

Subcommittee on Clean Coal and Carbon Management

The Future of the U.S. Coal Fleet: Retrofit, Retire, or Change the Business Model?

Monday, February 10, 2020

NARUC

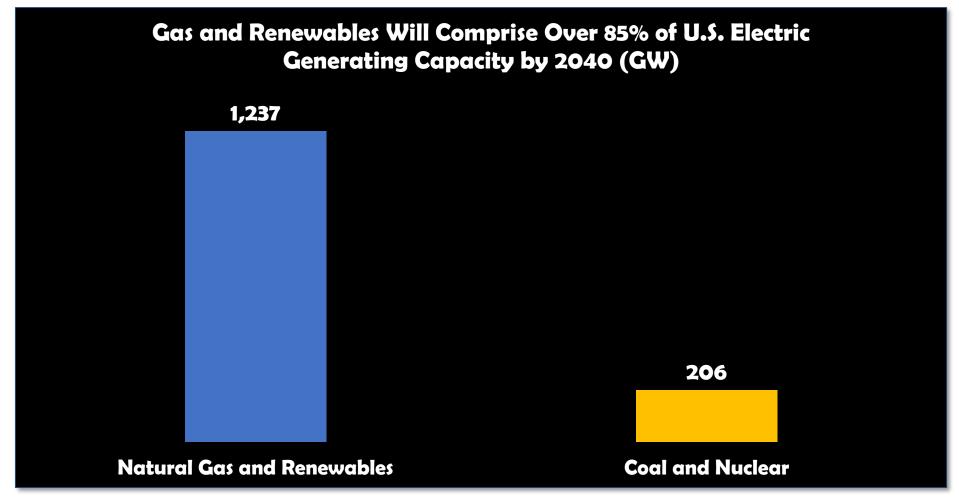
Subcommittee on Clean Coal & Carbon Management

"The Future of the U.S. Coal Fleet: Retrofit, Retire, or Change the Business Model?"

> Michelle Bloodworth February 10, 2020



The Grid is Becoming Less Fuel Secure



Source: EIA Annual Energy Outlook 2020.

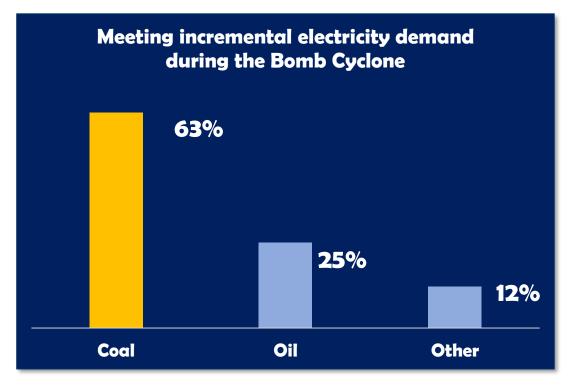
Coal Was Essential During Extreme Events

Polar Vortex

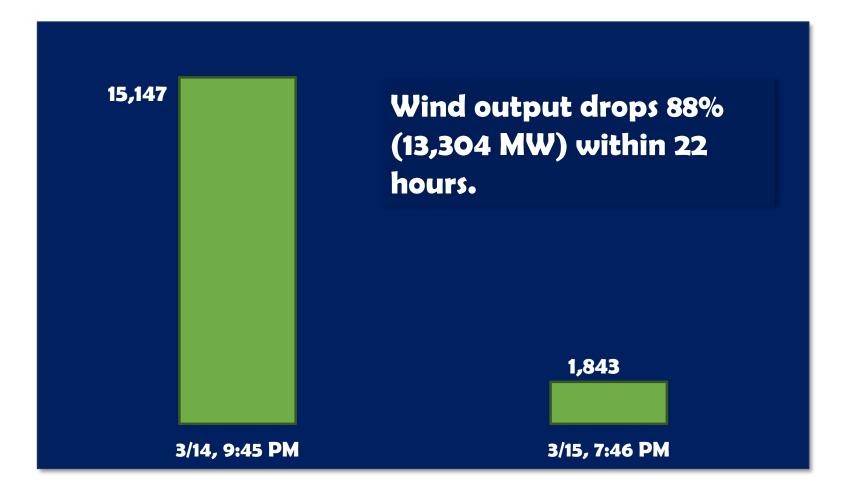
MISO was forced to follow emergency procedures to maintain grid operations on the coldest days in January 2019 because wind turbines were not able to produce electricity and a major gas compressor failed in Michigan.

Bomb Cyclone

During the worst of the storm in January 2018, the eastern U.S. would have suffered severe electricity shortages, likely leading to widespread blackouts, without the coal fleet.



Wind performance in SPP highlights the importance of having coal when it's needed.



Source: SPP.

New Sources Are More Expensive Than the Existing Coal Fleet



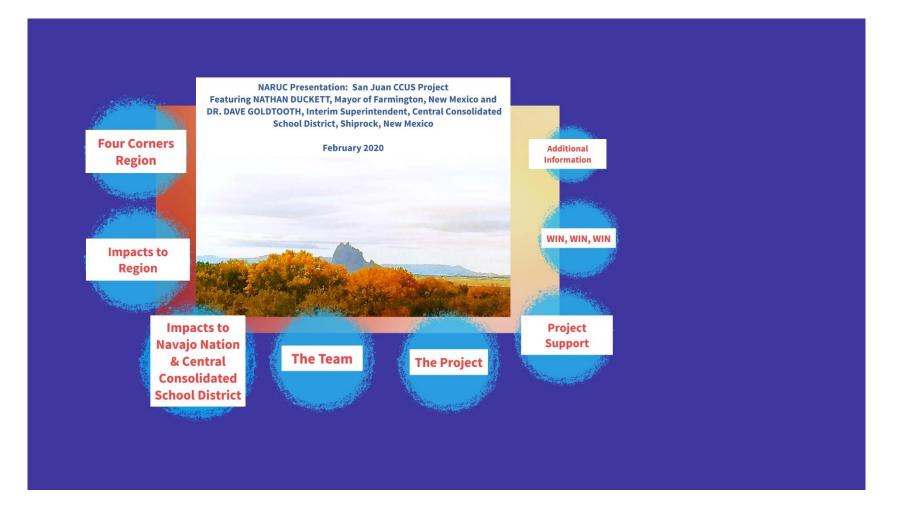
Levelized Cost of Electricity for New and Existing Resources (National Average, \$/MWh)



