

# Enchant Energy City of Farmington

## San Juan Generating Station Carbon Capture Update

### Economic and Rural Development Committee

October 19, 2020



# Presenters

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**Hank Adair**  
Electric Utility Director  
Farmington Electric Utility System

**Cindy Crane**  
Chief Executive Officer  
Enchant Energy Corporation

**Dr. Robert Balch**  
Director Petroleum Recovery Research Center  
Project Director DOE CarbonSAFE Project  
New Mexico Institute of Mining and Technology (New Mexico Tech)



# Public-Private Partnership, Farmington & Enchant Energy Corp

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- 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) past 2022, by adding carbon capture technology to the plant
- The public-private partnership intends to run the legacy coal plant until at least 2035 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 an existing agreement, the current and former owners legally 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 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

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



# Enchant Energy Management Team

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

Former President and CEO of Rocky Mountain Power, she had a 27-year career at PacifiCorp, a subsidiary of Berkshire Hathaway, and brings broad energy and electric utility experience across thermal electric generation, wind generation, nuclear energy, coal mining, and hydroelectric generation. While at Rocky Mountain Power, she was responsible for 9,000 megawatts of thermal generation in seven western states. She 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, COO and Chief Development Officer**

Thirty years of experience as the founder and or CEO of several for-profit wind, and non-profit solar project development companies including GRID Alternatives Tri-State Inc., Green Sail Energy LLC, Bluewater Wind LLC, and Arcadia Windpower Ltd. 1 of only 2 people in US to have successfully competed for and won offtake agreements (PPAs) for on land wind, offshore wind, and solar. AB in Government; 1983 Harvard University



# New Mexico Energy Transition Act (ETA) Compliance

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- Under the ETA, the plant would have to **comply with a new CO<sub>2</sub> emissions intensity limit of 1,100 lbs. per MWh**. SJGS currently has an intensity of 2,200 lbs. per MWh
- ETA implementation regulations have yet to be promulgated
- Farmington & Enchant Energy plan to retrofit the plant with proven, post-combustion Carbon Capture technology from Mitsubishi Heavy Industries America that will **lower the CO<sub>2</sub> emissions by 90+%**
- **The Project does not require any State or local subsidies**
- Post-retrofit, SJGS will have **CO<sub>2</sub> emissions reduced to ~250 lbs. per MWh – becoming Low Emissions Electricity (LEE)**
- LEE produces **70% less CO<sub>2</sub> emissions than a typical, new combined-cycle gas turbine (CCGT), and 80% less emissions than a gas peaking plant**



# SJGS Environmental Features and Improvements

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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 SO<sub>2</sub>, NO<sub>x</sub>, particulates, and mercury
- Carbon Capture Island (CCI) will remove ~5.8 million metric tonnes of CO<sub>2</sub> from flue gas each year, 2023-2035
- Installation of Carbon Capture will further reduce SO<sub>2</sub> from SJGS Units 1 & 4
- Existing Environmental Features:
  - Low NO<sub>x</sub> Burners (LNB)
  - Under Fired Air (Unit 1 Only)
  - Over Fired Air (OFA)
  - Selective Non-Catalytic Reduction (SNCR) for NO<sub>x</sub> 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



