INNOVATIONS

A PLAYBOOK FOR INNOVATION
Coal-to-Products and General
Innovation in Eastern Utah

UTAH

AGNC

ASSOCIATED GOVERNMENTS
OF NORTHWEST COLORADO

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Since the mid-1800s, coal has been part of the culture and economy of northwestern Colorado and eastern Utah, providing fuel for electricity, industry, and transportation in the process. Beyond this, it has provided the region with well-paying jobs and economic stability for innumerable workers, families, and communities. However, changes in the coal economy have led to powerplant and mine closures. As this continues, the last remaining coal power stations and mines that supply them are threatened.

Despite this, coal is still a useful resource that can continue to play an economic role as the feedstock for many innovative products. Through these products, it also has the potential to help alleviate domestic supply chain constraints and make the country more self-reliant.

This Playbook is a product of the Coal Communities Innovation Project conducted between September 2019 and March 2022. During this project, Grow Economy collaborated with RPPL, AGNC and Nathan Perry, PhD to conduct in-depth economic analysis of six coal-impacted counties in northwestern Colorado and eastern Utah. The counties addressed were Moffat, Routt, and Rio Blanco Counties in Colorado and Emery, Carbon, and San Juan Counties in Utah. This effort resulted economic playbooks for the AGNC and eastern Utah regions, as well as a larger economic analysis known as the Data Intensive Economic Report (DIER).

The playbook that follows contains recommendations for establishing local coal-to-products industries and other innovation initiatives in the eastern Utah region. This includes recommendations for projects that focus on specific innovation activities and supporting infrastructure projects.

This document is the product of in-depth research conducted by Grow Economy and Nathan Perry, Ph.D.[2] Funding for this project was provided by the Colorado Department of Local Affairs (DOLA), Rural Policy Public Lands Institute (RPPL), and the U.S. Economic Development Administration (EDA).

It is our hope that the information provided herein will help the region move forward as it adapts to changes in the coal Industry. Moreover, that the efforts it encourages will provide the region with resources to create jobs, encourage industry, and diversify local economies in the process.

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Introduction

This playbook provides recommendations for seeding high-value innovation initiatives in the eastern Utah region. Although these will help encourage economic diversity and job creation, they are not meant to replace coal in terms of wages and revenue generation. Accomplishing this will only occur over time as the industries encouraged by these initiatives grow. Likewise, coal-to-products (as discussed in this playbook) should not be viewed as a replacement consumer for coal. Rather, it should be viewed as a component of a larger innovation framework that encourages other industries as well.

The playbook itself is organized into three basic sections. The first of these discuss the competitive advantage of Emery, Carbon, and San Juan Counties. This includes local economic strengths, which provide opportunities for economic growth and diversity in the region.

The second section recommends innovation priorities based on regional competitive advantage. This includes a physical innovation space, advanced/light manufacturing, workforce development, remote work support, and broadband expansion.

The third section of the playbook provides recommendations for implementation. The first of these is an implementation strategy for coal-to-products. This contains implementation steps and makes recommendations like forming partnerships to increase program support. Following this is a strategy for general innovation program implementation. This strategy is applicable to the innovation priorities recommended in this playbook, as well as others that may emerge later.

Ultimately, the recommendations put forth in this playbook will help encourage economic diversity, innovation, and resilience within the region. The result for eastern Utah's coal communities will be increased regional growth, economic sustainability, and prosperity for their residents.

Competitive Advantage in the Eastern Utah Region

Emery County
MINING (Coal, Oil, and Gas): Emery County shares a coal-themed heritage with Carbon County. In fact, Carbon County was part of Emery County until 1894. Emery is home to the Hunter and Huntington coal fired power plants. Also, four active coal mines exist in the county: Lila Canyon Mine, Emery Mine, Gentry Mine, and Skyline Mine. Like Carbon County, the rail line that services the region is an excellent piece of infrastructure that

could support coal-to-products and other manufacturing industries. Furthermore, the coal miner skillset is transferable to many forms of manufacturing, providing human resources that could be utilized for this purpose. Figure 1 illustrates the percentage of GDP that comes from oil, gas, and mining.
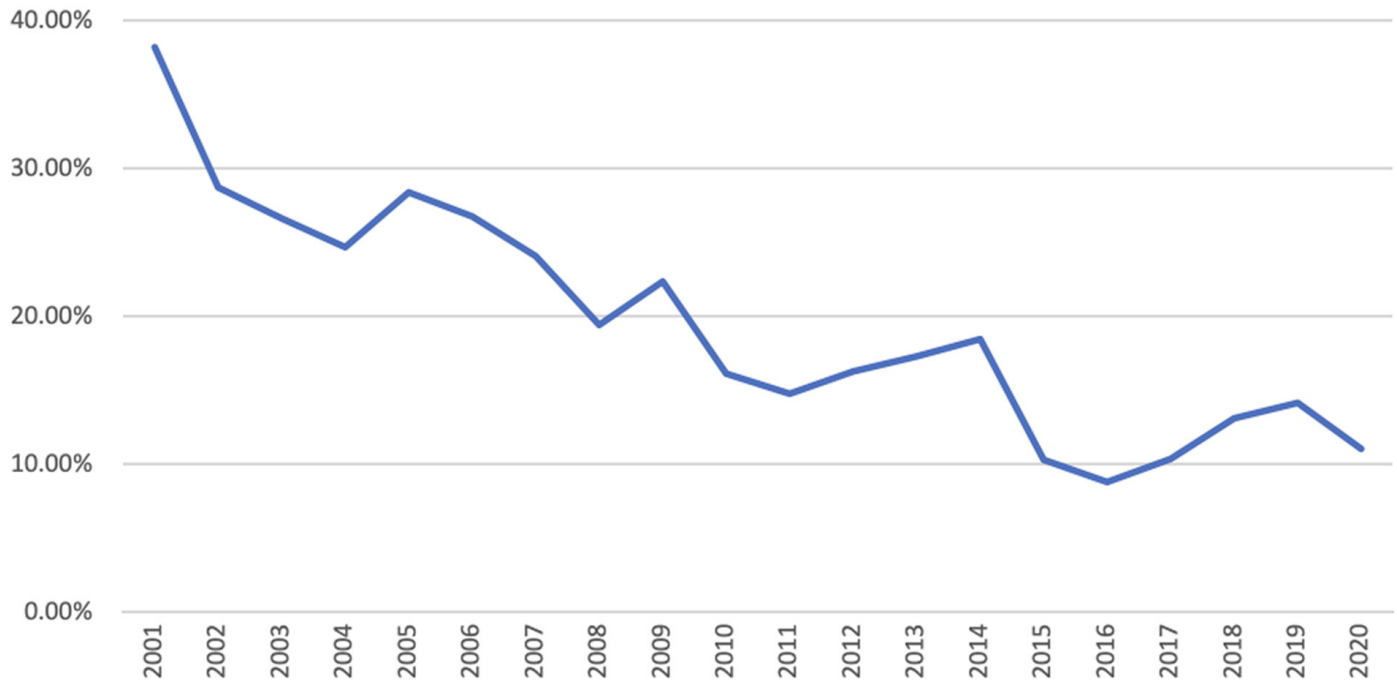

