

City of Farmington & Enchant Energy Corporation

San Juan Generating Station (SJGS)

Carbon Capture Utilization and Storage (CCUS)

Presentation to USEA

July 14, 2021



Presenters

Hank Adair
Electric Utility Director
Farmington Electric Utility System

Cindy Crane
Chief Executive Officer
Enchant Energy Corporation

Peter Mandelstam
Chief Operating Officer
Enchant Energy Corporation



Public-Private Partnership, Farmington & Enchant Energy Corp

- 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 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 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



Enchant Energy – Senior Management Team

- **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 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 for on-land wind, offshore wind, and solar.



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



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 coal mine, owned by Westmoreland Mining Holdings.
- Low NO_x/SO₂/Mercury/Particulates emissions, but currently significant CO₂ emissions
- 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 up to 95% 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



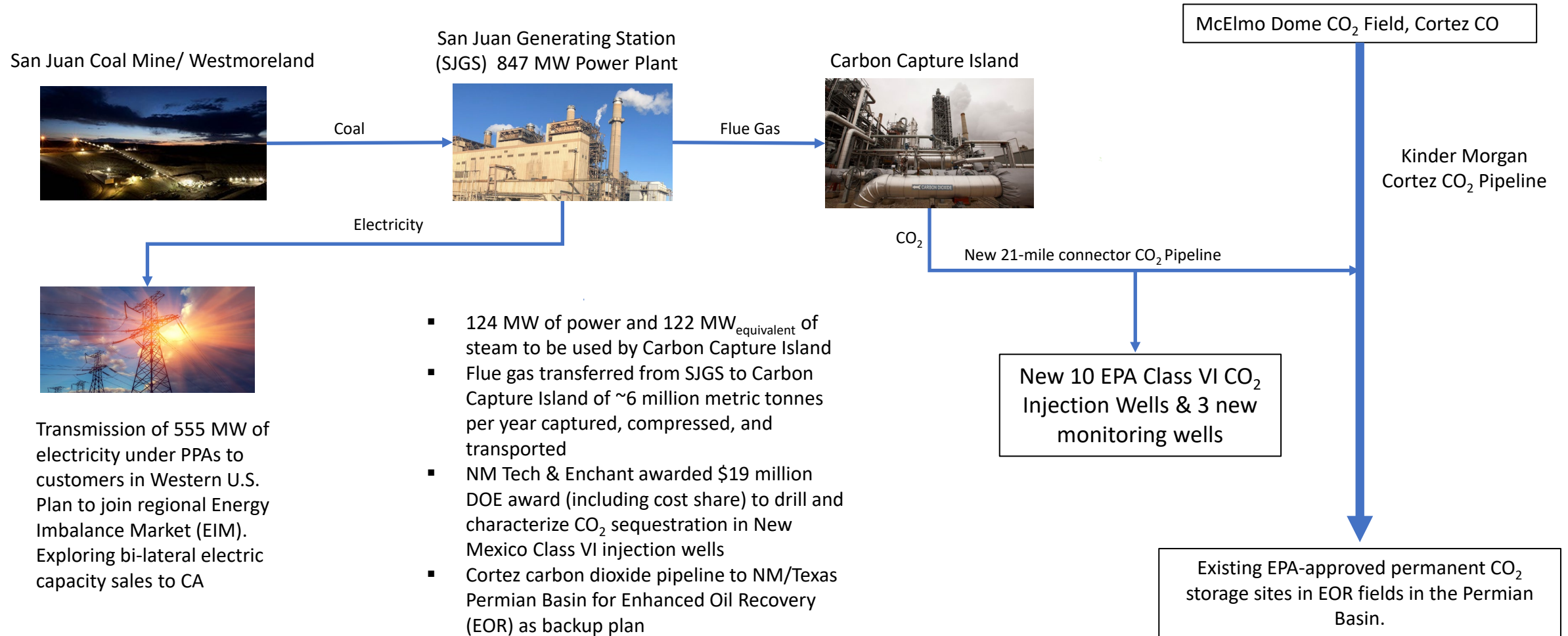
SJGS Current Environmental Features

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, and mercury, **pursuant to EPA agreement**
- **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



