

ACCELERATING

UTAH'S  
ENERGY  
INDUSTRY

Utah Cluster Acceleration Partnership Fall 2010



**A**ccelerating Utah's Energy Industry



Strategies to accelerate expansion of Utah's energy industry and fashion a well-trained workforce.

## About This Report



This report presents specific strategies designed to accelerate and support the growth and expansion of Utah's energy industry and to fashion a well-trained workforce possessing the critical skills needed by this industry.

These recommendations were generated by a number of dedicated leaders from within Utah's energy industry as well as public, academic, and business leaders. Each of these participants has contributed his or her time, expertise, and insight to this collaborative effort that sets the direction for the expansion and acceleration of this vital industry in Utah.

This Cluster Acceleration Partnership has been authorized and sponsored by the Utah System of Higher Education, the Utah Department of Workforce Services, and the Utah Governor's Office of Economic Development. Salt Lake Community College has led the project and served as the convener.

The consulting team from Grow Utah Ventures, a nonprofit organization, served as the strategy facilitators advisors on the project.

For more information on this and other Cluster Acceleration Partnerships, please contact the Utah System of Higher Education.



**A** strategic direction and high-level action plan to increase the existing 16,300 jobs and \$8.5 billion in revenue.

## Energy Executive Summary



**T**he Utah Energy Cluster Partnership Acceleration Strategy defines a specific course of action to sustain and grow this vital industry cluster in the state of Utah.

The result is a strategic direction and high-level plan of action to guide our collective efforts both in the short- and long-term.

Our major conclusions include the following:

- The energy cluster employs over 16,300 Utah workers.
- The cluster generates annual revenues of \$8.5 billion within the state.
- The value chain of the energy cluster comprises five distinct segments consisting of energy sources, power generation and oil refining, transmission and distribution, support and research, and energy consumption.
- The largest segments of the industry in terms of jobs and revenues are transmission and support; power generation and refining; and traditional energy sources including oil, natural gas, and coal.
- Utah has emerging opportunities in geothermal, solar, bio-fuel, wind, and clean coal technologies, including carbon capture and sequestration.

As a result of these findings, the Utah Energy Cluster Acceleration Partnership recommends a comprehensive strategy that includes enhancing the state's workforce talent and applied and basic research capabilities. Finally, long-term success is dependant on a partnership of industry, business, community and academic leaders.



## Contributors and Commitment

This Utah Energy Cluster Acceleration Strategy incorporates the views, insights and recommendations contributed by a wide spectrum of representatives from industry, academia and business. The intent is to accelerate the growth of the industry.

Utah’s energy industry employs over 16,300 workers statewide and has combined revenues of \$8.5 billion. Our workforce ranges from new technology researchers, to seasoned oil and coal operators, to high voltage transmission linesmen, to innovative entrepreneurs.

Our rich energy legacy extends from Utah’s earliest explorations of natural resources to today’s vast infrastructure of technology, services, and systems that comprise Utah’s energy industry.

Our efforts are vital to establishing energy independence for our state

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**U**tah's energy industry capitalizes on rich resources, expands vital support and captures emerging energy opportunities.

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## Introduction



*The Utah Cluster Acceleration Partnership (UCAP) is an initiative focused on increasing the economic impact of Utah's critical industry clusters and the contribution made by the various institutions of higher education.*

Utah's higher education institutions are strong drivers of economic development in the communities they serve. In addition to educating a well-qualified workforce for local employment, these institutions are committed to doing more to further expand Utah's economic base.

### **SPONSORING PARTNERS**

Key sponsors of the UCAP include the Utah Department of Workforce Services, the Utah System of Higher Education and its member institutions, the Governor's Office of Economic Development, and critical private employers in industry clusters across our state.

For the energy cluster, Salt Lake Community College has served as the project lead and convener.

### **PROJECT SCOPE**

An economic cluster acceleration strategy must address a wide range of facets that contribute to the rapid expansion of the targeted industry. In this project, primary focus has been placed on two significant elements:

*Talent and Workforce Development-* determining what skill sets the industry cluster needs to drive expansion.

*Innovation and New Technologies-* identifying ideas and technologies essential for future cluster expansion.

In order to achieve these general purposes, the UCAP initiatives have been organized into two specific phases of effort.

### **Phase I- Cluster Assessment**

This phase has focused on conducting a strategic assessment of the cluster to determine the overall value, economic status, growth potential, and competitive positioning of the cluster.

### **Phase II- Acceleration Strategies**

The second phase has focused on developing acceleration strategies with specific emphasis on developing talent and ideas that support and drive expansion of the cluster.

### **PROJECT LEADERSHIP**

The UCAP is under the direction of an oversight committee consisting of the Executive Director of the Utah Department of Workforce Services, the Executive Director of the Governor's Office of Economic Development, and the Commissioner for the Utah System of Higher Education.

In addition, a steering committee has been organized by Salt Lake Community College comprised of industry leaders representing various energy businesses across the state as well as certain key public and higher education leaders.

Grow Utah Ventures has provided project leadership in strategic economic and acceleration consultation.



## Energy Cluster Assessment



*Utah's energy industry occupies a unique position within our state. We have abundant reserves of varied renewable and non-renewable energy resources. However, accessing and developing these resources can be challenging because they often are located in remote and environmentally sensitive regions across the state. In addition, the overall financial practicality of accessing, processing, and distributing these resources is influenced by dynamic global and national economic factors.*

### CLUSTER ASSESSMENT OF INDUSTRY DRIVERS

#### Producers and Consumers

The fact that we produce, consume, and export the main product of this industry, namely energy for use in our cars, homes, and businesses, sets this industry apart from others in the state.

The capability of Utah's energy industry dramatically affects the cost of living and the cost of doing business. It also determines, to a great extent, Utah's attractiveness as a location for businesses and manufacturing plants considering relocating here. The success of our state's energy industry is vital to the economic future of our citizens and businesses.

#### Global Energy Trends

Global trends in energy development significantly affect the economics of our state energy industry. We continue as a nation to be dependent on fossil fuels. International supplies comprise the major source of these fuels and establish market rates for what is produced here in Utah. The dominance of fossil fuels sets even the benchmark parameters for economic considerations in determining the viability of alternative energy resources.

Consider just a few quick facts:

- Crude oil is now overwhelmingly a transportation fuel and transportation fuels are overwhelmingly crude oil-based.
- About 97% of transportation fuel demand worldwide is met by crude oil-sourced products.

- About 70% of U.S. oil demand is now used for transportation.
- Potential gasoline substitutes, such as ethanol from corn; ethanol from sugar-cane; cellulosic ethanol; biobutanol; and potential diesel substitutes (biodiesel from algae) are high-cost. Even with sizable subsidies, these require that market prices for traditional petrol be relatively high to make their production and usage economical.
- Natural gas as a transportation fuel is a less expensive fuel source.
- Increasing use of alternative energy sources might benefit power generation, but are not yet viable solutions for transportation fuels.
- Traditionally, as GDP has risen, a correlated increase in demand for transportation fuel has followed.

#### Geographic Distribution of Resources

Utah is fortunate to have a wide range of energy resources spread across the regions of the state. For example:

- Utah contains four of the nation's 100 largest oil sedimentary basins and two of its 100 largest natural gas fields.
- Coal-bed methane accounts for nearly one-third of Utah's natural gas production.
- Utah is one of the few states with electricity generated from geothermal power sources.
- Utah has enormous deposits of oil shale rock, known as marlstone, which can be converted into synthetic crude oil.

## ENERGY CLUSTER VALUE CHAIN

Over the years, Utah has developed a complex energy industry comprised of a number of interrelated elements that must be considered both individually and as a whole to fully understand how to accelerate the growth of the industry.

Utah's energy industry can best be considered by understanding the value chain, the cycle of where value is created and added in the course of supplying energy.

The following illustration shows the value chain for Utah's energy industry. The value chain will be described in more detail later in the report.

### Resources

The value chain begins with businesses that access raw energy sources. These are both traditional (such as oil, natural gas, and coal) and renewable (such as geothermal, wind, and solar).

### Generation

The energy resource is then refined by businesses that employ processes that make the resource useable. Electrical power is generated from coal or gas-firing power plants. Crude is refined for transportation use by the state's oil refineries. Geothermal heat and wind power are converted into electricity to be distributed through the power grid.

