

Governor Gary R. Herbert - March 2, 2011

Energy Initiatives & Imperatives

Utah's 10-Year Strategic Energy Plan 2.0

Updated Plan - February, 2014

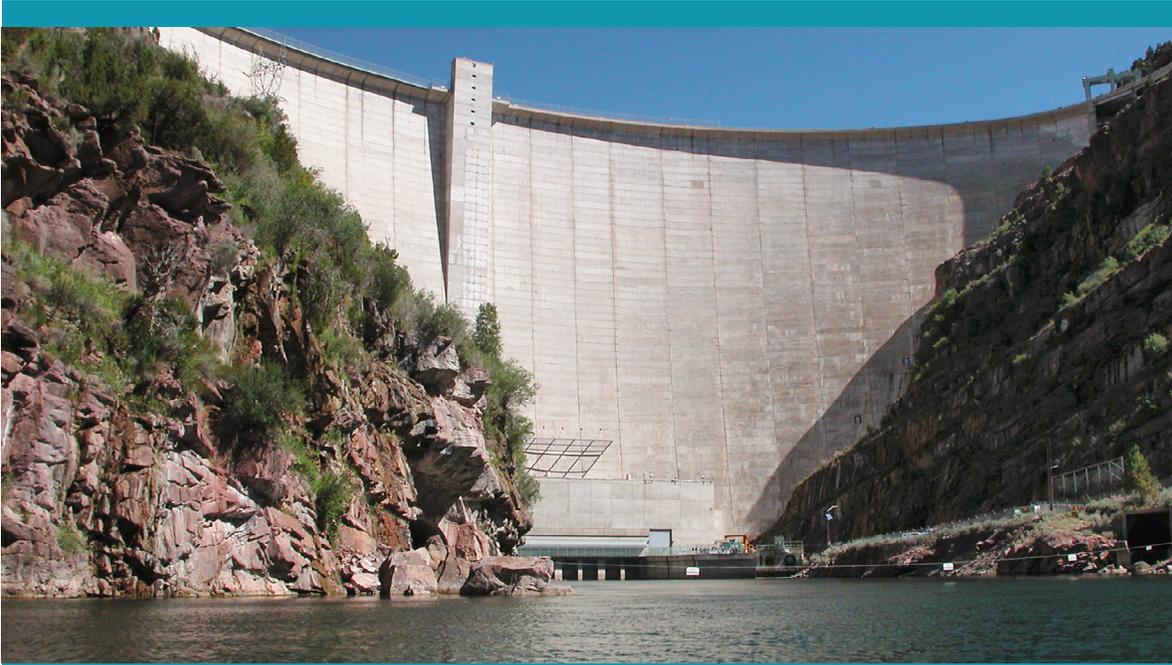




UTAH OFFICE OF
ENERGY DEVELOPMENT

Advancing Utah's Energy Future

Front Cover: Pumpjack in Utah. Photo Credit: Mike Vanden Berg,



Flaming Gorge Dam, Utah. Photo Credit: Michael Vanden Berg, Utah Geological Survey

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Governor Herbert's 10-Year Strategic Energy Plan

Introduction

In his 2010 State of the State address, Governor Gary R. Herbert announced his intent to create the Utah Energy Initiative—a 10-year strategic energy plan that combines Utah's rich abundance of diverse natural resources with our innovative and entrepreneurial spirit—to ensure that Utah is at the forefront of solving the world's energy challenges.

Utah will seek to excel in job creation, innovation, entrepreneurship, global business and quality workforce and have a stable and sustainable business-friendly environment. Under the Governor's leadership, the State has received several awards and accolades. Most recently, Forbes Magazine named Utah the best state for business and careers. One key factor in their decision was our low cost of doing business, especially our competitive energy costs.

While rich in energy resources, Utah is also known for its National Parks, State Parks and unrivaled natural beauty. It is critical that while we strive for energy development that it be done in conjunction with preserving the quality of life that draws people to live and play in Utah.

This Energy Plan has been developed by a Task Force appointed by Governor Gary Herbert. In turn the Task Force relied upon Subcommittees and input from numerous private and public individuals, officials and organizations. Four public hearings were held throughout the state and input was solicited from all residents interested in energy development, economic development, human health and environmental issues.



Governor Gary R. Herbert



Guiding Principles

Based on input, the plan will be implemented in accordance with the following five guiding principles:

1. Utah's economy is dependent upon responsible energy development. Governor Herbert, his Cabinet and his energy policy task force will consider and thoroughly examine the potential for development of all energy resources, allowing the free market to drive while the State provides appropriate legislative and regulatory oversight.
2. Energy development in Utah will carefully consider the impacts on human health, environmental impacts and impacts on wildlife habitat. An effort to avoid, minimize or mitigate these impacts will be made regardless of energy resource.
3. Governor Herbert's Energy Plan is not a static document; it ushers in an ongoing open and transparent public discussion about best practices. The Governor and his Cabinet will work hand-in-hand with local government, federal agencies, Native American Tribes, environmental organizations, energy producers and utilities, business and the public to determine the best path forward.
4. Utah will work to keep utility costs low while recognizing that longer term price stability and relative affordability will require significant and ongoing investment in energy infrastructure.
5. Through expanding Utah's energy independence and providing export opportunities, Utah can stabilize its economy and provide for further economic expansion.

Note:

This version of the Energy Plan contains the text of the original Plan augmented with updates since original publication. Updated text is highlighted in orange, either inline with the text or in separate boxes beside the original text.

Goals

This document describes a 10-Year Strategic Energy Plan that seeks to strengthen Utah's economy by setting the following goals:

1. Meet the projected energy growth demands over the next decade by making balanced use of fossil fuels and alternatives and renewable resources in a market-driven, cost-effective and environmentally responsible way.
2. Ensure Utah's continued economic development through access to our own clean and low-cost energy resources.
3. Develop the best new cutting-edge technologies, particularly those that enable us to utilize precious natural resources with an elevated environmental consciousness, and deploy them in Utah, the nation and the world.
4. Create new and support existing energy related manufacturing opportunities and jobs in Utah.
5. Modernize the regulatory environment to support sustainable power generation, energy transmission solutions and energy conservation.
6. Promote energy efficiency, conservation and peak consumption reductions.
7. Facilitate the expansion of responsible development of Utah's energy resources, including traditional, alternative and renewable sources.
8. Pursue opportunities for Utah to export fuels, electricity and technologies to regional and global markets.
9. Enhance and further integrate partnerships between industry, universities, state government and local communities—especially those in energy-rich rural communities—to address future energy challenges and opportunities.
10. Collaborate with other western regional states to present a strong and unified voice to federal regulatory agencies on energy and public land issues.



Modeling

Given the vigorous nature of energy development resources, technology and potential impacts on human health and the environment, a key element of the Plan will be creating a methodology for evaluating resources, costs and economic impact on a continuous basis. The PI+ model from Regional Economic Models, Inc. (the REMI model) is one tool that can be used to forecast economic impacts of resource development in a timely manner.

REMI is a dynamic model which generates annual predictions to 2050 and includes a detailed economic structure. While REMI has thousands of input variables, the change in energy prices resulting from various policies will be central. REMI includes the price of natural gas, electricity and other energy for residential, commercial and industrial users as inputs. Other inputs that may be affected by different policies include home prices and industry production costs. In particular, REMI models the labor market as a process in which labor supply and labor demand are matched through wage adjustment. Employment by industry is determined in the labor market. Gross domestic product (GDP), personal income and labor income are also estimated. REMI is an effective tool for energy scenario analysis precisely because it generates estimates of employment, GDP and income resulting from different policy decisions.

This Executive Summary and Plan contain recommendations, next steps and additional investigations needed to achieve the ten goals above. This report does not contain answers to all of the challenges identified, but it provides a roadmap to accomplishing that objective. Over the next ten years, as Utah continues to develop a robust, diverse portfolio of energy resources and related economic development, there will surely be changes and additions to the 10-year Strategic Energy Plan and opportunities for stakeholders to collaborate in building a stronger, more secure energy future.

Energy Resources & Demand

Utah's current energy resource consumption includes traditional fossil fuels and renewable resources, as

summarized in Figure 1. In 2009, residents, businesses and industries consumed approximately 27,411 gigawatt hours (GWh) of electricity and 131 billion cubic feet of natural gas. In 2012, residents, businesses and industries consumed approximately 29,723 GWhs of electricity and 132 billion cubic feet of natural gas.

The demand for energy in Utah is increasing. Rocky Mountain Power's total Utah load is expected to increase from approximately 4,700 megawatts (MW) in 2011 to approximately 5,600 MW in 2020. In terms of usage, rather than peak load, this means an increase from 25,153 GWhs in 2013 to 29,515 GWhs in 2022. Questar projects that natural gas consumption in Utah in the residential, commercial, and industrial sectors will increase from 170 million Dth in 2011 to 200 million Dth in 2020. New projections indicate that the residential, commercial, and industrial sectors will increase from 173 million Dth in 2013 to 214 million Dth in 2022. Based on increases in consumption over the last ten years, petroleum-based transportation fuel use is projected to increase from 45 million barrels/year to 52 million barrels/year during the same period. New projections suggest the increase will be from the current 47 million barrels/year to 53 million barrels/year. These figures are summarized in Table 1.

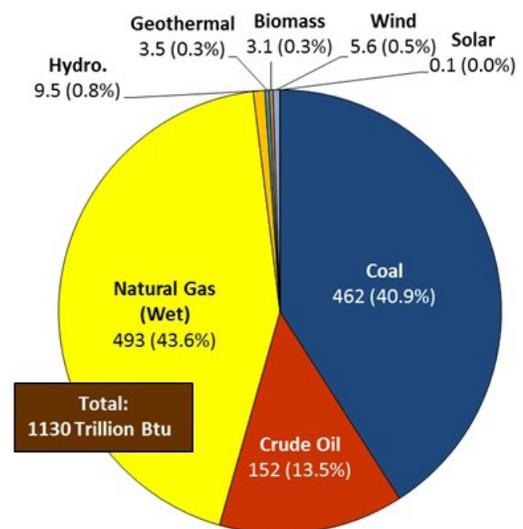


Figure 1. Energy Production in Utah by source in 2012. Source: Utah Geological Survey.

How Utah Will Accomplish Its Energy Goals

Table 2 summarizes Utah's proven reserves and current consumption rates for petroleum, natural gas and coal. It also shows remaining years of proven reserves at current consumption rates. Several factors affect these values, including national policy, exportation of coal, unproven reserves, change in production rates (e.g., natural gas projected to increase, coal possibly to decline) and new reserve discoveries. Utah already imports a significant part of its consumed petroleum.

To meet future demand, Utah should continue to use existing fossil fuel resources while augmenting them with new, cost-effective energy efficiency measures and alternative and renewable energy resources as they become more economically feasible.

The State of Utah should work to meet the energy demand of 2020 with a balanced use of Utah's abundant energy resources. Development of resources should be done thoughtfully through evaluation of resource potential, impact on economic development, the natural environment and human health and physical and regulatory constraints. Utah would be best served by pursuing development of all energy sources and focusing on strategies that do not favor one over the other. Success will come if the focus is on the following eight cross-cutting strategies that provide a solid basis to support development of all of Utah's energy resources.

Table 1

Utah's Projected Fossil Fuel Energy Growth – Next 10 years

Source: Rocky Mountain Power, Questar, Utah Geological Survey

	2013	2022	Percent Change	Annual Rate
Electricity Load (RMP) (GWh)	25,153	29,515	17.9%	1.8%
Natural Gas (Questar) (million Dth)	173	214	23.7%	2.4%
Petroleum/Transportation (mbbl/yr)	47	53	12.8%	1.3%

Table 2

Utah's Current Conventional Fossil Fuel Production Rates and Proven Reserves

(All values referenced elsewhere in this report.)

	Petroleum	Natural Gas	Coal*
Proven Reserves	504 mbbl	8.1 Tcf	201 mt
Annual Production Rates	26 mbbl	0.462 Tcf	20 mt
Remaining Years of Reserve at Current Production Rates	19 years	18 years	10 years

mbbl = million of barrels, bcf = billions of cubic feet, mt = millions of tons

*including Kaiparowits (federal lands), 505 mt proven reserves, 25 years proven reserves at current production rates



Recommendation 1 - Status: Nearly Complete, Ongoing

Overview:

It is recommended that Utah establish an energy office, administered by the Governor's Energy Advisor, with an Advisory Committee to oversee the implementation of the Governor's Energy Plan. This structure will address the evolution of the State's energy policy and act as an advisory body to the Governor. The Committee will respond to emerging issues in the energy arena and make recommendations on any necessary changes in state policy in response to emerging issues. This committee will develop the next steps related to the energy policy recommendations, identify and evaluate scenarios to be evaluated using economic models and oversee the action items identified by the Governor.



Millford Wind is located in Beaver and Millard Counties, with 306 MW energy generation capacity.
Photo Credit: First Wind and Douglas Barnes Photography.

Update:

In 2011 the General Session of the Utah State Legislature, [House Bill 475](#) created the [Office of Energy Development \(OED\) \(63M-4-401\)](#), which combined various energy programs and activities from multiple offices into a single agency tasked with advancing responsible energy development though economic development and policy initiatives.

OED's vision is to serve as the primary resource for advancing energy development in Utah. Its mission is to provide leadership in the balanced development of Utah's abundant energy resources through public and private partnerships for economic prosperity, energy independence and a reliable, affordable energy supply. In order to advance its mission, OED has identified the following strategic objectives: create and implement policy, provide industry assistance, build relationships, seek funding opportunities and support energy education.

The Governor's Energy Task Force, originally formed to create the 10-Year Strategic Energy Plan, served as OED's Advisory Committee, offering guidance and oversight at key moments in the office's short history.

Under the guidance of the Governor's Energy Task Force, OED has been organized with focus on five resource energy areas (conventional, efficiency, infrastructure, renewable and unconventional), as well as focus on the infrastructure that connects them. The conventional resource area includes oil, gas and coal, while the unconventional resource area includes oil shale, oil sands and nuclear. Renewable resources include wind, solar, hydroelectric, biomass and geothermal energy. The efficiency focus encompasses building efficiency, industrial process efficiency, agriculture and transportation.

Actions:

Streamline government processes and policies for executing the Plan. A clear and predictable policy voice creates a business friendly environment and intergovernmental alignment yielding investment in energy development and job creation.

A. Create an energy office by consolidating existing energy functions currently fragmented throughout state government.

- OED was created in 2011, in response to Recommendation 1 of the Plan. Per the guidance of the Plan, it consolidated existing energy functions, including the Governor's Energy Advisor's, State Energy Program and the Governor's Office of Economic Development's Energy and Natural Resources Cluster.

B. Form a State Energy Advisory Committee comprised of a diverse group of representatives of energy in Utah.

- The Governor's Energy Task Force provided periodic high-level energy policy assistance for the Governor's Office and OED.

C. Shape policy discussions to make informed decisions.

- OED tracks energy legislation, advises legislators and other policy makers on various energy issues through involvement in committee hearings and other forums, and actively supports policy to advance responsible energy development in the State. OED also conducts various [public communications](#) and outreach activities, and organizes the annual [Governor's Energy Development Summit](#).

D. Provide continuous policy analysis on resources, economic development, transmission and constraints on development.

- OED has created the Energy Analyst position, responsible for tracking trends in Utah's development of diverse energy resources. The Office shares its

assessments of the energy sector in a variety of venues, including the Natural Resources, Agriculture and Environment Committee, the Public Utilities and Technology Committee and the Governor's Energy Development Summit.

E. Implement this Energy Plan and assure state government agencies are working seamlessly to accomplish goals as outlined.

- The Energy Coordinating Council was formed in 2011, is chaired by the Governor's Energy Advisor and is comprised of state agency directors that work in the areas of energy, natural resources, land, economic development and associated regulation and technology.

Legislation:

[2011 Creation of Office of Energy Development \(H.B. 475\)](#): This bill created the Office of Energy Development (OED), in fulfillment of the first recommendation of Governor Herbert's 10-Year Strategic Energy Plan. The statute directs OED to focus on advancing responsible energy development through economic development and policy initiatives. Chief Sponsor, Representative Barrus; Senate Sponsor, Senator Van Tassell.

[2012 Energy Changes \(H.B. 137\)](#): Modified OED responsibilities to include administration of the Loan Program for Energy Efficiency Projects and administration of energy-related tax credits. Chief Sponsor, Representative Barrus; Senate Sponsor, Senator Okerlund.



Recommendation 2 - Status: Progress Made, Ongoing

Overview:

Utah should create an effective strategy for the legitimate use of Utah's public lands for energy development purposes by working with federal agencies to navigate the balance between economic and environmental sustainability. The federal government owns and manages approximately 60% of Utah's surface lands and a larger portion of the mineral estate. Many of these public lands include pristine air sheds, national parks and wilderness areas, important water resources that are essential to local communities, wildlife habitat and riparian zones, world-renowned archeological and culturally significant sites, nationally recognized scenic areas and prized recreational locations. Accordingly, federal land management agencies will play a central role in the State's ability to develop its traditional, alternative and renewable energy resources.

Update:

The Office of Energy Development has worked with the Bureau of Land Management (BLM) to form the Utah Energy Development Action Team. The Team coordinates through regular meetings and extensive data sharing, the goal of which is to advance forms of energy development on public lands.

OED has also supported the Governor's Office and Utah's federal delegation as it works with stakeholders to advance the Public Lands Initiative. While to date this support has largely been characterized by outreach and education about the aims of the Initiative, as OED continues to build its Geographic Information Systems (GIS) capacity, it expects to be engaged in detailed mapping and exchange considerations.

Actions:

Act to keep Utah's Public Lands open for responsible energy development.

A. Continue to work directly with federal officials, Western Governors' Association, National Governor's Association and other groups to advocate for energy development on public lands.

- OED has coordinated with the [Bureau of Land Management \(BLM\)](#) to create the Utah Energy Development Action Team and participates in the WGA's Transmission Siting and Permitting Task Force, both of which support communication and collaboration between the federal and state levels.

B. Designate access to public lands for energy development as a priority for the Governor's [Public Lands Policy Coordination Office \(PLPCO\)](#).

- The [PLPCO](#) coordinates the State's interests on public lands issues and ensures that state and local interests are represented in federal management of public lands. PLPCO is the state agency that responds to federal management decisions including Resource Management Plans, Environmental Assessments, Environmental Impact Statements, Threatened and Endangered Species decisions and other issues facing energy development in Utah.
- Advancing the Public Lands Initiative (PLI) is a primary objective for OED. The PLI is a locally-driven effort to bring resolution to some of the most challenging land disputes in the state of Utah. The initiative is rooted in the belief that conservation and economic development can coexist and make Utah a better place to live, work and visit. Resolving long-standing land ownership conflicts and helping to consolidate energy-rich lands and resources under state management or control will play a significant role in advancing our mission to responsibly develop energy in the state of Utah. OED plans to work closely with Utah's federal delegation to prepare legislation that will set aside significant amounts of land in the state for energy development and ensure that the ability to responsibly develop the energy resources of those lands is preserved.



C. Utilize the Governor's Balanced Resource Council to facilitate agreement on energy and environmental concerns.

- The [Council](#) meets quarterly and has focused on these areas since 2011. The Governor's Energy Advisor stays engaged with the Council, and brings OED to the table when energy development issues are being considered.

D. Assure that State agencies are taking lead roles in developing plans and strategies on how to address impacted resources under State jurisdiction and regulation (e.g. air quality, wildlife, archeology).

- Led by PLPCO, recent inter-department collaborative efforts to create a State plan for the conservation of the greater sage-grouse has demonstrated how effectively State agencies can work together to advance environmental protection and economic development goals. More generally, [Utah's Department of Natural Resources \(DNR\)](#) is a leader in the Intermountain West in the areas of forest fire mitigation, wildlife conservation, and water resource protection.
- The Clean Air Action Team was created by Governor Gary R. Herbert in 2013 to conduct research, work with the public, and recommend strategies for improving Utah's air quality. Similarly, Governor Herbert convened a series of listening sessions, a State Water Plan Advisory Team and a Water Summit to develop a 50-year water vision for the State.

E. Coordinate efforts with local government, [School and Institutional Trust Lands Administration \(SITLA\)](#), State agencies and interest groups to identify potential issues and work towards solutions.

- OED works hand-in-hand with PLPCO, SITLA, and energy development companies to coordinate development activities on State and private lands. These agencies and others also present a unified voice to the federal government on various federal regulatory issues standing in the way of responsible development.

F. Partner in joint efforts to leverage regional support with other western states for land rights.

- Governor Herbert's leadership of the Western Governor's Association (WGA) led to the creation of three energy-focused reports. WGA's [10-Year Energy Vision](#) was an important step in demonstrating that the western states can overcome partisan differences to advance a coherent regional energy policy. It is the hope of western governors that this Plan will serve as an example to a federal government that lacks a comprehensive energy policy. [Energy Perspectives](#) features essays from each Western Governor and Canadian Premier on aspects of energy policy particularly relevant to each of their states or provinces. [State of Energy in the West](#) provides an integrated summary of energy resource reserves and extraction throughout the west, as well as the infrastructure that connects them.

Legislation:

[2011 Energy Producer States' Agreement \(H.B. 461\):](#)

This bill provided for the appointment of legislative members to participate in multistate discussions involving agreements that encourage the development of domestic energy resources. Chief Sponsor, Representative Barrus; Senate Sponsor, Senator Hinkins

[2012 Uintah Basin Energy Zones \(S.B. 83\):](#)

This bill created the Uintah Basin Energy Zone, and adopted an energy exploration, access and development policy for the Uintah Basin Energy Zone, including the promotion of full, responsible development of energy and mineral resources within the Uintah Basin Energy Zone. It also promoted local, state and federal collaboration to develop energy and mineral resources in the Uintah Basin Energy Zone. Chief Sponsor, Senator Van Tassell; House Sponsor, Representative Mathis.



Recommendation 3 - Status: Progress Made, Ongoing

Overview:

Utah's research universities and regional colleges, the energy industry and nearby national energy laboratories all contribute to development and deployment of energy technologies and work force capabilities. These efforts will be enhanced through greater coordination.

Update:

The Utah Energy Research Triangle (UERT) is designed to connect the world class researchers and facilities at the University of Utah, Utah State University and Brigham Young University into a powerful energy research triangle. This triangle focuses on addressing Utah's substantial energy resources and challenges by using Utah talent and funding to develop technical solutions that support the State's strategy for energy innovation and self-reliance.

Through a merit-based selection process, UERT supports developing new energy production technology, energy transportation and energy use, resulting in more efficient, cost-effective and environmentally sensitive use of Utah's resources. The UERT was launched with support of OED and Utah's Department of Workforce Services Utah Cluster Acceleration Program (UCAP).

Actions:

Strengthen Utah's role in research and development of energy technology by making this a primary focus for the Governor's Energy Advisor with higher education, industry and other research partners.

- In addition to providing funding opportunities, the UERT was instrumental in creating the University of Utah's new [Petroleum Engineering Master of Science degree](#), which will be instrumental in further positioning Utah as an energy leader in the West.

A. Develop a "Research Triangle" of Utah's three research universities to expand interaction with regional technology leaders through collaborative efforts lead by the Governor's senior energy official and senior energy research officials from each of the universities.

- As described above, the UERT is well on its way to offering new collaborative opportunities to Utah's higher education institutions, opportunities that will be essential to advancing Utah's energy goals. The Governor's Energy Leadership Scholars are an important component of the UERT, designed to develop Utah's next generation of talent for scientific and engineering innovation leadership while simultaneously addressing Utah's unique energy challenges with cutting-edge solutions.

B. Place emphasis on clean technology for fossil fuels (i.e. gasification, carbon capture and sequestration, unconventional fuel, etc.) and the interface with other energy forms.