SJGS Carbon Capture Project Schematic

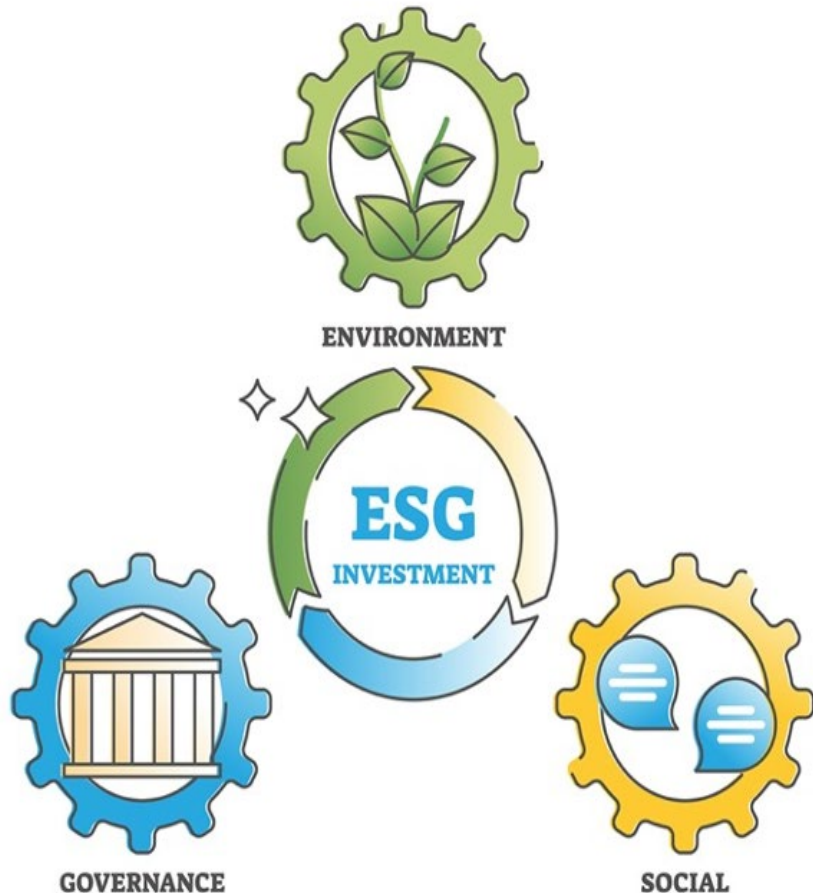


Transmission of 555 MW of electricity under PPAs to customers in Western U.S. Plan to join regional Energy Imbalance Market (EIM). Exploring bi-lateral electric capacity sales to CA

- 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



SJGS CCUS Meets ESG



- San Juan 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** for Navajo promoted by A) **cleaning local environment**, B) maintaining **2 generations of well-paying, middle-class Navajo 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**



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



Significant Climate Mitigation

- San Juan Generating Station (SJGS) will be the **largest carbon capture project in the world**
- With 95% warranted carbon removal by MHIA, SJGS will be the lowest emitting CO₂ per MWh large-scale, fossil-fueled power plant in the world:
 - Carbon dioxide intensity of well below **200 lbs.** or less of CO₂ /MWh – **over 80** percent lower than Combined Cycle Natural Gas-fired plants
 - **Upto 6.5m** metric tonnes of CO₂ captured and sequestered **annually** vs. largest announced direct air capture facility at ~1m metric tonnes annually
- Installation of Carbon Capture will further **reduce SO₂ by an additional 50%**
- DOE cooperative funding agreements:
 - \$9.4 million FEED study underway with Mitsubishi Heavy Industries America, and Sargent & Lundy
 - \$19 million study underway by New Mexico Tech, with Enchant as sub-recipient, to drill a test sequestration well to understand the sub-surface stratigraphy to be finished in Q3 2021 (Stratigraphic Well). Projecting nine (9) EPA Class VI Underground Injection Control wells would handle 100% of lifetime CO₂ via direct geologic sequestration (Class VI Wells)
- **Shovel-Ready and Operational by 2024 – helping to significantly assist in complying with Paris Accord commitments**



Carbon Capture is Win 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). 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 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**
- **New Mexico becomes a national pioneer in Carbon Capture** and develops workforce to apply Carbon Capture technology in other high CO₂ emitting plants near 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 San Juan County region is even more important



Carbon Capture is Win for New Mexico Ratepayers

- 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 power**
- As SJGS + CCUS will exit rate base on transfer date from Public Service Company of New Mexico (PNM) and seven (7) other exiting owners, to Farmington and Enchant on or before June 30, 2022, **zero ability to raise ratepayer price of electricity**
- Farmington and Enchant go at risk on transfer date to sell “merchant power” in New Mexico and across Western U.S.
- **Keeping SJGS open maintains Farmington’s low electricity rates, which are lower than comparable rates of other utilities in New Mexico**



