

City of Farmington & Enchant Energy Corporation

**Update on Large-Scale Commercial Carbon
Capture Retrofit of the San Juan Generating
Station (FE0031843)**

**Carbon Management and Oil and Gas
Research Project Review Meeting
Integrated CCUS Projects and FEED Studies**

For August 2, 2021 Conference Presentation



Project Funding Table

Department of Energy funded and cost share structure by fiscal year

	FY 2020		FY 2021		FY 2022		Total Project	
	Federal	Cost Share	Federal	Cost Share	Federal	Cost Share	Federal	Cost Share
Enchant	\$147,461	\$20,071	\$56,508	\$188,616	\$0	\$183,265	\$203,968	\$391,952
Farmington	\$0	\$0	\$0	\$3,435	\$0	\$6,565	\$0	\$10,000
MHI	\$0	\$0	\$2,489,808	\$522,297	\$3,012,106	\$0	\$5,501,914	\$522,297
Baker Tilly	\$29,910	\$7,570	\$30,376	\$40,160	\$0	\$48,099	\$60,286	\$95,830
S&L	\$435,263	\$0	\$100,503	\$480,578	\$993,598	\$380,916	\$1,529,365	\$861,493
Navigant	\$230,000	\$0	\$0	\$0	\$0	\$0	\$230,000	\$0
EJM	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Total	\$842,634	\$27,641	\$2,677,196	\$1,235,086	\$4,005,704	\$618,845	\$7,525,533	\$1,881,572
Cost Share	96.82%	3.18%	68.43%	31.57%	86.62%	13.38%	80.00%	20.00%

From PMP dated 7/27/21

- Total Project Cost: \$9,407,105
- Project Period of Performance: October 15, 2019 – June 30, 2022



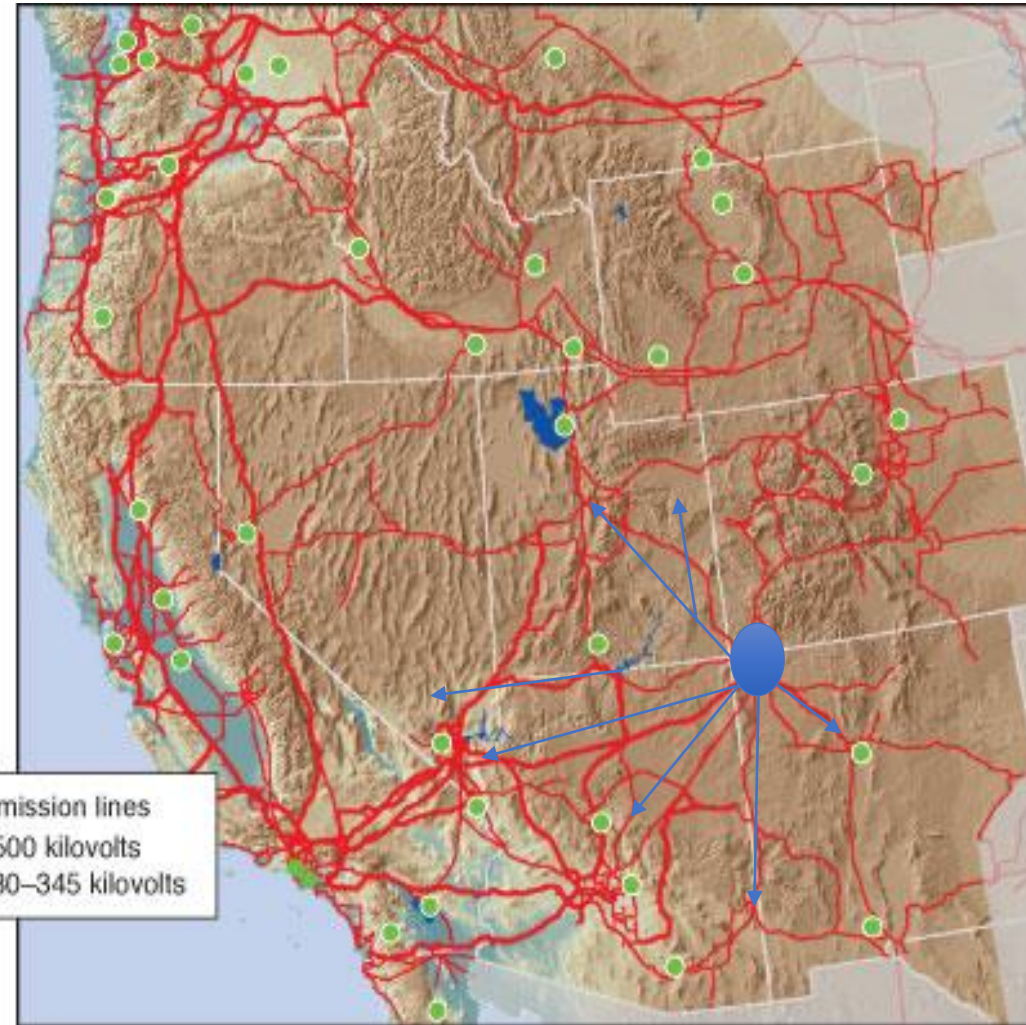
Public-Private Partnership: Farmington & Enchant Energy

