Developing Low Carbon Baseload Power

Pure Air Energy, LLC

Reduced Emissions with Tailored Carbon Capture Utilization and Storage

Important notice and safe harbor

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Problem: Coal and Baseload Power

- Coal remains an important producer of baseload power at a time of increasing US demand from data centers, electric vehicles (EVs), and the onshoring of manufacturing.
- Deficiencies in access to baseload power is both placing the US electricity grid at risk and stunting the growth plans of many of America's largest companies such as Microsoft, Nvidia, Google and Meta.
- Measures to protect air quality have forced utility companies to announce the closure of many of their coal plant operations.
- The scheduled shutdowns will further exacerbate US demand and supply imbalances.

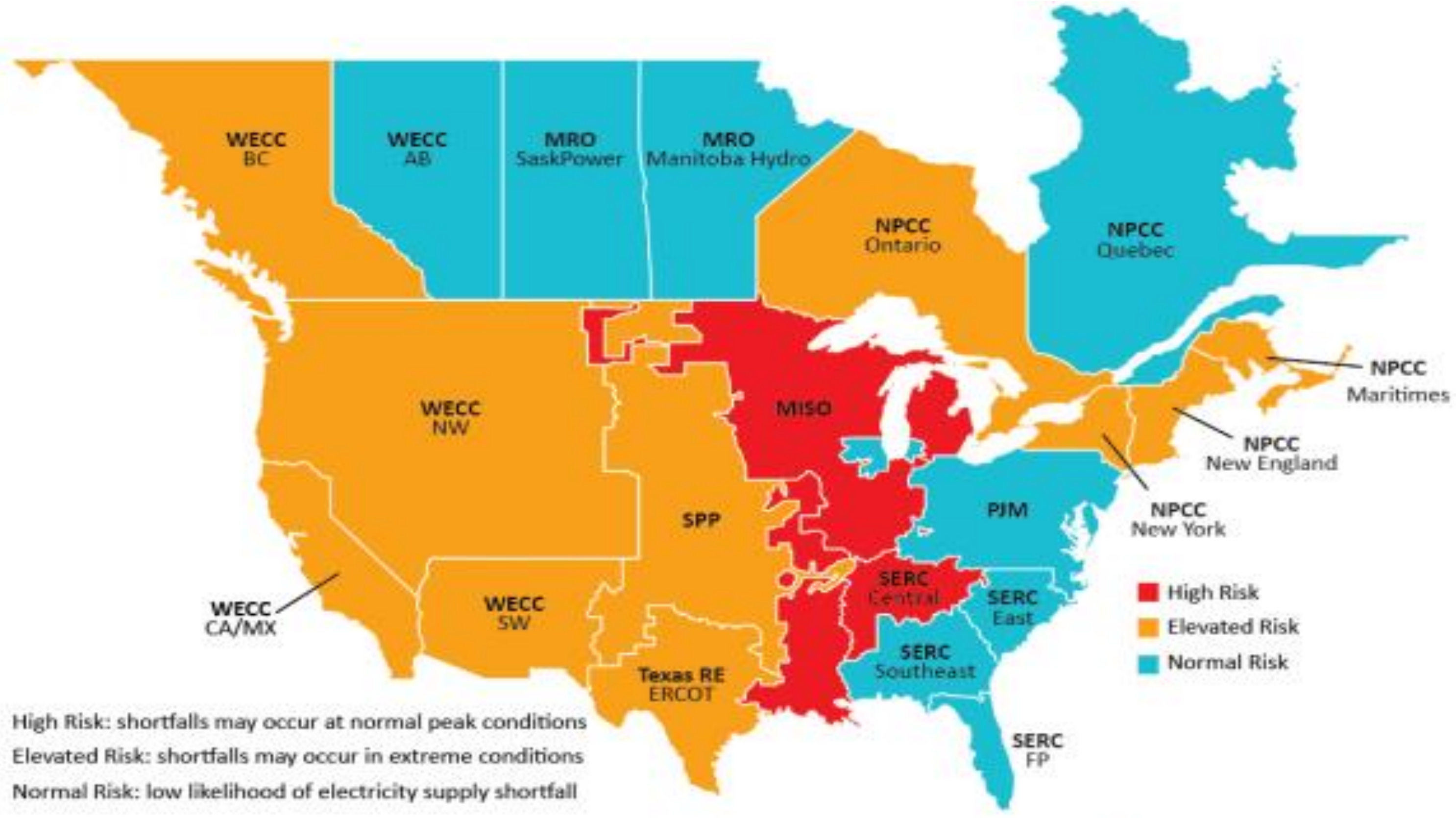


Figure 1: Risk Area Summary 2024–2028[8]

PAE's Clean Solution:

- PAE contributes to the US electrical grid capacity and stability through:
  - Conversion of existing coal power plants to natural gas, known as Coal-To-Gas Repowering (CTG).
  - Construction of efficient Combined Cycle Gas Power Plants (CCPP).
  - Evaluation and storage of emissions in depleted oil fields known as Carbon Capture Utilization and Storage (CCUS).
- CTG improves economics of electricity generation while reducing carbon emissions by over 37%.
- CCPP leverages advanced technologies to maximize efficiency and reduce environmental impact by utilizing a combination of gas turbines, steam turbines, and heat recovery steam generators (HRSG).
- CCUS will reduce emissions while improving economics through carbon credits under IRA 45Q.

