أديبك ADIPEC
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Abu Dhabi, UAE

DECARBONISING TODAY'S ENERGY SYSTEMS

CASE STUDY

Partnering to advance carbon neutral carbon capture

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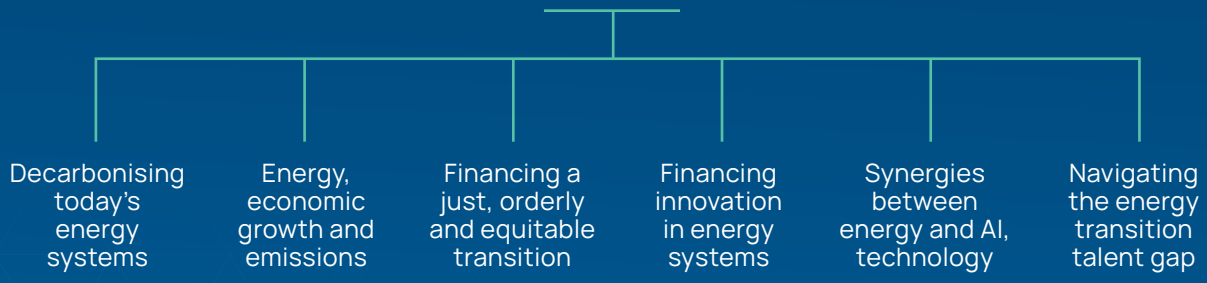

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Partnering to advance carbon neutral carbon capture

CONTEXT

Carbon capture, utilisation, and storage (CCUS) plants are crucial for mitigating climate change and supporting the transition to a low-carbon economy. CCUS technology captures carbon dioxide emissions from power plants and industrial processes before they reach the atmosphere, reducing greenhouse gas concentrations and helping to meet international climate targets. The technology scores highly for its ability to retrofit the existing infrastructure and allow continued use of facilities that might be too early to be retired. CCUS is also valuable for decarbonising hard-to-abate sectors like cement, steel and chemicals. But the biggest challenge so far has been economic viability and scalability.

The world's first utility-scale natural gas-fired power plant with near-zero atmospheric emissions by NET Power could usher in a change. The project fully integrates power production with transportation and underground sequestration of carbon dioxide. The new plant will be built near Occidental's Permian Basin operations and is expected to be online by late 2027 or mid-2028[1].

THE ROLE OF CCUS IN POWER SYSTEMS

NET Power is developing the world's first utility-scale natural gas-fired power plant that integrates CCUS technology, aiming for near-zero atmospheric emissions. Located near Occidental Petroleum's operations in the Permian Basin, Texas, US, this project is being built in collaboration with Baker Hughes, which will provide the technology behind the infrastructure, and 8 Rivers Capital, a venture capitalist firm focused on developing energy technologies. The project is scheduled to be online by late 2027 or mid-2028.

1/3

Share of all coal-fired capacity that is less than 10 years old[5]

40%

Percentage of energy-related emissions from the power sector[5]

4 Tcm

Amount of natural gas consumed worldwide[6]

20%

Percentage of gas as a source of power generation globally[5]

Organisations involved

- 8 Rivers Capital
- Baker Hughes
- NET Power
- Occidental Petroleum

Industry

Energy, carbon capture

Investment

US$1 bn

Location

Permian basin, Texas, US

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- **Baker Hughes Energy FZE: Hall 3, Stand #3432**
- **Occidental Oil And Gas International LLC: Atrium, Stand #A120**

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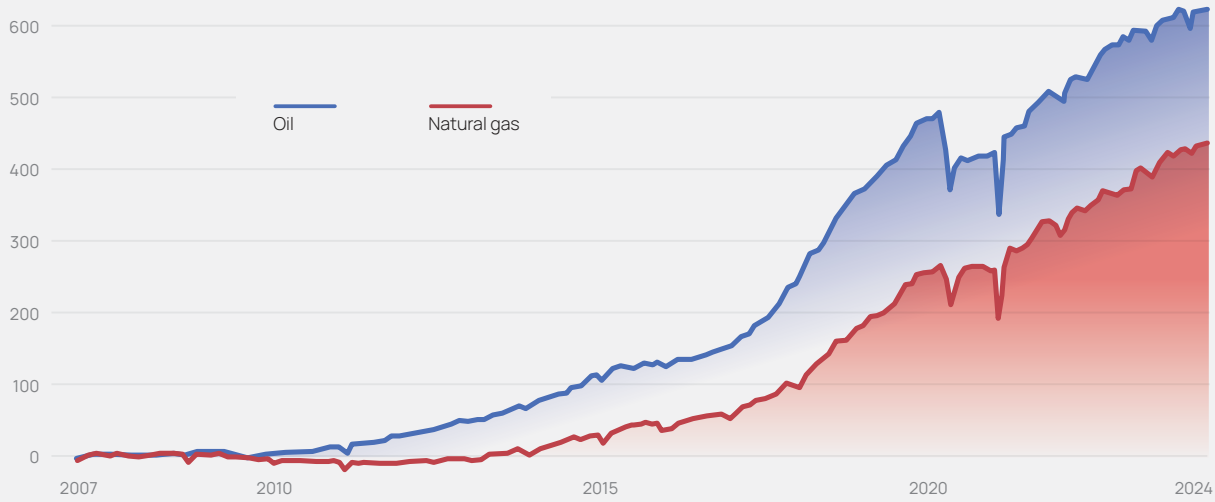
Natural gas is critical to the global energy transition

