

ACCELERATING UTAH'S  
ENERGY  
INDUSTRY



Utah Cluster Acceleration Partnership January 2013





**Accelerating Utah's Energy Future**



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# Energy Executive Summary



The Utah Cluster Acceleration Partnership was established in 2009 to support higher education as an economic driver in the State. Energy was one of the core industry clusters. The Energy Cluster Acceleration Partnership (ECAP) was formed to focus on that cluster. Energy plays a vital role in Utah. Energy employment accounts for almost 1.5% of the entire workforce and accounts for \$393 million dollars through taxes, royalties and production. On average, the wage in the energy industry is over 180% the State's average monthly wage.

The ECAP was convened by Salt Lake Community College (SLCC). When ECAP was started, SLCC had just been awarded a national grant for training in the renewable energy and energy efficiency industry sectors. These sectors were seen as potential growth opportunities for Utah and SLCC's head start on energy educational training made them a natural fit for the ECAP.

The ECAP process was a stakeholder driven one. It was led by a committee that included industry, academia, state and local government, non-profits, and entrepreneurs. Key objectives for the committee included sustaining the core energy industry, driving growth accelerators, and exploring future opportunities. Meeting these objectives led the ECAP to achieve several successful outcomes.

## Major outcomes include:

1. Developed new energy-specific curriculum through the \$4.6 million dollar State Energy Sector Partnership (SESP) grant from the United States Department of Labor.
2. Enhanced significantly the renewable energy and energy efficiency industry sectors through SESP grant, administered by Utah's Department of Workforce Services as a core ECAP member and in partnership with SLCC and the Utah College of Applied Technology.



3. Trained over 1,500 students for employment in the energy sector, as part of the SESP grant. 839 students were placed in jobs with 470 jobs retained. Over 1,600 National Career Readiness Certificates or industry credentials were awarded. There were 362 students enrolled into apprenticeships.
4. Revised career pathways that used transferrable skills to create more of a lattice framework for students, instead of the traditional career “ladder”.
5. Created partnerships between higher education institutions to support non-credit to credit transitions and allow a more smooth transition for students looking to continue their education.
6. Rolled out a sustainability strategy program through Utah’s Manufacturing Extension Partnership (MEP) called The Green Enterprise Program. Delivered this program to industry seven times at four different campuses, training and certifying 86 individuals that represented 41 companies and organizations.
7. Collaborated with the Utah Energy Research Triangle, which is a statewide partnership among Utah’s research and other universities, regional colleges, and applied technology colleges.

The momentum of the ECAP project will not end with this publication. The Office of Energy Development, Department of Workforce Services, Utah Systems of Higher Education, and industry and academic partners will support the work through the long-term partnerships that have been established during the ECAP process. Five key recommendations moving forward are:

1. Continue to foster the communication and collaboration that has developed from the ECAP work.
2. Enhance now established partnerships between academia, industry, and government.
3. Evaluate energy policy.
4. Review energy education curriculum, ensuring its content remains relevant with Utah’s interest as well as ever advancing technologies.
5. Support research collaboration opportunities.



## About ECAP



**A**ccelerating Utah’s Energy Future represents the continuing efforts to support the expanding energy industry in Utah through a dynamic partnership of government, industry, and higher education. This partnership stems from the Utah Cluster Acceleration Partnership (UCAP). This report is designed to highlight the successes throughout Utah’s colleges and universities as a result of the ECAP partnership.

The Utah System of Higher Education, the Utah Department of Workforce Services, and the Utah Governor’s Office of Economic Development partnered to accelerate key industries through UCAP. Core economic clusters, such as energy, are vital industries that play a large part in the economic health of the State. ECAP, as part of UCAP, focused on the overall objectives of UCAP. The objectives were:

1. Accelerate growth in targeted high-impact industry clusters.
2. Develop responsive, industry-driven education and training systems that produce a pipeline of skilled talent to meet the short and long-term needs of economic clusters or regions.
3. Enhance the role of a college or university as a primary steward for regional and statewide prosperity. Orient higher education towards its role as an economic stimulator for growth and business acceleration.
4. Capitalize on higher education institutions as idea centers of advanced and applied research to solve specific industry problems and enhance opportunities.



### **Sustain the Core Energy Industry.**

This principle represents specific opportunities essential to sustaining the core of Utah's current energy industry.

1. Maintain competitive oil, gas, and coal production.
2. Access resources on hydrocarbon based lands.
3. Increase consistently energy generation and transmission.
4. Maintain economically viable refineries.
5. Sustain energy transport and support businesses.

### **Drive Growth Accelerators.**

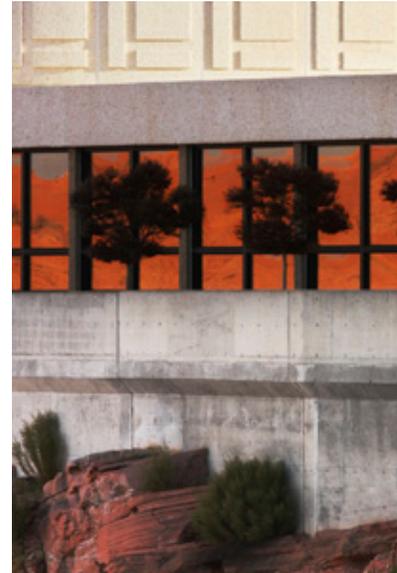
This principle represents the most important short-term opportunities that have the potential to expand the overall growth of the cluster.

1. Continue expansion of natural gas production.
2. Enable oil shale/ oil sands/ shale gas production.
3. Specialize in energy training and certification.
4. Develop fully Utah's renewable resources, both distribute power and utility-scale.
5. Integrate renewable power generation with traditional power plants.
6. Upgrade and support electrical grid.
7. Expand natural gas power plants.
8. Improve the viability of cost effective innovative energy efficiency business.
9. Expand natural gas vehicle use.