	CO2 Emissions
CTG	37.5% Reduction
	Average Thermal Efficiency
Conventional Power Plant	30-40%
CCPP	50-60%+
	Carbon Credits Under 45Q
CCS/CCUS	$85/$60 per Ton of CO2

Coal-to-Gas Repowering, CTG

Repowering an existing coal plant to operate on natural gas can be more cost-effective than building a new plant. The Electric Power Research Institute (EPRI) notes that repowering can save about 20% of the capital cost compared to constructing a new power plant.

Advantages include:

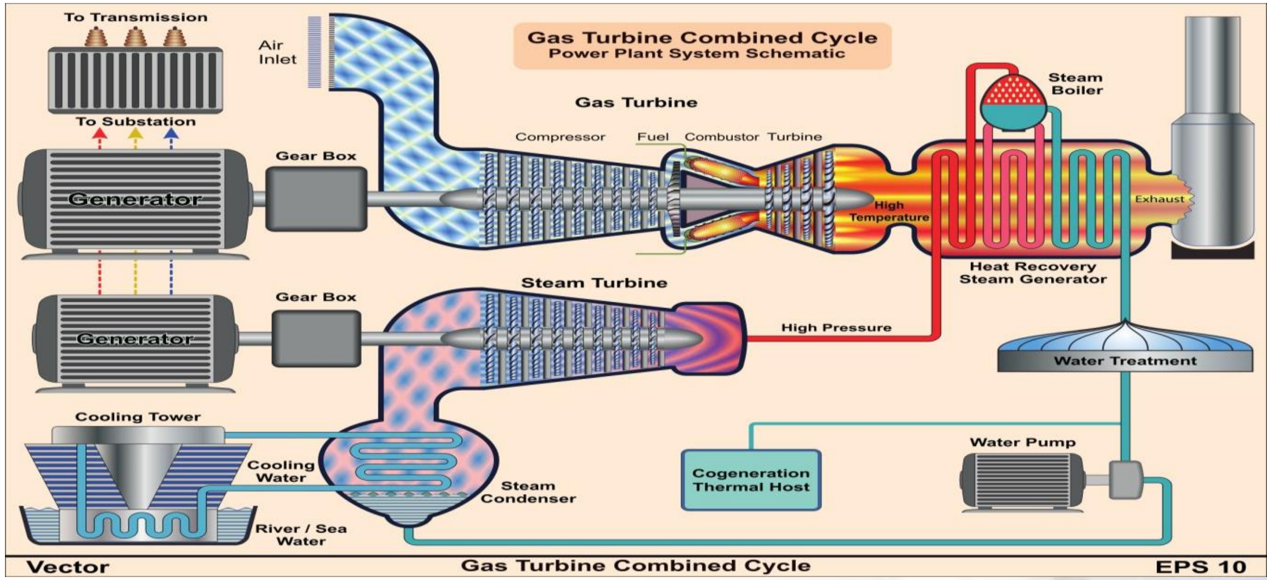
- Opportunity to reuse operating and environmental permits, equipment, facilities, water access and storage.
- Retainment of existing workforce and management expertise.
- Located next to infrastructure such as roads, railways, pipelines.
- Uninterrupted revenue stream from ongoing power plant operations during conversion to natural gas.

Reference: https://www.power-eng.com/coal/repowering-with-gas

Combined Cycle Power Plant - New Built

Clean and efficient CCPP capacity can be achieved through the following process:

- Natural gas is burned at a high temperature to produce very hot gases – which are passed through a gas turbine to generate electricity.
- Instead of being released, the exhaust gases pass through a Heat Recovery Steam Generator (HRSG) to generate steam.
- The steam is then sent to a steam turbine to generate additional electricity.
- The steam is cooled in a condenser to return to water.
- The condensed water is pumped back to the HRSG to be reheated and start the cycle again.



