

Carbon Capture Retrofit of San Juan Generating Station

Presentation to

San Juan County Community

by

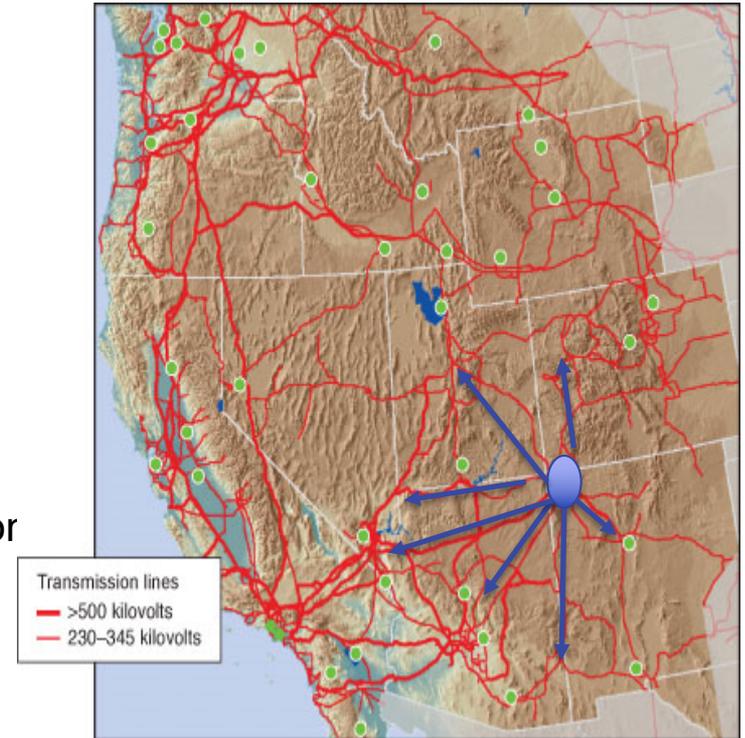


ENCHANT ENERGY

July 16, 2019

What is San Juan Generating Station (“SJGS”) ?

- 847 MW Coal-fired Electricity Generation Station in Northwest New Mexico originally built in the 1970s, expanded in the 1980s
- High BTU Coal is supplied by the adjacent San Juan Westmorland-owned mine
- Operated by PNM on behalf of PNM (66%), TEP(20%), Farmington (5%), Los Alamos (4%), & UAMPS (4%)
- Plant size decreased from 1,895 MW in 2017 from shut down of Units 2 & 3 in conjunction with installation of Selective Non-Catalytic Reduction (SNCR) equipment and settlement with EPA
- Low cost generator with low Nox/Sox/Mercury emissions
 - But very significant Co2 emissions
- Located at the center of the Southwestern transmission grid, with connections to New Mexico, Arizona, Nevada, California, Utah, and Colorado

