

Wyoming Integrated Test Center Provides Optimal Setting For Developing and Testing CCUS Technologies

The Wyoming Integrated Test Center (ITC) opened at Dry Fork Station in Gillette, Wyo. in May 2018. The center provides space for researchers to test carbon capture, utilization and sequestration (CCUS) technologies using coal-based flue gas. Research will help support jobs and local and state economies and keep electricity prices low for millions of people.

Jason Begger has nearly 20 years of public policy, government affairs, communications, messaging, campaign, and management experience. He is an expert in the energy industry, having worked in most sectors including utilities, coal mining, oil and gas production, energy export terminals, and carbon tech. Jason has been with the ITC since inception in 2014 and as managing director oversees all aspects of operations.

Scott Quillinan is a Wyoming native and a Wyoming-licensed professional geologist who has focused his career on the state's energy-related challenges. Scott was born and raised in Evanston and attended the University of Wyoming, where he earned a Bachelor's and a Master's in geology. Scott began work at the Wyoming State Geologic Survey (WSGS) shortly after obtaining his Bachelor of Science. While at the WSGS, he worked and collaborated with many departments including Coal, Oil and Gas, Coalbed Methane, Unconventional Resources, and Groundwater.

Dr. Will Morris has a PhD and MS in chemical engineering and extensive experience in providing engineering and technical advice to private and government entities across the globe in the areas of mercury emissions control, CO₂ capture, and NO_x control. Will is the listed inventor on three NO_x, mercury, and CO₂ emissions control patents, as well as other patents pending. As part of the ITC team, Will provides engineering and business development support services to potential and current tenants, in addition to working with onsite operations managers to ensure optimal operations of the facility.

CCBJ: Congratulations on your success so far with the Wyoming Integrated Test Center (ITC) and the recent increased funding from the Department of Energy. Why the Carbon Valley? What makes your location optimal for developing and testing carbon capture utilization and sequestration (CCUS) technologies and companies?

SQ: The location of the ITC has several benefits. Specifically, the geologic characteristics are favorable because:

- They are deep. The target zone is located at over 9,800 below ground surface. That means that there is approximately 1.8 miles of solid rock between the surface and the CO₂ storage zone.
- The formation has high porosity and permeability that allow for safe and high-volume injections and has a high storage capacity.

- The geology of the area has demonstrated that it can hold oil and gas for geologic time scales. Thus, we know that CO₂ can also be held for geologic time scales in those formations.

- There is no history of induced seismicity in this area.

The state of Wyoming has developed a legal framework to define who owns the pore space, who is liable, legal frameworks to allow for pooling of pore space ownership, and Wyoming has primacy over Class VI wells. One of only two states to do so. Legal frameworks lower the project risk for investors.

Essentially, there isn't a more favorable place in the United States to commercialize CCUS technologies.

CCBJ: Can you explain the basic processes to capture and sequester carbon?

JB: There are numerous ways to capture and permanently manage CO₂, including solvents, sorbents, membranes, and cryogenically. Each process works differently, having merits and shortcomings that additional R&D can hopefully overcome. However, the basic process behind CCUS is to isolate and concentrate CO₂ from sources such as power plants so it can be permanently stored geologically or in products such as aggregates.

CCBJ: Tell us about the history of Membrane Technology and Research and the team behind it. How has the company been financed?

WM: Membrane Technology and Research Inc. (MTR) was established in 1982 by Dr. Richard Baker and is currently located in Newark, Calif. Dr. Baker is a brilliant engineer who has steadily advanced membrane research over the decades. Since being founded, MTR has grown continuously as industry embraced membranes as an effective gas separation technology. The company has been funded through a combination of competitive research grants from federal agencies such as the U.S. Department of Energy, as well as reinvestment of profits from commercial sales. Today, MTR sells membrane systems for a range of gas separation applications such as natural gas or biogas processing, chemical manufacture and refining applications.

MTR's CO₂ capture program has been funded primarily from competitive contracts awarded by the U.S. Department of Energy (DOE) and its National Energy Technology Laboratory (NETL). This program began over a decade ago and has been steadily scaled up from the laboratory to the large pilot that will be built at the Wyoming ITC. MTR has to cover 20% of the program costs in order to maintain compliance with federal rules requiring 20% cost share.

CCBJ: You mentioned non-federal funding to match or exceed the contri-

tribution by the Department of Energy. Is state money or funds from carbon taxes or energy fees involved? What are the ITC's other major sources of capital?