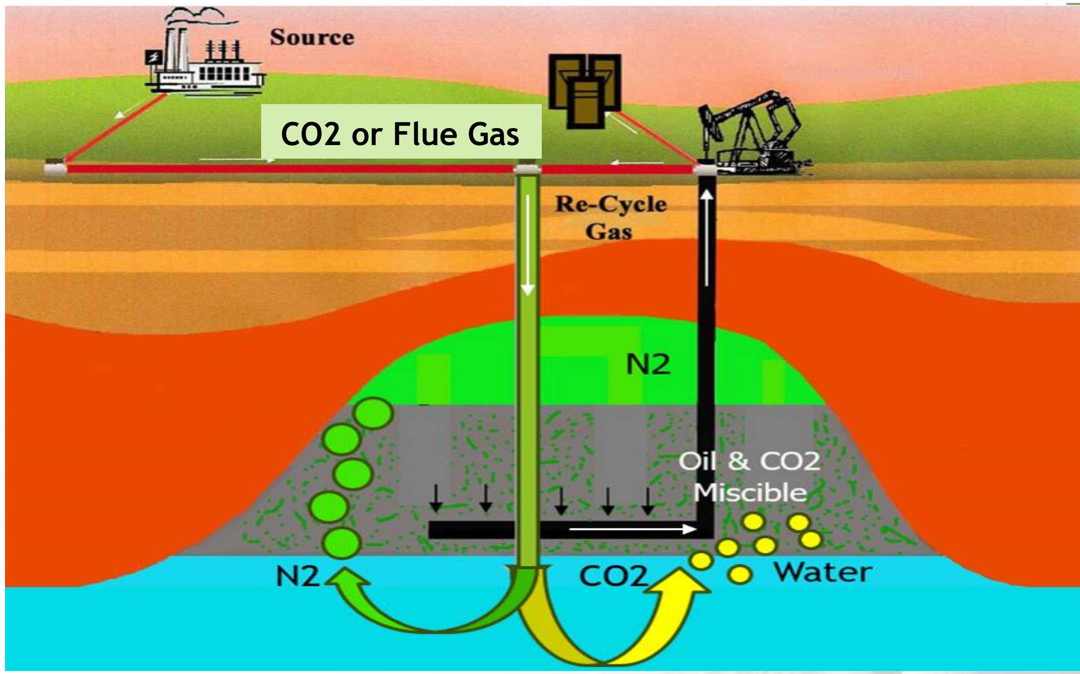
PAE experts evaluate opportunities to build, own, and operate CCPP facilities

Carbon Capture, Storage & Utilization (CCUS) in Depleted Oil Fields

PAE primarily focuses on CCUS in power plants adjacent to depleted oil fields and has compiled a short list of promising opportunities in three States.

Depleted oil fields offer several strong advantages for sequestration:

- The geological characteristics of property already established.
- They possess existing capped drill wells and monitoring systems.
- They are advantageously located next to infrastructure such as roads, railways, pipelines.
- Grandfathered rights of access eliminate obstacles to permitting and licensing
- Potential to acquire property/property rights at a discount
- Potential for additional revenue generation from enhanced oil recovery (EOR) that can offset the cost of sequestration



Reference: "APPLICATION OF CARBON CAPTURE AND SEQUESTRATION IN MATURE OIL&GAS FILEDS" Shane S Mohammadi and M Reza Fassihi, Oilman Magazine, Jan-Feb 2024.

Economics of CTG, CCPP and CCUS with EOR

Coal-To-Gas Repowering (CTG)

NPV12 = $345 MM, IRR > 50%

Combined Cycle Gas Power Plant (CGPP)

