# Substation west of Cheyenne, part of Black Hills Energy's Corriedale Wind Energy Project NO.1 BUSINESS FRIENDLY TAX CLIMATE

### IN THIS ISSUE

04

### WYOMING'S NEXT HORIZON

07

# WYOMING'S ENERGY PROJECTS

80

# ENERGY INDUSTRY PROFILES

22

### **WHY WYOMING**

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# WYOMING AGENCIES AND PARTNERS

28

### CROSSROADS OF THE WEST

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### WYOMING RESOURCES DIRECTORY

### **ABOUT**

**Population: 578,803** 

Size: 97,814 square miles (253,348 kilometers)

Capital: Cheyenne

Governor: Mark Gordon

President of the Senate: Ogden Driskill

Speaker of the House: Albert Sommers

### **BUSINESS CLIMATE**

- · No corporate or personal state income tax
- · No inventory tax
- · No franchise tax
- · No occupation tax
- · No value-added tax
- Governor's Energy Matching Fund
- Infrastructure Matching Fund

### THE FACTS

Spend Less & Earn More: Wyoming has the most business-friendly tax climate in the nation.

Regulatory Environment: Embracing a low-regulatory, minimally red-tape environment, Wyoming ranks as a top state for ease of doing business – year in, year out, including state permitting primacy. Wyomingites have a rich heritage in free enterprise and minimal government interference, which has allowed businesses to remain free from unnecessary and burdensome regulations.

Access to Government: Wyoming has been described as one large town with really long streets where everyone knows everyone. The accessibility to government officials remains unparalleled in the United States. Your questions and comments will be expeditiously and fairly addressed.

# COME SEE WHAT WE CAN OFFER AND LEARN FOR YOURSELF WHY IT'S BETTER IN WYOMING!

Wyoming has always taken great pride in responsibly managing our natural resources. From productively managing our agricultural land and bountiful minerals to wildlife and its habitat, Wyoming is a recognized leader. Wyoming's people consider properly managing natural resources a way of life, part of our cultural identity, and a legacy we will give to our children and grandchildren.

Wyoming energy powers the nation. In these times, an all-of-the-above energy philosophy is

paramount. That means we remain committed to our legacy energy sources such as oil, natural gas, coal and traditional mining - knowing we can always improve how we use them. And we embrace new energy technologies such as renewables, hydrogen, advanced nuclear, carbon capture and rare earth and critical material as essential to a prosperous future. Why limit our possibilities? Our battle should not be over the source of energy; but how fast we can deploy the

technologies to manage CO<sub>2</sub> while maintaining the highest reliability at the lowest cost.

Change and innovation are inevitable - they always have been. Science and engineering are poised for trailblazing advances which will transform technology, improve natural resource management, enhance outdoor recreation, and cultivate agriculture. Wyoming is the tip of the spear, and the University of Wyoming is at the epicenter of research and technology development. Wyoming is solving the challenges of our time - not with talk but with action.

Preserving the U.S. economy, our way of life, and national security demands all the energy Wyoming can produce. Wyoming is recognized for being forward-thinking on climate and energy. We can proudly point to significant accomplishments which establish Wyoming's energy and environmental leadership. We are poised to do more.

Recently, the Wyoming Legislature established the Governor's Energy and Infrastructure Matching Funds to invest in and spur innovation

and transformative projects. And, according to the Tax Foundation, for more than a decade, Wyoming has offered the "Best Business Friendly Tax Climate in the US" with no personal or corporate income tax, very low property tax, no value-added tax, no gross receipts tax, sales tax exemptions for manufacturing, and a state government committed to low regulation and business-friendly policies.



Wyoming's economy is already diversifying, and we know her people will be the driving force of her future, as they have always been. I remain dedicated to ensuring that Wyoming's people create their own future and are a part of and benefit from our efforts. That includes creating and keeping a nimble, skilled, and ambitious workforce, which was the impetus for launching the Wyoming Innovation Partnership (WIP). WIP brings together education, workforce development, and industry to foster economic development, ensuring Wyoming's people are equipped and ready to seize the days ahead when opportunity knocks.



WYOMING'S NEXT HORIZON

Wyoming's business is energy – having provided affordable, reliable power to millions of Americans for a century. Traditional fossil fuels have not only kept the lights on for Americans but have also provided jobs and revenue for Wyoming's communities.

As that market for fossil fuels changes both worldwide and closer to home, Wyoming's long-held all-of-the-above energy strategy means the State is ready to adapt its plentiful resources for a decarbonized economy.

In 2021, the Wyoming Energy Authority developed a vision whose goal is to move the needle towards Governor Gordon's goal of net-zero emissions. The strategy: using every tool in the toolbox, or an "all-of-the-above energy mix," including fossil fuels.

### BUT WHAT EXACTLY DOES ALL-OF-THE-ABOVE MEAN?

"It means simultaneously championing our extraction industries while dedicating time, energy and resources to new opportunities like hydrogen, nuclear, and carbon capture," said Dr. Glen Murrell, the former Executive Director of the Energy Authority.

The state's abundance of natural resources – from the Powder River Basin in the northeast to the class six and class seven wind sites in the southeast – means that Wyoming's existing potential is tremendous. The state is currently positioned first in the United States for coal, trona and uranium production, eighth in natural gas and crude oil, and 17th in wind generation. It is also home to one of the highest-grade rare earth deposits in North America.

When it comes to next-generation energy, Wyoming is an ideal candidate for the industry's emerging nuclear, hydrogen, and carbon capture utilization and sequestration technologies. Between existing infrastructure, a highly-skilled workforce, statewide academic support, and supportive communities, Wyoming is leading the way to energy's next horizon.

### NUCLEAR'S STARRING ROLE

As the most reliable carbon-free energy source, nuclear energy is getting a whole new lease on life. The new generation of nuclear revolves around advanced nuclear reactors, which are smaller, more fuel-efficient and inherently safer in design.

TerraPower, a nuclear innovation company from Bellevue, Washington, announced in November 2021 plans to build a demonstration project on the site of PacifiCorp's retiring Naughton Power Plant in Kemmerer, Wyoming.

Unlike traditional nuclear power facilities, The Natrium™ reactor demonstration project uses sodium as a coolant and a molten salt-based energy storage system. The versatility of the Natrium design combines power production with storage, featuring an output ranging from 345 MWe up to 500 MWe for up to five and a half hours when



needed – enough energy to power approximately 400,000 homes.

The storage component of the Natrium project makes it incredibly versatile and valuable to utility companies that are managing an evolving supply and demand as the way we produce and use energy continues to evolve.

When it came time to select the best place to build the Natrium demonstration project, Wyoming stood out amongst the competition.

"With the Natrium technology, we are creating the energy grid of the future where advanced nuclear technologies provide good-paying jobs and carbon-free energy for decades to come," said Chris Levesque, President and CEO of TerraPower. "Wyoming has a lot to offer and has been a leader in energy for more than 100 years. Wyoming communities understand what it takes to produce energy, and its highly skilled workforce is experienced in building and operating complex projects."

Having access to the existing infrastructure already in place, including transmission capability and a readily available workforce, coupled with substantial support from Governor Gordon and the Wyoming State Legislature, TerraPower hopes to begin construction in early 2024.

