ALASKA STATE LEGISLATURE
SENATE RESOURCES STANDING COMMITTEE
February 3, 2014
3:30 p.m.

MEMBERS PRESENT

Senator Cathy Giessel, Chair
Senator Fred Dyson, Vice Chair
Senator Peter Micciche
Senator Click Bishop
Senator Lesil McGuire
Senator Anna Fairclough
Senator Hollis French

MEMBERS ABSENT

All members present

COMMITTEE CALENDAR

PRESENTATION: GASLINE KEY THEMES

- HEARD

PRESENTATION: AKLNG PROJECT PLAN BY STEVE BUTT, SENIOR PROJECT MANAGER, EXXONMOBIL CORP.

- HEARD

PREVIOUS COMMITTEE ACTION

No previous action to record

WITNESS REGISTER

JANAK MAYER, Partner
Enalytica
Legislative Consultant on Gas Commercialization
POSITION STATEMENT: Talked about key gasline themes related to the in the HOA and the MOU with TransCanada.

NIKOS TSAFOS, Partner
Enalytica
Legislative Consultant on Gas Commercialization
POSITION STATEMENT: Talked about key gasline themes in the HOA and MOU with TransCanada.

STEVE BUTT, Senior Project Manager
ExxonMobil Corp.
POSITION STATEMENT: Presented an outline of the AKLNG project.

ACTION NARRATIVE

3:30:42 PM
CHAIR CATHY GIESSEL called the Senate Resources Standing Committee meeting to order at 3:30 p.m. Present at the call to order were Senators French, Micciche, Fairclough, and Chair Giessel. Senator McGuire joined the committee shortly after.

Presentation: Gasline Key Themes

3:30:57 PM
CHAIR GIESSEL announced taking up the presentation on Gasline Key Themes.

3:31:41 PM
SENATOR MCGUIRE joined the committee.

3:31:52 PM
JANAK MAYER, Partner, Enalytica, Consultant on Gas Commercialization, introduced himself.

3:33:06 PM
NIKOS TSAFOS, Consultant, Enalytica, introduced himself.

MR. TSAFOS said they wanted to give them initial reaction to the news that has come out; this is not meant to be the final word on these topics.

He said they structured the presentation on two themes, but first he wanted to comment on where they are in the process. He can look at Alaska developments from the Outside perspective, and the message he wanted to deliver was that a lot of different things were happening in Alaska with gas and oil and with the recent developments people are now noting that something is actually happening.

3:35:43 PM
SENATOR BISHOP joined the committee.

MR. TSAFOS said he would talk about project choices and commitments - what exactly is being bolted down right now - and

the Memorandum of Understanding (MOU) with TransCanada (the midstream).

3:38:35 PM
SENATOR DYSON joined the committee.

MR. TSAFOS said last year they said a lot of natural gas market fundamentals need to happen in parallel before an LNG project could take off, and he wanted to put the current decisions in the context of a project.

3:40:11 PM
He explained that his project has seven different components: upstream (fiscal), midstream (partnership and basic agreements), liquefaction (ownership structure), shipping, marketing, financing, and permitting.

The pre-FEED (Front End Engineering and Design) phase will last 12-18 months; the FEED process would last slightly longer. The final investment decision (FID) for construction comes 3-4 years from now. He stated that the real money gets spent after FID, because that's when everything has been sorted out. It's so much money that frequently companies partner with other companies and governments to have enough.

3:41:45 PM
Most of the estimated $45-65 billion for this project will not be spent until the later part of this decade, and that the decisions in front of them deal with the first parts of the entire chain that amount to usually less than 10 percent of CAPEX.

MR. TSAFOS said there are two layers of decision making: one is you have some gas and then you'll have to figure out what to do with it - take it in value or in kind; if you take it in kind, you will have to market it yourself or get someone else to do it. The state's intention seems to be going towards taking gas in kind.

3:43:49 PM
MR. TSAFOS said in examining all the LNG projects around the world they found state participation was all over the place in terms of equity. On one extreme the federal government and the State of Louisiana are purely a taxing authority and regulator; they don't have any equity in the LNG projects. On the other extreme, Algeria is 100 percent equity owner of the upstream,

the midstream, and the liquefaction; it even has some ships, as well.

So, he thought a good conversation for Alaskans would be about where they want to be in this world. And it seems that there is clearly an intention on the equity side, but nothing this year settles where the state will end up. It could start with equity and then get rid of it; it could start with the intention of being an active marketer and change its mind, or it could start with the intention of being a passive marketer and still change its mind.

3:45:45 PM
He advised to think about these deals as dynamic and over a long period of time, say 40 years, and advised that as states develop more experience they often opt to take a more active role. His point was that where you start is not necessarily the same place where you end up.

SENATOR FRENCH asked if there was any financial benefit one way or the other to the state for marketing its gas or having another agency do it.

MR. TSAFOS said he wanted them to think of equity as ownership of an asset and the level of engagement as a separate thing. You don't want to conflate the idea of equity and having to market your own gas.

SENATOR FRENCH asked if there was a financial benefit to the state one way over the other.

3:49:36 PM
MR. TSAFOS answered that it depends on what kind of deal you get if someone else is marketing your gas, and he was not ready to say which was better at this point.

3:50:44 PM
He had seen states participate in LNG projects through national oil companies, and because the LNG business tends to be slightly more complicated than the oil business in many ways, states tend to start off as slightly more passive participants in projects, but then take more active ownership as their expertise develops; Alaska's Permanent Fund is an example of how investing models change with experience. There is not a right or wrong way and there are tradeoffs. He wanted to highlight that nothing so far locks the state into any specific type of proposition.