Carbon Capture is Win 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**



All Union Work for Enchant Carbon Capture Construction

- 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 CO₂ 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) CO₂ pipeline construction



Project Milestones

- **2020**
 - Initiate raise of development capital (equity and debt)
 - Initiate power off-take negotiations
 - Initiate CO₂ off-take and associated transportation and storage negotiations
 - Initiate coal supply negotiations
 - Initiate CO₂ pipeline permitting
 - Secure DOE grant and initiate FEED Study work
 - Secure DOE grant and initiate sequestration well drilling and characterization
- **2021**
 - Secure remaining development capital
 - Complete power off-take, CO₂ offtake, and associated transportation and storage agreements
 - Complete coal supply agreement
 - Complete ownership transfer definitive agreements
 - Initiate Carbon Capture Island permitting
 - Continue sequestration characterization and EPA Class VI permitting for sequestration wells
 - Advance FEED study through Balance of Plant engineering, identifying long-lead equipment priorities
 - Initiate and advance state lands Pore Space and Post Injection liability legislation
 - Initiate and advance Federal lands Pore Space legislation
 - Initiate DOE Loan Program application process



Project Milestones

- **2022**

- Complete FEED Study
- Finalize EPC contract negotiations with construction consortium
- Initiate RFP and finalize plant operator contracts
- Secure project financing (construction)
- Initiate USDA RUS long-term debt financing
- Commence construction of Carbon Capture Island
- Transfer SJGS ownership of 95% to Enchant Energy Corporation

- **2023 - 2025**

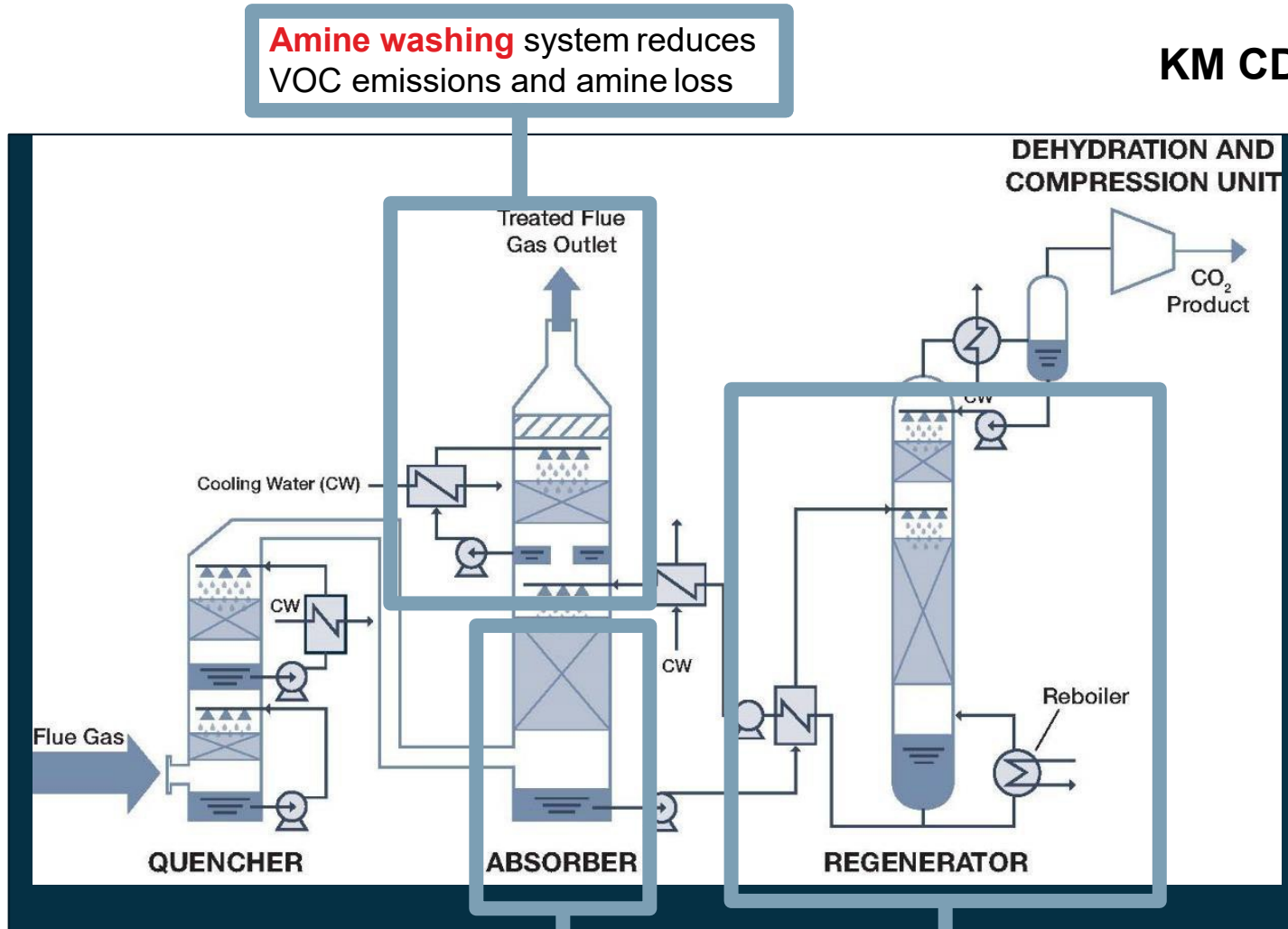
- Secure EPA Class VI injection well permits
- Submit and obtain CarbonSAFE IV funding – drill direct injection wells and build injection well infrastructure
- Initiate and complete CO2 connector pipeline
- Complete plant deferred maintenance construction
- Commercial operations of initial carbon capture train by 12/31/24
- Commercial operations of final carbon capture train by 6/30/25
- Full carbon capture operations through 45Q tax credit (2025 – 2037)