# San Juan Generating Station Carbon Capture Project

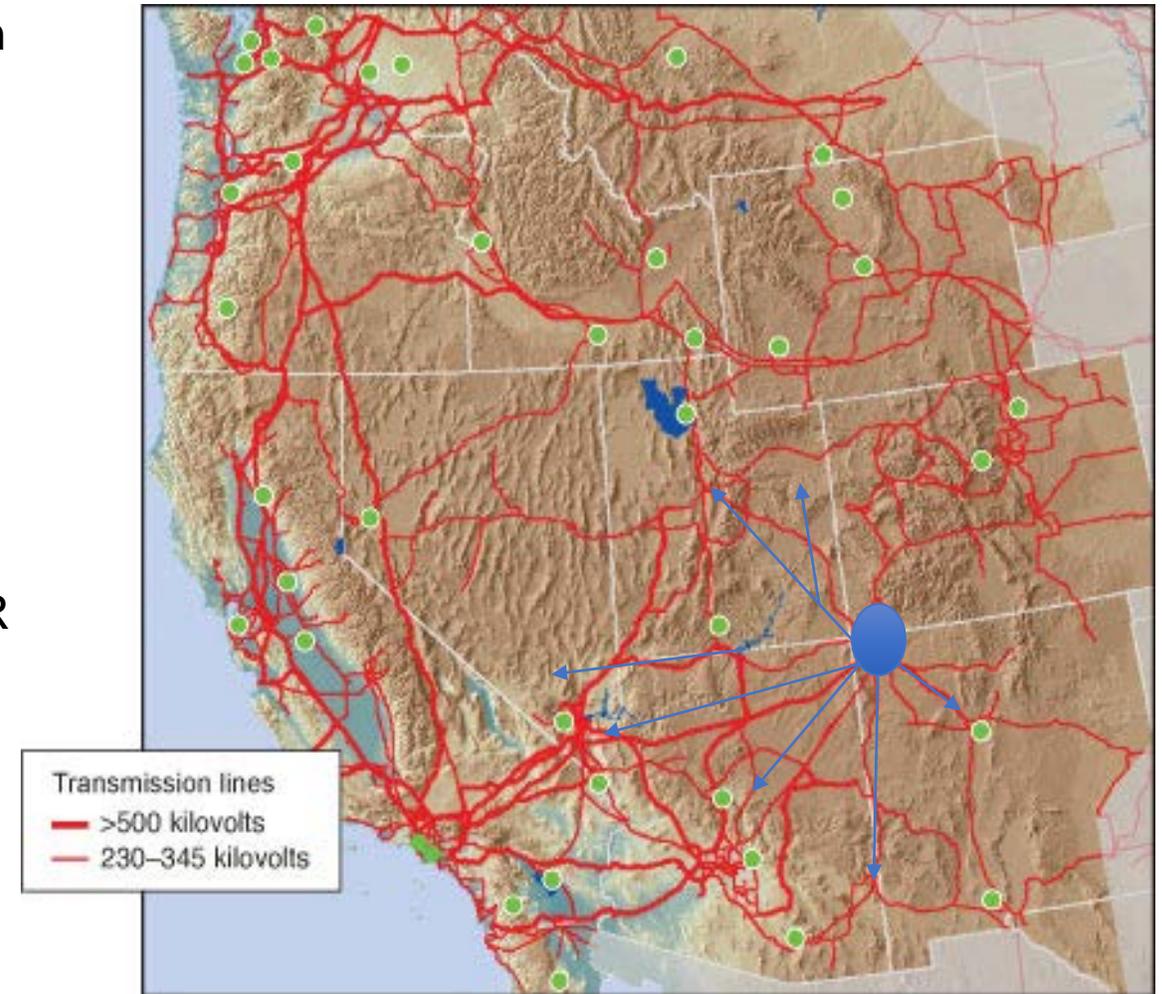
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- San Juan Generating Station will be the largest carbon capture project in the world
- With 90% carbon removal, SJGS will be the lowest emitting CO<sub>2</sub> per MWh large-scale fossil-fueled power plant in the world
  - CO<sub>2</sub> intensity of ~250 lbs./MWh, less than 30% of most efficient gas-fired power plants
- DOE cooperative funding agreements, Federal amount excluding private sector cost share: A) \$3.4 million FEED study, B) \$17.2 million drilling of a CO<sub>2</sub> sequestration well:
  - FEED study underway with Mitsubishi Heavy Industries America, Kiewit Power Constructors, and Sargent & Lundy
  - Partnering with NM Tech on drilling a sequestration well, DOE contract recently definitized, with test well to be finished in Q3 2021 which provides parallel plan for 100% permanent sequestration
- Bank of America has been retained to raise the ~\$1.4 billion for Carbon Capture Island construction and the tax equity during the 12 years of operation
- In parallel with NM sequestration well DOE program, advanced negotiations with CO<sub>2</sub> offtakers to take some or all of the CO<sub>2</sub>, approximately 5.8 million metric tonnes per year, combined CO<sub>2</sub> sales and 45Q tax credits pay for Carbon Capture Island construction and operation. Percentages stored in NM sequestration well and Permian enhanced oil recovery (EOR) to be determined based on technical and financial viability
- Power sales start with 34% of output committed to City of Farmington and Carbon Capture Island; additional 558 MW of electricity sales under negotiation



