

City of Farmington & Enchant Energy Corporation

**San Juan Generating Station (SJGS) Carbon
Capture Utilization and Sequestration
(CCUS)**

New Mexico Legislative Finance Committee

**Peter Mandelstam,
Enchant Energy COO**

July 22, 2021



Disclaimer

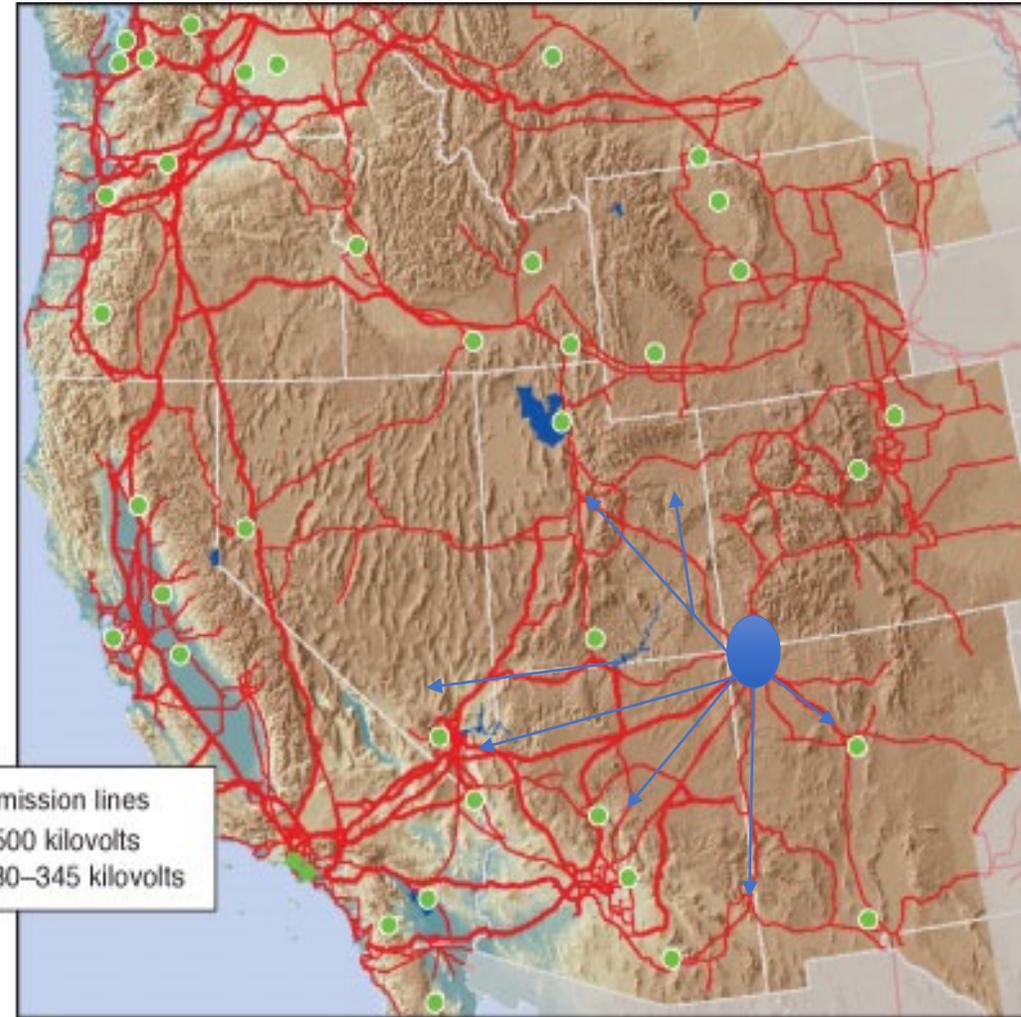
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San Juan Generating Station

- **847 MW (net)** coal-fired electricity generation station in Northwest New Mexico originally built in the 1970s, expanded in the 1980s
- Coal is supplied by the **adjacent San Juan Mine**, owned by Westmoreland Mining Holdings
- **Low NO_x/SO₂/Mercury/Particulates 2.5 emissions, but currently significant CO₂ emissions**
- **Near San Juan Basin** and its direct geologic CO₂ sequestration
- **Nearby CO₂ Pipeline** with access to Permian Basin for EOR
- Located at the center of the **Southwestern transmission grid**, with connections to rest of New Mexico, Arizona, California, Colorado, Nevada, and Utah
- Enchant able to Acquire 95% Interest in SJGS for \$1
- Ability to **Strip 90%+ of CO₂ guaranteed by MHIA**
- Ability to obtain **fixed-price engineering, procurement, and construction contract (EPC) with lump sum contract price, and full project wrap**



Project at-a-Glance: Adding Carbon Capture to SJGS

Why San Juan Generating Station (SJGS)?