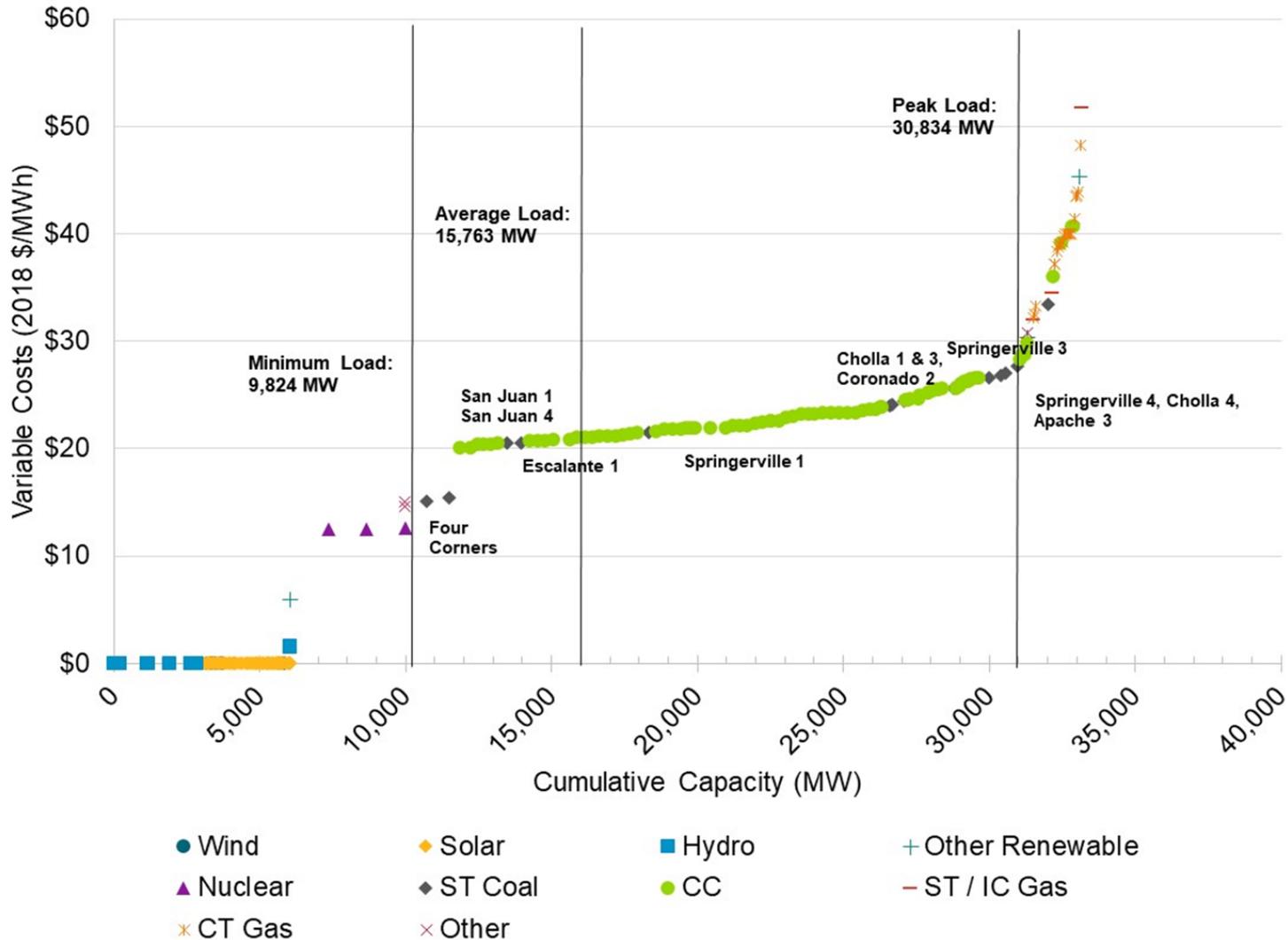


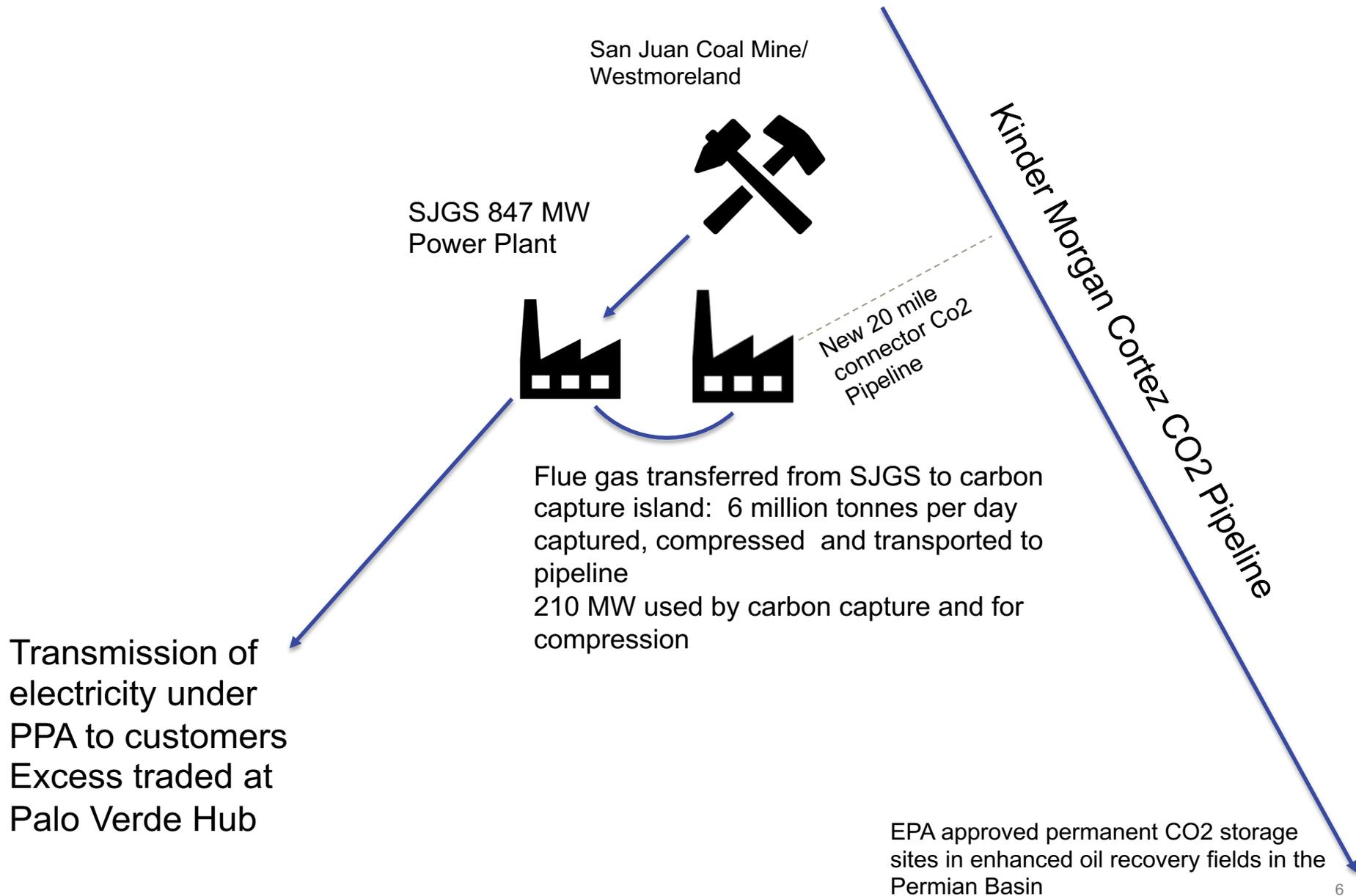


Who is Enchant Energy ?

- Enchant Energy was founded in 2019 by two veteran energy investors, Larry Heller and Jason Selch, for the purpose of enabling continued operation of SJGS and retrofitting it with CCUS
- Approached by the City of Farmington in January 2019 to formulate a strategy to save SJGS and associated San Juan mine from closure.
 - Proposed conversion to low-cost, clean coal plant through retrofit with proven carbon capture technology
 - Will acquire 95% interest in SJGS at 6/2022 from exiting owners
