

**The Economic Case for Power Plant Carbon Capture Retrofits:
A Case Study on the San Juan Generating Station – New Mexico**



ENCHANT ENERGY

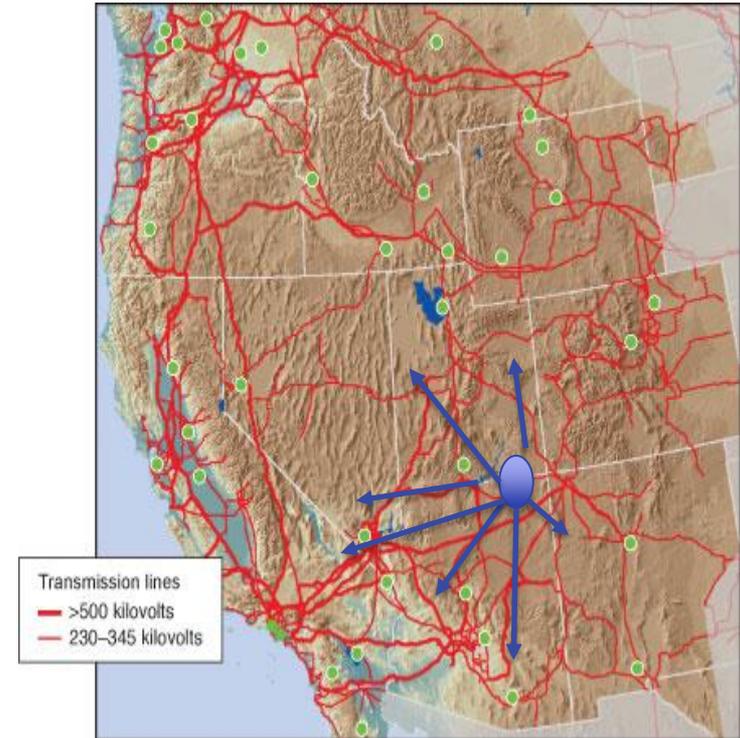
September 12, 2019

Summary

- San Juan Generating Station (“SJGS”) is perhaps the best site in the US for the next large-scale installation of Carbon Capture Utilization and Storage (“CCUS”) Technology
- Cost of Capture is estimated at \$39 to \$43 per metric ton: a 35-40% reduction from previous installations
- Proximity to a deep market for pipeline quality CO₂ in conjunction with revamped 45Q tax credit enables CCUS project installation without increasing the Levelized Cost of Electricity (“LCOE”) of the host generator
- Project is a for Win, Win, Win for Climate, Ratepayers, and the Community

What is San Juan Generating Station ?

- 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 coal mine, owned by Westmoreland Holdings
- SJGS is 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 shutdown 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 significant CO2 emissions
- Located at the center of the Southwestern transmission grid, with connections to New Mexico, Arizona, Nevada, California, Utah, and Colorado