MR. TSAFOS also stated that LNG projects can dynamically change. He illustrated with the Queensland Curtis (QC) project in Australia saying that it's hard to imagine it is actually the same project as it started. Today it is much bigger, very different ownership of resources, different ownership of liquefaction, offtake completely different, external financing from the Japan Bank of International Corporation as well as the U.S. EX-IM Bank, the ownership of the reserves had changed, and gas is being sourced from another LNG project. And this project had not come alive yet! His point was that Alaska is on the left of that FEED and that underscores how little is bolted down right now. It's quite typical for new partners to come in and new contracts to be signed even after FEED has started and even after FID has been taken.

3:55:09 PM
SENATOR MICCICHE said he agreed with Mr. Tsafos' explanation of the project, but it's important that the legislature understand the cost of the optionality in the MOU.

MR. TSAFOS said in any LNG project you have to look at the fine print, and the key thing in assessing this is not just to assess it for the purposes of today, but to make sure that the project can adapt over time.

3:57:05 PM
SENATOR BISHOP asked for an example of how the QC project had changed in six years.

MR. TSAFOS explained that BG thought they had they had a little bit less gas in the beginning and bought Queensland Curtis Gas Company (QGC) along with a few other companies. So, they were able to prove up and feel more comfortable about their resource, and, therefore, felt more comfortable expanding.

He explained also that for many LNG projects one of the ways to share risk is by having the same partners along the chain. Chinese National Offshore Oil Corporation (CNOOC) was looking globally for more gas and found this project; but they also wanted to become an investor, because of returns on the upstream and the liquefaction, and because it also provided a greater sense of security of supply.

Asian oil and gas companies actually measure very carefully how much LNG comes from projects that they are owners in and target them for security of supply. Side deals (liquefaction and

upstream) frequently come together with the offtake agreement; the same can be said for Tokyo gas.

MR. TSAFOS said what really changed beyond FID in the QC project was the ownership structure on Train 1 from 90/10 to 50/50 and then the project sold a little more gas to CNOOC; CNOOC also got an option for a third train. He reasoned that two things were probably going on: one is everyone wants to partner with Chinese oil companies, because that's where the growth is, and because BG had a number of capital commitments around the world and needed to raise cash. The idea is in the beginning when the project is a little bit riskier, sometimes you have to take more of the risk yourself, but as you start constructing, people feel more comfortable and that share can be sold down to new partners that maybe didn't want to come in six months or a year ago. It's mostly about de-risking the project and reallocating some of that risk; it's also about connecting the sales and purchase agreements with some burden-sharing on the cost structure. In fact, when the CNOOC took that 50 percent, it included reimbursements for some of the costs that BG had taken up until a certain point. So, this was both strategic and financial; and that type of deal where you see offtake together with equity is fairly common. He would be surprised if that element didn't occur at some point in Alaska.

He explained that a lot of times, these national company buyers bring in additional benefits; for example, having a Japanese equity owner usually opens up the project for state supported financing. The Japan Bank of International Cooperation is probably the largest third-party financier for LNG projects in the world, and they generally tend to give you money if you have a Japanese company in the mix.

4:02:34 PM
Switching to the MOU and midstream (slide 5), Mr. Tsafos said there are a large number of ways to structure a pipeline, and all sorts of ways to approach the midstream have been tried. It seems for the most part, there are three possible options: a midstream structured by the producers, the producers and the State of Alaska (SOA), or you can have the producers, the SOA and a third party. If one were to have the last structure, you could think either about leveraging the AGIA process or about terminating the AGIA process and going through with a new bid. The path in the MOU leverages the AGIA process.

MR. TSAFOS said he would go through each option in a systematic way and talk about the pros and cons. Before doing that he

wanted to list what is important to the state (in no particular order of priority).

4:04:59 PM
1. Producer and SOA alignment to minimize disputes over where value is allocated and has tariffs that reflect value maximization across the entire project
2. A project that favors expansions enabling additional investment throughout Alaska
3. Instate deliveries
4. Pipeline execution on time and at the lowest price possible cost
5. Continuity and momentum that accelerates current investment interest and leverages work to date

4:06:08 PM
MR. MAYER said he would analyze what each option might look like as measured by the five key criteria.

First, he said a midstream component for this project held solely by the producers might look like a series of problems with less than optimal solutions. SOA involvement is key to the question of alignment and the question of how it draws its value from the project versus how the producers do it. Specifically, from a producer's-only perspective, if this is one big integrated project that ends up with LNG being delivered into Asia, they are not sure where in the value chain value accrues.

But if you are a third-party shipper of gas who is not a shareholder in the liquefaction chain - maybe the SOA trying to get its own gas to market or trying to get gas to Alaskan residents - you care a lot about what the pipeline tariff is, because the higher the tariff the less you are able to meet those key objectives. With only the producers involved in the pipeline you get a much greater potential for disputes around the question of value and where in the value chain value accrues, what the tariff should be, et cetera. If the state is involved, that alignment begins to be addressed right away.

Similarly, third party expansions would be easier if the resources didn't all belong to the producers, because they would be most interested in commercializing their own resources. It also wouldn't be clear what the tariff would be for instate deliveries, because of the question of where value accrues across the value chain and whether it would be optimal or not.

4:12:17 PM

Finally, it seems that any option that doesn't in some way involve TransCanada specifically as a partner, because a bunch of work that has been done to date through the Alaska Gasline Inducement Act (AGIA) process, would have significant uncertainties about time, money, and litigation over terminating the agreement.