### **Explore Future Opportunities.**

This principle represents future opportunities in which Utah has a strong likelihood of succeeding.

1. Capitalize on federal research initiatives.
2. Explore the application of cost effective, new transmission storage and power usage technologies.
3. Promote the use and adoption of green construction technologies.





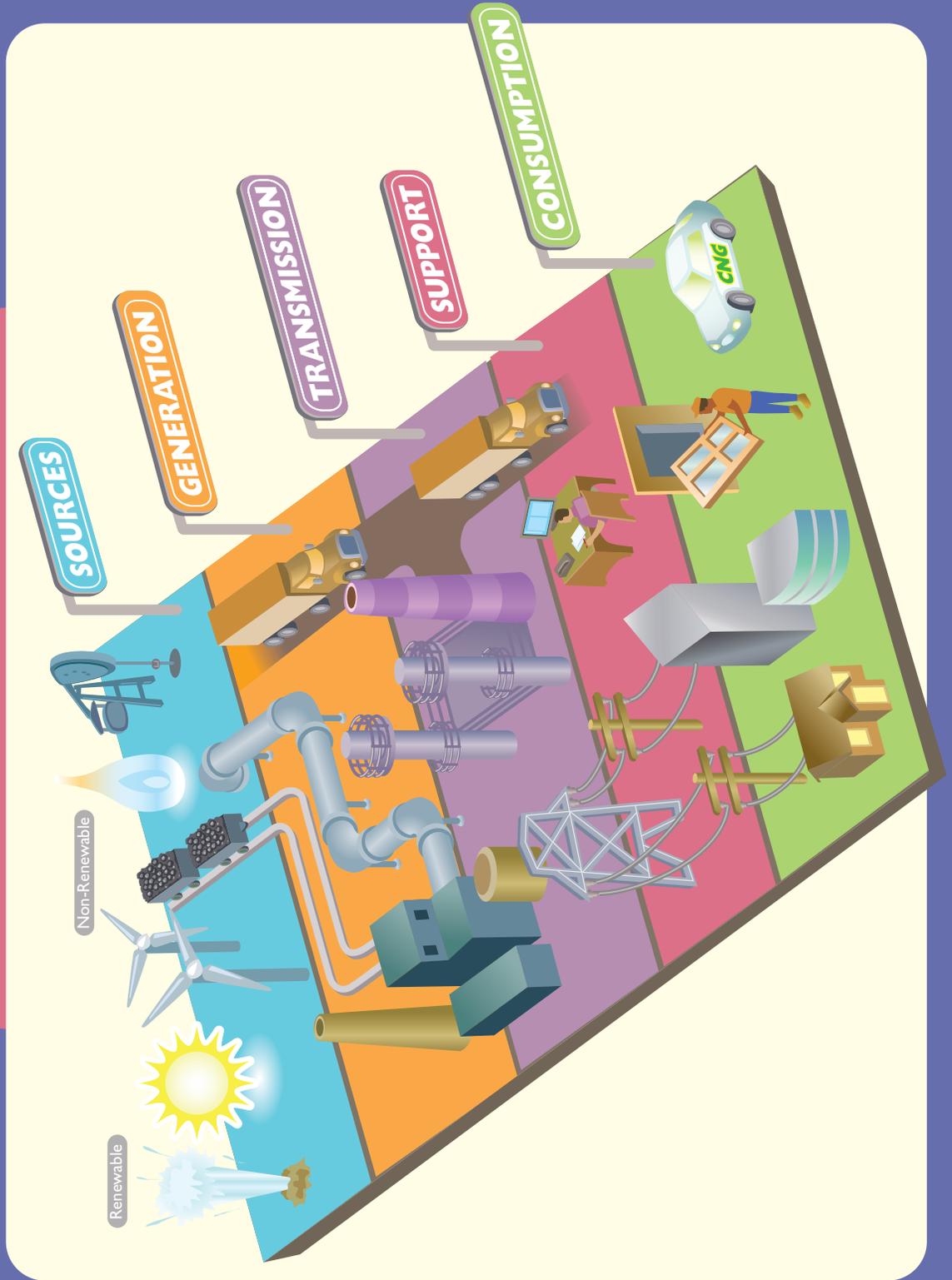
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4. Capitalize on higher education institutions as idea centers of advanced and applied research to solve specific industry problems and enhance opportunities.





# UTAH ENERGY INDUSTRY







## 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.*

The energy field is an integral part of Utah's economy. Energy is a business recruitment tool, a major revenue contributor, and a stable source of employment. In Utah, energy employment counts for almost 1.5% of the entire workforce and accounts for \$393 million dollars through taxes, royalties and production. The average wage in the energy industry is over 180% the State's average monthly wage. Many of these jobs support rural areas that depend on energy to sustain their economy. Realizing the importance of energy in the economy, the Energy Cluster Acceleration Partnership (ECAP) was established in 2009 to support higher education as an economic driver for energy. The ECAP process first assessed the current needs in the industry and academia, and then designed a strategy for the best course of action moving forward (see graphic on opposite page). That work is covered in the report "Accelerating Utah's Energy Industry". After the strategy was set, the ECAP looked at how to implement and measure the outcomes. The implementation strategy focused on four areas: policy and regulation, industry support, workforce and talent development, and research and innovation. This report highlights that work.

The role of higher education is vital to the energy sector. Universities and colleges support industry through education and training for new employees and by keeping businesses competitive through re-training current employees in the latest skills and technologies. The ongoing energy research in the universities is continually overcoming challenges faced in the industry and pushing energy development to new frontiers. In addition, partnerships have stepped in to fill gaps in training for businesses in new efficient and green practices to save resources, time, and money.