CO₂ Capture Technology

KM CDR Process™ Overview and Features



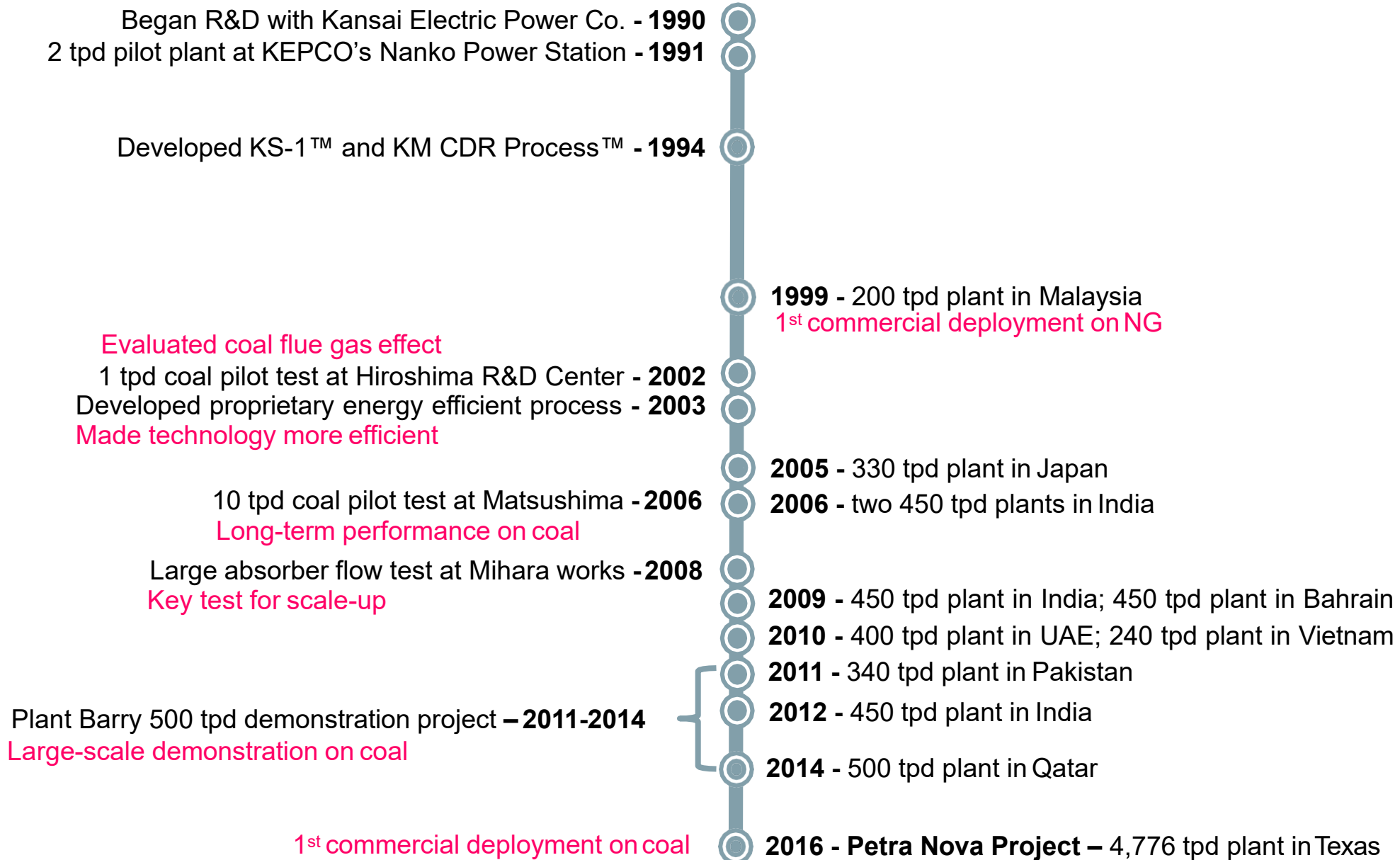
- Amine-based technology
- Capable of capturing ~90+% CO₂ from combustion gas sources
- CO₂ purity >99.9% (dry basis)
- Proprietary features developed over 29 years of experience