- OED and the UERT will continue to work with researchers, developers, national laboratories, and others who are seeking technology solutions to Utah energy challenges such as those related to the transport of black wax from the Uintah Basin.

C. Increase collaboration between the Research Triangle and nearby national laboratories, particularly the Idaho National Laboratory.

D. Continue to attract world class researchers to connect higher education to deployable technologies.

E. Collaborate with U.S. Department of Energy (DOE) Energy Commercialization Center and associated technology transfer or commercialization agencies within the Research Triangle and regional colleges.



Recommendation 4 - Status: Progress Made, Ongoing

Overview:

Government tax incentives are a powerful economic tool that can influence behavior and business decisions. Incentives should be used strategically in coordination with Utah's energy plan, and where they have the most beneficial impact on Utah's economy.

alternative resources, but will also attract energy companies interested in research and development and manufacturing to the State, making Utah a true hub for advanced energy technologies.

Update:

The [Alternative Energy Development Incentive \(AEDI\)](#) was created in 2012 as an expansion of the Renewable Energy Development Incentive, and is administered by OED. The AEDI will advance large-scale renewable and unconventional energy development through a fixed post-performance tax credit of 75% of new state revenue that lasts for 20 years. The Alternative Energy Manufacturing Incentive (AEMI) was created in 2012 along with the AEDI. The AEMI, which is administered by the Governor's Office of Economic Development (GOED), provides for a post-performance tax credit of up to 100%, for up to 20 years. The AEMI applies to manufacturing facilities, and is limited to those same alternative energy resources outlined in the AEDI.

The Utah Energy Infrastructure Authority (UEIA) was created in 2012 as a follow-on to the Utah Generated Renewable Energy Electricity Network (UGREEN), and its board is staffed by OED. The UEIA will aim to facilitate energy development opportunities that were formerly constrained by a lack of sufficient energy delivery infrastructure. In some cases this might mean substation development to facilitate solar photovoltaic projects in Iron County, in other cases it might mean pipeline development to further open the Paradox Basin to oil and gas development.

Actions:

Review the role of tax incentives for businesses to relocate to and expand in Utah and their potential impact on job creation, energy availability and the growth of energy production.

A. Assess how tax incentives may further foster energy production and the manufacturing sector connected to the energy industry.

- The Alternative Energy Development Incentive and the Alternative Energy Manufacturing Tax Credit will not only encourage the development of Utah's

B. Use economic modeling (REMI) to best determine the economic impacts of future development.

- OED is exploring a variety of modeling tools in order to determine how to most effectively characterize the economic impacts of resource development in the State. These modeling activities will both tell the story of energy's importance to Utah's economy, and help to advance policies and initiatives that fuel an expansion to responsible development.

Legislation:

[2012 Alternative Energy Development Tax Credit Act \(S.B. 65\)](#): This bill updated the Renewable Energy Development Incentive (REDI) so that it would apply to all qualified "alternative" energy resources, which are more broadly defined than renewable energy resources. Additionally, the authorization process was streamlined. Chief Sponsor, Senator Adams; House Sponsor, Representative Noel.

[2012 Utah Energy Infrastructure Authority \(H.B. 137\)](#): This bill renamed the Utah Generated Renewable Energy Electricity Network (UGREEN), broadening the applicability of the tax-free bonding mechanism so that it would apply to energy delivery infrastructure for all forms of responsible energy development. Chief Sponsor, Representative Barrus; Senate Sponsor, Senator Okerlund.

[2013 Cleaner Burning Fuels Tax Credits Amendments \(H.B. 96\)](#): This bill amended corporate and individual income tax credits for cleaner burning fuels. Further, it modified eligibility requirements to claim tax credits for cleaner burning fuels and extended the credits until the end of taxable year 2014. Chief Sponsor, Representative Draxler; Senate Sponsor, Senator Van Tassell.

[2013 Sales and Use Tax Exemptions for Sales of a Fuel Cell \(S.B.250\)](#): This bill created a sales tax exemption for combustion-free natural gas and/or biogas generation facilities, namely fuel cells. Chief Sponsor, Senator Okerlund; House Sponsor, Representative Noel.



Recommendation 5 - Status: Progress Made, Ongoing

Overview:

Increase energy development through coordination and transparency in the regulatory and licensing process. Utah's regulatory framework and process should be reviewed and revised to accommodate future demand. Within various state agencies there are competing requirements and a lack of standard policies and regulations related to application processes, timelines and paperwork requirements.

Update:

As part of the SUCCESS framework, all agencies are looking to reduce timelines and more effectively serve customers. In many instances in the regulatory space, this will mean identifying and mitigating any redundancy issues. Presumably any such streamlining would expedite energy development activities, and help to advance the State's energy policy.

Specifically, OED has completed a [Guide to Permitting Transmission Lines in Utah](#), a primary goal of which was to identify redundancies in State and federal processes. A second phase of the study to be completed in 2014 will build on the results of the initial study. OED has also supported activities aimed at reducing local permitting timelines and other soft costs associated with distributed energy development at homes and businesses.

Actions:

Align Utah's agencies to better meet and facilitate responsible energy development.

A. Establish a single point of contact for energy developers for information on all State and local permit and ordinance requirements and regulations.

- As the primary point of contact, OED is engaged in pre-application meeting related to energy development activities, and continues to coordinate with agencies and developers throughout the permitting process. DEQ has general pre-application meetings

with developers, in which the various relevant divisions are all represented, and a project is discussed. This helps identify any issues that might arise and permits that may be needed early on in the process.

B. Empower a new coordinating council of State agencies to work on energy development issues and activities.

- This has been completed. The Governor's Energy Advisor and OED convene and lead meetings of the Energy Coordinating Council, a body described above.

C. Instigate process improvement in state agencies that regulate the energy industry to assure greatest efficiency and protection to public health and environment.

- The [Utah Department of Environmental Quality \(DEQ\)](#) and [DNR](#) are working closely together to integrate and streamline permitting processes for oil and gas permits. The increased collaboration between State permitting agencies will increase efficiency and enable the oil and gas industry to fully develop Utah's energy's resources.
- The pre-application meetings described under Recommendation 2 are a key example of this type of improvement. Energy developers regularly praise not only the streamlined work of DEQ, but the permitting timelines of DNR, and the accessibility and advocacy provided by OED.

D. Develop a Utah long-range transmission plan.

- OED commissioned a [Guide to Permitting Transmission Lines in Utah](#), which was aimed at identifying redundancies in State and federal processes. Phase II of the study, scheduled for 2014, will further develop the findings of Phase I, and explore future corridor-planning strategies.

E. Strengthen the State's role in authorizing and facilitating transmission/infrastructure projects.



F. Adjust Utah's regulatory framework and process to address Utah's future energy demand and the role of emerging technology.

- The [Division of Oil, Gas and Mining](#) provides oversight of established and emerging oil, gas and coal production technologies, ensuring that energy development is facilitated in accordance with necessary health and environmental safeguards.
- Adequacy of future electricity and natural gas supplies is protected through the Integrated Resource Plan (IRP) process undertaken every two years by the regulated utility utilities. The State is very much involved in this process through the [Public Service Commission \(PSC\)](#), [Department of Public Utilities \(DPU\)](#), [Office of Consumer Services \(OCS\)](#) and [OED](#).

Legislation:

[2011 Energy Producer States' Agreement \(H.B. 461\)](#):

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Solar panel installation on the new Utah Natural History Museum rooftop. OED was instrumental in procuring funding for the new panels.



Recommendation 6 - Status: Progress Made, Ongoing

Overview:

Utah should have a state-wide program aimed at reducing energy consumption. Energy not consumed as a result of efficiency is a cost effective resource. Demand-side management (DSM) strategies reduce consumption during peak demand, resulting in lower costs because of avoided or delayed investment in new electrical generation and new natural gas supplies.

Update:

As the primary resource for advancing energy development in Utah, the Office of Energy Development worked with the Energy Advisor to facilitate production of a State Energy Efficiency and Conservation Plan. Energy leaders in the State were asked to oversee development of the planning document and to support implementation as Steering Committee members. The 15-member Steering Committee provided feedback throughout the process.

The Steering Committee members identified five main sectors to be addressed in the Plan, that include: Commercial and Residential Buildings; Alternative Transportation; Industrial; Agriculture and Public Outreach & Education. Each of these sectors was addressed separately by Team Committees. Experts from government, utilities, industry, academia, trade associations and non-profit organizations were invited to participate. Each Team Committee was chaired by a leader in their respective field.

Actions:

Maximize Utah's commitment to energy efficiency and demand-side management.

A. Support education and communication programs that enhance public awareness of energy efficiency and promote energy code training for new and existing energy professionals.

Education and communication efforts focusing on energy reduction have been supported across the state by several agencies and organizations. These include:

- Salt Lake Community College's Energy Manager program

- Energy codes training programs supported through partnerships with Rocky Mountain Power and Questar in conjunction with utility DSM programs
- K-12 energy education programs provided through the National Energy Foundation
- Utah Jazz Green Team Public Outreach Program
- University of Utah and Weber State Sustainability Programs
- Salt Lake City Sustainability Plan 2015
- Agricultural Agencies efficiency programs that include the State Department of Food and Agriculture, the United States Department of Agriculture and the Utah Farm Bureau
- Support by non-profit organizations such as Utah Clean Energy through the Industrial Energy Efficiency Challenges and Utah Clean Cities Coalition for the advancement of the Idle Free Campaign.

B. Encourage utilities and regulators to expand energy efficiency and demand response programs through State policy.

- The Energy Efficiency and Conservation Plan contains 27 recommendations that range from programs, policies, education, outreach, to financing and collaboration. The plan includes a responsibility matrix which list primary and secondary organizations that should play a leading role in implementation of the suggested policies, programs and projects for each recommendation. The Plan includes a variety of suggestions and ideas that may be further explored through investigatory dockets and other regulatory means, in partnership with State utilities.

C. Analyze financial incentives to enable investment in energy efficient construction and retrofiting.

The Energy Efficiency and Conservation Plan identifies many ways that the State can support programs that will enable investment in energy efficiency. These include:

- Incorporate Building Energy Performance Information Into Market Transactions



- Support and Promote Statewide Commercial PACE Financing
- Promote Best Practices in Non-Residential Energy Efficiency Through a Statewide Benchmarking Challenge & Recognition Program
- Support Multi-Use Districts Located by Mass Transit Hubs
- Expand Options for Industrial Energy Efficiency Financing - Create Energy Efficiency Tax Credit
- Expand Options for Industrial Energy Efficiency Financing - Expand Establish a State Revolving Loan Fund
- Expand Education and Training for Industrial Energy Efficiency
- Establish Program Funding and Producer Incentives
- Catalogue and Share Best Practices Online and Showcase Incentive Programs Online

Legislation:

[2013 Assessment Area Act Amendments, or "Commercial C-PACE" \(S.B. 221\)](#): This commercial "Property Assessed Clean Energy" bill enables municipalities to create clean energy assessment areas or designations to facilitate the issuance of municipal bonds for renewable energy systems and efficiency improvements in commercial buildings. Chief Sponsor, Senator Van Tassell; House Sponsor, Representative Froerer.

[2013 Energy Conservation Code Amendments \(S.B. 202\)](#): This bill adopted the 2012 energy codes for commercial buildings, along with a revised version of the 2012 code for residential buildings. Chief Sponsor, Representative Wilson; Senate Sponsor, Senator Bramble.

[2013 Sales and Use Tax Exemptions for Sales of a Fuel Cell \(S.B.250\)](#): This bill created a sales tax exemption for combustion-free natural gas and/or biogas generation facilities, namely fuel cells. Chief Sponsor, Senator Okerlund; House Sponsor, Representative Noel.



Thermal imaging camera used to detect heat loss in homes and to determine solutions for building efficiency.



Insulation being blown into attic to increase heat retention in a home.



Recommendation 7 - Status: Progress Made, Ongoing

Overview:

Utah should diversify transportation fuels and build a transportation infrastructure and a fleet to meet the needs and demands of future generations. Utah's dependence on out of state sources for crude oil—72% used for transportation from out of state sources—may create a future fuel crisis. At this time only 50% of Utah petroleum product consumption is from out of State sources. Transportation accounts for 83% of Utah's total demand for petroleum products. It is critical to our economy, air quality and our quality of life that Utah diversifies our transportation model.

Update:

Utah's transportation requirements are significant, consuming one-third of total energy use in the state. Passenger travel and freight movement account for the bulk of the energy demand. However, new transportation technologies and programs are expanding rapidly and could provide support for more efficient fleet options, alternative fuel choices and greater opportunities for mass transit. The State is often cited in national publications as leading the nation in the number of compressed natural gas (CNG) fueling stations per capita. Three examples of recent lead-by-example State transportation initiatives include:

- Executive Order EO/005/2012—Automotive Idling Reduction: This Executive Order was issued to reduce idling by State employees;
- Multi-state Memorandum of Understanding (MOU): Governor Herbert signed a MOU that supported a joint solicitation, multi-state Request for Proposal that aggregated annual fleet vehicle procurements to promote functional and affordable natural gas vehicles.; and,
- Executive Branch Memo: The memo was sent to all state agencies to review vehicle requirements and to consider an expanded state fleet role for hybrid electric vehicles or compressed natural vehicles.

Actions:

Utah should pursue energy independence for transportation fuels by developing a framework for reducing its dependence on outside sources for transportation fuels and the inherent impacts this dependence has on economic development.

A. Support augmentation of Utah's fuel supply with nontraditional fuels.

- As described above, OED is engaged in advancing the proportion of private and public vehicles fueled with nontraditional fuels through a variety of avenues, including multiple boards, regulatory engagement, legislative engagement, and through leading by example.

B. Promote research and commercialization of clean technology for nontraditional fuels and alternative fuel vehicles (USTAR and Research Triangle).

- OED typically focuses on large-scale energy development, the vast majority of which is fueled by proven technologies that are readily deployable; however, that is not to say that it does not support commercialization activities wherever possible. For example, recognizing the potential of wireless charging to transform the alternative transportation sector, OED honored USU's Wave company in its 2013 Summit Awards. OED will also seek to support commercialization activities through the Utah Energy Research Triangle.

C. Analyze current and future pipeline capacity for oil and gas.

- OED supports the Western Interstate Energy Board (WIEB), which is currently focusing on studying the gas-electric interface, which will be essential as Utah slowly transitions to natural gas-based thermal plants. OED is also working with local economic developers and other project proponents to facilitate pipelines and other infrastructure to open the Paradox Basin to further development.



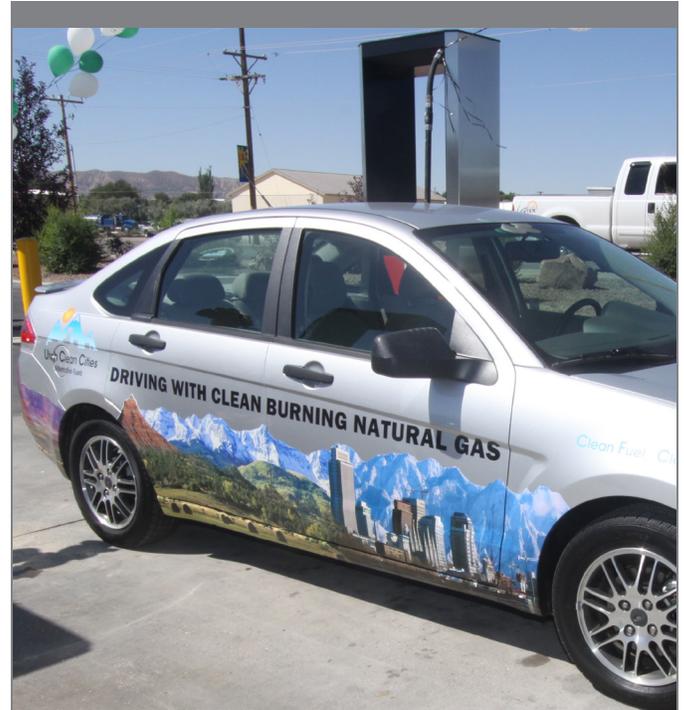
D. Assure that the State of Utah is engaged in transportation planning that promotes non-motorized and public mass transit infrastructure.

- The Public Service Commission (PSC) [ruled](#) in October, 2013 that electric vehicle charging service is not considered resale of electricity. This ruling will incentivize deployment of private charging stations, infrastructure that is essential to widespread adoption of electric vehicles in coming years.

Legislation:

[2013 Energy Amendments: Alternative Energy Interlocal \(S.B. 275\)](#): Created an interlocal entity to facilitate conversion to alternative fuel vehicles, and to facilitate the construction of maintenance facilities for such vehicles. Directed the Public Service Commission to investigate and report on measures for advancing cleaner air in the State. Provided a cost recovery mechanism for “a gas corporation” that pays for fueling stations and other related facilities. Chief Sponsor, Senator Adams; House Sponsor, Representative Draxler.

[2013 Cleaner Burning Fuels Tax Credits Amendments \(H.B. 96\)](#): This bill amended corporate and individual income tax credits for cleaner burning fuels. Further, it modified eligibility requirements to claim tax credits for cleaner burning fuels and extended the credits until the end of taxable year 2014. Chief Sponsor, Representative Draxler; Senate Sponsor, Senator Van Tassell.



The Compressed Natural Gas (CNG) vehicles above demonstrate the increasing popularity of nontraditional fuel usage.

Recommendation 8 - Status: Progress Made, Ongoing

Overview:

Utah should review the need for additional base-load sources of energy to supply electrical needs for our future. Given future demand projections, current and projected environmental regulations and constraints and Utah's unique mix of energy resources, the foundation for future base-load growth should be laid now.

Update:

Utah currently exports ~25-30% of the electricity produced within the state. This is largely owing to the Intermountain Power Project (IPP) and Milford Wind, which produce 2,100 of the State's 7,600 MWs of nameplate capacity generation. Rocky Mountain Power (RMP) cancelled the construction of a new gas plant scheduled for 2016 because of flattened load growth, and plans to serve new load over the next 5-10 years solely through Front Office Transactions. The state is not in need of new base generation at this time; however, this need is constantly monitored through the Integrated Resource Planning process, a public process involving the utility and various state agencies.

Actions:

Coordinate with major local and municipal utilities to develop a long-term strategy to broaden Utah's supply of base-load electricity.

A. Examine future coal supplies, the impacts of additional regulation on coal fired power plants and the potential of clean coal technology.

- Facing potential new EPA rules affecting new and existing power plants, OED is leading a coordinated response between the [Division of Air Quality \(DAQ\)](#), the [Division of Public Utilities \(DPU\)](#) and industry partners to assess the impact of such regulation, and to ensure that the EPA hears a unified voice from the State on the value of coal generation.

B. Assess Utah's natural gas resources and pipeline capacity in terms of delivering base-load energy.

- As mentioned under Recommendation 7, OED represents the State on the Western Interstate Energy Board (WIEB), which is currently focusing on studying the gas-electric interface, a critical nexus as Utah's electricity system slowly transitions to natural gas-based thermal plants.

C. Facilitate dialogue regarding Utah's potential opportunity for nuclear power development.

- Per the Plan and state energy policy (63M-4-301), OED is evaluating the potential role of nuclear energy production in Utah. To stimulate constructive discussion on the costs and benefits of nuclear, OED serves on the University of Utah's Nuclear Engineering Advisory Board, hosts nuclear education events, and considers diverse expert opinion on Utah's nuclear energy options at the Governor's Annual Energy Development Summit.

D. Evaluate Utah's role in energy storage strategies and capabilities for renewable energy sources including compressed air storage.

- Utility scale energy storage will be an essential component of the more distributed and intermittent generation system and Utah has supported development of a number of storage assets in the State.

Legislation:

[2012 Utah Energy Infrastructure Authority \(H.B. 137\)](#):

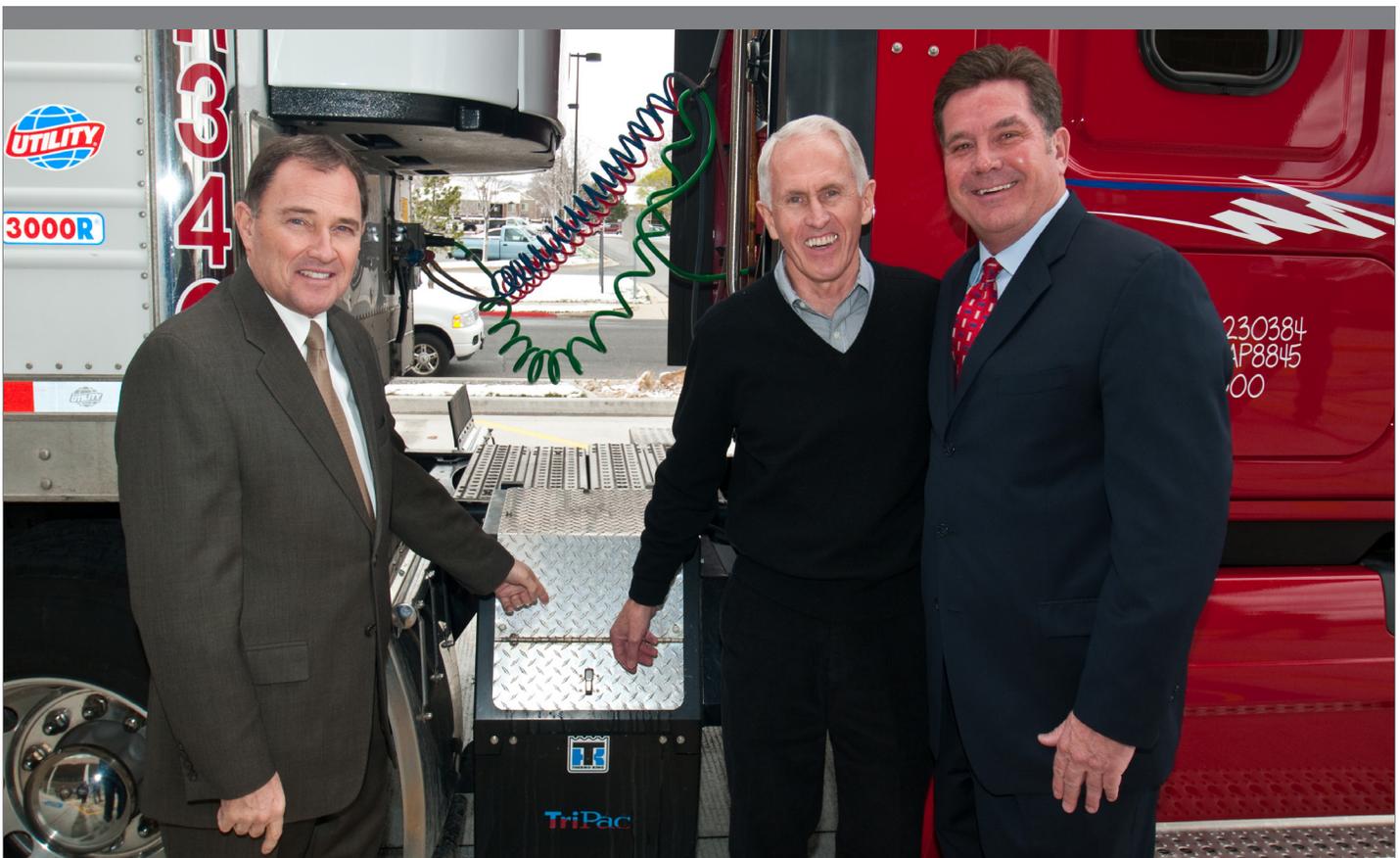
This bill updated the Utah Generated Renewable Energy Electricity Network (UGREEN), broadening the applicability of the tax-free bonding mechanism so that it would apply to energy delivery infrastructure for all forms of responsible energy development. Chief Sponsor, Representative Barrus; Senate Sponsor, Senator Okerlund.



