# PURPOSE & SCOPE

## Purpose

The purpose of this technical memo is to describe the basis used for calculating the estimated cost of on-site power generation for the planned Alaska LNG Project Liquefaction Plant. That cost is based on the data utilized and developed during the Class 4 Cost Estimate Update to 4th Quarter 2019 (4Q2019) basis, commissioned by the Alaska Gasline Development Corporation (AGDC) and executed by Fluor Enterprises Inc. (Fluor).

## Scope

The design and cost parameters used in Class 4 Cost Estimate Update were assessed and incorporated in this review. This memo details a calculation of the on-site power generation total cost based on the approved Class 4 Cost Estimate.

# POWER GENERATION COST CALCULATION

## Calculation Input Data

The power generation cost calculations are based on the following input data and assumptions:

* Fuel cost in $/Mcf = $4.13, as provided by AGDC internal economic modeling.
* Fuel cost in $/kWh using conversion rates of Mcf/kWh for SGT-750 2x1 units and as derived for Chugach Southcentral Power Project (SCPP).
* O&M costs excluding fuel, as shown in the original report that were derived from the SCPP 1Q2020 forecast numbers.
* Fixed costs in $/kWh based on the yearly fixed costs and the average estimated kWh per year from the Class 4 Cost Estimate Update.
* CAPEX conversion to $/kWh based on a 100% loan at several rates and terms.

## OPEX Calculations

The OPEX cost was calculated based on two options. The first being the estimated OPEX cost of the SCPP in Anchorage, AK, and the second is based on power generation using Siemens gas turbine generators (SGT 750). The operating costs (O&M cost and other fixed costs) are assumed to be the same for both options. The fuel cost was calculated based on an assumed gas cost rate of 4.13 $/Mcf.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| OPEX | | | | | | |
| Operating Costs | |  |  |  |  |  |
| O&M Costs | 0.03690 | $/kWh | Derived from SCPP 1Q2020 Forecast. | | |  |
| Fixed Costs | 0.00473 | $/kWh | Based on fixed costs per year at estimated kWh/yr. | | | |
| Subtotal | 0.04162 | $/kWh |  |  |  |  |
|  |  |  |  |  |  |  |
| Estimated fuel demand for on-site compression using SGT-750 machines | | | | | |  |
| kJ/kWh | 6,718 | SGT-750 combined cycle 2x1; 103.7MW Net electrical output. | | | | |
| Mcf/kJ | 9.47867E-07 | 1 cf = 1055 kJ; 1000 cf = 1Mcf = 1055000 kJ. | | | |  |
| Mcf/kWh | 0.00637 |  |  |  |  |  |
|  |  |  |  |  |  |  |
| Fuel Cost | SCPP based | SGT-750 |  |  |  |  |
| Mcf/kWh | 0.00779 | 0.00637 |  | $/Mcf | 4.13 |  |
| $/kWh | 0.03217 | 0.02630 |  | Fixed for this calculation. | |  |
|  |  |  |  |  |  |  |
|  |  | Rate of Return | | | | |
|  |  | 0% | 3% | 5% | 10% | 15% |
| Total $/kWh: | SCPP | 0.074 | 0.076 | 0.077 | 0.081 | 0.085 |
| (Fuel & Ops) | SGT-750 | 0.068 | 0.070 | 0.071 | 0.075 | 0.078 |
|  |  |  | Expected rates | |  |  |

## CAPEX Calculations

The CAPEX cost is based on the 4Q2019 Class 4 Cost Estimate Update value of $652 million for on-site power generation facilities.

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| --- | --- | --- | --- | --- | --- |
| CAPEX | | | | | |
|  | kWh/Yearly Avg. | 815,906,400 |  |  |  |
|  |  | YEARLY CAPEX PAYOUT OF LOAN AT 100% LOAN OF $652,319,453 | | | |
|  |  | 2% | 3% | 4% | 5% |
| Loan Term (YR) | 15 | $50,372,796 | $54,057,588 | $57,901,547 | $61,902,016 |
|  | $/kWh | 0.06173845 | 0.066254644 | 0.070965918 | 0.075869017 |
|  |  |  |  |  |  |
| Loan Term (YR) | 30 | $28,933,201 | $33,002,466 | $37,371,279 | $42,021,508 |
|  | $/kWh | 0.035461421 | 0.040448838 | 0.04580339 | 0.051502854 |

## Total Estimate Onsite Power Generation Calculated Cost

The on-site power generation costs ranges from 0.103 $/kWh to 0.144 $/kWh, with an average of 0.124 $/kWh based on the expected rate of returns for the power generation plants and the cost for CAPEX financing.

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| --- | --- | --- | --- | --- |
| COMBINED | | | | |
| Generation Plant Cost with contingency | | | | |
| High OPEX $/kWh= | 0.074 |  | 0.150 | High Opex + 15 Year High Rate CAPEX |
| Low OPEX $/kWh= | 0.068 |  | 0.136 | High Opex + 15 Year Low Rate CAPEX |
| CAPEX 15 Year Loan High Rate $/kWh= | 0.076 |  | 0.125 | High Opex + 30 Year High Rate CAPEX |
| CAPEX 15 Year Loan Low Rate $/kWh= | 0.062 |  | 0.109 | High Opex + 30 Year Low Rate CAPEX |
| CAPEX 30 Year Loan High Rate $/kWh= | 0.052 |  | 0.144 | Low Opex + 15 Year High Rate CAPEX |
| CAPEX 30 Year Loan Low Rate $/kWh= | 0.035 |  | 0.130 | Low Opex + 15 Year Low Rate CAPEX |
|  |  |  | 0.119 | Low Opex + 30 Year High Rate CAPEX |
|  |  |  | 0.103 | Low Opex + 30 Year Low Rate CAPEX |
| High $/kWh | | | 0.150 | For 15 year loan |
| Low $/kWh | | | 0.103 | For 30 year loan |
| Average $/kWh | | | 0.127 |  |

# DEFINITIONS

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| --- | --- |
| Term | Definition |
| Deliverable | Required documentation, whether specific to each individual sub-project (i.e., stand-alone), or an integrated document across all sub-projects |
| JVA | Pre-FEED Joint Venture Agreement executed on July 1, 2014 |
| Pre-FEED Lead Party | The party designated to conduct operations as described in the Pre-FEED JVA |
| Project Team | Any and all of the personnel assigned as part of the Pre-FEED organization, whether Lead Party or secondees |
| Sub-project | Project segments defined in the JVA, such as the GTP |