The ECAP was convened by Salt Lake Community College (SLCC). When the ECAP was being formed, SLCC had just been awarded a national grant for training in the renewable energy and energy efficiency sectors. These sectors were seen as potential growth opportunities for Utah and SLCC's head start on energy educational training made them a natural fit for the ECAP. This was a stakeholder driven process through leaders in industry, academia, state and local government, non-profits, and entrepreneurs. This work will continue through the momentum built upon strong partnerships, balanced energy policy, and the ongoing research and training in our colleges and universities.







## State Energy Sector Partnership

*As the ECAP strategic plan was launched, the State sought and received from the United States Department of Labor a \$4.6 million dollar energy sector grant. This grant established a statewide, sustainable State Energy Sector Partnership (SESP) that created and maintained a coordinated approach to workforce development for all renewable and energy efficiency industry sectors in order to foster economic growth, job creation, and sustainability.*

The grant was awarded to the Utah Department of Workforce Services (DWS) in January 2010 in partnership with other ECAP members. SESP goals:

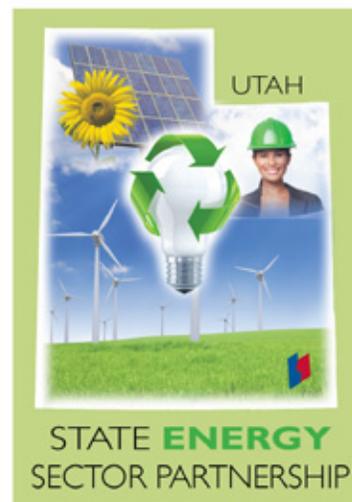
1. Identify and evaluate future job trends, and implement activities to sustain job growth and job retention.
2. Integrate the sector workforce development plan with the Governor's Strategic 10-Year Energy Plan, relevant national and state energy policies, and the Workforce Investment Act/Wagner-Peyser Act State Plan.
3. Align research and development and new technologies with energy sectors growth, emerging business needs, and job skill development.
4. Develop a statewide, comprehensive energy efficiency and renewable energy sector workforce development plan for Utah.
5. Expand the capacity for a skilled talent pipeline to meet the short and long-term needs of the energy efficiency and renewable energy industry sectors.

### Program and Partners

This no-cost-to-participant program provided energy training and job placement opportunities in all twenty-nine counties. A statewide strategy was developed to position Utah as a regional and national

leader in energy workforce development. Seamless career transitions were created for a mobile and marketable workforce within the state, and existing resources were leveraged to build capacity in emerging occupations related to energy.

The SESP project designed and delivered a statewide energy core curriculum which integrates basic energy technician level training. Upon completion of the core energy competencies, specific occupational training in the defined sectors was then completed. All training was designed and delivered to provide stackable credentials, national certificates, industry certifications or apprenticeship placement fostering self-sufficiency, job retention, and pathways of skill upgrades in energy careers.



**Participating partners included:**

- Salt Lake Community College
- Davis Applied Technology College
- Southwest Applied Technology College
- Utah State University – Eastern
- Bridgerland Applied Technology College
- Uintah Basin Applied Technology College
- Utah Clean Energy

**The program was expanded to other schools and organizations including:**

- Ogden-Weber Applied Technology College
- Dixie Applied Technology College
- Local chapters of the National Homebuilders Association
- Manufacturing Extension Partnership
- The Appraisal Institute
- Utah Valley University Community & Continuing Education

**Ongoing**

Each participating institution within SESP has developed a sustainability plan designed to continue to meet the energy training needs as well as the workforce and employment needs within their local community. It is expected these plans will be implemented in collaboration with the DWS as well as business and industry. DWS will also continue to work with the training graduates to obtain/retain employment. They will also identify resources that could be leveraged and for future funding opportunities that will maintain and build training programs based on industry needs. This work has further solidified partnerships that will enhance any future programs and provide support for Utah's energy industry moving forward.



