Carbon Capture, Utilization, and Sequestration (CCUS) Overview

TAKEAWAY: 01

GE supports customers in their decarbonization* journey, including hydrogen, carbon capture, coal-to-gas switching or other approaches.

TAKEAWAY: 02

GE has alliances across the breadth of the carbon capture value chain to provide our customers with comprehensive end-to-end carbon capture solutions.

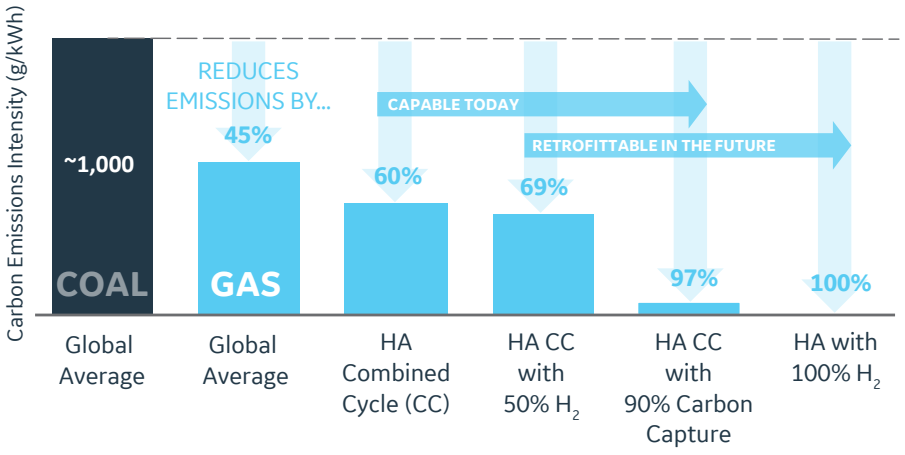
TAKEAWAY: 03

GE is investing now in R&D and resources to position power and industrial customers for a decarbonized future.

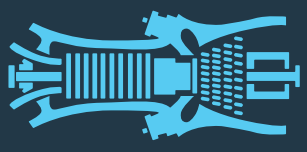
ENERGY TRANSITION: A DECADE OF ACTION

- The energy transition remains the greatest uncertainty for the power sector today. While the sense of urgency to address climate-change has never been higher, the pace and scale of investments must increase significantly in order to meet decarbonization goals.
- More work needs to be done to reduce the cost of hydrogen and carbon capture and sequestration technologies to accelerate their deployment. These technologies have the potential to significantly enable near-zero-carbon power generation and some governments are offering incentives to foster adoption.

PATHWAY TO LOW OR NEAR-ZERO CARBON WITH GAS TURBINES



PRE-COMBUSTION **POST-COMBUSTION**



USE A LOW OR ZERO CARBON FUEL
- Hydrogen (blue, green, pink)
- Synthetic (renewable) methane
- Biofuels
- Ammonia (NH_3)

REMOVE CARBON FROM THE PLANT EXHAUST
- Carbon capture (liquid solvents)