- Existing Qualities
 - Low cost & currently operating
 - **Existing EPA SO₂ / NO_x / Mercury / Particulates 2.5 Pollution Controls**
 - Permitted mine-mouth coal supply through 2035
 - Nearby CO₂ Pipeline to Permian
 - Able to Acquire 95% Interest in SJGS for \$1
- **45Q Tax Credits Apply**
- **DOE Awards, including cost share, of \$9.4 million and \$19 million for FEED Study, and NM sequestration test well and Class VI injection permitting**
- **Ability to Strip minimum of 90+% of CO₂ guaranteed by MHIA**

Technology, Partners, and Supporters

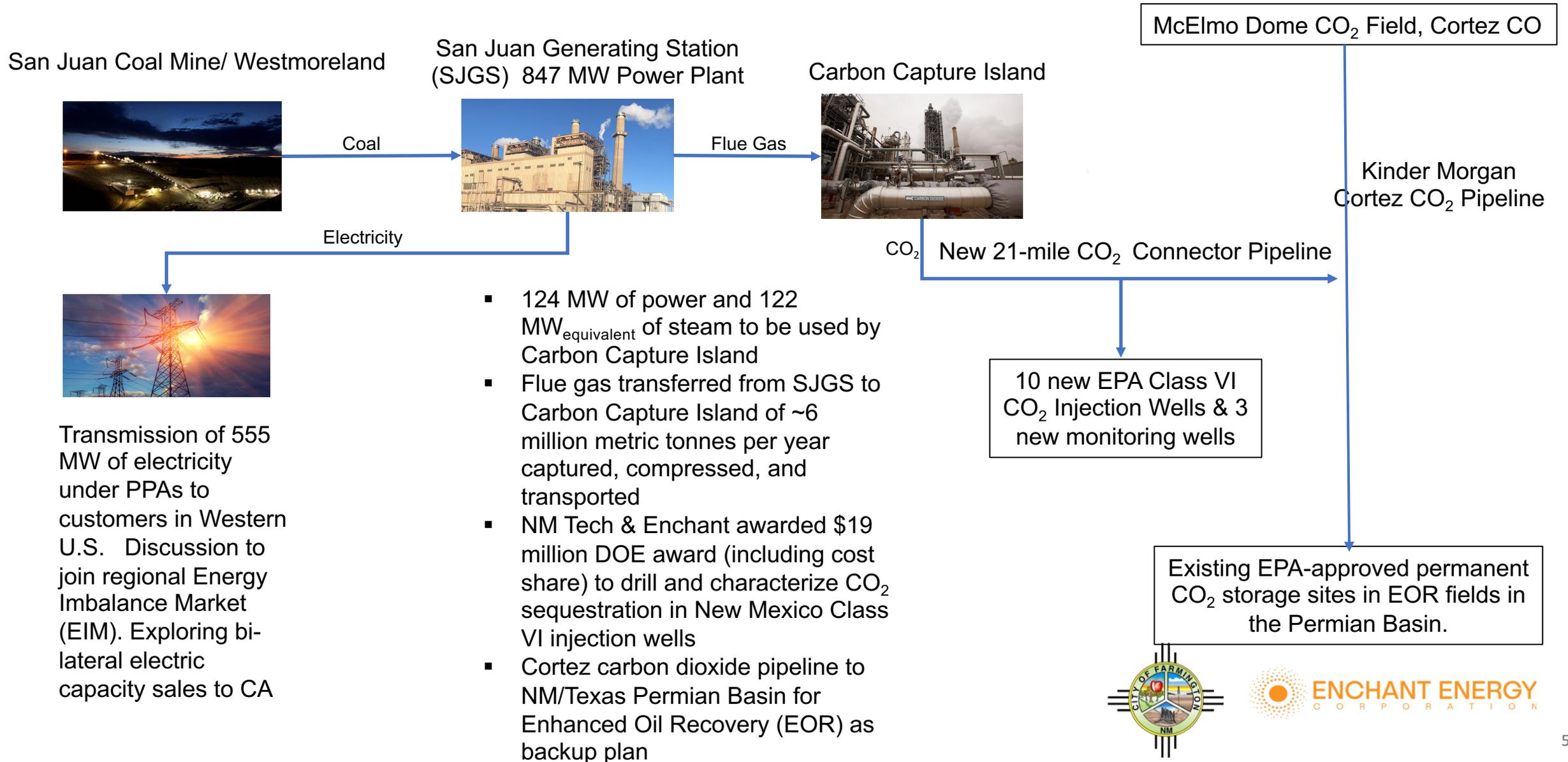
- Carbon Capture Technology
 - **Proven amine absorption** technology
- Partners and Supporters
 - City of Farmington in Public-Private Partnership with Enchant
 - Sargent & Lundy
 - Mitsubishi Heavy Industries America (MHIA)
 - Kiewit Power Constructors
 - Department of Energy
 - New Mexico Tech
 - Broad NM Support
 - **All NM Labor Unions**

Benefits from Jobs, Economic Development, and Climate

- **Maintain 1,500+ existing jobs**
- Maintain **\$53 million** annually in annual state and local tax revenues, including critical school district tax revenues
- Create a low-emission power plant, with CO₂ emissions significantly **below NM Energy Transition Act (ETA) levels**
- Construction period **jobs in excess of 2 million worker hours** from \$1.3 billion CAPEX
- Favorable Returns for A) Development Capital, and B) 45Q Tax Credit Investors



SJGS Carbon Capture Project Schematic



- 124 MW of power and 122 MW_{equivalent} of steam to be used by Carbon Capture Island
- Flue gas transferred from SJGS to Carbon Capture Island of ~6 million metric tonnes per year captured, compressed, and transported
- NM Tech & Enchant awarded \$19 million DOE award (including cost share) to drill and characterize CO₂ sequestration in New Mexico Class VI injection wells
- Cortez carbon dioxide pipeline to NM/Texas Permian Basin for Enhanced Oil Recovery (EOR) as backup plan