### HYDROGEN ECONOMY

The concept of a broad, economy-wide move to hydrogen may sound like the stuff of science fiction, but actually, the idea has been kicking around since the 1960s. As global efforts to build a net-zero energy portfolio intensify, public and private sectors have renewed interest in hydrogen.

"Hydrogen is uniquely flexible because it can exist in different forms – providing massive benefits when it comes to storage and transportation. Having multiple different feedstock sources – coal, natural gas, renewables, and nuclear – gives hydrogen in Wyoming almost a limitless potential," explained Murrell.

This flexibility provides for flowon benefits associated with transportation and use - opening up multiple different options for transportation by pipeline, rail, road, or maritime methods. It also presents multiple utilization options due to its flexible form.

Wyoming is home to twenty-five percent of the national production of hydrogen feedstock, and it could be generated from both hydrocarbon and renewable sources – gray hydrogen is derived from fossil fuels, green from renewables, and blue is a mixture of the two and/or uses CCUS to store offset carbon.



Hydrogen requires storage and transmission, potentially using the state's extensive natural gas infrastructure, to reach high-value markets like the Denver metropolitan area, Utah, Las Vegas and California.

Wyoming's already well-established carbon management background, in addition to a proactive regulatory framework, has attracted significant interest in hydrogen development projects. Williams Companies, the Oklahoma-based natural gas company, has partnered with the University of Wyoming School of Energy Resources' Hydrogen Energy Resource Center to explore production opportunities that could ultimately lead to a billion-dollar hydrogen hub in Wyoming's southwest corner.

The state has partnered with Colorado, New Mexico and Utah on establishment of a shared vision for a hydrogen economy - resulting in eight projects from the four states for a billion-dollar hydrogen hub.

### REIMAGINING COAL

Wyoming's energy industry has long since understood that decarbonization efforts will require outside-of-the-box thinking. The problem per se is not the source of energy itself but rather the amount of carbon dioxide it releases into the atmosphere.

So what if you could remove carbon dioxide from sources - like a coalbased power plant - capture it and permanently store it? Or use that carbon dioxide and make something valuable from it?

This is the basic concept behind carbon capture, utilization, and storage (CCUS). With multiple

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ongoing projects around the state. Wyoming has positioned itself as a leader when it comes to CCUS.

In Gillette alone, three projects

tackle different aspects of carbon capture - the Wyoming Integrated Test Center (ITC), the Wyoming CarbonSAFE project, and Wyoming Innovation Center. Together they form the cornerstone of Carbon Valley, Wyoming's answer to Silicon Valley.

The ITC hosts tenants from around the world who are trying to move their projects from bench scale to commercialization by using actual flue gas from the Dry Fork Power Station. In 2021 it hosted the NRG COSIA Carbon XPRIZE, a competition that encouraged the "development of new and emerging CO<sub>2</sub> conversion

technologies to help solve climate change." The winners injected three tons of carbon dioxide into more than 10.000 cinderblocks.

Next door to the ITC is the Wyoming CarbonSAFE, a project run by the University of Wyoming School of Energy Resources. The ultimate goal is to create a commercial-scale

> geological storage complex where carbon dioxide can be permanently stored deep underground after it has been isolated.

The Wyoming Innovation Center,

which opened in 2022, is a hybrid laboratory, business center and office space where companies and researchers will work to develop commercial products like asphalt, graphite and carbon fiber using coal, coal ash and rare earth elements.

All these technologies have already come a long way from big ideas to reality.

As Governor Gordon said in a speech at the 2022 Wyoming Energy Authority, "There is absolutely a place in Wyoming for every energy source."

### WYOMING'S ENERGY PROJECTS

### **01.** GILLETTE, WY: CARBON VALLEY

The center of CCUS research and development, home to the Wyoming Integrated Test Center, Wyoming CarbonSAFE and Wyoming Innovation Center.

### O2. LARAMIE, WY: UNIVERSITY OF WYOMING SCHOOL OF ENERGY RESOURCES

SER brings academics and industry together to research cutting edge energy technologies. Home to ten Research Centers of Excellence all dedicated to energy.

### 03. RAWLINS, WY: CHOKECHERRY AND SIERRA MADRE WIND ENERGY PROJECT

When completed, the Chokecherry Sierra Madre will be the largest wind farm in North America at around 3,000 megawatts of nameplate capacity.

### 04. MEDICINE BOW, WY: GATEWAY SOUTH TRANSMISSION LINE

Rocky Mountain Power's 416 mile, single circuit 500-kilovolt, overhead, alternating-current transmission line will link the Medicine Bow to Mona, Utah.

### 05. KEMMERER, WY: Natriumtm reactor Demonstration project

Site of TerraPower's first advanced nuclear reactor which will be operational in the next seven years.

### 06. LA BARGE, WY: EXXONMOBIL CARBON CAPTURE

An expansion project is underway at the facility to capture up to 1.2 million metric tons of CO2 in addition to the 6-7 million metric tons already captured each year.

### 07. ROCK SPRINGS, WY: PROJECT BISON

Wyoming is the first location for Project Bison, the largest carbon removal project in America. This modular direct air capture technology filters CO2 out of the air, then injects that CO2 into Class VI injection wells.

### **08.** UPTON, WYOMING: BEAR LODGE PROJECT

Rare Element Resources' Bear Lodge Project in northeastern Wyoming is developing what could be the next North American source of rare earth elements. With an expected forty-year lifespan, the project has the opportunity to produce many of the critical rare earths necessary to support today's evolving technologies.

### 09. RAWLINS, WY: SEMINOE PUMPED STORAGE

A 900-megawatt pumped hydro energy storage project being developed by rPlus Hydro in Carbon County, Wyoming, which shifts water between an upper reservoir and a lower reservoir – the existing Seminoe Reservoir – to store energy and generate power when needed.

### 10. OPAL, WY: WILLIAMS

With a nearly \$1 million grant from the Wyoming Energy Authority (WEA) to complete a feasibility study to evaluate water access, compatibility and asset integrity in support of green hydrogen production and transport near Wamsutter and Opal, Wyoming.

### 11. CHEYENNE, WY: TALLGRASS ENERGY

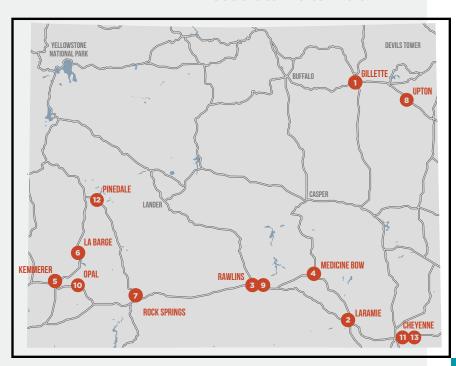
As part of the Western Interstate Hydrogen Hub (WIH2), Tallgrass will produce clean hydrogen serving the power, transportation, and other industrial markets through its eH2Power project in New Mexico and Front Range Hydrogen project in Colorado and Wyoming.

### 12. PINEDALE, WY: JONAH ENERGY

In 2021, Jonah achieved the Gold Standard, awarded to companies that develop verified emissions measurement, for its initial data submission to the United Nationssponsored Oil and Gas Methane Partnership 2.0 (OGMP 2.0). The multi-year efforts to innovate around emissions monitoring, measurement and reduction have resulted in one of the lowest documented emissions profiles of any producer in the country.