Figure 1: Oil, Gas, and Mining as a Percentage of GDP Emery County
DATA FROM BEA.GOV, AUTHOR CALCULATED

SAN RAFAEL ENERGY RESEARCH CENTER: The San Rafael Energy Research Center conducts research on molten salt reactors and thorium powered nuclear energy. The research center is also home to the L-1500 gasification furnace. This unit is used to analyze the content of gasified materials and support coal-to-products research. The facility's goal is to encourage more energy diversity in the region while drawing on local resources. Therefore, San Rafael the has potential to attract further energy research and funding to the region, which could help support an innovation cluster.

TOURISM: Tourism, defined by accommodation/food services, arts, entertainment, and recreation is not a large part of Emery County's economy (approximately 1% of its GDP). However, potential exists to capitalize on outdoor recreation tourism, which is a growing industry that has support on the state level to help create tourism infrastructure. Local recreational areas that have potential to expand tourism include the San Rafael Swell, Goblin Valley State Park, Little Wild Horse Canyon, the Manti-Lasal National Forest, and other areas that support outdoor recreation. Cultural and scientific attractions

such as the Cleveland-Lloyd Dinosaur Quarry and the Pioneer Museum also have potential to attract visitors to the area.

REMOTE WORK: The COVID-19 pandemic has led to an expansion of remote work in the United States. This has allowed millions of Americans to migrate from urban areas to lower-cost rural areas where they can work remotely. Both Carbon and Emery Counties are close in proximity to the Provo/Salt Lake area. Therefore, the Coal County Strike Team has specifically targeted the expansion and support of a "Silicon Slopes Eastern Hub" to support a remote workforce transition to these areas. Support of remote work will draw residents to the region with high-paying jobs that could help support local businesses and the economy in general.

Carbon County

ENERGY AND ENERGY INFRASTRUCTURE (Coal, Oil, and Gas): Carbon County is home to one active coal mine (Dugout Canyon) that is near northern Emery County's mines. Sunnyside coal power station is also located in the county. Coal power stations like this could potentially be used for coal-to-products or other advanced manufacturing facilities. Local railroad lines also exist in the county that could be used to transport manufacturing products.
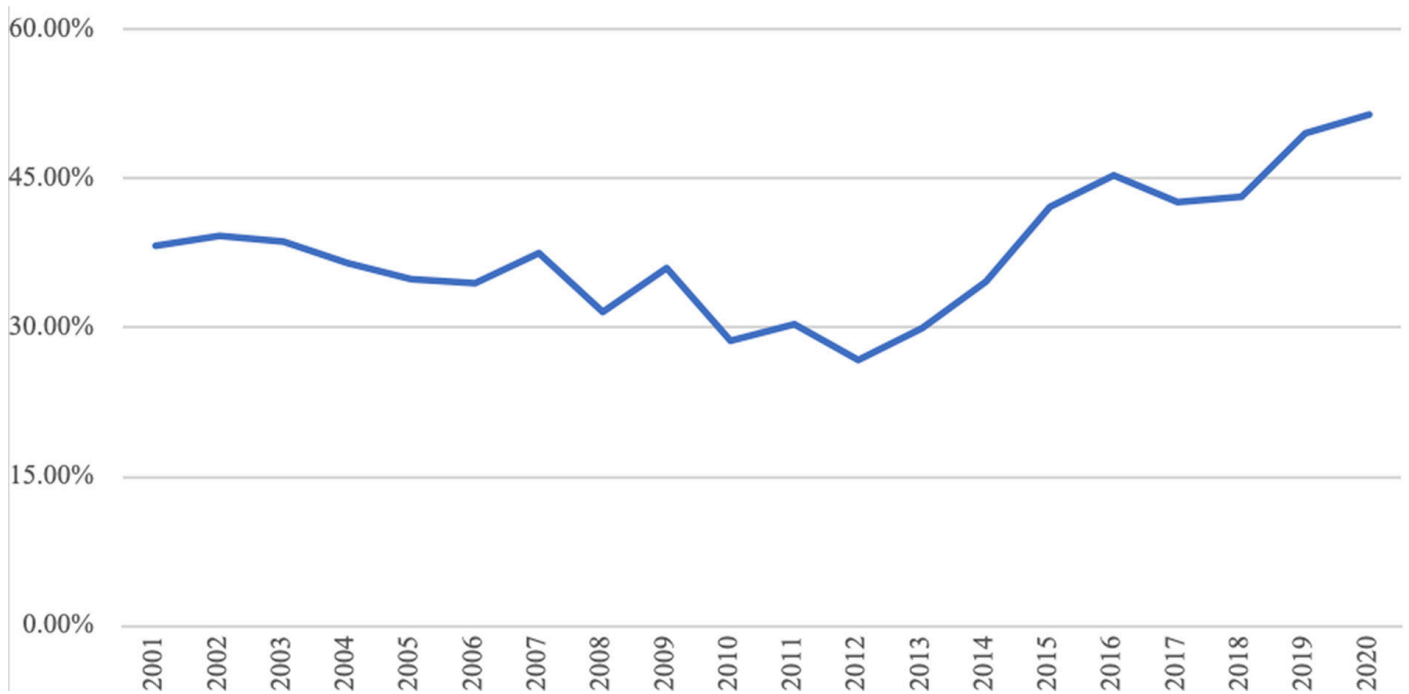