Transmission of 555 MW of electricity under PPAs to customers in Western U.S. Discussion to join regional Energy Imbalance Market (EIM). Exploring bi-lateral electric capacity sales to CA

Public-Private Partnership: Farmington & Enchant Energy

- City of Farmington through its **Farmington Electric Utility System** (Farmington) has partnered with Enchant Energy on a project for the continued operation of San Juan Generating Station (SJGS) post 2022, by adding carbon capture technology to the plant
- The public-private partnership intends to **run the legacy coal plant until at least 2037** by adding carbon capture technology that will allow the plant to comply with the stringent carbon dioxide emissions standards of the New Mexico Energy Transition Act
- Addition of carbon capture will also allow for electricity sales delivered into California, under CA's stringent decarbonization standards
- **Under a signed agreement, the current and former owners committed to transferring all of the assets of SJGS to Farmington by June 30, 2022**
- Under a signed agreement, Farmington committed to transferring 95% of SJGS assets to Enchant Energy. Farmington retains its original and current 5% ownership of SJGS
- **Currently Farmington, Enchant Energy, and current and former SJGS owners are negotiating the definitive agreements that will transfer the SJGS assets**



Farmington Key Officials in the Public-Private Partnership

- **Nate Duckett**
Mayor
- **Rob Mayes**
City Manager
- **Hank Adair**
Electric Utility Director
Farmington Electric Utility System
- **Jennifer Breakell**
City Attorney



Project Vital to Farmington Electric Utility System

- Successful completion of the Carbon Capture project will support the continuation of FEUS rates being some of the **lowest in the region**
- Project would allow use of **the \$25 million in undepreciated assets** the City has already invested in SJGS
- Need for **baseload, dispatchable resources** in the utility portfolio has never been more needed: to **protect against price volatility**, energy emergencies, and the need for resource adequacy



	Residential General 500kWh Bill	Rate Per kWh	% Higher than FEUS
La Plata Electric Co-op	\$ 89.10	\$ 0.1782	44%
Continental Divide Co-op	\$ 77.68	\$ 0.1554	26%
Kit Carson Co-op.	\$ 77.25	\$ 0.1545	25%
APS (Ave. Win/Sum)	\$ 71.79	\$ 0.1436	16%
City of Aztec	\$ 70.58	\$ 0.1412	14%
SRP (Ave. Win/Sum)	\$ 70.50	\$ 0.1410	14%
*PNM (Ave. Win/Sum)	\$ 66.79	\$ 0.1336	8%
Jemez Mountains Co-op	\$ 64.70	\$ 0.1294	5%
**SPS (Ave. Win/Sum)	\$ 59.85	\$ 0.1197	-3%
*FEUS	\$61.80	\$ 0.1236	

*With PCA adjustments

**SPS Requested 27% Rate Increase



BRAZOS ELECTRIC POWER COOPERATIVE, INC.
P.O. Box 2585, Waco, Texas 76702-2585
7010 Bagby Ave., Waco, Texas 76712
(254) 759-6500

\$960/MWhr

NEWS RELEASE

Brazos Electric Power Cooperative, Inc. Files for Chapter 11 Financial Restructuring

Brazos Electric acts to protect its Member cooperatives and their retail members from unaffordable electric bills



San Juan Carbon Capture - Project Details

- **\$9.4 million DOE Front-End Engineering and Design (FEED) Study** progressing well (Sargent & Lundy, Mitsubishi Heavy Industries America, with Kiewit Power Constructors coordination)
 - **Design Basis completed** (refinements/enhancements from other FEED studies incorporated)
 - **Stack testing at SJGS completed**
 - **Equipment listing/costing for CCI received** – ongoing work on long lead items
 - **Balance of plant engineering for CCI** – to be finished by 12/31/21
 - **Costing & Engineering, Procurement & Construction Contract (EPC) for CCI** – to be finished by 3/31/22
- **\$19 million DOE CarbonSAFE III** awarded to NM Tech with Enchant as Sub-recipient - Geologic Characterization and Sequestration Permitting Project: progressing well
 - **Geologic modeling** developed
 - **Location for stratigraphic test well identified** – to be drilled this summer
 - **EPA Class VI injection well permits** applications in progress
- Coal supply negotiations progressing well (bridge & long-term)
- Power offtake progressing well (short and long-term contracts)
- CO₂ Connector pipeline (~21 miles) – Interior’s BLM permit application filed 12/31/20
- CO₂ storage management contract – late-stage negotiations
- BOR/Navajo/Gallup water project progressing well – finalizing this summer



Project is Make-or-Break for Workers and Community

- Preserve **~1,500 direct and indirect jobs**, and more than **\$53 million in state and annual local tax revenues** (from NM independent assessment)
- Carbon Capture job creation and economic development **validated with release of DOE report** on October 5, 2020
- CCUS will create new construction jobs **exceeding 2 million worker hours** for the **~\$1.3 billion Carbon Capture Island construction**
- Additional jobs and local economic development for A) **~\$139 Million in SJGS deferred maintenance** and B) **\$100+ million in CO₂ pipeline construction** and **10 EPA Class VI Injection and Sequestration Wells**
- With the closure of Navajo Generating Station, and the announced closures of Four Corners as well as Escalante, and others in the region, **finding a way to avoid extreme economic impact** to the San Juan County region is even more important
- New Mexico becomes **national pioneer in Carbon Capture** and promotes workforce development regionally