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

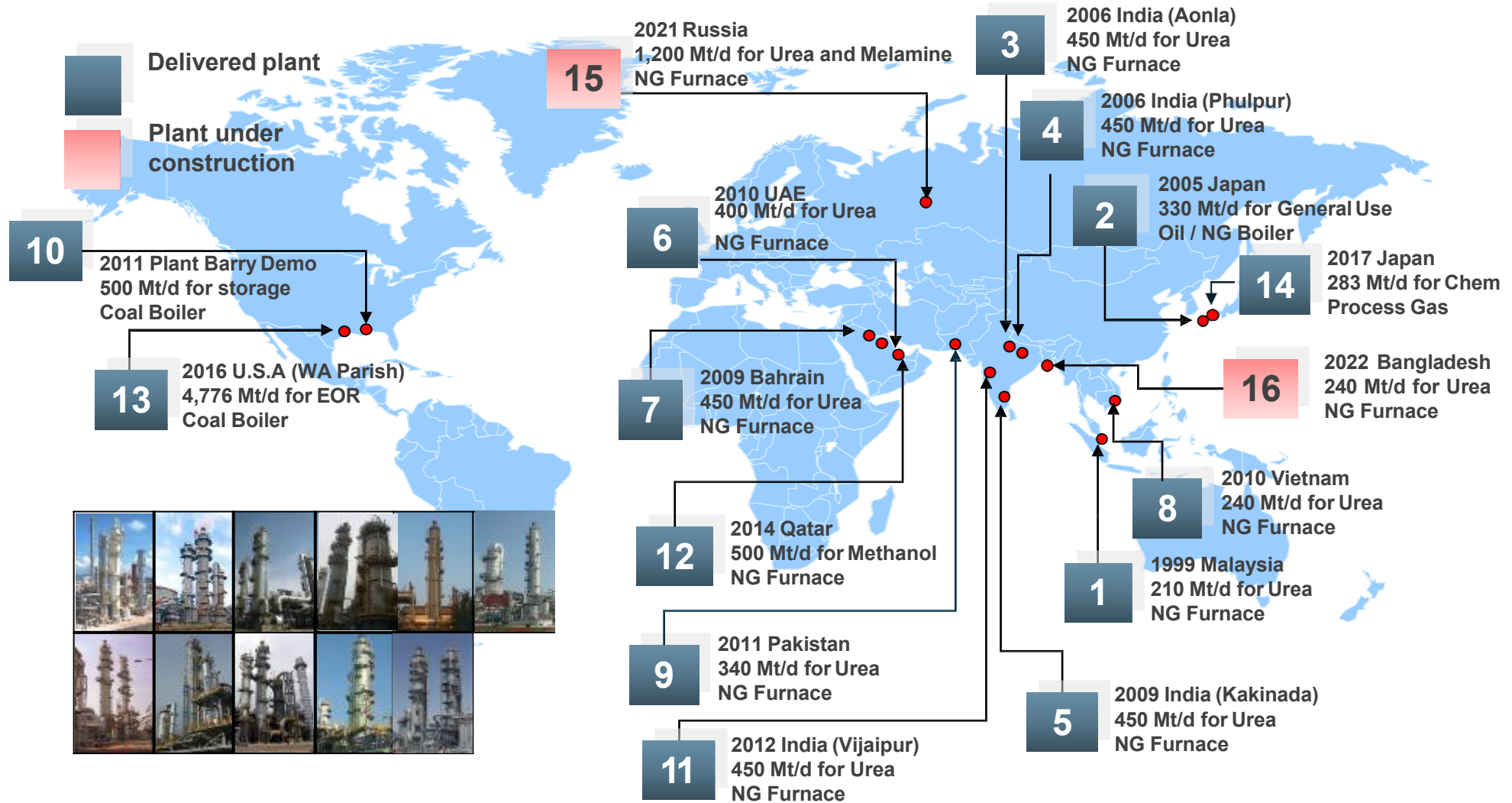
Heat integration system to reduce steam consumption