### 13. CHEYENNE, WY: SOUTH CHEYENNE SOLAR

Under development, this solar project on 1391 acres will generate 150 megawatts, with a short transmission line running north to a Black Hills Energy substation. The permit was approved in January of 2023 and construction is slate to commence in 2023.



# LEGACY INDUSTRIES

THE WYOMING OIL AND GAS INDUSTRY EMPLOYED MORE THAN 19,000 PEOPLE WITH AN ANNUAL PAYROLL OF NEARLY \$1.12 BILLION IN 2019.

(PETROLEUM ASSOCIATION OF WYOMING, 2023)

### OIL

Wyoming currently ranks 8th in the nation in crude oil production, averaging 244,000 barrels daily in 2022, accounting for slightly more than 2% of U.S. total crude oil output. (U.S. Energy Information Administration (EIA), 2023) Wyoming has five petroleum refineries with a total operable capacity of 168.5 Mb/day. (U.S. Department of Energy, 2021)

### Wyoming has:

- · 4,257 miles of crude oil pipelines
- 1,379 miles of refined product pipelines

### GAS

Wyoming is 9th in the nation in natural gas marketed production, producing 1,109,232 million cubic feet in 2021, accounting for approximately 3% of U.S. marketed gas production. The state is home to 28 natural gas processing facilities with a total of 5,979 MMcf/day capacity. Wyoming has two liquefied natural gas LNG facilities with a total storage capacity of 6,051 barrels.

### Wyoming has:

- 6,838 miles of natural gas transmission pipelines
- 5,429 miles of natural gas distribution pipelines

According to EIA, Wyoming ranks among the top 10 states in both natural gas reserves and marketed natural gas production. Wyoming has nine natural gas underground storage sites that can hold a combined 156 billion cubic feet of gas, approximately 1.7% of the U.S. total storage capacity. Despite this production, Wyoming ranks 33rd in the nation in total carbon dioxide emissions, producing 59.1 million metric tons.











### **COAL PRODUCTION**

Wyoming currently ranks 1st in the nation in coal production, producing 238,773 thousand short tons in 2021. (U.S. Energy Information Administration, 2023) Wyoming has been the top coal-producing state since 1986, accounting for about two-fifths of all coal mined in the United States in 2020. The state holds nearly two-fifths of U.S. coal reserves at producing mines. According to the EIA, Wyoming has ten major coal fields, including eight of the ten largest coal mines in the nation.

Wyoming coal mines employed just over 51,000 workers directly in the industry in 2019, collecting an average wage of \$93,905, excluding benefits. A coal miner's take-home pay is nearly twice the statewide average wage of \$49,756 per worker.

### **CARBONTECH**

Coal and carbon are essential resources for products beyond electricity generation. Some of the applications include:

- · Building and construction products
  - · Char-bricks
  - · Drywall boarding
  - Plaster
  - · Structural members
  - · Roofing and waterproofing materials
- · Health care products
- Electrical devices
- Agricultural products
  - Soil fertility
- Asphalt and paving materials and products
- · Carbon fiber mats
- Phenol

# CARBON CAPTURE UTILIZATION SEQUESTRATION (GGUS)

### CARBON MANAGEMENT LEADER

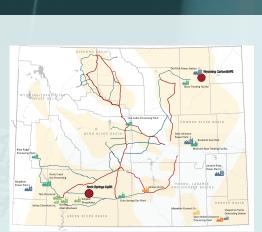
With an abundance of natural resources, Wyoming is known as the "Energy State," and for good reason. Wyoming consistently ranks high in traditional, emerging, and renewable energy sources.

### **BUSINESS ENVIRONMENT**

Wyoming has been a leader in energy for more than 100 years and is home to a highly-skilled, well-trained workforce with a high energy IQ. Wyoming knows what it takes to support major energy projects, and the state has a history as the nation's leader on energy issues.

### **POTENTIAL**

With the existing pipelines for transporting, using, and storing CO<sub>2</sub> in place, Wyoming is ready for continued CCUS development. The Wyoming Pipeline Corridor Initiative allocated corridors for the future use of pipelines associated with CCUS. Approximately 2,000 miles of pipeline corridors throughout Wyoming have been identified as essential. In terms of sequestration, Wyoming has Class VI wells primacy for CO<sub>2</sub> injection and geological formations suited for sequestration. The Enhanced Oil Recovery Institute has in-depth mapping demonstrating the potential for CCUS.



The Wyoming Pipeline Corridor Initiative (WPCI) aims to establish corridors on public lands dedicated for future use of pipelines associated with carbon capture, utilization and storage (CCUS), enhanced oil recovery (EOR) and delivery of associated petroleum products.

### CO, SOURCES

### INDUSTRY TYPE SIZED BY CAPTURABLE CO.

- Power Plants
- Gas Processing
- Trona
- Cement Processing
- Chemical Manufacturing
- CO<sub>2</sub> Storage Projects

### WYOMING PIPELINE CORRIDOR INITIATIVE

- Lateral Line
- Trunk Line
- Geologic Storage



### A FUTURE FOR CCUS IN WYOMING

### WYOMING CARBONSAFE PROJECT

Wyoming CarbonSAFE is focused on investigating the feasibility of practical, secure, permanent geologic storage of carbon dioxide ( $CO_2$ ) emissions from coal-based electricity generation facilities near Gillette, Wyoming. The study will include the collection of data from these formations and will also investigate regulatory and business issues related to implementing a  $CO_2$  storage site in the region.

### **EXXONMOBIL**

The company plans to expand existing carbon capture and storage operations at its LaBarge, Wyoming facility, which has already captured more CO<sub>2</sub> than any other facility in the world. The expansion project will capture up to 1 million metric tons of CO<sub>2</sub>, in addition to the 6-7 million metric tons already captured each year.

### INTEGRATED TEST CENTER

One of the only such facilities in the world and the largest in the U.S., the Integrated Test Center provides space for researchers to test Carbon Capture, Utilization and Sequestration (CCUS) technologies using 20 MW of actual coal-based flue gas at the Basin Electric facility. Along with testing capture technologies, additional research looks at taking flue gas and turning it into a marketable commodity. The ITC is one of the few research and testing facilities at an operating coal-fired power plant, allowing for real-world testing at an active power plant, alleviating typical concerns over being able to transfer technology from a lab to a plant.

## SUPPORTED INDUSTRY RESEARCH & TRAINING PROGRAMS

### UNIVERSITY OF WYOMING SCHOOL OF ENERGY RESOURCE'S CENTER FOR ECONOMIC GEOLOGY RESEARCH (CEGR)

CEGR research scientists actively collaborate with industry, the state of Wyoming, local governments, and national laboratories to characterize Wyoming's vast subsurface resources for carbon dioxide sequestration, oil and gas recovery, and mineral extraction.

# WIND ENERGY

\$6 BILLION
INVESTED BY WIND COMPANIES IN WYOMING 1

HALF OF THE BEST QUALITY ON-SHORE WIND CAPACITY IN THE CONTINENTAL UNITED STATES IS LOCATED IN WYOMING <sup>2</sup>

**3RD LARGEST**IN WIND GENERATING CAPACITY
IN THE US IN 2020 <sup>3</sup>

### WIND IN WYOMING

### **ENERGY LEADER**

With abundant natural resources, Wyoming is known as the "Energy State," and for good reason. Wyoming consistently ranks high in traditional, emerging, and renewable energy sources—including wind. The "Energy State" was named first of 11 states in the Mountain West and Pacific Northwest regions by the National Renewable Energy Laboratory (NREL) for Developable Nameplate Wind Power Production by class.