### Distribution/Transport

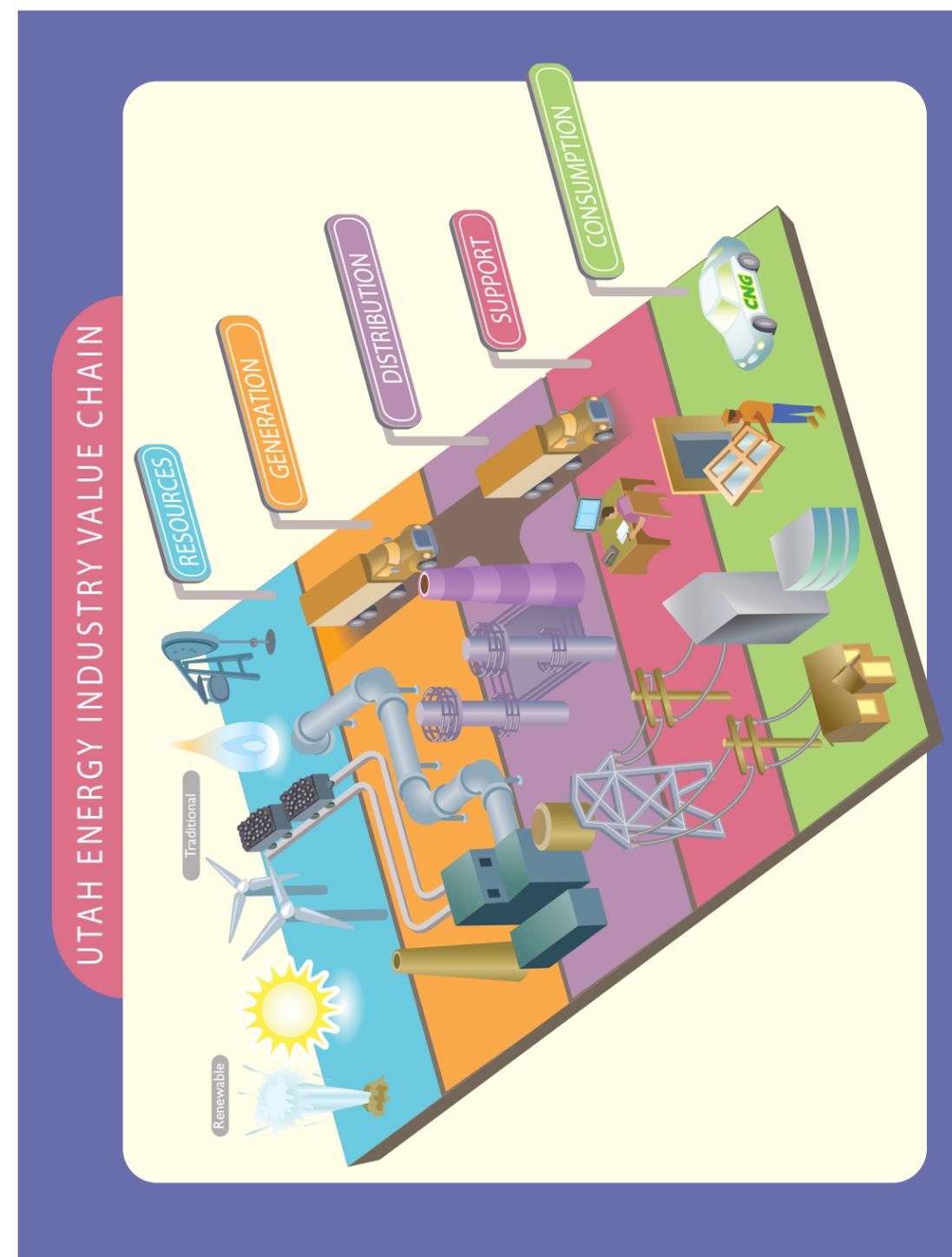
Getting the generated energy to consumers requires businesses that provide, manage, and support all means of energy transmission. This includes electrical transmission lines, natural gas pipelines, and oil transportation systems.

### Support

The energy industry is supported by suppliers, service providers, and business operators. These include businesses that haul water to distant energy extraction sites, provide critical mechanical parts and supplies, and perform essential welding and machining. This sector also includes businesses and entities conducting energy research to develop new innovations for the industry.

### Consumption

At the end of the chain are the energy consumers and those that advise and assist them. This includes businesses that provide service and technology to manage energy efficiency, convert vehicles to operate on natural gas, and employ green technologies in commercial and residential building construction.



## Acceleration Strategies



*The primary objectives of the UCAP is to lay out a strategy for accelerating the growth of the industry and, in particular, to determine how to provide the manpower and technologies required to meet future industry needs.*

The overall goals of the project are to:

*Accelerate Economic Growth*— Accelerate the growth of the industry to provide employment and career opportunities in the future and expand the state's overall economy.

*Create a Talent Development Strategy*— Define the workforce and talent base needed to grow the industry. This includes developing a sufficient talent base to attract businesses to the state, expand current industry employers, and create new entrepreneur-led businesses.

*Develop an Idea Generation Strategy*— Provide direction to academic research by discovering and advancing new research-based ideas and technologies as well as finding new applications of research and technology pertinent and beneficial to the industry.

*Enhance Coordination*— Enhance coordination of higher education, industry, and workforce training to improve the education services that ensure a qualified workforce.

It should be noted that this effort did not attempt to address or resolve the many policy issues surrounding energy development and usage. In fact, a concerted effort was made to avoid asserting a particular energy development policy or philosophy. Rather, the focus remained solely on the dynamic factors affecting the growth and expansion of the energy industry.

For this project, Salt Lake Community College, serving as the project convener, invited a group of industry leaders representing the various segments of Utah's energy industry to form the Energy Cluster Acceleration Strategy steering committee. These leaders, along

with representatives from higher education and the public sector, participated in a series of work sessions. Each work session was designed to identify the strategic drivers that influence the expansion of this cluster and to determine actionable strategies that could accelerate the growth of the industry.

Research and analysis were conducted to further assess unique elements of the industry and to determine the skill sets required in its future employees. While this research led to the refinement of specific strategies, it is not meant to be a comprehensive economic study of the industry. The collective expertise, years of experience, and in-depth understanding of the industry brought to the project by the steering committee members shaped the final recommended acceleration strategies.

The following describes in detail the recommended Utah Energy Cluster Acceleration Strategy. Supporting details and charts are included in latter sections of this report.

### **GROWTH OPPORTUNITIES**

The following achievable horizons for cluster growth each reflect an increasing level of opportunity with a corresponding increase in risk.

**Sustain the Core**—This category represents specific opportunities essential to sustaining the core of Utah's current energy industry.

**Drive Growth Accelerators**—This category represents the most important short-term opportunities that have the potential to expand the overall growth of the cluster.

Explore Future Opportunities— This category represents future opportunities in which Utah has a strong likelihood of succeeding.

**Sustain the Core**

*Resources*

**Maintain Competitive Oil, Natural Gas, and Coal Production**

Ensure Utah maintains its core energy businesses and capacity to extract the state’s reserves of oil, natural gas, and coal in a cost-competitive and environmentally responsible position relative to regional, national, and global markets.

**Access Resources on Hydrocarbon-Based Lands**

Ensure continued access to and timely issuance of federal and state government permits for energy exploration and development on lands within the state.

*Generation/Distribution/Transport*

**Consistent Increase of Energy Generation and Transmission**

Consistently generate and transmit an increasing supply of low-cost electrical energy by Rocky Mountain Power, Intermountain Power Agency, and Utah municipal power plants.

