Sargent & Lundy LLC

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Date: 03/15/2021

To: Mark Jones, NMED

From: Ken Snell, Sargent & Lundy

Subject: San Juan Generating Station, New Mexico
Four-Factor Analysis
Supplemental Information Submittal No. 1

Cc: Kerwin Singleton, NMED
Andrew Knight, NMED
Michael Baca, NMED
Peter Mandelstam, Enchant Energy, LLC
Hank Adair, City of Farmington
Stephen Wiley, Sargent & Lundy
Julianna Crumlish, Sargent & Lundy

The purpose of this memorandum is to provide a written response to questions from the New Mexico Environment Department ("NMED") regarding two specific aspects of the San Juan Generating Station (SJGS) reasonable progress four-factor analysis.

The San Juan Generating Station ("SJGS") is a nominal 847 MW-net coal-fired power plant located in northwest New Mexico approximately 15 miles northwest of the City of Farmington ("Farmington"). Farmington and Enchant Energy LLC ("Enchant") plan to continue operating the generating station and install post-combustion carbon capture technology on the two operating boilers, SJGS Units 1 & 4. Enchant-Farmington submitted a Regional Haze four-factor analysis to NMED on July 9, 2020, and provided a revised analysis in response to comments from NMED on September 1, 2020. Information provided herein is being provided specifically in response to the following two questions received from NMED in an e-mail dated February 4, 2021.

Question 1. Company Specific Interest Rate:

We have to document company specific interest rates in the form of a letter from the chief financial officer for the institution that lends to your company, or from an official with your company (your company's CFO, for instance) that is in a position to know your company's costs of debt and equity. Otherwise, we plan to use the current prime rate of 3.25% in the cost calculations.

Response: A letter from Mr. Peter Mandelstam, Chief Operating Officer & Chief Development Officer for Enchant Energy, LLC is included as Attachment 1 to this memorandum. The letter provides additional information regarding the interest rate Enchant would likely incur to finance a large capital project at SJSG.

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Question 2. Operation and Maintenance (O&M) Costs

Do the Operation and Maintenance (O&M) costs provided for in your four-factor evaluation of applicable equipment reflect the incremental cost of O&M for additional control? In other words, are these costs over and above those already realized for the units?

Response: O&M costs provided in the SJGS four-factor evaluation reflect the incremental cost of O&M for the additional controls (i.e., Selective Catalytic Reduction) compared to costs that are currently incurred to operate the existing Selective Non-Catalytic Reduction systems. Incremental O&M costs were provided in the control system cost tables included as Appendix B of the SJGS four-factor analysis. Cost tables from the four-factor analysis, including additional explanation of the incremental change in O&M costs, are also provided in Attachment 2 to this memorandum.

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ATTACHMENT 1

To: New Mexico Environment Department;

The purpose of the letter is to provide additional support for the interest rate of 7% used by Enchant Energy LLC ("Enchant") in the San Juan Generating Station ("SJGS") reasonable progress four-factor analysis, a key component in estimating total annual control system costs. As recommended in Section 1, Chapter 2 of EPA's Control Cost Manual, the appropriate interest rate for a facility-specific cost assessment is the "private interest rate" Enchant would incur to finance installation of the control technology under consideration (see, Control Cost Manual, Section 1, Chapter 2, page 20).

Financing large capital projects can be structured very differently at very different interest rates depending on choices available to the entity financing the investment. For example, funding sources available to large public utilities, cooperatives, or municipalities often include issuing bonds and expending existing cash reserves or operating income; however, as a private company Enchant does not have access to these sources of funds and will be required to secure financing through a private investment bank and/or private equity firm.