4:13:02 PM
Alignment is much better with the three producers and the SOA (slide 8). Then the state can ensure that the approach to the whole project meets its objectives as well as the producers' and gets rid of the fundamental questions of where the value accrues across the value chain.

MR. MAYER explained that the third party expansion issue is more of a question, because in principle the state can take a more active role as a participant in the midstream and seek to have its role be the vocal pro-expansion voice in this consortium. The question then becomes one of state capacity and how much experience the state has in being a pipeline company; because ultimately to have a truly pro-expansion outlook to this project you want an entity at the table that isn't just making money by transporting molecules to market and selling them, but is making money through the transportation process, itself, and actually wants to do the business of transportation of molecules. It's not clear that the state by itself has all the capabilities of an independent pipeline company that a dedicated pipeline company would bring.

MR. MAYER said the SOA can use its equity and total capacity to carry gas to local markets for instate deliveries, and while there are three producers with strong capabilities to execute on the pipeline front, when it comes to future expansions, it might be under such a model that it's solely the SOA that's carrying either the future expansion by itself or trying to bring in new partners. So, that raises the question of if the SOA, as the sole independent and expansion oriented partner in such a project, has the same capabilities as a third (pure midstream) party might.

4:16:21 PM
Finally, he said the same questions exist around loss of data or work done to date by TransCanada or of litigation that would apply to all of the non-leveraged AGIA options.

The third option of producers, SOA and a third party (TransCanada) has a lot of value on all of the key five points

Mr. Mayer said. The same value seen before on alignment because of state involvement, but greater value when it comes to third party expansion, because you have a company at the table with a substantial share in this that is not making value by upstream production or by selling molecules in end markets, but solely making its money by the molecules that it transports through the pipe, and its key to increasing profits is moving more molecules through the pipe and finding more people with molecules to provide. This is actually a key strength of bringing in a third party.

Instate deliveries is a strength of the pure producers plus SOA and the SOA plus a third party. A pure midstream company that makes money by moving molecules through the pipe doesn't care whether they are going to Asia or Fairbanks.

If you're the producer you really are concerned about how much is spent on the project, because you're not making your money by moving molecules through the pipe, you're making your money by selling them at the end market. And the more you spend on the project, the more expensive it is to move those molecules to market. Having a midstream company that is strongly pro-expansion and producers that really care about cost control is a compelling combination.

4:20:14 PM
On continuity and momentum, Mr. Mayer said, choosing the TransCanada option rather than another third party has the benefit of being able to maintain and accelerate all of the work that has been done to date as well as maintaining the general sense of momentum people see around this project rather than pushing back momentum because of needing to reopen a bidding process, taking another two years and possibly stalling HOA negotiations and other decisions while those things are being resolved.

4:21:21 PM
There is uncertainty with this option, however, because one of the overwhelming goals for the SOA is having the lowest possible tariff on the pipeline. One can compare the terms, which they have done with other Federal Energy Regulatory Commission (FERC) regulated interstate pipelines in the U.S., but it would seem that the capital structure proposed - the cost of equity and the cost of debt, the weighted average cost of capital - are all sort of in quite a comfortable range. Canada has a more aggressive regulatory approach to these things and tends to have

a lower cost of capital and lower tariffs, but it's in the ball park for the U.S.

However, he said that without an open bid process, you never really know what the alternative is; it could be that there are other highly capable midstream companies that could offer a better deal; it's also quite possible that one could open up the process to bidding and take a lot of time to do that and lose a lot of momentum in the process and find that there isn't a better offer or that the existing offer is no longer there and a worse one is presented.

4:23:20 PM
SENATOR MICCICHE asked if prioritizing these five areas of importance would have been helpful in making these decisions.

MR. MAYER answered that he would be hard pressed to demote one over another; they are all core priorities for the SOA. He thought that individual legislators needed to grapple with those issues.

4:25:19 PM
The last option (slide 10) proposes that the producers, the SOA and a third party is the best approach, but concludes rather than leveraging what's been done for AGIA to launch a new bidding process. It would be similar in its strengths on many of the key aspects but could lead to a worse tariff and slow the process down. The biggest difference in this scenario is momentum and what work done to date can be kept and how much it would cost the state in terms of litigation.

4:27:02 PM
He said the state needs to weigh some key questions in terms of its interests in the MOU:
-What compensation the SOA would have to pay to get out of the AGIA license?
-What intellectual property would AKLNG retain of work that has been done to date?
-What would happen to the HOA process (momentum) if the midstream were uncertain in various ways: either because of a bid process or litigation?
-What are the odds that a bidding process would open up better terms than are currently on the table - particularly when one looks at when there has been an open offer on bids for not completely dissimilar projects?
-Would a better tariff (through a competitive deal) offset the whole question of absence of a dedicated pro-expansion party in

the midstream from the negotiating table as other key aspects of the project are being nailed down. Would that be worth the reduced momentum, litigation and all the rest?

4:29:10 PM
SENATOR FRENCH asked how much the SOA has to participate in order to get alignment.

MR. TSAFOS answered if you consider equity as valuable for the purpose of alignment only, there wasn't a clear answer. If alignment is meant to say we're in this together, we're a serious player, we're willing to see this through by putting some more in, and willing to demonstrate our commitment to the partners and the world, the buyers and the bankers; he still didn't know the magic number, but he felt that 1 percent wouldn't quite cut it. Think of alignment as adding value to the creation, unlocking the project, and getting gas to local markets, he said.