- 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 **meet and exceed the stringent carbon dioxide emissions standards** of the New Mexico Energy Transition Act (ETA)
- Addition of carbon capture will also allow for **electricity sales delivered across the West**, including 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**

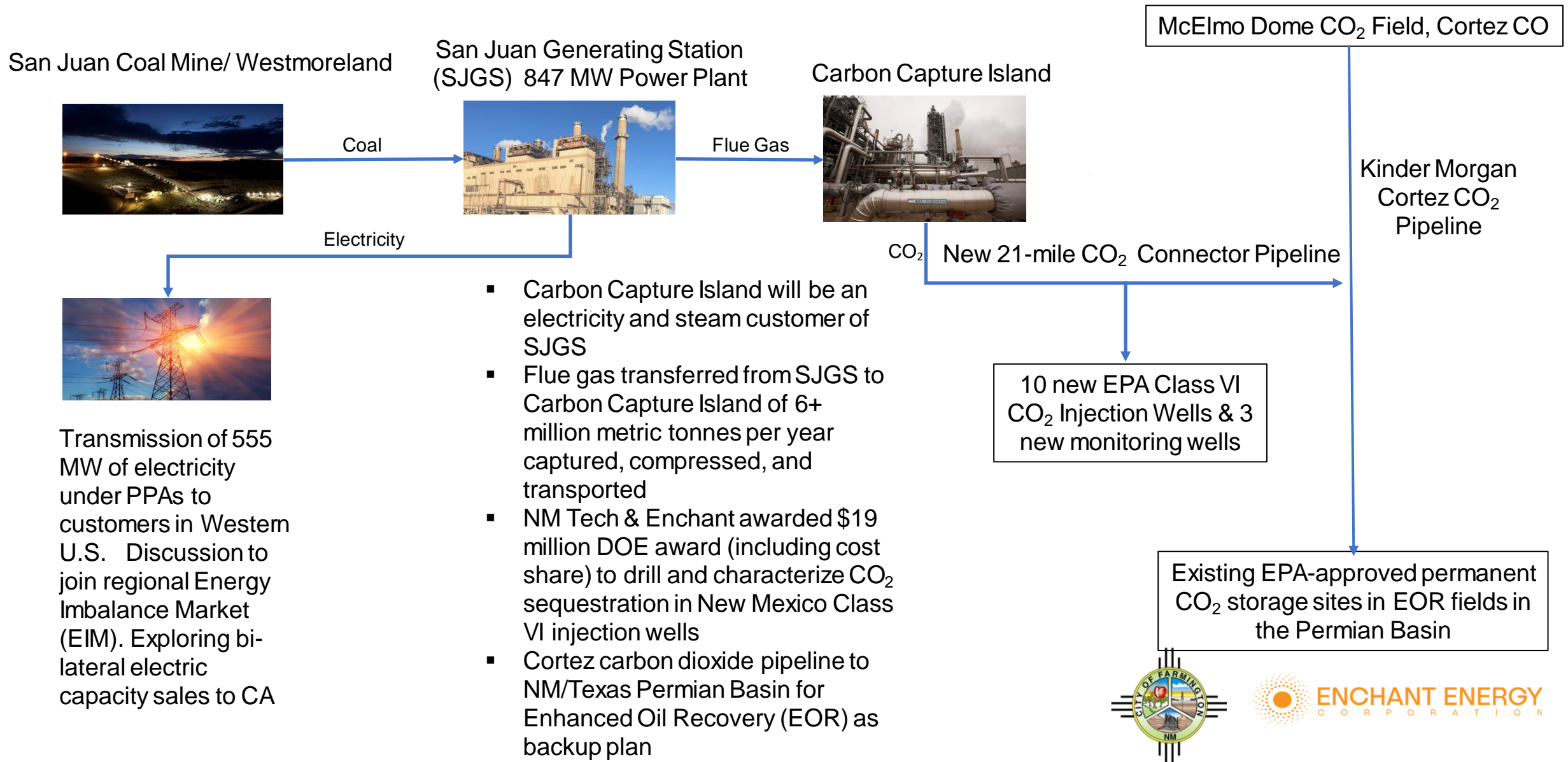


San Juan Generating Station

- **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
- **Design Basis is to capture 95% of the CO₂**
- Ability to obtain **fixed-price engineering, procurement, and construction contract (EPC) with lump sum contract price and full project wrap**