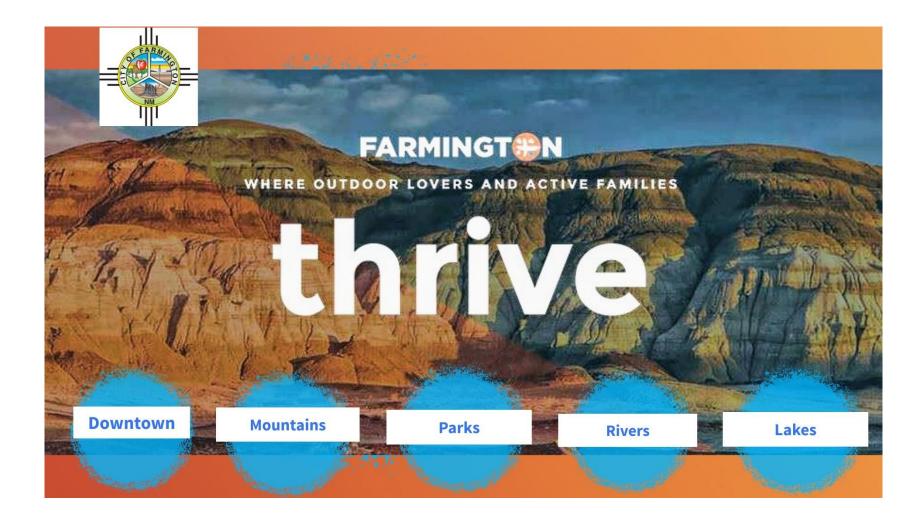
Farmington, New Mexico Mayor Nate Duckett Dr. Dave Goldtooth, Superintendent of Central Consolidated School District, New Mexico

www.Enchantenergy.com

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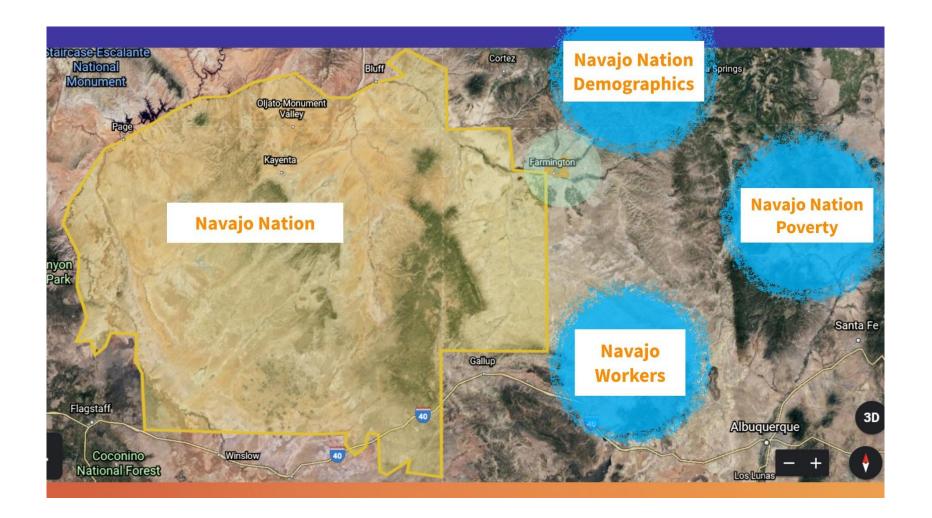








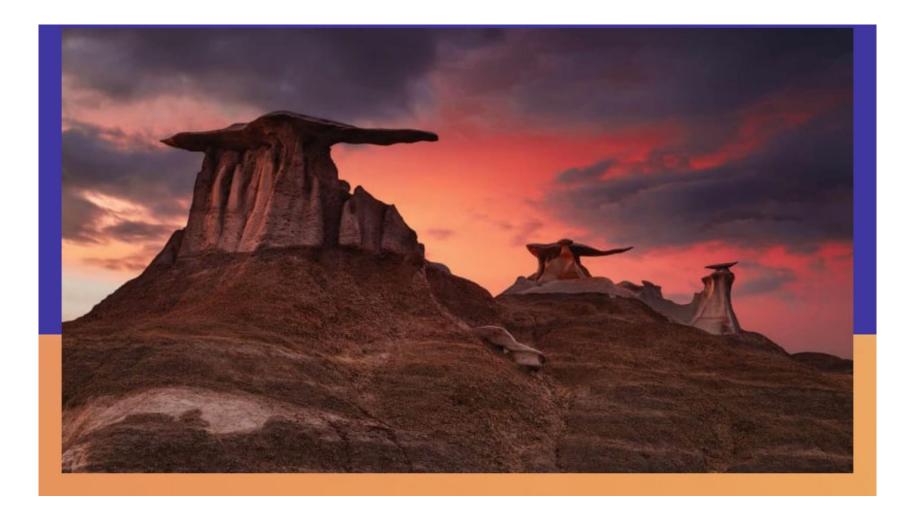


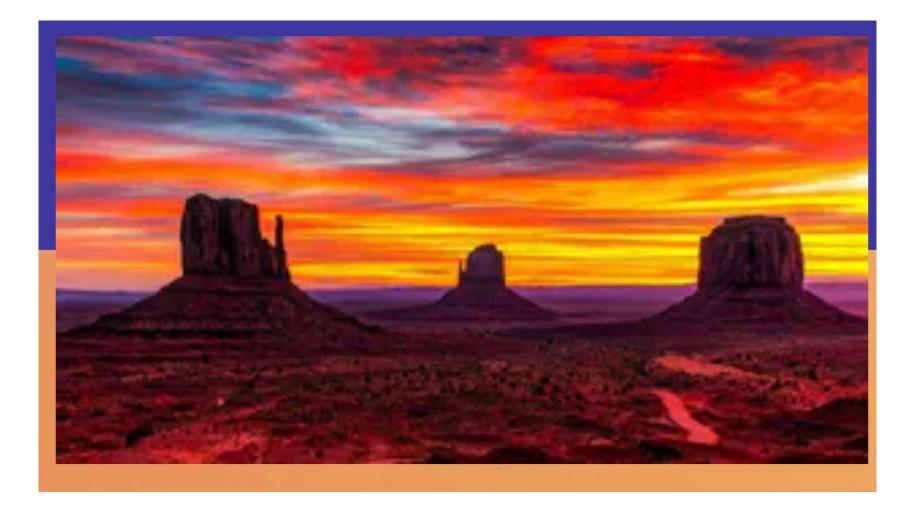


• The Navajo Nation is the largest reservation in the United States, covering more than 27,000 square miles and extending from Arizona into Utah and New Mexico - with a population of approximately 173,667 people. (The size of West Virginia).