Figure 2: Oil, gas, and coal percentage of GDP Carbon County
DATA FROM BEA.GOV, AUTHOR CALCULATED

UTAH STATE UNIVERSITY EASTERN: Combining the College of Eastern Utah with the resources of Utah State University created Utah State University Eastern (USUE). USUE has seen a small decline in enrollment, falling from over 2,500 students in 2010 to just under 2,000 since 2016. However, USUE, its facilities, and human capital create opportunities for the region. This includes research and development opportunities, a potential location for an innovation center, and workforce development/retraining programs.

TOURISM: Carbon County has potential to benefit from outdoor recreation. Recreation areas include Nine Mile Canyon, Scofield State Park, Gordon Creek Falls, Buried Forest Concretions. These sites offer hiking trails, scenic byways, and OHV destinations, which attract visitors from all over the world. The county also has a unique history surrounding early Mormon settlement that attracts other visitors. The discovery of coal within the county in the 1880s adds to this heritage, providing small towns with historic resources that have tourism potential. The historic downtown of Helper, Utah is an example of how historic resources can be capitalized to support the arts and tourism. The county is also home to the Utah State University Eastern Prehistoric Museum and Helper's Mining and Railroad Museum, which attract other visitors. Tourism potential also has potential for support state support, as it is one of the four targets of the Utah Coal Country Strike Team plan put out by the governor's office.

San Juan County

TOURISM: San Juan County is home to outdoor recreation, cultural, and historical tourism. Natural areas in the county such as Bears Ears National Monument, Canyonlands National Park, Natural Bridges National Monument, Hovenweep National Monument, Four Corners Monument, and Lake Powell attract visitors from all over the world. Additionally, the Navajo Nation provides tourism opportunities focused on cultural, history, outdoor recreation, and the arts. Casinos and resorts operated by Nation are other destinations that attract visitors to the county.

MINING, OIL, AND GAS: Uranium, Copper, and Vanadium are mined in San Juan County, making up 7.9% of the San Juan County GDP. It should be noted that mining is the largest contributor to GDP in the county. Additionally, Blanding is the location one of the last uranium mills in operation in the United States. Uranium milling and mining both have potential for expansion, as nuclear power gains renewed interest. Oil and gas represent 5.9% of the San Juan County economy; however, as of February 2022 there were no active rigs in the region.

USUE CAMPUS IN BLANDING: Blanding has a USU statewide campus, which creates opportunities for the San Juan region. USU Blanding, facilities, and human capital create opportunities for the region. These include potential research and development programs, innovation centers, and workforce development/retraining programs.

Program Priorities

Below is a list of recommended programs and activities that align with regional competitive advantage. Although it may not be possible to address all these priorities in a single program, multiple priorities may be pursued under a single umbrella program. Desired programs that fall outside of this program, lack resources for development, or compete with higher priorities should only be pursued after these. The development of an effective priority plan for the region will help ensure that the most critical activities are addressed first.

1: Coal-to-Products

Due to the presence of local feedstock and other resources in the region potential exists for a coal-to-products industry. Efforts to support this industry could be part of a larger manufacturing initiative and a focus of an innovation center. Although efforts to promote coal-to-products could result in business and job creation, it should not be viewed as a replacement of coal in terms of consumption or wage and revenue generation. Additionally, due to the innovative nature of coal to products, strategic partnerships are recommended to increase the likelihood of success. This is discussed in the step-by-step guide to coal innovation found in this playbook. For further information on coal-to-products, refer to Chapter 4 of the DIER.

2: Physical Innovation Space

Physical innovation spaces range from simple makerspaces to innovation centers, which provide a wide range of business support services. These include manufacturing/fabrication space, office and floor space rental for startups, business incubators, workforce development, and innovation outreach. A full-service innovation center that supports multiple program priorities would encourage business creation, job growth, and economic diversification in the region.

For maximum effectiveness, the innovation center should involve a local academic partner. Potential academic partners and other resources are discussed in Chapter 3 of the DIER. Support for the innovation center could come through several sources. One of these is through participation in grants that the managing non-profit helps businesses in the incubator program win. Other potential sources are floorspace rent and user fees charged to businesses and community members who use the site. For information on existing programs with innovation centers, makerspaces, and other facilities that fall into this category, refer to Chapter 6 of the DIER.

Below are the types of services this resource should offer:
- Lab/prototyping space
- Incubation services
- Remote work support
- Workforce development support
- Coworking space
- Remote worker support

3: Light Manufacturing

The region's transition from energy provides an opportunity for light manufacturing. This is especially true for workers in the energy

sector, as their skillsets transfers well to this industry. For more information about energy/coal sector skillset transfer, view Table 28 in the DIER. Another advantage the region has towards light manufacturing is its low cost of living and labor. Therefore, it may be possible to locate manufacturing efforts within it such as metal fabrication and other forms of light manufacturing to the region. This would enable companies in more expensive areas of the state to expand while reducing production costs at the same time. Local rail transportation resources also provide excellent access to shipping for finished goods and raw materials.