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

KM CDR Process™ Technology Development Timeline



MHI is the world leader in large scale CO₂ capture plant deployments.



MHI delivered the world's largest post-combustion CO₂ capture plant



Fall 2016 View of the Site

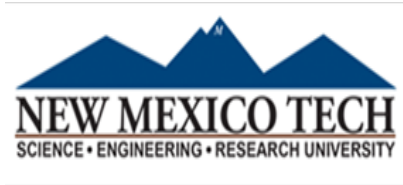
The Petra Nova Project is MHI's first commercial power project. Performance test was completed in December 2016.

- Plant is owned by NRG and JX Oil & Gas.
- Located at NRG's WA Parish Plant Unit 8 near Houston, TX.
- Captures 4,776 metric tons/day (240 MWeq, 90% capture) from a ~37% flue gas slip stream (1.4 million metric tons/year).
- MHI and TIC consortium provided full turnkey EPC delivery of the CO₂ capture plant.



CO₂ Utilization & Storage

CarbonSAFE III Partners to Study Direct Geologic Sequestration



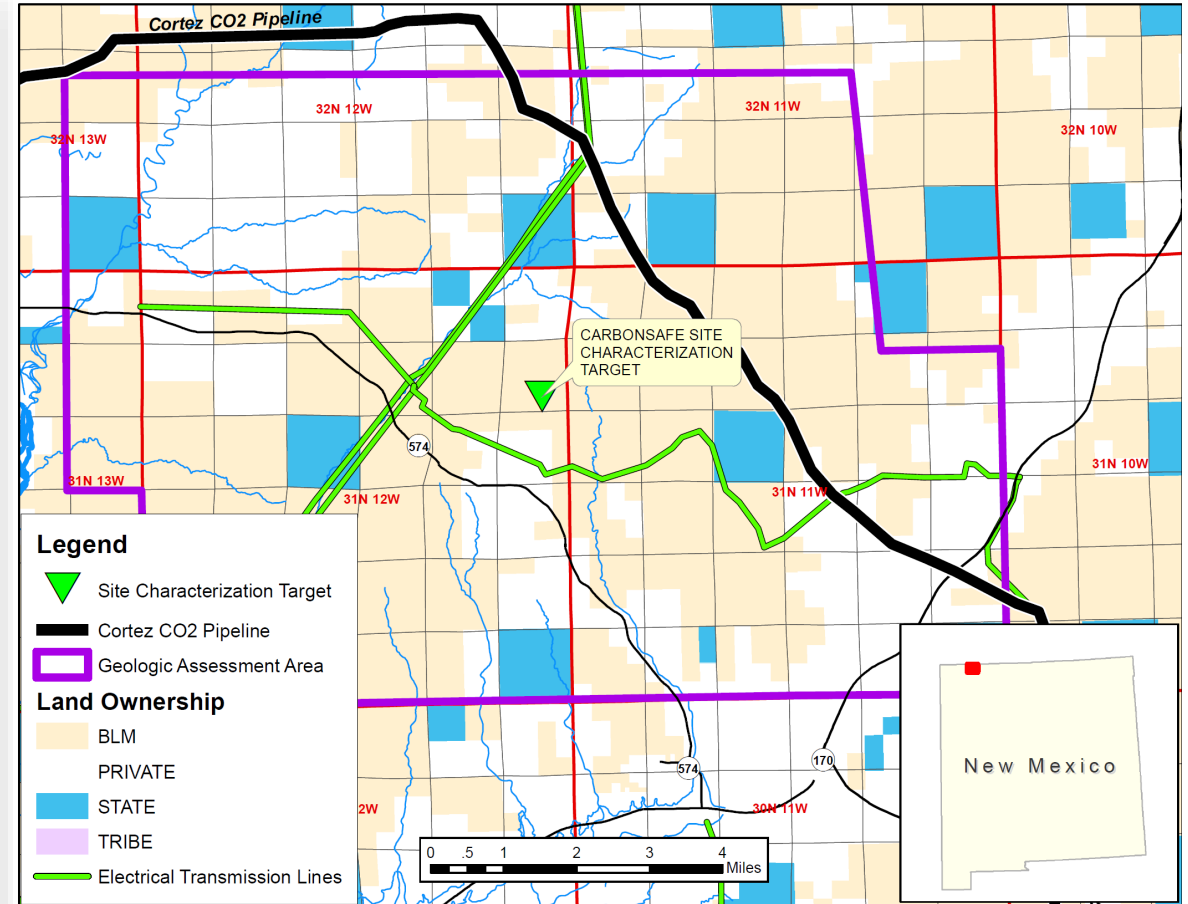
San Juan Basin CarbonSAFE Phase III Award by DOE: Ensuring Safe Subsurface Storage in Saline Reservoirs (DE-FE0031890)