Navajo Nation Poverty



 "The systemic poverty that pervades in Navajo Nation is nothing short of a national travesty." *

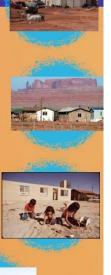
o On the reservation, an estimated 32% of all homes lack electricity, 31% do not have indoor plumbing, and 38% lack running water. In America. In 2019.

o The Navajo Nation is home to the poorest of the 10 largest Indian tribes. The poverty rate among the Navajo is three and a half times the national mean. The lowest median family income, \$13,940. The Navajo also had the lowest per capita income, \$4,788.

o More than 75% of Navajo school age children live in poverty. 100% of Navajo seniors over age 85 live in poverty.

o Approximately only 1/2 of Navajo students graduate high school.

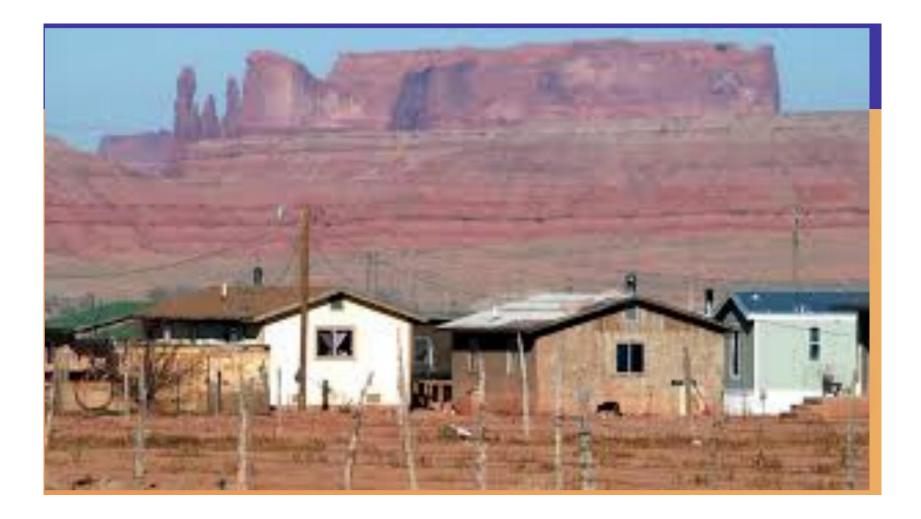
*Vincent DeGennaro, Jr., internal medicine physician providing medical services to Navajo residents, https://www.kevinmd.com/blog/2019/05/the-systemic-poverty-in-navajo-nation-is-a-national-travesty.html

















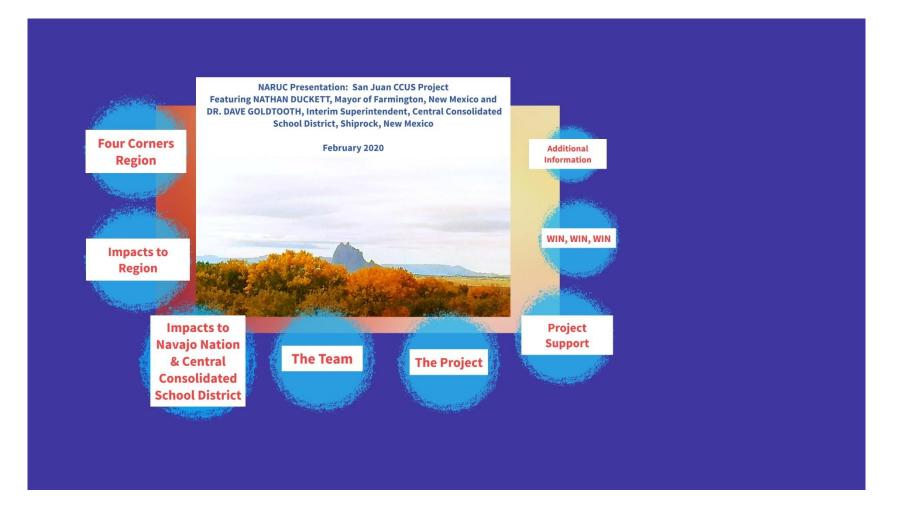
Navajo Workers

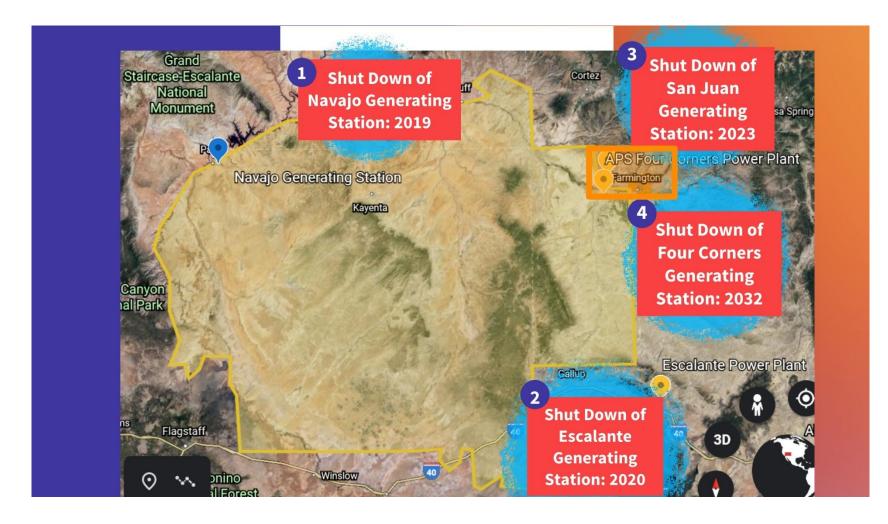


• Navajo workers support not just their immediate families, but support their extended families: Each salary derived from mine and plant salaries supports on average 20 to 30 people.

• Unemployment in Navajo Nation officially sits at 11% — nearly triple the U.S. average — but this number doesn't account for the 56% of adult Navajos who aren't considered to be part of the labor force at all. Taking those people into account, the unemployment rate is pushing 70%.