Construction of a large retrofit air pollution control project at SJGS would include both debt and equity financing. The total cost of capital to Enchant would include a combination of the cost of debt and the cost of equity (i.e., the weighted average cost of capital). Both costs would be established based on prevailing financial market conditions and the perceived financial risk relative to the amount of debt and equity in the capital structure. The cost of debt is the blended, effective interest rate required to service the debt and repay the equity based on a contractual, preferred Internal Rate of Return ("IRR"). The cost of equity or IRR is required by (A) the construction period equity; and (B) the IRS Section 45Q carbon capture tax credit equity.

Based on my 31 years of experience financing large construction projects, investment banks and private equity firms do not publicly disclose their lending costs, as this information is considered highly confidential business information. Based on conversations I've had with various financial institutions the current cost of debt Enchant would incur for a large capital project would be approximately 6%, and cost of equity would be approximately 14%. Assuming a 50:50 debt/equity ratio, which would be typical for these types of innovative projects with the concomitant risk premium, the resulting weighted average cost of capital would be approximately 10%. Enchant will use this weighted average cost of capital in its financial planning for the project. As such, we continue to think that an interest rate of 7% represents a conservatively low Enchant-specific interest rate, as well as a blended debt and equity interest rate that is consistent with the Control Cost Manual and other regulatory impact assessments.

Respectfully Submitted,

Peter D. Mandelstam
Chief Operating Officer & Chief Development Officer
Enchant Energy, LLC

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ATTACHMENT 2
SJGS Units 1 & 4
SCR Cost Estimate (Annual O&M

OPERATING COSTS	Cost (2020$)		Supporting Notes / Comments
	Unit 1	Unit 4	
Operating & Maintenance Costs			
Variable O&M Costs			
Dry Urea Reagent Cost (net change)	-$657,000	-$924,000	Cost savings associated with discontinued use of the existing SNCR systems. Cost savings calculated based on actual urea injection rate and dry urea reagent cost of $420.72 per ton.
Ammonia Reagent Cost (net change)	$1,064,000	$1,570,000	New O&M cost associated with SCR. Calculated based on ammonia injection rate required to achieve average controlled rate of 0.05 lbs./MMBtu (assuming no ammonia slip), and delivered anhydrous ammonia reagent cost of $785 per ton.
RO Water Cost (net change)	-$13,000	-$18,000	Cost savings associated with discontinued use of the existing SNCR systems. Cost savings calculated based on water cost of $6 per 1,000 gallons.
Steam Cost (net change)	$74,000	$111,000	New O&M cost associated with SCR. Calculated based on engineering calculations for steam required for ammonia vaporization system and steam cost of $5 per MMBtu.
Catalyst Replacement and Disposal Cost (net change)	$1,164,000	$1,807,000	New O&M cost associated with SCR. Calculated based on total catalyst volume of 580 m^3 (Unit 1) and 900 m^3 (Unit 4), three catalyst operating layers, assumed catalyst life of 24,000 hours, and catalyst replacement cost of $5,500 per m^3, including catalyst cost of $4,500/$m^3$ and catalyst disposal cost of $1,000 per m^3 (including installation and removal labor). **See, Note 1.**
Auxiliary Power Cost (net change)	-$473,000	-$411,000	Represents the incremental cost savings associated with an incremental reduction in plant auxiliary power realized by replacing the existing SNCR control systems with SCR, and assuming an auxiliary power cost of $37 per MWh.
Total Variable O&M Costs	$1,159,000	$2,135,000	Net Change in Variable O&M Costs