### **BUSINESS ENVIRONMENT**

With a tax climate extraordinarily favorable for business, higher education programs to develop a workforce skilled in wind energy technology and wind resources consistent with utility-scale production, Wyoming is poised to be a leader in the wind power industry.

### **POTENTIAL**

There are approximately 8 gigawatts (GW) of proposed and under construction wind energy in Wyoming, and 472 GW of technologically possible capacity. The proposed 8 GW is enough energy to power almost 6 million homes, 20 times the number of households in Wyoming.

- 1. Cleanpower.org
- 2. Windexchange.energy.gov/states/wy#capacity
- 3. Cia.gov/state/analysis



### WYOMING'S WIND PROJECTS

### CHOKECHERRY SIERRA MADRE WIND ENERGY PROJECT

Currently under construction in Carbon County, Wyoming, this project will be the largest single wind power project in North America, and one of the largest in the world. The project is designed to have a nameplate capacity of at least 3,000 MW and is estimated to produce enough clean electricity to power approximately 1 million households, resulting in a reduction of CO<sub>2</sub> emissions of 7-11 million tons per year.

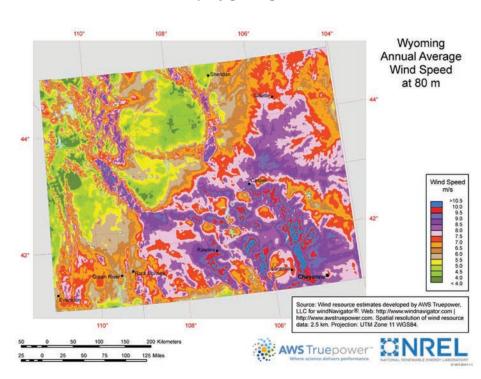
### TRANSWEST EXPRESS

The Transwest Express is a highvoltage interregional transmission system extending 732 miles from central Wyoming to southern Nevada. Using both HVDC and HVAC technology, along with the midpoint terminal, will increase the flexibility and physical transmission capacity of the Western U.S. power grid. A critical energy infrastructure, TWE provides Western electricity markets with brand-new, direct access to Wyoming's geographically diverse, complementary, highcapacity wind energy supplies. Scheduled to be completed in 2027.

### **WORKFORCE TRAINING AND EDUCATION**

There is a growing demand for jobs in the wind energy sector, including researchers, engineers, trade workers, technicians and transportation workers. Wyoming has developed programs at both the university and community college levels.

- The Wind Energy Research Center (WERC) at the University of Wyoming's (UW) School of Energy Resources is a collaboration with the College of Engineering and Applied Science dedicated to improving wind energy technology and its applications in Wyoming.
- The Wind Energy program offered at Laramie County Community College provides students with the critical skills needed to become successful technicians in the rapidly growing market.



# HYDROGEN

### HYDROGEN IN WYOMING

### **ENERGY LEADER**

With an abundance of natural resources, Wyoming is known as the "Energy State," and for good reason. Wyoming consistently ranks high in traditional, emerging, and renewable energy sources, including hydrogen. Wyoming has 25% of the nation's hydrogen production feedstock from both hydrocarbon and renewable resources, existing export infrastructure to reach high-value markets such as California and the Rocky Mountain metropolitan areas, and infrastructure for managing and storing CO<sub>2</sub> from blue hydrogen.

### **BUSINESS ENVIRONMENT**

Our state has a tax climate extraordinarily favorable for business and higher education programs to develop a workforce skilled in hydrogen technology. Wyoming's favorable business environment includes easy access to year-round recreational opportunities and wide-open spaces. Here, recreation and economic opportunity go hand-in-hand. With our tax-friendly climate and workforce training grants, Wyoming understands and supports all forms of energy development.

### POTENTIAL

- 25% of national hydrogen production feedstock
- Green and blue hydrogen production and potential export hubs
  - · Existing export infrastructure to reach high-value markets
  - Local offtake potential at retiring coal power generation stations or the Rocky Mountain metropolitan areas
  - Infrastructure for blue hydrogen includes
    - CO<sub>2</sub> transportation infrastructure
    - Geological formations for CO<sub>2</sub> sequestration

### **BUSINESS DEVELOPMENT**

**Black Hills Energy**, a utility company, is working with GE to analyze how to modify their existing natural gas generators at their Cheyenne Prairie generating station to use a blend of hydrogen.

**Williams Companies** is currently evaluating production and transportation of green hydrogen, including what the best methods are for transporting hydrogen using existing infrastructure, as well as providing water for proposed electrolysis.

**Tallgrass Energy,** as part of the Western Interstate Hydrogen Hub (WIH2), Tallgrass will produce clean hydrogen serving the power, transportation, and other industrial markets through its eH2Power project in New Mexico and Front Range Hydrogen project in Colorado and Wyoming.



### A HYDROGEN ECONOMY

### ROADMAP TO BUILD A HYDROGEN ECONOMY

Wyoming's Hydrogen Roadmap provides a course of action with specific roles and responsibilities for various stakeholders over the next five years, from 2022 to 2026. This roadmap leverages the combined strengths of these stakeholders to deliver on our shared vision while simultaneously addressing the challenges that must be overcome.

To view the roadmap, visit wbc.pub/Hydrogen\_Roadmap

### WESTERN INTERSTATE HYDROGEN HUB

This bipartisan, interstate coalition between Colorado, New Mexico, Utah, and Wyoming has been developing a regional strategy for the safe, clean, and sustainable use of hydrogen that will help to meet the region's diverse energy needs and policy goals, including reducing greenhouse gas emissions, using a broad range of feedstock to develop hydrogen, ensuring economic competitiveness, and supporting communities on the front lines of the energy transition. Eight projects across the four state region applied as WIH2 to be a hydrogen hub for the region.

# SUPPORTED INDUSTRY RESEARCH PROGRAMS

## UNIVERSITY OF WYOMING, SCHOOL OF ENERGY RESOURCES HYDROGEN ENERGY RESEARCH CENTER

A brand new developing center for advanced research into key technical aspects of the hydrogen production, delivery, and deployment sector, which stands to complement and enhance Wyoming's already robust energy sector, helping to diversify its economy.

# **NUCLEAR**

### **ENERGY LEADER**

Wyoming is known as the "Energy State," and for good reason. Wyoming consistently ranks high in traditional, emerging, and renewable energy sources. In November 2021, TerraPower and PacifiCorp announced the selection of the Naughton Plant in Kemmerer, Wyoming, as the site of the Natrium<sup>TM</sup> advanced nuclear reactor demonstration project.

### **BUSINESS ENVIRONMENT**

Wyoming has been a leader in energy for more than 100 years and is home to a highly-skilled, well-trained workforce. Wyoming knows what it takes to support major energy projects, and the state has a history as the nation's leader on energy issues. Many utilities have made significant investments in Wyoming's grid. Our state is pleased to be the home of this next generation of nuclear power facilities.