• A significant amount of the Nation's coal production facilities are located on Native American reservations. Coal Mines and coal fired plants are the primary employers on Navajo and many other reservations. Shut-down of coal mines and plants will have a disproportionate impact on Native Americans.

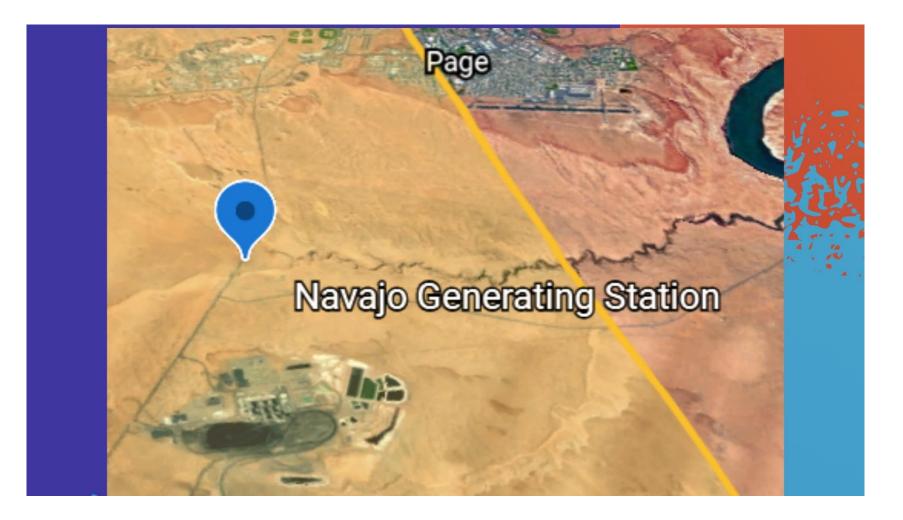




Based on independent third party review conducted by Four Corner's Economic Development:

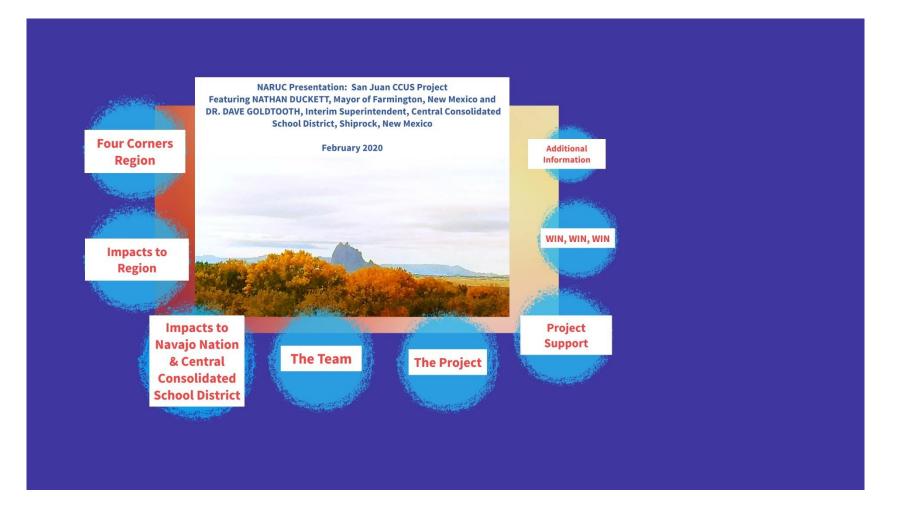
- Loss of at least 1500+ Direct workers including contractors, which figure does NOT include additional third-tier community job loss due to the reduction of worker-spending on goods and services within the local economy
- Loss of over \$ 50 million annually in state and local tax revenues
- Loss of over \$100 million in private wages
- Wipes out middle class in impoverished area
- Accelerated Erosion of Community and Families
- Loss of important educational property tax revenues
- Loss of Sizeable Corporate Charitable Donations to aid in social programs and educational scholarships











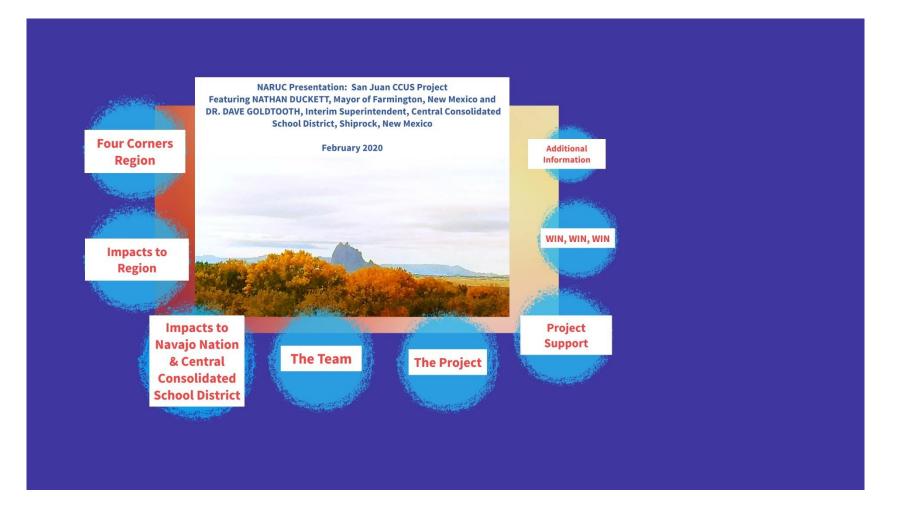
Impacts to Navajo Nation & Central Consolidated School District

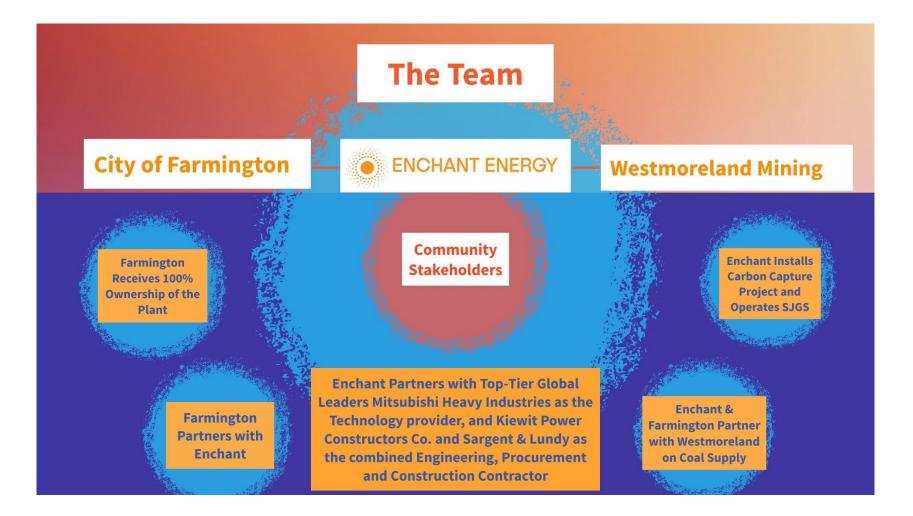
About 80% of the Navajo Nation's annual budget comes from revenues associated with extractive industry and supplies a majority of Navajo workers with good paying jobs, which has created a viable middle class.