NPV12 = $301 MM, IRR > 50%

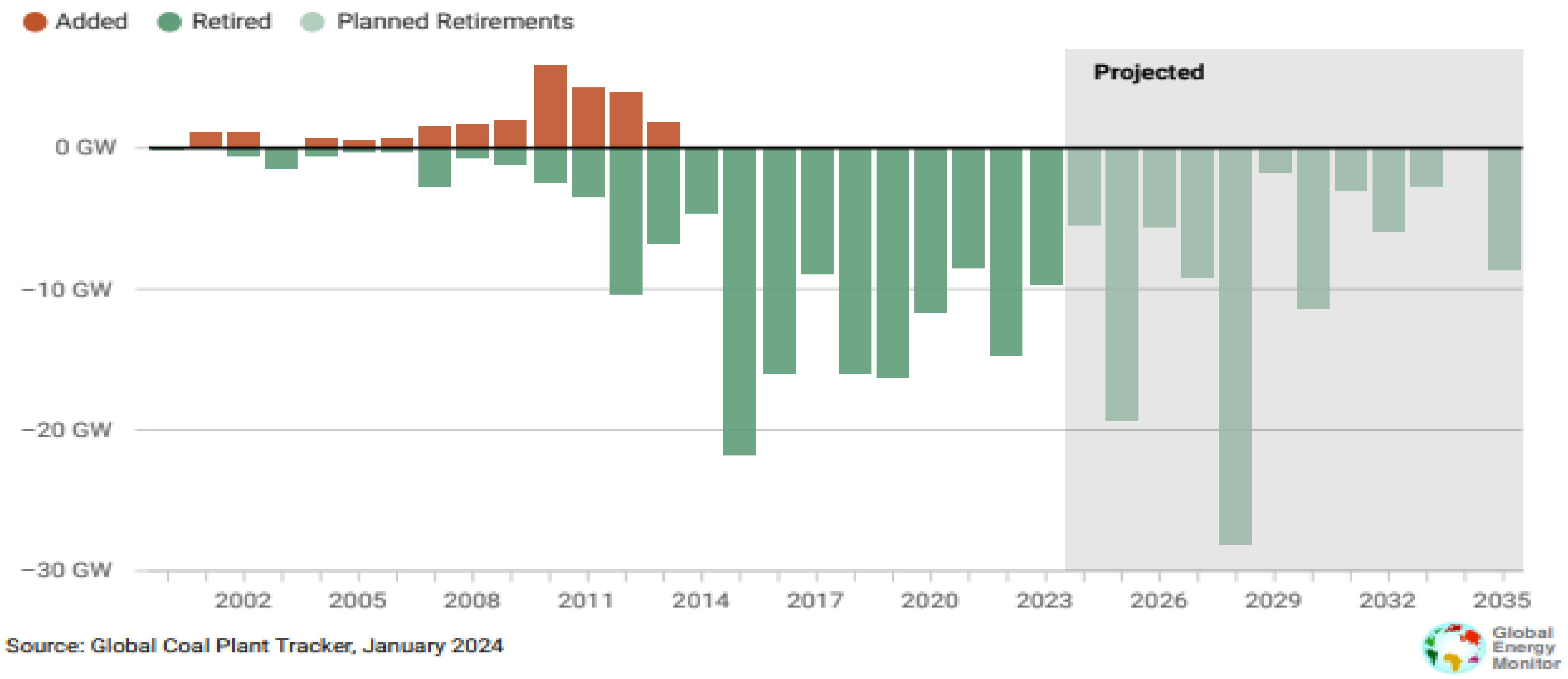
Carbon Capture Utilization and Storage (CCUS) with EOR

NPV12 = $746 MM, IRR >100 %

References:
1. Figures are based on conversion or capture of carbon emissions from a 600 MW power plant
2. https://www.power-eng.com/coal/repowering-with-gas
3. EIA “Capital Cost and Performance Characteristics for Utility-Scale Electric Power Generating Technologies”, Jan 2024
4. CO2 recovery factor: "Enhanced Oil Recovery Field Case Studies" by James J. Sheng (2013)

Our Target Market for CTGs

Coal-fired power capacity added and retired in the United States (2000-2023) and planned Retirements through 2035, in gigawatts (GW)