 - City of Farmington to retain 5% interest in SJGS and benefit from the cost savings from an improved coal contract
- Enchant Energy is working with leading engineering, consulting firms, and law firms such as:
 - Sargent & Lundy
 - Navigant Consulting
 - Thompson Hine LLP
 - Sidley Austin LLP
 - EJM Consulting
 - Tenaska Power Services Co.
 - WISER Institute at Illinois Institute of Technology
- In May 2019 Enchant Energy applied for DOE grant to fund a FEED study and associated studies. Selection expected in August 2019.

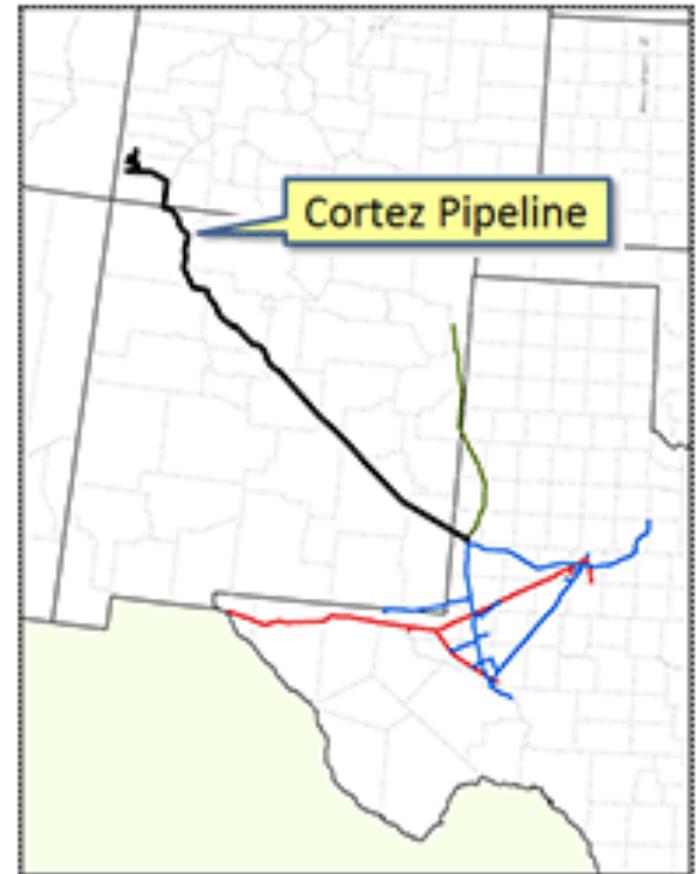
SJGS will become a low cost electricity supplier in the Southwest Market with new coal contract