# Why 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
- High BTU Coal is supplied by the adjacent San Juan coal mine, owned by Westmoreland Mining Holdings. Enchant signed MOU to extend coal supply through 2035
- Low NO<sub>x</sub>/SO<sub>2</sub>/Mercury/Particulates emissions, but currently significant CO<sub>2</sub> emissions
- Nearby CO<sub>2</sub> Pipeline with access to Permian Basin EOR
- Located at the center of the Southwestern transmission grid, with connections to rest of New Mexico, Arizona, California, Colorado, Nevada, and Utah
- Able to Acquire 95% Interest in SJGS for \$1
- Ability to Strip 90% of CO<sub>2</sub> guaranteed by MHIA
- Ability to obtain fixed-price engineering, procurement, and construction contract (EPC) with full project wrap



# Project is Win for Ratepayers

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- Farmington Electric Utility System customers avoid stranded costs of San Juan Generating Station and costs of replacement power
- New Mexico and regional electric customers gain access to environmentally friendly, reliable, cost effective, dispatchable merchant power
- Keeping SJGS open maintains Farmington's low electricity rates, which are lower than comparable rates of other utilities in New Mexico



# Project is Win for Workers and Community

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- Preserve ~1,500 direct and indirect jobs, and more than \$53 million in state and annual local tax revenues (from NM independent assessment). CCUS will extend life of plant which would otherwise close given New Mexico Energy Transition Act
- 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 ~\$1.4 billion Carbon Capture construction
- New Mexico becomes a national pioneer in Carbon Capture and develops workforce to apply Carbon Capture technology in other high CO<sub>2</sub> emitting plants in New Mexico and across the United States
- 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 Four Corners region is even more important



# Project is Win for Schools & Students

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- **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



# Project is Win for Environment & Climate

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- Reduces New Mexico emissions by ~5.8 million metric tonnes of CO<sub>2</sub> per year
- Carbon capture project at SJGS with its performance guarantee of 90% capture by Mitsubishi Heavy Industries America greatly exceeds the carbon percentage reduction recommended by the Intergovernmental Panel on Climate Change
- Carbon Capture technology, which is the centerpiece of the DOE strategy to fight Climate Change, will be advanced through its world's largest deployment to date at SJGS



# Special Focus on the Navajo Nation's Role at SJGS

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- **Long and important history at the San Juan Generation Station (SJGS):**
  - Navajo Nation members helped build the San Juan Generating Station, and the adjacent San Juan Mine
- **Significant part of the workforce:**
  - 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 many times the per capita income on the Navajo Nation
- **Preserving regional Navajo jobs:**
  - The San Juan Generation Station Retrofit Project will preserve hundreds of Navajo family-sustaining jobs
  - The Navajo Nation has had significant job loss from 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, and other area industrial complexes
  - 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 retrofit at SJGS
- **Essential Stakeholders:** Farmington and Enchant will continue to work in collaboration with Navajo leadership



# All Union Work for Enchant Carbon Capture Construction

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- EPC Team and Labor Leaders have finished negotiating Project Labor Agreement (PLA) for \$1.4 Billion Carbon Capture construction
- Enchant has agreed to full union job and PLAs for 1) Significant plant deferred maintenance for SJGS, and 2) Construction of CO<sub>2</sub> Pipeline. Enchant is urging that the sequestration wells be union labor
- Major Trades for Carbon Capture Work include:
  - New Mexico Building Trades Council
  - Boilermakers
  - Plumbers and Pipefitters
  - Electricians
  - Laborers
  - Operators
  - Millwrights
  - Operating Engineers



# 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 and
- B) CO<sub>2</sub> pipeline construction



# DOE CarbonSAFE Objectives

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- Perform a comprehensive site characterization of a storage complex located in northwest New Mexico to accelerate the deployment of CCS technology at the San Juan Generating Station (SJGS)
- The data and analysis performed will be used to prepare, submit and obtain UIC Class VI permit from the Environmental Protection Agency (EPA)
- Techno-economic assessment of entire SJGS CCS project to reduce emissions by more than 90%
- Public awareness of CCS technology and its benefits
- Collaborate with regional partnerships and regional initiative projects to accelerate CCS technology deployment