## Grant Specific Outcomes

*1,500* Participants Trained

*839* Job Placements

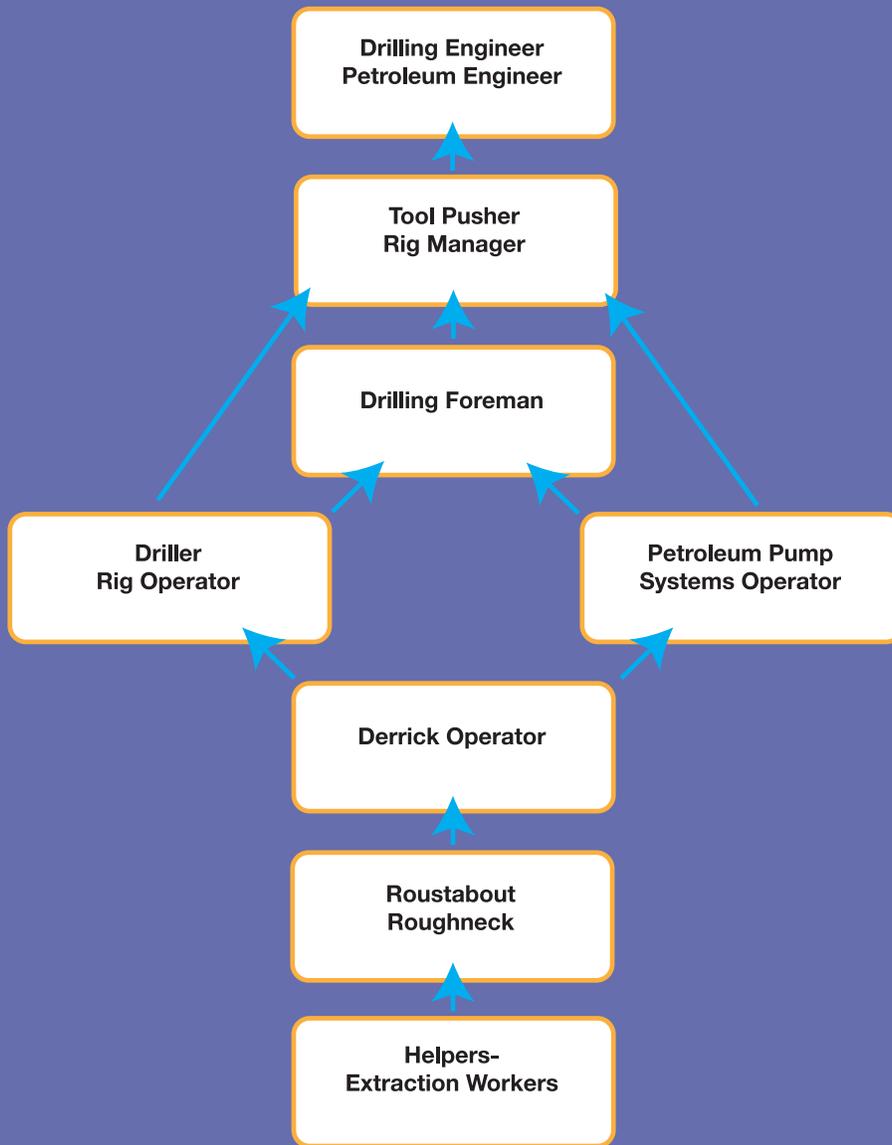
*470* Job Retention

*1,600* National Career Readiness  
Certificates or Industry Credentials

*362* Apprenticeship Program Enrollments

\*Outcomes reflected through December 2012







## Career Pathways Using Portable & Transferable Skills

*ECAP reviewed post-secondary educational processes and systems in Utah. One of the dominant ideas to emerge as a good fit was career pathways using portable and transferrable skills. Potential career pathways are typically depicted in the form of a career ladder. This pictorial device is designed to assist individuals in visualizing job options and a career progression pathway. Until recently, the prevailing career metaphor has been the ladder. The emerging model is the career lattice.*

Rather than the straight forward trajectory, career pathways using a lattice model may follow a diagonal framework that integrates lateral experiences, adjacent skill acquisitions, and peer networking to move employees to a variety of positions for which they have become qualified as a result of building or adding to their professional skill sets. Portable and transferable skills, which are often documented by certification or Continuing Education Units (CEUs), help to meet the challenges of an ever-changing and evolving economy and its accompanying workforce needs. Workforce education focused on energy has served Utah workers by providing the opportunity to add skills and knowledge to existing portfolios, thus positioning workers to be able to advance and/or adjust to changes in their current employment situations. This is a value-add just as powerful as the capacity to train and place unemployed individuals.

According to the Occupational Information Network (O\*NET) which is being developed under the sponsorship of the United States Department of Labor/Employment and Training Administration (USDOL/ETA), career ladders and lattices may be used in a variety of ways. For example:

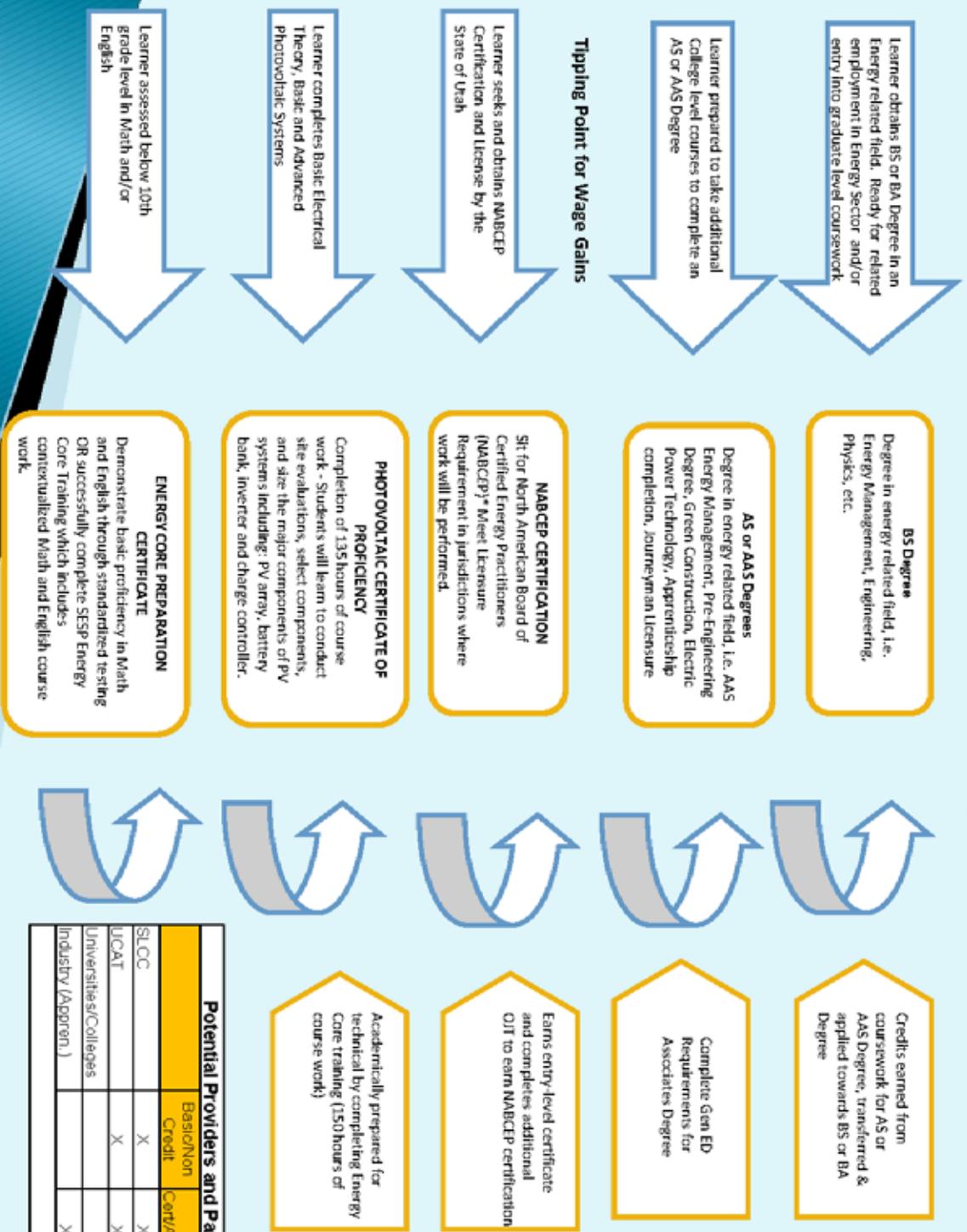
1. Attract individuals to an industry by showing potential career progression beyond entry points.
2. Focus workforce development efforts.
3. Show candidates how different jobs interconnect within careers in an industry.
4. Inform industry workforce about the training, education, and developmental experiences that would enable them to accomplish their career objectives.