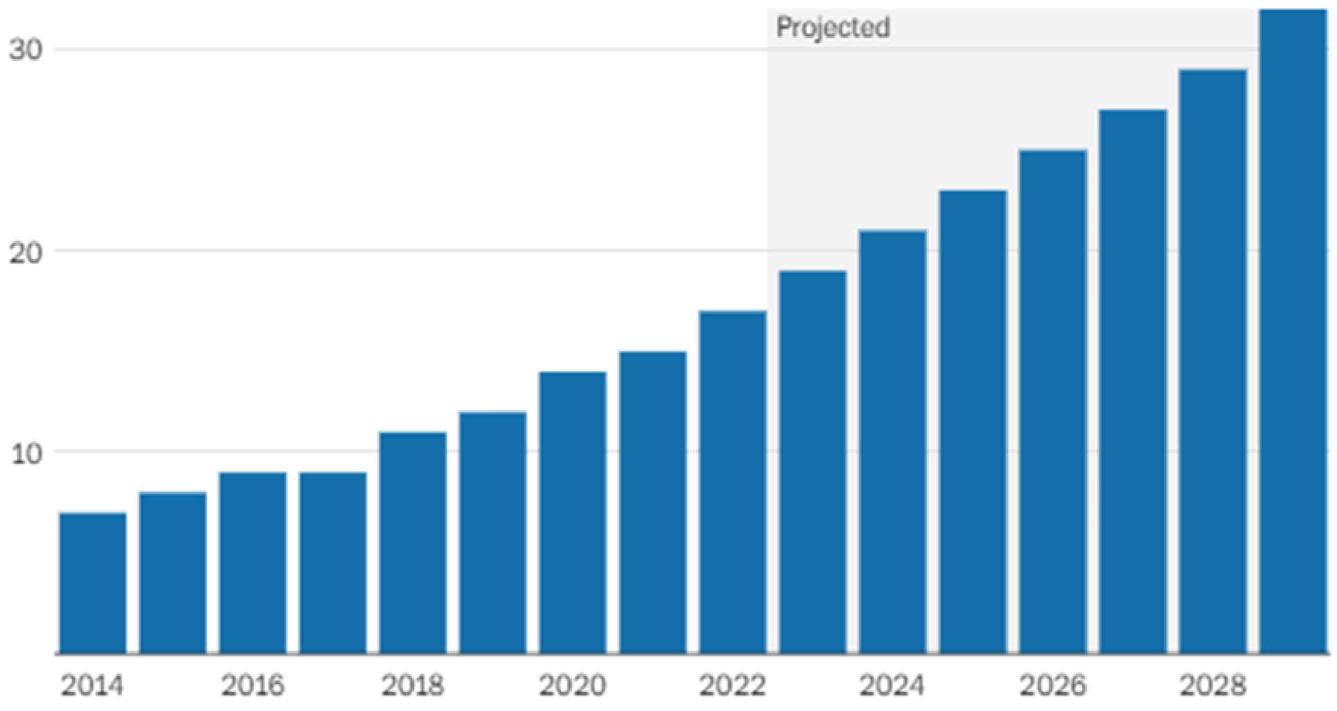


Our Target Market

- In 2022, America's 2700 data center locations consumed just over 4% of the country's total electricity demand.
- This number is projected to increase to 6% by 2026 and 9% by 2030.
- A major factor behind the skyrocketing demand is the rapid expansion of artificial intelligence which requires about 10x the electricity of traditional internet searches.
- CTG and CCPP with CCUS are environmentally friendly, reliable, and more cost-effective than alternatives such as nuclear or renewables.

U.S. data centers tax the power grid

Data center energy demand, in gigawatts. Each gigawatt is roughly the amount of power generated by a large nuclear plant.



Source: McKinsey and Company, January, 2023.

PAE Qualified Target Power Plants for Conversion and/or CCS/CCUS*

	Deseret Power Electric Cooperative	Vistra Energy	PacifiCorp	American Electric Power	LUS Lafayette Utilities System	Talen Energy
Scheduled Decommission Date:	2033	2027	2027-2039	2026	2028	2028
Aggregate Size**: (MW)	499	665	818	473	558	1,558
Operational Units:	1	1	4	1	1	3
Distance to Oil Field: (Miles)	<1.0	<1.0	3.6	20-30	30	30-50

Notes:
* An additional 29 candidates have passed our initial screening and will be included in detail ranking during the early planning phase
** Aggregate MW from all units
** Refers to specific generating unit #, consisting of a boiler, turbine, generator, and auxiliary equipment

Management Team

William Divine, Chief Executive Officer

Over 45 years of experience in all aspects of the energy industry all over the world.

Co-Founder of companies that were some of the most successful start-ups in the history of the industry.

Bill has a vast amount of experience in many countries around the world with an extensive network of industry relationships and capital sources for energy projects worldwide.

Shane Mohammadi PhD, President

Dr. Mohammadi brings extensive expertise in the planning, execution, and management of major capital projects. Over the course of his career, he has contributed to project management teams for several high-profile LNG, Oil & Gas, Power, and Pipeline projects with ExxonMobil and Unocal.

Earlier in his career, Dr. Mohammadi specialized in Enhanced Oil Recovery, LNG/LPG production, and the fundamentals of heat transfer. His current work focuses on integrating cutting-edge technologies to enhance electrical generation efficiency while reducing the carbon footprint of Coal and Gas power plants.
Dr. Mohammadi holds a PhD in Chemical Engineering and an Executive MBA from the UNC Kenan-Flagler Business School. He is a graduate of MIT and the Colorado School of Mines.

Michael Paterson, Business Development Officer

Holding an MBA and MA, Michael brings 15 years of business management experience.

Serving the last 5 years as President of AMECA Mining Inc and Aliya Mining LTD, he has developed a large network of investors in the natural resources space.

Michael is currently a business advisor to Volt Carbon Technologies Inc, Solid Ultrabattery Inc and Carbonon Bio Farms.

Amir Sardari, Chief Technology Officer

Amir is a holder of several patents, especially the Advance Heat Recovery systems, Advance Combine Cycle Co-Generation And Abatement System™ as well as new applications on innovative technologies in energy efficiency, waste to energy and Renewable Energy system.

Amir started his career as Worldwide Project Manager for Dresser Industries in energy, Oil & Gas recovery, offshore drilling and power generation design. Designed and supplied many complex power generation systems from Waukesha Engine Division of Dresser Industries for various applications of wastewater treatments, Oil field and offshore platforms. Later, as VP of Power generation at Cummins Power and Atlas energy System specializing in UPS (Un interruptible Power Supply) and power quality systems.