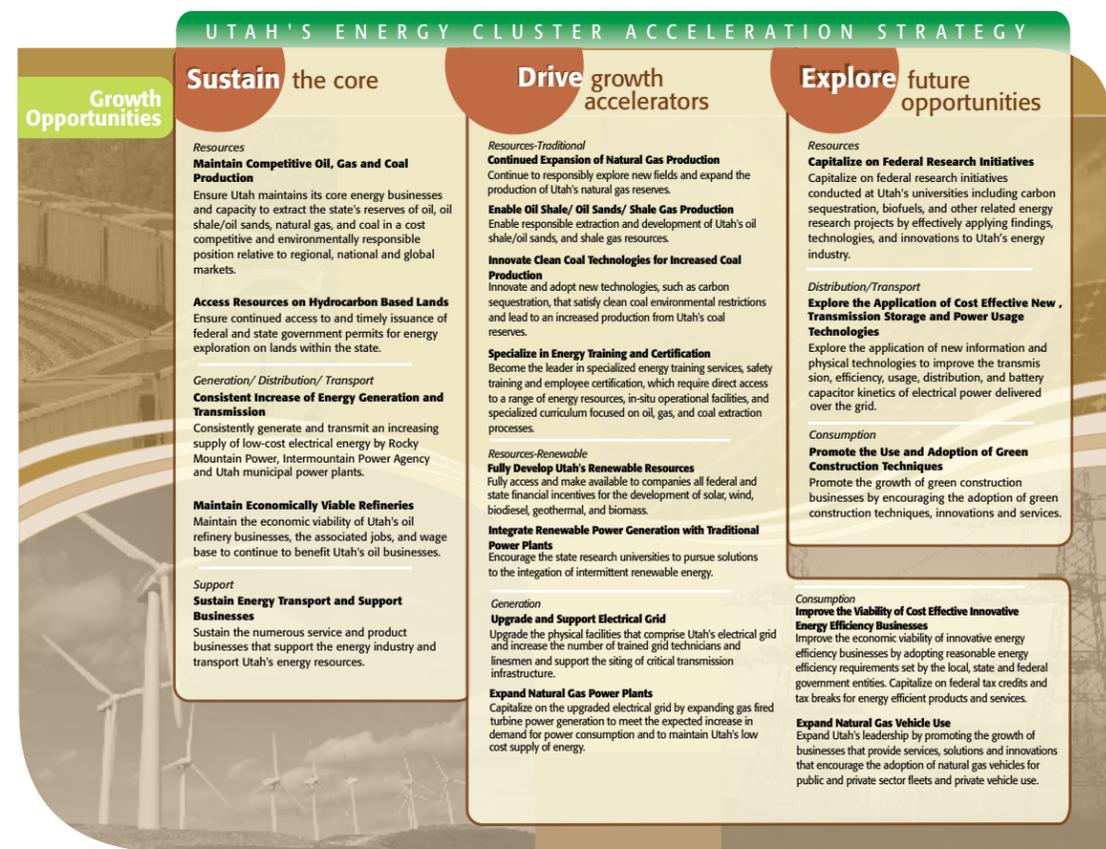
**Maintain Economically Viable Refineries**

Maintain the economic viability of Utah’s oil refinery businesses, the associated jobs, and wage base to continue to benefit Utah’s oil businesses.

*Support*

**Sustain Energy Transport and Support Businesses**

Sustain the numerous service and product businesses that support the energy industry and transport Utah’s energy resources.



**Drive Growth Accelerators**

*Resources-Traditional*

**Continued Expansion of Natural Gas Production**  
 Continue to responsibly explore new fields and expand the production of Utah’s natural gas reserves.

**Enable Oil Shale/ Oil Sands/ Shale Gas Production**  
 Enable responsible extraction and development of Utah’s oil shale/oil sands and shale gas resources.

**Innovate Clean Coal Technologies for Increased Coal Production**  
 Innovate and adopt new technologies, such as carbon sequestration, that satisfy clean coal environmental restrictions and lead to an increased production of Utah’s coal reserves.

**Specialize in Energy Training and Certification**  
 Become the leader in specialized energy training services, safety training, and employee certification which require direct access to a range of energy resources,

in-situ operational facilities and specialized curriculum focused on oil, gas and coal extraction processes.

*Resources- Renewable*

**Fully Develop Utah’s Renewable Resources**

Fully access and make available to companies all federal and state financial incentives for the development of solar, wind, biofuel, geothermal, and biomass.

**Integrate Renewable Power Generation with Traditional Power Plants**

Encourage the state research universities to pursue solutions to the integration of intermittent renewable energy.

*Generation*

**Upgrade and Support Electrical Grid**

Upgrade the physical facilities that comprise Utah’s electrical grid, increase the number of trained grid technicians and linemen, and support the siting of critical transmission infrastructure.

### **Expand Natural Gas Power Plants**

Capitalize on the upgraded electrical grid by expanding gas-fired turbine power generation to meet the expected increase in demand for power consumption and to maintain Utah's low-cost supply of energy.

#### *Consumption*

### **Improve the Viability of Cost-Effective Innovative Energy Efficiency Businesses**

Improve the economic viability of innovative energy efficiency businesses by adopting reasonable energy efficiency requirements set by the local, state, and federal government entities. Capitalize on federal tax credits and tax breaks for energy efficient products and services.

#### *Transport and Support*

### **Expand Natural Gas Vehicle Use**

Expand Utah's leadership by promoting the growth of businesses that provide services, solutions, and innovations that encourage the adoption of natural gas vehicles for public and private sector fleets and private vehicle use.

### **Explore Future Opportunities**

#### *Resources*

### **Capitalize on Federal Research Initiatives**

Capitalize on federal research initiatives conducted at Utah's universities, including carbon sequestration, biofuels, and other related energy research projects by effectively applying findings, technologies, and innovations to Utah's energy industry.

#### *Distribution/Transport*

### **Explore the Application of Cost-Effective New Transmission, Storage, and Power Usage Technologies**

Explore the application of new information and physical technologies to improve the transmission, efficiency, usage, distribution, and battery capacitor kinetics of electrical power delivered over the grid.

#### *Consumption*

### **Promote the Use and Adoption of Green Construction Techniques**

Promote the growth of green construction businesses by encouraging the adoption of green construction techniques, innovations, and services.

## **KEY SUPPORTING STRATEGIES**

Underlying the pursuit of each of the previously outlined opportunities is a set of supportive strategies fundamental to the success of the entire acceleration strategy. Each of these supportive strategies is described below.

### **Talent Development**

#### **Increase Trained Workforce**

Increase the overall number of trained energy industry workers to meet projected needs in renewable and traditional resource development, generation distribution and transport, support, and energy consumption.

### **Applied Research**

#### **Research Viability of Renewable Energy**

Undertake consistent research and development of reasonable factors that will eventually make renewable energy an economically viable energy source not dependent on government subsidies or specialized fiscal policies.

### **Research and Development**

#### **State-Sponsored Research Agenda**

Promote and sponsor a state agenda for energy research, innovations, technologies, and applied research in fields that are of specific interest to Utah, including carbon management, cleaner hydrocarbon, energy efficiency, energy management, electrical grid management, energy consumption, and renewable energy resources.

### **Business Expansion**

#### **Expand Oil Refineries**

Expand Utah's oil refinery business by becoming a viable hub for refining crude oil extracted in Canada and Mexico by partnering with producers in these regions.

### **Business Attraction**

#### **Increase the Regional Demand for Natural Gas and Low-cost Power**

Leverage Utah's low-cost power and abundant natural gas reserves to attract national and international heavy power users, such as fertilizer and chemical manufacturers.

### **Create Strong Base of Power Demand**

Create a strong economic and industrial base in Utah that utilizes and demands Utah's abundant supply of low cost power.

### **Business Creation**

#### **Create Energy-Efficient Businesses**

Foster the creation of innovative entrepreneurial businesses in the fields of energy efficiency, energy production, energy management, and energy storage.

### **Cluster Leadership**

#### **Link Small Company Innovation with Large Company Resources and Needs**

Foster partnerships between small business innovators of new energy development and production technologies, methods, and processes with larger companies able to effectively capitalize on and integrate these developments into their operations.

## **SHORT-TERM ACTIONS**

The success of the Cluster Acceleration Strategy hinges on accomplishing both short- and long-term actions. The following describe recommendations in each of the opportunity sections.

### **Drive for Growth**

#### **Statewide Energy Policy**

Update and aggressively implement a comprehensive, economy-centered energy policy that coordinates state policies with incentives for energy use and development

#### **State Energy Subsidy Policy**

Design and implement a statewide energy subsidy policy that stimulates growth of businesses developing solar thermal, geothermal, and wind power generation through the use of state funds. This policy would not arbitrarily establish or maintain false market conditions, but would encourage eventual viability of the businesses.

### **Explore the Future**

#### **Renewable Energy Goal**

Define a realistic renewable energy portfolio standard for the state with interim targets of achievement, that are competitive with surrounding states.

#### **Energy Industry Career Pathways**

Provide training and workforce skill development in the following career pathways: (See Appendix Career Pathways- Utah Energy Cluster)

- Electrical linesmen
- Grid technicians
- Technicians in oil, gas, and coal extraction
- Energy efficiency
- Energy management
- Carbon management automation
- Energy Trades- pipefitters, welders, installers and electricians
- Green construction methods

#### **Industry-Assisted Training**

Engage the industry in promoting and providing practical skill training workshops in conjunction with regional educational centers.

#### **Capitalize on Training Grants**

Fully utilize the training grants received by the Department of Workforce Services and managed by Salt Lake Community College for re-training workers for energy industry positions.

#### **Business Attraction Incentives**

Define an incentives package to be used to attract heavy natural gas and power users into the state. Encourage incentives that are paid back by the companies over time and are not continual subsidies.