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	Fixed O&M Costs			
	Additional Operators per Shift	1	1	Assumes one (1) additional operator per shift for safe and effective operation of the SCR control system. **See, Note 2**.
	Operating Labor	$526,000	$526,000	Assumes labor cost of $60/hr. (salary + benefits) for each additional operator.
	Supervisor Labor	$79,000	$79,000	Calculated at 15% of Operating Labor. EPA Cost Manual Section 1, Chapter 2, page 32 "Generally, cost estimates include supervisory labor as a flat fifteen per cent of the operating labor requirement."
	Maintenance Materials	$1,714,000	$2,303,000	Includes costs for maintenance materials and maintenance labor. Calculated based on 1.5% of Total Direct Costs. **See, Note 3**.
	Maintenance Labor	$0	$0	Included in cost for maintenance materials.
	Total Fixed O&M Cost	$2,319,000	$2,908,000	
	Indirect Operating Cost			
	Property Taxes	$1,930,000	$2,594,000	Calculated property tax increase associated with installation of a large capital project at 1% of TCI to be consistent with EPA Cost Manual Section 1, Chapter 2, page 35. **See, Note 4**.
	Insurance	$1,930,000	$2,594,000	Calculated insurance cost associated with the SCR control system at 1% of TCI to be consistent with EPA Cost Manual Section 1, Chapter 2, page 35.
	Administration	$3,861,000	$5,187,000	Calculated administrative charges at 2% of TCI to be consistent with EPA Cost Manual Section 1, Chapter 2, page 35. **See, Note 5.**
	Total Indirect Operating Cost	$7,721,000	$10,375,000	
	Total Annual Operating Cost (net change)	**$11,199,000**	**$15,418,000**	

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Note 1. S&L calculated catalyst replacement costs by multiplying the quantity of catalyst (m^3) expected to be replaced on an annual basis (i.e., m^3/yr.) by a catalyst replacement cost of \$5,500/m^3 (including the cost of the catalyst, removal, disposal, and installation). The quantity of catalyst replaced each year was calculated based on an assumed catalyst life of approximately 24,000 operating hours. Assuming 8,000 hours/year operation, approximately 1/3rd of the catalyst (or one layer) would be replaced on an annual basis, resulting in annual catalyst replacement costs of:

Unit 1: 580 m^3 x \$5,500/m^3 x 8,000 operating hours/yr. / 24,000-hour catalyst life = \$1.063MM/year

Unit 2: 900 m^3 x \$5,500/m^3 x 8,000 operating hours/yr. / 24,000-hour catalyst life = \$1.807MM/year

The approach used by S&L does not use a future worth factor (FWF) to account for the time value of money as described in Section 4 (NOx Control), Chapter 2 (Selective Catalytic Reduction), pg. 78 of the Control Cost Manual. However, given the relatively short three-year catalyst life, the approach used by S&L and the approach described in the Control Cost Manual result in similar catalyst replacement costs. Using the approach described in the Control Cost Manual, annual catalyst replacement costs would be calculated as follows:

Annual Catalyst Replacement Cost = [Catalyst Replacement Cost] x FWF (Control Cost Manual Eq. 2.64)
Assuming an interest rate of 3% and catalyst life of three years: FWF = 0.324
Annual Catalyst Replacement Costs:
Unit 1: [580 m^3 x \$5,500/m^3] x 0.324 = \$1.033MM/year
Unit 2: [900 m^3 x \$5,500/m^3] x 0.324 = \$1.603MM/year

Note that the interest rate included in the FWF calculation is not the same as the interest rate Enchant would incur to finance a large capital project. Rather the interest rate used in the FWF calculation accounts for the time value of money or interest Enchant might earn on money expended in a future year. An interest rate of 3% represents a conservatively high interest rate.

Also note that Equation 2.64 applies the FWF to the total catalyst volume and total catalyst replacement costs, while Equation 2.63 in the manual calculates catalyst replacement costs on a per layer basis.

Note 2. S&L assumed one (1) additional operator per shift to safely operate the SCR control system. Although the revised Control Cost Manual SCR Chapter estimates operating labor time of 4 hours/day for an SCR; SCRs require continuous monitoring and calibration to ensure appropriated ammonia injection rates, acceptable ammonia slip, and effective NOx control. Even more frequent monitoring and system adjustments are required during

boiler load changes and following system upsets. In addition, operator time is needed to operate and monitor the anhydrous ammonia system, ammonia unloading and storage, and ammonia vaporization and injection systems. Operator time is also required for compliance monitoring, safety inspections and monitoring, recordkeeping, and reporting. Based on operating and monitoring requirements for an SCR control system on a large coal-fired steam electric generating unit, it is reasonable to assume one (1) additional operator per shift for SCR control.

