

**ALASKA STATE LEGISLATURE
SENATE RESOURCES STANDING COMMITTEE**

January 31, 2007

3:30 p.m.

MEMBERS PRESENT

Senator Charlie Huggins, Chair
Senator Bert Stedman, Vice Chair
Senator Lyda Green
Senator Gary Stevens
Senator Lesil McGuire
Senator Bill Wielechowski
Senator Thomas Wagoner

MEMBERS ABSENT

All members present

OTHER LEGISLATORS PRESENT

Senator Fred Dyson

COMMITTEE CALENDAR

Cook Inlet Gas Overview - BOB SWENSON, Division of Geologic and Geophysical Surveys (DGGS)

PREVIOUS COMMITTEE ACTION

No previous action to consider

WITNESS REGISTER

BOB SWENSON, State Geologist & Acting Director
Division of Geologic and Geophysical Surveys (DGGS)
Department of Natural Resources
400 Willoughby Ave.
Juneau, AK 99801-1724

POSITION STATEMENT: Presented Cook Inlet Gas overview.

ACTION NARRATIVE

CHAIR CHARLIE HUGGINS called the Senate Resources Standing Committee meeting to order at [3:29:50 PM](#). Senators Wielechowski, Green, Huggins, Stevens and Huggins were present at the call to order.

Cook Inlet Gas Overview

CHAIR HUGGINS announced that the committee would hear the Cook Inlet gas overview.

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BOB SWENSON, State Geologist and Acting Director, Division of Geologic and Geophysical Surveys (DGGS), Department of Natural Resources (DNR), said he would give them an overview of gas potential around the state focusing on Cook Inlet. Of the 36 trillion cubic feet (tcf) of Alaska gas, nearly all was discovered while searching for oil. Gas exploration is in its infancy mostly because of the lack of a large market in which to sell it. He noted that published resource assessments often have very large associated "error bars" due to a fairly large distribution around a mean number. Significant exploration potential exists in a number of basins around the state, but access to markets is important to its development. In Cook Inlet, most of the "easy" gas has been found and delineated. The rest of the gas will be more expensive to develop.

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CHAIR HUGGINS asked what gas was included in his 36 tcf.

SENATOR MCGUIRE joined the committee.

MR. SWENSON replied that the 36 tcf includes all the gas in the state that is "booked." Reserve potential is another issue. He said Alaska's topography is complicated and the geology is likewise complex. On his PowerPoint, he indicated the population centers and roads, which is the only infrastructure in the state. Only the sedimentary basins have gas potential and all have different and distinct potential, and they have a different amount of data available to determine that - a key point.

SENATOR STEVENS asked if a sedimentary basin is likely to have oil.

MR. SWENSON replied when geologists talk about a sedimentary basin, they mean it has not gone into any kind of metamorphosis - into hard rock, for instance. Whether or not it has gas is related to whether it is a marine source rock or gas source rock. The gas can be either marine or coal. A lot of biogenic gas in Alaska is associated with coals. Almost all of the sedimentary basins in the state do have some potential.

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MR. SWENSON compared the size of Colorado to the size of Alaska and said Colorado is a very rich oil and gas province. But Alaska has basins that nearly cover up the state of Colorado. He said the North Slope has tremendous gas potential and the Barrow arch is where most of the oil in the state and North America has been found. The Beaufort Sea and Colville basin probably have the dominant potential within the state for natural gas. Extending the Colville trough out into the Chukchi Sea area, is the Chukchi Basin, which has similar geology to onshore North Slope geology. It is a tremendous gas province, he said.

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He said the Division of Geological Geophysical Surveys (DGGS) has gone through a series of mapping programs in the last 15 years to map the Brooks Range Foothills. It is an important gas province with only limited exploration wells because of the gas the early wells had. He showed lease sales in the Foothills area that were picked up by a number of gas companies, and he remarked that the only difference between the Brooks Range and the Foreland Basin associated with it and the Canadian Foreland Basin and Rocky Mountain front is the infrastructure.