This has been the strategy behind the use of career ladders, lattices, and pathways in the ECAP project. Central to this strategy is the identification of core portable and transferable skills that may be applied to either traditional or renewable fields. These skills provide flexibility and mobility within employment as well as educational options.

One example is the energy core content that was identified and brought together under the State Energy Sector Partnership (SESP). The foundational or core knowledge identified by a statewide team was then packaged and delivered in a basic workforce training certificate. The content included basic electricity, math for industry, safety standards, handling of hazardous materials, report and



# Sample Energy Career Pathways- PV Technician to Engineer



**Potential Providers and Partners**

	Basie/Non	Credit	CC/AS/DOC	BS/BA	ADV
SLCC		X		X	
UCAT		X		X	
Universities/Colleges				X	X
Industry (Apprent.)			X		X

technical writing, and an overview of essentials to energy that crossed both the traditional and renewable domains. Individuals with no previous background and knowledge had access to all of this training. Additionally and importantly, individuals who had some or all of this background knowledge were able to immediately build upon that knowledge, taking more advanced training in either a traditional or renewable field. Individuals selected the type of energy field based on personal interest, economic focus of the region of the state in which they resided, and the work experience and education level upon which they were building.

Training in energy has been accessed by many workers in Utah. This training has provided the opportunity to add critical skills that have prepared them to respond to issues such as energy efficiency, land use, transportation, changing safety standards, return on investment, and automation of systems. These skills are portable and transferable in addition to offering added value to current employers.

### **Non-Credit to Credit Transitions**

One of the most important outcomes from the ECAP has been increased collaboration and communication between educational institutions, including high school to higher education institutions, as well as technology schools and community colleges to universities. These communication links are vital to support pathways for students to continue their education. Once career pathways have been charted, educational institutions can move towards partnerships that enhance educational pathways from non-credit to credit curriculum. This has allowed

students who have started their education at a technical school, perhaps earning hours instead of credits, to be able to continue their education and apply that education towards a higher degree. There are three main objectives of non-credit to credit transitions. Foremost is that this piece is needed to achieve Governor Gary R. Herbert's goal that seeks to have 66% of working-age Utahns possess a postsecondary degree or certificate by the year 2020. This goal was put in place to support Utah's leadership through individual and community benefits from higher education, for higher wages for the citizens, and to create a stronger economy.

The second objective is student success and career readiness. By working closely with industry, programs are able to pinpoint the key skills needed in the workforce and provide relevant training and credentials. Targeted training means that the skills learned can be readily applied in the workforce and students are more quickly employed. Also the coursework could potentially transfer into another certificate if the student wants to further their education. There is increased student retention due to early success in shorter term goals which present a clear vision of next steps in education.

The last objective is to establish long-term pathways. Higher educational institutions are able to formalize articulation agreements for certain courses. This is accomplished by the non-credit granting institution reaching out to another credit granting institution and requesting a formal written agreement regarding the transfer of non-credit coursework. These agreements positively affect student's



transitions by reducing duplication of coursework and minimizing delays that students encounter in navigating career training.

The partnerships to accomplish these higher education goals have been strengthened during the ECAP process. Institutions are working together to align curriculum and learning outcomes to meet industry needs and prepare students for the next educational steps. This leads to more student successes. This work will continue through the formal agreements established, and undoubtedly new agreements will be put into place now that the successes have reached demonstrable and quantitative results.

#### **Highlights of Higher Education**

Energy education and curriculum is constantly shifting to meet employer demands. Over the last three years, there have been many changes at the technical and community college level to meet these new demands. These colleges fill the need for specialized or technician level training. Many of the degrees offered provide support staff employment for energy jobs such as CDL training, welders, energy technicians, etc. The Green Energy Training Program at the Bridgerland Applied Technology College (BATC) focuses on the Industrial Maintenance Department by training those students the green energy skills needed by industry. Utah State University – Eastern (USU) also has focused on CNG installation classes and green construction. In the Uintah Basin Applied Technology College (UBATC) is a program to train CNG installers and mechanics, commercial drivers, pipeline technicians, safety courses specific to the energy industry,

and heavy equipment operations. UBATC's Petroleum Technology I & II, Energy Safety, and Transportation programs had over 10,000 student enrollments in 2012 alone. UBATC recently has instituted a new, unique training program that gives students first-hand training in the energy industry. Fourteen oil and gas companies came together to help create curriculum for their specific industry needs. The students are trained through on-site work experience and rotated through different employers in the industry. This allowed students the chance to see the work they would perform, and allowed future employers to meet them individually. As a result, there was almost 100% employment placement of students from this program. The Southwest Utah Renewable Energy Center (SUTREC), in conjunction with Southwest Applied Technology College (SWATC) and Southern Utah University (SUU), focused on meeting the renewable energy and energy efficiency training needs of local employers in southwest Utah. This includes wind and solar technicians for the renewable energy field. SWATC was designated as the "Energy Academy" for the State.