He said the state might get alignment with 20-25 percent equity share today, but you might not have to risk it now, because you can start off and as the project gains momentum it could be sold down without risking either alignment or momentum of the project. He really thought the equity needed to be thought of as serving multiple purposes, not just alignment. One percent is better than zero, because it brings you to the table and 51 percent is too much in the sense of being a majority owner in a project. But some states do that, so there is nothing unprecedented about it.

4:33:21 PM
MR. MAYER said part of the alignment question is the between how companies generate value from this project and how the SOA generates it. We're all in it together. The vision of an initial structure of the state's share of gas at 20-25 percent and a corresponding equity stake has a certain compelling logic in terms of the degree of alignment that it creates that other approaches would not create; and it goes beyond just the sort of "we have some skin in the game" that a smaller stake might entail.

4:36:20 PM
SENATOR FRENCH said he was starting to wonder about some of their economic analysis of the downside, because the state was giving up the power to tax this project in exchange for a piece of it in order to make it happen, and this piece should pay the same as the taxation, or more, because it's riskier. What could

go wrong? How big of a commitment could the state be asked to make in the middle of the project?

MR. TSAFOS said there are two risks before the first cargo leaves the port: delays and cost overruns. Their survey of most of the LNG projects that have come on line over the last decade revealed a range of 6-9 months early to 2-2.5 years late and cost overruns that range from being on budget to being 20-40 percent over budget. Companies have recognized the uncertainty of construction costs, which is why they quoted publicly a range of $45-$65 billion for this project; $65 billion is the higher end of an estimate rather than an overrun.

4:39:05 PM
After that there are risks of lower utilization, and looking at projects historically they tend to operate at 85-90 percent of their nameplate capacity. This one is 15-18 million tons due to weather, so one of the risks could be at any given time it may be at 85-90 percent and have years of being at 60-70 percent, because something happened and the plant had to be shut down.

Other risks are less relevant for Alaska: he said domestic gas diversion happens in a lot of places where powerful constituencies ask for gas and it gets diverted from the export market, but his sense was that Alaska would be hard pressed to find that LNG demand any time soon.

MR. TSAFOS explained that market risk is another factor for Alaska. In the past, market risk could manifest itself by the inability to produce or an inability to get a lower price. But in general, Mr. Tsafos said, LNG projects don't lose money. They may be suboptimal investments, because once you put the infrastructure in, the cash generated is generally much higher than the operating costs, but it's hard to be cash negative at any given time. You may decide that you didn't invest your capital wisely, but for the most part, your exposure isn't until the project comes on line. Even in projects that have experienced severe cost overruns, the impact is really lower return on investment rather than being cash negative.

4:41:43 PM
MS. TSAFOS said there are a number of commercial arrangements in which the state could limit its exposure: one is using an S curve. Imagine the price of gas being linked to the price of oil: the S curve says well, the price of gas is linked to the price of oil, but if you get above a certain point, you won't keep increasing the price of gas in the same way. In order to do

that, the downside has some protection. So, you could think of this as having a balanced portfolio with a little bit of bonds, some equities, and maybe some emerging market equities. The same can be done for the LNG project, too. The SOA can have 20-25 percent of 15-18 million tons; it doesn't take a lot of upside, but it would protect on the downside by having at least some revenue coming in. A second stream of gas has a little bit more risk exposure and maybe 10-20 percent is fully market dependent. If the market is great, we'll make a killing; if the market tanks, that cost will be absorbed. For sure, nothing in front of them today precludes the state from picking that investment philosophy, which can be changed over time. BG in the Queensland Curtis project, back in 2008, marketed almost all of its LNG in the spot market and were getting great returns. Then they realized that the market was changing, so they locked all this gas down into short and medium term contracts. Nothing prevents the state from being able to adapt to the circumstances, and there are a number of contractual ways, especially if you are willing to forgo some upside, to protect the downside. He said that most LNG projects have state partners and states like some kind of predictability.

MR. MAYER added that it's important to think about the reward part of the equation, and where in the overall valuation chain one maintains ownership of the gas is important to the rewards. Under the HOA, the state has a lot of options: if it doesn't come up with successful negotiations around gas in kind and decides to take it in value at the wellhead, it could decide to not want the exposure of being an LNG producer and marketing gas to Asia and negotiate with the producers to buy the gas, or it could ship it through the pipeline and make LNG out of it - but not wanting to go through the expense and difficulty of finding out what is involved in building an LNG marketing operation, could contract out to different parties to sell our LNG.

Maybe over time what the state decides could change, Mr. Mayer explained. The key thing to remember is that where you participate in that value chain certainly shapes the risk that you take, but it also dramatically shapes the rewards, too. Equatorial LNG Guinea, the upstream resource holder, gets about $.25 mmcf/gas; the LNG producer makes it for $2.85 and that gas is sold into Japan for $14-18/mmbtu. So, there is enormous variation in the value of gas (both on the risk and the reward), and having 25 percent of a resource at the wellhead is very different than having 25 percent of a resource landed in Japan.

4:47:49 PM

SENATOR MICCICHE said our biggest risk is in not understanding the impacts of an agreement, and asked if the state had no additional burden under the AGIA agreement what would change on the producer/state alignment.

MR. MAYER answered that it becomes a question of how one trades off the possibility (by no means a certainty) of a better tariff through a competitive process versus the question of both momentum and having a pure midstream company that makes its money by moving gas through the pipeline at the table over the 6-18 months when the commercial agreements are being signed.

SENATOR MICCICHE said the state might still have a different third party.

MR. MAYER said it would take some time for that third party to come to the table, maybe two years. It would mean a delay of 6-24 months in the process and other parts envisioned by the HOA would take longer, or those parts are able to move in tandem but they are moving only with the SOA without that third party at the table.