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MR. SWENSON said Bristol Bay has the North Aleutian Basin. He showed the annual lease sale held last year. At the most recent sale, Shell Oil spent \$1.2 million on leases.

He explained that the map they were looking at showed the thickness of the tertiary sediment in the basin and explained the potential for hydrocarbons. He noted that the Bristol Bay area is significantly larger than the Alaska National Wildlife Refuge 1002 area and that the presence of volcanoes makes the potential for oil and gas essentially zero; it's really in the near shore and offshore areas.

SENATOR WIELECHOWSKI asked how much oil and gas is there and how does one get it to market.

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MR. SWENSON said the market issue is the big one, and the Gulf of Alaska is Alaska's sleeper basin. A significant amount of exploration has already happened there. In fact, the first oil production in Alaska in the late 1800s was at Katalla [west of Kayak Island]. His map marked oil seeps with green dots and wells with red dots. The on-shore wells were drilled primarily in the 1950s and 1960s; the offshore wells were drilled in the

1970s following the discovery of Swanson River. Unfortunately, however, none of the wells in the entire exploration program found economic reserves. One reason for that is the complexity of the geology, and he showed a cross section that goes from Chugach to the north all the way down to the Pacific plate. It has a thrust belt, similar to the Wyoming-Canadian thrust belt. It is deforming today, and the oil seeps with big structures got people excited, but the sediment is too thick to get down into what was expected to be reservoir rock.

CHAIR HUGGINS asked if neither oil nor gas was found. Mr. Swenson replied that there were lots of shows and lots of indication of hydrocarbons throughout the system, but no economic reserves.

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MR. SWENSON showed an oil seep on Johnson Creek, about 50 miles west of Yakutat; about a barrel a day is seeping out of the ground a quarter of a mile from the Gulf of Alaska. He showed estimates provided by the MMS [Minerals Management Service] and United States Geological Survey (USGS) from assessments they had done. He explained that the numbers were for technically recoverable reserves. This means if there are no economic or access constraints, those hydrocarbons could be recovered. The ranges of estimates of the volumes of gas are 95 in 5 probabilities. This is an important concept to understand. When geologists are asked to give a number, they may say 5, but they really mean somewhere between 1 and 10, but he said it is based on rigorous analysis of data in any given area. The figures are predictions of what kind of technically recoverable reserves exist. The 95 number means that there is a 95 percent probability that the amount of reserves in the basin are greater than that number. The 5 percent probability means that there's a 5 percent chance that it is not greater than that number or a 95 percent chance that it's smaller. The mean is usually in the 50 percent range, he explained.

The point is that usually what everyone sees published is the mean number. But it's really important to understand, depending on how much data one has in an area, what the distribution looks like. In a district with very little data, like the Hope basin, there is a chance that there are no hydrocarbons because all mean numbers are often added together.

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SENATOR STEDMAN asked how much exploration has been done in Southeast Alaska.

MR. SWENSON replied that the Yakutat block is the limit of exploration.

SENATOR STEDMAN asked about exploration in Chatham Strait, which is similar to Cook Inlet.

MR. SWENSON replied that one of the key issues for any hydrocarbon basin is the thickness of the sediments. The basement rock, which is all around Juneau, has no oil and gas potential at all; the potential is in the sediments. In Chatham Strait, the thickness of the sediment is no more than 1000 meters. The potential there is relatively low.

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SENATOR WIELECHOWSKI asked how much of Alaska would one tcf fuel and for how long.

MR. SWENSON replied that 8.2 tcf of gas was found in Cook Inlet in 1968, and it has 2.2 tcf left. He estimated that 60 percent of that was export from the Agrium plant; the Anchorage Bowl uses 260 bcf per year.

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SENATOR HUGGINS asked him to elaborate on the gas exports.