Key Project Facts:

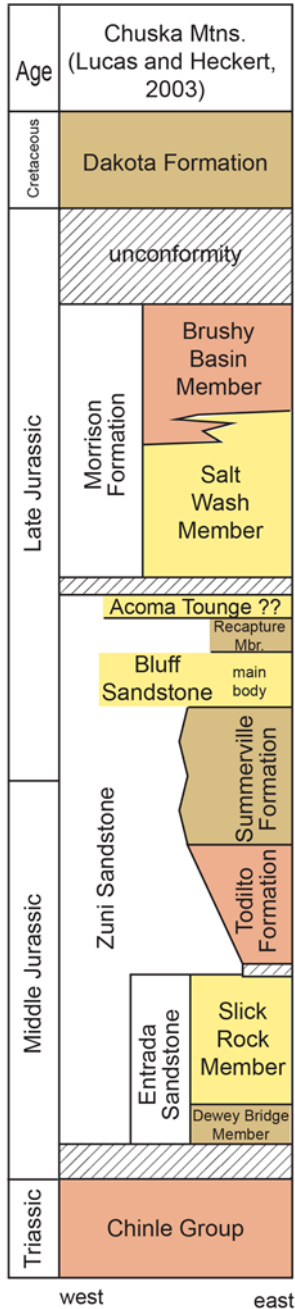
- **Total Project Cost: \$18,968,196**
- DOE share: \$14,616,376 and Private Cost Share: \$4,351,820
- Project Duration: October 2020 – September 2023
- Retrofit the San Juan Generating Station with ~6 MMT/yr. CO2 capture technology, locally store within San Juan Basin
- Strong corporate support with Hilcorp Energy & Schlumberger
- 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 beginning in Summer 2021
- Perform many, varied injectivity tests
- Perform suites of laboratory experiments and modeling based on acquired on-site data