Estimated Union Work Hours for Carbon Capture Construction

Trade	Project Work Hours	Annual Full-Time Equivalent Jobs
Boilermakers	500,000	240
Pipefitters	300,000	144
Electricians	500,000	240
Laborers	400,000	192
Operators	200,000	96
Millwrights	<u>100,000</u>	<u>48</u>
	2,000,000	960

Note: There will be significant additional work hours for:

- A) SJGS deferred maintenance
- B) CO₂ pipelines and geologic sequestration wells construction



Carbon Capture is Beneficial for Schools & Students

- **Preserves, and potentially increases, millions in tax and other revenues for schools:**
 - **Central Consolidated School District:**
 - \$3.6 million annually in property tax revenue (equal to one medium sized school, 39 teachers or 90 non-certified employees)
 - Provides a significant source for repayment of outstanding bonds and provides ability for future bond issuance to improve much needed facilities and technology to better serve children in the remote rural areas of the District hit hard by COVID-19
 - Avoids families relocating to find work and the multi-million dollars in reduction in federal and state funds by keeping families in the District
 - **San Juan College:**
 - \$2 million annually in property tax revenue from SJGS
 - \$115,000 in corporate giving for lost scholarships
 - \$300,000 in lost customized employee training expenditures
 - **Farmington Municipal Schools:**
 - Multi-millions annually in State and Federal funding by avoiding the need for families to relocate
- Expands educational and career pathways in Carbon Capture and related fields
- Potentially expands tax revenues for education into the Severance Tax Fund
- **Based on signed MOU, Farmington, Enchant Energy, and San Juan College have launched a workforce development and job training initiative at San Juan College**



New Mexico Energy Transition Act (ETA) Compliance

- Under the ETA, SJGS would have to **comply with a CO₂ emissions intensity limit of 1,100 lbs. of carbon dioxide per MWh**. SJGS currently has an intensity of 2,200 lbs. per MWh
- Plan to retrofit the plant with proven, post-combustion carbon capture technology from Mitsubishi Heavy Industries America (MHIA) that will **lower the CO₂ emissions by 90+%, backed by a MHIA warranty**
- Post-retrofit, SJGS will have **CO₂ emissions reduced to below 250 lbs. of CO₂ per MWh**
- ETA Rules and Compliance:
 - Need for clarity in timely fashion
 - Rulemaking timing and process
 - Compliance details
 - Interim compliance approaches and benefits



Enchant CCUS Meets ESG



- Carbon Capture project benefits New Mexico **economic and social conditions in local communities**, especially the **Navajo Nation** in an environmentally responsible manner along with solid governance gains with union jobs
- Environmental Justice & Beneficial Governance for Navajo promoted by A) cleaning local environment, B) maintaining 2+ generations of well-paying, middle-class Navajo **union jobs at power plant and mine**, and C) Enchant's San Juan College job training for **over 2 million worker hours of new construction at SJGS**
- Both Bank of America and JP Morgan Chase determined that **Enchant CCUS meets their sustainability goals**
- Can a company retrofitting a coal-fired power plant be considered ESG compliant: While standards still emerging, the short answer is: **Yes**



Special Focus on Environmental Justice for the Navajo Nation

- **Long and important history at the San Juan Generating Station (SJGS):**
 - Navajo Nation members helped build the San Juan Generating Station, and the adjacent San Juan Mine
- **Significant part of the workforce:**
 - Over its operating life, approximately 40% of the plant workers and miners are Navajo
 - Multiple generations of Navajo workers have earned middle class wages, supporting immediate and extended family
 - Average SJGS wages today are more than 9 times the per capita income on the Navajo Nation, per DOE report
- **Preserving regional Navajo jobs:**
 - The San Juan Generating Station Carbon Capture Project will preserve hundreds of Navajo family-sustaining jobs
 - The Navajo Nation has had significant job loss from COVID-19 and the closure of the Navajo Generation Station and the downturn in the regional oil & gas industry
 - Further job losses are looming with the planned closures of the Escalante and Four Corners Power Plants
 - Disproportionate impacts of COVID-19 on the Navajo Nation has illustrated the critical needs of the Navajo Community, needs that will be made exponentially worse if jobs are not preserved
- **Expanding workforce development:**
 - Enchant is committed to ongoing workforce development and job training of the already skilled Navajo workforce needed to build the Carbon Capture Island at SJGS
- **Essential Stakeholders:** Farmington and Enchant will continue to work in collaboration with Navajo leadership



SJGS Current Environmental Features and Recent Improvements

San Juan Generating Station (SJGS) Units 1 & 4 are each coal-fired boilers burning New Mexico sub-bituminous coal. **Current operations in full compliance with Federal and New Mexico environmental regulations**