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Addendums

1. US Government Financial Incentives

2. Utilizing Compressed Nitrogen Energy Storage (CNES) to Transform a Depleted Oil Reserve into a Giant Battery

Addendum 1:
US Government Financial Incentives

The U.S. federal government offers a variety of financial incentives and programs to support the conversion of coal plants to natural gas, though the specific incentives available depend on the nature of the project. The following are some of the key programs and policies that may be applicable to coal-to-natural gas conversion projects

Federal Program	Incentive
Advanced Energy Project Credit (Section 48C)	**Eligibility**: At least $4 billion in tax credits for advanced energy projects, including those in areas affected by coal mine closures or coal-fired plant retirements. **Credit Amount**: This credit offers up to 30% for qualifying investments.
Clean Electricity Production and Investment Credits (Sections 45Y and 48E)	**Eligibility**: Starting in 2025, these technology-neutral credits apply to facilities with zero or net-negative greenhouse gas emissions by incorporating measures like carbon capture and storage (CCS). **Credit Amount**: Up to 30% for facilities with zero or net-negative greenhouse gas emissions.
Carbon Capture and Storage (CCS) Incentives (Section 45Q)	**Eligibility**: The IRA tax credit for CO_2 captured and stored from industrial sources, including power plants. Implementing CCS technology during the conversion could qualify the project for these credits. **Funding Amount**: $85 per ton of CO_2, $60 per ton of CO2 for EOR purposes

Government Incentives (Continued)

Federal Program	Incentive
Energy Community Bonus Credit	**Eligibility**: Projects located in energy communities, such as those with significant employment related to coal, oil, or natural gas. **Credit Amount**: An additional 10 percentage points on top of the Investment Tax Credit (ITC).
Grants for Energy Communities	**Eligibility**: Projects that promote economic revitalization in coal, oil, gas, and power plant communities. **Funding Amount**: Varies; the Economic Development Administration (EDA) has announced significant grants to support energy communities.
Department of Energy (DOE) Funding for Carbon Management	**Eligibility**: Projects that reduce CO_2 pollution through innovative technologies. **Funding Amount**: Up to $54.4 million available to advance carbon management approaches.
U.S. Department of Energy (DOE) Assistance to Coal Communities (ACC)	**Eligibility**: The Economic Development Administration (EDA) has allocated financial support to coal communities transitioning to new energy sources. Projects that revitalize former coal plant sites are prime candidates for this funding. **Funding Amount**: Over $300 million allocated
DOE Funding for Tribal Clean Energy Projects	**Eligibility**: Allocated funding to support clean energy technology deployment on Tribal lands, aiming to strengthen Tribal energy sovereignty through local clean energy generation **Funding Amount**: $15 million

Non-Recourse Loans

The Department of Energy (DOE) offers loan guarantees through programs like the Title XVII Innovative Energy Loan Guarantee Program. This can be applied to projects that support the transition to cleaner energy sources, including natural gas and associated technologies that reduce emissions.

Projects that incorporate carbon capture or other advanced technologies may be eligible for these loan guarantees, lowering the financing cost for coal-to-gas conversion projects.

Program	Details
U.S. Department of Energy's (DOE) Loan Programs Office (LPO)	**Eligibility:** • Retooling, repurposing, or replacing existing energy infrastructure to reduce air pollutants. • Projects that utilize advanced energy technologies, including renewable energy, carbon capture, and energy efficiency improvements • Community-centric projects, especially those in energy transition areas
	Non-Recourse Financing: • DOE loans are typically non-recourse, meaning the borrower is not personally liable beyond the pledged project assets and revenues
	Loan Size: • No minimum or maximum; the total loan amount can cover up to 80% of eligible project costs. • Minimum loan amounts often exceed $100 million, although smaller loans may also be considered in certain cases • There is no formal cap on the maximum loan amount, allowing large-scale projects to apply for substantial funding
	Interest Rates: • Competitive rates, often aligned with U.S. Treasury rates, due to the federal guarantee backing the loan • Rates are typically lower than private-sector loans, significantly reducing financing costs
	Repayment Period: • Typically up to 30 years, depending on project specifics and negotiated terms
	Fees: • Administrative fees may apply, but application fees have been eliminated to improve accessibility

State Programs

State incentives vary and may include grants, tax credits, or allowances for emission reductions. Some states operate cap-and-trade programs or emissions trading systems for pollutants like SO_x and NO_x, where reducing emissions below certain thresholds can generate tradable credits. Eligibility depends on state-specific regulations and the design of these programs.

Grants and Financial Assistance:

Beyond tax credits, the federal government and some states offer grants and low-interest loans to support energy infrastructure projects that reduce environmental impact. Programs targeting communities affected by coal plant closures may provide additional funding opportunities.

State	Program
Colorado	Clean Air-Clean Jobs Act (CACJA): Requires utilities to develop plans reducing NO_x emissions by 70% from specified coal-fired facilities, encouraging transitions to natural gas
Texas	Texas Energy Fund: Proposed expansion to $10 billion to support building new natural gas plants, offering low-interest loans to incentivize such projects
Indiana	Support for Coal-to-Gas Conversions: Utilities like AES Indiana have pursued coal-to-gas conversions, indicating a supportive regulatory environment for such transitions
New York	Clean Energy Funding: Significant investments in modernizing the grid and decarbonization efforts, with funding from the U.S. Department of Energy to support energy infrastructure projects
California	Renewable Energy Incentives: Offers substantial rebates for renewable energy installations, which may indirectly support infrastructure upgrades associated with plant conversions
Oregon	Energy Transition Support: Provides incentives for renewable energy projects, potentially benefiting infrastructure improvements related to energy transitions.
Iowa	Renewable Energy Incentives: Offers various incentives for renewable energy projects, which may support broader energy infrastructure transitions