MR. SWENSON responded that when the 8.2 tcf of gas was found in Cook Inlet, it was all stranded--there was no market. To develop a market and start monetizing the gas, both Phillips and Marathon created a LNG plant, and Unocal developed the fertilizer plant. The amount of gas used in both of those export facilities probably makes up about 60 percent of the usage.

MR. SWENSON said there is a mean estimate of 20 tcf of undiscovered conventional reserves in all of southern Alaska, derived from adding all the means together. Central Alaska, the interior basin, has a mean of about 9 tcf of undiscovered gas, and northern Alaska has greater than 33 tcf of reserves, with a mean estimate of 150 tcf undiscovered for all the basins he has spoken about. The proven (booked) gas reserves total 36,170 bcf in the 2000 annual report. Cook Inlet has only 6 percent of those total proven reserves. In the USGS' opinion, Cook Inlet has a mean of 1.4 tcf yet to be found.

SENATOR STEVENS said that he thinks of Cook Inlet as including Shelikof Strait, but this refers to just the Cook Inlet.

MR. SWENSON agreed, and he showed the committee a geology map of the Cook Inlet area indicating a significant amount of activity over the years. He said the stratigraphy "that we'll be talking about in the gas is the Sterling, Beluga and Upper Tyonek formations." Oil and gas are totally separate hydrocarbon systems. "The oil is generated down in these rocks and has some associated gas. Ninety-five percent of the gas that's being produced in the basin all comes out of the coals and is a biogenetic gas and does not require the thermogenic hit; it does not require to be cooked to release those hydrocarbons." He said the beluga coal fields are just behind the town of Tyonek.

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MR. SWENSON said the Alaska Peninsula and Cook Inlet are created from the Pacific plate subducting under the North American plate, which moves as fast as a fingernail grows and creates the region's earthquakes and volcanoes. Cook Inlet basin is a unique type of depositional system, he noted. It is a forearc basin [a depression in the sea floor located between a subduction zone and an associated volcanic arc], and it is unusual for that system to have hydrocarbon accumulations. The material scraped off of the Pacific plate becomes the Kenai and Chugach Mountains, he explained.

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MR. SWENSON said the Cook Inlet basin is bounded by the Bruin Bay fault on the west side. The Cook Inlet forearc basin was filled in with non-marine sediment that came from Interior Alaska and erosion from the arc in the northwest and southwest. Understanding the geology is important for understanding the potential, he noted. Major rivers filled the basin for the last 40 million years. Point bar is a very good reservoir, but "the flood plain and channel abandonment-type things are very poor reservoirs." The sands deposited by the river system are the hydrocarbon reservoirs and the other areas in between make up the coals, and that is why there is so much coal in the basin, he said. There is a complicated sequence of different types of reservoir rock. He showed outcrops and seams of coal. In the subsurface, well logs are used, he said.

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MR. SWENSON showed the sand distribution and a structure map of the tertiary reservoir section. It is five miles thick in the deepest part of the basin, and that is why there are hydrocarbons, he said. There has been a significant amount of exploration and lots of discoveries since the 1958 discovery of Swanson field. He showed a map of the wells drilled since then,

but nearly all were drilled in search of oil. By 1968, "they had found 8.2 tcf of gas in the basin and no market for it, and a little over 2 billion barrels of oil--incredible hydrocarbon province," he said. At that time it made no sense to look for gas. He showed a field size distribution map. There are many 100-300 bcf sized fields. There are two fields in the 1.2 to 1.5 tcf range, and there are two fields that are huge--greater than 2 tcf. "What's very, very interesting about this is that normally if you go to any other hydrocarbon basin in the world, what you see is that this distribution is that you have a full distribution. There'll be lots of small fields, there'll be very, very few big fields, and this will be filled in with a number of the other interim fields." He said it is an incredibly important diagram because it shows what could be out there.

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SENATOR WIELECHOWSKI asked the success rate when drilling wells.

MR. SWENSON said wildcat success is usually around 10 percent, and with new technology like 3-d seismic, there is a 40-50 percent success rate. Drilling around existing fields has a 70 to 80 percent success rate.