4:50:15 PM
SENATOR BISHOP asked who has the best track record globally on marketing gas.

MR. TSAFOS answered that he was uncertain, because most companies can make a killing in any given year, so one must look at their record over time. Having a good price for gas is an indication of good marketing strategy, but a portfolio usually has a range of pricing. No one company stands out; seven or eight companies are extremely competent LNG marketers that can get sustainably good value for their gas, but even they sometimes sign bad deals, in retrospect, because at the time they signed them the market conditions were such and then they changed. He thought the state would have lots of options to choose from and said that a good price is more important than who signed it.

4:54:08 PM
SENATOR FAIRCLOUGH said legislators receive information from global experts, but they have to agree as a group on what the variables are inside the project and that she valued the conversation about continuity and momentum. It seemed to her that execution was another gate to go through. Do we agree that these five ideas encapsulate all of the different opinions on what is most important for Alaska in considering moving forward

with a huge investment that has potential risk and potential upside?

CHAIR GIESSEL followed up on that theme saying the state did have a bid process several years ago - for AGIA.

MR. TSAFOS said there were four parties: TransCanada was the fifth, but at the end of the day TransCanada's application was the only one that had a measure of completeness.

CHAIR GIESSEL asked him with his knowledge of who the other companies were and supposing they were to raise their hands again in interest, is there a best company in the world that builds pipelines in Arctic conditions across mountain ranges and comes in on time and in budget?

MR. TSAFOS said part of the answer is lack of comparable data points - not a lot of people have built 800 mile pipelines across similar territory. Shell built the 500-mile Sakhalin in Russia; it stands out in their table of cost overruns. IHS Energy puts out a list of the 50 largest publicly traded companies in the world and does a segmentation of each aspect of the oil and gas business. So, they looked at the midstream infrastructure aspect where TransCanada was fourth. One company was at the top at about $60 billion and three companies below at the $30-40 billion market cap. So, TransCanada is definitely in the top five.

4:59:21 PM
However, he pointed out that none of the companies in the top 15 have shown an interest in building a pipeline in Alaska. He couldn't say why not, but generally they look at risk/reward and likely completion, and this could look like a tough pipeline to build. What would you get going to a bid process? He didn't know, but if you look at the past, none of the other companies had been associated with Alaska. He reiterated the questions about how momentum and litigation would be reflected in the tariff if the state would open the process to bidding.

5:03:28 PM
SENATOR MICCICHE said it is important to clarify that TransCanada is an incredible company, but their experience on a pipeline of this size and pressure is non-existent. Their execution record is incredible, but the one question he had was there are new entrants into this area of expertise (in the last 10 large scale projects) that if it weren't for AGIA, the state might be looking at as competitors.

MR. TSAFOS said there are large pipelines associated with LNG, but if you focus on compatibility of not just diameter but of terrain and everything else, he couldn't think of an LNG project that has an infrastructure under construction that is comparable to what will happen in Alaska with the exception of maybe Sakhalin in Russia. A lot of pipelines are being built right now in Australia, but the climate there is fairly different. There have been technical advancements, but for building big pipelines in this terrain for an LNG project there is a pretty short list of companies.

5:08:05 PM
CHAIR GIESSEL thanked them for the presentation.

5:08:17 PM
At ease from 5:08 to 5:19 p.m.

Presentation: AKLNG Project Plan by Steve Butt, Senior Project Manager, ExxonMobil Corp.

5:19:49 PM
CHAIR GIESSEL called the Senate Resources Committee meeting back to order at 5:19 p.m. and welcomed Steve Butt to the committee to present the Alaska LNG project (AKLNG).

STEVE BUTT, Senior Project Manager, ExxonMobil Corp., said he had his first introduction to the Alaskan gas business in 1984 when he worked briefly for SOHIO in Mukluk. Since then, he has had about 30 years of project experience, primarily in the U.S. He had also been the operations manager in Venezuela, Equatorial Guinea where they built significant infrastructure, Angola, Nigeria, Cameroon, West Africa, Qatar (production vice president responsible for bringing four of the world's largest LNG trains on line and general manager of the world's largest gas plant). He came back to Alaska a couple of years ago and started working with a "great group of people" representing BP, ConocoPhillips, ExxonMobil and TransCanada in the AKLNG project with the goal of figuring out the best way to commercialize the North Slope gas resources through the use of the LNG process.

5:21:13 PM
He wanted to put forth one principal as background: through the last couple of years working with the project team he used three ideas to test what they were doing: alignment, risk reduction, and cost reduction, what he called the "Arch of Success." This is the most important framework in which to think about the

project. Success in this project comes from maximizing alignment. This is a unique opportunity where all the principle resource owners in Alaska, including the state, are trying to come together to put this forward, a level that has never been achieved before.

There are still a lot of risks: A regulatory framework that has never been tested on a project this large, a market that has never been tested on this project, and a high level of uncertainty around costs and other issues. His job was to work with the team and drive them down, to make sure they understand what the uncertainties are and mitigate them. Working together in aligned fashion to reduce risks is all about reducing costs of supply, the guiding metric the companies use to decide if a project can really survive.

He said gas is a commodity and buyers want a cheap commodity that they can trust, because they are going to put their entire economy at risk to the LNG that they buy. Their children and their grandchildren are going to use that LNG over long term contracts and they want to know that the project is going to deliver LNG to their doorstep every two days or three days for the next 35 years. That's a huge commitment, but it all comes down to their confidence in the project: if have they reduced the risks and built enough alignment that they can deliver at low enough cost, because those markets go up and down.