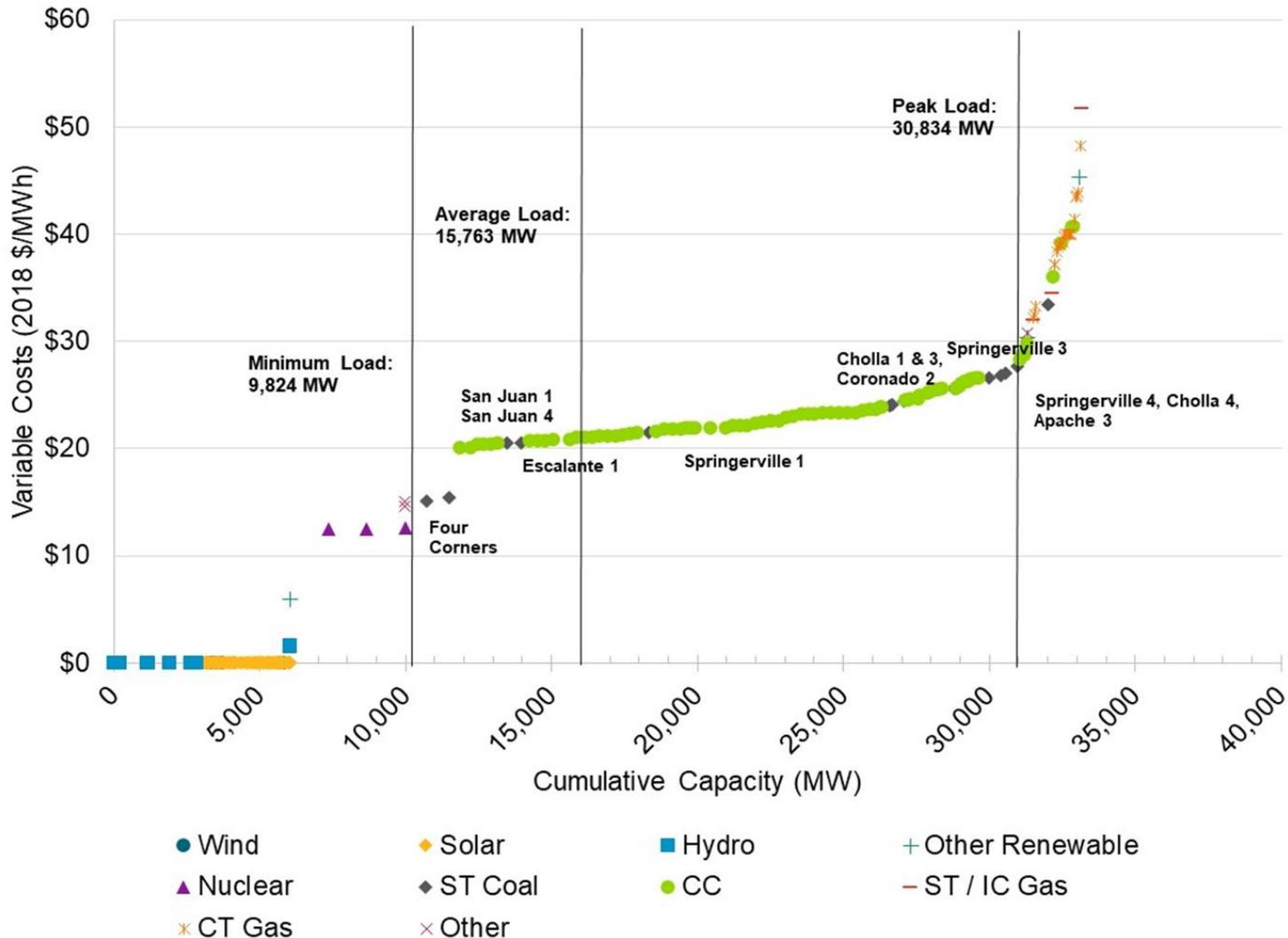


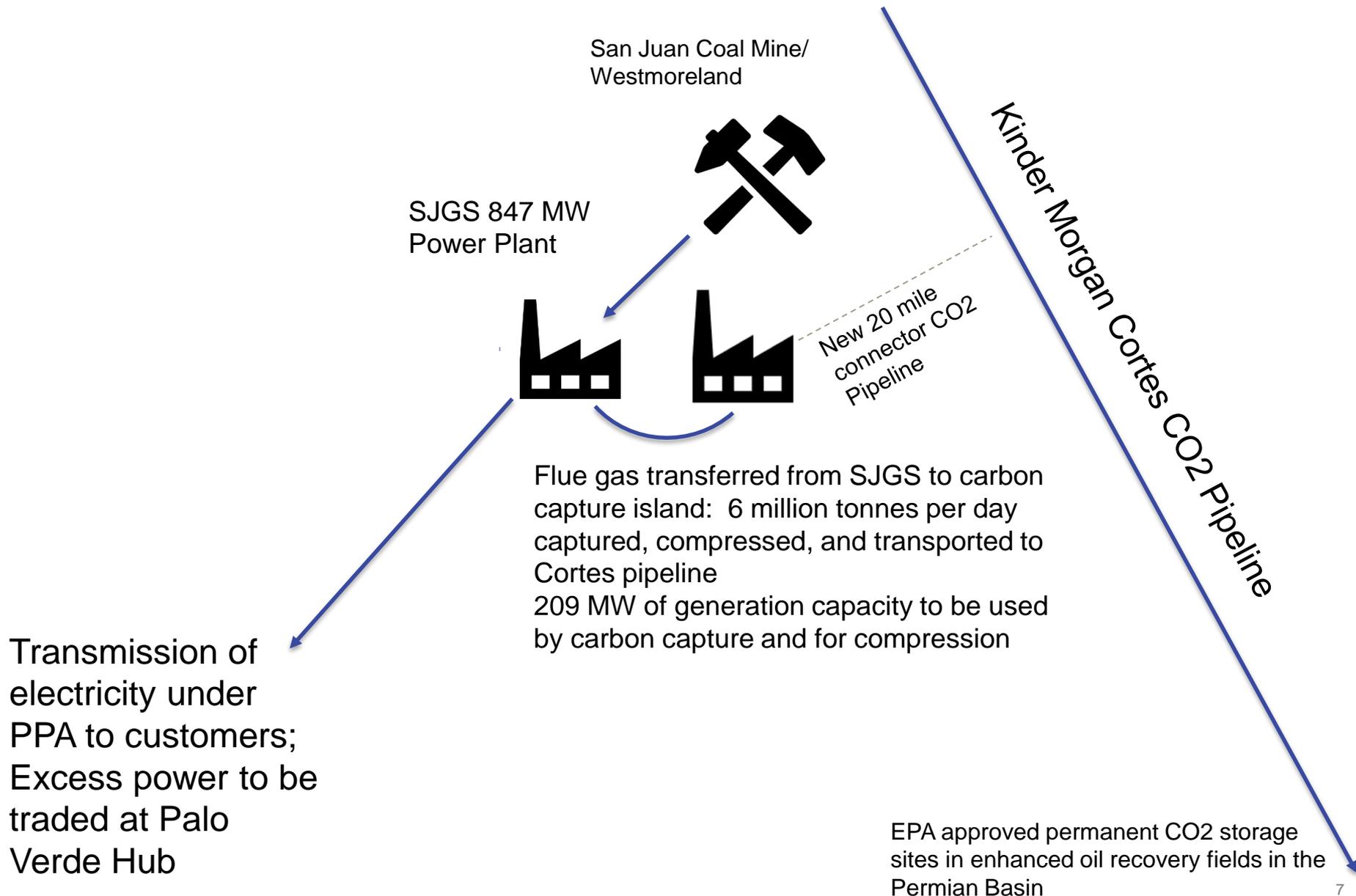


Who is Enchant Energy ?

- 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 technology
- 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
- Enchant Energy is working with leading engineering, consulting firms, and law firms such as:
 - Sargent & Lundy
 - Navigant Consulting
 - Thompson Hine LLP