Summary

Energy is one of Governor Herbert's top priorities. The Utah Energy Task Force was appointed by the Governor to develop a 10-year Strategic Energy Plan. Eight recommendations have emerged from the comprehensive stakeholder driven process to help shape Utah's energy future. The Plan takes into consideration our abundant natural resources, economic development objectives

and the importance of environmental sustainability. It is intended to be a working document to which modifications will be made as new information is realized. Energy development is an essential component to the vitality and success of the state and Utah will strive to lead our nation in the development of traditional, alternative efficiency and renewable energy resources.



Governor Herbert inspects a newly installed Auxiliary Power Unit (APU) for a semi truck. It is estimated each truck with APU's installed will save 6,450 gallons of diesel fuel per year.



Utah Energy Initiative

Governor Herbert's 10-Year Strategic Energy Plan

Section I: Introduction

Utah has a vast supply of diverse energy resources. These resources foster job creation and economic development through exploration, development, production, research and manufacturing. Additionally, Utah's low cost energy has been a driver in attracting businesses to locate in Utah. The revenue from energy development is the backbone of Utah's strong economy, providing funds for education to develop the scientists, engineers, technicians, entrepreneurs and workforce that match the opportunities of a strong economy and a vibrant quality of life.

Section II: Current & Future Energy Demand in Utah

Utah's current energy resource production base includes traditional fossil fuels and renewable resources, as summarized in Figure 1.

In 2009 [2012], residents, businesses and industries consumed approximately 27,411 [29,723] gigawatt hours (GWh) of electricity and 131 [132] billion cubic feet of natural gas. With the exception of crude oil, Utah currently produces more energy (including electricity, transportation fuels, and fuel for residential, commercial and industrial sectors) than it uses.

In 2008 [2011], Utah produced 29% [32%] more energy than it consumed.¹ Rocky Mountain Power's Utah load is expected to increase from approximately 4,700

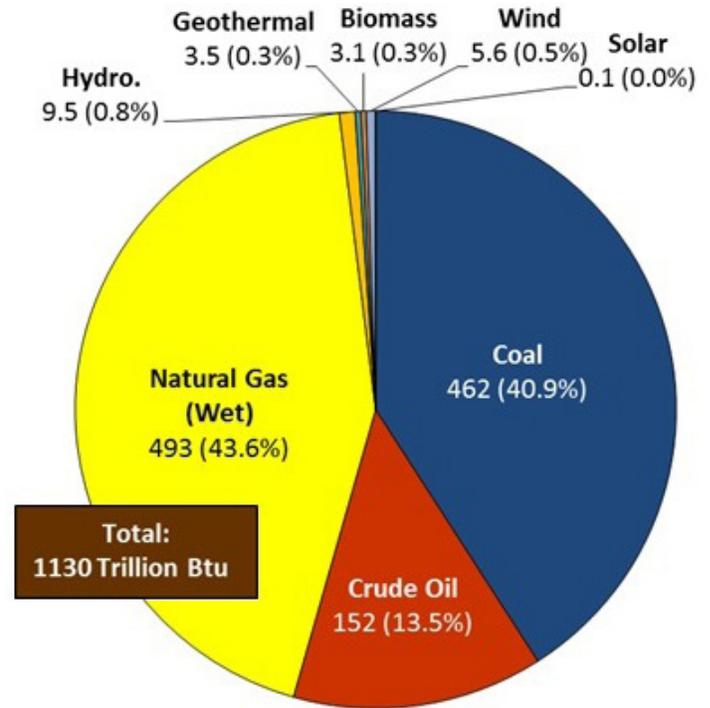


Figure 1. Energy Production in Utah by source in 2012. Source: Utah Geological Survey.

Table 1

Utah's Projected Fossil Fuel Energy Use Growth – Next 10 years

Source: Rocky Mountain Power, Questar Gas, Utah Geological Survey

	2013	2022	Percent Change	Annual Rate
Electricity Load (RMP) (GWh)	25,153	29,515	17.9%	1.8%
Natural Gas (Questar) (million Dth)	173	214	23.7%	2.4%
Petroleum/Transportation (mmbbl/yr)	47	53	12.8%	1.3%



megawatts (MW) [25,153 gigawatt hours (GWh)] in 2011 [2013] to approximately 5,600 MW [29,515 GWh] in 2020 [2022]. Questar projects that natural gas consumption in Utah in the residential, commercial, and industrial sectors will increase from 170 [173] million Dth in 2011 [2013] to 200 [214] million Dth in 2020 [2022].² Based on increases in consumption over the last ten years, petroleum-based transportation fuel use is projected to increase from 45 [47] million barrels/year to 52 [53] million barrels/year during the same period.³

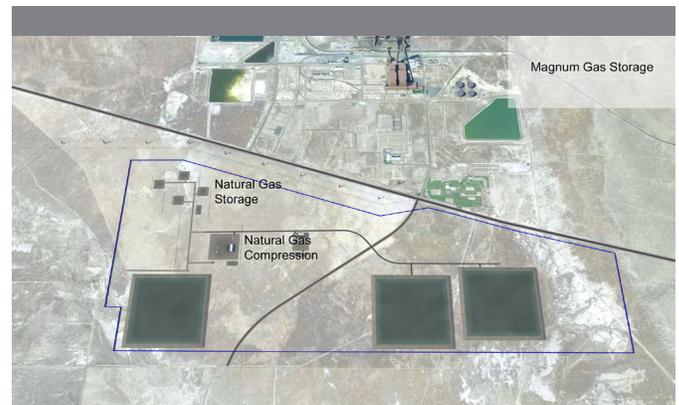
Table 1 shows Utah's projected energy demand growth for three of the four fossil fuels (all but coal). Coal reserves are at least sufficient to last this coming decade; and in general, existing coal plants will likely continue to produce electricity through the decade. The coal use may remain about the same, but this energy is accounted for in the electricity

This report notes that RMP provides about 80% of the State's electrical power, the balance coming principally from public municipals. Thus, the values in Table 1 will be low. Further, Utah is not self-sufficient in petroleum and imports about 72% [50%] of its petroleum consumed.

Figure 1 shows that currently, nearly 99% [98%] of Utah's energy production is from these three conventional fossil fuels. Renewable resources provide only 1.3% [1.9%] of the total.

While it is anticipated that renewable and alternative energy sources will likely grow at more rapid rates than the conventional fossil fuels, by 2020, Utah's energy will still be dominated by fossil fuels. To illustrate this, these 10-year projections for Utah can be compared to the federal government's energy plan which goes to 2035.⁽⁴⁾ The U.S. Energy Information Administration projects a 14% [12%] increase in consumption from 2008 [2012] to 2035 [2040],⁴ an annual growth rate of only 0.5% [.43%], significantly less than projected for Utah's growth rate (Table 1). The U.S. also projects a significant growth rate in renewables and biofuels. It also projects small increases in coal and natural gas with declining reliance on imported petroleum.

Currently, the conventional fossil fuels provide 84% [83%] of the U.S. energy demand. By 2035 [2040], the U.S. projects the fossil fuel percentage will drop from 84% [83%] to 78% [80%]. This is an important observation for Utah's 10-year energy plan. The U.S. has an aggressive program to expand renewable and alternative energy sources. Yet, even by 2035 [2040], the U.S. will still be principally dependent on these three fossil fuels. It is very likely that, even with aggressive efforts toward



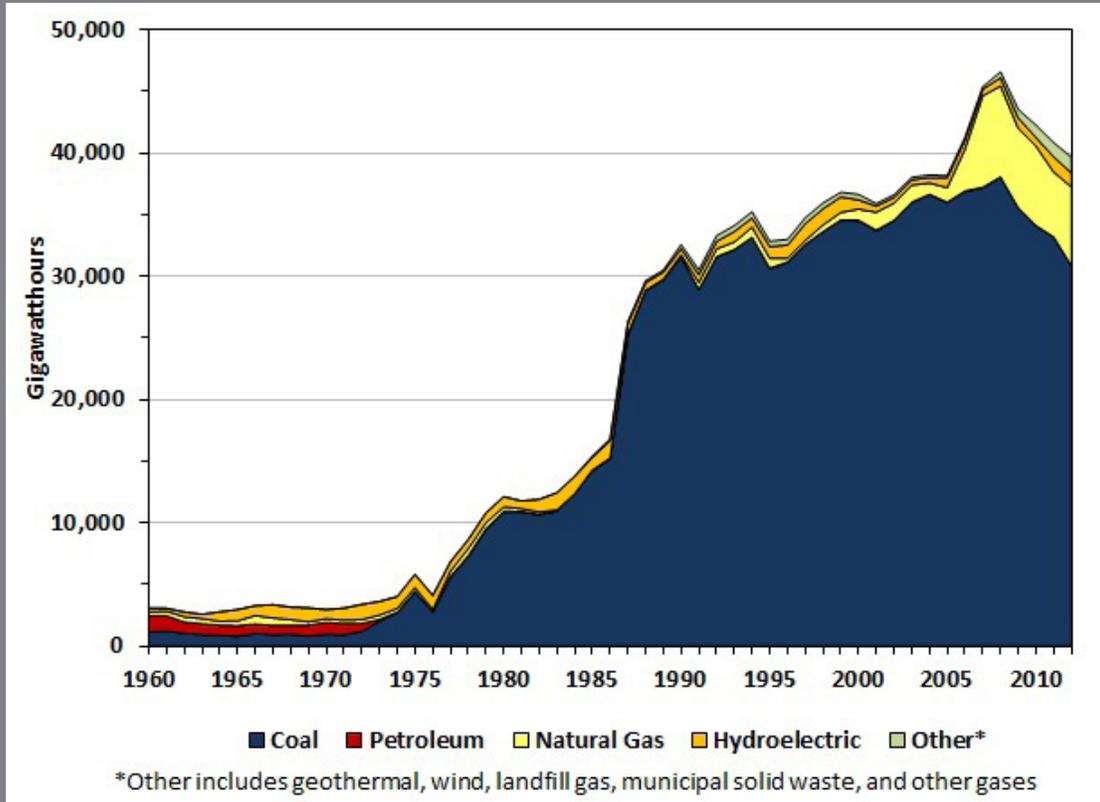
Magnum Energy

Magnum Energy's Western Energy Hub is located atop a unique natural salt dome that provides a variety of development opportunities, the most notable being energy storage, whether in the form of natural gas, natural gas liquids, petroleum, or compressed air energy storage (CAES). The Millard County project is located north of Delta at a critical crossroads of existing and developing electric, natural gas and petroleum liquids infrastructure in the West. The first phase of the Western Energy Hub, a series of caverns for the storage of natural gas liquids, is currently under construction. While a variety of options exist for a second phase, recent changes to California's Renewable Portfolio Standards requiring utility scale energy storage is a promising development for Magnum, which may have an opportunity to pursue its CAES project earlier than originally anticipated.



Figure 2: Net generation of electricity in Utah by energy source (2012)

Source: Utah Geological Survey



renewable energy sources, Utah must continue to rely principally on fossil fuels over the next 10 years.

To meet future demand, Utah should continue to use existing fossil fuel resources and augment with new, cost-effective energy efficiency, renewable and alternative energy resources to the extent it is technically and economically feasible, and continue the research and development of clean and secure energy through research centers around the State, e.g., the Bingham Entrepreneurship and Energy Research Center in Vernal.

Utah's dependence on imported transportation fuels is a concern over the next ten years. Utah current-

ly imports about 72% [50%] of its petroleum to meet transportation needs. This is similar to U.S. imports of petroleum, which is considered to be a national crisis. As discussed elsewhere in this report, Utah has vast reserves of oil shale and oil sands in the Green River formation in eastern Utah.

Newer, cleaner technologies have been developed to produce liquid transportation fuels from these unconventional resources.⁵ Oil shale has been and is being commercially produced in Brazil, China and Estonia.⁶ A single small oil shale plant would have the capacity to produce 6,000 bbl/day of oil, which is about 11% of Utah's daily consumption of about 53,000 bbl/day.⁷

Section III. Background Information on Utah's Energy Resources

A. Status of Utah's Energy Resources

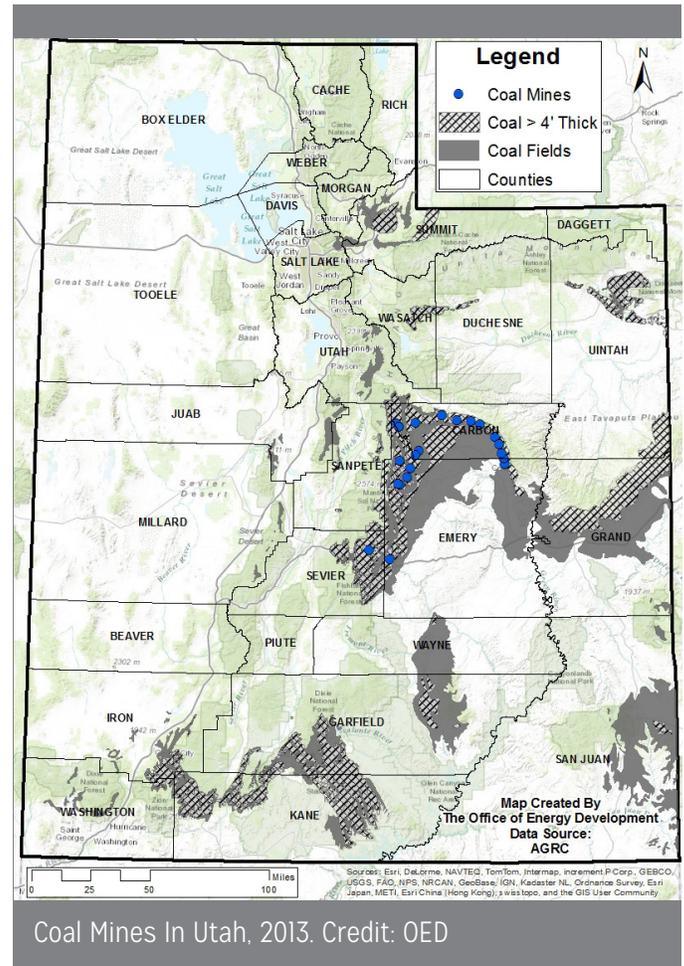
Utah's energy portfolio should include fossil fuels, alternative fuels, renewable resources and energy efficiency. Diversifying Utah's energy base not only provides jobs and revenues, but also critical resources and energy to fuel Utah's broader business and industrial sectors.

Coal:

In 2008, Utah produced its one-billionth ton of coal. In 2009 [2012], Utah ranked 13th [15th] in the nation in the production of coal at 21.9 [17.2] million tons and coal made up about 47% [41%] of Utah's total produced energy resources.

Coal also accounts for 41% [40%] of the energy consumed by Utahns.⁸ There are estimated to be over 3,722 jobs in Utah's coal production industry, including direct and related support jobs (this figure does not include indirect jobs).⁹ In 2012, there were estimated to be 1,831 jobs directly in Utah's coal production industry. This total does not include indirect support jobs, or the many jobs in coal-based electricity generation, which are counted separately. Utah's most economic coal reserves are located in the three coal fields forming an inverted "U" primarily across Sevier, Emery and Carbon Counties. Utah currently has about 202 [201] million tons of coal reserves under lease at active mines, while state-wide recoverable coal resources total about 15 billion tons (this number does not take into account economic or land use constraints).¹⁰ Another estimate from the Bureau of Land Management Price Field Office resource management plan indicates statewide coal reserves at 14.3 billion tons or greater than 50 years at current production rates.

The majority of Utah coal, 68% [67%] in 2009 [2010], was used in-state, while 32% [30%] was shipped out of state, and 3.3% was shipped to other countries. Foreign exports, mostly to Asia, peaked in 1996 when 5.5 million tons, or 19.7%, of Utah coal was shipped to foreign markets. This export market ceased to be economic as Aus-



tralia and China increased production.¹¹ Utah's research universities are evaluating carbon capture and related technologies with direct application to Utah's coal-fired generation.¹²

From 1973 to 1988, electricity generation increased from approximately 3,000 GWh to over 30,000 GWh. Utah became a net exporter of electricity. Coal-fired power plants comprised about 95% of total net generation as the amount of hydroelectric generation declined. Today, approximately 82% [78%] of Utah's total net generation of electricity comes from coal-fired power plants, with 16% [17%] from natural gas, and 2% [5%] from hydroelectric, geothermal, landfill gas and biomass, wind and solar.¹³ Utah consumes about 60% [75%] of the electricity that is generated in the State. The resource mix consumed in Utah, as the Utah Geological Survey notes, is more



accurately reflected in the fuel mix of Rocky Mountain Power, which serves 80% of the electricity (MWh) and 75% of the electric customers in Utah. (Rocky Mountain Power also serves customers in Wyoming and parts of Idaho.) That fuel mix includes approximately 58% [60%] coal, 17% [12%] natural gas and 13% [17%] renewables (including hydroelectric).¹⁴ The remaining Utah electricity customers are served by two municipal groups, Utah Associated Municipal Power Systems (UAMPS) and Utah Municipal Power Agency (UMPA) and by an association of rural electric cooperatives. They have a similar fuel mix as Rocky Mountain Power, but with a larger percentage from hydroelectric power.

Utah's proven coal reserves, adjacent to operating mines, have been steadily decreasing, from a high of 429 million tons in 2000 to 202.5 [201] million short tons in 2009 [2011]. There are three existing ways of estimating coal reserves. Reserves adjacent to active coal mines are the most conservative estimate, but also the most accurate estimate of readily available coal.

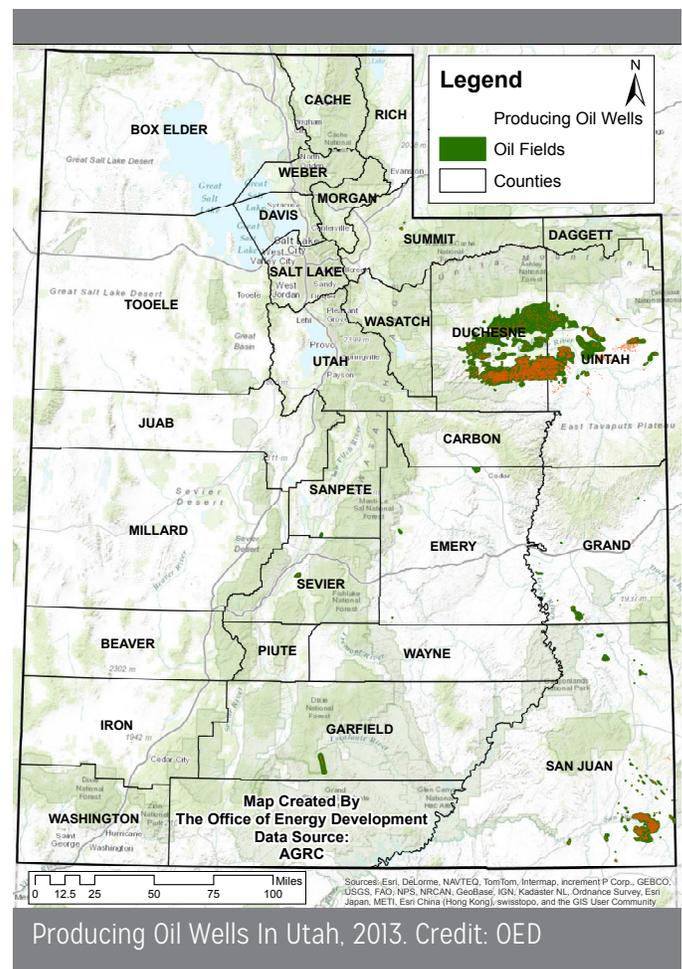
During this same period, 2000 to 2009 [2012], the number of mines decreased from 13 to 8 [9].¹⁵ Business-sector investments in coal-fired generation, including carbon capture and sequestration, appear unlikely until there is certainty regarding federal carbon regulation. The cost of compliance with additional air-pollution controls at existing plants is also under review. More restrictions are anticipated in the next few years, which will also decrease the probability of investment in new coal mines or new coal-fired electric generation.

Furthermore, as some Western states evaluate the generation and importation of electricity from cleaner sources (including renewables and natural gas), electricity portfolios may change. The technology and cost of integrating intermittent, non-dispatchable renewable resources, as well as the need to ensure reserve generation to back-up intermittent generation, are factors in the diversification of electricity resources in Utah and across the Western Interconnect.

Crude Oil (Petroleum Products):

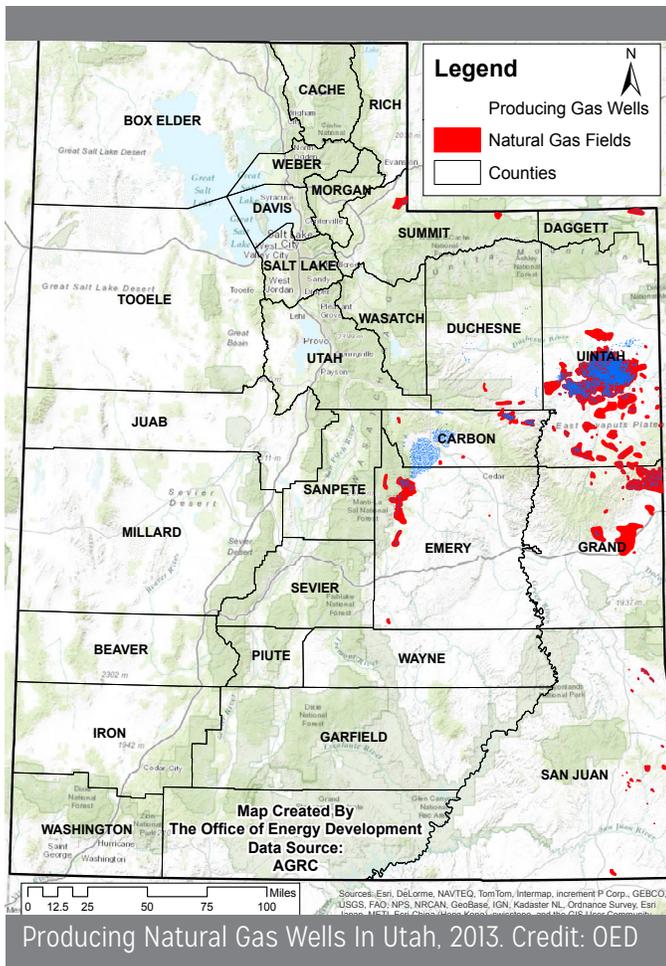
In 2008 [2013], Utah ranked as the 13th [11th] largest producer of crude oil in the United States. In 2009 [2011], crude oil made up approximately 12% [13%] of Utah's total produced energy resources. Crude oil also accounts for 33% of the energy consumed by Utahns.¹⁶

Utah has five refineries with over 150,000 barrels per day of refining capacity making gasoline, diesel, jet fuel and related products. While Utah is a net exporter of energy, it imports approximately 72% [56%] of the crude oil that is processed in its refineries. Imports come principally from Canada, along with Wyoming and Colorado.



The refineries monetize Utah crude oil production. They are a significant source of jobs both for full time employees and contractors. Refineries are regional businesses exporting products to adjoining states. Though they are also significant consumers of natural gas and electricity, they provide transportation fuel reliability and accessibility in Utah. The environment in which they work is competitive because of the number of individuals and firms involved in the industry. This industry needs stability in regulation and taxation to invite the investment of necessary capital to continually modernize and make their operations more efficient.