Navajo Generating Station has already closed, Escalante is set to close in 2020, San Juan Generating Station is slated to close in 2022, and Four Corners **Power Plant** closure is set for 2032.

CCSD is comprised of over 90% Navajo Children - with some of the worst poverty rates in the country

SJGS and Four Corners are 80% of the Property Tax Revenues for CCSD. These funds are critical to the education of CCSD children





To achieve a Win, Win, Win for the community the Team is conducting ongoing community listening tours and outreach to:

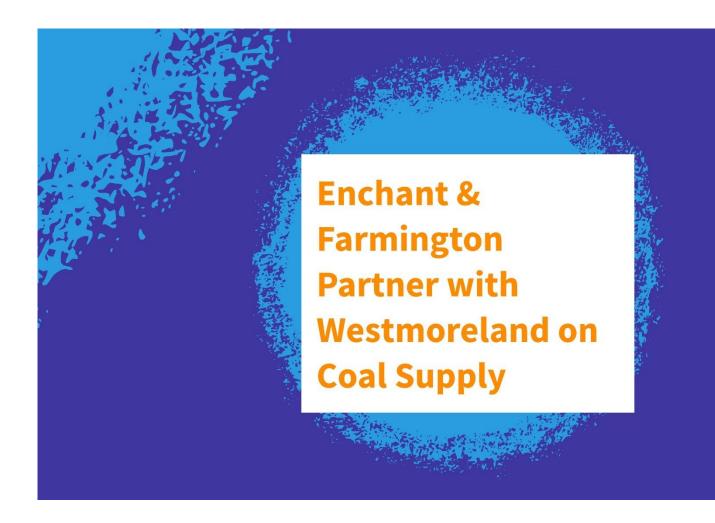
- Central Consolidated School District
- San Juan College
- Surrounding Communities
- Navajo Central and Local Governments
- Charitable Groups
- Economic Development Groups
- Environmental Advocates