4: Alternative Energy

Alternative energy production potential is another competitive advantage of the eastern Utah region. Diversifying the energy portfolio of the three counties in the region, would create jobs, and help offset some of the lost revenue from coal mine and power plant closures. Additionally, they could help the region remain energy self-sufficient as thermal coal energy begins to play less of a role in the future.

In a report that can be found at *https://geology.utah.gov/docs/emp/UREZphase2.pdf* , the Utah Renewable Energy Zone Task Force identified areas in Utah with alternative energy feasibility. The report discussed wind power generation potential in Emery and Carbon Counties. Additionally, it identified strong solar potential in southern San Juan County and promising wind power potential in the Monticello region.

5: Retraining for High Demand Trades and Professions

Providing educational opportunities for coal industry workers to retrain in high-demand careers is another innovation possibility for the region. Developing such a program in partnership with local colleges and universities would ensure that the program meets local needs. Furthermore, its support could come through state funding and from coal industry employers as part of their workforce transition efforts. The program would essentially allow coal workers to continue to earn wages while they earn degrees and certificates in fields like nursing, welding, electrical, plumbing, and home building, all of which are in high demand locally. Worker retraining that fits regional needs while supporting business development in the trades, can help the region recover from coal job losses. Additionally, it may help alleviate labor and housing shortages by increasing the number of construction workers in the region.

6: Remote Work Support

Initiatives that support remote work have potential to attract people to the region who bring high paying jobs with them. In turn, these individuals help support the local economy by paying for goods and services and by contributing to tax revenue. The Utah Coal Country Strike Team targeted Carbon and Emery Counties for business relocation and remote work through Silicon Slopes East. Silicon Slopes East capitalizes on and supports Utah's tech industries. Their efforts in Emery and Carbon Counties include coworking support, entrepreneurial resources, events, and innovation advocacy.

Emery and Carbon Counties are attractive locations for remote workers due to their low cost of living and rural environment. Therefore, Silicon Slopes East provides remote work support in both counties directly and through affiliated entities. One such entity is the Business Technical Assistance Center located in Price. This facility is a remote working space with innovation resources that support onsite and offsite remote workers and entrepreneurs. Although Silicon Slopes East primarily focuses on Emery and Carbon Counties, other remote workforce resources exist in San Juan County that could be expanded on through future initiatives. The San Juan County Community Incubator and co-working space is operated by Utah State University. This entity provides coworking space, support for new businesses, and remote work resources for the region. Resources like these, along with broadband expansion (discussed next), are important examples of remote work infrastructure.

7: Broadband Expansion

Effective broadband infrastructure is vital to attract high tech industries, medium-large businesses, and remote workers to the region. Although the maps found in Chapter 3 of the DIER illustrate broadband availability in Carbon, Emery, and San Juan Counties, below are some recommendations that policy makers should consider:

- San Juan County needs wireless and wired broadband development. The expansion of broadband into this area would help facilitate remote work. To accomplish this, there is need of detailed assessment and mapping. Such a map should contain priority areas for broadband infrastructure projects that could be carried out over a specified number of years. This planning phase could then be followed by physical work.

- There is a project being carried out to bring broadband to the Navajo Nation. During this project fiber will be laid from Blanding to Bluff, east to Montezuma Creek, west of Bluff through Kayenta, and back north to Navajo Mountain.

- All three counties need access to higher speed internet to attract business. When using 25 mbps as the threshold for business internet speeds and 3 Mbps as the cutoff, Carbon, Emery, and San Juan Counties all decline in coverage as can be observed in figures. This is most apparent in San Juan County. 25 Mbps is a low threshold and would only support a small business. Businesses with several employees that all actively use internet would need much higher download speeds to function properly, increasing the need for higher broadband performance in certain areas.

Broadband Project Planning Approach

In addition to the previous recommendations, certain planning approaches will facilitate a phased expansion that takes place as resources become available. Such an approach should contain the following:

- GIS-Based Broadband Map: GIS provides a visual resource for mapping out areas

where proposed broadband projects should take place. As far as broadband is concerned, an effective map will show existing coverage, fiberoptic infrastructure, and telecommunication towers. Expansion areas in all these categories may also be added to the map in layers, which can be updated as needed.

- Expansion by Priority Area: The GIS-based map should include expansion priority areas for broadband projects. Priority areas consist of defined geographical areas where expansion will take place within a specified number of years. Projects that will be carried out the soonest are the ones with the highest priority. An example of what priority areas consist of is as follows:

    PRIORITY 1 (0-5 years)
    PRIORITY 2 (6-10 years)
    PRIORITY 3 (10-20 years)

Program Implementation

INGREDIENTS FOR A SUCCESSFUL INITIATIVE

Several ingredients are required for successful innovation initiatives. These include the following:

- INFRASTRUCTURE: Certain innovation programs like coal-to-products and light manufacturing require industrial facilities to operate in. If available, these may come in the form of existing facilities that could be retooled as manufacturing centers. Transportation resources like railroads and feedstock sources such as coal mines are examples of other forms of infrastructure useful to these initiatives.

- POTENTIAL PARTNERS: These are entities that have the potential to support a local initiative. This is because a successful program requires partnerships with entities that provide research and development expertise, funding sources, long term vision, and investment. Potential partners include academic institutions, government entities, private industry, and foreign partners.

- FUNDING CAPACITY: A successful innovation initiative depends on adequate funding. Funding is necessary to support any needed research and development, equip facilities, and scale products to manufacturing levels (if a product is involved). Potential funding sources include federal and state grants, private industry investment, low-cost loans, and investment from foreign partners.

- REGULATORY ENVIRONMENT: The final ingredient for a successful program is a favorable regulatory environment. The regulatory environment determines the regional support for a given initiative. This is especially true for coal-to-products, which involves the extraction of a resource and its processing/manufacturing into a finished product. A supportive environment will provide investment opportunities and advocacy, while a non-supportive one can challenge outside investment and competitiveness. In areas where the regulatory environment is not favorable, finding a way to compromise and align with broader regional goals is key.