The U.S. DOE estimates that U.S. crude oil production averaged 7.5 million barrels per day (bbl/d) in 2013, the highest annual average rate of production since 1989, and a 1.0-million-bbl/d increase from 2012. It projects crude oil production to average 8.5 million bbl/d in 2014 and 9.3 million bbl/d in 2015, which would be the highest annual rate of crude oil production since 1972. The record highest annual average crude oil production was 9.6 million bbl/d in 1970. In 2012 Utah produced more oil than any year since 1988, and that level of production reflects a significant growth in production that began in 2004. While the numbers are not complete for 2013, production seemed on track at least to be comparable to 2012.



Natural Gas:

In 2007 [2012], Utah ranked as the 8th [10th] largest onshore producer of natural gas in the country. In 2008 [2012], Utah's natural gas was mostly used for home heating (nearly 29%) [33%] and by the electric utility sector (nearly 25%) [26%]. Natural gas makes up approximately 40% [44%] of Utah's total produced energy resources. Natural gas also accounts for 24% [25%] of the energy consumed by Utahns.¹⁷ In 2012 there were estimated to be over 9,322 jobs in Utah's oil and gas industries, including direct and related support jobs of extraction, wells operations, distribution, transportation, refining, construction and manufacturing (this figure does not include induced jobs in electricity generation and other industries that exist because of natural gas production).¹⁸

Future energy projections place significant demands on natural gas production in Utah. Natural gas demand has historically come from the residential home heating, commercial, and industrial sectors. In 2008 [2012], those sectors consumed approximately 137 [132] billion cubic feet (bcf) of natural gas.¹⁹ Natural Gas vehicles consumed only approximately 240 million cubic feet. Even a doubling of transportation fuel use would have little impact on consumption.



ed should significant wind generation be developed in Utah. Wind's unpredictable nature means grid operators and planners must construct a shadow grid, particularly gas-peaking units, to stand as a reserve generator for those times when wind resources are not delivering their potential capacity. An increased reliance on natural gas for electricity generation also means that there is a need for additional pipeline capacity.

The U.S. DOE expects total natural gas consumption for the entire country to average a record high 71.2 billion cubic feet per day (Bcf/d) in 2013, an increase of 1.5 Bcf/d (2.1%) from the previous year. Increases in natural gas prices are expected to contribute to declines in natural gas used for electric power generation from 24.9 Bcf/d in 2012 to 22.3 Bcf/d in 2013 and 21.7 Bcf/d in 2014. However, as retirements of coal power plants rise in 2015 in response to the implementation of the Mercury and Air Toxics Standards, the DOE expects natural gas consumption in the power sector to increase to 22.6 Bcf/d. The development of the Lakeside Plant (a natural gas powered plant) six years ago in Utah County reflects these market dynamics and policy trends, as does the planned closure of the Carbon Plant (a coal burning facility) in Carbon County.

Unconventional Fuels:

Utah possesses unprecedented oil shale and oil sands resources. There have been wide-ranging estimates of the volume of resources in the Uinta Basin. The Utah Geological Survey's 2009 evaluation estimates that a continuous oil-shale interval that averages 35 gallons per ton contains an in-place resource of 76 billion barrels of shale oil.²³ Tar sands potential includes 14-15 billion barrels of measured in-place oil, with an additional estimated resource of 23-28 billion barrels.²⁴ The 2005 Rand Corporation Report indicates that, "the largest known oil shale deposits in the world are in the Green River Formation, which covers portions of Colorado, Utah, and Wyoming. Potentially recoverable oil shale resources include 500 billion barrels to 1.1 trillion barrels of oil. For policy planning purposes, it is enough

to know that any amount in this range is very high. Present U.S. demand for petroleum products is about 20 [18.5] million barrels per day.²⁵ The largest volume of deposits of bitumen is in Utah, which has measured reserves of 8 billion to 12 billion bbl and total resources in place, including speculative ones, of 23 billion to 32 billion bbl."²⁶ The 2008 Rand Corporation Report on oil sands notes that "U.S. resources of bitumen have not been heavily exploited and are not characterized as thoroughly as resources in Canada (USGS, 2006). Major deposits of bitumen (i.e., larger than 100 million barrels) in the United States can be found in Alabama, Alaska, California, Kentucky, New Mexico, Oklahoma, Texas, Utah, and Wyoming."

As of December 2013, both the U.S. Oil Sands oil sands project, and the Red Leaf Resources oil shale project have been fully permitted by the appropriate regulatory agencies in the State of Utah. Although U.S. Oil Sands is still involved in legal proceedings associated with its water permit, both projects anticipate breaking ground in 2014 or early 2015. Both projects will be in a position to benefit from the State's new Alternative Energy Development Tax Credit, which was designed to help developers of these new alternative resources be successful in the State. U.S. Oil Sands has 184 MM barrels of discovered resource on 5,930 acre PR Spring Development Block, and Red Leaf Resources SITLA parcel has an estimated 1.1 billion barrels of oil, and will initially proceed at 9,800 barrels per day.

Uranium:

Utah's San Juan County has a history of uranium mining dating back to the 1950s. Currently the Nation's only licensed and operating uranium mill, the White Mesa Mill, is located south of the community of Blanding, Utah. Uranium mined in Utah, in addition to Uranium mined in the Arizona Strip, is being transported to White Mesa for processing. There is the potential nuclear power plant project in Utah that would depend on this ore, additionally a market exists currently and may grow as additional plants are brought on line around the country.



There are more than 150 jobs in Utah's uranium industry, including direct and related support jobs in uranium mining and milling (this figure does not include indirect jobs).²⁷ Future job growth in Utah is dependent on the growth of the nuclear power industry, nationally and in Utah. Additionally, job growth in Utah is dependent on the area known as the Arizona Strip remaining open for uranium mining. Currently the Bureau of Land Management is proposing to withdraw over 1 million acres from development.

U.S. uranium mines produced 4.3 million pounds U3O8 in 2012, five percent more than in 2011. Six underground mines produced uranium ore during 2012, one more than during 2011. Uranium ore from underground mines is stockpiled and shipped to a mill, to be milled into uranium concentrate (a yellow or brown powder). Additionally, five in-situ-leach (ISL) mining operations produced solutions containing uranium in 2012 that was processed into uranium concentrate at ISL plants. Overall, there were 11 mines that operated during part or all of 2012. Total production of U.S. uranium concentrate in 2012 was 4.1 million pounds U3O8, four percent more

than in 2011, from six facilities: one mill in Utah (White Mesa Mill) and five ISL plants (Alta Mesa Project, Crow Butte Operation, Hobson ISR Plant/La Palangana, Smith Ranch-Highland Operation, and Willow Creek Project). Nebraska, Texas and Wyoming produced uranium concentrate at the five ISL plants in 2012.

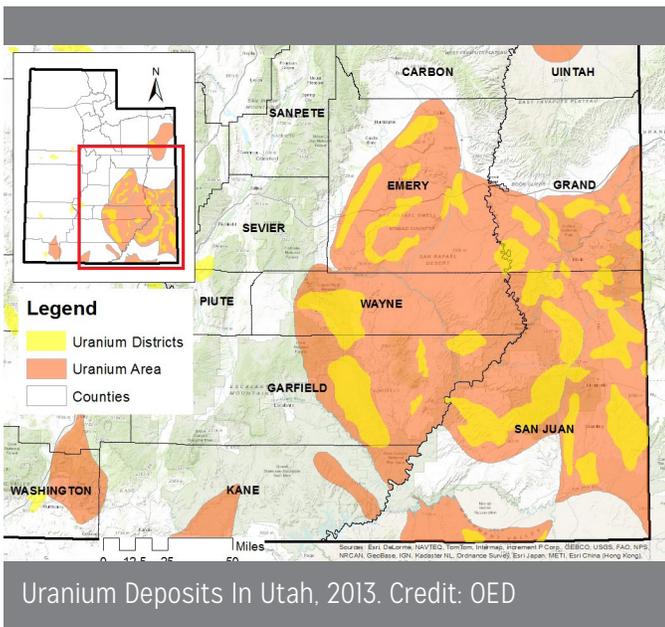
Hydroelectric:

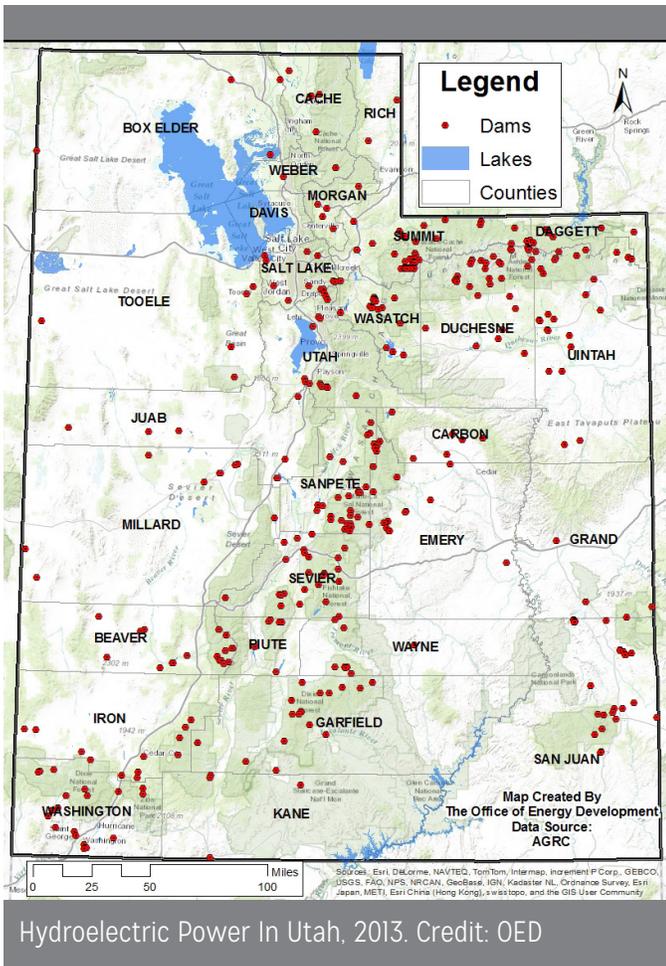
In 2008 [2012], hydroelectric made up 0.5% [0.7%] of Utah's total produced energy resources. Hydroelectric also accounts for 0.7% [0.8%] of the energy consumed by Utahns.²⁸ Hydroelectric power comprises about 1.5% [1.9%] of electricity produced. There are estimated to be more than 30 direct jobs in Utah's hydroelectric industry, (this figure does not include indirect jobs).²⁹

In terms of existing value, the [U.S. Bureau of Reclamation operates two hydro plants in the State](#), including the small facility at Deer Creek Reservoir, and the much larger 150 MW plant at the Flaming Gorge Reservoir. Additionally, [RMP operates 10 hydroelectric plants in the State of Utah](#), nine of which range in size from 0.16-10.3 MWs in nameplate capacity, and one of which - the Cutler Plant in Box Elder County - is an appreciably larger 30 MWs. Most of the plants were constructed between the very early 1900s and 1930. However, the oldest are Granite (Big Cottonwood Creek) and Pioneer (Ogden River), which went into operation in 1896 and 1897, respectively. Local municipal utilities and irrigation companies operate at least [a few dozen additional smaller facilities throughout the State](#), the majority of which are 0.5-3 MWs in size.

Geothermal, Solar, Wind and Biomass:

In 2008 [2012], geothermal made up 0.5% [0.4%] of Utah's total produced energy resources. Geothermal also accounted for 0.8% of the energy consumed by Utahns, but in 2012 that fraction was 0.5%. Utah is one





nation in percent of total net electricity generation from renewable resources.³¹

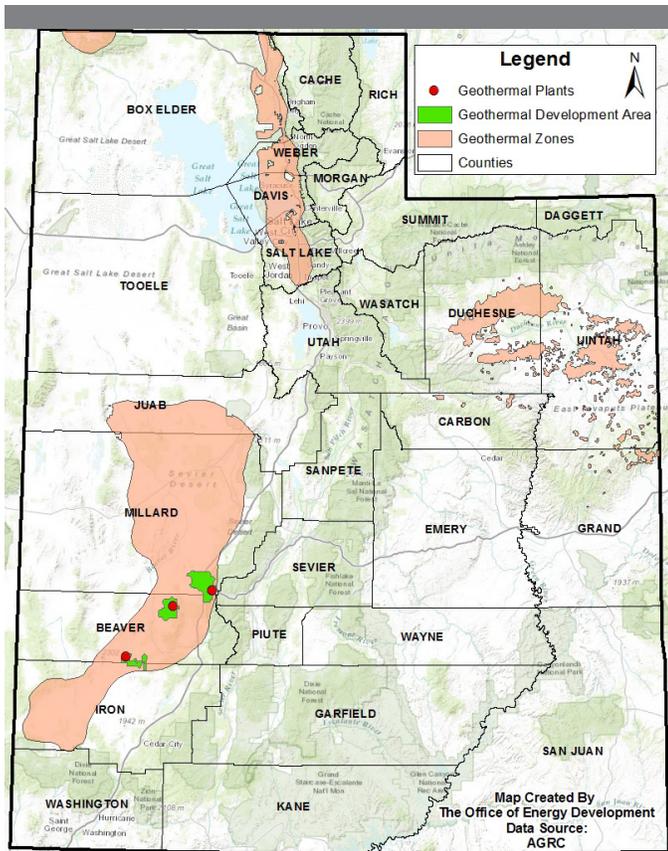
While Utah may possess considerable renewable energy potential, many legitimate challenges currently impact the development of these resources. Among these challenges are the substantial investments in transmission infrastructure to connect these widespread resources to the grid, as well as policy, economic, technological and regulatory considerations. Combined, these challenges render many renewable energy projects in Utah not cost effective when compared to other resource options. Nevertheless, renewable energy represents a small, but growing, portion of Utah's energy generation portfolio, with a statewide installed renewable energy capacity, including hydroelectric generation of 570 MW [673 MW], with an additional 142 MW currently under contract.³³ Some of these resources are consumed in-state, while others are exported to surrounding states. Utah's renewable energy resource potential varies by technology and location.

The numbers found in the Utah Renewable Energy Zone Task Force Report (UREZ) represent the upper boundary of what is theoretically possible, but does not identify what is reasonably probable and economic. Ongoing efforts by members of the Committee support the premise that commercially viable renewable energy projects exist and should be developed in Utah as they are demonstrated to be cost-effective.

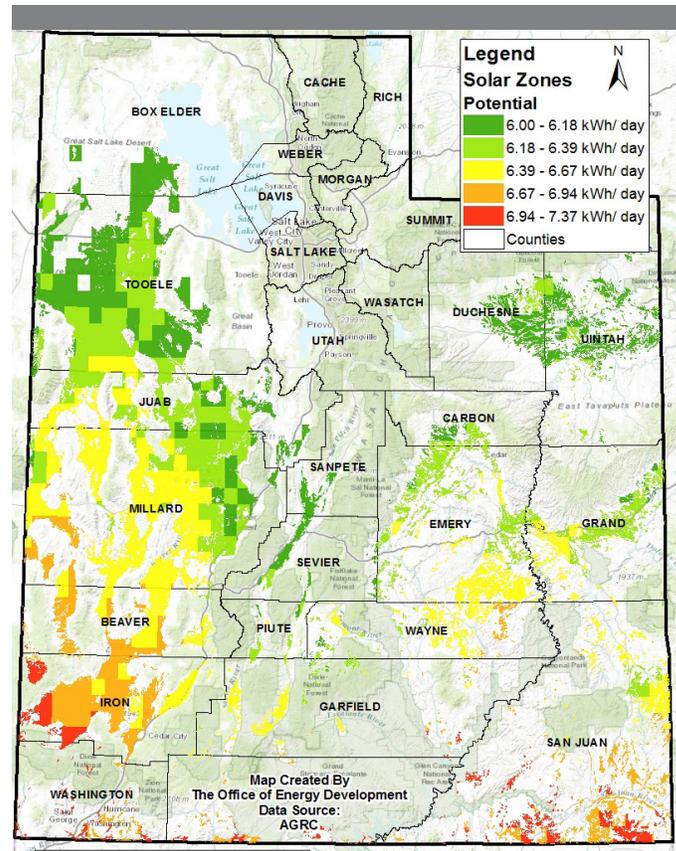
Utah's policy-making authorities, public demand, cost, the utility regulatory and planning arenas and continued coordination among stakeholders should collaborate to identify pathways to address existing challenges to renewable energy development. Given growing energy demand and constraints on current energy supply, renewable energy could play an important role in Utah's energy future if these challenges are sufficiently addressed, though not likely having a major impact in the next 10 years.

It should be noted regarding Utah's renewable ener-

of only six states where electricity is generated from geothermal resources.³⁰ In 2010 [2012], Utah's wind generation capacity was 224 [324] megawatts (MW), most of which is exported to California. In 2009 [2012], 0.1% [1.8%] of Utah's electricity need was met by wind power. Solar energy generation made up 0.01% of total produced energy in Utah and 0.01% of the energy consumed by Utahns. In 2012, those numbers were 0.02% and 0.03%, respectively. In 2009, biomass made up 0.2% of Utah's total produced energy resources and 0.3 % of the energy consumed by Utahns. In 2012, those fractions were unchanged. In 2008, Utah ranked 45th in the



Geothermal Plants In Utah, 2013. Credit: OED



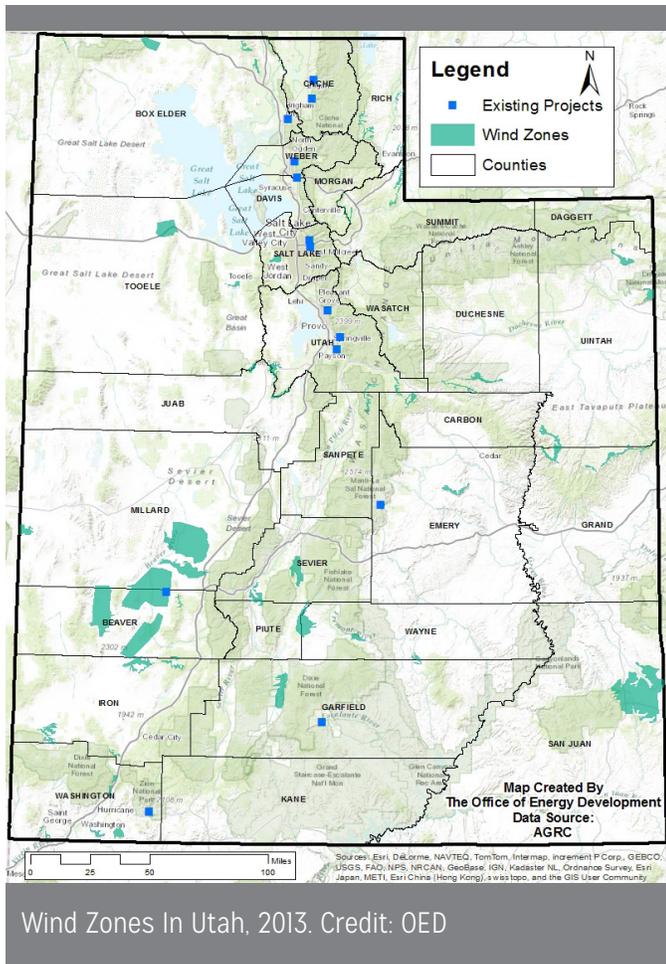
Solar Zones In Utah, 2013. Credit: OED

gy resources that to date, Rocky Mountain Power (RMP) has found potential renewable energy projects in Utah to be less cost-effective than projects in surrounding states. Current regulatory policy in the State applies a least-cost risk adjusted standard to RMP in providing electric service to its Utah customers. Under this standard, RMP has directed the majority of its investment in renewable energy generation facilities to areas located out of state, with the bulk of investment being directed to wind facilities in Wyoming. Under the current least-cost standard, RMP will invest in renewable energy facilities located in Utah (such as the Blundell geothermal facility located in Beaver County) to the extent they are

found competitive from a cost effectiveness standpoint.

Also worthy of note regarding renewable energy facilities in general are the operational challenges of implementing renewable energy resources into an electrical system. By their very nature, energy production from renewable facilities is intermittent and can be random and unpredictable. Solar facility production is impacted by cloud cover and shading from nearby structures, while production from wind facilities can drop off in a matter of minutes as the wind ceases to blow. Also, production from renewable energy facilities may or may not occur at the time it is most needed - when de-





mand on the electrical system peaks. Because electric utilities are expected to provide service on a continuous basis, renewable energy facilities need to be backed up by production resources which can be dispatched 1) in a short period of time; and 2) at the time the energy is needed. Presently, RMP backs up its wind resources primarily with natural gas-fired generation and power purchases from the market, both of which add cost to the provision of electric service. The development of battery storage technologies, which is not a mature technology on a utility scale at this time, will improve the ability of renewable energy facilities to deliver energy at the time it is needed.

Shortly after the original 10-Year Strategic Energy Plan was published in 2011, First Wind completed Phase II of its ambitious Milford Wind project. This second phase was 102 MWs, making Milford Wind a 306 MW facility in total. Although 2012 did not see any activity in the realm of utility scale generation, it was the state's most successful to-date in the realm of distributed generation of renewable energy on homes and businesses. This was owing largely to the American Reinvestment and Recovery Act, which reached the height of its deployment activity in this year. 2013 saw a resurgence in activity in the utility scale renewable energy arena, with Enel Green Power North America's Cove Fort geothermal project coming online in November. That facility, which has a capacity of 25 MWs and expects to add capacity in the coming years, has a power purchase agreement with the Salt River Project in Arizona. Also in 2013, PacifiCorp signed a number of power purchase agreements with solar and wind producers, suggesting that 2014 and 2015 will see significant new development of these resources.

Compressed Air Energy Storage (CAES) as a Renewable Energy Resource.

The 2010 Legislature, through SB 104, designated air that is compressed and stored using renewable energy to be classified as a renewable energy resource under certain conditions. While there are no operating CAES facilities in Utah, the legislation was based on the potential for compressed air storage in proximity to potential renewable energy resources. A compressed natural gas storage facility, using storage in salt domes, is being permitted in Millard County. The CAES process uses stored compressed air, with the addition of natural gas combustion, to run turbines to generate electricity. This approach will not likely have a significant impact on Utah's energy production in the next 10 years.





Summit County Solar

In 2013 Summit Community Solar (SCS) helped 60 homeowners in Summit County install nearly a third of a Megawatt (331 kilowatts) of rooftop solar PV, which is more than five times the amount of residential solar installed in Summit County in 2012 and more than double the County's total installed residential solar capacity. Thanks to the bulk-purchasing power of the community, participants received upwards of 35% discounts off of average installed prices, before incentives. The average Summit County homeowner will save at least \$700 per year on their electricity bills for the next 25 years (that adds up to over \$1 million in electricity savings)!

Homeowners and local solar contractors also benefited from more simplified solar permitting processes and reduced permitting fees, which Summit County and Park City adopted in conjunction with the project. SCS was a collaborative partnership among Utah Clean Energy, Summit County, Park City and a volunteer citizen-led Steering Committee. SCS was modeled after Salt Lake Community Solar, a similarly successful bulk-purchase initiative in Salt Lake County in 2012. Both community solar projects were managed by Utah Clean Energy and supported by the Wasatch Solar Challenge.

Biofuels:

Biofuels such as ethanol, biodiesel and others, are fuels derived from biomass or waste feedstocks. Global production of biofuels - liquid and gaseous fuels derived from biomass - has been growing steadily over the last decade from 16 billion liters in 2000 to more than 100 billion liters in 2011. Today, biofuels provide around 3% of total road transport fuel globally (on an energy basis) and considerably higher shares are achieved in certain countries. Brazil, for instance, met about 23% of its road transport fuel demand in 2009 with biofuels, and the United States met 7.1 percent of its demand in 2012.

