Governmental and public interest in carbon capture, utilization and storage (CCUS) is on the rise. Federal officials, labor unions and experts – including the International Energy Agency – have all identified CCUS as critical to achieving significant near-term reductions in greenhouse gas emissions. And U.S. fuel and petrochemical industries continue to advance CCUS projects as innovators and significant enablers of this technology worldwide.

ExxonMobil has invested in CCUS for over 30 years, positioning Exxon with an equity stake in roughly one-fifth of all of the carbon capture projects worldwide and having "captured approximately 40 percent of all the captured anthropogenic CO2 in the world." And that investment is set to grow. Exxon announced the formation of its Low Carbon Solutions business earlier this year, with the business looking to advance more than 20 CCUS projects internationally. These new projects will dramatically expand Exxon's already-impressive current carbon capture capacity of about nine million metric tons annually – the equivalent of planting 150 million trees every year.

Exxon is also a member of the Oil and Gas Climate Initiative and is helping to lead its Kickstarter initiative, which was launched to facilitate large-scale commercial investment in CCUS. The project focuses on creating multiple low-carbon industrial "hubs" to capture CO2 from several industrial sources in each region. To further that ambition, Exxon has recently proposed a public-private carbon storage project for the Houston Ship Channel, which would collect carbon dioxide from the 50 largest emitters in the area and store them deep under the Gulf of Mexico. The project is estimated to store 50 million metric tons of CO2 by 2030, with capacity potentially doubling by 2040.

Valero's Port Arthur refinery became the first industrial site in the United States to host a large-scale carbon capture project back in 2013, and it continues to capture more than 1 million tons a year. The company's Jefferson ethanol plant, meanwhile, sends 65,000 tons of CO2 a year to a third party for use in carbonated beverages. Valero is also partnering with BlackRock Global Energy & Power Infrastructure Fund III and Navigator Energy Services to develop a 1,200 mile pipeline system to gather and transport CO2 across five Midwestern states. The project will have the capability of permanently storing up to 5 million metric tons of CO2 annually, with the potential to expand to transport and sequester up to 12 million metric tons per year.

Chevron is also aggressively incorporating carbon capture in its business ventures. Chevron recently announced that it is partnering with Microsoft and Schlumberger to build a bioenergy with carbon capture and sequestration (BECCS) project in Mendota, California. The plant will use agricultural biomass to produce electricity while capturing and storing the CO2 produced into the geologic formation below the facility. When fully operational, the project is expected to result in net-negative emissions, storing about 300,000 tons of CO2 annually. Chevron is also readying to test technology that captures CO2 from post-combustion gas at their Kern River facility in California, where they plan to design, construct, commission and test a pilot-scale carbon capture plant as a part of a project awarded to them by the Department of Energy.

Additionally, Chevron recently invested in Blue Planet Systems, a startup that "manufactures and develops carbon aggregates and carbon capture technology," including a substitute for limestone –a

substance used in concrete and building materials – made from captured CO2.

In 2018 Occidental formed Oxy Low Carbon to capitalize on their 40 years of experience with large-scale carbon capture, transportation and storage and to expand their ability to capture CO2 through partnerships and technology advancements. One of those partnerships resulted in the creation of 1Point5, a direct air capture business that is currently building a huge facility in Texas. The 100-acre project looks to capture as much as 1 million metric tons of CO2 annually.

The fuel and petrochemical industries are also providing financing, technology and expertise to help others create and expand CCUS projects. Baker Hughes' technology has been enabling CCUS projects for decades, and it recently acquired Compact Carbon Capture (3C), a technology development company specializing in carbon capture solutions whose modular and scalable designs can be as little as a quarter of the size of other CCS models. And last month Baker Hughes entered into a global exclusive licensing agreement with SRI International to use their Mixed-Salt Process (MSP) for CO2 capture, further expanding the ways Baker Hughes can support a wide range of CCUS projects.

Similarly, Honeywell recently announced that several of its Honeywell UOP technologies would be used to sequester up to 1.65 million tons of CO2 annually for Wabash Valley Resources' plant in West Terra Haute, Indiana. And Suez Water Technologies has aligned key technologies to support CCUS projects –its technology can be retrofitted to most exhaust gas systems, enabling CO2 to be selectively absorbed from flue gas and conditioned for further utilization or storage.

Members have been active on the international CCUS front as well. INEOS has been capturing greenhouse gas emissions from plants in Antwerp and Germany for the last 10 years and is now partnering with other industries and the Danish government to store CO2 in depleted oil fields in the North Sea, as well as building a demonstration plant to make clean fuel from captured CO2 and green hydrogen. And Sabic built a huge CCU plant to capture 500,000 metric tons of CO2 per year, converting it into feedstock for industrial purposes.

The fuel and petrochemical industries provide a unique combination of experience, commitment, technology and expertise in the carbon capture arena – factors that will keep them integral to carbon reduction efforts for decades to come.

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