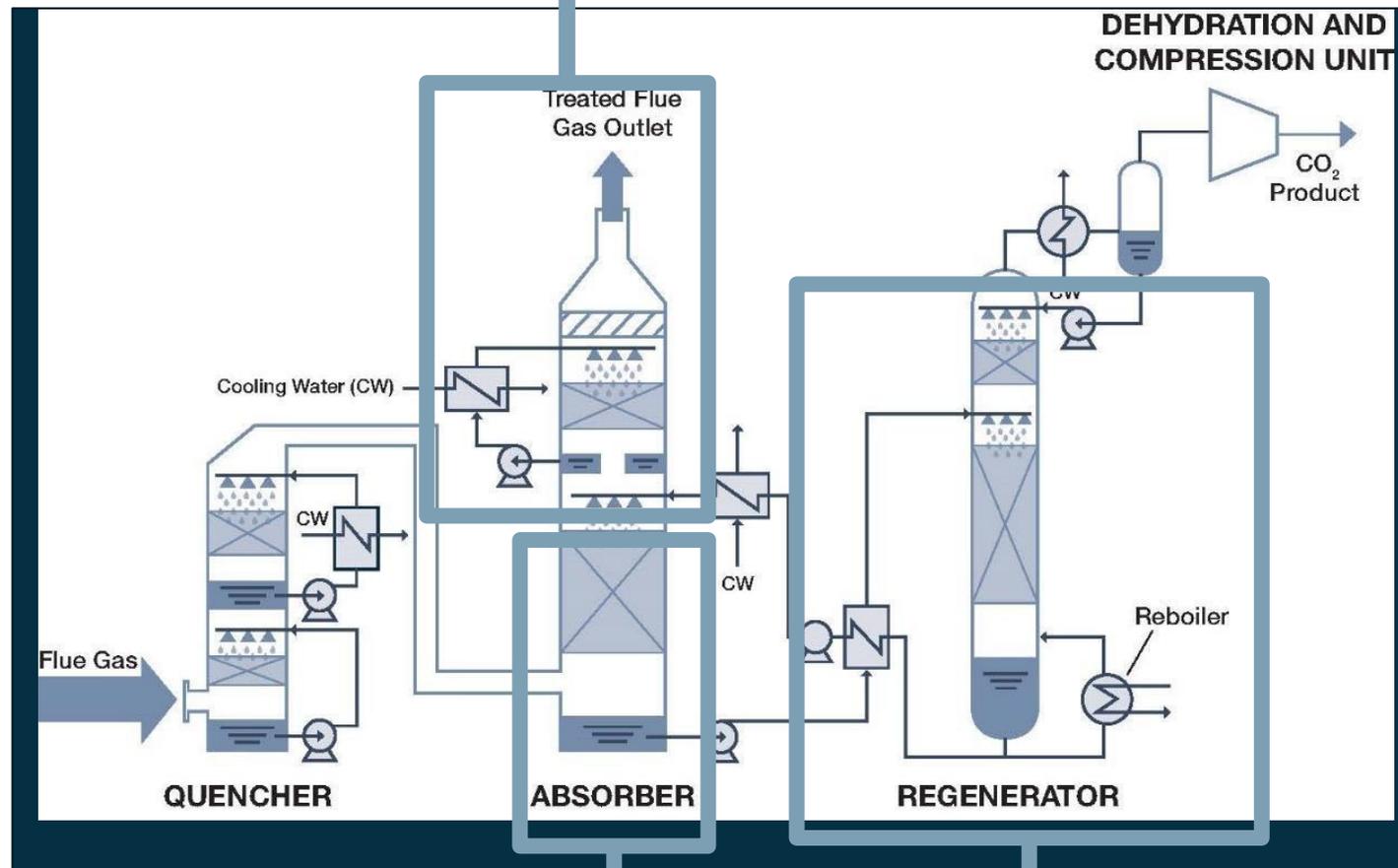
- **\$500+ million in pollution controls completed in 2017**, and closure of Units 2 & 3 significantly reduced SO₂, NO_x, particulates 2.5, and mercury, **pursuant to EPA agreement**
- Carbon Capture Island (CCI) will remove **~6 million metric tonnes of CO₂** from flue gas each year (**90+% removal and sequestration**) by treating **100% of flue gas**
- Installation of Carbon Capture will further **reduce SO₂ by an additional 50%**
- **Existing Environmental Features:**
 - Low NO_x Burners (LNB)
 - Under Fired Air (Unit 1 Only)
 - Over Fired Air (OFA)
 - Selective Non-Catalytic Reduction (SNCR) for NO_x removal
 - Brominated Activated Carbon Injection (ACI)
 - Baghouses for mercury removal
 - Wet Flue Gas Desulfurization (WFGD)
 - Zero Liquid Discharge (ZLD) water handling currently, and also post CCUS



Carbon Capture Technology Overview

Amine washing system reduces VOC emissions and amine loss

KM CDR Process™ Overview and Features



- Amine-based technology
- Capable of capturing 90+% CO₂ from combustion gas sources
- CO₂ purity >99.9% (dry basis)
- Proprietary features developed over 29 years of experience

KS-1™ solvent with high CO₂ capacity, low degradation, and low regeneration energy

Heat integration system to reduce steam consumption

- Automatic load adjustment control
- Amine filtration and purification systems
- Proven tower design for even gas/liquid distribution