In Utah there are only a handful of commercial biofuels producers, including Pleasant Valley Biofuels and Washakie Renewable Energy, both of which rely on waste vegetable oil as a feedstock. However, researchers focused on the utilization of woody biomass produced through invasive species mitigation activities have developed new technologies that may improve the feasibility of large-scale Utah biofuel production.

Biomass Utilization:

Utah's biomass energy potential is only partly realized at this time. Currently, landfill gas, municipal solid waste combustion, and some experimental algae and anaerobic digestion processes constitute biomass energy utilization. The numerous national forests and wide expanse of public domain produce an excess of wood, beetle kill waste and forest undergrowth waste. The web-based Coordinated Resource Offering Protocol (CROP) provides potential wood users with information on wood fiber available within economical haul distances from federal and non-federal lands. Additionally, crop residue and animal waste associated with agricultural operations provide a potential resource that can be used for direct combustion or gasification, though significant contribution to Utah's energy needs by 2020 is not likely.



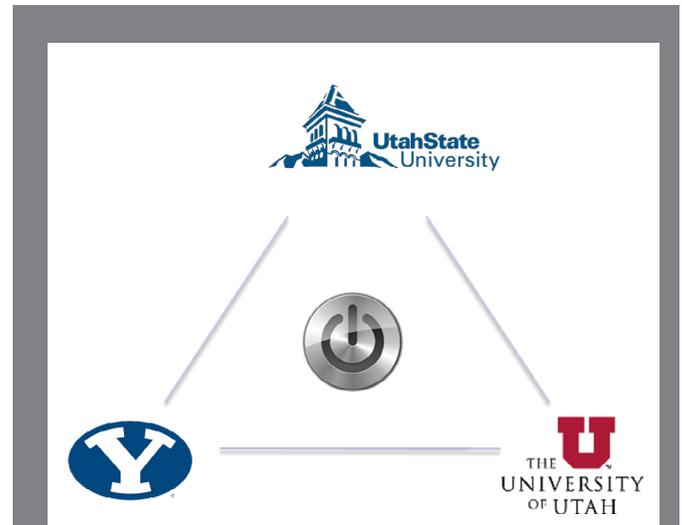
The Algae Biofuels Program at Utah State University is designing new ways to grow algae without needing fertile soil or rain. The approach uses sunlight to its fullest potential, conserves water, produces oil 50 times faster than regular crops and can co-produce electricity.³⁴

Nuclear Power Generation:

This resource deserves additional evaluation, but will likely not be available for electricity generation in this 10-year strategic plan. The feasibility of future nuclear energy development in Utah will be impacted by the emerging role of nuclear energy nationally, as well as water, waste disposal, size of the plant, rail access, transportation of spent fuel, transmission costs and available certified designs. Important impacts on the economic basis for developing new nuclear-energy projects include the possibility of forthcoming taxes or cap-and-trade programs to restrict carbon emissions, cost of compliance with regulations to control other air pollutants, the instability of natural gas prices and the possible reduction in the use of coal as a base-load electric generation fuel.

Converting the current interest in building new nuclear energy plants in the United States into a series of new plant construction projects is dependent on public acceptance (this is particularly true in Utah), regulatory certainty, water availability and the ability to finance. This new environment will provide a context for encouraging nuclear energy development in Utah. Furthermore, if environmental concerns or policies curtail the development of future coal and/or gas-fired plants, or increase their net generating costs, this would provide an additional incentive to consider nuclear as a component of the State's base-load electrical generation.

Nuclear power has the potential to become a re-emergent industry within the United States. Utah should assess and develop its capacity to serve and supply the development of this industry, including the State's manufacturing capability and uranium ore reserves.



The Utah Energy Research Triangle

The Utah Energy Research Triangle is a unique component of Governor Gary R. Herbert's 10-Year Strategic Energy Plan. It is designed to connect the world class researchers and facilities at Utah's three main research universities into a powerful energy research triangle.

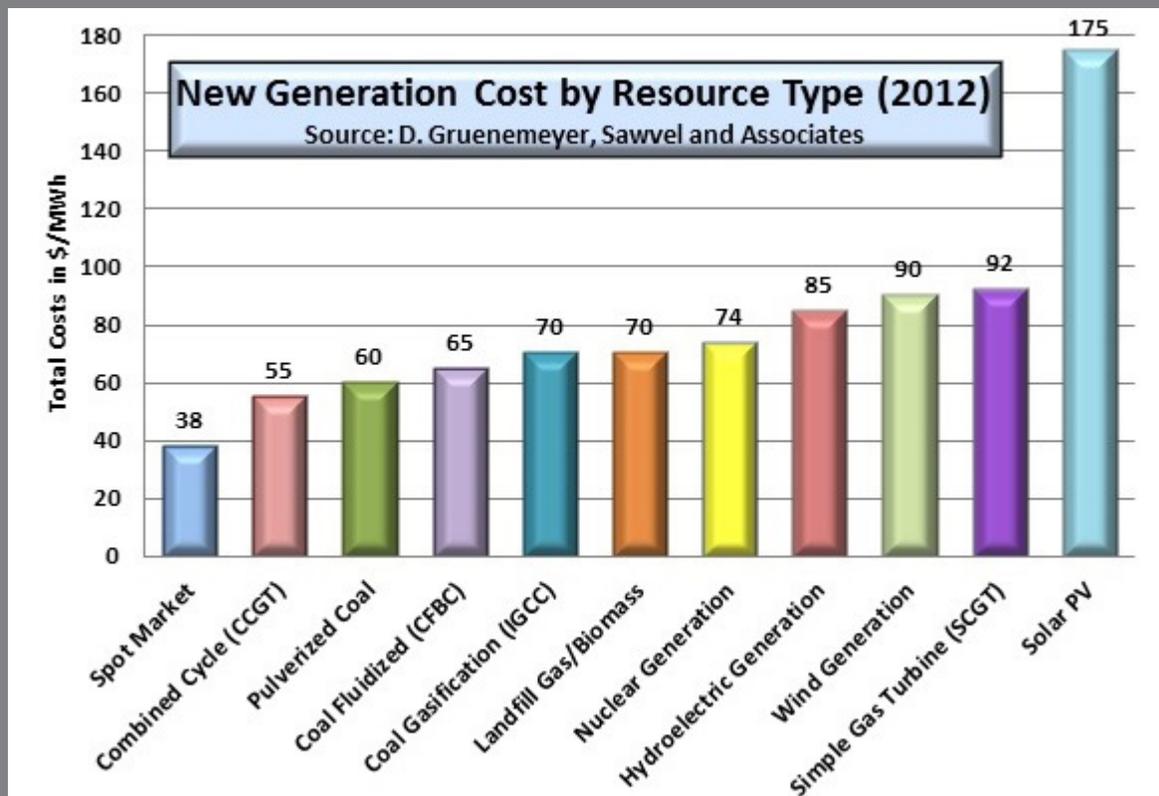
This triangle will focus on addressing Utah's substantial energy resources and challenges facing development by using Utah talent and funding. The Energy Research Triangle is a key component to the State of Utah's strategy for innovation and self-reliance in energy.

The Energy Research Triangle will support Utah-focused energy research at the State's research universities to develop technical solutions to the major energy-related challenges facing Utah. By developing new technology in energy production, energy transportation and energy use, we will use Utah's resources in a more efficient, cost-effective and environmentally sensitive manner.



Figure 3: New Generation Cost by Resource Type (2012)

Source: D. Grunemeyer, Sawvel and Associates



There are proposals to develop nuclear power in Utah, but there is not a proposal that has moved through the permitting process.

B. The Cost of Energy

It has been noted above that Utah has enjoyed low energy costs and that these low energy costs have been important in Utah's economic development. As Utah's energy portfolio changes over this next decade, cost of power will be a vital factor in maintaining Utah's economy.

Over the next decade, it is likely that Utah's energy cost will rise. Increases have/are occurring in some energy sectors such as motor fuels and electricity. Causes include costs of feedstock fossil fuels, costs of increasing regulation, impacts of supply and demand, the economic climate in the U.S. and other costs. Government

expenditures through incentives, loans, tax credits and grants, several of which are mentioned in this report relating to development of renewable energy, will also impact energy cost. As larger fractions of Utah's energy are produced from alternative and renewable resources in the years to come, energy costs will rise. Figure 3 shows current typical generation costs for several energy resources, with combined cycle gas turbine plants being the least costly and solar photovoltaic energy the most costly.

Differences in costs among the various resources are dependent on the time period, the location, federal subsidy, pending regulations and other factors. But the comparisons of Figure 3 are current, realistic estimates for the State of Utah. As Utah implements its 10-year plan, implications of energy cost increase for various alternatives can be evaluated with the REMI Model.



Table 2

Utah's Current Conventional Fossil Fuel Production Rates and Proven Reserves (All values referenced elsewhere in this report.)			
	<u>Petroleum</u>	<u>Natural Gas</u>	<u>Coal*</u>
Proven Reserves	504 mbbl	8.1 Tcf	201 mt
Annual Production Rates	26 mbbl	0.462 Tcf	20 mt
Remaining Years of Reserve at Current Production Rates	19 years	18 years	10 years

mbbl = million of barrels, bcf = billions of cubic feet, mt = millions of tons
*including Kaiparowits (federal lands), 505 mt proven reserves, 25 years proven reserves at current production rates

Utah retail electricity prices have historically been among the lowest in the nation. That pattern has continued in 2012, when Utah's residential rates at 9.93 cents/kWh were 16% lower than the national average, commercial rates at 8.06 cents/kWh were 20% lower, industrial rates at 5.62 cents/kWh were 16% lower, and the average across all sectors at 7.84 cents/kWh was 20% lower.

With respect to retail natural gas prices, Utah's residential prices at \$8.70/Mcf in 2012 were 19% lower than the national average, while commercial prices at \$7.00/Mcf were 14 percent lower.

IV. Economic Development and Energy Jobs

Utah has abundant conventional energy resources, including three large oil fields with an estimated 286 [504] million barrels in oil reserves. Utah is home to two large natural gas fields, and Utah's proven natural gas reserves total 6.7 [8.1] trillion cubic feet (tcf).³⁶ In 2009 [2012], the State ranked 13th [15th] in the nation in the production of coal at 21.9 [17.2] million tons. Utah currently has about 202 million tons of coal reserves under lease at active mines, while state-wide recoverable coal resources total about 15 billion tons (this number does not take into account economic or land use constraints).³⁷ Another estimate from the Bureau of Land Management Price Field Office resource management

plan indicates statewide coal reserves at 14.3 billion tons or greater than 50 years at current production rates.

Table 2 summarizes Utah's proven reserves and current consumption rates for petroleum, natural gas and coal. It also shows remaining years of proven reserves at current consumption rates. Several factors affect these values, including unproven reserves, change in production rates (e.g., natural gas projected to increase, coal possibly to decline), new reserve discoveries, etc. Utah currently imports a significant part of its consumed petroleum.

Conventional energy and mineral resources have historically served as the backbone of Utah's energy production. For example, in 2009 [2011], over 96% [94%] of electricity generated in Utah was fueled by coal and natural gas, 82% [78%] of which was coal and 14% [16%] natural gas.³⁸ Of the electricity generated in Utah in 2009 [2012], approximately 37% [25%] was exported out of state.³⁹

That is not to say, however, that the State's electricity needs are served only by the in-state coal and gas fired plants. Rocky Mountain Power, the State's largest electric utility provider, supplies electricity to the State through a diverse portfolio that includes coal, natural gas, hydro, geothermal, wind, wholesale market purchases and other generation resources. For example, in 2009, Rocky Mountain Power-owned wind plants produced over 2,000 GWh of electricity. Generation re-



Table 3

Employment Baseline for Utah Energy Industries

Source: U.S. Department of Labor

Total Employees (2012)	17,502
Percentage of Utah's Total Workforce (2012)	1.4%
Total Wages (2012)	\$1,362,801,701
Percent of Utah's Total Wages (2012)	2.7%
Percent of State's Average Monthly Wage.....	191.6%
Number of Companies/Firms	811
Total Patents (2005-2009) (To be updated in 2014)	162
Venture Capital Deals (2000-2008) (To be updated in 2014)	20
Public Deals (2000-2008) (To be updated in 2014)	11

Table 4

Energy Revenue for Utah

Source: Office of Energy Development (2012)

<u>Production Value</u>	<u>Severance Taxes</u>	<u>Property Taxes</u>	<u>Royalties</u>	<u>Total Revenue</u>
\$4.663 Billion	\$66 Million	\$202 Million	\$235 Million	\$518 Million

sources located in Utah contribute to Rocky Mountain Power's portfolio, including some Utah renewable resources, primarily from geothermal and hydro resources. Utah possesses an array of renewable resources, **most of which** are used to generate electricity. About 2.5% [5%] of the State's electricity generation comes from renewable resources, approximately 26% [18%] of which is from geothermal, 65% [40%] from hydroelectric, 3% from biomass and 6% [38%] from wind, with a small fraction from solar.⁴⁰ **UREZ and other recent studies identify new and significant renewable resource areas throughout the state, primarily concentrated in the rural southwest portion of Utah.**⁴¹

Utah's energy sector is critical to future employment and investment opportunities, **especially in rural Utah.** U.S. Department of Labor employment statistics for 2012 provide the following baseline (Table 3) for Utah's energy industries.⁴²

The energy sector contributes substantially to state tax revenues, thereby enhancing and stimulating various employment sectors of the State beyond energy. Also, a significant amount of energy development takes

place on School and Institutional Trust Lands generating direct revenues that support K-12 public education programs. A Headwaters Economic Study, Energy Revenue in the Intermountain West, identifies revenues from energy development for Utah.⁴³ **Table 4 updates these findings. This is especially important for rural Utah, where counties rely heavily on revenues generated from land use agreements and taxes from energy projects to fund county economic development programs, jobs and infrastructure.**

In 2009, the estimated value of energy and mineral production in Utah was \$6.8 billion, about \$2.6 billion less than the record high of the \$9.4 billion in 2008.⁴⁴ **In 2012, the estimated value solely of primary energy production in Utah was \$4.6 billion.**

Developing Utah's energy resources creates a demand for jobs. Energy development **throughout** Utah enables the State to attract new jobs and manufacturing and improve its economic development and employment landscape. The ability to attract jobs is directly related to energy costs, availability of resources and quality of life in Utah. According to the U.S. Energy Information Ad-



ministration, Utah consistently has **among the** lowest electrical and heating energy costs in the country, due in large part to the low costs of coal-fired and natural gas **electricity generation**. This competitive advantage over other states is one way Utah is able to recruit new and expand existing businesses, particularly high-tech manufacturing. A September 2008 study, Fossil Fuel Extraction as a County Economic Development Strategy, compared²⁶ energy-focused counties in the West. Four of **Utah's rural** counties were included in the study: Carbon, Duchesne, Emery and Uintah. The study shows quite clearly that as energy production/development jobs surged, “the principal growth came from direct energy-related occupations and largely in occupations indirectly associated with energy development.”⁴⁵

The study raises both a concern and an opportunity: energy-focused counties, and by extension the State, need to have strategies in place to adequately balance their reliance on energy as an economic and employment driver. Utah can do much to attract future energy-related jobs and manufacturing by taking specific actions to eliminate barriers and provide enhancements to companies locating or expanding in Utah. In general, development will broaden and diversify Utah's energy economy. Energy development in **Utah's rural and urban** communities can become a strong stimulus to create vital and growing economic conditions.

As Utah's energy portfolio is diversified, the demand for new energy-sector employees will increase. Utah's energy employment reflects its historic strength in conventional energy resources. Efforts are underway to meet the demand for contemporary skill sets in power generation and transmission for the electric utility sector. In 2011, it was estimated that over 42% of the technician level workforce in sub-station management, metering, and line technology will retire within the next five years. The State should ensure that industry is engaged in developing, promoting and assisting with contemporary skill training workshops and programs in conjunction with regional education centers in order to provide qualified “work-ready” employees to fill the retirement gap.

In 2007, Utah ranked 34th in the nation for the number of green jobs. The State of Utah has started to allocate funds through the State Department of Workforce Services, Salt Lake Community College and the Applied Technology Colleges (ATC) to establish curriculum, certification and degree programs to prepare Utah's workforce in green jobs. The Utah Cluster Acceleration Partnership has established four pathways for green (sustainable energy, renewables and energy efficiency) job training – Green Construction, Alternative Fuels, Energy Management and Renewable Transmission. The State of Utah opened the Intermountain Weatherization Training Center in Clearfield for training and certifications of staff from public agencies and private companies. The State is investing to help train thousands to become certified solar installers, certified wind-turbine maintenance workers, certified energy management workers and alternative-fuel vehicle technicians.

In support of its partners at Salt Lake Community College, in 2013 OED completed the State's Energy Cluster Acceleration Report, which was paid for with American Recovery and Reinvestment Act (ARRA) funds administered through the Department of Workforce Services (DWS).

Until renewable energy becomes **more** cost-effective, the State should carefully consider whether or not to subsidize renewable energy development in an effort to grow Utah's renewable energy sector. **This sector is concentrated in rural Utah, which often lacks the infrastructure to make these potential projects economically feasible.** The committee needs to evaluate the renewable energy potential in Utah based on technological and economic feasibility **in conjunction with other state and federal opportunities or grants.** Any subsidies warranted to incentivize renewable energy development should be approved by State policy makers, i.e. the legislature and the Governor.

To the extent the State wants to encourage renewable energy development without mandates or incentives, legislation should be developed which enables utilities to offer renewable energy tariffs to their customers who want a greater share of renewable energy as part



of their usage mix than is provided by the utility. Rocky Mountain Power is supportive of this concept and supports a thorough, holistic review of potential renewable tariffs for customers who want them. Currently, under its Blue Sky program, Rocky Mountain Power encourages customers to voluntarily purchase renewable energy certificates (“RECs”) that represent the environmental attributes of electric power produced from renewable energy projects.

In 2012 the Utah State Legislature passed Senate Bill 12, sponsored by Senator Mark Madsen. This bill allows for large load centers – e.g. a hospital or data center – to purchase power “directly” from a large-scale generator, with the utility agreeing to serve as an intermediary, creating back-to-back contracts to facilitate the deal. Rather than through a special tariff, this bill establishes an arrangement through which large consumers can chart their own course with respect to their specific portfolio mix.

Because of Utah’s world-class conventional and unconventional fossil fuel resources, the State possesses unique opportunities for attracting rural and urban job growth in the areas of research, development, demonstration and deployment of new technology innovation through business relocation and start-up companies. While the State is making great strides through its Utah Science, Technology, and Research (USTAR) efforts in basic research and development, more investment and support is needed to take technology innovation to the next level using demonstration/pilot projects on the resources in Utah.

The State should continue to attract significant domestic and international investment funding. Such funding provides essential opportunities to help supplement the shortage of “seed” funding and second- and third-phase funding.

OED is working with GOED, the World Trade Center, the U.S. Commercial Service and others to explore opportunities to export coal from Utah.

Arch Coal’s recent divestment of significant coal holdings in a sale to Bowie Resources, LLC, a Kentucky Company, has enhanced Utah’s position with respect to coal exports. This is due to Bowie’s access to significant West Coast export capacity.

Utah can be a national leader in energy resource management and environmental and technical training. Utah’s expertise in resource and environmental management has great potential to attract high-skilled, high-paying jobs.

In summary, Utah’s energy jobs are in the research and development, investment, technology, exploration, extraction, development, production, transmission, distribution and manufacturing industries, as well as professional support services. These jobs help to support Utah’s position of being one of three states in the United States that is a net exporter of energy. If coal-fired generation and hydroelectric resources decline, new and expanded industry and jobs will be needed in these rural communities. State government should promote continued state and federal land access for exploration, extraction and production of crude oil and natural gas, investment in unconventional fuels technologies and development and the recruitment of manufacturing of renewable energy production components. Utah must show an unwavering commitment to the future energy economy that includes balancing fossil fuel development with development of renewable and alternative energy.

V. Energy Development and Our Natural Resources

Utah has the resources necessary to diversify its energy portfolio to provide affordable, sustainable and secure energy now and in the future. Utah’s Energy Plan includes workable strategies to sustain its economy and protect its quality of life and environment.



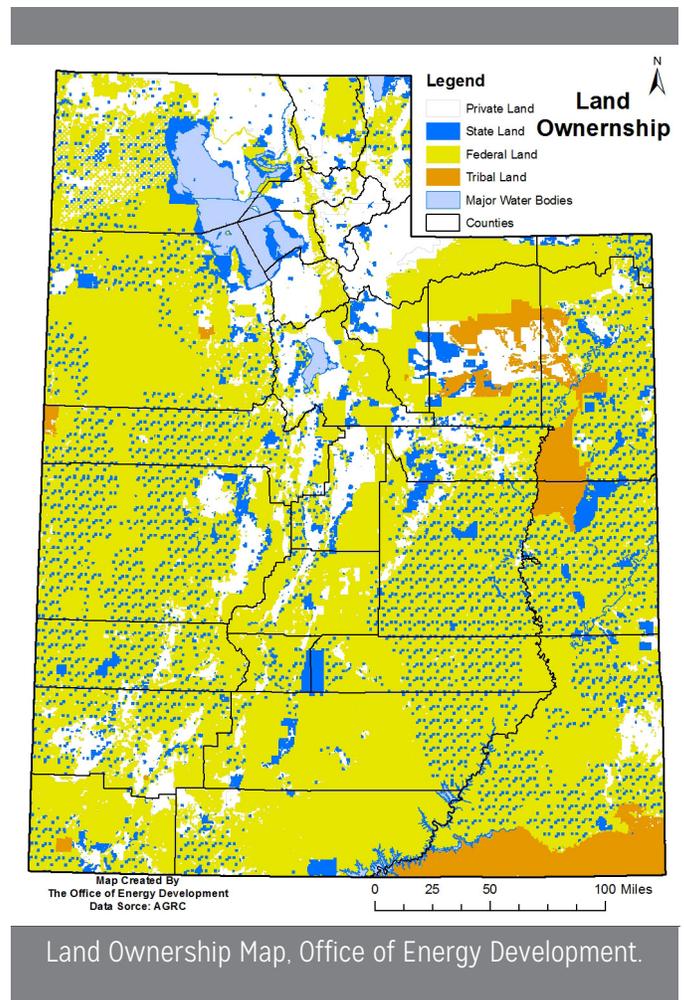
A. Land Ownership

Federal Lands

The federal government owns and manages approximately 60% of Utah's surface lands and a larger portion of the mineral estate. Accordingly, federal land management agencies will play a central role in the State's ability to develop its oil, gas, coal and renewable energy resources. It is also true that the State's public lands include pristine air sheds; national parks and wilderness areas; important water resources that are essential to local communities and wildlife habitat and riparian zones; world-renowned archeological and culturally significant sites; and nationally recognized scenic areas and prized recreational locations. Conflicts inevitably arise between industry, conservation organizations and State and local leaders over how and where energy development should occur on Utah's public lands and what resources should be protected for their environmental and cultural values.

These conflicts have triggered costly legal and administrative challenges that impact energy development in Utah. Energy development is a legitimate use of our public lands. To be successful in achieving the Governor's energy-development objectives, Utah officials will need to develop strategies to work with the federal agencies and navigate the balance between economic and environmental sustainability. Although some progress has been made in resolving conflicts on federal lands regarding energy exploration and development, many Utah officials who are active in this area believe that conflict resolution is still a long laborious process.

Representative Bishop's Public Lands Initiative (PLI) effort, advanced in coordination with the Governor's Office, is making significant strides toward addressing tension over the disposition of natural resources on federal lands. PLI proponents have managed to bring a diverse array of stakeholders together, including natural resource developers, environmental organizations, county commissioners, state legislators, and others.