SJGS Carbon Capture Project Schematic



San Juan Coal Mine/ Westmoreland



Coal

San Juan Generating Station (SJGS) 847 MW Power Plant



Flue Gas

Carbon Capture Island



CO₂

New 21-mile CO₂ Connector Pipeline

McElmo Dome CO₂ Field, Cortez CO

Kinder Morgan Cortez CO₂ Pipeline

10 new EPA Class VI CO₂ Injection Wells & 3 new monitoring wells

Existing EPA-approved permanent CO₂ storage sites in EOR fields in the Permian Basin

Electricity



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

- Carbon Capture Island will be an electricity and steam customer of SJGS
- 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



Significant Climate Mitigation

- San Juan Generating Station (SJGS) will be the **largest carbon capture project in the world**
- **Will serve as national model for significant carbon reduction across US energy sector while 1) maintaining reliability of supply, 2) keeping electricity affordable, and 3) preserving well-paying union jobs**
- Designed to **capture 95% of the CO₂**, SJGS will be the **lowest emitting CO₂ per MWh large-scale, fossil-fueled power plant in the world**
- Carbon dioxide intensity of **less than 200 lbs. of CO₂ per MWh**: Better than 80% lower than Combined Cycle Natural Gas-fired plants
- 6+ million metric tonnes of CO₂ captured and sequestered annually at SJGS vs. world's largest announced Direct Air Capture (DAC) facility at only ~1 million metric tonnes annually
- **Shovel-ready and operational by 2025 – helping to significantly assist in complying with Paris Climate Accord commitments**



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 (Carbon Capture Island)** – 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 (not in DOE FEED Scope but integral to project) - 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



FEED Study for Carbon Capture – Progress - 1 of 2

Task 1.0 – Project Management and Planning

- Updated PMP was submitted to DOE on July 27, 2021, reflecting a no-cost extension and schedule reflecting Balance of Plant Engineering by December 31, 2021 and Final FEED Package by June 30, 2022

Task 2.0 – Front-End Engineering and Design Study

Subtask 2.1 - Process Engineering and Design

- Stack testing performed and completed in support of MHIA design basis to optimize recovery of CO₂
- Modest design changes expected to allow MHIA to increase its CO₂ capture percentage from 90% warranted to a target of 95%
- MHIA completed the block flow diagram, process flow diagram, initial heat and material balances, utility flow diagrams, equipment list, and preliminary plot plan. MHIA's engineering teams also developed standard specifications/drawings and design basis/criteria
- S&L reviewed MHIA's Design Basis documents and also made a trip to SJGS to perform site walkdowns and finalize tie-in locations for the existing systems

Subtask 2.2 – Balance of Plant Engineering

- Mechanical Engineering - BOP P&IDs were reviewed with MHI for interface



FEED Study for Carbon Capture – Progress – 2 of 2

Subtask 2.3 – Studies and Investigations

- Water Supply Study: S&L, in coordination with Enchant and its partner, the City of Farmington, reviewed the water supply resources historically available to the SJGS. The existing BOR Permit 2838 was deemed sufficient for the continued operation of the SJGS plus the additional water for the Carbon Capture Island
- Enchant and its sub-recipient City of Farmington and its municipal utility, Farmington Electric Utility System (FEUS) finished its year + work with the Bureau of Reclamation on the appropriate transfer of water conveyance system assets while retaining full rights to the water under Permit 2838. The transfer would be voluntary by FEUS and Enchant and would further the multi-decade effort called the Navajo Gallup Water Project
- Control System Study: S&L visited the SJGS plant to review the existing control systems and develop a plan for integrating the new Carbon Capture Controls with the existing controls
- Enchant and S&L continued consultations with the New Mexico Environment Department (NMED), answering questions and providing additional information in support of the submitted Four Factor Analysis
- Report of carbon production intensity, named the ETA CO₂ Emissions Calculation, was completed