At the university level, SUU gives students a hands-on approach to green building in the DesignBuildBluff Program where students spend a semester designing energy efficient homes for Navajo families. At Brigham Young University (BYU), students research energy topics that will affect the future of the energy industry such as gasification of coal, biomass, and petroleum coke; oil shale; oxy-fuel combustion; CO<sub>2</sub> removal technology that will also remove mercury, SO<sub>x</sub>, and reduces water use; new battery technology; wind-turbines; and both Fischer-Tropsch catalysis and bio-fermentation of

syngas to form liquid fuels and chemicals. USU's Office of Commercialization is focused on a key project that is producing metallurgical coke that uses waste and underutilized coal deposits.

Governor Herbert's 10-Year Strategic Energy Plan states that over 42% of technician-level jobs in substation management, metering, and line technology will retire within the next five years. SLCC has been proactive to address the needs of a retiring energy workforce by creating programs to train students at the entry level for the electric power industry. Examples include the Electric Power Technology (EPT) certificate program and upgrading the coursework for Lineworker, Metering, and Substation apprentice program. The EPT program was designed so that students who desire to earn a degree could pursue an Associate of Applied Science degree with the addition of general education core coursework.

Salt Lake Community College (SLCC) has also focused on sustaining the core energy industry while supporting the growing renewable energy and energy efficiency fields. The SLCC Green Academy at SLCC was first of its kind in Utah in 2009. The Academy included courses such as Solar, Energy

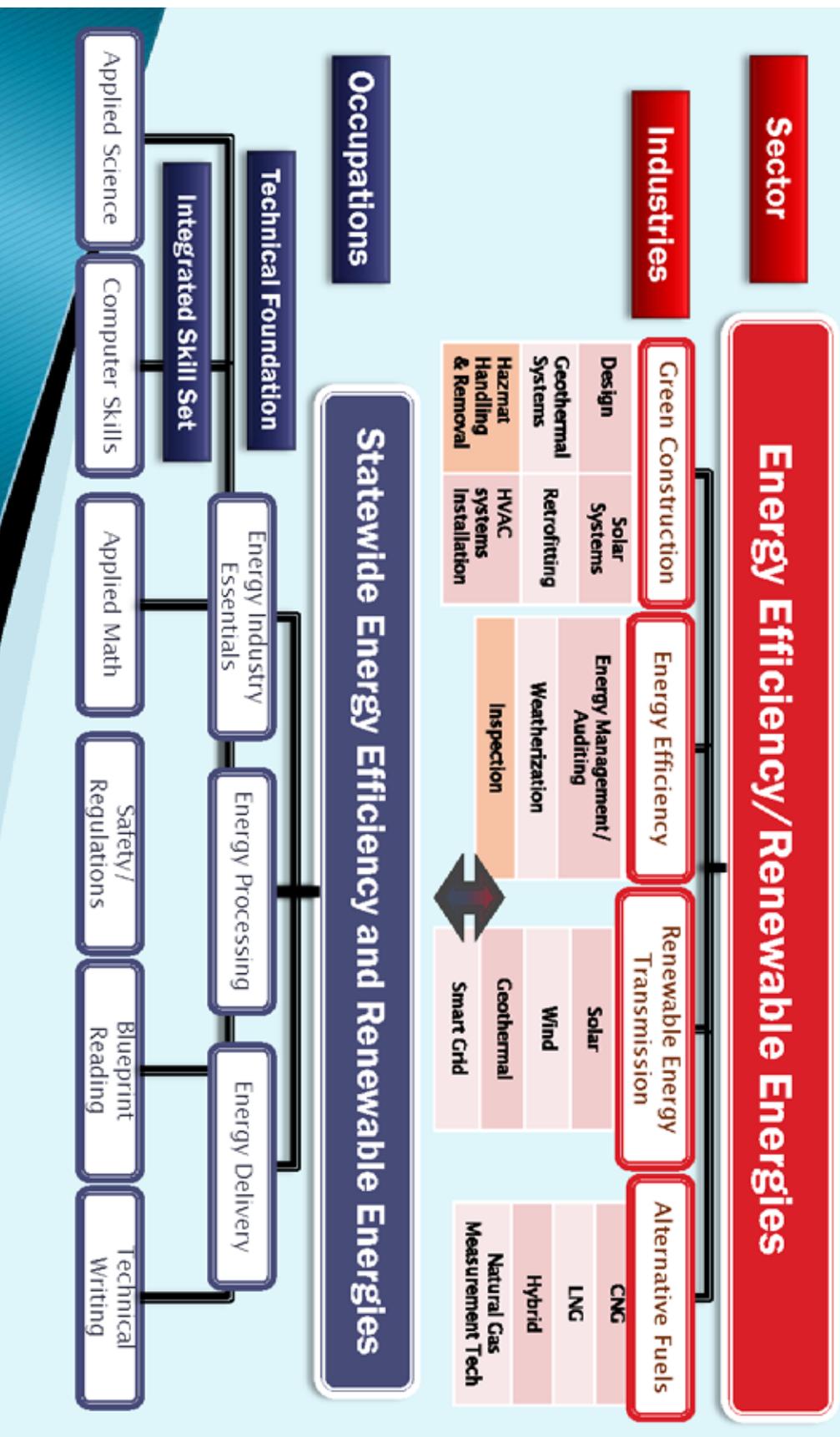
Management, Green Retrofit, and continuing education options, and has expanded to include an AAS Degree in Energy Management, Solar Photovoltaic Program Certificate of Proficiency, Green Retrofit and Weatherization, CNG vehicles conversions as well as over 100 continuing education offerings ranging from 60 minutes to 8 hours. Topics are relevant to engineers and contractors interested in both traditional and renewable energy.

