/17) In making syngas all the poisons must be removed and that is why the plants cost so much money. Fischer-Tropsch CTL is gasification with capture. He said our kids don't understand that CO<sub>2</sub> is an essential ingredient for life on this planet. It has been shown that the earth is greening with the increase in atmospheric CO<sub>2</sub>. Current estimates are that the earth has increased plant growth by 15 percent.

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(Slides 18/19) How to lower their CTL footprint by looking for biomass outside of Alaska: California has a process that converts municipal solid waste (MSW) into what looks like giant rabbit pellets that can be co-fired with coal. If he does that, he can get the credit for reducing his carbon footprint. California has offered him \$100/ton for the MSW and he can convert it to pellets for \$60/ton and it can be shipped to Alaska for \$20/ton. It can possibly get here in a positive financial context and they might be able to get credit for reducing their CO<sub>2</sub> footprint.

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(Slides 21-22) Keeping our resources in Alaska is a much more economical use of our coal than if it were exported to China.

CO-CHAIR MCGUIRE thanked him for his presentation and announced Marvin Yoder to give the next one on compact nuclear generation.

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MARVIN YODER, MyiT Solutions, LLC, presented a power point on the Toshiba 4S compact nuclear generation project. He began by showing a picture of a nuclear battery and a reactor for the Toshiba 4S plant that comes in either a 10 mgW or a 50 mgW size.

(Slide 2) The core is seven feet tall and a couple of feet in diameter; the rest is a casing. Most nuclear plants have their cores removed every 18 - 24 months and have a new one put in. So, technicians and expensive equipment are needed on site to handle the nuclear materials. The reason they call this core a battery is because it is sealed up and will last for 30 years without any of that - no need for technicians and heavy equipment. At the end of 30 years, the whole tube goes out to be cleaned up someplace else.

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(Slide 3) Overview of plant that sits mostly about 60 ft. underground: The steam turbines are to the side and the reactor is protected way down on the bottom.

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(Slide 4) Diagram of the heat transport system: It is all passive! The system doesn't have any fans or pumps; all of the sodium coolant is moved with electro-magnets. Two towers for convection cooling - all air - no water. The entire plant runs without any mechanical systems, so when problems occur you don't have to worry about auxiliary power and things like that.

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(Slide 5) Passive decay heat removal diagram and the secondary outlet.

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(Slides 6/7) Passive shutdown for unprotected events: The nuclear reactor is basically called a negative heat coefficient. In a traditional steam plant, once the steam has been used, it cools off and condenses and returns back to whatever is heating

it. So, you keep heating the water up, it turns to steam, it runs the generator and it comes back.

With the nuclear plant, the hotter the return water, the slower the plant runs - the opposite of what one would think. The cooler the return water is, the quicker it runs. If a plant is running at 600 Centigrade and the system is totally shut off and no water is coming back, the plant will begin to heat up. But at a certain point - about 200 seconds - this negative heat coefficient kicks in and the plant starts to cool down. This means that if everything is shut off or if there is some kind of accident, it will shut itself off. This concept was actually tested in the 1980s at the Idaho National Lab by the Department of Energy. This model was also run with one of the cooling towers missing; so it will shut itself off even without the entire cooling system available.

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(Slides 7/8) He reviewed the main design features: passive safety, no onsite refueling for 30 years, low maintenance, high inherent security, low pressure with pool design and guard vessel, negative coolant temperature coefficient promotes safe and stable operation, large margin to coolant boiling or cladding failure, reliable redundant scram systems to remove the heat, smaller excess reactivity with metallic fuel core design - limited potential for reactivity insertion accident, passive reliable and diverse shutdown heat removal systems amount of radioactive material (about one gallon) after 30 years.

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(Slide 9) Nuclear safety compared to other fuels is by far the safest for the period of 1969-1996.

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(Slide 10) Graph of tests to support 4S design to date - design features, verification items, required testing, and status. Toshiba has purchased Westinghouse; so they are heavily involved in this.