APPENDIX

NEPA Work to Date – Carbon Capture Island

Agency	Permit	Status
U.S. Department of Agriculture (USDA) Rural Utilities Service (RUS)	NEPA Environmental Review and Authorization (will include both SJGS and pipeline route)	<ul style="list-style-type: none"> • 5/15/20 meeting with RUS. • 6/12/20 meeting with RUS, DOE, BLM, and BIA. • 9/2/20 meeting with DOE. • 9/15/20 meeting with RUS. • Ongoing phone and email coordination with all involved agencies. • FAST-41 Initiation Notice drafted. • Preliminary impact list drafted. • BLM/BIA ROW applications submitted 12/31/20 (currently under review). • Biological, archaeological, and wetland field surveys in process/scheduled.
Department of Energy (DOE) Loan Program Office (LPO)		
Bureau of Land Management (BLM)		
Bureau of Indian Affairs (BIA)		



NEPA - Related Regulatory Coordination

Agency	Permit	Status
U.S. Fish and Wildlife Service (USFWS)	Section 7 Endangered Species Act Consultation	<ul style="list-style-type: none"> • Biological survey performed; survey report currently being finalized. • Applicability of formal consultation is TBD, pending level of NEPA review, results of field surveys, and evaluation of potential impacts.
New Mexico Game and Fish Department	State Threatened/Endangered Species Consultation	
State Historic Preservation Officer (SHPO)	National Historic Preservation Act Consultation	<ul style="list-style-type: none"> • Will likely be required to support NEPA review.
UMUT Tribal Historic Preservation Officer (THPO)	National Historic Preservation Act Consultation (for Project areas on tribal land)	<ul style="list-style-type: none"> • Will likely be required to support NEPA review.



Carbon Capture Island – Associated Pipeline Permitting

Agency	Permit	Status
BLM	ROW Agreement	<ul style="list-style-type: none"> Application submitted 12/31/20, currently under review
Ute Mountain Ute Tribe (UMUT)	ROW Agreement	<ul style="list-style-type: none"> Application submitted 12/31/20, currently under review
U.S. Fish and Wildlife Service (USFWS)	Section 7 Endangered Species Act Consultation	<ul style="list-style-type: none"> Biological survey performed; survey report currently being finalized
New Mexico Game and Fish Department	State Threatened/ Endangered Species Consultation	

Other permits/coordination required for project construction will be obtained prior to the start of construction



Carbon Capture Island – Active New Mexico Permitting

Agency	Permit	Status
New Mexico Environment Department (NMED)	Part 72 Pre-Construction Permit	<ul style="list-style-type: none">Part 72 (non-PSD) Pre-Construction Permit Application being drafted.