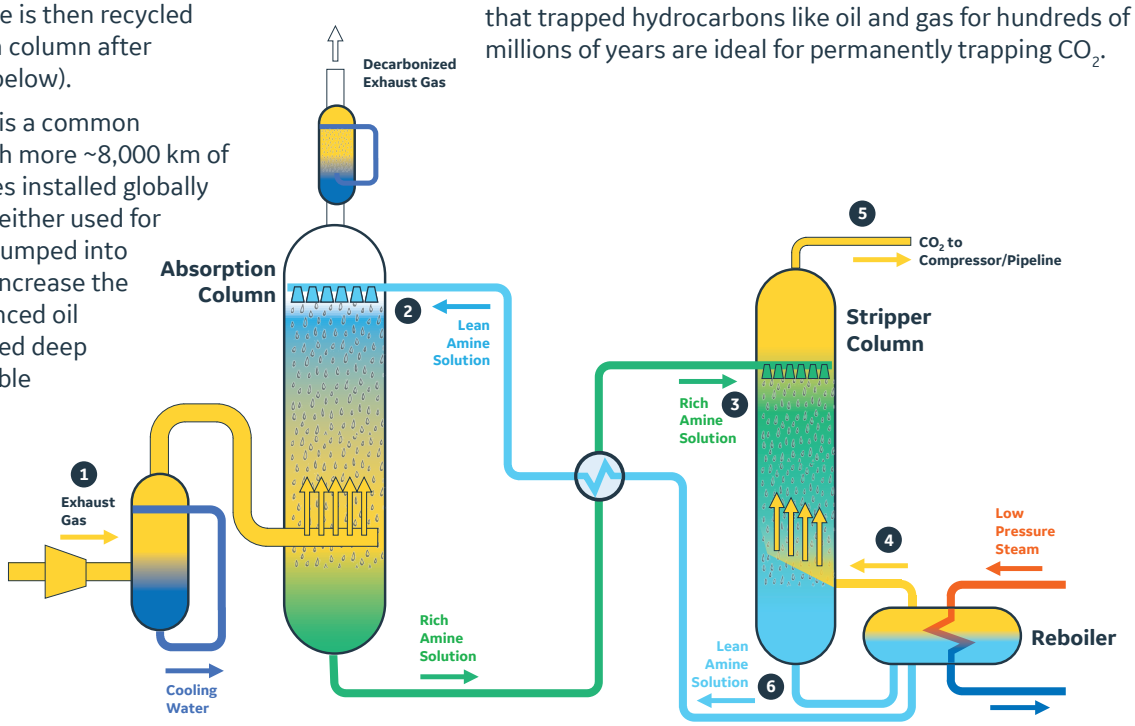
HOW GE GAS POWER DELIVERS VALUE FOR ITS CUSTOMERS

- Improved capture economics through:
  - Thermal integration
  - Controls integration and operability
  - Hardware integration
  - Strategic upgrades
- GE is committed to investing in research and development and working with various technology providers and EPCs to deliver pre and post-combustion decarbonization technologies in a turn-key or phased approach, thereby allowing customers to pace their decarbonization journey to meet their needs.

OVER

HOW CARBON CAPTURE WORKS

- Post combustion carbon capture is a potential pathway to decarbonize the power sector and other energy-intensive industries that rely on fossil fuels.
- In a typical liquid solvent carbon capture system, exhaust gas from the plant (point 1 in the diagram below) enters the bottom of a tall, specialized stack called an *absorption column* where a chemical with an affinity for carbon, called a solvent (typically an amine), is introduced (point 2 below) and rains down from the top through the rising exhaust gas.
- The amine bonds with the CO_2 in the exhaust stream and the resultant rich amine solution enters a *solvent stripper column* (point 3 below) where heat is introduced (point 4 below).
- This heat separates the CO_2 from the liquid, and the resulting gaseous CO_2 (point 5 below) can then be compressed for transportation and storage.
- The lean amine mixture is then recycled back to the absorption column after being cooled (point 6 below).
- Transportation of CO_2 is a common industrial practice, with more ~8,000 km of dedicated CO_2 pipelines installed globally today. The CO_2 can be either used for industrial processes, pumped into an existing oil field to increase the well's output for enhanced oil recovery, or sequestered deep underground in favorable geologic structures.



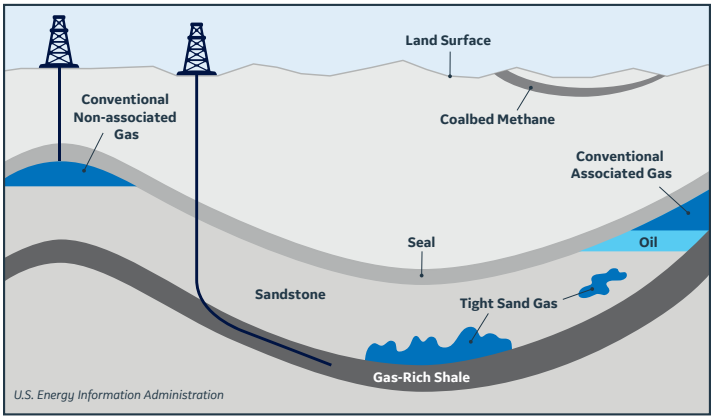
BASICS: CARBON SEQUESTRATION

- Most of the carbon capture facilities around the world today are associated with industrial facilities. There are a few carbon capture demonstration projects with coal-fired power plants, but none are connected to gas-fired power plants today.
- There is a misconception of not having enough capacity deep below the Earth to house a meaningful amount of carbon, or that potential storage reservoirs that do exist are far away and hard to access. According to 3rd party studies there are hundreds of years of suitable storage reservoirs available at today's global CO_2 emissions rates.
- An additional public misconception is that carbon sequestration is unsafe, and there are fears that the carbon may not stay underground. While there are risks, they can be mitigated through proper regulation, monitoring, maintenance and implementing tools that already exist. The same non-porous geologic structures that trapped hydrocarbons like oil and gas for hundreds of millions of years are ideal for permanently trapping CO_2.

POWER PLANT IMPACTS

A carbon capture system can be added to a new or existing gas-fired power plant to extend the useful life of the power plant as the world moves to decarbonize. Key factors to consider include:

1. Adding a carbon capture system to a gas plant would roughly double its capital cost and double its footprint.
2. Heat is needed for the carbon capture process and GE's integration expertise is focused on providing site specific solutions to minimize this impact.



Geologic formations have stored gaseous natural gas, CO_2 and other hydrocarbons for hundreds of millions of years.

*Decarbonization in this paper is intended to mean the reduction of carbon emissions on a kilogram per megawatt hour basis.

For more information, visit our website: **gepower.com/CCS**