By example Utah's schools lead the building efficiency and sustainability initiatives. MATC's Thanksgiving Point Campus is LEED Silver certified. The new Samuel H and Marian K Barker Health Technology Building at Ogden-Weber Applied Technology College (OWATC) is LEED Gold certified. BATC recently remodeled all their heating, ventilation, and air conditioning to be more efficient in their buildings. Weber State University (WSU) is working on a 7,000 foot steam tunnel upgrade. In addition, WSU put in place a revolving loan fund to continually focus on efficient upgrades to the university building system. Utah Valley University (UVU) library was the first High Performance Building in Utah.

Outreach to the community and businesses are also a main focus on higher education institutions. SUTREC annually holds the Milford Renewable Energy Fair. SLCC received the Green Business Award in 2011 for the Green Academy courses as well as work done through the SLCC Sustainability Committee. UBATC have held several workshops for continuing education for contractors to help them learn how to use energy efficient materials and to design Energy-Star construction standards. BATC has a green energy conference for contractors. WSU has an annual sustainability summit.



# Benchmark Highlights: STATE CORE ENERGY CURRICULUM









## Green Enterprise Development Program

*Sustainability is one of the five focus areas of the National Manufacturing Extension Partnership's (MEP) Next Generation Strategy.*

With support from ECAP, MEP Utah was one of four state MEP centers selected by the United States National Institute of Standards and Technology to develop and roll out a pilot program for the sustainability strategy. The goal of the pilot Green Enterprise Development program was to involve many companies from across the state within several industries, to train and develop “sustainability champions” that would have the knowledge and skills to make changes within their own companies, and to demonstrate the economic, personal and societal benefits of ensuring a sustainable future. While projects are ongoing, and metrics are still being reported, the program has been remarkably successful.

The Purdue University Technical Assistance Program developed content and materials for the program. MEP Utah implemented a plan to teach the materials to companies in several areas of the State, as well as to administer an examination for industry certification developed in partnership with the Society of Manufacturing Engineers (SME).

### **Green Enterprise Development Program**

Designed for manufacturers and others interested in learning how to apply sustainable, environmen-

tally friendly practices in the workplace, Green Enterprise teaches a body of knowledge and practical skills that is immediately applicable in the workplace and elsewhere. Concepts also expose students to Lean Manufacturing which is compatible to reducing wastes and increasing efficiency and profitability. The course itself consists of a series of day-long training modules for Water, Air, Solid Waste (Zero Waste Landfill), Chemistry and Toxicity, and Energy Management. Students also learned a valuable tool called “Waste Stream Mapping” in another module, concluding with “Sustainability in Practice”, a final module which emphasizes strategies to implement a sustainable culture in the workplace, including calculating economic returns on investment, public well-being, and community responsibility.

A certificate of course completion is presented to all students who complete all the course modules by MEP Utah. A rigorous, three-hour examination is administered as a final exam under the auspices of the Society of Manufacturing Engineers (SME). Those who pass the exam are recognized by SME earning the “Green Manufacturing Specialist Certificate”, which is recognition of the knowledge gained to apply sustainable and environmentally friendly practices in the workplace.



## Program and Partners

The Green Enterprise Development program was delivered seven different times at four different ECAP campuses, training and certifying 86 individuals representing 41 companies and organizations.

This course was designed to be applicable to workers in any occupation and in any type of organization. Companies large and small have enrolled employees in the course. One of the successes of the program has been its ability to bring together different companies and different occupations, resulting in networking, camaraderie, and insights shared among participants.

The ECAP partnership was an excellent outreach support for this program. While most companies who have participated in the pilot courses are manufacturers, others have included distribution, county public works department, higher education, and consultants. The size of manufacturing companies participating range from a company a single location and 25 employees to international companies with multiple sites and thousands of workers. Participants have come from the following counties: Box Elder, Cache, Weber, Davis, Salt Lake, Utah, Iron and Washington.

Several colleges also supported the effort by helping with logistics. Participating partners included: Salt Lake Community College, Ogden-Weber ATC, Bridgerland ATC, Southwest ATC, Custom Fit offices, and Department of Workforce Services.

## Ongoing

Training is ongoing, and the metrics will continue to be developed. A combination of classroom lectures, on-hands simulations, and “homework” assignments were designed to have students apply materials taught in their own work environment. Participants from the courses reported to MEP a \$5.1 million increased profitability as a result of projects and ideas generated during the course. Post course projects in progress will continue to contribute to a “triple bottom-line” of profits, people and planet.









## Utah's Energy Research Triangle & Utah's Science Technology, Talent and Innovation Plan

*The ECAP collaborated with The Utah Energy Research Triangle to support research and development in Utah. The Utah Energy Research Triangle is a statewide collaboration among Utah's research and other universities, regional colleges, and applied technology colleges, aimed at strengthening research partnerships leading to new future industries and discoveries in Utah.*

The Office of Energy Development (OED) was responsible for administering the Energy Research Triangle related activities in 2011 and 2012. During this time, OED staff completed a statewide energy resource, infrastructure, and university research inventory. This was done with representatives from the private sector, university administrators and leading faculty, state agencies, and others from the public sector, including core ECAP representatives.