# DOE \$22 Million Award for CO<sub>2</sub> for Injection (page 1 of 2)

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- *DOE Project Name: "San Juan Basin CarbonSAFE Phase III: Ensuring Safe Subsurface Storage of CO<sub>2</sub> in Saline Reservoirs"*
- The Department of Energy has awarded Federal funding of \$17.2 million along with \$4.4 million in private cost sharing from the other parties to the agreement to the New Mexico School of Mining and Technology (New Mexico Tech) for comprehensive analysis of a site near SJGS in northwest New Mexico to accelerate deployment of Carbon Capture and Storage (CCS) technology at the San Juan Generating Station
- The data and analysis produced under the award will be used to prepare, submit, and obtain a permit from the U.S. Environmental Protection Agency (EPA) to construct a Class VI well (wells used for geologic sequestration of CO<sub>2</sub>) to inject and store a minimum of 72 million metric tonnes of CO<sub>2</sub> at wells near SJGS. This represents 100% of lifetime CO<sub>2</sub> removed by Carbon Capture Island
- The development of an injection well for the SJGS CCUS will provide an additional location for CO<sub>2</sub> storage that will qualify for the IRS Section 45Q tax credits, and potentially avoid any CO<sub>2</sub> transportation on Cortez Pipeline, or any sales for Enhanced Oil Recovery (EOR)
- Overall Project Performance Dates: *October 2020 – September 2023*



# DOE \$22 Million Award for CO<sub>2</sub> Injection Well (page 2 of 2)

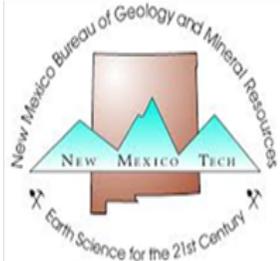
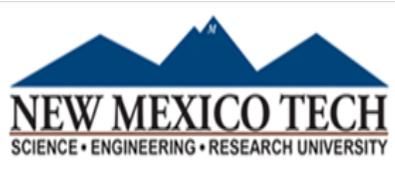
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## Project Team:

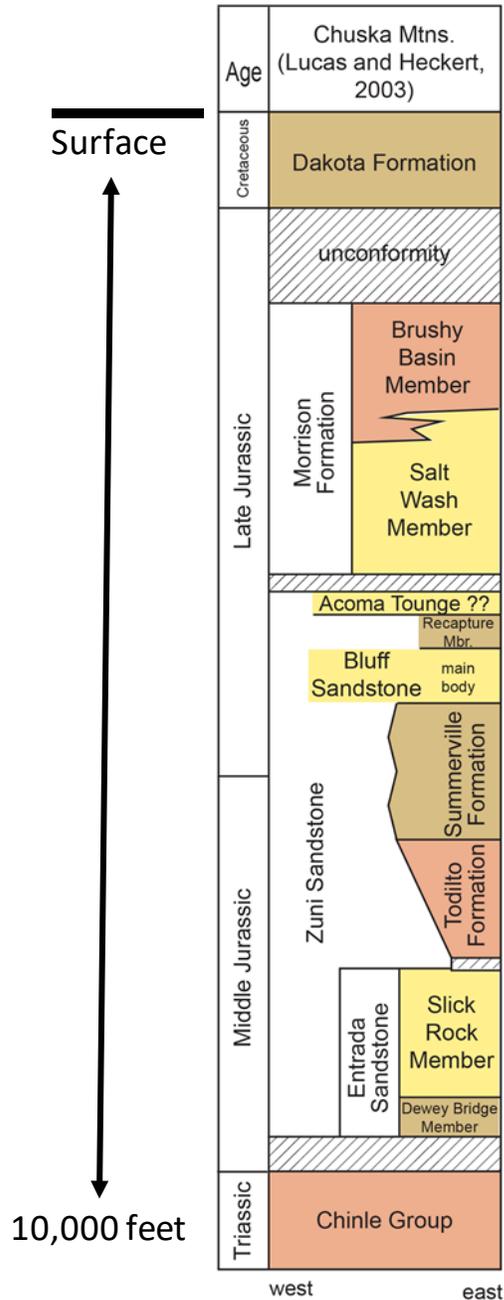
- Project Director, Co-Lead Investigators, and Co-Principle Investigators: A) Dr. Robert Balch, Director of the Petroleum Recovery Research Center at New Mexico Tech. B) Dr. William Ampomah of New Mexico Tech's Petroleum Recovery Research Center is also a Co-Lead Investigator
- Other Co-Principle Investigators on the project are 1) Prof. Brian McPherson - University of Utah, 2) Mr. Peter Mandelstam COO - Enchant Energy LLC, 3) Dr. Nelia Dunbar – Director of the New Mexico Bureau of Geology and Mineral Resources, and 4) Mr. George El-kaseeh of New Mexico Tech's Petroleum Recovery Research Center
- Additional collaborating organizations for the project include the University of New Mexico, the University of Wyoming, Los Alamos National Laboratory (LANL), Sandia National Laboratories (SNL), Hilcorp Energy, Schlumberger, and Robert L. Bayless, Producer LLC