## Utah's Energy Cluster Traditional Sources



*This section presents a current overview of Utah's energy industry using the value chain to identify key businesses operating in various segments of the chain, their current employment, and overall revenue impact.*

Utah is predominantly an oil & gas and coal producing State. In 2009, these industries contributed over \$500 million in wages to Utahns<sup>1</sup>. According to the Division of Workforce Services, Utah's employment base in these industries is 1,358 and 1,999 employees respectively.<sup>2</sup>

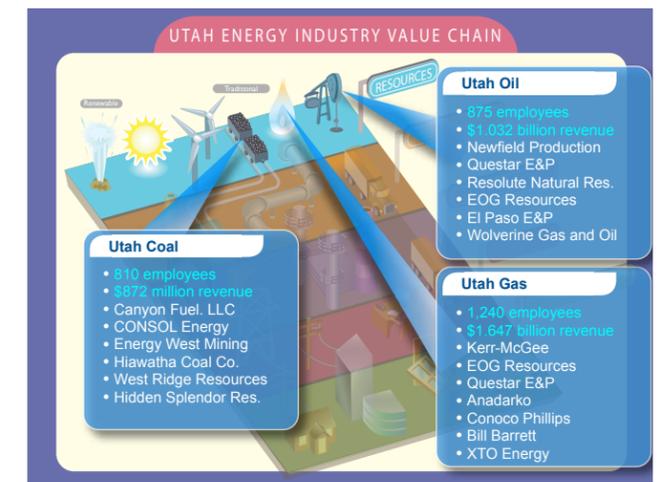
Utah produces just over 1 trillion Btu. This is comprised of 1.9 million barrels of crude oil, over 433 billion cubic feet of natural gas and over 24,000 short tons of coal. This means Utah generates approximately 1.5 percent of the nation's energy with just 0.9 percent of the population.<sup>3</sup> With some 85 percent of the state's energy development occurring on federal land, production is greatly influenced by federal land use and environmental policies.

### Coal

Employment in Utah's coal industry has remained steady since 2000. By comparison, Utah's oil & gas employment has grown over this same period by 138 percent.<sup>4</sup> Given recent difficulties in permitting for coal plants, Utah must look at ways to improve the viability of cleaner burn-ing coal.<sup>5</sup>

### Natural Gas

Natural gas development represents a significant opportunity to expand the energy cluster. New combined cycle gas turbines enhance the efficiency of gas-fired plants. With their flexibility, gas-fired



turbines can also offset intermittent production by wind or solar farms.

New technologies for converting Utah's 'black wax' oil into more valuable crude oil are being developed using natural gas, which is a double benefit for Utah.<sup>6</sup>

### Carbon Capture and Sequestration

This technology is supported by strong technical and industry research capabilities in Utah. The University of Utah's Institute for Clean and Secure Energy (ICSS) and the Energy & Geo Science Institute (EGI) have created a Carbon Engineering USTAR team to address this issue. Not only is the release of carbon better managed, but oil extraction is increased.

## Utah's Energy Cluster Renewable Resources



*Utah's emerging geothermal energy development continues to demonstrate promise as a viable energy source in some limited locations.*

Critical research in wind mapping is being conducted at Utah State University. This, along with recent and planned projects in Milford and Spanish Fork, will demonstrate the viability of these renewable resources.

### **Geothermal**

Globally, geothermal capacity is expected to experience strong growth into the future. Its benefits include clean, steady production at prices that are comparable to current energy prices.<sup>7</sup> According to the Geothermal Energy Association, global geothermal MW production is expected to grow from approximately 10,000 MW to over 18,000 MW through 2015<sup>8</sup>, a compound annual growth rate of almost 12 percent.

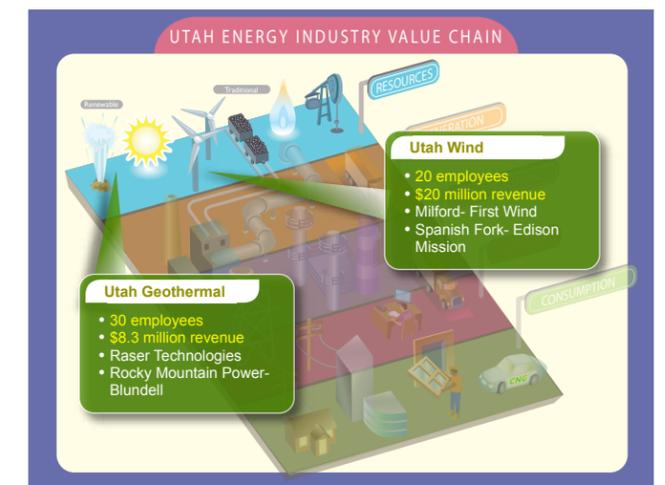
Utah already has 44 MW of capacity, mostly coming from Raser's Thermo No. 1 and Rocky Mountain's Blundell plants. Some estimate that total possible production within the state is approximately 2,100 MW.<sup>9</sup>

Beyond production, Utah can benefit from products and technologies developed within the state. Raser is using its technology to develop geothermal resources in various locations, both nationally and internationally.<sup>9</sup>

### **Wind**

Global wind capacity reached 155 GW at the end of 2009. Some expect that amount to triple by 2014, representing a 20 percent forecasted annual growth rate.<sup>11</sup> Of the total global capacity, approximately 35 GW are generated in the US annually.

As of the end of 2009, Utah's capacity was 223 MW<sup>12</sup> of wind power, most of which comes from Spanish



Fork and the Milford Flats installations. Utah has a total of 2,750 MW of potential capacity within the state. This could be an important piece of Utah's overall renewable energy portfolio.<sup>13</sup>

Key Utah companies competing in the wind energy market include Wasatch Wind and V-BAR. Wasatch Wind is an independent developer that created the Spanish Fork Project, as well as others. V-BAR is seen as a leading consultant to the industry.

Utah State University is developing products that could improve the efficiency of wind farms. Through the Energy Dynamics Lab, lidar technology is being used to better understand wind patterns. This could lead to improvements in prospecting, maintaining, and maximizing efficiency for wind farms.<sup>14</sup>



*Electrical power generation, transmission of energy resources, support services, and energy efficiency and management are essential to the expansion of Utah's Energy Cluster:*

### **GENERATION**

The largest players in Utah in the generation, transmission and distribution of electricity are Rocky Mountain Power, Deseret Generation and Transmission, Utah Association of Municipal Power Systems, and Utah Municipal Power Association, which in total produce 27.7 million megawatt hours. Questar is the largest business distributing natural gas.

### **Electricity and Heating**

Utah enjoys some of the lowest energy prices in the nation. Approximately 80 percent of the state's residents get their home heating from natural gas.<sup>15</sup> The average energy price per kilowatt hour in the Rocky Mountain Region is 8.4 cents, 17 percent lower than the national average.<sup>16</sup> These traditionally low prices make the opportunity cost of adopting more expensive renewable energy sources higher.

### **Oil Refining**

Oil refining capacity, both in Utah and across the country, has peaked. Utah refines 167,000 barrels of oil per day. This figure has remained steady. Nationally, oil refining production has only increased 8 percent between 2000 and 2009. Overall capacity usage has dropped slightly from about 84 percent to about 82 percent over the same period.

### **DISTRIBUTION—TRANSPORT**

The transmission and transport section of the energy industry consists of those businesses that are involved in the transmission of power, natural gas, and transportation of energy-related resources and products.

A large component of this segment is dedicated to constructing, operating and maintaining Utah's power grid system. Additionally, this includes the extensive infrastructure that comprises Utah's gas pipelines and those associated with their operation.

### **SUPPORT**

A wide range of transportation-related businesses further expand this segment. These businesses provide the critical transportation services so vital to sustaining this industry.

Support businesses for energy are extensive, providing such vital services as welding, machining, hauling, rigging, custom equipment, and the range of products and services required by the industry. Although there are some very large businesses that service this support market, there are also numerous small business operators. Although small in terms of number of employees, these businesses collectively comprise the extensive service network that provides the essential undergirding to the overall industry.