Greater research collaboration, through the Utah Energy Research Triangle, was introduced during a session of Utah Governor's Energy Summit in 2012. During the session, which was attended by about 100 stakeholders, university research and commercialization administrators outlined areas of mutual interest and collaboration and members of the audience were encouraged to ask questions and provide input.

As an outgrowth of these and related activities, new, more wide-ranging, multidisciplinary research and development partnerships are being created; Utah companies are looking more closely at opportunities to collaborate with research universities; multiple new companies have been formed; established out-of-state firms have moved

into Utah; and research universities are working to better collaborate with local colleges and other universities. This is leading to a more unified and better-coordinated energy research ecosystem led by Utah research universities, industry-sponsored interdisciplinary research, internships for undergraduate and graduate students, and job creation in Utah energy industries of the future.



### **Utah's Science, Technology, Talent and Innovation Plan**

The Science, Technology, Talent, and Innovation Plan is a comprehensive outlook at clusters within Utah's economy, similar to ECAP, and identifies opportunities to accelerate economic development. Energy forms one of the main components of the plan. Three specific groups were determined to be of most value for Utah to focus efforts toward improvement:

1. Clean technologies for traditional and unconventional sources of fossil energy.
2. Energy storage and power delivery systems.
3. Water and ecosystem sustainability.

The first sector of clean technology for traditional and unconventional sources of fossil energy addresses such issues as clean coal, black wax, tar sands, and shale oil and gas. The University of Utah's Energy and Geosciences Institute (EGI) and Institute for Clean and Secure Energy (ICSE) have been leaders in fossil fuel combustion, geothermal, carbon sequestration, gasification and computer modeling. Utah State University's College of Natural Resources (DNR) has moved ahead in environmental and water quality management. Brigham Young University's Department of Chemical Engineering (DChE) has focused on cryogenic carbon capture and oxy-fuel patented processes.

The second section of energy storage and power delivery systems was chosen due to Utah's innate innovation and the emerging opportunities in the field. This included vehicle and roadway electrification at the Utah State University, catalysis and electrochemistry emphasis at the University of Utah, and the concentration of battery and cells of the future at the Brigham Young University.

The third sector of water and ecosystem sustainability is one that is integrated into each sector of research. There is a universal recognition that natural resources are not unlimited nor should be taken for granted. As such, the impact on the environment is a key question that must be reviewed upfront. In addition, efficiencies and reduction technologies are in themselves a core research topic.

These three centers of economic development activity are well-placed in a state that seeks to be at the forefront of solving the world's energy challenges. The ECAP members will be able to use this information moving forward as Utah continues to build upon the specialized strengths of each university and to find economic development opportunities within the universities to increase the energy arena for the State.









## Recommendations

*The momentum of the ECAP project will not end with this publication. The Office of Energy Development, Department of Workforce Services, Utah Systems of Higher Education, and industry and academic partners will support the work through the long-term partnerships that have been established during this process.*

Definite successes and positive outcomes highlighted throughout this report have demonstrated the effectiveness of higher education as an economic leader. To ensure continuity, five key recommendations going forward will help perpetuate the successes of earlier ECAP efforts:

1. Foster the communication and collaboration that was developed from the ECAP work.
2. Enhance the recently established partnerships between academia, industry, and government.
3. Evaluate energy policy.
4. Review energy education curriculum, ensuring its content remains relevant with Utah's interest as well as ever advancing technologies.
5. Support research collaboration.

### **1. Foster Communication**

Continual, open dialogue between higher education, government, and industry will be maintained to utilize higher education to the fullest as an economic cornerstone. Best practices, policies, and processes will be promoted through discussion and decision-making. This will allow further effective integration of academic, industry, and policy-makers partnerships. Forums will be promoted that support school to school and industry or government to school communication.

### **2. Enhance Academia and Industry/Government Partnerships**

Perhaps one of the preeminent successes of ECAP is the partnerships between colleges and universities. Research agreements, articulation agreements between institutions of higher education and a unified voice of higher education all work to boost economic development.

Industry and government will actively seek to partner with educational institutions to be more proactive in the energy arena, and vice versa. By engaging all partners, efforts can avoid duplication and encourage balanced energy policies. These partnerships can help create a comprehensive picture of the energy industry and in turn provide greater support in energy efforts and education.

### **3. Evaluate Energy Policy**

Balanced energy policy fosters a healthy market environment. Policy will be evaluated to be streamlined and barriers removed where possible to ensure an open, free market where responsible development can thrive. Energy policy will continue to be focused on maintaining Utah's energy economic prosperity through responsible development. Higher education is recognized as one of those drivers and policy should respond appropriately to address those needs and opportunities.



#### 4. Review Energy Education Curriculum

Higher education will need to continue to evolve as new technologies and processes, job opportunities, and training demands alter the talent needs of the energy industry. There will be consistent review of curriculum to make sure it is timely and applicable to meet the needs of the employment sector and workforce. Industry and education partnerships should continue to meet specific training needs of the community and to help employers retrain employees for the needs of the future. This will help employees to retain their position and learn the new skills that support their value to the company. As mentioned in the report, lattice frameworks for education should continue to be pursued to enhance student-specific needs in the employment sector. Non-credit to credit articulation agreements should be encouraged to support student transitions and career development.

#### 5. Support Research Collaboration

The Utah Energy Research Triangle, which is a partnership of the research universities, should be used to the fullest extent possible to collaborate between

universities. By drawing upon the unique abilities of each university, there is a synergetic energy that can result in well-formed ideas and a well-rounded approach to research, including application across geographic, demographic boundaries. In addition, this partnership can be used for Utah's universities to access greater research funding.





# Energy Cluster Acceleration Partnership Committee

Special Thanks to Salt Lake Community College for serving as the convening institution for this project.

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