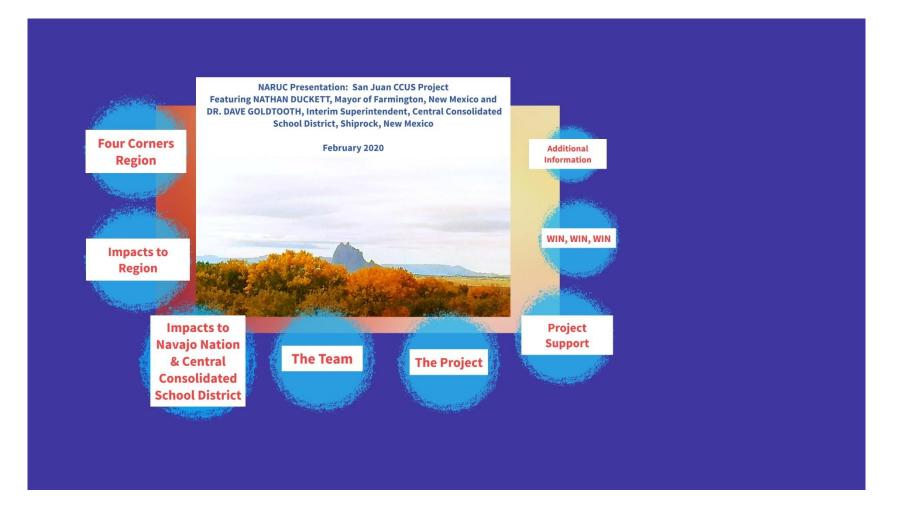


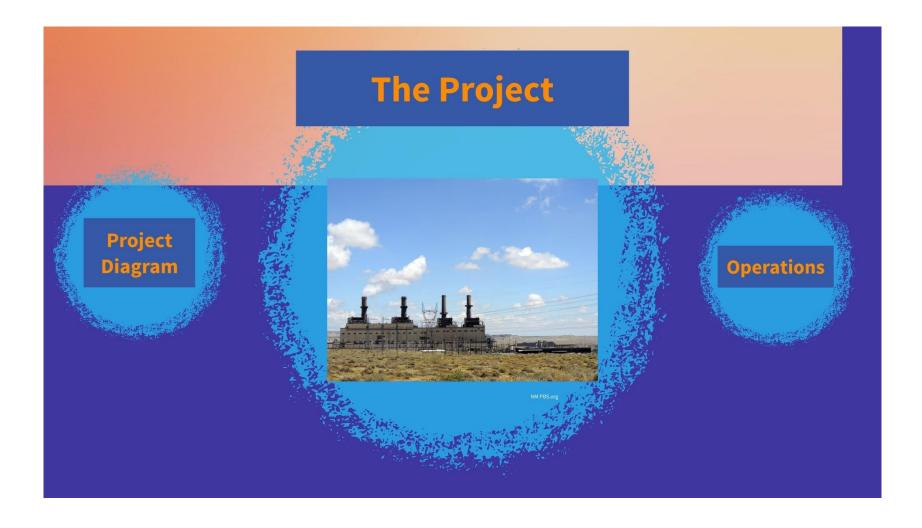


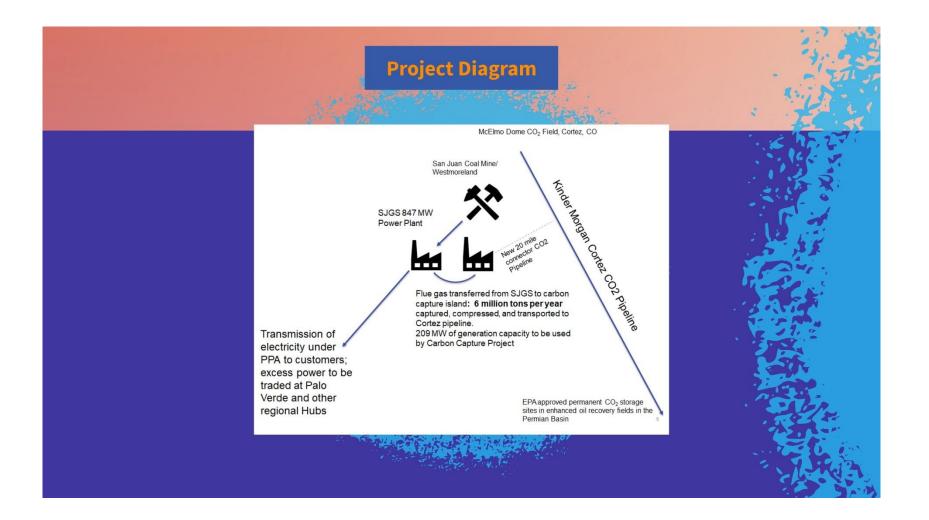


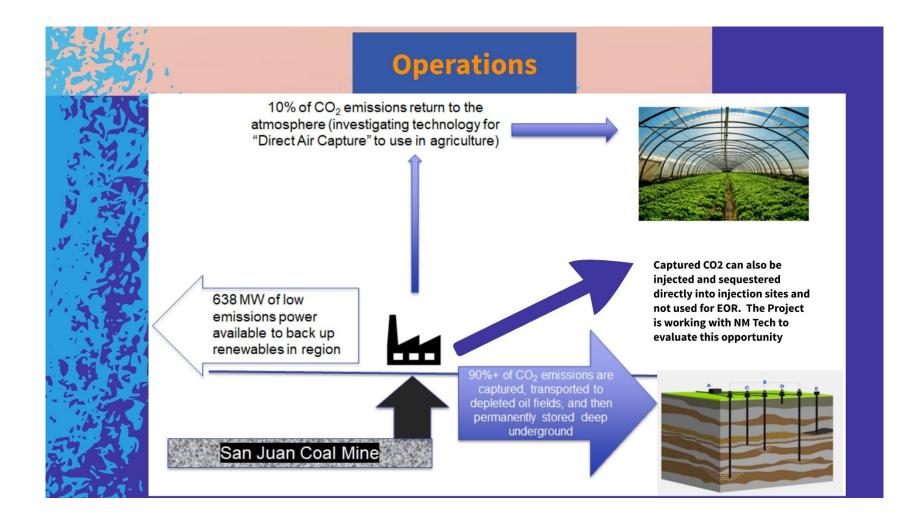


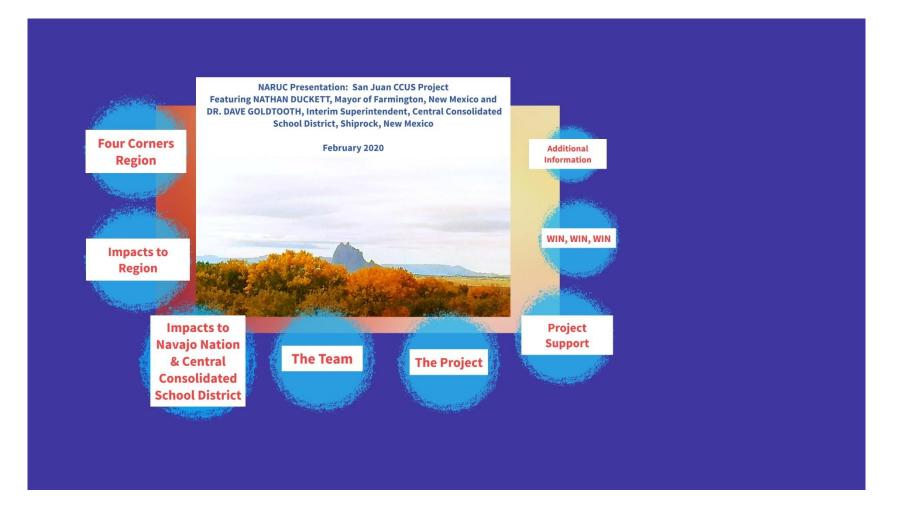
















The Technology is Proven

- Petra Nova
 - Retrofit of 240 MW unit in multi-unit coalfired power plant near Houston
 - Completed December 2016 after 30-month construction period: on time and under budget
 - Capturing 1.4 million metric tons per year with 90% capture rate for over 2 years
 - Technology from Mitsubishi Heavy Industries
- Boundary Dam
 - Retrofit of 110 MW unit in multi-unit coalfired power plant in Saskatchewan, Canada
 - Currently capturing 2,400 tons per day equivalent to 876,000 metric tons per year
 - Commissioned in October 2014
 - Technology from Cansolv division of Shell
- San Juan Generating Station
 - Retrofit 2 coal-fired units with combined 847 MW of electric generation capacity with CCUS equipment.
 - Will Capture 6 million metric tons per year starting in 2023 or earlier if possible.

-





Federal Bi-Partisan and International Support:

Applying the Amine process to power plants was developed over ten-year period with support from Obama DOE, Canadian Department of Energy, and Trump DOE.

Carbon Capture Technology is Gaining Momentum: large scale has global impact

Proportionate share of emissions globally - can be leader to create global change and support climate change

Somebody needs to take carbon capture to the next level – why not us?

Perfect situation for carbon capture retrofit with the greatest circumstances for success:

- proximity of the Kinder Morgan CO2 Pipeline
- \$500 million in state-of-the-art pollution control equipment
- economies associated with mine-mouth coal
- ready CO2 market
- regional need for reliable, economic baseload power

The Buzz About the Enchant/Farmington CCUS Project



DUtility DIVE

New Mexico must apply clean energy law to the San Juan coal retirement, but CCS could still save plant January 31, 2020 · By Catherine Morehouse

"Farmington and Enchant said the ruling does not deter their plans for the plant — which include retrofitting the facility with carbon capture technology and taking over 95% of its ownership. The ETA leaves the door open for carbon capture until 2045 and PRC staff advocated for this method in November testimony on the proceeding."

"Carbon capture and storage (CCS) technologies must be part of the portfolio of solutions to decrease emissions from energy-intensive sectors and existing infrastructure, as well as remove CO2 already present in the atmosphere."