CarbonSAFE III Partners to Study Direct Geologic Sequestration



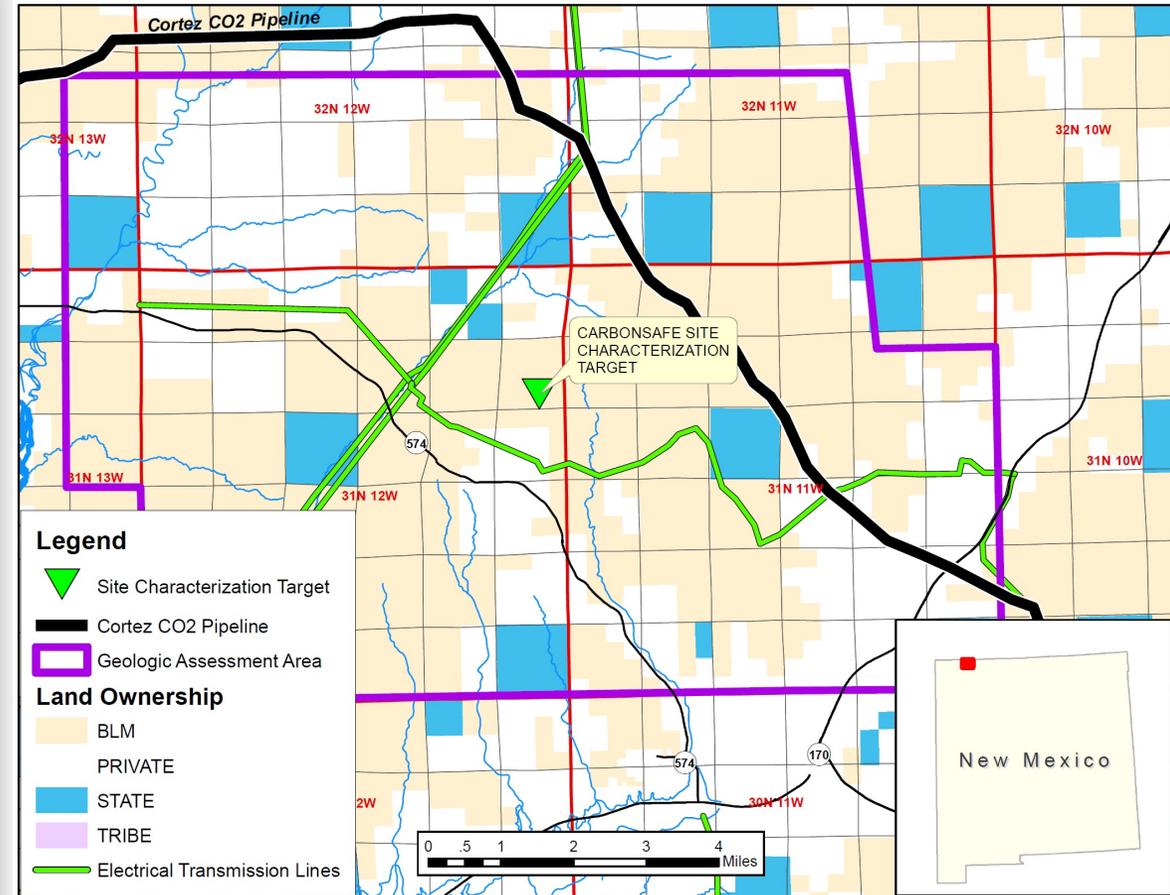
San Juan Basin DOE CarbonSAFE Phase III Award: Ensuring Safe Subsurface Storage in Saline Reservoirs (DE-FE0031890)

Key Project Facts:

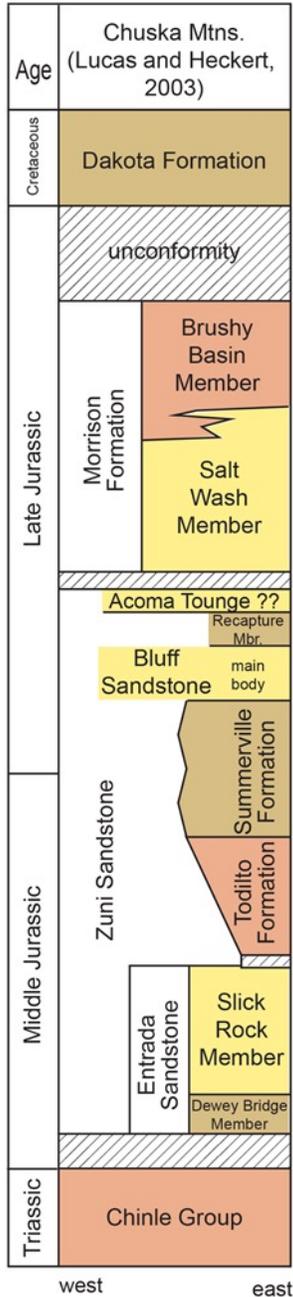
- DOE Total Project Budget: \$18,968,196
- DOE Award Share: \$14,616,376 and Private Cost Share: \$4,351,820
- Project Duration: October 2020 – September 2023
- Retrofit the San Juan Generating Station with ~6 MMT/yr. CO₂ capture technology, locally stored within San Juan Basin
- Stratigraphic Test Well located ~20 miles from SJGS
- Submission of EPA Class VI Underground Injection Control Sequestration Wells (Class VI) application by end of 2021

Characterization Test Plan:

- Drill stratigraphic test well in Summer 2021
- Perform many, varied injectivity tests
- Perform suites of laboratory experiments, and modeling based on acquired on-site data