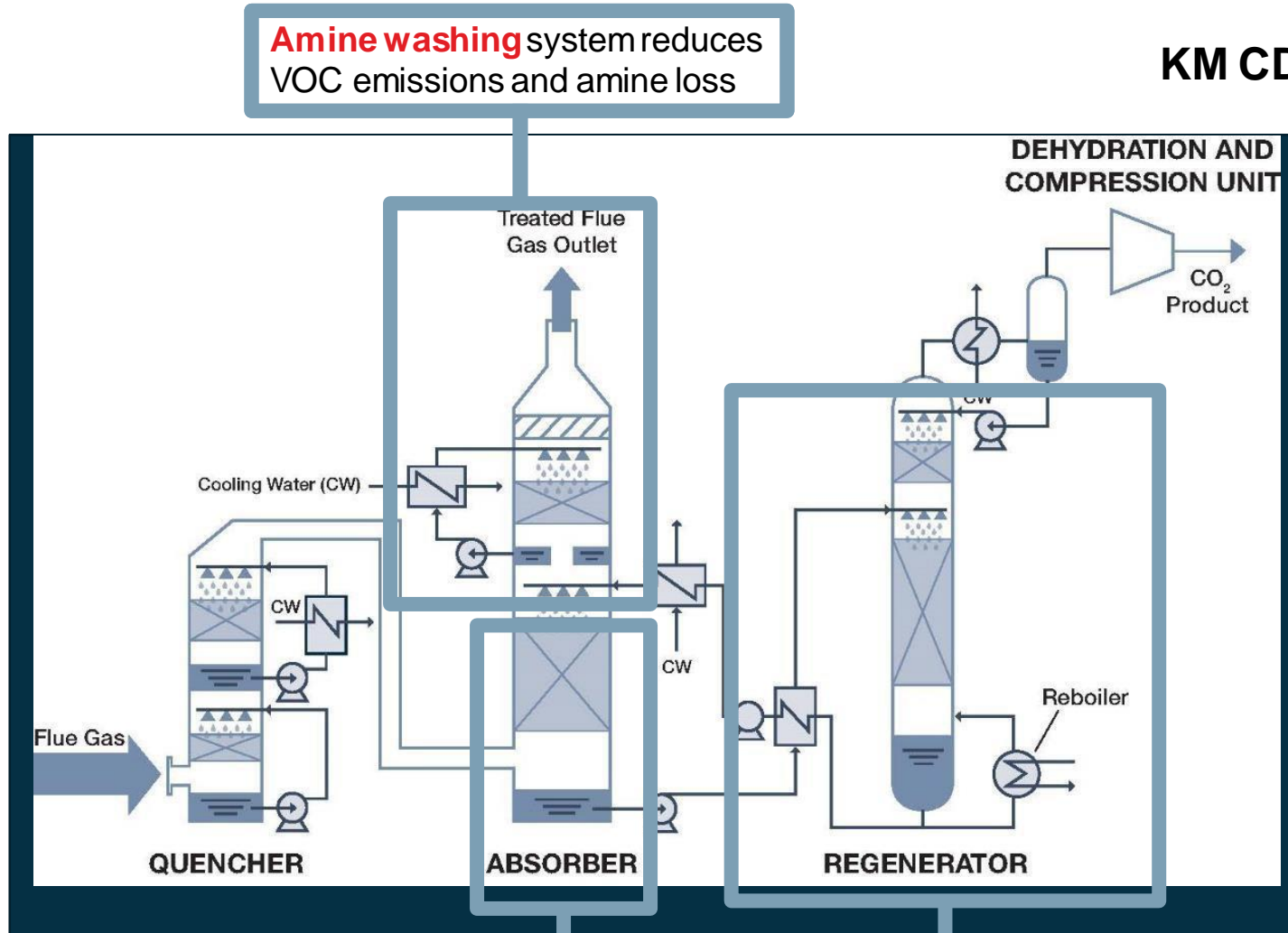
Other permits/coordination required for project construction will be obtained prior to the start of construction



Carbon Capture Technology Overview

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



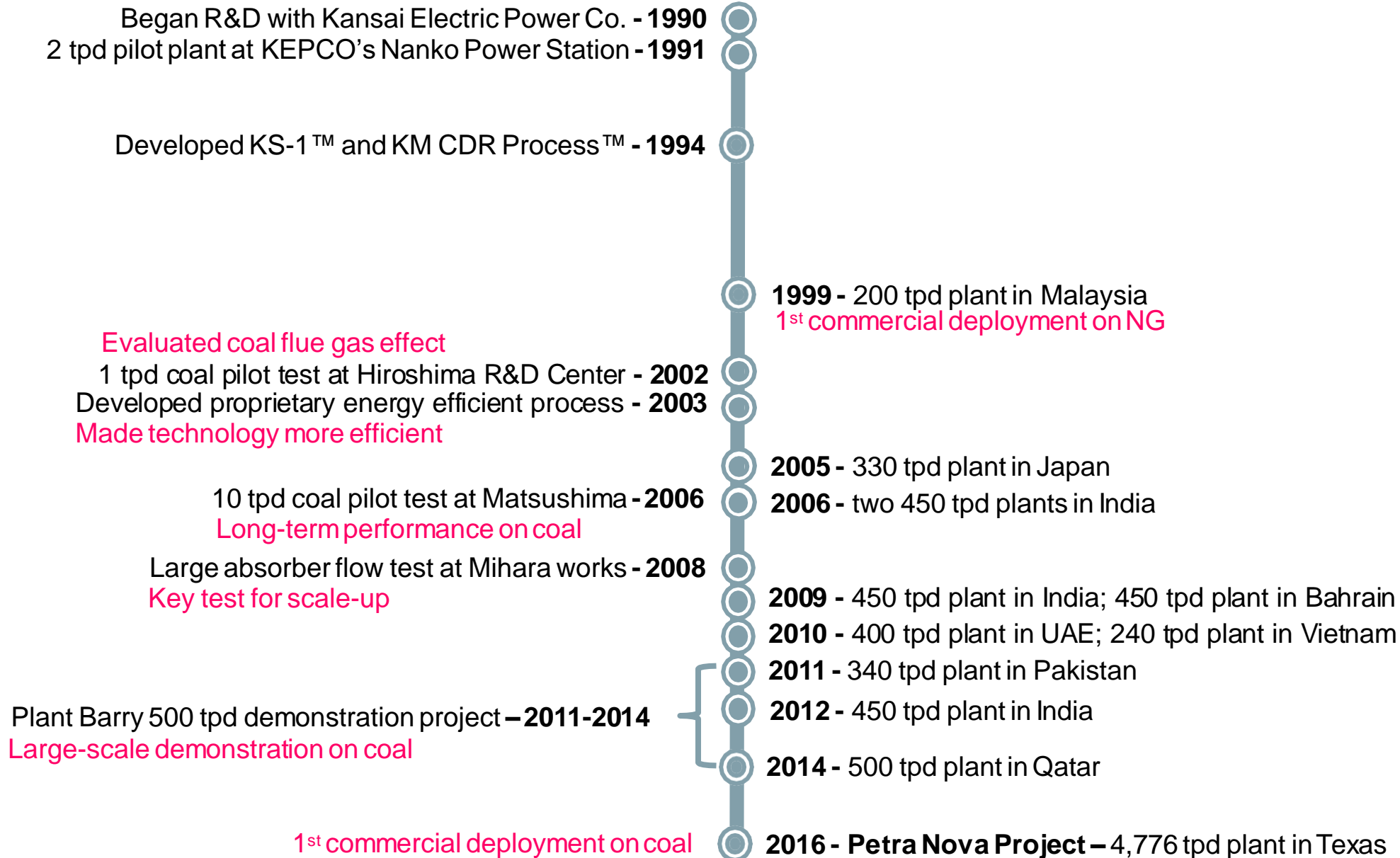
Amine washing system reduces VOC emissions and amine loss