 - Sidley Austin LLP
 - Cuddy McCarthy, LLP
 - EJM Consulting
 - Tenaska Power Services Co.
 - WISER Institute at Illinois Institute of Technology
- In May 2019 Enchant Energy LLC applied for a DOE grant to fund a FEED study. Award to be decided in September 2019.

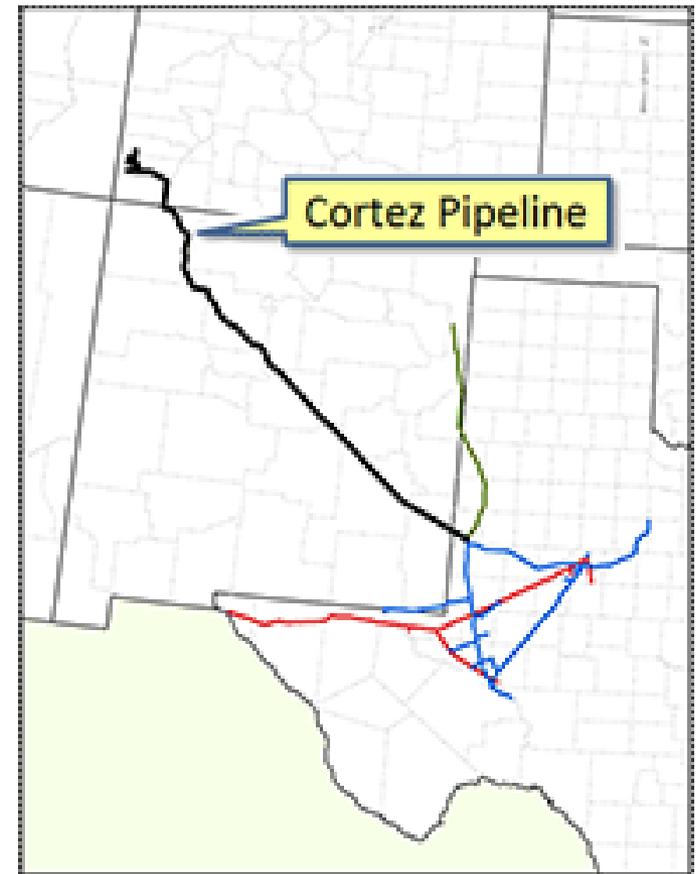
SJGS will become a low cost electricity supplier in the Southwest Market with new coal contract