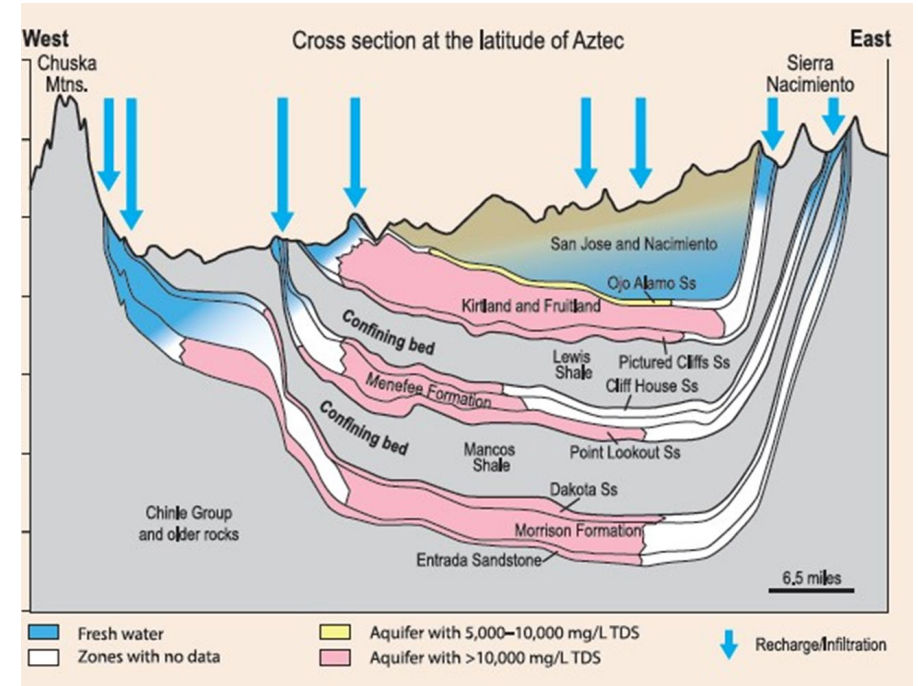
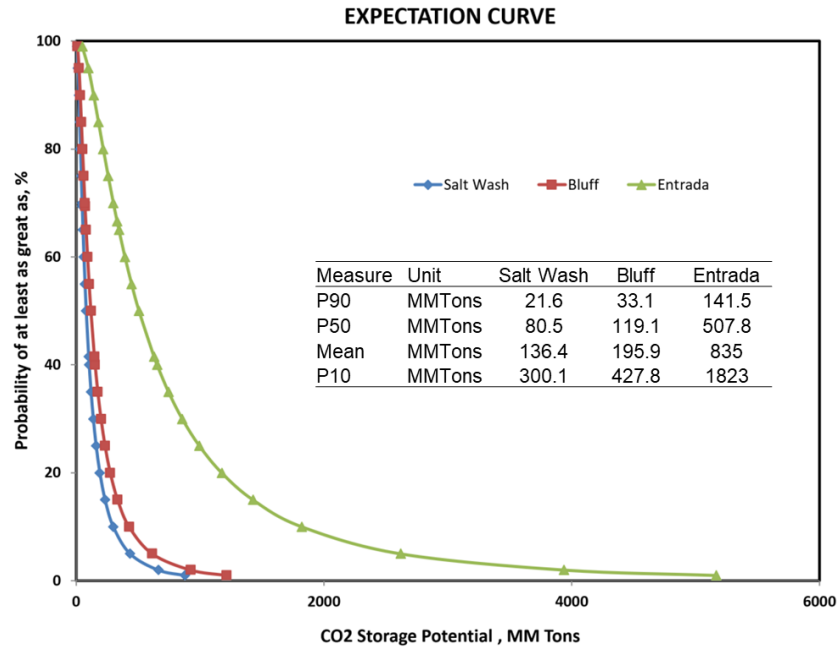


Storage Complex Geology at San Juan Basin



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	

CO₂ Purity Specifications from SJGS Carbon Capture Island to Direct Geologic Sequestration (with Enhanced Oil Recovery as Backup)

• Component	Specification
• CO ₂ Content	>95 mol%
• Water	<30 lbs./MMSCF
• H ₂ S	<20 ppm by vol
• Nitrogen	<4 mol%
• Sulphur	<35 ppm by wgt
• Oxygen	<10 ppm by wgt
• Hydrocarbons	<5 mol%
• Glycol	<0.3 gal/MMSCF
• Carbon Monoxide	<4,250 ppm by wgt
• NO _x	<1 ppm by wgt
• SO _x	< 1 ppm by wgt
• Particulates	<1 ppm by wgt
• Amines	<1 ppm by wgt
• Hydrogen	<1 mol%
• Mercury	<5 ppb by wgt
• Ammonia	<50 ppm by wgt
• Argon	<1 mol%

Delivered Pressure & Temperature

Pressure 2,020 – 2,120 psig

Temperature >65F and <120 F

Liquids: Product shall be free of liquids at delivery conditions and shall not produce condensed liquids in the pipeline at the pipeline pressure and temperature.

Compressor Lube Oil Carry Over: Compressor lube oil carry over in the product shall not exceed fifty (50) parts per million, by weight, and shall not cause fouling of pipeline, pipeline equipment downstream systems or reservoirs.

Impurities Deleterious to Pipeline, Equipment, Downstream Systems or Reservoirs: In addition to compositional limits listed above, product shall not contain impurities deleterious to pipeline, equipment, downstream systems or reservoirs.



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Thank You