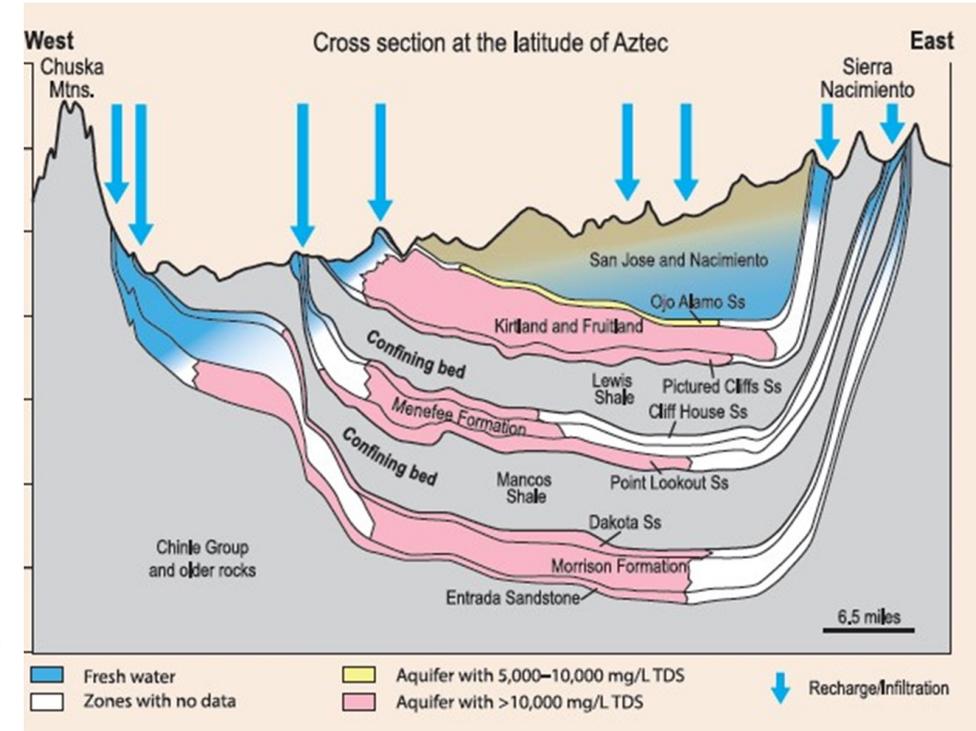
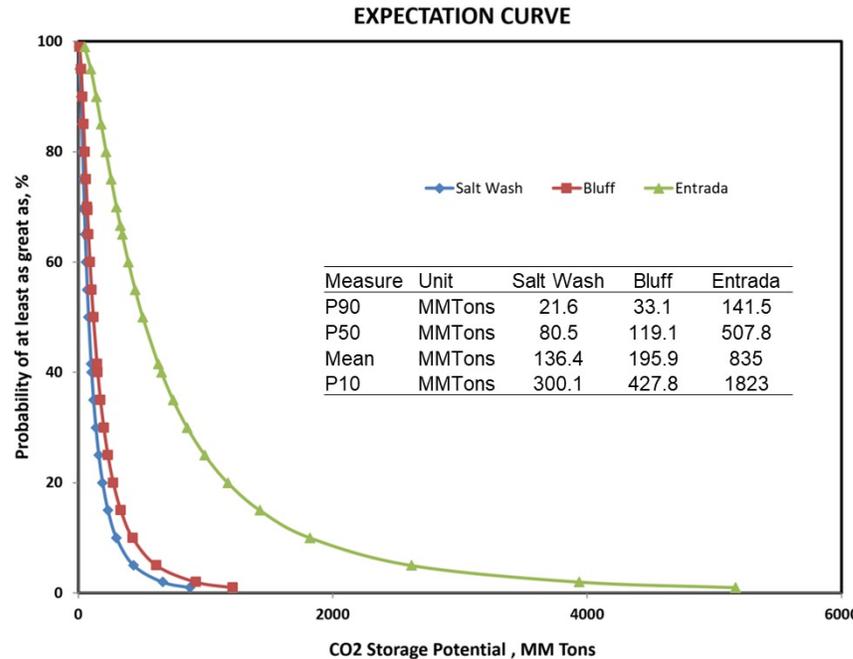


San Juan Basin Stratigraphy to be Examined by Test Well



Seals

Reservoirs



Unit	Depositional Environment	Range of Thicknesses (ft)	Porosity (%)	Permeability (mD, lateral)	Ratio of Sand Thickness to Total
Cretaceous Mancos Shale	Marine	1000-2000	0 to 10	.01	0.05
Cretaceous Dakota Sandstone	Marine	200-350	7 to 14	0.15	0.4
Jurassic Brushy Basin Member	Alluvial-Fluvial	150-200	10	0.1	0.4
Jurassic Salt Wash Member	Alluvial-Fluvial	350-500	15	5 to 60	0.4
Jurassic Bluff Sandstone	Eolian	100-250	15	15 to 150	~0.6
Jurassic Summerville Formation	Eolian-Fluvial	80-100	8	11	
Jurassic Todilto Formation	Marginal marine	0-25	1	.001	
Jurassic Entrada Sandstone	Eolian	130-750	23	335	1.0
Triassic Chinle Formation	Fluvial	1100-1300	0 to 1	.01	