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.



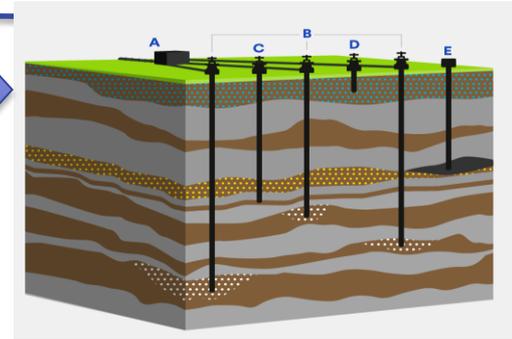
10% of CO2 emissions escape to the atmosphere

638 MW of low emissions power available to back up renewables in region



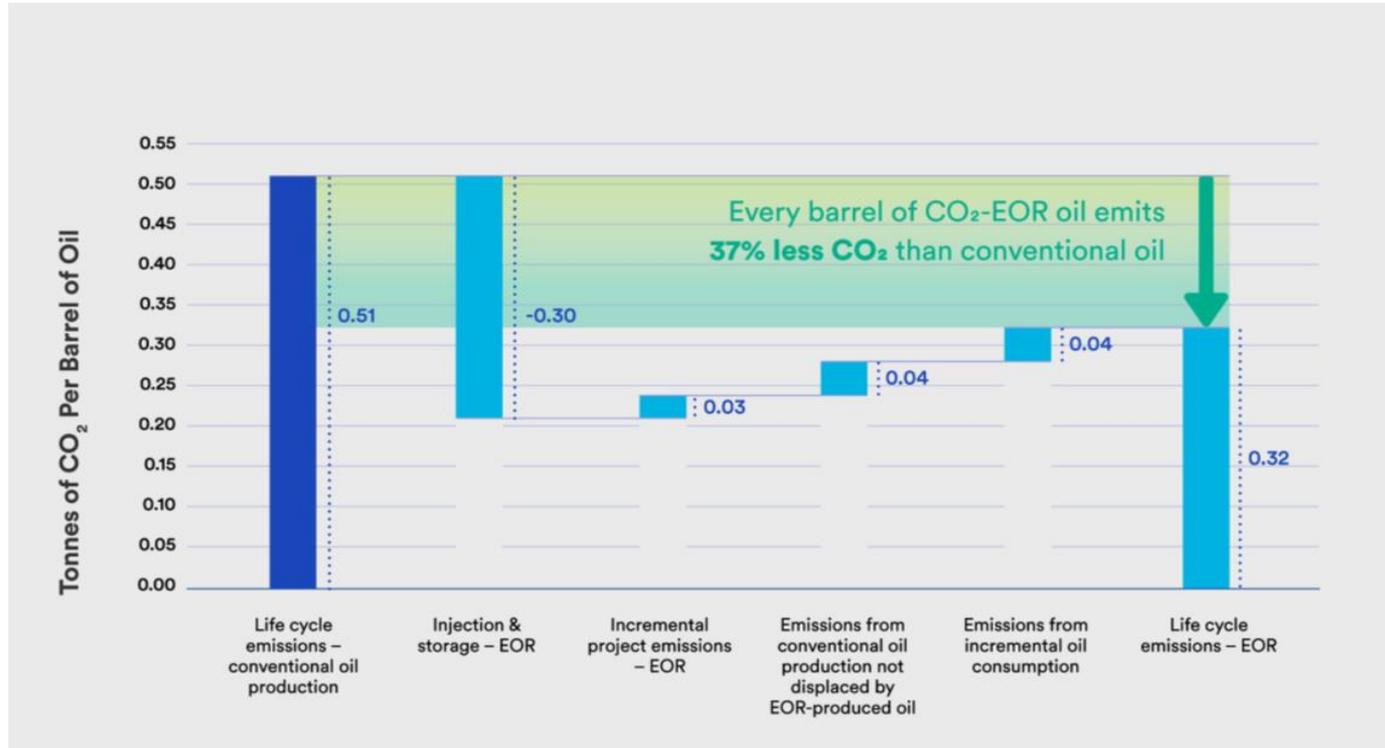
90% of CO2 emissions are captured. Then transported to depleted oil fields and permanently stored deep underground