Below are available resources for implementation that the eastern Utah region may capitalize on for a successful initiative (refer to Chapter 3 of the DIER for further information):

INNOVATION RESOURCES

LOCAL INFRASTRUCTURE

Power Stations

Power stations provide access to industrial grade utilities and infrastructure that could support advanced manufacturing and other initiatives. The eastern Utah region is home to three coal fired power plants, two of which are set to retire in 14-20 years. Therefore, opportunity may exist in the future to utilize these facilities in local innovation programs like the following:
• Coal-to-products
• Advanced/light manufacturing
• Workforce development
• Remote work support
• Physical innovation spaces

Eastern Utah Coal-Fired Power Stations
• Hunter Power Station
• Huntington Power Station
• Sunnyside Power Station

Railroad Resources

Railroad resources provide the region with a cost-effective method for transporting raw materials and finished goods. The Eastern Utah is home to one major railroad and a short line railway. Both have potential to support innovation programs such as the following:
• Coal-to-products
• Light manufacturing

Eastern Utah Railroad
• Union Pacific (Emery and Carbon County)

Coal Mines

Eastern Utah is home to four active coal mines. These mines produce low-sulfur subbituminous or bituminous coal that is used for power generation, export, and industrial applications. Additionally, two active mines exist in Utah outside of project region, which produce subbituminous coal used for power generation. For further information on coal types (ranks) and the materials that can be produced from them, refer to Chapter 4 of the DIER. Coal mines like these could be used to help support the following:
• Coal-to-products
• Advanced/light manufacturing

Emery and Carbon County Mines
• Lila Canyon Mine (Emery County): Lila Canyon is just south of Sunnyside power plant and in 2020 ranked third in production among Utah coal mines.

• Skyline Mine (Emery/Carbon County): Skyline Mine is a coal mine located between Fairview, Utah, and Price Utah, bordering Emery County and Sanpete County. Skyline #3 had the second most coal output of Utah coal mines in 2020, producing 3.7 million short tons of coal.

• Bronco Mine (Emery County): Emery Mine is located 4 miles south of the town of Emery, Utah, in Emery County. Emery Mine produced 474,000 short tons of coal in 2020.

- Gentry Mine (Emery): Gentry Mines number 3, and 4 are located north of the Huntington coal power plant and produced 660,000 and 11,000 short tons of coal, respectively, in 2020.

Other Utah Coal Mines
- Sufco Mine (Sevier County): SUFCO min is located near the town of Emery, south of Castledale and East of Salina, Utah. SUFCO mine was the top producing mine in Utah at 4.4 million short tons of coal in 2020.

- Alton (Coal Hollow) Mine (Kane County): the Coal Hollow Mine is in Kane County and produced 569,000 short tons in 2020.

POTENTIAL INNOVATION PARTNERSHIPS

Academic
Academic institution involvement is necessary for certain innovation programs like coal-to-products and workforce development. However, it can benefit other programs as well. Academic partners can provide expertise, exposure to other partnerships, and access to potential funding opportunities. Academic partnerships should be pursued for the following programs:
- Coal-to-products
- Advanced/light manufacturing
- Workforce development
- Remote work support
- Physical innovation spaces

In State Academic Institutions
- University of Utah, Industrial Combustion and Gasification Research Facility, Salt Lake City, UT.

Out-of-State Academic Institutions
- Montana Technological University
- University of Wyoming

Department of Energy (DOE) Laboratories
DOE laboratories are actively involved in coal material, sustainable power technologies, and energy development. DOE laboratory partnerships can benefit the following:
- Coal-to-products
- Advanced/light manufacturing

Nearby DOE Laboratories
- Idaho National Laboratory (NREL)

Other National Laboratories of Interest
- National Renewable Energy Laboratory in Colorado (NREL)
- Oak Ridge National Laboratory (ORNL)

Coal Sector Companies
Companies in the coal sector provide opportunities for partnership and are sources for personnel that could participate in multiple innovation programs. They could also help support programs like workforce development, help provide feedstock for coal to products, and help test power technologies. The following initiatives could benefit from their involvement:
- Coal-to-products
- Advanced/light manufacturing
- Workforce development
- Physical innovation spaces

Local Power Companies
- Sunnyside Cogeneration Associates: Sunnyside Cogeneration Associates owns the Sunnyside Cogeneration Plant.

- PacifiCorp: PacifiCorp owns the Huntington and Hunter coal power stations.

Coal Mine Operators
- Wolverine Fuels: Skyline #3, Dugout Canyon, and SUFCO
- Gentry Mountain Mining, LLC: Castle Valley #1
- COP Coal Development Co.: Gentry #3 and #4
- Bronco Utah Operations: Bronco (Emery) Mine
- Emery County Coal Resources: Lila Canyon

POTENTIAL INDUSTRIAL PARTNERS FOR COAL-TO-PRODUCTS

Carbon fiber is useful to a variety of industries such as aerospace, automobile manufacturing, sporting goods, and energy production. It is also used in aerospace where it replaces metals such as aluminum and titanium. In sporting goods, it is used for tennis rackets, golf clubs, hockey sticks, bats, bows, and arrows. In energy production, it is used as a lightweight material for wind turbine blades. And, in the automotive industry it is used to reduce vehicle weight, increase energy efficiency, and reduce material cost. For information on potential industry partnerships to advance coal-to-products, visit the Institute for Advanced Composites Manufacturing Innovation (IACMI) website: *https://iacmi.org/*.