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

KM CDR Process™ Technology Development Timeline



Environmental Justice Considerations

- Additional CO₂ and SO₂ reductions bring regional environmental improvement while maintaining and adding jobs
- Capture and sequestration of CO₂ along with existing pollution controls brings environmentally friendly and highly reliable electricity to the region
- Navajo Nation tribal lands disproportionately affected by current availability of electricity and other energy sources with 30% of homes on Navajo Nation lacking water and electricity and many homes heated with coal and wood
- Bringing a grid-stabilizing and dispatchable electricity source with good environmental characteristics provides the benefit of solidifying electric reliability which is extremely important to those living in remote areas, including much of the Navajo Nation



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 (currently 60%)
 - 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 have 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



Environmental Justice – Navajo Gallup Water Project

- Enchant Energy is working with the Bureau of Reclamation to voluntarily turn over the water conveyance system (WCS) assets from San Juan Generating Station in order to benefit the Navajo Gallup Water Project
- When Farmington and Enchant take over San Juan Generating Station assets in 2022, they will convey the WCS to the Navajo Nation, City of Gallup, and the Bureau of Reclamation
- The conveyance will benefit the Navajo Gallup Water Project, assist in planning and implementation, and provide continued species protection in the San Juan River
- The conveyance of the WCS will support the Navajo Gallup Water Project in order to provide much needed water on the Navajo Reservation and for the City of Gallup



Environmental Justice – Mitigation of Impacts

The San Juan Generating Station Carbon Capture Project will:

- Continue and enhance jobs that pay 5+ times the average wage in the area with large percentage of jobs retained and added for Navajo and Hispanic workers
- Provide 2 million worker hours for construction with locally-sourced, union wages and benefits
- Ongoing work force & job training program in conjunction with San Juan College, a majority community of color institution (primarily Navajo and Hispanic)
- Puts Northwest New Mexico area workers at the forefront of the next generation of well-paid workers in the region as Carbon Capture and Sequestration grows nationally



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**



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



Partners and Service Providers – 1 of 2

- **City of Farmington** is Enchant Energy's public partner 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** provides 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 a world leading industrial firms with 80,000 group employees and annual consolidated revenues of \$38 billion. 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 EPA Class VI Sequestration Wells near SJGS



Partners and Service Providers – 2 of 2

- **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 (SJC)**. The College’s School of Energy has launched carbon capture workforce training programs in partnership with Farmington & Enchant. SJC is also 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 the Carbon Capture Island tax equity and project financing planned for 2022. Top-ranked tax equity placement bank in the US for the last five years
- **Baker Tilly**. Retained as Enchant’s original development capital advisor. Contracted to provide DOE compliance and accounting services
- **Cohn Reznick**. 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



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.



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