### NUCLEAR ENERGY INDUSTRIAL DEVELOPMENT

As nuclear energy undergoes a renaissance in the United States, the state of Wyoming is on the forefront of nuclear energy research, development, and value-added industrial development in this space. Repatriating and growing the nation's energy supply chain, especially the supply chain around nuclear energy, is critical for our nation's security. Wyoming companies are engaged with leading nuclear energy companies to supply critical components ensuring new nuclear technologies will be ready to deploy.





The Natrium technology enhances safety, relying on natural forces and advanced design making it inherently safe. The reactor has a net negative power coefficient, which means that if the temperature goes up, the reactor will naturally respond by reducing power. In addition, the Natrium reactor operates at atmospheric pressure and uses sodium, instead of water, as its coolant. The reactor operates at a temperature more than 350 degrees C below the boiling point of sodium. This gives the operator plenty of time to respond to any unusual event. Further, the Natrium reactor is a pool-type reactor, so there are no penetrations in the reactor vessel below the upper closure, which eliminates the possibility of a leak or loss of coolant accident. The design also relies on natural forces, like gravity and hot air rising, to cool the reactor if an unexpected shutdown occurs.

### **DEMONSTRATION SITE**

The demonstration plant is intended to validate the design, construction, and operational features of the Natrium technology. The energy storage capability allows the plant to integrate seamlessly with renewable resources. Along with PacifiCorp and GE Hitachi Nuclear Energy, members of the demonstration project team include engineering and construction partners Bechtel, Energy Northwest, Duke Energy, and nearly a dozen additional companies, universities, and national laboratories.

# DIRECT AIR CAPTURE (DAC)

### WHAT IS DIRECT AIR CAPTURE (DAC) TECHNOLOGY?

DAC is a form of Carbon Capture Utilization and Sequestration (CCUS) where air is captured, and the CO<sub>2</sub> is separated out and then permanently stored underground or converted into products.

- It is similar to what plants and trees do daily, but DAC does it faster and on a larger scale with a smaller footprint.
- DAC is helpful in balancing carbon emissions for industries that don't have a lot of other choices, like long-distance transport and heavy industry.
- In May of 2022, the Department of Energy (DOE) released a Notice of Intent to provide \$3.5 billion in funding to establish Direct Air Capture Hubs for large-scale CO<sub>2</sub> removal.

### WHAT DOES A DAC FACILITY PRODUCE?

- CO<sub>2</sub> for permanent storage underground
- CO<sub>2</sub> to be used in food processing or in products like synthetic aviation fuels or cement
- CO<sub>2</sub> for enhanced oil recovery
- · Carbon Removal Credits

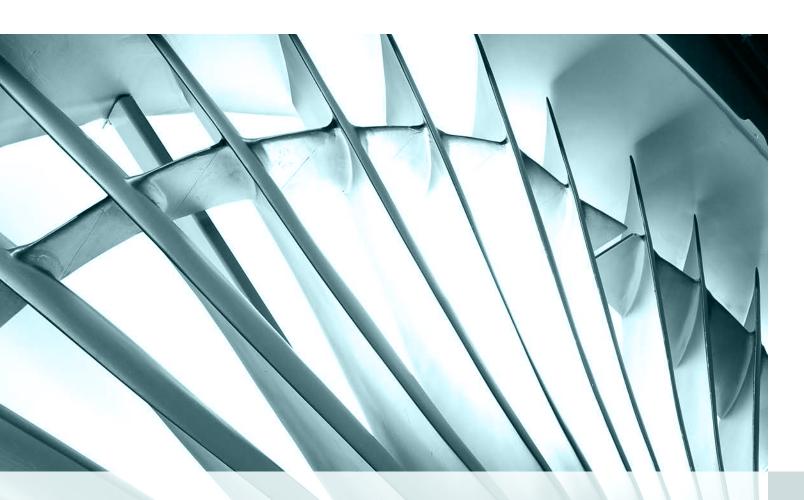
### WHAT ARE THE NEEDS OF A DAC COMPANY?

DAC company inputs include land and a variety of power sources. Also important to siting are sequestration wells and the availability of DAC-specific manufacturing.

- Energy: A variety of energy sources can be used to power a DAC facility. Scaling up today's DAC systems would use non-trivial amounts of energy. Many DAC companies are interested in renewable energy sources in order to keep facility emissions overall net negative.
- Land: Because DAC facilities are small and modular, there is flexibility when it comes
  to siting DAC facilities. Many companies are looking to locate close to suitable
  storage, eliminating the need for long-distance CO<sub>2</sub> transport. DAC facilities also
  require permanent storage. Wyoming has more than 40 billion tons of CO<sub>2</sub> storage.
- · Water: Water usage will vary depending on the DAC system, local temperature and humidity.

### WHAT KIND OF JOBS DO DAC FACILITIES NEED?

Many of these jobs will be similar to plant operators and maintenance, as well as some construction needs. Job opportunities will fit well with Wyoming's current mining and plant workforce. The majority of engineering, technical and innovation positions will likely be held offsite.



### **CARBON REMOVAL**

When you purchase a carbon removal credit, you are paying for someone to remove  $CO_2$  from the atmosphere and store it permanently for you. This differs from a carbon offset, which is a permit showing you've paid someone not to emit  $CO_2$  rather than remove it.

Companies, including Shopify, Microsoft, and others, have committed to buying carbon credits in addition to taking other measures, such as using renewable energy to help reach their net-zero or net-negative emissions goals.

### HOW DOES A DAC FACILITY PRODUCE CARBON REMOVAL CREDITS?

A DAC facility can create carbon credits by capturing  $CO_2$  from the atmosphere, storing it permanently, and tracking and recording the process very precisely. Then, they can sell these credits. This is one way for DAC companies to make money.

Carbon removal credits produced from DAC are considered among the most reliable and valuable but are also currently the most expensive. The global carbon credit market is projected to grow at least 15x by 2030 to reach \$50 billion.

### WHY WYOMING?

DAC requires many of the same exact skillsets, infrastructure, assets, and know-how that Wyoming's current energy industries do, making it one of the best places for DAC in the world.

Wyoming is the Energy State and has been a leader in carbon management for decades:

- CCUS leader
- High density of active oil/gas extraction
- · Renewable energy generation
- · Existing transmission infrastructure
- Capacity for geological storage
- Class VI primacy and other forward-looking carbon management policy provides responsible and reliable stewardship on short timelines

Wyoming has energy industry-friendly policies and policymakers.

Wyoming has a veteran energy workforce.

Wyoming's existing industry, workforce and infrastructure may make it a strong candidate for DOE funding for DAC Hubs.

# NEW AND DEVELOPING INDUSTRIES

In the true spirit of frontier exploration and innovation that encapsulates the state's all-of-the-above energy strategy, Wyoming is a leader in new and developing energy industries. Building off our heritage resources, Wyoming is leveraging the state's high IQ in energy to develop technologies that will enhance America's energy security in the 21st Century.

### **PUMPED HYDRO**

Seminoe Pumped Storage: The Seminoe Pumped Storage Project is a 900-megawatt pumped hydro energy storage project being developed in Carbon County, Wyoming. This type of system shifts water between an upper reservoir and a lower reservoir to store energy and generate power when needed. In this case, the lower reservoir will be the existing Seminoe Reservoir. The project will bring substantial economic benefits to the local community and will serve as an important element of Wyoming's modernized and reliable energy infrastructure.