FUNDING SOURCES
Coal-to-products and other innovation programs require funding to get started. Some of this funding will be needed to construct infrastructure, while other sources will be needed to develop products and managed programs. Although local funds can be used to get programs started, grants available through public agencies on state and Federal levels will make larger programs possible. Below are some potential sources to investigate:

Federal Level
- EDA: Grants are available from EDA with 0-50% match funds required. These can be used to construct and equip facilities and industries if they are owned by a non-profit entity. These grants should be investigated for physical facilities and equipment.

- DOE: Grants are available from DOE with 0-50% match funds required. These grants aim at supporting research that benefits power generation, renewable energy, and alternative uses for coal. These grants should be investigated for funding product development related to these areas.

- USDA: Low-cost loans are available from USDA that could be used to construct, renovate, and equip facilities. These loans should be investigated for physical facilities that fall outside of EDA's scope or match funds are not available for a traditional grant. Please note that these funds cannot be used as a match source for any Federal grants.

State Level
The Governor's Office of Economic Opportunity (GOEO): Several grant opportunities exist through GOEO that can be viewed at *https://business.utah.gov/grants/*. These include:

- Broadband access grant
- Outdoor recreation grants
- Rural County grants

The Utah State Governor's Office: The Governor's Office has rural community specific programs that can be found at https://business.utah.gov/rural/ . These include:
- Utah Rural Jobs
- Main Street Program
- Rural Economic Development Incentives

Steps to Innovation

STEPS TO COAL INNOVATION

Below are recommendations for seeding a coal-to-products industry in Eastern Utah. For Success, project stakeholders should consider the recommendations below:

- Involvement of one or more industry partners: Advancing coal-to-products in the eastern Utah region requires effective partnership with private industry. Partnerships like these will attract investment, technical expertise, and help build markets for products. A good start for building private industry collaboration is through the Institute for Advanced Composites Manufacturing Innovation (IACMI). IACMI is a membership-based organization that is a partnership of industry, academic, and governmental entities. These members collaborate to make low-cost, energy efficient composite materials ready for commercial marketing. IACMI's website lists partnership industries in 30 U.S. states and foreign countries like Austria. These industries range from automotive manufactures like Volkswagen Group to composite material manufactures.

- *Collaboration with Utah universities and out of state universities*: Due to the recent emergence of coal-to-products, partnership with academic institutions is essential. Therefore, program stakeholders should pursue a partnership with a university that has the resources and expertise to carry out coal materials research. They should also pursue other partnerships with universities in different coal producing states, which could provide resources and strategic alignment for funding.

- *Incorporate coal-to-products into a larger innovation program*: To increase the likelihood of funding, program competitiveness, and promote increased economic diversity, coal-to-products should be a component of a broader innovation program. This program should focus on light manufacturing, workforce development, and remote work support. It should also utilize an innovation space, especially during the early stages of the project. Additionally, it should be tied into programs that have broad appeal such as green energy, battery technology, critical materials, and similar areas.

- *Invest in research and development prior to manufacturing*: Although it may be tempting to focus on building manufacturing infrastructure for coal products, investment in research and development should take place first. This is because many technologies are at a bench scale level of development

and patented by other entities. This necessitates collaboration with patent holders and efforts to improve existing technologies or develop new approaches altogether. Collaboration with existing patent holders can take place by engaging universities involved in material research.

After considering the recommendations above, the steps below will guide the development of a local coal-to-products industry in eastern Utah:

Step 1: Program Development Plan

Action A: Establish a Program Entity
Before efforts begin to establish a coal-to-products industry, project stakeholders should designate or establish a non-profit organization to serve as a program entity. This entity should carry out program management tasks, participate in program development, and manage the initiative once manufacturing begins. Therefore, it should consist of individuals who understand the region, funding development, and the coal-to-products industry.

Action B: Define a Location
After establishing a program entity, project stakeholders should identify the main location where work will be carried out. This location should be an area with a strong coal presence and possess infrastructure that is suitable for advanced manufacturing. Also, as program resources permit, satellite locations may be in other areas involved in the project.

Action C: Define Product Specialty and Coal Sources
The next action is identifying the coal products to focus on and suitable feedstock. Chapter 4 of the DIER discusses feedstock suitability and the products that can be made from coal. Product specialization will depend on markets, partnerships, and the suitability of local coal as a feedstock source.

Action D: Framework for Research, Development, and Product Scaling
Coal products are a relatively new area of research. Many technologies that exist do so at a "bench" or laboratory scale. Others require finetuning and development. The projects that this program focusses on should be limited to one or a few related products at first. This is because methods for producing these will have to be scaled to industrial levels. Also, the program will need an effective testing strategy for coal samples, to fully identify the best coal sources for a given product.

Step 2: Organize a Partnership

Action A: Define the Partnership
Following the formation of a development plan, a program partnership should be organized. Partnerships like these ensure that programs are well thought out, operate efficiently, and attract investment from public and private sources. This partnership should include key stakeholders such as government agencies, non-profit enterprises, academic institutions, private industries, and foreign entities. Partners should be selected based on strategic contributions, expertise, and program relevance. For

information on other coal producing states that may yield partnerships, refer to Chapter 4 of the DIER.

Step 3: Industry Plan

Action A: Identify Target Industry
A successful coal-to-products initiative requires an industrial focus. By targeting a specific sector or industry, the region can specialize and encourage cluster development. However, it is important that this specialization is in line with existing skillsets and economic realities of the region. The DIER, which accompanies this playbook contains useful information on local skillsets, industry clusters, economic diversity, and industry potential within the region. Therefore, project stakeholders should consult this document when identifying a target industry.

Action B: Identify Target Industry Partners
Once project stakeholders find a target industry, they should identify potential partnerships within that industry. This includes foreign and domestic companies that are relevant to the program. Other target industry partners are government agencies that work with the targeted industry, as well as state and local governments that support these industries in their jurisdictions.