### **RESEARCH**

The research area includes both public and private entities conducting advanced and applied energy research and development. Utah has several key strengths in various types of energy research. At Utah State University, the Energy Dynamics Lab is working on creating "intuitive buildings," buildings that use lighting and HVAC in ways that can save money and enhance productivity of workers. The lab anticipates that by 2015 they will be able to

deploy systems that use novel, task-adaptive lighting systems that consist of a network of intelligent, self-adapting luminaries, which will cut energy costs by 50 percent.<sup>17</sup>

Utah should further strengthen its research position by creating a clearinghouse of information on existing and potential research and development funding. Furthermore, Utah should consider a coordinated research forum to tackle Utah-specific problems. Wyoming currently has a program like this for natural gas research and development.<sup>18</sup>

## CONSUMPTION

### Energy Efficiency

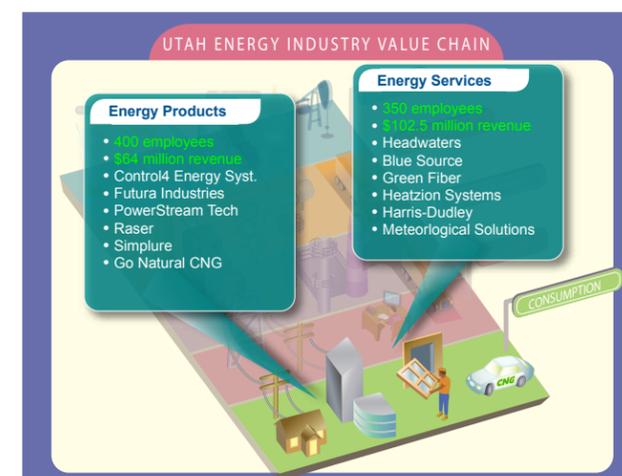
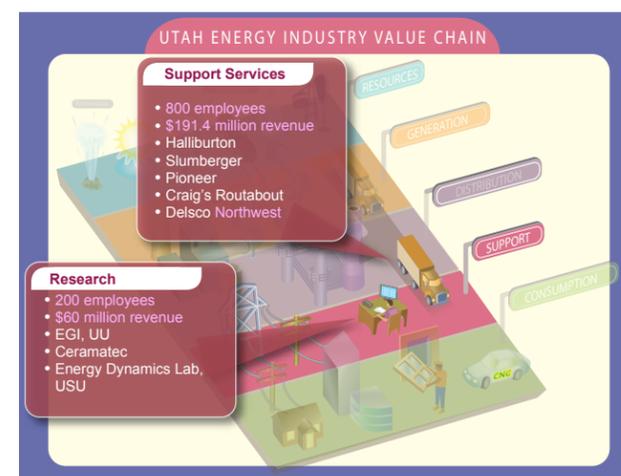
Conservation is one of the keys to maintain Utah's historically low energy prices because it limits the need to build expensive new capacity. Incorporating energy-efficient building techniques into Utah buildings will conserve energy over the long term. Some of these techniques include the use of distributed power capabilities, use of greener materials, and the development of "smart" buildings that sense when to conserve energy.

Utah has unique strengths in "smart" building technology. Control4 Energy Systems has created

an application that allows homeowners to manage appliances and HVAC systems via wireless connectivity and sensors. Their system is "designed to monitor individual appliances' energy consumption, expand home automation, and generally encourage energy efficiency and conservation."<sup>19</sup>

Utah will be faced with expanding energy demands in the future. In its 2009 Internal Resource Plan filed with the Public Service Commission, Rocky Mountain Power indicated that it anticipates a 2.1 percent annual increase in supply through 2018. However, during that time energy demand is expected to grow by 2.5 percent. While Rocky Mountain Power has a plan to increase its supply through gas-fired plants, wind, geothermal, and various upgrades, Utah must look at appropriate conservation measures to keep marginal costs of energy generation down. In fact, Rocky Mountain must plan for many demand spikes of 100 MW for just 90 hours out of the year. Various demand management programs are in place now to mitigate the costs of such supply. During 2008, approximately 102 megawatts of power and over 190,000 megawatt hours of energy were offset through these programs.<sup>20</sup>

Questar estimates its 2008 demand management



plan will reduce natural gas consumption annually by almost 400,000 decatherms, or approximately 5,000 homes. Questar also projects approximately 62,000 customers will participate in its energy efficiency program.<sup>21</sup>

Utah also has a strong base of contractors who provide basic energy efficiency upgrades to homes. In addition, a number of companies provide passive solar, solar photovoltaic, geothermal, and wind energy options to residential customers.

### Natural Gas Vehicles

Utah can enable more natural gas usage via more ubiquitous deployment of natural gas transportation. There are a number of efforts underway in the state to do this. In 2009, Utah Clean Cities was awarded a \$14.9 million grant to create new natural gas filling stations, upgrade 24 others, create 3 liquid natural gas facilities, and convert vehicles to natural gas.<sup>22</sup>

Before this grant was awarded, Utah's natural gas filling capacity grew 45 percent and that number is expected to grow another 50 percent this year.<sup>23</sup> The I-15 Natural Gas Corridor is now in place, which makes refueling possible along I-15 from north to south.<sup>24</sup>

H.B. 70, passed in the Utah legislature earlier this year (2010), allows for non-EPA certified conversion of vehicles, enabling the Division of Air Quality to

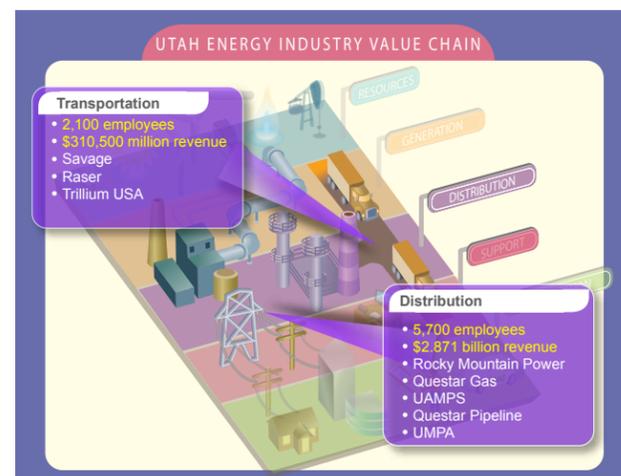
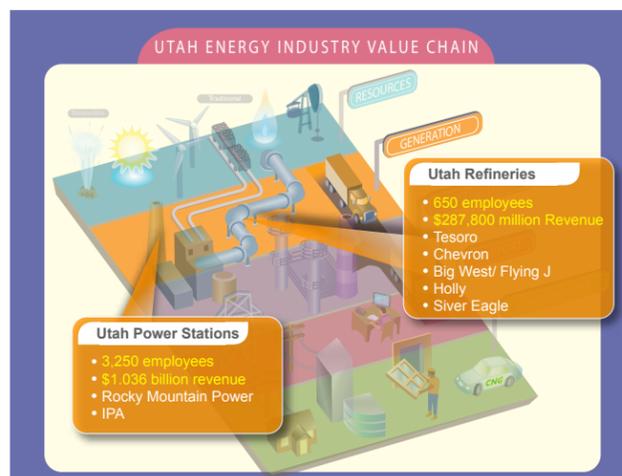
perform the certifications.<sup>25</sup> Coupled with increased station deployment, Utah is poised for increased growth of CNG use.

Utah has over 10,000 vehicles running on natural gas which use over 400,000 gas gallon equivalents per month or roughly 605 million cubic feet of natural gas a year. Utah is considered the leader in natural gas vehicles and fuel stations in the nation. This is primarily due to the efforts of industry and the state to place enough natural gas fueling stations in Utah.

These steps could lay the groundwork for Utah's growth in a clean, locally-produced fuel source.

### Battery Storage

Potentially one of the most disruptive technologies for future energy use is improved batteries for energy storage. One of the world leaders for battery development is Utah's Ceramatec. The company was recently recognized by Popular Mechanics as one of the "10 Most Brilliant Ideas of 2009" for its sodium-sulfur battery design.<sup>26</sup> This battery, anticipated to be about the size of a refrigerator, would enable homes to capture and store various types of renewable energy and store that to get consistent power.<sup>27</sup> This technology would enable millions of homes to generate their own electrical power, reducing demand loads on the traditional grid.



## Economic Value of the Cluster



*Accurate and complete employment and revenue data for Utah's energy industry is not readily available. There is no complete list of energy companies and no one source for business data. Therefore, it has been difficult to first compile a comprehensive list of energy-related businesses and second, to obtain employment and revenue data from these primarily private companies. This section reflects available data.*

The assessment of the industry includes our most complete listing of companies. Also included is the job and revenue data that is available. For many of the companies there has been only sufficient information to identify and categorize them. Additional efforts will need to be made to further refine this list.