SENATOR HUGGINS asked how success rates correlate with price.

SENATOR WIELECHOWSKI asked if there is good success finding gas in Cook Inlet.

MR. SWENSON said no, there is not; it is probably 10 percent right now in new exploration wells. When drilling right next to existing fields, the rate goes up. He noted that many of the recent dedicated gas wells are actually wells that were drilled in the 1960s, where gas was seen in the shallow section but was ignored. "So they're going after those old opportunistic wells right now. From a wildcat standpoint it's really not specifically fair to make that comparison."

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MR. SWENSON showed a diagram --"the reason why we're here"--of the proven reserves in Cook Inlet. He stated that "we're sitting on a precipice." He said he is only showing the proven or booked reserves and it is not the only gas. There is additional gas to be found within the fields and there is exploration gas. He said, "It clearly is something that we all need to pay specific attention to. The days of having a significant amount of stranded gas are over in the Cook Inlet." He stated that there is more gas out there, and it will certainly be found within the

existing fields and in new exploration play types. The majority of the exploration plays that have been drilled in the basin have been on very easily-defined structures on seismic (on big folds). He said the hurdles are the limited market, complicated land access, and expensive data and drilling costs. The costs of exploration are high compared to other places in the United States, he explained.

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MR. SWENSON said only structural traps have been explored and developed; stratigraphic trap potential is untapped in the basin. He said 85 percent of the gas was discovered in the early exploration cycle. At least 70 exploration wells were drilled strictly for gas. Nearly one in ten fields is over 2 tcf, and that is a very unusual statistic. The four largest fields have 86 percent of the reserves, and field-size distribution lacks discoveries in the "300 to 1.3 tcf range," and "that's what we're here for is to understand the potential of finding those fields." He explained that structural traps are indicated by large anticline with a cap rock that stops the movement of hydrocarbons and that most of the big plays have been drilled. He showed the types of gas that have not been drilled and said that the gas that has been drilled has obvious hydrocarbon indicators in the seismic data.

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MR. SWENSON pointed to an example of gas push-down that happens when the velocity of the seismic wave slows down dramatically going through the gas zones. It takes longer for the wave in to get back to the surface to be recorded. Gas push-down is a good indication of a major gas accumulation.

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MR. SWENSON said they look for the subtle stratigraphic traps and how the distribution of the sands is associated with the different river systems. Where the sands pinch out is where the hydrocarbons are generally stopped. The state geologic survey is looking at the basin as geometry and looking for those subtle changes in stratigraphy. He showed the committee examples of the thick lateral traps and exploration outlines in Cook Inlet of areas with potential gas. He said one of the exploration issues is that there are areas of potential that don't have access.

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SENATOR HUGGINS asked if the Kenai National Wildlife Refuge was within the exploration area.

MR. SWENSON replied that that area goes along the Sterling Highway and is state acreage, which was up at the last lease sale. That's why it was picked up. He explained, "During a lease sale, we only offer everything inside with all the squares in it." Federal acreage is not up for lease. "The Swanson River field and the Cannery Loop and Beaver Creek field are actually located within the wildlife refuge."

He moved on to non-conventional exploration gas in the Cook Inlet basin. One of the issues is that so much gas was found in so many stacked reservoirs that explorers had a difficult time completing those fields. Because of the variance in pressure, one bore can open up two zones of gas with different pressures. Gas from one zone can move up to the other zone because of the higher pressure. To get around that, the explorer does "dual completions or triple completions" by running a production tubing string down to just pick up those two sands. Then it would run another one down to pick up two or three other sands. Some wells have up to 50 sands - like the Blue River gas field. To make sure all the gas is retrieved, the entire tubing string has to be pulled out and major well work needs to be done.

MR. SWENSON moved on to certain potential within the basin using a porosity-permeability plot. This relates to the pore spaces between rocks and the ability to move fluids in them.