Natural gas is a reliable, low-cost, and abundant source of energy that is cleaner than traditional fuels. This graph represents natural gas consumption worldwide from 1998 to 2023 (in billion cubic metres)



Source: US Energy Information Administration

Unlike traditional power plants, NET Power's facility is designed to capture and sequester carbon dioxide produced during electricity generation, preventing it from entering the atmosphere.

The project utilises NET Power's proprietary Allam-Fetvedt Cycle, a revolutionary natural gas power system that generates low-cost electricity with zero emissions. The cycle combusts natural gas with pure oxygen instead of air, producing only carbon dioxide and water. The water is condensed out, and the CO2 is captured and either sequestered underground or utilised in various industrial applications, such as enhanced oil recovery (EOR) or carbon-based products. This integrated approach ensures that the plant operates efficiently while minimising its environmental footprint.

Chris Barkey, CTO (Industrial & Energy Technology) at Baker Hughes, said: "We are excited to support the development of the NET Power system. Our technology is robust, and the programme is progressing well to deliver a world-class 300MW class suite of equipment enabling utility-scale operation in 2026, and a rapid ramp-up in commercial deployments thereafter."

The project stands out on multiple counts. Firstly, it is a significant advancement in clean energy technology. By integrating power generation with carbon capture and storage, the plant addresses the dual challenge of meeting energy demand while reducing greenhouse gas emissions. This innovation could pave the way for future developments in clean energy, offering a model for other natural gas power plants worldwide to adopt similar technologies.

Secondly, it reduces carbon emissions on a scale. The project demonstrates the potential for CCUS technology to reduce emissions from existing and future power plants. The Intergovernmental Panel on Climate Change (IPCC) has emphasised that limiting global warming to 1.5 to 2 degrees Celsius requires a significant increase in carbon capture efforts[2]. NET Power's approach could capture up to 90% of the CO2 produced, a major step towards achieving these climate goals.

One of the main challenges with CCUS technology, so far, has been its economic viability, especially at scale. NET Power's project aims to prove that capturing and storing carbon emissions can be both technically and economically feasible. The plant's success could help reduce costs and drive the widespread adoption of CCUS technology, making it a critical component of global efforts to mitigate climate change.

The project is also notable for supporting a transition to low-carbon energy. While renewable energy sources like wind and solar are crucial for a sustainable future, the transition to a fully renewable energy grid will take time. In the meantime, technologies like CCUS provide a practical solution to reduce emissions from fossil fuel

power plants, which are still a significant part of the global energy mix. NET Power's project exemplifies how innovation in the fossil fuel sector can contribute to climate goals without compromising energy reliability or affordability.

Natural gas remains a key energy source globally due to its reliability and flexibility in meeting energy demand[3]. By enabling natural gas plants to operate with near-zero emissions, NET Power's technology supports energy security.

The success of NET Power's CCUS project in the Permian Basin could also have far-reaching implications for the global energy sector. Major developing economies like China and India, where energy demand is rapidly increasing, could benefit immensely from this technology. These countries continue to build new coal and gas power plants to meet their growing needs[4], and integrating CCUS technology into these plants could significantly reduce their carbon emissions.

Moreover, the International Energy Agency (IEA) highlights that meeting long-term climate goals requires a diversified approach that includes renewable energy, energy efficiency, and carbon capture technologies. In the IEA's Sustainable Development Scenario, CCUS-equipped coal and gas plants play a vital role in providing low-carbon electricity, contributing to a secure and flexible power system[5]. By capturing and storing emissions, these plants can help maintain grid stability and support the integration of variable renewable energy sources, such as wind and solar.

As the global community strives to meet its climate commitments, projects like NET Power's are essential for demonstrating that it is possible to balance energy needs with environmental responsibility. By advancing CCUS technology, NET Power is helping to chart a path towards a low-carbon future, ensuring that energy production is both sustainable and secure.

> We are excited to support the development of the NET Power system. Our technology is robust, and the programme is progressing well to deliver a world-class 300MW class suite of equipment enabling utility-scale operation in 2026, and a rapid ramp-up in commercial deployments thereafter.

Chris Barkey
CTO (Industrial & Energy Technology),
Baker Hughes

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