Available Credits for Reducing Emissions

Credit	Amount
45Q	\$85/ton \$60/ton for EOR
Carbon Credit	\$10-20/metric ton
California Cap-and-Trade (CCAR)	~\$30 per metric ton
SO_2 Credit Programs	\$1 to \$500 per ton depending on market conditions and EPA policy
NO_x Credit Programs	\$200–\$2,500 per ton during ozone season, depending on demand and supply

Addendum 2: Utilizing Compressed Nitrogen Energy Storage (CNES) to Transform a Depleted Oil Reserve into a Giant Battery

Most proposed CCS/CCUS projects have failed to prove financially viable due to the prohibitive costs of separating carbon dioxide (CO_2) from the flue gas. Despite lucrative 45Q incentives, the high CAPEX and OPEX of CO_2 separation exceeds what is economically feasible as standalone projects.

The primary reason why CO_2 is separated from the flue stream is to reduce the volume of gas which is captured and sequestered. CO_2 only comprises 5-10% of the total percentage of flue gas from natural gas facility emissions.

Due to both the increased compression costs and storage space required to capture and store all flue gas emissions, other CCS projects have dismissed the possibility of foregoing the CO_2 separation process.

Components of Flue Gas in Natural Gas Plant	
Component	Percentage of Flue Gas
Nitrogen (N_2)	70-75%
Carbon dioxide (CO_2)	5-10%
Water vapor (H_2O)	5-10%
Oxygen (O_2)	2-5%
Nitrogen oxides (NO_x)	Trace amounts (<0.1%)
Carbon monoxide (CO)	Trace amounts
Sulfur dioxide (SO_2)	Trace amounts
Particulate matter (PM)	Trace amounts

Limited, Adjustable CCS During Off Peak Hours

In contrast, PAE has developed a unique approach to:

i) Reduce the CAPEX and OPEX required for both compression and separation of the flue gas, and
ii) Monetize the pressurized N_2 by converting it into energy

PAE's CCS Process

Limited CCS

Instead of using an extremely large compressor to take all of the facility's flue gas emissions, PAE will employ smaller compressors to only draw limited amounts from one boiler.

Diverting an adjustable percentage of the flue gas for permanent sequestration ensures that the facility can continue to operate within any compliance environment.

The flexibility provided from the controlled diversion of a limited portion of the flue gas also assists in ease of management over the well pressure.

Compression During Off Peak Hours

Compression and injection of the flue gas into the depleted oil-well will only be conducted during off-peak times when electricity costs are low. It is the high electricity costs that makes flue gas compression otherwise unfeasible.

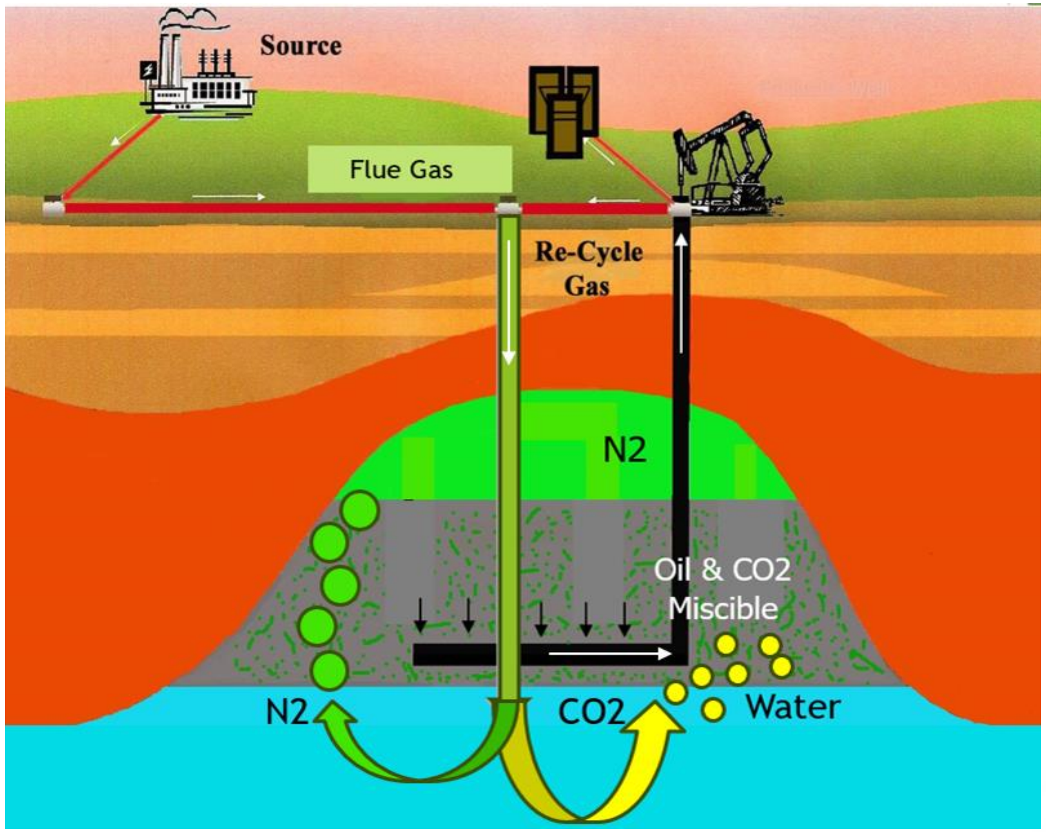
Natural Separation of Nitrogen (N2) in Supercritical State