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MR. SWENSON said that "tight gas sands" have the potential to reservoir a significant amount of gas, but it is expensive to get into the well bore because of the low permeability. In the Lower 48, gas is produced from fractured shale - the Red Dog mine in northwestern Alaska is doing this for its mine energy. Twenty years ago producing gas out of fractured shale was unheard of and now it's the hottest exploration play in North America. "So technology does make a big difference. Good data collection is critical - and sound interpretation."

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SENATOR STEDMAN asked if the Yukon-Kuskokwim Delta had a lot of exploration.

MR. SWENSON replied that some exploration has occurred there. Most of the sediment directly offshore from the river is relatively thin; the sediments have been transported into the offshore basins. A number of majors did stratigraphic tests in those regions in the 1980s, and what they saw was that all the

basins were gas-prone. The economics and the costs back at that point in time didn't warrant further exploration.

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SENATOR WAGONER asked if Escopeta was still pursuing the Kitchen project [in Cook Inlet]. He heard they were having problems with the first drill rig.

MR. SWENSON replied yes, but he was not completely up to date on it. He understood that Escopeta got a waiver from the Jones Act to tow the rig, which was a big issue. The company that was retrofitting the rig had a contract with Escopeta, but it was sold, according to the newspaper, and the new company did not honor that contract.

SENATOR DYSON asked what the market issues are and what the legislature should do to help.

MR. SWENSON said, "The bottom line of that is that we're not connected to the Lower 48 hub." There are three companies exploring for gas right now, and if one found a two-tcf gas field, for example, it would totally overwhelm the local market. He said as early as ten years ago, when gas was \$1.50 per mcf, "we would be put into, again, a stranded gas situation unless there is an export market or others." Without a larger consumer base, it will be very hard for an exploration company to "come up," he explained. He noted that Enstar is paying a significant amount for gas because the price is associated with lower 48 prices. The potential gas in Cook Inlet now is not "easy gas" and will be relatively expensive to find, "so the companies are risking a significant amount of money to go out and explore for that, and without a wide open market where they can sell as much gas as they can produce, that's a fairly risky venture."

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SENATOR DYSON said any projection for power generation or heating is incremental. It would take a large industrial user to provide a large enough market, he surmised. "We're whipsawed here," he said, because some people say Alaska needs to spend billions for a spur line or a bullet line, but there may be more gas than is needed domestically. "We need to know what gas is out there, and if we have a solution there, as opposed to a very expensive gas pipeline," he said. He has heard that the structures are good east of Swanson River field, and that no has asked to go out there and look. He said it is the same dilemma, and he asked what should be done.

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MR. SWENSON said it is a complicated interactive system. In the moose range, the oil potential is fairly limited and the gas potential depends on who is looking at the small amount of data. Exploration in the basin is in its infancy. Marathon actually has approached the federal government to do an expansion, he said. He thinks that was approved. He said he is not an expert on markets, but there are experts in the Division of Oil and Gas, and they are working hard to understand what can be done. Mr. Swenson said they should be asked to address the committee.

SENATOR DYSON said the committee needs his wisdom, because it does not have enough information to make decisions. He asked how that information could be attained.

MR. SWENSON said the state is putting significant money into understanding the potential and looking at the specifics of the geology. He just hired a new geologist, he said. The Division of Oil and Gas is in the final phase of a study on the market.

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SENATOR WIELECHOWSKI asked if, because the gas is stranded, there is no incentive for companies to drill.

MR. SWENSON said the recent activity in the basin is associated with the gas price. For many years the spot market was \$1.50 per mcf, and now the price is tied to the oil price. When the oil price rises it "certainly" gives incentives for companies to do exploration, "and we've seen that increase in exploration." The market is small, and it is like a small pipe with a huge funnel feeding it. To fill the funnel without changing the size of the pipe will make it stranded again. Expanding the pipe will increase exploration efforts significantly, he opined.

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SENATOR WAGONER asked about how gas storage relates to production and keeping the wells going.