Note 3. Maintenance Materials (or maintenance costs) were calculated based on 1.5% of the total direct costs of the SCR equipment. Total direct costs include purchased equipment costs and direct installation costs, and are often used as a proxy to estimate equipment repair, replacement, and maintenance costs. Maintenance costs include those costs required for routine preventive and predictive maintenance, maintenance of structures, maintenance of operating equipment(including the SCR system and injection nozzles, anhydrous ammonia system, ammonia vaporization, ammonia forwarding equipment, pumps, piping, etc.), maintenance of process monitoring equipment and plant support equipment, as well as spare parts, tools, and shop supplies. See, Control Cost Manual, Chapter 1, Section 2, pg. 32. Maintenance costs are incurred to ensure effective and safe operation of the control system and are a function of the size and complexity of the system and associated subsystems. EPA's SCR cost calculation spreadsheet[1] calculates annual maintenance costs at 0.5% of the total capital investment, which, in addition to the total direct costs includes indirect installation costs. Although either approach can be used to estimate maintenance materials and maintenance costs, total direct costs are generally a better proxy for system equipment, system complexity, and equipment costs.

Note 4. Although, the revised Control Cost Manual SCR Chapter includes a general statement that in many cases property taxes do not apply to capital improvements such as air pollution control equipment, S&L included property tax based on 1% of the Total Capital Investment to be consistent with Chapter 1, Section 2 of the Control Cost Manual, and for consistency with cost evaluations prepared for other regulatory cost evaluations. In addition, although pollution prevention projects (including equipment substantially for the reduction, abatement, or prevention of pollution) authorized by the Pollution Control Revenue Bond Act are exempt from property taxation (NMSA 1978, §7-36-3); air pollution control equipment installed by Enchant at SJGS would not be authorized by the Pollution Control Revenue Bond Act, and would likely not qualify for the property tax exemption. As such, it is reasonable to include annual property tax in the calculation of O&M costs for the SCR system.

[1] EPA's SCR cost calculation spreadsheet is available at: https://www.epa.gov/economic-and-cost-analysis-air-pollution-regulations/cost-reports-and-guidance-air-pollution

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Note 5. Administration charges or administrative costs were calculated at 2% of Total Capital Investment to be consistent with Section 1, Chapter 2 of the Control Cost Manual, and for consistency with cost evaluations prepared for other regulatory cost evaluations. These costs are described in Section 2, Chapter 1 as costs to "cover sales, research and development, accounting, and other home office expenses." EPA's SCR cost calculation spreadsheet includes an Administrative Charge calculated as 3% of the sum of Operator Costs plus 40% of Annual Maintenance Costs (i.e., 0.03 x [Operator Costs + 0.4 x Annual Maintenance Cost]). As described in Notes 2 & 3, the SCR cost calculation spreadsheet calculates Maintenance Costs at 0.5% of the Total Capital Investment and Operator Costs assuming 4 additional operator hours/day. However, neither the cost calculation spreadsheet nor the Control Cost Manual (SCR Chapter) provides a definition of the Administrative Charges or a basis for applying the 3% multiplier. Furthermore, this approach results in administrative costs of approximately $13,200 and $18,600 per year for SJGS Units 1 & 3, respectively. In S&L's opinion, the approach in the SCR cost calculation worksheet significantly underestimates costs any facility would incur to safely and effectively operate an SCR control system on a large coal-fired steam electric generating unit. Administrative costs associated with an SCR would include, but not be limited to, purchasing ammonia, scheduling shipments and deliveries, inventory control, purchasing and maintaining replacement parts and maintenance materials, monitoring catalyst activity and implement the catalyst management plan, monitoring the ammonia handling system, monitoring NOx emissions and ammonia slip), safety and safety training, recordkeeping, and similar activities.