### **SOLAR**

Wyoming saw its first utility solar project built in 2019, with additional interest in commercial solar projects around the state. Currently, there is approximately 650 MW of solar capacity under development and 146 MW of total installed capacity. In the 2020 Wyoming State Legislative session, Senate File 0036 – Large-scale solar and wind energy facilities – placed the permitting of commercial-scale solar projects (more than .5 MW of power) under Wyoming's Industrial Siting Council.











### INDUSTRIAL, CRITICAL AND RARE EARTH MINERALS

Wyoming mines the most uranium in the United States, producing approximately 173 thousand pounds in 2019 and employing 125 people. Wyoming's known reserves are estimated at 350 million pounds.

Wyoming is blessed with an abundance of industrial minerals and rare earth elements (REEs) and is the number one producer of both trona and bentonite. These industrial minerals are found in everyday items such as kitty litter and plastics, are critical elements in the production of wind turbines and solar panels, and are currently being researched for further use and as part of the increased interest in coal-to-products development.

Wyoming hosts significant deposits of REEs and other critical minerals. Our coal reserves have a variety of rare earth elements. Economic mineral commodities such as gold and copper and strategic mineral commodities such as uranium and helium are also found in Wyoming. When coupled with historical data and a proven mineral extraction history, Wyoming is uniquely positioned to become a national leader in developing domestic critical mineral production.

### POSITIONING WYOMING FOR GROWTH

### **HB61**

HB61 passed during the 2023 Legislative Session. This act authorizes the Governor to negotiate on behalf of the state of Wyoming with the federal Nuclear Regulatory Commission (NRC) for the state to assume primary regulatory authority over source material byproduct (generally, uranium or thorium) recovered from any mineral resources, like rare earth elements, that occurs from mining in the state.

### BEAR LODGE PROJECT

Rare Element Resources is positioning the Bear Lodge Project in northeastern Wyoming to be the next North American source of rare earth elements. With its premier location and expected +40-year life, the project has the opportunity to produce many of the critical rare earths necessary to support today's evolving technologies.

### HALLECK CREEK RARE EARTHS PROJECT

American Rare Earths is a rare earths exploration project located in the central Laramie Mountain range of southeastern Wyoming. With a globally significant exploration of target of over one billion tonnes of mineralized rare earth rocks, the 100% owned Halleck Creek project has the potential to be among the largest rare earths deposits in the United States.

# WHY WYOMING?

Ranked as the nation's "Most Business-Friendly Tax Climate" since 2013, Wyoming offers a pro-business mindset, industry incentives, a skilled workforce, and wide open spaces full of adventure that allow businesses and people to thrive.

Wyoming's higher education institutions continue to take a prominent role in fostering economic diversification, entrepreneurship, and innovation. The Wyoming Innovative Partnerships (WIP), created in 2021 by Governor Gordon, is a collaboration to align education and workforce development in order to support innovation, entrepreneurship, and research to help drive Wyoming's economy. WIP supports economic growth and efforts to build a highly-skilled, ambitious, and qualified workforce by linking community goals with the state's economic strategy. This partnership will be driven by data to ensure a return on investment for the people of Wyoming.

Building a strong workforce is important to the growth Wyoming has seen in the manufacturing and energy sectors in recent years. Other initiatives to support this growth can be seen from Manufacturing Works and the Wyoming Innovative Entrepreneurs, as well as Wyoming's Manufacturing Sales Tax Exemption.

Manufacturing Works, housed at the University of Wyoming, is Wyoming's NIST MEP center and assists Wyoming manufacturers, producers and entrepreneurs in increasing their productivity and performance, growing

their revenues, as well as strengthening their global competitiveness. They tailor their services to meet the critical needs of Wyoming manufacturers. Wyoming's Innovative Entrepreneurs (WIE) exists to grow and diversify Wyoming's economy by helping Wyoming entrepreneurs think big and tap into information and resources that help them upgrade and accomplish their individual missions and increase their company's longevity. WIE is an affiliate of the Alliance of Wyoming Manufacturers, a nonprofit membership organization for Wyoming manufacturers focused on maintaining a legislative and regulatory environment that supports and encourages the growth of Wyoming's manufacturing economy.

The Manufacturing Sales Tax Exemption exempts the sales tax burden on the sale or lease of machinery to be used directly and predominantly in manufacturing tangible personal property, as well as the sales of power or fuel to a person engaged in the business of manufacturing, processing or agriculture when the same is consumed directly in the manufacturing process.

The state of Wyoming is incredibly business-friendly, not just economically, but in our regulatory environment as well as the open access to policymakers and influential leaders in our tight-knit state.

CHECK OUT THE FOLLOWING PAGES TO SEE OTHER WAYS WYOMING CAN HELP YOUR BUSINESS!





# WYOMING BUSINESS COUNCIL

Through leadership, policy, and investments, the Wyoming Business Council (WBC) stands firmly upon Wyoming's heritage while advancing innovation, business creation, and growth in order to build resilient communities and create opportunities to thrive. We envision a future where traditional Wyoming values and innovation go hand-in-hand to create opportunities so communities can confidently withstand economic uncertainties and continue to thrive for generations to come.

Created in 1998, the WBC is a team of passionate professionals with a wide breadth of knowledge and expertise

in recruitment, development, and investment services.

Our team is focused on creating new opportunities for current and future generations of Wyomingites by adding value to Wyoming's core industries (natural resources, tourism and outdoor recreation, and agriculture) and leveraging them to activate new economic sectors such as healthcare, financial, scientific and professional services, digital and technology, arts and culture, and advanced manufacturing.

The Business Council is headquartered in Cheyenne with offices in Casper, Cody, Evanston, Laramie, Riverton, Torrington, and Wright.

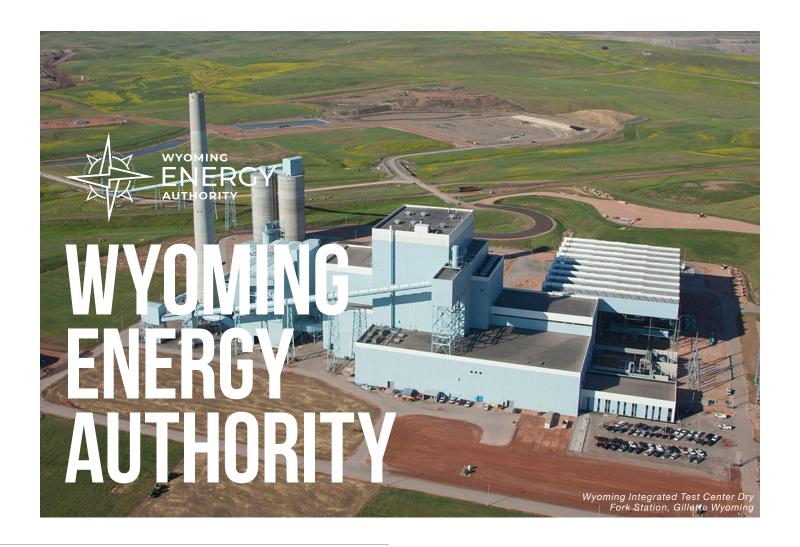
Find out more about the <u>State</u>

<u>Economic Development Strategic</u>

<u>Plan at wyomingbusiness.org/about</u>

Wyoming offers the most businessfriendly tax climate in the US, a pro-business attitude, and wideopen spaces full of adventure. With a skilled workforce and industry incentives, Wyoming is a great place to grow a business.

