

Department of Natural Resources
AKLNG Pipe Size Issue
October 28, 2015

Background on pipe size

Beginning in 2012 as part of the Alaska Pipeline Project (APP)/Alaska Gasline Inducement Act (AGIA) effort, TransCanada and ExxonMobil came to the conclusion after extensive engineering work that a 48-inch pipe was the best choice for their project due largely to optimal expandability. The APP/AGIA project was premised on exporting North Slope stranded natural gas via an overland pipeline to tie into the North American gas pipeline grid in Alberta. With the termination of APP/AGIA, North Slope gas commercialization efforts reemerged under South Central LNG (SCLNG), premised on exporting LNG to high-value Asian markets, and initial conclusions by SCLNG on pipe diameter largely reflected the same conclusion reached in earlier APP/AGIA Project (48-inch pipe has optimal expandability). By the time SCLNG evolved into AKLNG, the Producers (ConocoPhillips, ExxonMobil, BP) had reversed prior conclusions and settled on a preference for 42-inch pipe size based on minimizing upfront capital costs.

Administration's past and current position on pipe size

Since 2013, the State of Alaska has consistently advocated for a 48-inch case in AKLNG Pre-FEED engineering work. During SB 138 hearing in 2014, DNR Commissioner Balash advised that a larger pipe was an alternative to be evaluated during AKLNG Phase 2 technical work, and that such an evaluation was in the best interest of the State to make an informed decision on appropriate pipe size.

Consistent with legislative direction in SB 138, the Administration has continued to advocate that a 48-inch case be preserved as a viable alternative for AKLNG. In February 2015 the State learned that no engineering work was under way on the 48-inch case as part of Pre-FEED, which would make an eventual apples-to-apples comparison between 42-inch and 48-inch pipe impossible. Due to strong advocacy by the State of Alaska, the AKLNG Parties voted in September 2015 to change the Pre-FEED Work Plan and Budget (WP&B) to include all the engineering work necessary to raise the 48-inch to an equivalent level to the 42-inch case. This work should be completed by April 2016, at which time appropriate technical and commercial data will be available to make an informed decision by all Parties to AKLNG.

Basis for Administration's desire to have a full analysis of a 48-inch pipe size

When evaluating pipeline sizing options, it is normal to consider at an early stage in the process all pipe diameters and maximum operating pressures that are potentially feasible. On the basis

of technical work completed to date, there appears to be consensus that only two pipe diameters require further detailed consideration, a 42-inch pipeline and a 48-inch pipeline. As part of Pre-FEED, a broad-based engineering study is underway to determine which of these two options satisfies the technical needs of AKLNG as well as achieves broader State of Alaska gas development interests.

Early on in the project, it was recognized that there was a fundamental difference between the State of Alaska's primary design criteria and the producers' preferences on sizing the AKLNG pipeline. Producers are focused on the lowest cost transportation capacity needed to monetize their PBU and PTU resources, as might be expected. Using only this single criterion, the 42-inch diameter is likely the best option. However, the 42-inch option does not easily accommodate entrance of new gas until after PBU and PTU come off plateau and begin to decline. The State of Alaska is more broadly focused on its ability to more timely open the North Slope's gas resources to development beyond PBU and PTU, as anchor fields for AKLNG, and the capability to serve greater in-state needs. The 48-inch pipe is a much better option to meet these requirements as its expandability is significantly easier and cheaper.

When completing a study to determine the optimum pipeline diameter, there are many factors that influence the final selection. The importance of each factor varies with the perspective of the decision-makers. Some of the main factors are described below:

- **CAPITAL COSTS** – For the base case throughput of 3.3 bcf/d the 42-inch is the lowest cost option. The 48-inch option, transporting an equal amount of gas, could cost as much as 8% more.
- **OPERATING COSTS** – At the base case throughput, the 42-inch initially has a lower cost of service than the 48-inch largely because of its lower cost of capital. Because the 48-inch pipeline has fewer compression stations it burns less fuel, and needs less maintenance. Over time, the larger pipe begins to overtake the smaller, less efficient pipeline.
- **EXPANSION** – The 42-inch pipe can be expanded to transport up to 1 bcf/d. The incremental cost of expanding the 42-inch is double what it costs for the same 1 bcf/d additional capacity with the 48-inch pipe. Furthermore, since this size expansion requires 10 additional compression stations on the 42-inch compared to only four more on the 48 inch operating costs considerations strongly favor the larger, more efficient pipe, which is 10% to 15% cheaper. Finally, a 1 bcf/d expansion on the 42-inch pipeline is the maximum achievable while the larger pipeline can be expanded at least another 1.5 to 2 bcf/d above the limit of the 42-inch.
- **SCHEDULE RISK** – Since engineering work on the 42 inch case is almost complete, pursuing the equivalent level of work on the 48-inch option does represent a setback in the Project schedule. Currently this potential delay in the Pre-FEED to FEED transition could be as much as eight months; it should not have any delay on Final Investment Decision

(FID) or first gas. Given the heavier weight and larger diameter of the 48-inch pipe, it does represent additional logistical, installation, and safety risks, but with careful planning and choosing high performing contractors these risks can be mitigated. These added construction risks are contemplated in the additional 5% contingency and will be better understood, and potentially better mitigated after the 48-inch engineering work is complete during pre-FEED.

- The 48-inch pipeline is also expected to offer additional flexibility; more line pack, lower maintenance, fewer emissions, and more stability in discontinuous permafrost.

Process for proposing and approving Project Scope changes and securing State funds

During Pre-FEED, the AKLNG Work Plan & Budget (WP&B) is approved in the late fall for the following calendar year. The process for amending an AKLNG Work Plan & Budget is straightforward. A change proposed by a JVA Party to the existing Pre-FEED WP&B is reviewed for scope, technical, cost, and commercial implications through a series of committees and then voted on by the AKLNG partners (currently including AGDC and TransCanada for the State of Alaska). Note that some requests may require a change in scope, without a cost increase, while others may require additional work, but ultimately may result in cost savings for the overall Project. These sorts of requests still require approval of all the partners, as they will likely require additional Pre-FEED or FEED expenditures.

Changes to the WP&B costs which require State funding above amounts already approved via legislative appropriation are requested through the normal State budget process, such as the current request before the Legislature.

Once the AKLNG parties make a FEED decision, they intend to have a single Work Plan & Budget for the entire FEED process, rather than an annual Work Plan & Budget. Scope and cost amendments to the FEED Work Plan & Budget will follow the same process outlined for pre-FEED.

Who will bear the additional costs and receive the benefits of a larger pipe?

All AKLNG parties are currently participating in funding the engineering analysis for Pre-FEED for the 48-inch pipe size at an approximate cost of \$30M. Until that work is complete, the Parties will not know all the costs and benefits associated with the larger pipe.

Can a 48" pipe be designed to cross Cook Inlet?

The technical alternatives for the AKLNG pipeline crossing of Cook Inlet are the subject of extensive analysis now underway. There are three alternatives currently being investigated by the Project team:

- **Cross Cook Inlet with 48-inch pipe**

- **Cross Cook Inlet with 42-inch pipe as per the current design basis** (may require an additional compression station on the west side of Cook Inlet)
- **Cross Cook Inlet with twin smaller diameter pipes**

It is anticipated that this alternative analysis, including feasibility, cost, schedule and reliability/maintenance components, will be completed during 1Q2016. At that time, the results and recommendation will be presented to the AKLNG Project parties for review and approval.