# CarbonSAFE Partners



# Storage Complex at San Juan Basin



**Seals**

**Reservoirs**

Multiple sandstone zones with good porosity and permeability

No production in the area within the lower units

Sandstones are interbedded with siltstones and shales as well as overlying shales and carbonates that can act as seals

Morrison Formation has numerous high porosity zones encased in siltstones and shale

# Low Cost Government Debt Through DOE and RUS

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- The US Department of Energy's Loan Program Office (LPO) has an existing program with a successful track record to lend debt financing for innovative projects
- LPO interest rates are extremely low cost in the COVID-19 environment
- The US Department of Agriculture's Rural Utilities Service (RUS) has an existing program with dedicated funds for CCUS debt financing. RUS requires that "rural customers benefit"
- Will seek total debt financing of up to \$906 million (DOE LPO) and \$90.3 million (RUS) for 3 potential construction scopes:
  - 1) Carbon Capture Island, 2) San Juan Generating Station Deferred Maintenance, 3) CO<sub>2</sub> Pipeline
- The debt financing will be placed at financial close in late 2021, for a term of 2 years of construction and 12 years of operation
- DOE & RUS: Both require National Environmental Policy Act (NEPA) environmental reviews
- Enchant is formally engaged with DOE and RUS and has begun NEPA consultations
- Enchant has reviewed all DOE and RUS underwriting requirements and sees only one challenge: The RUS debt amount is proportional to the percentage of electricity sold to rural customers



# Project Milestones

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- **2020**

- Raise development equity
- Initiate carbon capture plant permitting
- Continued expansion of the management team
- Continued CO<sub>2</sub> off-take and associated transportation and storage negotiations
- Continued power off-take negotiations
- Continued transfer negotiations with non-extending owners

- **2021**

- Finalize EPC contract negotiations with construction consortium
- Sequestration well drilling and core samples extracted for CO<sub>2</sub> permeability tests
- Complete Carbon Capture Island permitting
- Close financing of Carbon Capture Island, plant deferred maintenance, and CO<sub>2</sub> pipeline
- Commence construction of Carbon Capture Island, if granted permission by current and former owners of SJGS

- **2022 - 2024**

- Transfer SJGS ownership of 95% to Enchant Energy Corporation
- Complete plant deferred maintenance construction
- Energize first of 4 units (trains), and begin commercial operation of Carbon Capture Island
- Full, 4-train commercial operation of Carbon Capture Island



# Partners and Service Providers

- **New Mexico Institute of Mining and Technology (New Mexico 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 CO<sub>2</sub> 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 creating carbon capture degree and certificate programs under a MOU with the City of Farmington and Enchant Energy
- **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 2018 revenues of \$9 billion and employs 20,000 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 CO<sub>2</sub> emissions. Provided ~\$250 million of funding for the Petra Nova project and is providing \$3.4 million of funding for the SJGS FEED study and \$17.2 million in funding for the development of a sequestration well near the San Juan Generating Station
- **Bank of America.** Retained as lead financial advisor for \$1.4 billion tax equity, and project financing planned for 2021. Top-ranked tax equity placement bank for the last five years



# Contact Information

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[www.EnchantEnergy.com](http://www.EnchantEnergy.com)

[www.fmtn.org](http://www.fmtn.org)



A landscape photograph capturing a sunset. The sky is filled with horizontal bands of orange and yellow clouds, with the sun partially visible on the right side. In the foreground, there is a dark, silhouetted hillside with sparse vegetation. In the middle ground, a factory or industrial complex is visible, featuring several tall smokestacks that are emitting plumes of white smoke. The overall scene is bathed in the warm, golden light of the setting sun.

**Thank You**