Cortez Pipeline and McElmo Creek Pipeline

The Cortez Pipeline and the McElmo Creek Pipeline serve the McElmo Dome and Doe Canyon CO₂ source fields in southwestern Colorado. Kinder Morgan operates the approximately 500 mile Cortez Pipeline which carries CO₂ from the McElmo Dome and Doe Canyon to the Denver City, Texas, hub. The Cortez pipeline system is capable of transporting 1.5 billion cubic feet of CO₂ per day. The McElmo Creek Pipeline is an approximately 40-mile pipeline that supplies the McElmo Creek unit in Utah and is operated by Resolute.



Who is Sargent & Lundy ?

- S&L is a leading global engineering firm based in Chicago with specific focus on the electricity generation and transmission business
 - Founded in 1890's at the birth of electrification
 - Has designed 958 power plants in 91 countries. 740 licensed engineers
- S&L was selected for study as they were the engineering firm that worked for NRG when they developed the Petra Nova Carbon Capture retrofit
 - Petra Nova has been in successful operation since 2017 and has been capturing over 1 million tonnes per year of Co2 which is then permanently stored in an EOR field in Texas
 - Petra Nova uses the Mitsubishi Technology and was partially funded with \$190 million in grants from the DOE and \$250 million in financing from the Japanese Government
- S&L has also worked for PNM on studies for the San Juan Generating Station
 - S&L is very familiar with the equipment at SJGS.
- Enchant Energy retained S&L in April 2019 to provide a site-specific scoping study of the costs to retrofit SJGS with carbon capture
 - S&L will also be the principal sub-contractor for FEED study to be funded by the DOE

Results of Sargent & Lundy Scoping Study

- S&L scoping study estimates that cost of capture at SJGS will range from \$39.15 to \$43.49 per tonne
- Carbon capture will decrease Co2 emission intensity from 2,201 lbs/MWh to 249 lbs/MWh
- Co2 captured will be 6 million tonnes per year which will provide 313 mmscfd of pipeline quality Co2
- Annual O&M costs including the allocated cost of 29% plant derating are estimated at \$16.34 - \$16.65 per tonne

Table ES-1: Cost of CO₂ Capture

Description	Units	85% Capacity Factor	100% Capacity Factor
Total Project Cost	\$	1,295,280,000	1,295,280,000
CCF		0.1243	0.1243
Annualized Capital Cost	\$/yr	161,000,000	161,000,000
Annual O&M Cost	\$/yr	99,939,000	115,389,000
Total Annual Cost	\$/yr	260,939,000	276,389,000
CO ₂ Captured	mmscfd	313	368
Annual CO ₂ Captured	tonnes/yr	6,000,000	7,060,000
Cost of Capture	\$/tonne¹	43.49	39.15

Note 1. Cost of capture reported as dollars per metric ton (equivalent to 2,240 lbs).

Table 3-3: CO₂ Rates for San Juan Generating Station

SJGS CO ₂ Rates		Unit 1	Unit 4	Total Plant
Baseline Plant CO ₂ Emissions Rate ¹	(lb/MWh _{gross})	2,165	2,236	2,201
Post-Project CO ₂ Emission Rate	(lb/MWh _{gross})	243	254	249
Max Full Load Post-Project CO ₂ Capture Rate	(lb/hr)	703,724	1,071,852	1,775,576
Post-Project CO ₂ Capture Rate ²	(mmscfd)	124	189	313
	(mmscfy)	45,200	68,845	114,045

Note 1. Data from EPA's Air Market Program Database (AMPD) - Annual average for 2014-2018 - Total plant is estimated based on the average of Units 1 and 4.

Note 2. Values calculated assuming an annual average facility capacity factor of 85%.