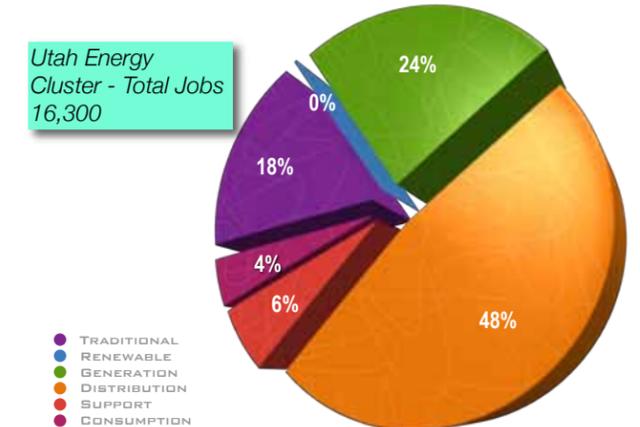
Based on the data collected to date, the following table indicates that Utah's energy industry has combined annual revenues generated within the state of Utah of approximately \$8.5 billion and employs some 16,300 workers.

### INDUSTRY STRATEGIC INSIGHTS

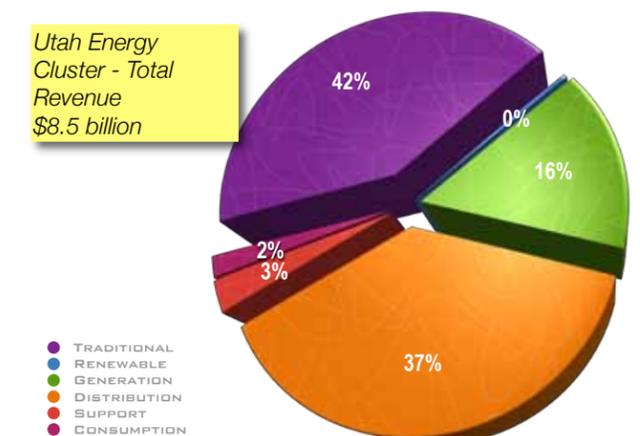
Utah's Energy industry reflects the influence of a multifaceted set of national and global factors each of which shape the forces that drive the viability and expansion of the industry.

The following describes the key factors affecting this cluster within Utah today and which are likely to influence the future expansion.

Economic Impact - Jobs by Sector



Economic Impact - Revenue by Sector



# Implementation



*This section highlights efforts that are already underway to train the energy industry workforce as well as clarifying implementation responsibilities.*

## CURRENTLY UNDERWAY

Utah was recently awarded an energy sector training grant from the Department of Labor in the amount of \$4.6 million with Salt Lake Community College (SLCC) receiving \$2.1 million as the lead sub-grantee. This grant will fund a comprehensive training initiative titled the Utah State Energy Sector Partnership (SESP), which will be administered by SLCC. Outlying educational institutions also will be engaged in delivering energy training programs.

The SESP project will design and deliver a state-wide energy core curriculum integrating basic energy technician level training. Upon completion of the core energy competencies, specific occupational training in four defined energy related sectors also will be offered. All training is designed and

delivered to foster national certificates, industry certifications, or apprenticeship placement.

Energy sector training and job placement activities are delivered through three regionally located one-stop training centers. Energy one-stops serve as integrated community resources balancing state-wide training programs with regional leadership in specific energy sectors such as wind, geothermal, alternative fuels, etc. These one-stops will focus on training referral, professional development, and employment in the energy sector.

Overall, this program will enable rapid training deployment and certification for dislocated and at-risk workers, while having the full array of services provided through traditional DWS one-stops available to those target populations who require additional services.

Utah Energy Cluster Acceleration Strategy  
Implementation Responsibilities

Action Items	Industry	USHE	DWS	GOED	USTAR	Other
<b>Growth Opportunities</b>						
<b>Statewide Energy Policy</b>						
Update and aggressively implement a comprehensive, economy-centered energy policy that coordinates state policies with incentives for energy use and development.	○	○	○	○	○	● Governor and Legislature
<b>State Energy Subsidy Policy</b>						
Design and implement a statewide energy subsidy policy that stimulates growth of businesses developing solar thermal, geothermal, and wind power generation through the use of state funds. This policy would not arbitrarily establish or maintain false market conditions, but would encourage eventual viability of the businesses.	○	○		●	○	
<b>Secure the Future</b>						
<b>Renewable Energy Goal</b>						
Define a realistic renewable energy portfolio standard for the state with interim targets of achievement that are competitive with surrounding states.	○	○	○	●	○	
<b>Key Supporting Strategies</b>						
<b>Expand Workforce</b>						
Increase the overall number of trained energy industry workers to meet projected needs in renewable and traditional resource development, generation, distribution and transport, support, and energy consumption.	○	●	○	○		ATC's and Public Education
<b>Energy Industry Career Pathways</b>						
Provide Training and workforce skill development in career pathways defined in the Career Pathways- Utah Energy Cluster. (See Appendix)	○	●	○	○		ATC's and Public Education
<b>Industry Assisted Training</b>						
Engage the industry in promoting and providing practical skill training workshops in conjunction with regional educational centers.	○	●	○	○		ATC's and Public Education

Furthermore, this program supports innovative strategies focused on employer recruitment, coordinating regional economic and workforce development partnerships in the green jobs sectors, resulting in unified solutions to identify skill shortages and specific green industry needs within each region.

### IMPLEMENTATION RESPONSIBILITIES

The following table indicates the general responsibility for implementing the action items referenced in this strategy.

Utah Energy Cluster Acceleration Strategy  
Implementation Responsibilities  
Page 2

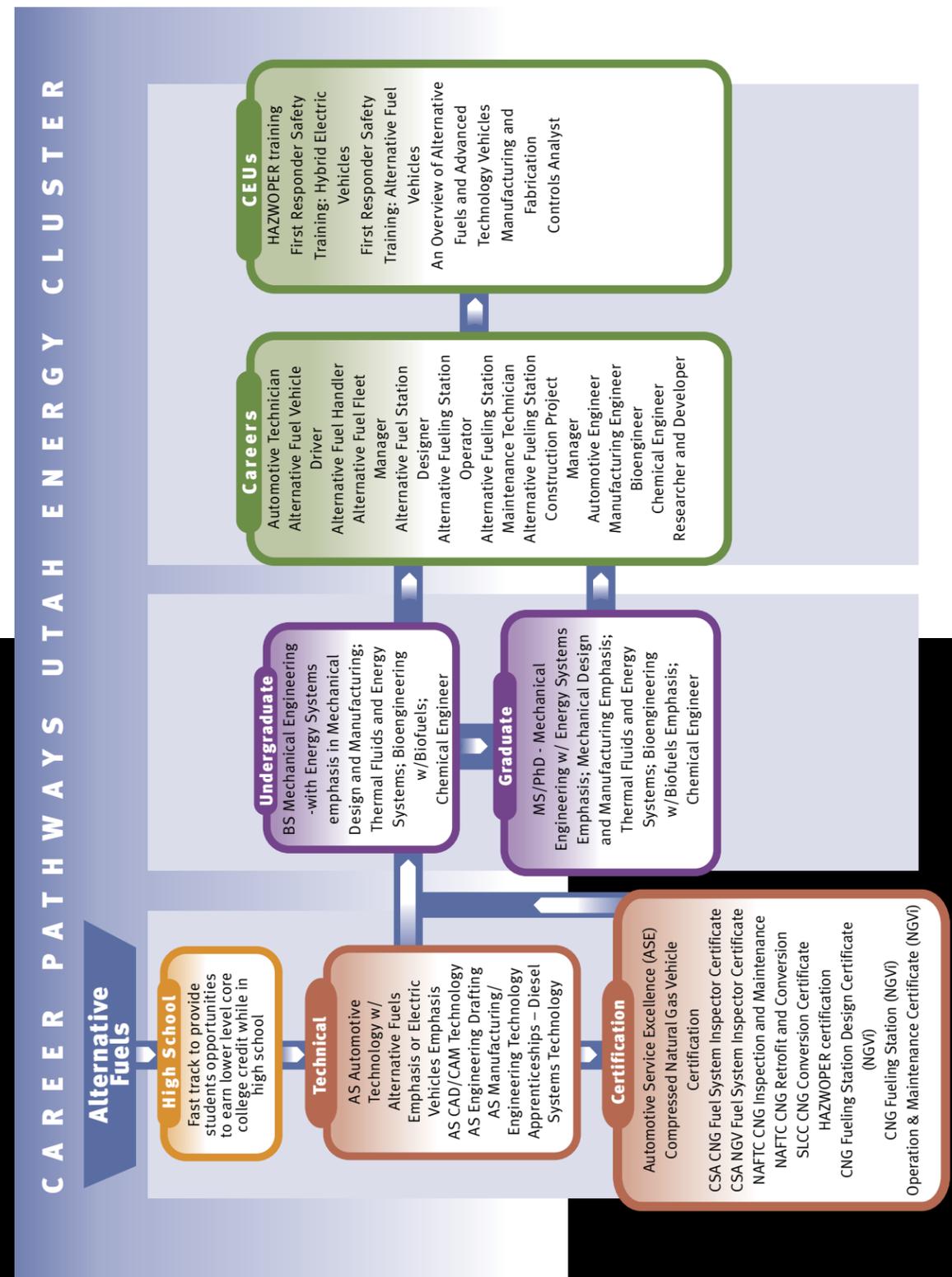
Action Items	Industry	USHE	DWS	GOED	USTAR	Other
<b>Capitalize on Training Grants</b> Fully utilize the training grants received by the Department of Workforce Services and managed by Salt Lake Community College for re-training workers for energy industry positions.						ATC's and Public Education
<b>Expand Research</b> <b>Research Viability of Renewable Energy</b> Undertake consistent research and development of reasonable factors that will eventually make renewable energy an economically viable energy source not dependent on government subsidies or specialized fiscal policies.						
<b>Expand Oil Refineries</b> Expand Utah's oil refinery business by becoming a viable hub for refining crude oil extracted in Canada and Mexico by partnering with producers in these regions.						
<b>Reverse Attrition</b> <b>Increase the Regional Demand for Natural Gas and Low-cost Power</b> Leverage Utah's low-cost power and abundant natural gas reserves to attract national and international heavy power users, such as fertilizer and chemical manufacturers.						Economic Development Corporation of Utah
<b>Create Strong Base of Power Demand</b> Create a strong economic and industrial base in Utah that utilizes and demands Utah's abundant supply of low cost power.						Economic Development Corporation of Utah