He invited the committee to test him against those three concepts: alignment, risk reduction and cost of supply.

5:23:26 PM

Overview of the Project Design:

MR. BUTT said they have an integrated design; they know where the gas would be treated, how it would be transported, and how it would be liquefied. The Nikiski industrial area is their lead site; they were in Kenai last week and it is a great place to work. Kenai has a long history of LNG manufacturing and they are getting a good reception from the land owners, a very important point, because to go to the DOE and get an export permit they have to demonstrate that they have the land that they need to build the plant. It is a critical uncertainty that they are working on right now; and once that is resolved they will go to the next one on permitting.

They have moved forward on their summer field season and were able to get some information north of Livengood for permitting, which is a big help.

MR. BUTT said they had confirmed their ability to integrate into Prudhoe Bay, which differentiates this project from previous projects that worked gas in Alaska. This is not a pipeline project, so some of the FERC regulatory firewalls required in the pipeline don't apply here. Phrases like "open season" are really misnomers in this project.

Most importantly they have some great progress on the gas treatment plant (GTP), sealifts, and logistics. A project this big is all about managing those little tiny things that drive the big costs. If you get them all right, then you can deliver in a lost cost manner. In Qatar, for instance, all those trains were delivered on or head of schedule and on or ahead of budget. The companies involved in this project have a long history of successfully developing LNG. When you look at LNG and who is doing what, it is important to understand who is helping drive the decisions, and if they are working in a manner that is going to be successful.

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MR. BUTT said this project will have huge benefits to the state; a $45-65 billion investment in Alaska, 9,000-15,000 jobs for construction and another 1,000 for the long term. The oil and gas industry creates a lot of other jobs beside the operating jobs: those 1,000 folks need to eat, places to stay, they need to buy lunch. Folks use multipliers on the order of 7-9 for the oil and gas industry.

More importantly, the LNG is unique in that it generates revenue for the state. As it's designed with the state as a participant, the state has the opportunity to take its share of the revenue commensurate with its share of the investment and that creates alignment which over the decades will bring significant revenue to the state. This gas also provides natural gas for Alaskans.

MR. BUTT said they have a really good start on their safety, health, and environmental work. About 150 people in the field worked almost 100,000 hours in the 2013 summer field season incident free and were able to measure and quantify the systems; they understand every ecosystem they touch so that in the event the project is built they can assure there is no damage.

Megaprojects are often defined as any project over $1 billion and now they are sometimes defined as a project over $10 billion. By any metric this is one of the largest megaprojects ever and those will be some of their big challenges. In some ways it's really five megaprojects, each one working with each other. It so big, it creates its own weather, and if they are not careful, it competes with itself. You don't want to have a challenge with welders on part A working at odds with part B. So, the work has to be planned carefully match the resources needed along with the right craft skills.

They also have to look through some complex commercial arrangements, so the right framework is in place to deliver the gas, and mitigate socio-economic impacts. They opened an office in Kenai trying to understand the community and be a good member of it.

MR. BUTT said no one has ever permitted an 800-mile pipeline in the post NEPA era in the U.S., or done an LNG plant this big, or a GTP this big, and they must do all three. They must be done in a coordinated manner under a single review process, which ostensibly would be coordinated through FERC. FERC will help them by coordinating all the other federal and state agencies that will be involved in the pipeline: hazardous materials safety administration, Coast Guard, seaways, the EPA and so on.

All of those permits are a challenge that creates risk; they pay very close attention to them, so they can be managed.

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They want to finish their studies this year and move into pre-FEED. They want enough clarity from the legislature to understand the participants, the equity and the process. One of their BP colleagues said they need help with the three P's: participants, project equity, and process. As they provide information to the legislature, their help is needed to understand those P's so they can move into pre-FEED, a level of project integration not seen in Alaska.

He showed a schematic of what the AKLNG project would look like: starting on the North Slope, the oil and gas fields will be integrated with Pt. Thomson, the "anchor tenants," because that's where a majority of the gas is. There are other fields on the North Slope with gas but the majority is there. He likened it to a real estate mall that has the big anchor tenants, but also has room for plenty of other folks. But you have to have

anchor tenants, so that when the mall is built, folks will come to it.

From a high level overview, the pipeline runs across the Brooks Range through discontinuous permafrost over the Alaska Range, across the Cook Inlet into the eastern Cook Inlet area with the lead plant site in Nikiski.

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Looking at each of the pieces, he said, Pt. Thomson is about 60 miles east of Prudhoe Bay; about 25 percent of the gas is there. About $1.8 billion has been invested there to date and $4 billion will be invested to get the condensate on stream no later than early 2016. That work is going really well; the ice roads and air field are in, the camp is in place, all the supports for the pipeline are in, and they are working on the pipeline right now between Pt. Thomson and Badami.

The other big anchor tenant is Prudhoe Bay; it is THE anchor tenant, because it is the largest oil field in North American and has a tremendous amount of associated gas with it, but it had to be managed very carefully, because oil and gas go together. In thinking about this project's costs, the integration of Prudhoe Bay as an oil field underpinning this investment is very important. This project has tons of challenges: it's got to have the gas treated and transported. No other project has an 800-mile pipeline between the field and the plant. The one in Qatar is 26 miles; the one in Equatorial Guinea is 10 miles. Normally you can site the plant very close to the source. Here, given the reality of the Arctic conditions and the fact that you can't ship in the winter, you have to build this pipeline. You also have to deal with 12 percent CO_2 at Prudhoe Bay. Those challenges have to be offset by other advantages and one of them is the existing infrastructure where all the compression is already in place at Prudhoe Bay supporting the oil field.