Implication of Sargent & Lundy Study on feasibility

- The total amount of 45Q credits generated from capturing 6 million tonnes a year of Co2 over 12 years, \$2.554 billion, will cover the estimated capital cost of \$1.295 billion by almost 2 times.
- As tax equity financing normally requires an 8-10% after tax IRR, the project will generate more than enough tax credits to support a tax equity financing that covers 100% of the capital costs
- Pipeline quality Co2 delivered to Cortez Pipeline can be sold for \$16.32 to \$17.84 per tonne depending on the price of WTI oil.
- The sale of Co2 to the EOR market covers the annual operating costs, including the costs of the derating

Projected Stream of 45Q Tax Credits at 6 million tones a year	
Discount Rate	Value
0.0%	\$2,554.05
8.0%	\$1,558.25
9.0%	\$1,475.43
10.0%	\$1,399.03
11.0%	\$1,328.45
12.0%	\$1,263.15

S & L study demonstrates that when Carbon Capture is installed at a site with advantages, like SJGS, this technology provides a way to reduce Co2 emissions by a substantial amount without burdening the consumer with higher costs of electricity

Advantages of SJGS site

- Advantages incorporated into study:
 - Site benefits from the environmental upgrade and closure of Units 2 & 3 completed in 2017
 - No need for additional emissions controls for Nox, Sox, Mercury, and particulate
 - Capital cost is reduced by the utilization of the excess infrastructure that remains from the prior downsizing
 - Site benefits from proximity to Cortez Co2 pipeline
 - Construction cost for connector pipeline will be low as distance is only 20 miles
 - Sale of Co2 to EOR industry facilitates financing using 45Q tax credits
 - Proceeds from sale of Co2 covers the operating costs of the CCUS, including lost revenues from power sales
 - Annual operating costs benefit from the low cost of electricity which is used for auxiliary power and to value lost generation revenue from derating
- Factors not included in S & L scoping study but which will be investigated in FEED study starting in Q3 2019
 - S & L scoping study does not benefit from competitive bidding among the several EPC companies that have developed proven Amine-based Carbon Capture Technology
 - S&L uses conservative 29% derating while other investigators have assumed 22% derating
 - S&L study includes 20% contingency and \$100 million owner's costs

Challenges for SJGS site with CCUS

- New Mexico Bill 489 passed in March 2019 requires compliance with 1100 lb.Co2/MWh emissions limit by 1/2023
 - If retrofit is financed in mid-2020, expected on-line date is 6/2023
 - Plant could experience 6-12 month shut-down before restart with CCUS
- Successful CCUS requires successful transition to Merchant model
 - Southwest Power Pool has no ISO
 - Incumbent Utilities (APS, PNM, TEP, SRP) control transmission
 - California, Nevada, Colorado are good target markets that will need low-emission fossil fueled electricity in 2022+
 - SJGS emissions at 200-300 are well below 1100 current California Emissions Performance Standards and 850 proposed new limit
 - Dispatch cost of plant is lowest cost non-renewable with low-emissions
- Environmental community is highly invested in shutting down SJGS
- Project Financing will be a challenge
 - Tax Equity financing over \$1 billion has never been done
 - 45Q tax credits are new and Treasury has not written the regulations
 - Project sponsor does not have an investment grade rating
 - While long-term contracts from investment grade oil and gas producers are likely, the power market has not provided PPA's for non-renewable power.
 - Will power buyers make an exception for low-emissions fossil power ?

How does Carbon Capture retrofit benefit the local community?

- Enables plant to avoid shut-down due to Bill 489
 - Saves 478 direct jobs and 1,000 indirect jobs in rural area, significant in maintaining a stable regional economy
 - Maintains tax revenues that supports local schools
 - Avoids disruption of Navajo community which could be harmed by lay-offs of hundreds of Navajo employed in high-paying private sector jobs
- Allows power to be marketed as “Eco-friendly, low-emissions” power that may enable the power to be sold into markets such as California, Nevada, and Colorado
- One billion dollar plus construction project will provide short term stimulus to local economy
- Successful development of Carbon Capture can spur local industries based on exploitation of captured Co₂
 - Co₂ can be utilized in existing greenhouse agriculture
 - Availability of Co₂ raw material can attract other industries
 - SJGS can become model facility for CCUS attracting research and jobs

How does Carbon Capture retrofit at SJGS benefit the Environment?

- Post-retrofit, SJGS will become the lowest Co2 emissions fossil-fueled power plant in Western US
 - The growth of renewables is increasing demand for this type of power
 - Continued operation of this low-cost power facility will temper the cost impact to the consumer of the transition to high-renewables electricity supply market
- Retrofit will make substantial climate impact by reducing Co2 emissions by 6 million tonnes per year
- Region will continue to benefit from the existing environmental upgrades for Sox, Nox, and Mercury installed in 2017
- Demonstration of Carbon Capture at this scale will spur adoption of the technology at other US sites and the export of carbon capture technology to developing markets where coal-fired generation is still growing

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