From:	Lisa Haas
To:	Jones, Dave F (DEC)
Cc:	Simpson, Aaron J (DEC); Plosay, James R (DEC); Renovatio, James J (DEC); Andrea Stacy; Paul Burger; Blakesley, Andrea J; Shepherd, Don; King, Kirsten L; Collins, Catherine; Peters, Melanie; Frank Richards; Katie Blake; Brad Chastain; Chris Humphrey
Subject:	RE: Electricity Costs at the Liquefaction Plant for SCR BACT Calculations
Date:	Monday, November 9, 2020 3:46:56 PM
Attachments:	Technical Memo_LNG Plant Power Generation Cost_11092020.docx

Hi Dave,
As requested in the October 29 e-mail below, AGDC has reviewed the electricity cost used in the BACT cost effectiveness calculations to help assess the cost of implementing SCR on the turbines at the Liquefaction Facility. Our analysis of the anticipated cost of electricity for the Liquefaction Facility to generate its own power is outlined below, and the attached technical memorandum provides backup details, summarized from the project cost analysis completed by Fluor Enterprises Inc. (Fluor).

AGDC On-Site Power Generation Cost Analysis

AGDC requested Fluor provide an assessment of electricity costs at the Liquefaction Facility, using their detailed cost assessment completed at the end of 2019. That assessment looked at all of the project costs in order to assess the overall cost effectiveness of the project, and a separate piece of work was commissioned in November 2020 to address ADEC's October 29, 2020 request.

The attached Alaska LNG Liquefaction Plant Power Generation Technical Memorandum (3043-EST-TMM-00001) provides the basis for determining an electricity cost range for power generation using the current design combined cycle gas-fired turbine power generation configuration. The total power generation cost rate incorporates the following cost elements:

- Fuel cost in $/Mcf = $4.13, as provided by AGDC internal economic modeling. Please note the publicly available cost of Cook Inlet natural gas is $7.74/Mcf, so the number we are using is significantly under market.
- Operating and Maintenance Costs (OPEX) derived from comparable southcentral Alaska natural gas power plants and design turbine operating basis.
- Capital Cost (CAPEX) financing and debt service payout costs via probable loan term scenarios.

The analysis resulted in the following range of electricity generation costs:

- High: $0.150/kwh (15-yr CAPEX loan basis)
- Low: $0.103/kwh (30-yr CAPEX loan basis)
- Average: $0.127/kwh

Based on this analysis, AGDC recommends using the average rate of **$0.127/kwh** for purposes of the BACT cost effectiveness calculations for implementing SCR on the turbines at the Liquefaction Facility. We note that this estimate is less than AGDC's original cost effectiveness electricity rate of $0.16/kwh that was based on an 2017 Utility Bundled Retail Sales- Industrial for Alaska, and is likely more accurate because it is based on an updated cost estimate recently completed for the project.

Resulting Revised Cost Effectiveness Calculations

Based on these revised cost estimates, AGDC modified the SCR BACT cost effectiveness calculations submitted to ADEC on January 14, 2020 using the average on-site electricity rate of $0.127/kwh. This included using both the 2002 (6th Edition) and 2019 versions (7th Edition) of the EPA Cost Control Manual. The results are summarized in the table below, using the previous January 2020 results for comparison. The revised cost effectiveness calculations continue to demonstrate that installation of a SCR system on the Liquefaction facility turbines is not cost effective under both the editions of the EPA cost manuals.

Facility	Unit	EPA 6th Edition Cost Manual ($/ton NOx Removed)		EPA 7th Edition Cost Manual ($/ton NOx Removed)	
		AGDC January 2020 ADEC Response Facility Specific Cost Factors Applied	Revised electricity cost (on-site power)	AGDC January 2020 ADEC Response EPA Default Calculation Tool Applied	Revised electricity cost (on-site power)
LNG	Compressor Turbines	$18,164	$17,838	$11,241	$10,506
LNG	Power Generation Turbines	$24,588	$24,197	$10,904	$10,759

Comments on FLM Basis of Change

The electricity rate of $0.0244/kwh calculated by the NPS ARD that was based solely on the cost of the national average spot price for natural gas doesn't accurately address the cost for the on-site power generation for the Alaska LNG plant configuration. Further, the spot market natural gas price of $2.56/MMBtu used in the FLM's calculation does not reflect the Alaska natural gas market or cost/ pricing for the Alaska LNG project.

Please let us know if you have any questions.

Thank you,
Lisa

From: Jones, Dave F (DEC) <dave.jones2@alaska.gov>
Sent: Thursday, October 29, 2020 4:06 PM
To: Lisa Haas <lhaas@agdc.us>
Cc: Simpson, Aaron J (DEC) <aaron.simpson@alaska.gov>; Plosay, James R (DEC) <jim.plosay@alaska.gov>; Renovatio, James J (DEC) <james.renovatio@alaska.gov>; Andrea Stacy <andrea_stacy@nps.gov>; Burger, Paul A <paul_burger@nps.gov>; Blakesley, Andrea J <Andrea_Blakesley@nps.gov>; Shepherd, Don <Don_Shepherd@nps.gov>; King, Kirsten L <kirsten_king@nps.gov>; Collins, Catherine <Catherine_Collins@fws.gov>; Peters, Melanie

<Melanie_Peters@nps.gov>
Subject: Electricity Costs at the Liquefaction Plant for SCR BACT Calculations

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Lisa,

As we discussed earlier on the phone, we have received some feedback from the FLMs regarding BACT cost effectiveness calculations for implementing SCR on the turbines at the Liquefaction Facility. One of the areas that the FLMs cost calculations differ from AGDC and the Department's calculations is in regards to the electricity cost for running SCR. The FLMs note the following:

- **Electricity Costs** - ARD analysis assumed $0.0244/kWh in electricity costs, in comparison with the applicant's estimate of $0.16/kWh.
    - Basis for change: The AK LNG liquefaction facility will generate power onsite with the four power turbines firing pipeline natural gas.

> Accordingly, AGDC will not pay utility power usage fees. We recognize that, despite this, there will likely be some electricity costs incurred by the applicant due to natural gas usage that would otherwise be a salable product. To account for this, we calculated the electricity costs based on the 2019$ annual average natural gas spot prices (EIA, $2.56/MMBtu)[1] and natural gas usage in the power turbines generating onsite power. Calculations are provided in the power turbine spreadsheets. (On Electrical usage/onsite power generation, excerpt from the Technical Analysis Report For the terms and conditions of Construction Permit AQ1539CPT01: "The emissions units (EUs) at the stationary source will include combined cycle gas-fired turbines for power generation.")

[1] Reported value from EIA, and represents the average of the daily closing spot prices for natural gas at the Henry Hub in Louisiana. Spot prices were used rather than industrial consumer prices, as the fuel utilized at the source is a salable product. https://www.eia.gov/naturalgas/monthly/pdf/table_03.pdf

Can you please provide the Department with a detailed cost analysis of the anticipated price of electricity in $/kWh that AGDC expects to pay for providing their own power at the Liquefaction Facility.

Regards,

Dave Jones
Env. Engineering Assistant II

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907.465.5122

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[1] Reported value from EIA, and represents the average of the daily closing spot prices for natural gas at the Henry Hub in Louisiana. Spot prices were used rather than industrial consumer prices, as the fuel utilized at the source is a salable product. https://www.eia.gov/naturalgas/monthly/pdf/table_03.pdf

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