"To achieve net-zero, mitigating emissions will not be sufficient. Removing CO2 from the atmosphere will be needed, and the deployment of negative emissions technologies is gaining traction."



US leads new wave of carbon capture and storage deployment January 5, 2020 * By Brad Page





LANL: San Juan CC2 capture feasible December 19, 2019 • By Kevin Avita-Robinson

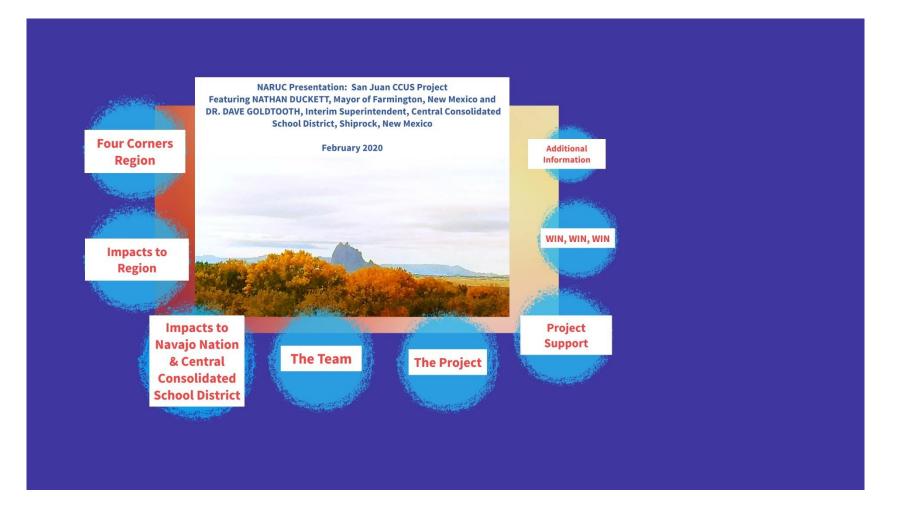
"The study concluded that the technology, to be supplied by Mitsubishi Heavy Industries Engineering Ltd., is well proven and can capture up to 90% of carbon emissions at San Juan, which is Enchant Energy's goal. The technology is already deployed at Petra Nova in Texas, which is the only commercial carbon capture plant currently operating in the U.S.

Bloomberg Green

Energy chiefs tout CO2 capture as Thunberg slams lack of action January 21, 2020 • By Francine Lacqua and Jeremy Hodges "Capturing carbon dioxide from the fossil-fuel industry is key to slowing dangerous global warming, energy chiefs said in Davos, as climate concerns dominated the annual business forum more than ever before."

"Oil and gas producers are under mounting pressure to help prevent a damaging rise in temperatures, and carbon capture is increasingly luring investors as a tool to curb emissions."



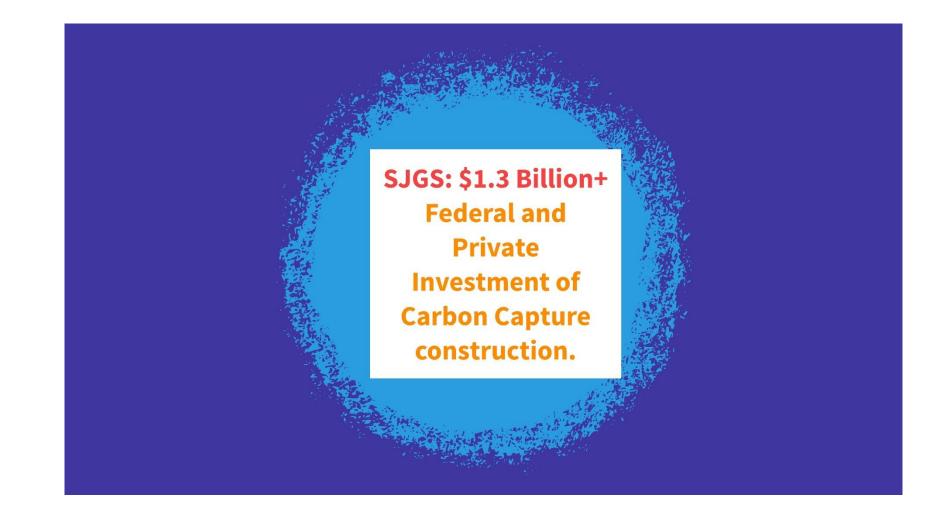








SJGS: \$50 million+ annually in state and local tax revenues are preserved by using Carbon Capture to extend life of plant





International Pioneer New Mexico becomes a global leader in Carbon Capture and develops workforce to apply Carbon Capture Technology in other high CO2 emitting plants across the United States.









Installation of Carbon Capture Technology provides additional learning opportunities and career paths for our children so they can raise their families with family right here at home.



Protects the Well-Being of the Community

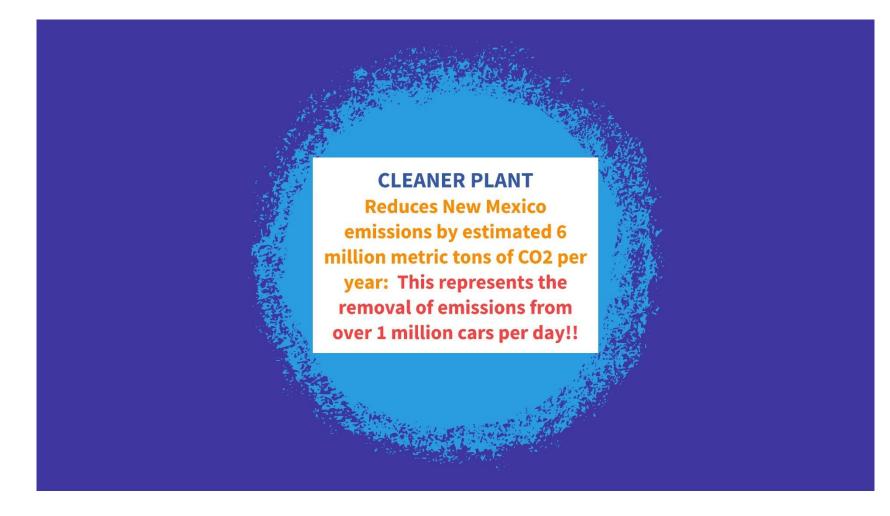
The Project Benefits the Community environmentally, economically and socially