San Juan Coal Mine



Depleted Oil Field

Clean Air Task Force Study demonstrates EOR from Captured CO2 emits 37% less CO2 than conventional oil



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	\$/tonne ¹	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%.

S&L Study demonstrates financial feasibility

- Project generates \$2.5 billion of 45Q Tax Credits over 12 years which covers estimated capex of \$1.3 billion by almost two times
- Sales of pipeline quality CO2 fully cover the annual operating costs of the CCUS including the cost of power and steam used in the CCUS
- At SJGS, the retrofit with CCUS will be self-financing and will not increase the cost of generation for the power plant
 - The CCUS will provide a captive customer using 29% of output and paying for 29% of generation costs
 - SJGS remains low-cost power generator in Southwest power market

	85% Capacity Utilization
Cost of Capture	\$ 43.39
45Q tax credit in 2026	\$ 35.00
Value of pipeline quality CO2	\$ 17.50
Total Revenue	\$ 52.50
Coverage of cost of capture by revenues	121%

Win, Win, Win

- Win for Climate:
 - Reduces New Mexico emissions by 6 million Metric Tons per year
 - SJGS with CCUS will generate 27% less CO2 Emissions if used as replacement power instead of Solar and Wind backed by a natural gas peaking unit
 - Carbon capture technology which is generally agreed to be necessary to fight Climate Change will be advanced through its largest deployment to date at SJGS
- Win for Ratepayers:
 - Removing SJGS from the rate base in conjunction with securitization will reduce the average monthly bills for New Mexico ratepayers.
 - Including a 300 MW PPA from SJGS after the retrofit as part of the replacement power plan will increase the cost savings further
- Win for Community:
 - 458 direct jobs, 1,000 non-direct jobs, and about \$8 million in annual local tax revenues are preserved
 - New Mexico becomes a pioneer in Carbon Capture and develops workforce to apply Carbon Capture Technology in other high CO2 emitting regions such as Russia, Indonesia, China, and India

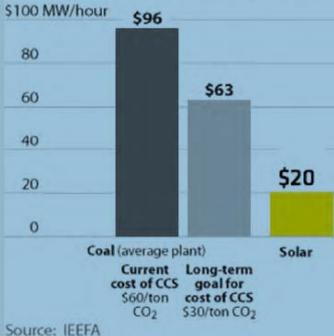
Misinformation on Carbon Capture Abounds



The Cost of Coal is Just Too High

- Even if all these obstacles could be overcome, the cost of CCS power is far too much for our customers, the communities we serve or the environment.

The High Cost of Carbon Capture



Source: IEEFA



Innovative Public Private Partnership

- City of Farmington was faced with prospect of shut down of major employer and taxpayer due to need to comply with Energy Transition Act (“ETA”) which was designed to transition New Mexico to increasing levels of renewables
- Farmington utilized legal right as 5% owner to acquire ownership of exiting participants
- Farmington identified partner that proposed using proven Carbon Capture Technology to allow plant to continue operating as a Merchant Generator while complying with the ETA regulation that CO2 emission intensity be less than 1,100 pounds per MWh.
- Enchant Energy plan will save the jobs and tax base, continue to allow Farmington to benefit from low cost power, and will position the region to take advantage of the expected growth of the Carbon Capture industry
- I am honored to introduce Mayor Duckett who has come from Farmington, New Mexico to provide a few comments and answer your questions

**For Further Information,
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