Action C: Formulate a Manufacturing Plan
After project stakeholders have identified the targeted industries and partners, a manufacturing plan can take place. This plan is where stakeholders should identify where manufacturing facilities will be located, how they will be constructed/equipped, and how they will operate. This plan will also include what research and development resources are needed to perfect bench scale technologies and rescale them to industrial levels.

Step 4: Budget Development

Action A: Identify Program Needs
Following an effective industry plan, budget development should take place. The first part of this step is identifying the resources needed to execute the manufacturing plan and larger program development plan. Resources include the people, facilities, and capital necessary to bring a local coal-to-products industry to production and self-sustaining operation.

Action B: Identify Program Costs
During this process, program stakeholders will generate budget line items and specific cost amounts. To ensure competitiveness, program scope and costs should be adjusted to reflect funding realities.

Action C: Consider Long Term Funding Mechanisms
It is important that the budget not only reflect the costs of launching a program, but also of sustaining it. A variety of mechanisms can be employed for this purpose. Annual membership fees through a manufacturing initiative, private equity stakes, foreign investment, and domestic business partnerships could help fund the program long term.

Action D: Budget Finalization
During the budget finalization process, project stakeholders should make final adjustments to line items and amounts.

These should reflect the funding levels that will be pursued during Phase 1 and 2 funding development. The budget should be drafted so it is ready for use in funding proposals.

Step 5: Establish Program Parameters

Action A: Scale Program to Reflect Funding Reality and Research Needs
During this step, final adjustments to the scope of work should take place so that they are in line with the budget. This may make it necessary to scale the project down to meet funding realities or expand it to meet increased research needs if resources permit.

Action B: Encourage Domestic Manufacturing at the Site
Due to the importance of investment in this initiative, manufacturing should be encouraged at the site. Encouraging manufacturing will increase partnership opportunities. These partnerships will help expand the program into other regions through increased participation.

Step 6: Secure Phase 1 Research and Development Funding

Action A: Determine Scope of Funding
Phase 1 of this program includes efforts like testing coal samples to determine suitability for target products. It also includes developing products and manufacturing methods at the bench scale and exploring ways to scale these to industrial levels. Therefore, at a minimum, phase one funding will need to support research efforts, facilities, program management, and funding development efforts for phase II.

Action B: Applicable Funding
Programs offered by the Department of Energy, National Science Foundation, and Department of Transportation could fund research and development on a national level. Programs offered by EDA that fund infrastructure and equipment could help support the project by paying for equipment and facilities.

On a state level, programs that fund research development and partnerships with local academic institutions could help support these efforts and provide matches for larger grants. It should be noted that academic partnerships will be essential for carrying out Phase I research and scaling products to industrial levels.

Although programs on federal and state levels should both be pursued, programs should be well targeted to ensure maximum competitive. Therefore, efforts to engage one or two agencies will be far more effective than targeting all programs at once. And in all cases, agency interface, collaboration, and effective program development are essential to funding competitiveness.

Step 7: Secure Phase 2 Project Scaling and Infrastructure Funding

Action A: Identify Remaining Infrastructure Needs
When Phase II funding development begins, it will be important to identify any remaining infrastructure needs. This is because research and development efforts may change the direction of the project or requirements for industrial scaling. Infrastructure pursued at this stage will also need to facilitate project scaling and production until the program becomes self-sustaining.

Action B: Identify Product Scaling Methods
The work carried out during Phase I should demonstrate the feasibility of one or more bench scale production technologies. The next priority will be determining how to scale these technologies to industrial production levels. Therefore, project stakeholders will need to explore potential methods for scaling, identify the resources needed to do this, and determine what it will take to construct and equip a manufacturing facility. For this purpose, they should develop a detailed scaling plan prior to pursuing funding for manufacturing infrastructure.

Action C: Applicable Funding
For infrastructure funding, project stakeholders should purse grants from EDA and low-cost loans from USDA and the SBA. Applications for all these programs will require a well-designed facility, suitable locations, applicable matches, and environmental reviews when necessary. Therefore, engagement with the appropriate agencies should occur prior to the application process.

For project scaling, a combination of federal and state grants and private investment should be pursued. This will also help encourage domestic investment due to the reduced risk that comes with having other funding sources available to support a project.

Action D: Construct the Facility and Manage the Program
The final action is to construct/equip the facility and manage it. The program entity identified during Step 1 should manage the program through a non-profit organization. However, manufacturing efforts and sales should be carried out by private industry partners.

STEPS TO GENERAL INNOVATION
The sections on Competitive Advantage and Program Priorities in this playbook discuss regional strengths and recommend areas of focus for local innovation. Below is a strategy that can be used to develop programs from these areas of focus. This strategy is intended for use by individual counties, AOGs, or a multiregional coalition as they develop innovation projects.

Due to the need for effective project development, stakeholders should carry out initiatives in three general phases:

PHASE 1: This phase consists of identifying a program entity, developing a program focus, and formulating partnerships for implementation.

PHASE 2: This phase consists of developing a detailed implementation plan and securing funding to carry it out.

PHASE 3: This phase consists of implementing and managing the project.

Phase 1

1. *Create/identify an entity to manage all program priorities:* The first step to developing an effective innovation program is designating or establish a non-profit organization to serve as the program entity. This entity should carry out program management tasks, participate in program development, and manage

the initiative once operation begins. Therefore, it should consist of individuals who understand the region, funding development, and the selected focus of the program.

2. *Partnership development:* Partnerships are a critical element of any innovation program. These include partnerships with relevant industries, academic programs, and government entities. The first step to developing an effective partnership is identification. This occurs through research, effective outreach, and stakeholder involvement in program development. Once partnerships are developed, they can work collectively to develop program focus and general program design.

3. *Develop Program Focus:* Before step one of this phase, a rough program focus should already exist. However, during this step the focus should include things like project goals, participant roles, and a vision to carry work out under. This step should involve the partners identified in the previous step, other relevant stakeholders, and key beneficiaries of the project.