School and Institutional Trust Lands Administration

At statehood, Congress granted Utah millions of acres of land to be held in trust by the new state to provide financial support for public schools. These school trust lands are managed by the [School and Institutional Trust Lands Administration \(SITLA\)](#). SITLA manages approximately 3.4 million surface acres. In addition, SITLA manages another 1 million split estate oil and gas acres. Revenue from school trust lands is deposited into the Permanent School Fund, a perpetual endowment that distributes income annually to each K-12 public school in Utah.



Energy development is the largest component of SITLA's contribution to education funding. The SITLA's greatest source of existing revenue, accounting for over half the revenue to the trust, is natural gas production, followed by coal. SITLA has leased over 90,000 acres of trust lands for oil shale exploration, with initial development of commercial projects beginning. SITLA also has an expanding renewable energy portfolio. Over 100,000 acres of geothermal leases are in place, and the first new geothermal power plant built in Utah in the last 20 years was constructed on state trust lands in Beaver County. Leases for utility-scale wind and photovoltaic solar projects are also in place.

Finally, the unique Western Energy Hub project near Delta will be wholly located on trust lands. This project will store massive quantities of natural gas in engineered underground salt caverns, providing energy flexibility to industrial and power generation customers throughout the West. The Western Energy Hub project also contemplates developing underground compressed air energy storage, an innovative technology that can largely solve problems of intermittency with other renewable energy sources, thus supporting further development of wind and solar projects in Utah.

One critical issue for SITLA is access to and through federal public lands. The millions of acres of proposed wilderness in Utah have trapped over 1 million acres of state trust lands - almost 1/3 of the entire trust portfolio - in areas that are restrictively managed by the federal government, and to which access is highly limited. In the event that Congress and current and future administrations choose to continue managing federal public lands largely for wilderness, there needs to be an efficient legislative process for exchanging state trust lands out of proposed wilderness for consolidated blocks of federal land that can then be managed by SITLA for energy and economic development.

SITLA's assets include 3.29M acres of Surface Rights, 4.09M acres of Oil and Gas Rights, 4.08M acres of Coal Rights, and 4.12M acres of Other Mineral Rights. In FY 2012, of the \$91.4M in total revenues, 79% was from min-



Kennecott's Efforts to Improve Air Quality

Due to its topography and growing population, Utah faces a number of challenges to maintaining healthy air quality, particularly along the more densely populated Wasatch Front. Rio Tinto Kennecott is aware of the importance of air quality, and is working hard to reduce its own impact. Rio Tinto is finding opportunities to improve air quality through upgrades to its truck fleet, improving the efficiency of engines, and implemented anti-idling programs for light/medium duty vehicles and haul trucks at the mine.

Together the programs have resulted in significant reductions in tailpipe emissions. Kennecott has also upgraded onsite power plants by installing renewable energy generation and combined heat and power systems to maximize energy use. Additionally, they have implemented smelter cogeneration and emissions capture to reduce waste heat and emissions. Lastly, Kennecott's portfolio contains five high-performing LEED-certified buildings. The Rio Tinto Regional Center was the first LEED Platinum-rated building in Utah.



erals development, 7% was from surface activities such as grazing, and the remaining 14% was from a mix urban development activities, land sales, interest, etc. Total distributed Trust revenue to the schools in FY 2012 was \$29M.

Tribal Lands

Utah tribes are important partners with the State of Utah, and tribal lands are an important component of Utah's energy production.

B. Air Quality

Much of Utah enjoys clean air for many days of the year. However, due to topography, weather patterns and a highly urbanized population, Utah also suffers some of the worst air quality days in the nation. It will be critical for human health, the environment and economic development to implement energy development in a way that takes this unique situation into account. Additionally, the [Environmental Protection Agency \(EPA\)](#), in implementing the [Clean Air Act](#), is continuing to strengthen the nation's air quality standards for most pollutants. This will result in higher costs for coal and natural gas plants.

The natural byproducts of burning coal and, to a lesser extent natural gas, include air pollutants permitted and regulated by the Clean Air Act: particulate matter, sulfur dioxide and oxides of nitrogen. The emissions are permitted and regulated through the Clean Air Act. Throughout the West, the energy-production sectors have been viewed as major contributors to visibility impairment, especially in the national parks. Recent plans to address regional haze have resulted in substantial controls on emissions of sulfur dioxide. The full implementation of the regional haze plans will result in additional improvements as emissions from electrical generation are reduced.

Oil and natural gas drilling and production may impact air pollution. The Uinta Basin has recently recorded ele-



Red Leaf Resources, Inc.

Utah-based Red Leaf Resources has more than 20 U.S. patents for its EcoShale™ technology, which was specifically designed to address traditional environmental challenges of oil shale production. The EcoShale™ process extracts oil with lower energy consumption, lower emissions, lower water use and less environmental impact than any oil shale technology deployed in the world today. The resulting end product is of higher quality than traditional oil shale extraction -- equal to or better than the oil industry benchmark of light sweet West Texas Intermediate crude. Red Leaf has more than 1.2 billion barrels of recoverable oil on current lease holdings, and is actively pursuing opportunities to both acquire more resources and license its technology through strategic global partnerships.

vated levels of wintertime ozone. If these levels continue, they may impact attainment of [National Ambient Air Quality Standards](#). It may be that energy development contributes to the Uinta Basin's elevated ozone levels, although the causes of the high ozone readings are still being investigated. Monitoring from Vernal, Utah, indicates that fine particulate pollution may also be a problem in the winter with cold pool temperature inversions.⁴⁶



At the behest of Governor Herbert, a collaboration involving the Division of Air Quality, county governments in eastern Utah, researchers from Utah State University, and the Western Energy Alliance produced (February 2013) the first study of wintertime ozone formation conditions and characteristics in the Uinta Basin. The “[2012 Uintah Basin Winter Ozone & Air Quality Study](#)” represented the first phase of a multiyear study of how ozone forms in the Basin.

C. Transportation and Air Quality

Transportation accounts for more than half of the air pollution along the Wasatch Front.⁴⁷ The combined criteria pollutant inventory for Davis, Salt Lake, Utah and Weber Counties in 2009 [2011] indicates that 51.9% [50%] of total annual emissions of criteria pollutants originated from the on-road mobile sector (cars, trucks and buses).

Ozone and PM2.5 are responsible for acute spikes in air pollution and unhealthy air days in Utah as confirmed by the Utah [Division of Air Quality's](#) (DAQ) monitoring network along the Wasatch Front. Both ozone and PM2.5 emissions are related to on-road mobile sources. Ozone and PM2.5 are respiratory irritants that can trigger asthmatic episodes and cause acute respiratory symptoms in sensitive individuals at concentra-

tions that approach and exceed the [National Ambient Air Quality Standards](#). Both pollutants are statistically confirmed risk factors for a number of respiratory and cardiovascular conditions. Since acute spikes in concentrations of air contaminants are predictable based on reasonably reliable weather forecasts, it is particularly beneficial to eliminate all nonessential driving to protect personal and public health when the UDAQ announces its yellow and red action alert days.

Transportation is also the largest consumer of energy in Utah at 31% [32%].⁴⁸ Saving energy and cleaning Utah's air will improve public health, thereby reducing costs. It will also bolster economic development efforts by helping to attract new companies and jobs, reduce Utah's dependence on foreign energy sources and generally improve the quality of life of all Utahns. This can be accomplished through strategies that include changing the vehicles used or eliminating the energy used to power those vehicles; managing vehicle traffic with technology, engineering and community design; and individual actions and business decisions. Implementation of these strategies should also include meaningful metrics for success, such as reducing particulate matter (PM2.5) and ozone levels in the air.



Alternative-fuel vehicles proven to reduce vehicle emissions and increase fuel economy include electric, electric hybrids, bio-fuels, bio-diesel, propane, hydrogen, compressed and liquefied natural gas (CNG and LNG) and hydraulic hybrids.

Utah should seek to improve vehicle technology/efficiency and alternative fuels (refueling) infrastructure. Utah can reduce emissions and non-attainment air-quality days by encouraging adoption of emission-reducing technologies. A barrier to increased alternative-fuel vehicle use is inadequate refueling infrastructure. The State should consider ways to incentivize alternative-fuel vehicles and to make refueling infrastructure more accessible. **The Utah Public Service Commission approved a docket opened to clarify that electric vehicle charging services are not considered resale of electricity. This ruling allows charging stations to be added without considering the business as a utility.**

Alternative-fuel vehicles proven to reduce vehicle emissions and increase fuel economy include electric, electric hybrids, bio-fuels, bio-diesel, propane, hydrogen, compressed and liquefied natural gas (CNG and LNG) and hydraulic hybrids, often with increased transportation costs. New technology continues to expand this list. Even gasoline and diesel powered vehicles are producing fewer emissions due to improving technology.

In 2011, Utah signed a Memorandum of Understanding with 15 other states that is designated to increase the use of natural gas vehicles in each state's fleet. In 2012, Utah Governor Gary R. Herbert signed an Executive Order prohibiting idling of state-owned vehicles. In another lead-by-example action, Governor Herbert requested that state agencies consider CNG vehicles when expanding or replacing their state fleet vehicles to expedite adoption of CNG and HEV. The [Utah Transit Authority](#) has replaced several of their diesel buses with CNG buses in 2013, with anticipating that a third of its fleet will be CNG in the next three to five years. To reduce emissions in school zones, Jordan School District's fleet is being converted to CNG, about 25% has been switched over from diesel school buses.

The State should continue its support of results-driven economically sound solutions and not favor one technology over others. However, reducing emissions and eliminating non-attainment days will depend on adoption of new technologies. If incentives are appro-

prate, they should be based on full-fuel-cycle efficiency since those technologies are the ones most likely to be developed and receive market support.

Fuel consumption and air pollution can be reduced through more efficient traffic flow, using engineering and technology to effectively manage all modes of traffic and maximizing the effectiveness of Utah's transportation systems. This includes continued implementation of proven ideas such as HOV/HOT lanes, reversible lanes, innovative intersection design, transit-vehicle signal pre-emption and signal coordination, especially during peak hours.

Strategic ideas such as dynamic speed control, peak hour use of shoulders, and increasing Park-and-Ride lots (both private and public) should be reviewed. All traffic-operation plans should include a thorough evaluation of the proven energy saving, air quality and safety benefits of reduced speed limits.

Changing behavior is difficult, but communication strategies and tactics that provide awareness and education, supported by incentives, marketing and promotions can succeed in reducing unnecessary travel, particularly the number and duration of solo-driver trips. **Utah Clean Cities and Kennecott Utah Copper have teamed up to hold an annual "Idle Free Conference" that educates the public and private sector on how to implement idle-free programs in their organizations.** Existing programs like TravelWise, Rideshare and Idle-free, along with events like the Clear the Air Challenge, Bike Month and Free-Fare Day are beginning to show effectiveness in promoting, encouraging and ultimately increasing alternative-transportation use. Programs such as Safe Routes to Schools, Student Neighborhood Access Program (SNAP) and Walking School Bus, all of which encourage walking or pooling to schools, need more resources to increase awareness. It is critical to educate and promote the benefits of more energy efficient transportation with such tools as the TravelWise Tracker.⁴⁹ The tracker allows people to measure the money, emissions and energy saved by using TravelWise strategies.



The State could help reinforce and encourage behavior change by more public education about air-quality indicators and using electronic signage as triggers to promote transportation alternatives such as using public transit, telecommuting, flexible work hours, trip chaining, biking, walking, carpooling, vanpooling and work at home opportunities. The statewide [Utah Clean Air Partnership \(UCAIR\)](#) provides education to individuals, businesses and communities about small changes that will improve Utah's air. UCAIR provides funding to implement projects that will impact air quality and build greater awareness of conservation and efficiency overall.

Many of the traffic-reducing strategies listed can be enhanced by business practices in the private and public sectors. Managers should implement policies that encourage and even coordinate ride sharing, telecommuting and flexible work schedules. Parking subsidies can be eliminated and given to employees as cash or transit passes. Salt Lake City announced it would offer Utah Transit Authority bus passes at a big discount - \$360 per year for its residents as a pilot program. The State of Utah provides free bus passes to all employees living within bus routes. Above all, educational and promotional material should feature Utah's leaders at every level of state government and private business as examples of smart travel.

The State should assist communities in choosing land-use options that reduce per-capita energy consumption, improve air quality and make it easier for people to get from one place to another. Utah's population is projected to double over the next 30 years, with vehicular travel increasing at least as much. As the population and economy grow, Utah has an opportunity and responsibility to design communities in ways that support energy-efficient transportation and commerce, reduce congestion and long commutes and remove physical barriers to using public transportation. Vision Dixie⁵⁰ in Washington County and Envision Utah's Quality Growth Strategies⁵¹ along the Wasatch Front are good examples of community input in the development of alternatives for transportation, infrastructure, land use, planning and zoning.

The State should work with local government to entice people to walk and cycle more often by designing accessible, safe and interesting paths and destinations. Government services should be located in neighborhood centers that draw people by offering a variety of public services and private businesses. Salt Lake City and Downtown Alliance partnered to establish the first bike sharing program, [GREENBike](#), in Utah. In Park City, a new car sharing program has been launched, open to businesses, organizations and individuals. Neighborhood economic centers should reduce commutes by bringing jobs and housing closer together, with the added benefits of community cohesion and vitality. Seamless connections should be made from these neighborhoods to mass/public transit.

Transportation costs can be further reduced by emphasizing new building construction in already developed areas. Collectively known as walkable neighborhoods, transit-oriented development and the "Envision Utah 3 Percent Strategy," these strategies are thoroughly examined in the summary document for Wasatch Choices 2040 Project⁵² and are designed to respond to changing demographics, increasing energy use and market demand for more residential choices. [Wasatch Choice for 2040](#) focuses on transit-oriented development centers and recently released the Wasatch Choice for 2040 Toolbox Training to help communities explore scenarios, develop a community vision and form an effective implementation plan.

A better balance of regional travel choices between auto, public transit, bicycling and walking is imperative. Transportation's share of growing oil-consumption is a concern. Transportation accounts for approximately 25% [19%] of total energy demand worldwide (32% for Utah) and 81% [83%] of Utah's petroleum consumption.⁵³ Better load share among the available energy sources will be part of the solution.

In the process of allocating public funds for transportation, the priority should be projects that demonstrate the greatest science-based, long-term benefit. Mass transit should be given meaningful consideration. Pro-





Institute for Clean and Secure Energy

The Institute for Clean and Secure Energy (ICSE) grew from a long tradition of combustion research at the University of Utah beginning in the 1950s and continuing to today's level of over 120 faculty, staff, and students. ICSE formed from the combination of several strong research programs that focused on combustion simulation, analysis, and experiments.

In 2004, the University of Utah officially recognized ICSE as a permanent institute. The mission of ICSE is education through interdisciplinary research on high-temperature fuel utilization processes for energy generation, and associated environmental, health, policy, and performance issues.

ICSE employs an integrated, multi-disciplinary approach to the study of energy, combustion and high-temperature fuel-utilization processes by combining hands-on experimental work with analytical tools and simulation. This approach enables ICSE to develop predictive tools for these highly complex processes, which span multiple scales of time and space. ICSE has the resources and expertise to address and improve the understanding of these processes, which are often associated with applied systems and industrial applications.

viding more convenient, reliable and affordable travel options and infrastructure that supports biking and walking will reduce the amount of time people spend in their cars, saving energy and reducing air pollution.

As Utah provides a more balanced transportation system, it will need to expand pricing and land-use policies, well connected bikeways and vehicle miles traveled (VMT) and reduction strategies throughout the region to support this system.

D. Water Consumption and Quality

Limited quantities of water may be available for new energy development. Most areas of the State are closed to new surface and groundwater appropriations (especially new consumptive appropriations) and those that are still open are primarily for ground water in relatively small quantities. What little may be currently available will undoubtedly decline over the next decade.⁵⁴ Water currently used at other facilities or by other water users may be purchased for use in energy development in the future. This is how water resources were developed for the Huntington, Hunter and IPP power plants. Technology and efficiency advances in the energy industry may provide additional water for existing power plants or reduce the demand for water at new power plants in the future.

Given Utah's population growth and projected economic growth over the next decade, the possibility of increased drought and with limited new water resources available, water consumption of energy resources should be given careful consideration. The State of Utah may wish to calculate the water consumption associated with different energy portfolios that can meet projected electricity demand over the next decade.

As an arid state, an energy portfolio that encourages low water-use technologies should be considered. Power plants located in water-scarce regions may rely on dry cooling systems, which use air to cool and condense steam, or hybrid wet-dry cooling systems. Dry or hybrid cooling is typically a less efficient means of

power plant cooling than water, and thus typically increases the cost per kilowatt-hour of electricity. Dry or hybrid cooling can be more or less cost-effective, depending upon the type of electrical generation (nuclear, solar, etc.), and is not the current baseline technology.

The development of primary fuel sources such as oil, oil shale, tar sands, natural gas and biofuels also consume water. Specific information on the water quantity and quality and the impacts of technology for developing many of these resources, particularly tar sands and oil shale, is limited. Additionally, the water used to develop biofuels can vary tremendously. There are currently a dozen or more different technologies under consideration for these fuel resources. It is unlikely that all technologies will be developed. Water issues, including water availability, water pollution effects of specific technologies and potential pollution from spent shale waste sites, need to be evaluated as commercially viable technologies emerge and are developed.

In May 2009, the U.S. Department of Energy (DOE) published a report titled [State Oil and Natural Gas Regulations Designed to Protect Water Resources](#) from a study by the Ground Water Protection Council. This report identified key messages and suggested actions for regulating oil and gas activities, including hydraulic formation fracturing and coordination of State water-quality protection and oil and gas agencies. Utah already has most of these water-quality protection measures in place, including an MOU between the [DEQ Division of Water Quality](#) and the [DNR Division of Oil, Gas and Mining](#), which was established in 1984 and updated in 1986 and 2010.

Additionally, the EPA has launched a [Hydraulic Fracturing Study](#) in order to assess potential impacts of this method of recovering natural gas on drinking water and human health. **A progress report was released in December 2012 and a draft report is expected to be released for public comment and peer review in 2014.**

Nuclear wastes, including uranium mining, uranium milling, low-level and high-level wastes, can impair surface and groundwater resources if they leak from

impoundments and disposal sites. As with other waste-management units, best available technology combined with ground-water monitoring is used to minimize the discharge of contaminants from the waste source by applying control and containment technologies such as liners, leak detection systems, leak-collection systems and pump-back systems. These issues need to be reviewed regularly by the Department of Environmental Quality (DEQ), with remedial actions recommended if problems occur.

Governor Herbert has tasked his Senior Environmental Advisor, Alan Matheson, with the creation of a 50-Year State Water Strategy. Over the course of 2013, Matheson held public meetings across the State, culminating in a Water Summit in Salt Lake City in the fall of 2013. The 800+ comments received from the public will inform the ongoing work of the State Water Strategy Advisory Team.

E. Archaeology.

Energy extraction and transportation generally require construction and ground disturbance, which can be damaging to historic and archaeological resources. Federal and state statutes require the responsible agencies (e.g., land owners and permitting agencies) to consider the effects of their actions on cultural resources, and to allow the [State Historic Preservation Office \(SHPO\)](#) to comment. With advance planning, use of the State's web-based GIS database of archaeological and historic resources and consultation with interested parties, along with on-the-ground survey, most of the potential conflicts can be avoided.

Recent successes such as the West Tavaputs Programmatic Agreement and the Questar Pipeline Nine Mile Canyon Project demonstrate that energy development and transmission can occur without compromising fragile archaeological and historic resources. Advance planning, using the best available data and inclusion of all interested parties are critical components of a successful strategy.



F. Wildlife

Energy development has the potential to negatively impact wildlife, critical wildlife habitats and migration corridors. The most acute problem occurs when an energy project negatively impacts a federally-designated endangered, threatened or candidate species. One example is the potential for wind, solar, oil, gas and coal bed methane development to negatively impact greater sage-grouse and the sagebrush ecosystems they inhabit. Sage-grouse inhabit numerous Utah energy-development sites and were recently designated by the US Fish and Wildlife Service as “candidate species” for Endangered Species Act Protection. Extensive study indicates energy development related activities may negatively impact sage-grouse and critical sage-grouse habitat. These impacts include tall-structure avoidance, habitat loss and fragmentation, predation, human disturbance, road networks, increased noise, reduced nesting success, effectiveness of vocalizations, lek (courting site) attendance by males and females, shifts in nesting habitat selection away from energy-development infrastructure and reduced sage-grouse breeding populations.

The State of Utah, partnering with the Western Governors Association, is developing a Decision Support System (DSS) that will make crucial habitat and wildlife corridors available in the form of maps.⁵⁵ The State of Utah is also engaged in developing Best Management Practices approaches to reviewing energy projects. Conservation groups are compiling a series of Best Management Practices to assist land managers, conservationists, utilities and developers in the process of zoning, siting, building and operating renewable energy installations in a way to minimally impact wildlife and their habitats. They are also identifying the highest priority areas for conservation and ecosystem services in the region and then using a blend of land offsets and mitigation strategies to attain “no net loss” of biodiversity values. The analysis of the specific impacts of new energy development on wildlife and critical wildlife habitats will need to be thoroughly assessed through

science-based processes at the project-site level. Once impacts are avoided and minimized, remaining impacts must be mitigated and long-term wildlife monitoring implemented to measure mitigation success.

The State strives to create a balanced approach between energy development and the protection of natural resources. Currently, there are several Utah species that are of concern to energy development, including: the greater sage-grouse, Uintah Basin hookless cactus, and Graham’s beardtongue.

The State has crafted a [Conservation Plan for Greater Sage-grouse Utah](#) from recommendations made by all major stakeholder groups. The Utah Conservation Plan



Graham’s beardtongue on oil shale.
Photo Credit: Michael Vanden Berg, UGS.

includes over 90% of known sage-grouse within Utah's jurisdiction.

The Uintah Basin hookless cactus has been on the Endangered Species List since 1979. Oil and gas development increases noxious weed invasions because of the associated surface disturbance that can alter the ecological characteristics of the cactus habitat, making it less suitable.

The Graham's beardtongue grows almost exclusively on exposed oil shale in Utah's Uintah Basin. Several state agencies have signed on to a conservation agreement that seeks a balance between responsible development of Utah's vast oil shale resource and the preservation of the beardtongue.

The State strongly believes in using science to develop policy to find the correct balance between protecting natural resources and enabling energy development. Utah is also working with industry to find smart ways to advance energy development with minimal impacts.

G. Carbon Management

As the debate on climate change continues, Utah must participate in this discussion to represent Utah's energy mix and to assist in developing complementary policies to address environmental pollutants. Congress and the last four administrations have not developed a policy on carbon emissions, and it seems less likely to occur in the immediate coming years. **In the three years since publication of the original Energy Plan, the Administration has taken steps to regulate carbon emissions.**

Uncertainties in possible future legislation impact decisions at the state level, including Utah, where decisions on energy projects totaling several billions of dollars will be made during the next decade. Local western utilities are including assumptions in their integrated resource plans on carbon emissions to help guarantee the plans reflect factors that may negatively impact the cost of energy. This is a risk-management exercise for them, and not an endorsement of what scientific

factors should, or will be used to establish a national policy on carbon.

The EPA is moving forward with regulating Greenhouse Gases (GHGs) through the Clean Air Act. This is based on the [Endangerment Finding](#), which **applies to six gases collectively known as GHS's:** (carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HCF₃), perfluorocarbons (PFC₅) and sulfur hexafluoride (SF₆)). EPA's phased-in approach through the Tailoring Rule limits regulation initially to facilities already permitted and emitting at least 75,000 tons per year. The effect of this regulation will be increased cost to energy production and ultimately to the consumer, though cost estimates vary depending on source. Again, any such regulations should be accounted for when determining cost/benefit of future energy sources.