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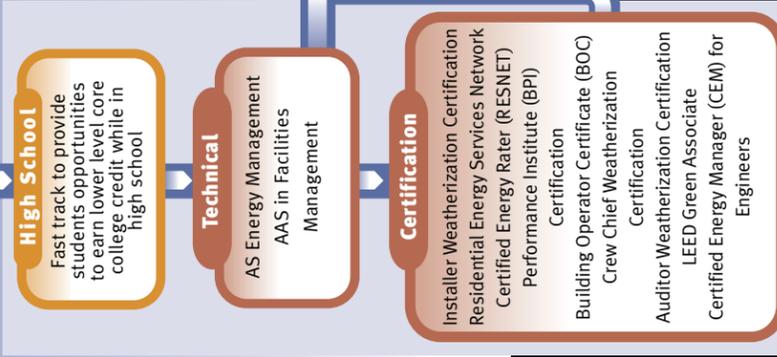
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## Apendix



CAREER PATHWAYS UTAH ENERGY CLUSTER

Energy Management



**Undergraduate**  
BS degree in Mechanical Engineering w/Energy Systems Emphasis

**Graduate**  
MS/PhD - Mechanical Engineering w/Energy Systems Emphasis

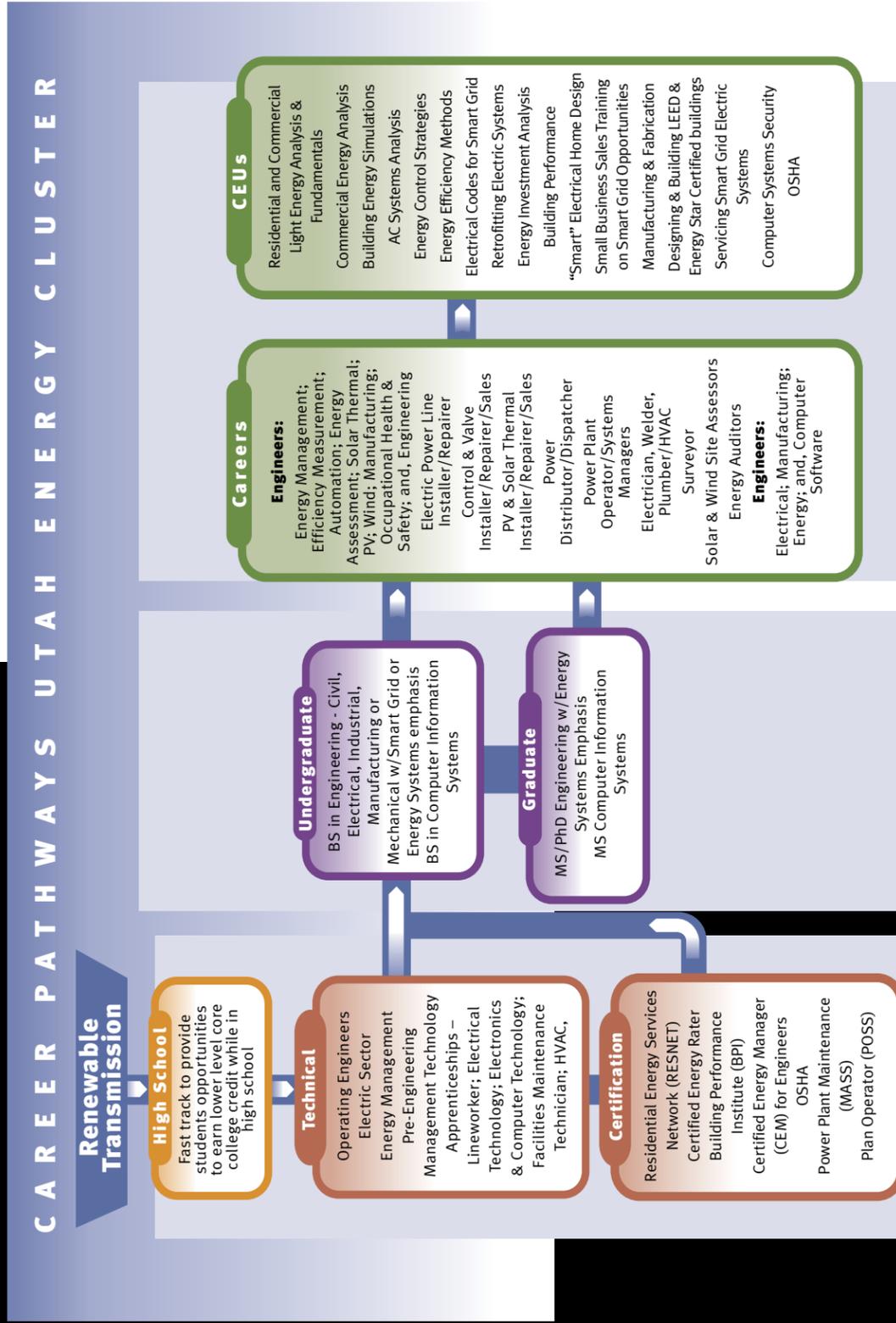
- Careers**
- Weatherization Installer
  - Weatherization Certification Crew Chief Weatherization Certification
  - Auditor Weatherization Certification
  - Certified Residential Energy Auditor or Rater
  - Commercial Energy Auditor or Rater
  - Building Operator
  - Energy Manager
  - Facilities Manager
  - Energy Engineer
  - Plant Manager
  - Plant Operator
  - Facilities Manager; Energy Program Manager
  - Sustainability Officer
  - Energy Specialist; Power Supply and Market
  - Operations Manager
  - Productions Manager
  - Contract Manager
  - Energy Manager/Engineer
  - Resource Efficiency Manager
  - Sales Engineer
  - Researcher and Developer

- CEUs**
- Green Building Strategies LEED: Construction and Design
  - Advance LEED Topics
  - Energy Investment Analysis
  - Energy Control Strategies
  - Benchmarking Software Training
  - Residential and Commercial Light Energy Analysis & Fundamentals
  - Commercial Energy Analysis Building Energy Simulations
  - AC Systems Analysis
  - Energy Control Strategies
  - Energy Efficiency Methods
  - Energy Investment Analysis
  - Building Performance Small Business Sales Training
  - Designing & Building LEED & Energy Star Certified buildings
  - Manufacturing and Fabrication
  - Sustainable Landscapes

UTAH ENERGY CLUSTER

- Careers**
- Weatherization Technician
  - Hazardous Materials Handler
  - Hazardous Materials Removal Worker
  - Construction Laborer
  - Installation Helpers
  - Roofers
  - Framers
  - Carpenters
  - Foundation Setters
  - Solar Installation Manager/Project (Solar w/Photovoltaic or Solar Thermal) (Installer and Service Technician)
  - Solar Sales Representative
  - Solar and Wind Farm Site Locators
  - Sustainable Landscape Architects
  - Industrial Green Systems and Retrofit Designer
  - Architect
  - Site Locator

- CEUs**
- Green Building Strategies LEED: Construction & Design
  - Advanced LEED Topics International Building Code for Commercial Buildings
  - Residential and Commercial Light Energy Analysis & Fundamentals
  - Commercial Energy Analysis Building Energy Simulations
  - AC Systems Analysis
  - Energy Control Strategies
  - Energy Efficiency Methods
  - Energy Investment Analysis
  - Building Performance Small Business Sales Training
  - Designing & Building LEED & Energy Star Certified buildings
  - Manufacturing and Fabrication
  - Sustainable Landscapes



## Energy Cluster Acceleration Project- Strategic Insights




**Specific industry insights that are directly relevant to the acceleration of Utah's Energy Industry Cluster.**

### ENERGY CLUSTER DRIVERS

- Utah's Energy Industry Cluster is directly affected by Federal government policy, federal regulations and federal funding for research and development.
- Utah is one of the most difficult places to do business because approximately 85% of energy development in the state is located on public lands subjecting business development to federal controls.
- Environmental restrictions and threat of restrictions dramatically drive the economics of developing Utah's coal resources. Regional and national pricing drive the economics of developing Utah's electric, natural gas and coal resources. Renewable energy resources are not price competitive because of lower energy prices particularly in the Rocky Mountain region.
- The level of energy efficiency and renewable energy resources achieved are dependent on the policies defined by local, state and federal regulatory bodies.