MR. SWENSON said gas storage is a critical part of the basin's deliverability and production. The Swanson River field and the Kenai gas field have storage capabilities and permits, he stated. The Enstar and Chugach contracts have the problem of large seasonal swings of demand. When there were many gas wells with lots of deliverability, that was not an issue; there was always excess deliverability. "The amount of holes that are in the rock that are producing gas are becoming less because we're seeing more water come in and all those different issues." So

there is not enough deliverability in cold winter months, so the export market gets shut down. "What the storage does, is that we take that deliverability in the time when we're having that huge demand, and we take that gas and we put it back in other reservoirs that are not producing," he said. The gas is pumped out when needed instead of halting the exports. It lessens the seasonal swing in demand, he explained.

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SENATOR WAGONER said he would like to know what Escopeta knows. "If they think there's enough gas there to bring in the jack up rig...and explore and start producing that gas, what kind of market are they looking at?" He said he has been asking that question and he hasn't gotten an answer.

MR. SWENSON said it is a good question and he doesn't know the answer. Looking at the basin-wide scale, it goes all the way down to the prospect level, he said. And when an "explorationist" looks at a prospect that person "has to do that same probabilistic analysis about how much gas is in that prospect, and so you will say, OK, I have a 95 percent chance that it is bigger than 200 bcf, and I've got a 5 percent chance that it's as big as 20 tcf, and my mean number is somewhere around 5 or 6 tcf...from the prospect level, that really depends on how much data that you have. And if you have a wide distribution like that, you most likely don't have a lot of data that you're basing those assessments on. As far as the market, that's a good question to ask Escopeta." He said there is exploration going on, and he doesn't want to make it sound like it is a hopeless case without any place to sell gas. He said there are a lot of places to sell gas from the basin. Agrium has been looking for cheap gas, he noted. It is the huge discoveries that would make a difference on the marketing and create a stranded gas situation, he said.

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SENATOR HUGGINS said there is a relatively dynamic interface between the producers and Enstar in the peak periods "to make sure it is in the line."

MR. SWENSON said he doesn't know the details of the market, but there are days that it is very challenging.

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SENATOR WIELECHOWSKI said gas prices for Alaska consumers have increased by 75 percent in the last three years, and he has

heard that LNG is being exported to Asia for a lower price. He asked if Alaska consumers are paying more.

MR. SWENSON replied that he didn't know.

SENATOR HUGGINS said there is some validity to that issue and he intended to shine a bright light on Cook Inlet from multiple perspectives. The gas business and the proposal to bring in a super-expensive pipeline make him question what gas would cost and if it would be competitive based on what's in Cook Inlet.

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SENATOR WAGONER said the LNG plant is already permitted and it could be turned into a receiving station. In some places in the world people are paying \$0.50 to \$0.75 per mcf for gas for LNG. It might be cheaper to bring gas in by LNG and regasify it than to bring it from the North Slope.

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SENATOR HUGGINS said the good news is that there appears to be significant gas in Cook Inlet. He then asked about methane.

MR. SWENSON said all gas from the North Slope is thermogenic, whereby for hundreds of thousands of years accumulated marine organisms were buried and cooked, and it includes both oil and gas. The Cook Inlet is not a marine system, and there are coals throughout. As those coals are being formed methane is produced. He said in a five-mile thick stratigraphy, it is a significant amount. It is biogenic and not cooked. Buried, the methane gets dissolved onto the coals, "and when you uplift that with a structure, it releases pressure. It comes out of solution and then migrates up into the structures."

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SENATOR HUGGINS said it was a controversial subject in Mat-Su.

SENATOR WAGONER surmised that there is still gas in Cook Inlet, but no more cheap gas, and that is why industry is looking for other options in order to continue to operate there.

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SENATOR HUGGINS noted that the committee will hear about Agrium using some of Alaska's coal in the future. There being no further business to come before the committee, he adjourned the meeting at [4:44:42 PM](#).