As long as the oil business stays healthy, you have that can be leveraged to underpin the gas business, a really important advantage. If one doesn't have a healthy oil business that moves from the advantage column over to the disadvantage column, because that health has to be recreated.

After the gas is gotten out of Prudhoe Bay and Pt. Thomson it is brought into a facility that gets it ready to transport, and one of the key things they have done is understand how the gas would be readied to move to market. The market only wants the

hydrocarbon gas that they can use for utility, because that is what heats homes and creates electricity and all the other benefits of energy.

Prudhoe Bay gas has about 12 percent CO_2 and Pt. Thomson has about 4 percent. So, Pt. Thomson reservoir pressure is a little bit higher, about 10,000 psi and Prudhoe Bay reservoir pressure is a little bit lower at 3,200 psi. So, you have to look at those two systems and then design a gas treatment plant (GTP) that will work for both.

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He showed the GTP design: the 130 ft. high X 28 ft. towers would treat the gas such that the impurities can be stripped out through the "Amine process." The plate steel in the walls is about 8-12 inches thick; the gas is moved up and the liquids go down, so that the impurities are carried off. The importance of that is that the only thing that goes in the pipeline is very dry hydrocarbon gas; that means there is no water and very small traces of hydrocarbon liquids, like propane and butane, but it's inconsequential. This is because in Prudhoe Bay the gas has been getting cycled for 30 years. That means the operator has done a great job of taking the gas out of the ground, taking the liquids out, putting it in TAPS, and then putting it back in the ground.

MR. BUTT state that the Prudhoe Bay reservoir had been cycled three times. In doing so, they have stripped most of the hydrocarbon liquids normally associated with gas, so this gas stream is almost all methane with a little bit of ethane - another important point, because there is enough ethane in this to make - a rich gas, a rich LNG stream at 1100 Btus that the Asian market really likes.

So one of the things they were able to design early on with the benefit of an integrated system is how to make an "LNG spec" that people will want to buy. And they could put gas in that pipeline without any impurities or contaminants that might represent corrosive risks and move that gas down a pipeline.

He said this is designed as a 42-inch system to move about 3.3 billion cubic feet off the North Slope. They are looking hard at the materials; the type of material is important, because it defines the amount of steel in the line and the type of steel needed, and that tells you who can make it and what it will cost. So, one of the things they have to study in pre-FEED is the material in that pipeline design. Those are the questions

and those are all uncertainties: little questions that drive huge value, because the system is so big that any little change you make is hundreds of millions of dollars of decisions. They go from the really big questions and keep grinding them down, and finally get to such a high level of certainty that investors are ready to make a decision.

SENATOR FRENCH asked the maximum throughput for a 42 inch pipeline.

MR. BUTT replied this 42 inch system has a designed pressure of about 2100 psi - so the standard spec of ANC-600 can be used. It has eight compression stations and is designed so it can be expanded another 25-30 percent. Gas is compressible; you can put as much gas as you want into any system as long you have integrity in the wall to hold it and you have enough pressure to put it there. It's a question of steel and pressure, and it comes down to how much money it will cost to add compression.

He said he sensed that everyone wants more gas now, but you want to have 20 years of plateaus, so that when you go to the market to sell LNG you will be able to provide it for a long time. Buyers want to know it's there for years and years, like the ConocoPhillips plant in Kenai that successfully delivered LNG to Japan for 40 years. That's what they want, because they put their entire economy at risk to get it.

He explained that you don't want to move too much gas too fast, so you balance that plateau. This system was balanced out about 20 years based on the resources known at Prudhoe Bay and Pt. Thomson, but if more is brought in the line can be expanded, and that capability is there on a unilateral basis.

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MR. BUTT said their design has five off-takes points for Alaskans, a roughly 250-450 mmcf/day average for summer to winter. Seasonal swing is important, because the system has to be built to operate on the coldest day of the year. The other 364 days they just try to balance it: the volumes are lower and they try to liquefy all the gas moving through the system that isn't delivered to Alaskans. And because they have been able to work together with an integrated view, they have been able to balance that system: horsepower in the plant with idle capacity in the summer so they always have the ability to move the gas and liquefy it.

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He said this integration is unique. In previous projects, because of the firewall, those decisions couldn't be made; only what was in the pipe is what could be seen, because it was about delivering from point A to point B. This integrated system sees the resources, knows what's in the ground, and having an integrated process model that understands the composition, pressure, temperature of the gas at every point will help it be built to be as efficient as possible. That was impossible in previous efforts, because under FERC rules they had to be firewalled off.

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Once you get it down to the eastern Cook Inlet, you build the liquefaction facility; the whole reason being is that liquid gas is very small, dense, and easy to move. Mr. Butt explained that if you could build a pipeline across the ocean to the Asian market and touch every single market, you might consider it, because a pipeline is a very stable delivery source. But the costs and challenges of building a pipeline across the ocean are daunting and all the markets can't be touched. An LNG plant allows flexibility to ship to any market that can buy it. All that is done is take this really cold LNG at -260 F and warm it up and it gets used as gas. It's no different than pipeline gas, but it's delivered in a liquid form, because it's so much more efficient. It would take 600 ships to deliver the same volume of gas that you haven't liquefied; if you liquefy it you only need one. So, the amount of shipping and infrastructure goes down by a factor of 600, and that is why you put the investment into building a plant. Theirs is designed for 5-MT trains of average size and those provide 15-18 million tons of LNG per year. Three storage tanks are needed to store it before shipping and a jetty with two birthing facilities.