To learn more about the opportunities Wyoming offers and how the Wyoming Business Council can help your business, please visit **WhyWyoming.org** 



The Wyoming Energy Authority (WEA) advances Wyoming's energy strategy by driving data, technology, and infrastructure investments. With abundant natural resources and deep energy expertise, Wyoming is leading the way to the next-generation energy economy. Wyoming powers the nation – 90% of our energy-generating products are exported to markets outside our state borders. As consumer sentiment changes and the demand for low-emissions energy products increases, the Wyoming Energy Authority has developed a cohesive response to evolving market conditions.

Created in 2020 by the Wyoming State Legislature, the WEA merged the Wyoming Infrastructure Authority and the Wyoming Pipeline Authority. Wyoming's energy strategy focuses on empowering the nation with a net-zero energy mix. This includes harnessing the full value of our energy resources with an all-of-the-above energy strategy: products from our legacy industries, along with the newer players of renewable energy and emerging opportunities in CCUS, hydrogen, small modular nuclear, geothermal, and rare earth elements.

In pursuit of net-zero energy goals, Wyoming continues to invest in and deliver reliable and affordable energy to the nation. The state's highly trained workforce stands ready to put new technologies into action, and decades of policy work and strategic investments have positioned Wyoming as the premier location for transformative energy research and technology commercialization.

### **ACTIVE INITIATIVES**

- Wyoming Energy Strategy
- Idaho National Laboratory Partnership
- · Hydrogen Roadmap
- Nuclear Energy Roadmap
- Wyoming Integrated Test Center (ITC)
- State Energy Program (SEP)
- Direct Air Capture Hub

To learn more, please visit: wyoenergy.org



THE UNIVERSITY OF WYOMING

# SCHOOL OF ENERGY RESOURCES



The School of Energy Resources (SER) at the University of Wyoming collaborates with stakeholders at the state, national, and international levels to advance energy

technologies and policies to grow and support Wyoming's robust energy sector. SER's mission is energy-driven economic development for the state of Wyoming. In upholding its mission, SER is dedicated to achieving excellence in its three pillars -- energy education, outreach and research.

### **Academics**

Fully interdisciplinary and collaborative, SER capitalizes on partnerships with other University of Wyoming departments. Offering a B.S. degree in Energy Resource Management & Development and funding graduate students in departments across campus devoted to energy research, SER is training the future energy leaders of Wyoming.

### **Outreach**

SER transfers technology and knowledge to a broad range of constituents. SER collaborates extensively with partners to provide timely access to information to stakeholders and Wyoming decision-makers about dynamic energy developments stemming from research.

### Research

SER's research programs focus on maximizing energy production, minimizing the environmental footprint and leading technology innovation, always to benefit the state. Through its Centers of Excellence, SER bridges the gap between academia and industry – and ensures that the technology and policy solutions developed can be deployed.

SER provides funding for the Centers of Excellence (COE) to be established as mechanisms to bring together faculty and graduate students from multiple disciplines to develop important energy research programs. Work conducted in the COE's can stem from cutting-edge technical development to research and advocacy for policy and regulation.

Researchers at SER partner directly with businesses and organizations to perform the necessary research, testing, and modeling on energy topics. Projects are advanced toward commercialization with the goal of a full transition to industry and business entities for wide-scale deployment.

To learn more, please visit uwyo.edu/ser



The Wyoming Department of Environmental Quality (DEQ) consists of seven divisions: Air Quality, Water Quality, Solid and Hazardous Waste, Land Quality, Industrial Siting, Abandoned Mine Lands, and Administration. Together we ensure that Wyoming's natural resources are managed to maximize the economic, environmental and social prosperity of current and future generations. The department does this through a combination of monitoring, permitting, enforcement, remediation and restoration activities, which protect, conserve and enhance the environment while supporting the responsible development of Wyoming's resources.

### INDUSTRIES WE SERVE

More than 5,000 businesses work with us each year to ensure that

operations at more than 28,000 individual facilities throughout the state are in compliance with state and federal laws, rules and regulations.

Some of the businesses and operations include:

- · Oil and Gas Development
- Power Plants
- · Large Industrial Projects
- Mining (Coal, Hardrock, Uranium, Rare Earth Minerals)
- Solar and Wind Farms
- Carbon Sequestration
- Supporting Wyoming's Environment and Energy Development

DEQ provides meaningful oversight to enable responsible economic development. Our agency staff is responsive to the needs of large and small businesses in Wyoming. We provide the guidance necessary to ensure that your business has the best information to comply with state and federal regulations and minimize environmental impacts.

### A STEP AHEAD

The Wyoming Department of Environmental Quality received primacy over Class VI wells (Carbon Sequestration) on September 3, 2020. Wyoming is one of two states to have received primacy for implementing the Class VI program; the other is North Dakota.

To learn more, please visit deq.wyoming.gov

# WYONING DEPARTMENT OF WORKFORCE SERVICES

The Wyoming Department of Workforce Services (DWS) offers a variety of business support for the energy industry from business training and support to workers' compensation and apprenticeships and internship programs. Most services listed below are free and available to businesses throughout Wyoming. Visit dws.wyo.gov or call 307-777-8650 for more information.

### BUSINESS TRAINING AND SUPPORT UNIT

Administers Workforce Development Training Fund grants, including apprenticeship, internship, business training, pre-hire, and pre-obligation grants.

Assists companies with training grants from application to reimbursement.

Provides technical assistance in the establishment of Registered Apprenticeship programs.

### **WORKFORCE CENTERS**

Posts job openings and matches job seekers with available jobs.

Assists with specialized recruitment and screening services.

### **RISK MANAGEMENT SERVICES**

Provides an understanding of your Workers' Compensation account, including the industry base rates and Experience Modification Rating (EMR).

Ideas on how to be proactive in preventing injuries and methods to reduce costs after an injury has occurred.

Offers discounts for safety programs, drug testing programs, and employers willing to invite and work with a Workers' Compensation Safety and Risk (WCSR) Safety Specialist or an Occupational Safety Health Administration (OSHA) Consultant.

Utilizes Wyoming Safety Improvement Fund program to help businesses implement health and safety training programs, or assists with the purchase of health and safety equipment up to \$10,000.

### **WORKERS' COMPENSATION SAFETY AND RISK**

Identifies and addresses occupational safety and health hazards.

Assists employers with tools to manage their safety and health processes better.

Improves workplace safety and health programs.

Assists in reducing Workers' Compensation costs.

Performs safety consultation and industrial hygiene consultation.

Offers other services, including safety management assessment and advice, written safety and health program development assistance, safety culture assessment and behavior change process assistance, and safety team/committee development and enhancement.

# CROSSROADS OF THE SEATTL WEST SEATTLE

Wyoming's advantageous geographic location and ample transportation infrastructure provide reliable access to and from communities statewide.