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(Slide 11) Cost for Alaska: Capital costs for 150 mgW heat is about 2 cents kW over 30 years, another 1 cent to operate it, and another penny for fuel - and then a special federal fund that all nuclear plants contribute to to take care of nuclear waste. It already has billions of dollars, but the government hasn't figured out how to deal with nuclear waste yet. All in

all they assume a 50 mgW plant will operate at about 6-10 cents kW. A smaller plant would probably cost double that.

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(Slide 12) The Department of Energy was established in 1977 to get the U.S. off of foreign oil and the joke is that we are more dependent than we were when it was established.

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(Slide 13) Chart of Emission-free energy in the U.S. showed nuclear at 76 percent, hydro at 20 percent, wind at .7 percent, solar at .1 percent and geothermal at 1.4 percent. Nuclear power has experienced a hiatus for the last 30 years, and wind is still less than 1 percent even with all the emphasis on wind energy.

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(Slide 14) Energy crisis: we are too dependent on foreign oil: the cost of energy is driving up the cost of living and damaging the economy, too much carbon footprint, and over consumption. Nuclear is the only energy that meets three of those criteria - no carbon footprint, lower cost, and domestic supply. He supported the state diversifying its energy sources.

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CO-CHAIR MCGUIRE thanked him for his presentation and announced Dominic Lee and Martin Burger to be the next presenters.

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DOMINIC LEE, Little Susitna Construction Company, Inc., introduced Martin Burger, and John Eliason, CEO, Blue Energy Canada, Inc.

MR. LEE said their project is called the Turnagain Arm Tidal Project and uses the Davis Turbine Power System. It can solve the whole energy problem in the Railbelt for 6-8 cents kWh without CO<sub>2</sub>, without state funding, and with Chinese financing of \$2.8 billion in place, Mr. Lee stated. Mr. Burger would explain the proposal.

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MARTIN BURGER, Founder and Director, Blue Energy Canada, Inc., said he has been in the energy research business for the last 25 years and that the level of "innovation dysfunction" is acute. He has investigated about 500 different technologies all over the world in 25 years, and has found that tidal power is a technology that is just now coming to the forefront in places

like the UK and the EEU. Investment levels are now approaching \$300-400 million and a race is on for tidal power to establish primacy in the energy industry.

Alaska has two men, Steven Haagenson, Executive Director, AID-AIDEA Energy, Department of Commerce, Community & Economic Development (DCCED), and David Lockhard, Engineer, AID-AIDEA Energy, DCCED, who can provide expertise and one of the best tidal resources in the world; Blue Energy has the technology that will be used one day. With Mr. Lee's friends in Asia they are at a very critical opportunity.

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He urged them to step up tidal energy efforts. Alaska could lead the way in a new trillion dollar sector in the Pacific Rim. It could mean scientific job creation, manufacturing leverage and economic development. The state already has people who can sort out the different technology methods like R.W. Beck, who has risk-mapped this technology.

MR. BURGER stated that Cook Inlet has 30-foot tides. Seawater is a non-compressible fluid medium and provides a predictable source of sustainable energy. The wind speed equivalent of an eight-knot current is almost two hurricane Mitchells at 300-400 kilometers per hour.

France has an ocean-going dam at LaRance Inlet. Canada has built a smaller-scale device and these projects have proved that civil works can be engineered in these environments to produce electricity. His aerospace finesse vertical access turbine design provides a much more efficient build and a much better ecological footprint than these earlier efforts produced.

MR. BURGER discussed his developments using graphs. His design (graphic 5) has one moving part that turns at about 25 rpm; it is a simple elegant solution. Another graphic showed a stream device that they have built eight of over the years. They are positioned now to scale up the technology where it could be useful especially in rural Alaska.

A tidal bridge design provides renewable power and a transportation system in terms of a bridge. He said that bridge builders of the world have already approached Blue Energy that has accumulated pre-commercial \$40-50 billion in buildable tidal power projects. They are building quite an order book; so when it goes, it will go fast.