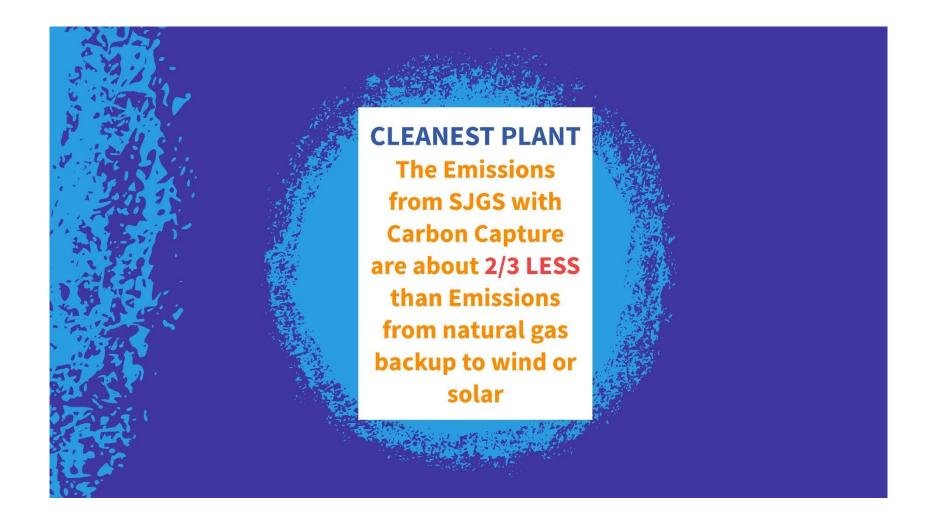
The Project will include community stakeholders and will work with CCSD, Chapters and other educational and governmental entities

The Project will help avoid disruption to families and the education of our children



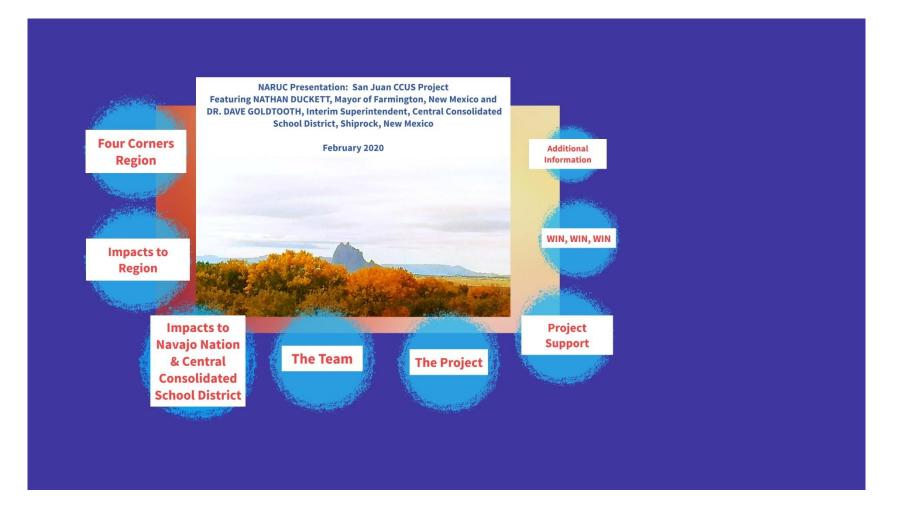


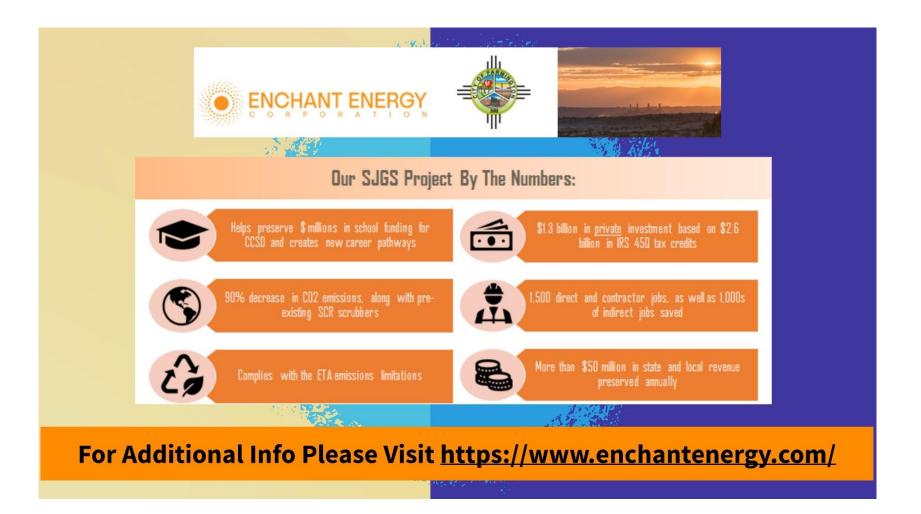


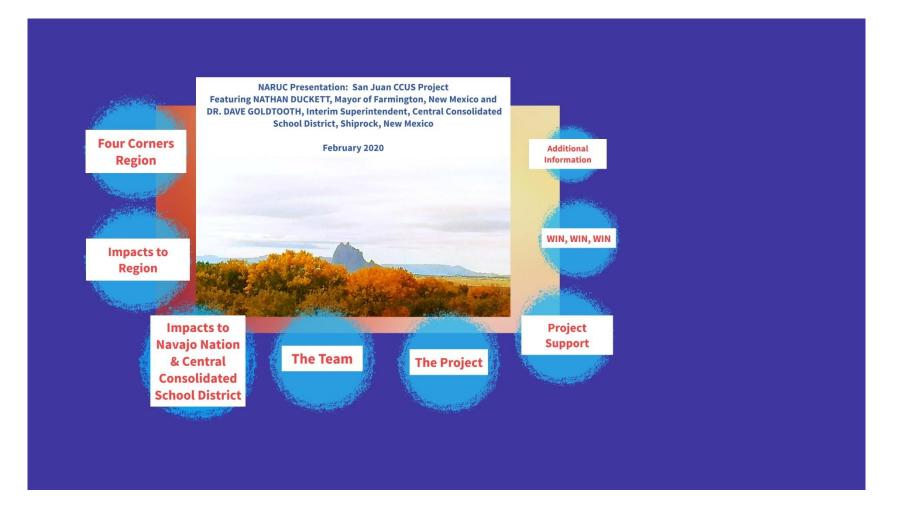














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