JB: All ITC funding to date has been provided by the State of Wyoming and the utility partners Tri-State G&T, Basin Electric and NRECA. No additional fees or taxes are being assessed in Wyoming. Certain project developers such as MTR and GTI are using U.S. Department of Energy (DOE) project grants to finance their work, but no DOE funding has been utilized in the construction, design or operations of the ITC. Politically, the odds of ever seeing a carbon tax or fees in Wyoming are minuscule.

CCBJ: You suggest that the experience and business models developed at this project have export potential. Does the United States have an advantage in CCUS, and will doubling down our efforts have economic and social benefits?

JB: Globally, there are a lot of resources being made available to advance CCUS technology. It is difficult to say if the United States has an advantage, but we do know there are great opportunities for those who discover breakthroughs. It won't be one technology but several. For Wyoming, an ideal world is one where the state can develop an advanced energy technology sector while preserving the massive economic footprint the fossil energy industry provides utilizing those technologies. ⚙️

Carbon Infrastructure Partners Makes Ambitious Bet on Carbon Capture Utilization and Storage

Broader focus on reducing GHGs, not eliminating fossil fuels, is needed for a stable energy system, CIP contends.

Carbon Infrastructure Partners (CIP) is an alternative investment firm that invests in and champions unlocking capital across the entire carbon lifecycle, from hydrocarbon-based energy production through to carbon capture and storage (CCS). With offices and partners in Palo Alto, Phoenix, and Calgary, CIP is the evolution of a team from JOG Capital that produced a 14-year track record managing more than \$1.3 billion in energy investments.

Craig Golinowski, CFA, is President and Managing Partner of Carbon Infrastructure Partners (CIP). He has been involved in private equity fund management since 2007 and has board experience representing \$437 million of invested fund capital. Craig was formerly Managing Partner at JOG Capital, Investment Banking Analyst with RBC Capital Markets, and Analyst with Alberta Investment Management Corporation (AIMCo). He has an MBA from Western University and a degree in BCom Finance from the University of Alberta.

CCBJ: What was the original concept for Carbon Infrastructure Partners, and how has the firm evolved?

CG: Carbon Infrastructure Partners is an investment management firm dedicated to investing across the carbon lifecycle. We have managed dedicated oil & gas private equity funds for over 20 years. We invest across the carbon lifecycle from hydrocarbon production through to carbon capture and storage (CCS). Our mission is to meet energy demands from 7.7 billion people while rapidly reducing emissions.

During 2019 and 2020, I attended several conferences with the Stanford Carbon Management department. During one presentation I learned that humanity is

emitting 40 billion tons per year of CO₂ into the atmosphere.

It's a staggering volume of emissions that results from our reliance on coal, oil and natural gas for 85% of primary energy (wind and solar represent approximately 5%). I knew that the rest of my career would be dedicated to working on the energy and emissions problem.

We re-branded our firm in 2021 and have been evaluating investment opportunities in CCS and have designed a dedicated investment fund product with our law firm, Kirkland and Ellis, to invest in projects and companies based on CCS.

Knowing that 7.7 billion people will demand ever-increasing quantities of energy, and acknowledging the intermittency of wind and solar, I conclude that CCS is critical to the portfolio of solutions.

Carbon capture and storage enables something we have called "Clean Firm Energy." We (humanity) continue to produce and consume hydrocarbons (which we are going to anyway) and by removing the carbon, CCS can enable energy carriers like Clean Firm Power, Clean Firm Hydrogen, and Clean Firm Ammonia, etc. These energy carrier products work with renewables to create a portfolio solution.

Wyoming ITC Wins \$51 Million DOE Award

Wyoming's coal-rich Carbon Valley has leapt to the next level in the race to scale key technology for decreasing CO₂ emissions by winning a \$51 million project from the **US Department of Energy**. The **Wyoming Integrated Test Center (ITC)**, which evaluates carbon capture, utilization and sequestration (CCUS) technologies using coal-based flue gas, will host **Membrane Technology and Research (MTR)** for Phase III studies of a large-scale pilot carbon capture project. With additional non-federal funding, MTR's work will bring over \$64 million in research dollars to Wyoming. Carbon Valley – in and around Gillette, Wyo. – is a national leader in carbon studies amid today's climate crisis and will prove pivotal to the state's efforts at reaching carbon neutrality. MTR will be operating in the large test bay at the ITC and utilizing flue gas from the adjacent Dry Fork Station.