Energy Storage Potential of a Depleted Oil Reserve

<u>Natural Separation of N_2 and CO_2</u>

Because CO_2 has a much higher density than lighter gases like N_2, it naturally becomes separated in a supercritical state. The pressure and heat of applied in sequestration can create such supercritical conditions - with the lighter N_2 migrating into a space above the CO_2.

In effect, PAE will use earth's natural processes to conduct the separation process without the prohibitively high CAPEX and OPEX of above ground facilities.



Release and Utilization of Compressed N2

Release of Pressurized Nitrogen

Comprising 70-75% of the volume of the flue gas, a portion of the separated N_2 must be regularly released in order to maintain well pressure and prolong the storage capacity of the well.

Although some treatment may be required, N_2 is considered a harmless gas[1] and can be safely released into the atmosphere.

Utilizing Compression Pressure for Electricity Production

By driving the pressurized N_2 through turbines prior to release, PAE can create electricity to sell to the grid.

In effect, PAE will convert the depleted oil field into a giant energy storage source.

Timing of Storage and Release

The timing of both the flue gas draw and N_2 release can be favorably coordinated to minimize costs and maximize revenues.

Energy Storage Phase: When there is excess electricity from renewable sources like wind or solar, PAE will draw from the boiler and power compressors to transport and inject the flue gas into the depleted oil field.

Energy Release Phase: When energy is needed (during peak demand or when renewable generation is low), the compressed N_2 is released from the underground storage and driven through turbines to generate electricity.

1. Approximately 78% of the Earth's atmosphere is nitrogen (N2)

Growing Electrical Grid Imbalances

Growing Imbalances in US Electricity Demand and Supply

Unlike fossil fuel-based power plants - which require a steady price to cover operating costs, renewable energy sources often produce electricity at near-zero marginal costs once the infrastructure is in place. **Production of renewable energy is driven by natural forces rather than market forces.**

As renewable energy continues to constitute a growing percentage of total US electricity production, its intermittency and variability increasingly threatens grid operators' ability to balance supply and demand.

Electricity Price Fluctuations

Surges and contractions of renewable power are reflected in wildly fluctuating prices with increasing instances of negative prices in the US (particularly Texas and California).[2]

In times when oversupply threatens to overwhelm the grid, grid operators are forced to:

i) Pay other parties to assume excess electricity to stop it from overwhelming the grid
ii) Pay the energy producers to stop producing electricity at certain times of the day[3]

As a result, there is an emerging business opportunity to be paid to take the excess power.

2. Price per KW/H can range between -$20 and $200 over the course of a single day. The share of negatively priced hours in southern California was above 20 percent in the first half of 2024, more than triple from the same period in 2023. IEA, Electricity Mid-Year Update, July 2024
3. BNN Bloomberg, "World to Pay to Turn Off Green Power Unless Grids Improve," 2024; Global Energy Association, "British regulators have paid more than £1 billion ($1.3 billion) to wind farm operators for forced downtime since the beginning of this year," 2024

CNES Contribution to Grid Imbalances

Benefits of Compressed Nitrogen Energy Storage (CNES)

Compared to Battery Energy Storage Systems (BESS), PAE's proposed CNES solution is:

- Less expensive to build
- Offers longer lasting storage duration compared to lithium-ion batteries

The stored energy would only be released during times when the grid is under maximum stress and prices are highest. Whereas compression and storage would occur when electricity prices are lowest.

Offering both a means of absorbing excess electricity from the grid and generating electricity during times of shortages, CNES would allow PAE to generate revenue streams in both scenarios.

Combined with the potential for EOR, 45Q tax credits, carbon credits, SO_X & NO_X credits, CNES offers the possibility to further transform a depleted oil field from a giant liability to a lucrative asset.

Grant Funding

PAE management is unaware of any other groups considering CNES in a depleted oil field. Accordingly, the piloting of such an idea could be a good candidate for a government funding from one or more of the organizations identified in **Addendum 1**.