Strong Bipartisan Support for Carbon Capture

Fiscal Year 2021 Omnibus bill, and the Energy Act of 2020 (the Omnibus)

- Passed with strong bipartisan support, included the largest energy package to be enacted into law in ten years and clear support for carbon capture
- IRS Section 45Q Carbon Capture Tax Credits (45Q) extended for 2 years, to allow facilities to begin construction by the end of 2025
- Establishes Carbon Capture Technology Program, including R&D, large and small-scale pilot projects and demonstrations, and a front-end engineering and design program (FEED)
- Authorizes funding to support six (6) Carbon Capture and Sequestration (CCS) demonstration projects, including for coal-fired electric generating facilities
- Authorizes additional CCS research, development, and demonstration program to identify and assess novel uses of carbon and carbon oxides for commercial and industrial products and other products with market value
- Authorizes Federal investments in research, development, and demonstration of direct air capture technologies

New Legislation in play that could extend start of construction an additional 5 years, provide for direct pay option on 45Q Tax Credits, increase tax credit price per tonne value, and/or lengthen tax credit duration beyond current 12 years to perhaps 20 years



Enchant Energy – Senior Management

- **Cindy A. Crane, Chief Executive Officer**

Former CEO of Rocky Mountain Power and 27-year career veteran at PacifiCorp, a subsidiary of Berkshire Hathaway. She has broad energy and electric utility experience across thermal electric generation, wind generation, nuclear energy, coal mining, and hydroelectric generation and a focus on the Western states, a critical region for Enchant Energy. While at Rocky Mountain Power, she was responsible for 9,000 megawatts of thermal generation in seven Western states. Previously she led PacifiCorp/Interwest Mining and Fuel Resources and also brings significant experience in coal supply to the team. Cindy also serves as the Chair of the School of Energy Resources at the University of Wyoming, and Chair of the Salt Lake City, Utah Olympic Games Committee.



- **Peter Mandelstam, Chief Operating Officer and Chief Development Officer**

Thirty-one years of experience in renewable energy development, as the founder and or CEO of several for-profit wind and non-profit solar power development companies including GRID Alternatives, Tri-State Inc., Green Sail Energy LLC, Bluewater Wind LLC, and Arcadia Windpower Ltd.; pioneer in the offshore wind industry who successfully competed for and won multiple Power Purchase Agreements (PPA) for on-land wind, offshore wind, and solar, including Nation's first offshore wind PPA with contracted revenues of \$3.9 billion. Leading conservation advocate. Member of national Board of Directors of the American Wind Energy Association for 14 years. Member of national Board of Directors of the League of Conservation Voters for 6 years. Graduate of Harvard University, A.B. in Government.



Partners and Service Providers

- **City of Farmington** is Enchant Energy's public partner in the project to add carbon capture to San Juan Generating Station
- **Westmoreland Mining LLC** owns and operates 12 coal mines in the US and Canada, including the San Juan mine which supplies the fuel for the San Juan Generating Station
- **Kiewit Power Constructors** offers construction and engineering services in a variety of markets including transportation; oil, gas and chemical; power; building; water/wastewater; industrial; and mining. Kiewit had 2020 revenues of \$12+ billion and employs 27,000 staff and craft employees. **A subsidiary of Kiewit completed Petra Nova CCUS Project on time and under budget in 2016**
- **Mitsubishi Heavy Industries, Ltd. (MHI)** is one of the world's leading industrial firms with 80,000 group employees and annual consolidated revenues of \$38 billion U.S. dollars. MHI delivers innovative and integrated solutions across a wide range of industries from commercial aviation and transportation to power plants and gas turbines, and from machinery and infrastructure to integrated defense and space systems. **MHIA, wholly owned MHI subsidiary, provided the technology for the successful Petra Nova CCUS Project**
- **Sargent & Lundy (S & L)** is a global leader in power and energy engineering with expertise in grid modernization, renewable energy, energy storage, nuclear power, and fossil fuels. **Sargent & Lundy was NRG's Owner's Engineer for Petra Nova CCUS Project**
- **US Department of Energy.** Major funder of CCUS technology development under the current and two past Administrations as a way for the US to contribute to the reduction of global CO₂ emissions. Provided ~\$250 million of funding for the Petra Nova project and is providing (without cost share) \$7.4 million of funding for the SJGS FEED study and \$14.6 million in funding for the development of a Class VI sequestration Wells near the San Juan Generating Station
- **New Mexico Institute of Mining and Technology (NM Tech)** is an internationally recognized research university focusing on science, technology, engineering, entrepreneurialism, and mathematics. New Mexico Tech is leading the DOE project "*San Juan Basin CarbonSAFE Phase III: Ensuring Safe Subsurface Storage of CO₂ in Saline Reservoirs*" for development of EPA Class VI carbon dioxide injection wells for carbon sequestration
- **San Juan College.** The College's School of Energy has launched carbon capture workforce training programs and is creating carbon capture degree and certificate programs under an MOU with the City of Farmington and Enchant Energy
- **Bank of America.** Retained as lead financial advisor for \$1.4 billion tax equity, and project financing planned for end of 2021 Top-ranked tax equity placement bank for the last five years
- **CohnReznick.** Retained as leading 45Q tax equity financing, and financial structuring firm
- **Sidley Austin** provides varied legal counsel for Enchant, as a top ranked US energy law firm



Contact Information

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