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He estimated that Cook Inlet has 100,000-200,000 mgW, a very large part of Alaska's energy future - one way or another. The only question is when to bring it on line, and there are some very compelling reasons to accelerate that process. So he recommended that they support the efforts of Mr. Haagenson and Mr. Lockhard and include a \$10 million budget to do some feasibility work.

In the Panhandle, he is privy to some transmission line capacity developments that will be available in three-five years. And tidal power resources there will be able to feed the southern markets in Canada and the intertie with British Columbia into Washington State and as far down as San Diego. The capacities of our transmission lines will go up dramatically and the cost for laying marine cables will go down as well.

The Cook Inlet could be developed - opportunities exist for a bridge beyond the oil terminal in Knik Arm and Mr. Lee's vision for a road-link from the Anchorage Airport over to Fire Island and the Kenai Peninsula where 22,000-35000 mgW of power are available. Homer has opportunities as well and across the Bay mining developments are under consideration with large electrical load requirements. Tidal power could be a very effective solution there.

MR. BURGER said price is in the 6-8 cent price range, but like wind, the cost curve started at 55 cents and is now down to less than 4 cents. His development will start in the 10-12 cent range and be down to less than 2-3 cent range. So, 6-8 cents gives the state about a 50-percent saving on the existing power bill.

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He showed an aerial view of Cook Inlet that had a causeway developed from Fire Island across the mud flats to the east and a roadway bridge between the west side of Fire Island over to Pt. Possession with two turbine banks in the deeper parts of those channels. Dredging for the project could provide material for the state's silt management in Cook Inlet.

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He said that the firm of R.W. Beck is anxious to accelerate the tidal power agenda in Alaska. In response to an interested investment banker it has already risk-mapped the Blue Energy technology. R.W. Beck could also assist AIDEA in realizing the state's immense, exciting tidal resources in a very timely fashion. Lockheed Martin has approached Blue Energy about being

part of the team building for developments in Alaska. He has previously recommended to Senator Dyson and Mr. Lockhard that they employ Triton Consultants out of Vancouver; Penn State and Blue Energy are forming a research partnership, and they have a long rich history with the U.S. Admiralty and the U.S. Admiralty in Puget Sound that has offered up its resources to see this technology move forward.

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He described further support within and around Blue Energy - Jon Ellison, CEO, Dr. Sergey Barmichev, the top Russian aerospace design engineer, and trained group of engineers from UBC, and Paul Gill, ASME chair in B.C. to name a few. Obviously, any developments in Cook Inlet would respect the environmental sensitivities of the maritime and marine life. They enjoy the advice on these matters from Dr. Hazel Henderson and Mr. Goldsmith from the Ecologist Magazine in the UK.

He summarized that they haven't yet built a large project such as they have proposed for Cook Inlet, but he assured them that he has done this for over 20 years because of his own passions for greater energy harmony and a high regard for the ecology.

He proposed to increase the Stevens budget \$10 million to for a \$4.5 million feasibility study for the state's tidal resource assessments, socio-impacts and environmental studies. He reminded the committee that Mr. Lee's Asian funding would bring the needed resources to proceed with larger project developments.

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In conclusion, he said this is a well-behaved scalable technology within present-day construction practices. The state already has contractors and personnel that can participate and provide a lot of expertise; Blue Energy would bring the core parts of the design to Alaska and actually build the foils for the Pacific Rim markets. Alaska would form, at least, the seat for the opportunity for the Pacific Rim and early action could even see leadership provided from Alaska with these technologies for the whole world.

MR. BURGER said that regulators have had a problem with cutting through the red tape and "come to grips with the scale of it." Tiny devices are good for rivers and streams, but when you get to the Cook Inlet scale, it's unprecedented.

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CO-CHAIR MCGUIRE thanked them all very much for flying in and giving the committee their ideas. There being no further business to come before the committee, she adjourned the meeting at 12:05.