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The annual LNG output is the same as about 40 years of gas to Alaskans, because there is so much resource; Alaskans use about a tenth of the 3.5 bcf put into the system.

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SENATOR MICCICHE asked the storage capacity of the three tanks.

MR. BUTT answered they are three-160s.

He summarized that ExxonMobil's activities at Prudhoe Bay continues to work on the integration; he said it is such an important difference between this project and other ones. Because of integration, they know how the CO_2 reinjection would

be managed. At 500 mmcf/day, CO_2 reinjection is really important; it's 4 tcf over the life of the project. More CO_2 has to be re-injected than Alaskans use every day. So, you want to work with the Prudhoe Bay operator to make sure all that CO_2 gets used well and the Prudhoe Bay operator has thought that through.

He summarized that they had looked at how the power grids would be looped and integrated. At Pt. Thomson, you're always thinking about how to manage the 10,000 psi; it's 10,000 pounds on every square inch of that pipe. So, to handle that load the pipe in that line (a recycle line on the high pressure side) has to be four inches thick, and because it is so thick you have to have special welding capabilities, which they are working on and the design has to be well thought through.

His point was that by integrating everything can be understood. It delivers benefits at the GTP because by understanding the whole system, it has been redesigned. Both Denali and APP thought they need four GTP trains based on the public data, and that's because Prudhoe Bay has 12 percent CO_2. But understanding the composition better and taking a sharper pencil to the design of, for instance, those really big 130 ft. towers: inside them is a bunch of packing beads that allows that gas and liquid to mix. You want them to touch each other and when they do that, the liquids strips out the impurities in the gas. So, the better you can cause them to talk to each other, the better that can be integrated, the better it can be co-mingled and the more efficient they are. So, they were able to improve their packing technology in those towers and went from four to three trains, saving a lot of money. But more importantly, it means that the system in the north with three trains for treating is now balanced with the system in the south with three trains for liquefaction. So, for operations and maintenance over the next 35 years, the system is a much better balance. Getting back to the three important things, he said, this reduces costs, reduces risks and helps them move the project forward.

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SENATOR BISHOP asked how many sealifts to bring this on.

MR. BUTT answered the APP design had four sealift seasons using 120 different modules up to 85 tons each. The GTP is 250,000 tons - or 140,000 F-150s or 200,000 Subaru's; it all has to be moved. The original plan was to do it over four trains and three sealifts; now they are thinking three trains and four sealifts. What they did is split out the trains and pulled the utilities forward, which means building the utilities in the first year

and then bringing up the trains one at a time. That allows balancing the start up with the plants; so, again, the system has been balanced.

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SENATOR MICCICHE said he didn't have any experience in dilution of CO_2, and asked if the cost of handling it would increase because it's going to be a higher proportion of gas through the years.

MR. BUTT answered the way the Prudhoe Bay operator is going to manage the higher vapor pressure liquids is by using the miscible injection system that is used on TAPS. That system is designed to handle up to 25 percent CO_2. So, you flush gas through that system to reduce the CO_2 to about 12 percent, and then come backwards and re-inject that gas until you come up to 25 percent. As you go from east to west and see the CO_2 rates go up, you shut in the wells and just keep moving. The Prudhoe Bay operator has done an outstanding job of thinking this through and has come up with some great ideas. If given a couple more years to work it, they would come up with stuff that's even better, because they are a smart bunch.

The challenge is how to move through some of the more difficult areas: Antigun Pass is tall and challenging, because it's already got a pipeline; the Denali National Park area is particularly challenging with Glitter Gulch that doesn't have a lot of room for pipelines. There are three different ways of moving the pipeline through Denali and all have questions of how closely the terrain can be followed and where to use bridges; the other challenge is how to cross the Cook Inlet and the Yukon River. They are pretty sure the Yukon gets crossed with a bridge and they are working on the Cook Inlet right now. It's a question of where and how to cross the Susitna; one option is just stay on the west side; the other options involve moving it to the east, but they just don't know right now. That is the work they are trying to finish over the next few weeks.

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It's really exciting to have a fully integrated team of people from all the companies looking at this route; six primary engineers are working on it and between them they have 200 years of experience. He was sure they would come up with some good ideas.

On the LNG plant, he said sea states, currents, ice and managing larger LNG carriers in the Inlet because of the presence of ice

are being monitored. They have looked at ice monitoring systems and think with some intrinsically safe design they can put in caissons to manage any ice flow and protect the LNG carriers when they are moored. They will also have a set of fairly large tugs to support the LNG carriers when they move.

They have finished the environmental work and with that said, they have some things left to do in the 2014 summer season. He concluded that if they can keep alignment and integration, this project can see and do things that its predecessors couldn't. The challenge is to keep understanding the risks and reducing them, so that cost of supply can be minimized. That is what makes a project successful; you measure their impact on your ability to deliver LNG at the lowest possible cost, because that is what makes it competitive and it's also what secures your margin. If you can't get all those hundreds of factors and elements aligned to support the lowest possible cost of supply, you need to keep working it; that's the challenge.

CHAIR GIESSEL asked what his role would be, theoretically, should this project go forward in the AKLNG project.

MR. BUTT replied that right now he works as the project manager under what is called the Concept Selection Agreement; it has a lead party and he works for that on behalf of the whole project. The next phase would be to move into a joint venture agreement that defines a lead party, and that lead party would define a person to fulfill the same role he has, which is a lead project manager role. He will keep doing it if asked.

5:55:41 PM
Finding no further questions, Chair Giessel thanked him for the presentation and adjourned the Senate Resources Committee meeting 5:55 p.m.