The EPA is now taking steps to regulate carbon dioxide emissions from new and existing power plants. The Office of Energy Development is leading a team including the Division of Air Quality, USTAR and electrical utilities to coordinate Utah's response.

VI. Energy Efficiency, Conservation and Demand-Response Update

The Governor and the Legislature have established energy efficiency as a priority and urged state and local governments and utilities to promote and encourage cost-effective energy efficiency and conservation.⁵⁶ Utah is making notable progress in energy-efficiency efforts and was recently recognized by the American Council for an Energy-Efficient Economy (ACEEE) as one of the "most improved" states and the highest-ranked in the region.⁵⁷ **In 2013, the ACEEE ranked Utah 24th in the nation for energy efficiency.**

Models and studies recognize energy that is not consumed as a result of energy efficiency as a cost-effective resource. Recent national studies conducted by the McKinsey Company and the National Academy of Scienc-



es show, respectively, cost-effective energy-efficiency technologies and building practices could reduce energy consumption 23% by 2020⁵⁸ and 30% by 2030.⁵⁹ These studies align with Utah-based analysis. Rocky Mountain Power and Questar Gas studies show that the maximum achievable cost-effective potential for energy efficiency would reduce natural gas consumption by 20% (21.4 million Dth) by 2013⁶⁰ and electricity consumption by 1,641 GWh by 2020.⁶¹

The first supplement to Utah's 10-Year Strategic Energy Plan - the Utah Energy Efficiency and Conservation Plan - was drafted in early 2014. This plan was produced through a stakeholder-driven, consensus-based approach by which leaders in the energy efficiency community put forth recommendations to further adoption of energy efficiency and conservation practices in Utah. There are recommendations in five main sections: Industrial Energy Efficiency, Building Energy Efficiency, Agricultural Energy Efficiency, Public Outreach, and Transportation. This plan, and the recommendations within each section, serve as a call to action to both the public and private sectors in Utah to commit to and expand a culture of energy efficiency and conservation in order to support Utah's growing economy, shape future policy and partnerships, and further Utah's commitment to responsible energy development.

A. Education and Public Awareness

A barrier to widespread adoption of energy efficiency and conservation is the lack of public and building official awareness and understanding about energy, energy-efficiency technologies, practices and programs. Rocky Mountain Power and Questar Gas have excellent energy efficiency and demand-side management programs and effective marketing campaigns. Other energy education efforts underway in Utah include some by municipal utilities and utility cooperatives, the State Energy Program, the Utah Building Energy Efficiency Strategies (UBEES) partnership, Utah's Weatherization and HEAT programs and nonprofits such as Utah Clean Energy.

Public and building officials' awareness could be increased through the following methods:

- Developing and implementing a State-sponsored, Governor-led, single-messaging communication program modeled after the Slow the Flow and former PowerForward programs that works with existing utility efforts to raise public awareness and understanding about the importance, cost-effectiveness and risk management opportunities of energy efficiency and to recognize excellence in energy efficiency.
- Requiring energy code education as part of continuing education credits for building officials, contractors, and trades and providing funding and other incentives to local building departments to train staff in the science of building energy demands, controls and efficiency and in code implementation and enforcement. The Building Energy Codes Training program originated in 2007 through a grant through the U.S. DOE with matching funds from the State. The training is now made possible with funding from utility demand-side management programs and the American Institute of Architects. Continuing education credits are provided to licensed building officials who attend the training. In 2013, OED held eight training webinars, and twelve full-day training sessions, which provided building code officials and other energy efficiency practitioners with 3,120 hours of continuing education credits.
- Increasing the minimum hiring standards for building-plan reviewers and inspectors to include energy management degrees, certificates, IECC training or equivalent.
- Educating home buyers regarding the importance of energy efficiency in general and providing specific information about the energy efficiency of homes they are building or buying.
- Helping low income households to maximize energy efficiency and reduce energy impacts on



household budgets. Between 2011 and 2013, the Olene Walker Housing Loan Fund (administered by the [Department of Workforce Services, Housing and Community Development](#)) constructed 1,660 new housing units that qualified for EPA's Energy Star Program. During that same period, 4,591 residential units were weatherized through the Weatherization Assistance program.

- The Office of Energy Development has worked with the National Energy Foundation (NEF) to provide Utah educators and students with renewable energy and energy efficiency education. The NEF estimates that they have provided over 3,240 teachers with energy education materials through support from OED. The "Water Energy in Action" program, directed towards K-12 schools throughout the state, provides teachers with tool kits, lesson plans and curricula that result in hands-on, interactive activities to teach students the importance of water and its relationship to energy.
- The Solar for Schools program, implemented through the American Recovery and Reinvestment Act (ARRA), resulted in installation of 5.3 kW rooftop solar photovoltaic arrays at 83 Utah schools in 27 districts throughout the state. NEF provided renewable energy training and materials to 340 teachers that teach an estimated 121,400 students.
- The Energy Efficiency and Conservation Plan also includes recommendations to expand education and public awareness opportunities for building officials, building owners, and the public.

B. Demand-Side Management and Load Control

While the impact energy efficiency can have is significant, it cannot entirely obviate the need for new production facilities, transmission lines, pipelines or transportation facilities. Each new customer added to a

utility's system increases the demand on that system. In addition, demand is increasing as existing customers install high energy consumptive appliances, such as central air conditioners, large screen televisions and computer systems, etc. to their homes and businesses. Energy efficiency programs can contribute towards meeting this growth in demand.

Demand-side management (DSM) strategies enable energy users to reduce consumption during periods of peak demand. This reduces costs because of avoided or delayed investment in new electric generation and new natural gas supplies. Questar Gas's 2009 DSM programs confirm annual energy savings of 1,086,200 Dth, while Rocky Mountain Power's DSM Programs achieved 247.8 GWh of first year energy savings, or 1.2% of 2009 sales [236.2 GWh in 2012],⁶² In 2009, Rocky Mountain Power spent \$45.6 million to acquire these savings [\$47.2 million in 2012]. Load control programs, such as Cool Keeper and Irrigation Load Control, are a subset of DSM, allowing the utility to reduce peak demand. In addition to



The Utah Intermountain Weatherization Training Center created a two-story 1200 foot replica of a home used to demonstrate best practices for weatherization and efficiency, providing important education to Utah community members and builders.

other DSM measures, Rocky Mountain Power spent \$12.5 million in 2009 [\$8.7 million in 2012] to acquire 155.9 MW [150.5 MW] of load control resources.

For close to a decade, Rocky Mountain Power has worked with its customers to reduce electricity use through demand response (including load control) programs. By actively controlling specific equipment such as residential and small commercial air-conditioning and agricultural irrigation pumps, the utility is able to reduce consumption and strain on the grid during periods of peak demand. In 2010 [2012] Rocky Mountain Power had approximately 100,000 [114,079] customers in Utah (roughly 25-28% of qualifying homes and businesses), representing over 112 [115] MW, under direct load control. (These savings reflect the Cool Keeper program.) The company also had about 43 megawatts of irrigation pumps under direct load control. Customers participating in these programs allow, under terms and conditions approved by the Public Service Commission of Utah, Rocky Mountain Power to leverage the existing infrastructure by curtailing usage of customers' equipment (irrigation pumps and air conditioners) at times when demand for electricity is high.

The state could enhance DSM and load control programs by:

- Identifying innovative demand-response programs and removing barriers that limit participation in these programs
- Designing demand-response programs that have been shown to increase participation significantly
- Supporting increased participation in cost effective distributed generation

C. Industrial Sector

Utah industries currently benefit from energy prices among the lowest in the nation. While these prices have helped make the industries cost competitive, they also create a barrier for investment in energy efficiency, i.e.,

multi-state industries receive a higher return for investments made where energy prices are higher.

Possible strategies to advance energy efficiency in Utah's industrial sector include:

- Provide a well-designed and integrated technical assistance program, addressing both electrical and natural gas energy efficiency. It should leverage existing resources and new energy-efficiency/ green-workforce training programs to include industrial energy management.
- Increase efforts to pursue energy-efficiency opportunities that involve recovering wasted energy to generate power. These opportunities could be evaluated for capturing energy otherwise unused in industrial processes. On October 29, 2013 the U.S. DOE, in coordination with State and Local Energy Efficiency Action Network and Southwest Energy Efficiency Project hosted a regional dialogue meeting in Salt Lake City, UT on industrial energy efficiency and combined heat and power (CHP) in the west. Dialogue focused on developing and implementing state best practice policies and investment models that address barriers to greater investment in industrial energy efficiency. The Governor's Energy Advisor, Cody B. Stewart, addressed the attending group of regional policy makers, non-profit groups, energy managers, trade associations and private sector firms, reinforcing the importance of industrial energy efficiency to Utah's growing economy.
- Encourage utilities and their regulators to continue or begin offering cost-effective programs to support industries' energy efficiency investments. Industrial energy efficiency was the focus of one of the many valuable energy efficiency and renewable energy projects and programs brought to Utah through the three-year course of ARRA. From 2009 to 2012, the State Energy Program coordinated the Utah Industrial Energy Efficiency Program (IIEEP), which helped industrial companies gain greater expertise in energy efficiency



practices and reduce facility energy usage. Industrial companies made voluntary commitments to reduce energy intensity and related emissions, while the program provided training and technical assistance to maximize facility performance. The program provided training workshops and opportunities for networking with other industrial partners. It also helped participants establish a system for tracking annual energy consumption and reduction, and offered annual awards for companies that showed exemplary improvements.

D. Financial Incentives

In many situations, incentives are sufficient to encourage industries, businesses, and residential consumers to pursue individual energy-efficiency measures, but barriers remain for obtaining significant energy savings on a whole-plant, whole-building or whole-house

basis. Utah businesses and residential consumers used 13,944 [19,991] GWh of electricity⁶³ and 103.8 [95.2] million Dth of natural gas in 2009 [2012].⁶⁴ The utilities, as well as the State, could offer incentives to customers who retrofit or purchase high-efficiency appliances, motors, lighting, increased insulation, more energy-efficient windows and other equipment. Home energy retrofit programs offered by the State and Salt Lake County also provide homeowner financing. Financing programs try to match the loan payment with the energy bill savings; however this is difficult with Utah's low energy costs. The State's Utah Home Performance program is based on the contractor delivering a whole package energy analysis, home improvement and financing program to the homeowner. Salt Lake County's Energy Smart program is an interest rate subsidized loan program serviced by Community Development Corporation of Utah, a 501(c)³ organization.

Additional financial incentives to be considered include:

- Provide tax credits, tax deductions and/or rebates to industries, businesses and home owners, landlords and condominium associations for investments made in energy efficient equipment, processes, retrofits, etc.
- Create a no/low-interest loan program for industrial energy-efficiency capital projects, such as that provided by the Colorado Governor's Energy Office, or providing a volume cap allocation for tax-exempt funding from the Olene Walker fund.
- Include energy-efficiency and conservation requirements in state/local tax incentives for new businesses.
- Consider a job-creation tax incentive for hiring resource efficiency/energy managers at industrial facilities.
- Encourage banks to include evaluating energy costs as part of the mortgage application and develop low-interest loan services for energy-efficient retrofits, such as DOE's PowerSaver Loan



Cooling towers in the City Creek development in downtown Salt Lake City utilize some of the most energy efficient technologies. Photo Credit: Andrew Gillman



New Anadarko Natural Gas Project: Praised for Environmental Coordination

In the summer of 2012, in a show of cooperation and compromise that is promising for the future of energy development in the state, Anadarko Petroleum Corporation (APC) and Southern Utah Wilderness Alliance (SUWA) were able to come to an agreement for a 3,675 well natural gas development proposed for Uintah County. The agreement limits the number of wells in wilderness-quality lands of the White River area, and provides for conservation easements will for certain high-value segments of the river. SUWA has determined that the White River agreement will help ensure the area will be protected from the sights and sounds of oil and gas development.

As proposed by Anadarko Petroleum Corporation, the Greater Natural Buttes' infill project is for an existing developed gas field in Uintah County, where up to 3,675 new natural gas wells will be drilled from 1,484 well pads. The active drilling time is slated for a period of 10 years.

Program.

- Require a home energy rating for all homes listed for sale or rent.

In addition to the incentives noted above, the Utah Legislature passed and the Governor signed into law Senate Bill 221, which amends Utah's Assessment Area Act and authorizes municipalities (and certain other parties) to provide assessment bond financing for energy efficiency upgrades and renewable energy systems on commercial and industrial properties. This financing method, known as Commercial Property Assessed Clean Energy or "C-PACE," can be used to provide 100% financing on building energy improvements and is repaid through a voluntary assessment on the property owner's property tax bill. There is a growing interest in C-PACE among Utah property owners and municipalities and efforts are underway to bring tools, resources and information to these parties to assist with the development of standardized C-PACE program guidelines.

E. New Construction

New home and new commercial building design and construction should be energy efficient. Utah is one of the fastest growing states in the nation. As such, more than 198,000 residential building permits⁶⁵ and an estimated 22,000 commercial building permits have been issued over the last ten years, and construction continues even during the economic downturn. These new homes and buildings will be part of the Utah landscape for decades to come. It is critical that steps be taken to ensure these buildings incorporate cost-effective energy efficiency measures at the time of construction rather than burdening owners and utilities with the cost of retrofits.

The State of Utah will continue to lead by example in energy efficiency. The Division of Facility Construction



and Management (DFCM) established Leadership in Energy and Environmental Design (LEED) Silver certification as a minimum standard for all new state-building construction. In 2010, DFCM also installed \$4 million in renewable energy projects (mostly solar) with American Recovery and Reinvestment Act economic stimulus funding; established private/public partnerships with energy service companies (ESCOs) and utilities to fund energy efficiency improvements in existing buildings; benchmarked or tracked energy use in over 90% of large buildings under their management through **ENERGY STAR's** Portfolio Manager; used a re-commissioning platform for tuning up buildings; established a \$2.5 million energy-efficiency revolving loan fund that is currently fully subscribed Update; established a statewide employee energy behavioral program "Think Energy" and employee E-teams; and continued to track the "Working 4 Utah" initiative that has shown a 10% energy use reduction.

Constructing buildings to current or above energy



Professional energy auditors perform "blower door tests" to determine a home's airtightness. Reducing drafts increases building energy efficiency.

code standards reduces the occupant's energy costs and puts downward pressure on utility rates by deferring investment in new energy generation that would otherwise be needed to meet rising demand. Utah's commercial and residential buildings use 42% of its total energy, more than either the industrial or transportation sectors. Increasing energy efficiency in Utah's new buildings will potentially save \$1.17 billion between 2001 and 2020.⁶⁶ The economic cost to builders to achieve such savings has not been determined and should be analyzed.

Building energy codes dictate minimum standards for the design and construction of all new and renovated buildings. The codes impact energy use for the life of the building. Utah's statewide building codes are adopted by the Legislature and enforced by local jurisdictions. Many Utah builders are effectively ensuring energy efficiency is a component of all new and retrofitted homes and buildings.

Energy codes are not effective if those codes aren't properly implemented by the design and construction industry or enforced by local building departments. To effectively do their jobs, everyone involved in building design, construction, plan-review and on-site enforcement must be aware of the latest building-science technologies and codes. Compliance tools and training materials that support energy codes are available through the U.S. Department of Energy's Building Energy Codes Program. The Utah State Energy Program, supported by Rocky Mountain Power and Questar Gas, provides energy code training. However, qualitative observations in 2010 reveal Utah's compliance rate could be improved.

The Task Force makes the following recommendations to improve energy efficiency in new construction:

- Encourage builders' participation in programs that encourage continued improvement. Voluntary programs that encourage more energy-efficient construction and renovation, such as **ENERGY STAR** for Homes, provide the opportunity for better-than-code products. **The Energy Efficiency and Conservation Plan** recommends increasing

the effective use and enforcement of the International Energy Conservation Code (IECC) by jurisdictional authorities and the design and construction industry through ongoing and expanded education, training and credential licensure.

- Use the most current Utah state energy code for both residential and commercial construction. 2013 Energy Conservation Code Amendments (S.B. 202) adopted the 2012 energy codes for commercial buildings, along with a revised version of the 2012 code for residential buildings. The Energy Efficiency and Conservation Plan recommends adoption of current and future International Energy Conservation Codes in full, amending out only provisions that can be proven to not pay for themselves on a cash flow basis or life cycle cost-effective basis (safety items should be measured independently from this calculation).
- Improve and clarify the administrative feedback loop for code enforcement professionals between local jurisdictions and the Uniform Building Code Council, and develop a resolution process for consensus-based code enforcement disputes.
- Approve development fees or allocating a portion of the DOPL's fund created from surcharges associated with construction as a funding source for energy-efficiency code enforcement at the local level.
- Encourage and fund programs that provide whole-house and building systems energy analysis and significant whole-house or whole-building retrofits.
- Encourage government and non-government organizations to utilize energy service companies as a financing mechanism for energy-efficient retrofits, recommissioning and ongoing commissioning.

In addition to the points previously noted, the Energy Efficiency and Conservation Plan proposes that the State should be a leading example of energy efficiency

and conservation for buildings.

F. Regulatory Changes

Utah's regulatory framework is most effective in focusing its efforts on reducing overall energy consumption, managing peak loads through best practices, and supporting energy efficiency and demand-response programs, consumer education and utility rate design to promote energy efficiency and conservation. It is also important to ensure that utilities are not disadvantaged or economically harmed as a result of state energy and economic policy decisions.

Utah's regulatory environment, consistent with Utah statutes governing its operations, has provided support and recovery of costs directly incurred by public utilities associated with cost-effective energy efficiency and demand-response programs. Both Questar Gas and Rocky Mountain Power have robust and active advisory groups, established within Public Service Commission processes, to provide recommendations on program design, scope and implementation. This collaborative effort is an important ingredient to the ongoing success and achievement of these programs. Ongoing work should:

- Continue encouraging all customers and suppliers to pursue all cost-effective energy efficiency through its current regulatory culture.
- Make greater efforts to ensure all system and environmental benefits provided by energy efficiency are fully and appropriately valued in the planning, acquisition and regulatory decisions. Likewise, the costs and challenges associated with energy efficiency should be fully and appropriately considered as well.
- Consider establishing energy-efficiency targets and/or utility incentive programs for successful management of energy-efficiency and demand-side response programs. The Energy Efficiency and Conservation Plan recommends promotion of best practices in non-residential building energy efficiency through a statewide benchmarking challenge and recognition





Electrical transmission lines at the IPP coal plant, Utah. Photo Credit: Michael Vanden Berg, UGS

program.

- Pursue additional analysis and evaluation of utility and ratepayer impacts of high-efficiency scenarios.
- Consider rate recovery mechanisms that balance the first-year costs of energy-efficiency programs while benefits are accrued across many years. Alternative rate recovery mechanisms may be necessary to give energy-efficiency resources comparable treatment to supply-side generation resources that are amortized over multiple years. Impacts this approach may have on a utility's financial condition should be considered as part of this effort.

VII. Transmission, Infrastructure and Transportation

Historically, energy producers have focused on providing competitive costs while balancing other factors and risks. Increasingly other requirements and public policy objectives have become more predominant in thinking about the new energy economy and climate change. In-

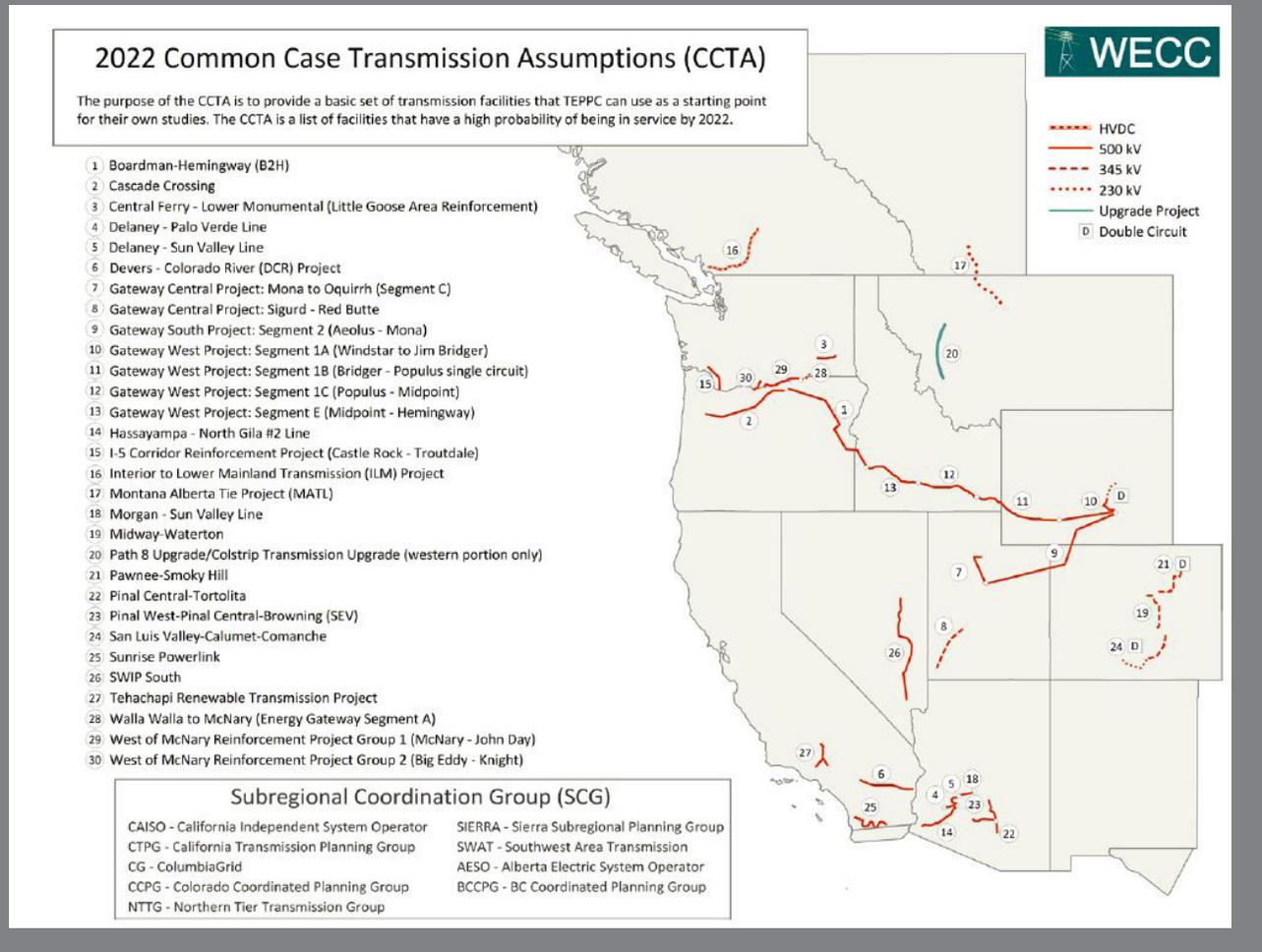
frastructure providers find themselves caught between customers who have become accustomed to low energy costs and continue to demand low costs, and those policies that promote renewable energy, conservation and the green economy with the potential for incrementally higher energy costs.

In Utah, peak demand for electricity rose steadily through the 1990s, with significant increases in the years prior to 2008. While growth has slowed significantly, consumer demand for electricity is still growing. The demand for natural gas has followed a similar path since natural gas is now increasingly being used for electricity and faces the same challenges.

Electric and natural gas transmission is a key part of any state's overall energy policy, but it is the most difficult component of the energy delivery system to construct. Long planning timelines, large geographic footprint, complex permitting from multiple jurisdictions and huge capital costs make energy transmission the most complex and highest risk enterprise an electric utility can undertake. Regardless of the energy policy selected, the mix of generating resources utilized-fossil fuels, nuclear, wind, solar or geothermal-all require

Figure 4: Proposed western foundational transmission projects by 2020

Source: Western Electricity Coordinating Council



robust transmission capacity to move electricity and natural gas to where customers need it.