### NON- RENEWABLE ENERGY SOURCES

- In general, the energy extraction industry is quick to adopt new methods, processes and technologies creating opportunities for innovative new service providers to the industry.
- The demand for oil refining has peaked and will decline in coming decades as alternative fuels and vehicles become more widely adopted.
- The abundance of natural gas resources in the country as well as the expanding capacity to ship liquefied natural gas will keep natural gas prices down.

### RENEWABLE ENERGY SOURCES

- Although significant federal research funding is being invested in the areas of clean technology,

Utah's Energy Cluster by Value Chain

Sources			
Traditional Energy			
Coal	Production (000's Short Tons)	Employees	Revenues
Canyon Fuel, LLC - Arch Coal, Inc.	12,757	200	\$510,280
West Ridge Resources, Inc. - UtahAmerican Energy, Inc., Intermountain			
Power Agency	3,063	200	\$122,519
CONSOL Energy	1,238	140	\$49,507
Energy West Mining Co.	3,833	100	\$153,329
Hawatha Coal Company	633	100	\$25,324
Hidden Splendor Resources, Inc.	194	70	\$11,000
<b>Total</b>	<b>21,718</b>	<b>810</b>	<b>\$871,959</b>
Oil			
Production (BBLs)	Employees	Revenues	
Newfield Production	6,869,302	300	\$263,669
Resolute Natural Resources	3,353,194	75	\$150,894
Wolverine Gas & Oil	3,057,070	25	\$137,568
El Paso E&P	2,257,436	30	\$101,585
EOG Resources	1,516,529	35	\$68,244
Questar E&P	1,157,339	200	\$52,103
Berry Petroleum	1,003,931	50	\$45,177
Kerr-McGee Oil & Gas Onshore	705,180	15	\$31,733
Flying J Oil & Gas	600,217	15	\$27,010
Citation Oil & Gas	533,255	15	\$23,996
Devon Energy	512,754	15	\$23,074
Misc. Small Companies	2,367,897	100	\$106,565
<b>Total</b>	<b>20,556,707</b>	<b>875</b>	<b>\$1,031,607</b>
Gas			
Production (MCF)	Employees	Revenues	
Kerr-McGee	126,382,390	200	\$468,879
EOG Resources, Inc.	73,430,732	200	\$272,428
Misc. Small Companies	45,892,688	100	\$170,262
Bill Barrett	40,589,068	25	\$150,585
ConocoPhillips	39,020,773	100	\$144,767
XTO Energy	38,329,806	90	\$142,204
Questar E&P	28,966,012	200	\$107,464
Aradarko	14,653,573	200	\$54,372
Newfield Production	11,615,346	50	\$43,093
Berry Petroleum	11,293,557	50	\$41,899
Merrit Energy Co	8,002,774	15	\$29,690
Gasco Production	11,354,240	10	\$21,000
<b>Total</b>	<b>438,178,719</b>	<b>1,240</b>	<b>\$1,646,643</b>
Renewable Energy			
Production (MW)	Employees	Revenues	
Wind			
Millard - First Wind	306	10	\$15,000
Spanish Fork - Edison Mission	19	10	\$5,500
Geothermal			
Rocky Mountain Power - Blundell	27	10	\$4,800
Raser	36	10	\$3,500
<b>Total</b>	<b>388</b>	<b>40</b>	<b>\$28,800</b>

Utah's Energy Cluster by Value Chain

Generation			
Power Stations	MW	Employees	Revenues
IPA	1800	20	\$520,000
Rocky Mountain Power	9140	3,250	\$416,000
<b>Total</b>	<b>9,140</b>	<b>3,250</b>	<b>\$1,036,000</b>
Refineries			
Production (BPCD)	Employees	Revenues	
Tesoro	58,000	205	\$99,531
Chevron	45,000	159	\$77,222
Big West/Flying J	29,400	130	\$50,452
Holly	25,050	111	\$42,987
Silver Eagle	10,250	45	\$17,589
<b>Total</b>	<b>167,700</b>	<b>650</b>	<b>\$287,781</b>
Distribution/ Transport			
MWh/Dth	Employees	Revenues	
Distribution			
Rocky Mountain Power	22,362,159	3,250	\$1,384,000
Questar Gas	70,000,000	1,160	\$918,000
UJMP/S	4,358,000	775	\$330,000
Questar Pipeline	50,000,000	300	\$170,000
UJMPA	1,075,268	162	\$69,000
<b>Total</b>	<b>5,667</b>	<b>\$2,871,000</b>	
Transport			
Savage	1,800	\$280,000	
DALBO	200	\$20,000	
Western Petroleum	81	\$10,000	
<b>Total</b>	<b>2,081</b>	<b>\$310,000</b>	
Support			
Services	Employees	Revenues	
Halliburton	250	\$75,000	
BJ Services	75	\$22,609	
Schlumberger Terra Tek	35	\$20,000	
Unit Drilling	35	\$18,662	
EOG	75	\$17,096	
Weatherford	75	\$13,231	
Baker Hughes	35	\$10,551	
Delco Northwest Resources	75	\$7,500	
Craig's Roustabout	105	\$5,000	
Pioneer	10	\$1,000	
Superior Drilling	8	\$720	
<b>Total</b>	<b>778</b>	<b>\$191,370</b>	
Research			
Ceramatec	165	\$50,000	
Energy Dynamics Lab USU	40	\$5,000	
EGU, Univ of Utah	40	\$5,000	
<b>Total</b>	<b>205</b>	<b>\$60,000</b>	

Appendix

Utah's Energy Cluster by Value Chain

Consumption			
Energy Products	Employees	Revenues	
Futura Industries	250	\$50,000	
Control4 Energy Systems	100	\$7,500	
Wesatch Wind	10	\$3,250	
PowerStream Technology	8	\$1,900	
Raser	7	\$500	
Go Natural CNG	12	\$1,000	
Simpleure	12	-	
<b>Total</b>	<b>368</b>	<b>\$64,150</b>	
Energy Services			
Employees	Revenues		
Headwaters Energy Services	155	\$65,000	
GreenFiber	30	\$15,000	
Blue Source	20	\$7,500	
Harris-Dudley	75	\$7,500	
Envirotherm	4	\$1,750	
V-Bar	7	\$1,000	
Heatizon Systems	7	\$1,000	
Meteorological Solutions	15	\$1,000	
Gardner Engineering	4	\$750	
Warmzone	11	\$700	
Warmzone	11	\$700	
Washakie Renewables	5	\$310	
GeoEngineers	3	\$250	
<b>Total</b>	<b>347</b>	<b>\$102,460</b>	
<b>Grand Total</b>	<b>16,323</b>	<b>\$8,501,770</b>	

Sources: EDCUtah Report, Uintah Basin Standard, Utah Coal, Oil & Gas, DWS, Yahoo! Finance, D&B, UGS, PSC  
 Note: Revenue is expressed in millions. The number of jobs and total revenue has been estimated for some private companies.  
 Actual figures may vary.

**Utah System of Higher Education**

60 South 400 West  
Salt Lake City, UT 84101-1284  
801-321-7111

**higheredutah.org**

**Department of Workforce Services**

State of Utah  
140 East 300 South  
Salt Lake City, UT 84111

**jobs.utah.gov**

**Governor's Office of Economic Dev.**

State of Utah  
324 South State Street, Suite 500  
Salt Lake City, UT 84111

**business.utah.gov**

**Grow Utah Ventures**

450 Simmons Way Suite 500  
Kaysville, Utah 84037  
801 593 2267

**growutahventures.com**