SALT LAKE CITY

BILLINGS

CHEYENNE

DENVER

SAN FRANCISCO

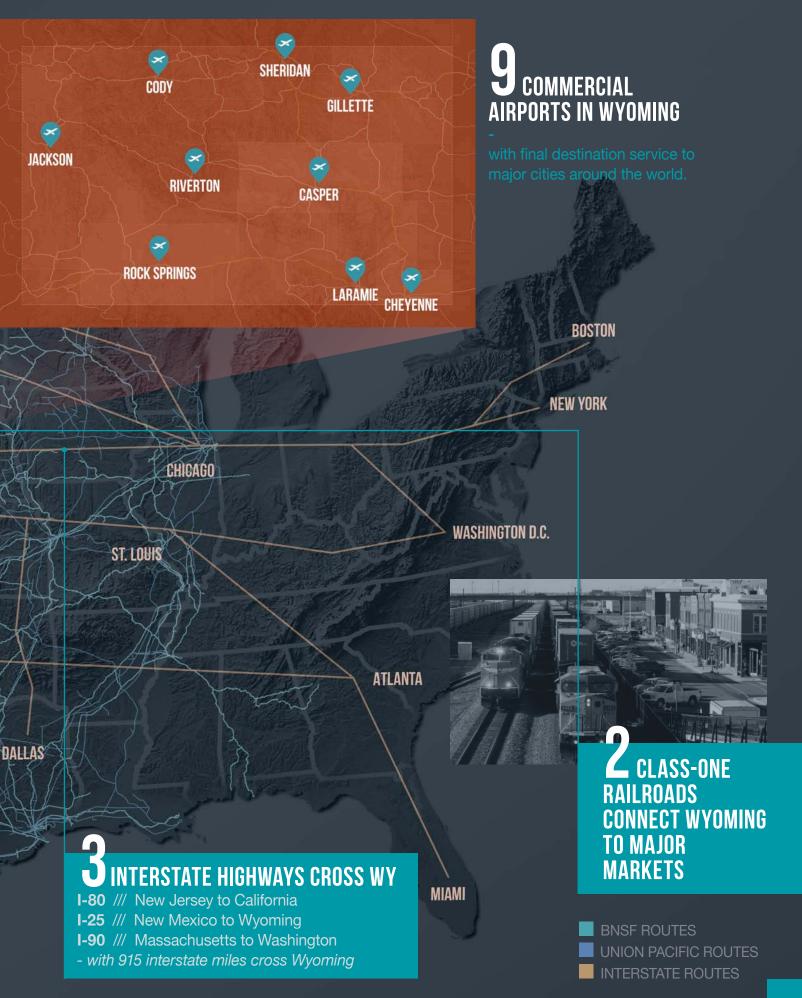
LOS ANGELES

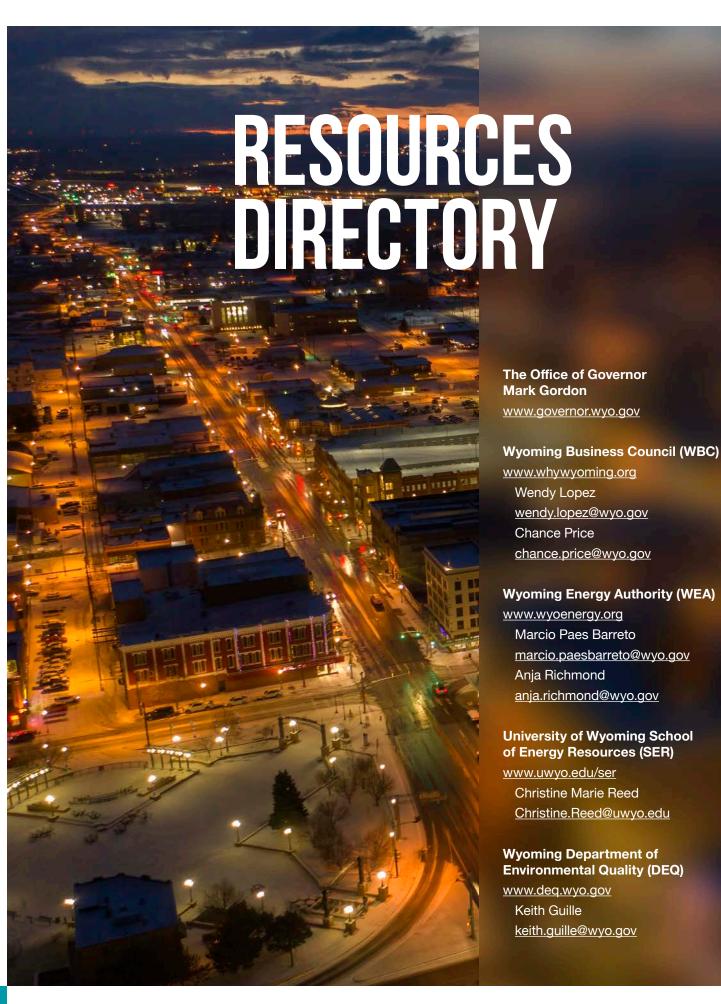
MAJOR INTERNATIONAL AIRPORTS SURROUND WY

- /// Denver, CO
- /// Salt Lake City, UT

466 MILE RADIUS FROM GEOGRAPHIC CENTER

PHEONIX





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### Wyoming Department of Workforce Services

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### Wyoming Enhanced Oil Recovery Institute (EORI)

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### Wyoming Innovation Partnership (WIP)

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### **Wyoming Integrated Test Center**

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### **Wyoming Legislature**

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### Wyoming Office of State Lands & Investments

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### **Wyoming Oil & Gas Commission**

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### Wyoming Public Service Commission

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### **Wyoming Secretary of State**

www.sos.wyo.gov business@wyo.gov

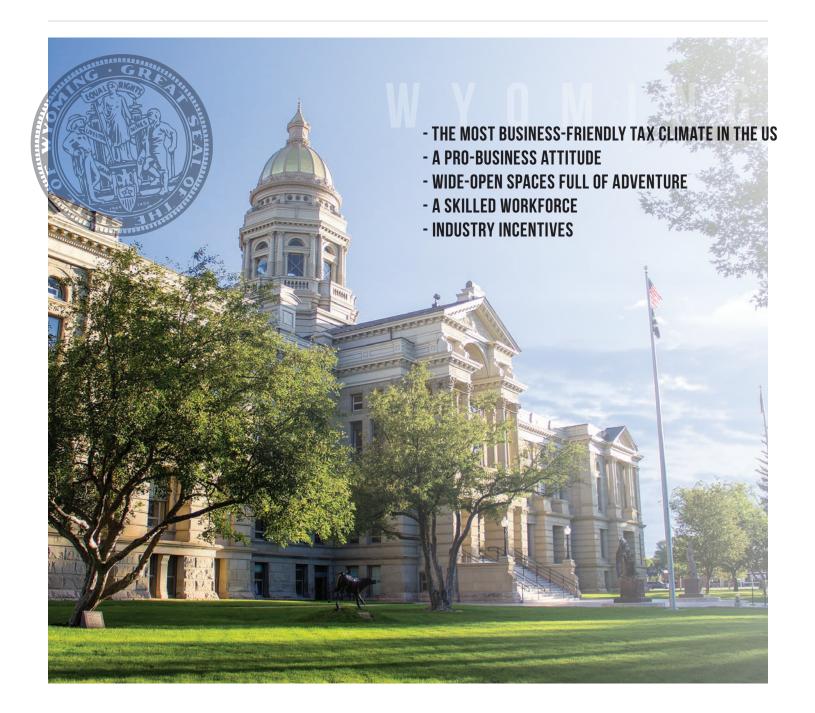
### Wyoming Small Business Development Center (SBDC)

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