Electrical transmission is accomplished by above-ground high voltage lines. The last major additions to the electric transmission network in the Western U.S. were made some 20-30 years ago. While some companies have begun major transmission additions or proposed major projects, the huge capital cost of transmission is a barrier to new investment. Because State policies still require that most transmission construction costs be borne by the retail customers of the load serving entity that construct them, few investor- or consumer-owned utilities have committed the large capital investment required for such projects, despite

a pressing need. Likewise, private investors have been reluctant to propose projects of their own or commit funding to projects proposed by others.

During the summer of 2009 Rocky Mountain Power served approximately 85% of the total electrical peak demand in the State of Utah.⁶⁷ The peak demand in the Wasatch Front of Utah (Ogden area to Spanish Fork area) is 80% of the peak electrical demand for the entire State. This area is Rocky Mountain Power's largest and highest density urban load center. It also represents some of the company's greatest challenges in providing safe, adequate and reliable transmission service due to large population and established communities, land use (both existing and future planned) and the limited

Table 5

Existing Natural Gas Transmission and Distribution Pipelines in Utah				
Source: Questar Gas				
Pipeline	Miles of Gas Transmission Pipeline	Miles of Gas Distribution Pipeline	Total Miles of Gas Pipeline	Utah Interstate Pipeline Interconnection
Kern River Northwest Pipeline	712	0	712	1
Questar Pipeline	2,500		2,500	2
Questar Gas*	1,029	15,909	16,938	11
Total Customer Interconnections	4,241	15,909	20,150	14
State Tax Commission Est.**	1,957			

Table 6

Proposed Natural Gas Transmission Pipelines in Utah					
Source: Questar Gas					
Pipeline	Project Name	Miles of Transmission Pipeline	Pipe Diameter	In-Service Date	Description
Kern River	Apex Expansion	2.8	36 inch	11/1/2011	This project will close the currently unlooped of Kern River's pipeline in the Wasatch mount
Questar Pipeline	ML 104 Extension	23.5	24-inch	11/1/2011	This project extends QPC's mainline to the east receive gas from the processing hubs in the Uintah Basin of Utah
El Paso Natural Gas	Ruby Pipeline	181.5	42-inch	Spring 2011	This project transports Rocky Mountain natural gas to end users in California, Nevada and the Pacific northwest

geography available to site and construct transportation facilities.

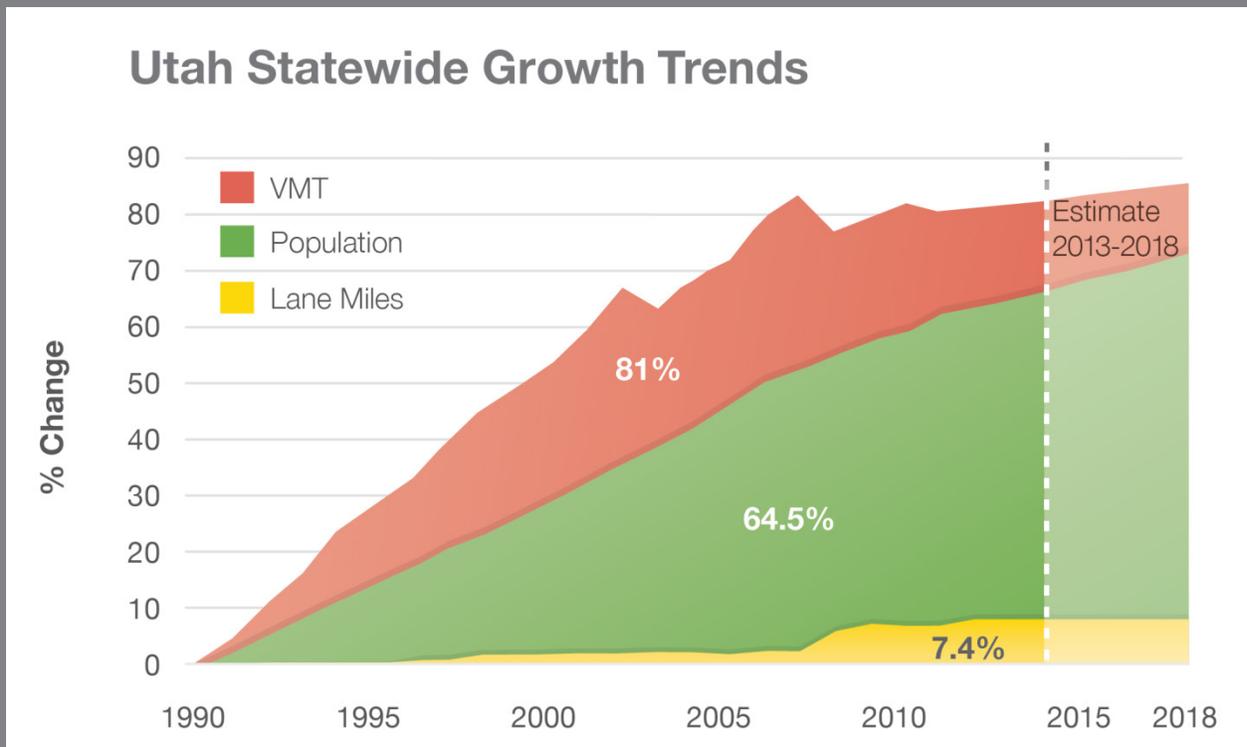
There are approximately 150 electrical interconnection points to Rocky Mountain Power's transmission system alone. The Company provides transmission services to more than eight other transmission owners and load serving entities. There are eight major electrical transmission paths that interconnect the State of Utah to bordering states. All of these existing paths are currently fully subscribed for transmission usage and have constraints and limits regarding their ability to serve

the State long-term.

Figure 4 is a map of electrical transmission projects with a high probability of being in service by 2022 within the Western Electricity Coordinating Council (WECC)⁶⁸ and projected to be developed over the next 10 years. These projects are being proposed by a number of sponsors, including electric utilities and independent power producers and private investors. Update on these projects. Utah's transmission plan should be developed in coordination with sub-regional and WECC transmission plans, and Utah should work with other states/prov-



Figure 5: Comparison of population growth, increased vehicle miles traveled and highway mileage change in Utah. Source: Utah Department of Transportation



inces in the Western Interconnection to capitalize on synergies among transmission development in other states/provinces.

Natural gas transmission is accomplished by underground pipes, which have seen dramatic growth in the last 30 years. Natural gas export capacity from the Rockies has increased from 1.8 MMcf/day in 1980 to 8.1 MMcf/day in 2010. With the addition of the Ruby Pipeline and the Kern River expansion, which are scheduled to be completed in 2011, pipeline export capacity in the Rockies will be 10.4 MMcf/day. Pipeline transmission capacity inside Utah has dramatically increased as well, with new transmission capacity from Questar Pipeline and Kern River Pipeline. Questar Gas is also spending significant capital to replace and expand intrastate high-pressure feeder lines. Tables 5 and 6 provide more detailed information. Whether Utah is a net importer or exporter of natural gas in the future is dependent on development of resources in-state and regional and na-

tional market forces.

Transmission of coal and gasoline are typically by train or truck. Leaks in oil pipelines in the Salt Lake Valley have been of particular concern.

To develop renewable energy projects within the State's borders, additional transmission capacity would need to be built. To build a clean energy economy, gain more energy independence and promote development and jobs, Utah will need to develop its own large-scale renewable energy projects. A major obstacle to getting these sources on the grid is the availability of transmission to collect the output of these renewable resources from remote locations. Utah's regulatory framework is not currently set up to make this possible.

Potential barriers to transmission infrastructure development include financing, integrated planning across all levels of government and permitting procedures. Funding methods, sources and options need to

be explored and implemented, while building on previous state-based efforts. A long-range transmission feasibility study of a large-scale renewable energy projects in the state should be considered. Such a plan would include significant stakeholder input upfront. Substantial public and private sector participation, combined with the utilization of natural and cultural resource data early in planning and budgeting can help secure as much public support as possible. This, in turn, would reduce the probabilities of suits against any future projects that may be built as a result of the plan, facilitate permitting and produce more efficient siting and mitigation practices, thereby saving time and resources.

With the projected increase in travel and population, there is a need to expand the State transportation system, as defined in the Utah Long Range Plan. The Utah Department of Transportation (UDOT) maintains over 6,000 miles of highway infrastructure and 35,000 miles of road within the State of Utah. Currently there are 1.6 million drivers. This number is expected to grow 65% to 2.6 million by 2030. Population is expected to grow from 2.8 million residents in 2011 to 4.1 [3.9] million residents by 2030. See Figure 5. The amount of travel has increased faster than the rate of growth of the population. UDOT estimates that it will require \$10.2 billion between now and 2030 to maintain the physical condition of the highway system at its current level.

There may be opportunities to both improve the energy transmission network and the transportation system that offers both overall efficiencies and reduced impacts through better coordination and planning.

RECOMMENDATIONS TO SUPPORT TRANSMISSION DEVELOPMENT:

Consider alternatives to current regulation and funding sources to encourage transmission line and pipeline construction in areas that promote economic development or renewable and alternative energy resource development. State economic regulation requires that

investments be prudently made, competitive cost (risk adjusted) and used and useful for existing and future customers. Federal and state regulation requires non-discriminatory application of all tariffs to transmission users. If stakeholders decide it is in Utah's best interest, legislation could be developed that creates a state authority and funding vehicle that would be granted to transmission companies or developers to build lines that are found to be not economic by state utility regulators.

The State needs a clear process for siting and permitting transmission infrastructure projects. Local opposition can impede the development of infrastructure projects, which are critical and vital for the economic health of the State and its communities. Review the authority for the Utility Facility Siting Board that would specifically address local zoning and conditional use requirements and determine modified language that would allow the Board to review proposed permitting requirements.

In 2013, the Office of Energy Development commissioned a [Transmission Permitting Guide](#) summarizing the process of siting transmission lines across multiple jurisdictions and land ownership types. This report is a resource for the benefit of transmission developers in Utah, and will be followed by additional transmission policy analysis in 2014.

Inadequate coordination among state agencies involved in siting and permitting activities can impede the development of infrastructure projects. There are competing requirements and lack of standard policies relating to linear facilities within various State agencies. Strengthen the State infrastructure departments mission and support, review all State agencies' roles in successfully completing facilities development and consider options for better coordination among state and federal agencies.

Public interest multiple infrastructure corridors cannot be secured without funding and right-of-way acquisition. Infrastructure providers do not generally have



mechanisms to acquire future rights-of-way that meet state law and provide a return on that long-term investment. Develop funding methods to acquire long-term multiple infrastructure corridors. Review the statutory framework to identify options to provide funding to acquire Utah interest in joint corridors.

Infrastructure should be built in a way to minimize environmental and social impacts. For example, in July 2013, the Utah Office of Energy Development supported Enefit American Oil's utility corridor project, which promises to provide important project infrastructure that will greatly benefit the local economy without sacrificing environmental protection. Federal, state and private land owners often prefer impacts to be located elsewhere. Work with the Governor's Office to create a forum to balance infrastructure and the environment in the management of public and private lands. Create a team to develop specific language and recommendations that the State can take to federal land managers.

Encourage strong energy efficiency, demand-side management measures and distributed generation to minimize the need to build additional transmission. Fixed cost recovery is a problem and stakeholders disagree on the appropriate level of spending on demand-side management measures. Create a multi-dimensional stakeholder group to further discuss the issues. Utilities work with stakeholders to develop policies that encourage demand reduction and energy efficiency participation at optimal levels. Consider policy changes recommended by the stakeholder group.

VIII. Developing and Applying Technology and Science

Utah's heavy reliance on fossil fuels, coupled with rapid growth in the demand for energy and new environmental regulations, calls for a strategic energy plan to secure Utah's energy future. To stimulate economic growth, protect the environment and develop the State's vast energy resources, Utah must invest in its energy research and development infrastructure and

improve coordination of the State's research universities, national energy laboratories, energy research and development industry, energy-related university spin-off companies and other key partners to collectively contribute to the development and deployment of energy technologies and work force capabilities.

Access to low-cost energy is a key incentive for businesses to expand in Utah and to locate in the State. However, Utah is facing a potential risk from carbon and green-house gas emission legislation on the cost of electricity in the state. Rapid growth in the demand for energy, coupled with new environmental regulations, will lead to higher costs for energy, which in turn could negatively impact the State's competitive position for job creation, as well as business attraction and retention.⁽⁶⁹⁾ While the electricity in Utah is primarily generated from fossil fuels, accounting for 96% [95%] of Utah's total electricity production in 2009 [2012], a significant portion of this generation is exported to other states. Electric power providers serve the State with a portfolio of resources (coal, natural gas, hydroelectric, wind, geothermal, purchased power, etc.) that are included in customers' electricity prices and mitigate the exposure to economic effects of federal regulation of carbon dioxide and other greenhouse gas emissions. Development of new energy resources is becoming increasingly costly and challenging while Utah's energy demand growth, competition for water resources and air quality issues place additional upward pressure on energy prices. While the state's energy costs will continue to increase, other states will likely also experience similar pressures.

To address these challenges and take advantage of its vast energy resources and talented workforce, Utah will have to take several key steps:

- Enhance the State's energy research facilities and continue to attract world-class researchers to the State.
- Align the State's main research universities - University of Utah (U of U), Utah State (USU) and Brigham Young University (BYU) - into a powerful



energy research and development triangle.

- Connect this “Research Triangle” with global industry, national laboratories and regional universities to effectively commercialize new energy technologies and develop Utah’s conventional, alternative and renewable energy resources.
- Empower Utah’s education system to expand its ability to train, attract and retain the skilled talent necessary to grow Utah’s energy economy.

Utah’s Research Triangle will optimize the role of the U of U, USU and BYU as innovation leaders in energy economy. The faculty, staff, students and facilities are engaged and respected on a global basis, and Utah’s research universities are among the nation’s leaders in many areas of energy research and development. Their separate capabilities are impressive, yet their efforts could be more effective, through increased collaboration. The research universities investment in developing and deploying energy technologies includes research faculty and programs; research labs and related infrastructure; commercialization offices; and coordination with industry, national labs, regional universities and State commercialization and economic development agencies. The research universities will also work closely with Utah’s other universities, such as Weber State University, Utah Valley University and Southern Utah University, where notable energy research initiatives have already been established.

Utah’s Research Triangle is well-connected nationally and internationally and has access to regional energy industry technology leaders with a global reputation for implementing and commercializing technologies developed within the Research Triangle. Closer collaboration between Utah’s research universities, industry, national labs and state agencies will help achieve even greater returns on Utah’s investment in energy research and development. Improved collaboration will also improve deployment of technology to develop Utah’s natural energy resources affordably with minimal environmental impact. Additional information regarding specific re-

search at the universities is also available in the Subcommittee’s full report.⁷⁰

A. *The University of Utah*

The University of Utah (U of U) is Utah’s largest research institution and is ranked among the top 30 public research universities in the nation. Best known for its health sciences research, the U of U has also established itself as a leader in energy research. The U of U is home to two of the nation’s leading energy research institutions, the Energy & Geoscience Institute (EGI) and the Institute for Clean and Secure Energy (ICSE). EGI is a leader in fossil fuel, geothermal and carbon sequestration research. EGI research projects cover the globe and 70 of the world’s leading energy companies support its research. EGI is continuing to expand both its applied research in hydrocarbons, as well as geothermal and carbon management applications for both government and industry. ICSE is a leader in fossil fuel combustion, gasification and computer modeling research. ICSE utilizes its impressive off-campus pilot-scale research facilities, and partners with industry to commercialize new technologies for responsibly utilizing conventional and unconventional fossil fuel and biomass resources. ICSE’s carbon mitigation program includes oxyfuel combustion, chemical looping and gasification.

The University of Utah also has emerging energy research programs in such areas as solar power, renewable energy storage, biofuels and smart-grid technologies. The Technology Commercialization Office at The University of Utah manages the commercialization of energy technologies produced at the university. The University of Utah will work closely with the Energy Commercialization Center to promote its successful model for bringing university-based renewable energy and energy efficiency technologies to market.



B. Utah State University

Utah State University (USU) is Utah's land-grant institution and home to several world-class research, development, demonstration and deployment platforms. USU is proficient in the areas of natural resource management and mitigation, agricultural development, animal and veterinary science and water resource management. Further, the University plays host to Energy Dynamics Laboratory, Colleges of Engineering and Science which are national leaders in bio-fuels, environmental monitoring and sensing, waste-water treatment, hybrid energy systems, electrical engineering, nuclear, geothermal and wind profiling. USU also has the ability to address environmental issues and socio-economic issues. Finally, USU is a world leader in the area of space sensing and imaging, with a 50-year history of designing, engineering, constructing, calibrating and deploying satellites and sensing equipment for NASA, JPL and US Department of Defense. Much of this work is now being brought to bear on terrestrial efforts related to weather, environment and energy both in the academic and commercial areas.

The USU Technology Commercialization Office is tasked with commercializing USU energy technologies. USU is uniquely equipped to test and deploy energy technologies in rural Utah through its rural partnerships and extension program. USU has just opened the Bingham Energy Research Center in the Uintah Basin; the center serves as a research center and to educate the workforce in energy-related careers.

C. Brigham Young University

Brigham Young University (BYU) is a private university engaged in substantial research and commercialization activities regarding environmentally sound energy resources. Research is both applied and academic with considerable strength in combustion, bio-mass, gasification, clean coal, and carbon management. Central to BYU's capability is the Advanced Combustion Engineering Research Center (ACERC) and the Technology Trans-

fer Office (TTO). The ACERC has a global reputation for modeling and experimental work on clean coal combustion and has expanded to focus on sustainable energy. The TTO is a national leader in commercializing technology and products efficiently. BYU also has numerous initiatives in hybrid energy technologies and carbon management with expertise and intellectual property in both carbon capture and storage.

D. Research Partners

Utah's research universities seek closer research collaboration with all of the Nation's laboratories. In particular, the Idaho National Laboratory (INL) is collaborating with the State's universities on numerous projects. The Research Triangle can benefit greatly by expanding this relationship with INL, as well as pursuing collaboration with additional Department of Energy national assets in the region and energy space such as Los Alamos, National Renewable Energy Laboratory, Oakridge National Laboratory, National Energy Technology Laboratory and others.

INL, with its headquarters in southeastern Idaho, is one of ten multi-program national laboratories. It is a unique resource serving as one of America's premier energy research laboratories with a mission to develop and advance clean, smart and secure energy systems essential to national security, economic prosperity and environmental sustainability. INL has lead responsibilities for the Nation in nuclear energy research but also engages in research regarding development of fossil, renewable and integrated energy systems.

INL is dedicated to collaborating with regional research institutions, government, and industry in addressing current and anticipated energy challenges. As part of this effort, INL has been building key relationships in the Western Energy Corridor, a transnational region containing world-class energy resources strategic to North American energy security and regional economic development. Utah is key to the Corridor and hosts many of these resources.



Utah's energy industry is leading the way in research and development in such fields as geo-mechanics, new material technology and clean coal technologies. Examples of the leaders developing technology in the State include TerraTek, Ceramatec and Combustion Resources. TerraTek is a global leader in geo-mechanics laboratory testing and analysis provides multidisciplinary expertise in geosciences and engineering. Its expertise lies in unconventional gas recovery, drilling and completions performance, core-log integration and rock mechanics. Ceramatec is a national leader in developing new materials technology for the energy industry. Its focus is energy and environmental (clean-tech) areas, including industrial applications of ionic conducting ceramics and electrochemistry and fuel reformation and synthesis. Regionally, Combustion Resources' clean coke demonstration plant converts regional carbonaceous materials such as coal, coke fines, and chars into high-grade metallurgical coke. Utah is blessed with regional universities and colleges that grant bachelor degrees in science, technology, engineering, math, and commercial subjects that support energy producers, users, and research with a skilled work force. These institutions provide for a full spectrum of training from high school through post-doctoral education.

The eight Utah College of Applied Technology (UCAT) campuses, Salt Lake Community College, and other institutions of higher education offering energy-related technical training fill an essential role in developing and maintaining a technically-trained Utah workforce. These institutions focus on the safety, regulatory, implementation, production and other technical certifications that energy employees must possess. Typically, several technically-trained employees function as support to each researcher and engineer in the energy industry occupations.

E. Research Initiatives

- The U of U, USU and BYU should collaborate and optimize research capabilities and efforts. Recognizing the accomplishments and addressing the

challenges of this collaboration will be the focus of semi-annual meetings convened by the Governor's senior energy official and attended by each university's senior energy research official at the State Capitol.

- INL should be invited to provide a senior staff member to participate in the Utah Research Triangle semi-annual meetings. Other national laboratories may be invited in the future.
- The Research Triangle will review the report and conclusions of the Utah Cluster Acceleration Partnership and implement findings appropriate to optimizing the welfare of the State of Utah and regional partners. The Utah Cluster Acceleration Partnership has worked extensively with industry, academia, and government to accelerate and support the expansion of Utah's energy industry and to fashion a well-trained workforce possessing the critical skills needed by this industry.
- The Energy Research Triangle continues to partner with UCAP to support energy education and workforce development, and to advance innovation and research in Utah's higher education institutions. Through such initiatives, Utah can maintain its leadership in energy and economic development.
- The Research Triangle will expand its interaction with regional technology leaders through collaborative efforts lead by the Governor's senior energy official and senior energy research official from each of the Universities towards commercialization and implementation of technology to meet Utah's energy challenges.
- Directed by the Governor's senior energy official and senior energy research official from each university, the team will collaborate with industry to form plausible solutions to energy challenges. The efforts include collaboration with Idaho National Laboratory and the Utah Cluster Acceleration Partnership to encourage energy career trainings and skilled workforce. To implement this recommenda-





Bingham Entrepreneurship and Energy Research Center

Utah State University's Bingham Entrepreneurship and Energy Research Center works hand-in-hand with the energy industry and government agencies to bring real life solutions to environmental issues by researching wintertime air quality, endangered species, and water and soil quality. Additionally, the Center works to develop environmentally-friendly energy technologies and new methods for environmental measurements.

tion on an annual basis, the research universities will alternately host a Utah Energy Symposium to present topics related to Utah energy resources, reserves, new developments, new installations and facilities and other emerging topics.

- The [Governor's Energy Development Summit](#) has consistently highlighted emerging resources and technologies, while drawing participants from Utah's research universities. Programs and presentations from past years are available on the OED website.
- Funding that encourages collaborative efforts in the research and development community is

currently insufficient to promote and enable significant collaborative research. The Governor's senior energy official and the senior research official associated with energy at each of the universities will propose appropriate budget items at the State and federal level specifically focused on promoting cooperation between the Research Triangle in energy research and technology.

- The Department of Energy's national laboratories present significant opportunities to collaborate on critical research and development needs for the State, region and nation. The Research Triangle should expand its interaction with Department of Energy national laboratories, and specific funding should be identified to promote opportunities for appropriate collaboration in the State and nation's interest.
- Utah is positioned with natural resources, research institutions, capable industry and regional support to conduct meaningful demonstration scale projects that can lead to cost effective commercial and environmentally sound energy development.
- Demonstration-scale research projects supported by the State of Utah should be conducted by unprecedented partnerships between the Research Triangle, national laboratories, industry and the public sector to capitalize on the region's rich resources to meet the region's energy needs in an environmentally sensitive manner.

Implementation of these recommendations will significantly improve Utah's energy research, development and deployment performance and foster unprecedented collaboration between academia, government, laboratories and industry.



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