4. *Formulate a Program Plan:* Once program stakeholders are on board and a focus is developed, the next step is planning how it will function, be funded, and managed. An effective plan should include the following elements:

   • VISION: A short statement that describes what the program does

   • GOALS: The program goals identified during the previous step

   • STAFFING PLAN: The staff roles and the people filling or needed to fill them

   • MANAGEMENT PLAN: How the program will be developed, carried out, and improved

   • COST PROJECTION: A projection of the costs to launch the program, perform any necessary infrastructure work, purchase equipment, and maintain it on an annual basis

   • SUSTAINABILITY PLAN: A revenue generation strategy for long term sustainability

   • SCOPE OF WORK FOR PHASE 2: A budget with actions, deliverables, and potential match sources identified

   • METRICS OF SUCCESS: A method for measuring program success so it can be modified during the project if needed

5. *Secure Funding for Phase 2 Development:* Planning effective project implementation and securing grants takes resources. To accomplish Phase 2, project stakeholders will need to develop funding hire individuals to design infrastructure, assist with environmental reviews, write funding proposals, and manage these activities. Securing the best support possible in this area is critical. Although there are limits on what types of federal funding can be used for this purpose, programs on local and state levels, as well as private sources should be pursued. Once adequate funding for Phase 2 is secured, work can begin on designing physical infrastructure and securing implementation funding.

Phase 2

1. *Determine Locations of Physical Infrastructure:* The first step of Phase to is selecting a location for any physical infrastructure needed for the project. These locations may include vacant land or new facilities that can be renovated or rehabilitated. In the case of the latter, they may include historic buildings (50 years or older) which may make certain activities eligible for additional funding opportunities.

2. *Formulate a Project Budget and Scope of Work for Phase 3:* After a location for the project is selected, the next task will be to develop a budget. This should detail all the building/renovation costs, equipment, and personnel costs associated with bring the facility into operation. This budget should be included in a scope of work that discusses the various tasks involved in this process. This scope should also illustrate relevant labor costs and have an equipment list, all of which are necessary to secure implementation funding.

3. *Design Physical Infrastructure:* With the budget and scope of work in place, the next task will designing any physical infrastructure for the project. Funding from the EDA and other entities will require design plans as part of the implementation process, as will many private sources of capital.

4. *Formulate a Phased Development Plan:* Another plan that is recommended for larger projects is a phased development plan. This type of plan can divide the project into smaller segments, which is useful for projects that consist of multiple sites, buildings, or improvements. Higher priority items should be constructed first with others following based on priority levels and funding realities.

5. *Select Funding Sources:* Potential funding opportunities for innovation projects include local, state, Federal, and private capital sources. Select Funding Sources on page 18 of the Utah Playbook.. When selecting funding sources, it is best to concentrate on a few with high potential rather than taking a random approach with opportunities that have low potential. This will conserve resources and make applications more competitive.

6. *Formulate Implementation Proposal/ Application:* The tasks that took place during steps 1-4 will provide many of the items necessary to formulate a strong implementation proposal. However, other items may be required depending on the funding agency and program. Well organized proposals that show a high level of collaboration and stakeholder support are typically the most competitive. In most cases, grant opportunities will include a notice of funding opportunity (NOFO) that will describe all the necessary elements for a successful application. These should be thoroughly reviewed before any application begins. Other factors that contribute to application success include the following:

- AGENCY ENGAGEMENT: Most NOFOs on the Federal level will list a representative within an agency who interfaces with applicants. Discussions these representatives will help applicants produce better applications and make local agency offices aware of the project.

  - QUALIFIED PROPOSAL DEVELOPMENT STAFF: Although often overlooked, it is very important engaging professionals with strong proposal development skills to produce an application. Therefore, it is important to set aside funds to hire individuals to conduct these services.

  - POLICY ALIGNMENT: Government agencies on Federal and state levels typically operate under administrations with everchanging funding priorities. However, applications that relate to current priorities have a better chance of receiving funding. Therefore, understanding the priorities and designing programs that target them is very important.

  - SECURABLE MATCH SOURCE: Most funding sources on the Federal level and many on the state level require match funding. Depending on the source, this may be cash or in-kind (labor, buildings, equipment, etc.) dedicated to the project at a specified ratio. These generally range from 10% to 50% matches. Having an adequate match source identified and committed to the project ahead of application is one of the most important elements of a success.

Phase 3

1. *Construct and Equip Physical Facilities:* After implementation funding is secured, constructing, and equipping physical facilities may take place. This process should follow the scope of work developed previously and be completed within the timeframe specified in the award. This timeframe will vary based on the project scale, but in most will range from 1-2 years from the date of the award.

2. *Recruit Program Staff in Accordance with Program Plan:* Once the facility is constructed, the next step will be to staff it with qualified people. The number of positions and people needed to fill them will depend on the facility. However, it will at least require a facility manager and other support staff as specified by the scope of work.

3. *Manage the Program in Accordance with the Program Plan:* During Phase 1, a program plan will have been developed. This plan should have outlined the management, sustainability, and metrics of success for the program. Prior to managing the program, this should be reviewed and updated it if necessary. At this point, the program should be managed according to the plan. However, regular updates should take place to reflect any changes that occur as operation takes place.

Conclusion

This playbook has discussed the competitive advantage of the eastern Utah region and provided a starting point for local stakeholders to foster innovation. To these ends, it has discussed initiatives that encourage new uses for local resources like coal. It has also discussed other efforts that will promote economic diversity, clustering, and a broader culture of innovation. The program implementation strategies recommended herein also provide a roadmap for developing a competitive coal-to-products cluster and other programs that can offset local job losses. The approach from here should be multifaceted, focusing on innovation, economic development in multiple sectors, and similar strategies recommended in this playbook. The result for the region will be greater economic diversity, innovation, and resilience. And, in short, a better future for eastern Utah's coal communities. ■