



Utah Policies and Regulations Support for Clean Coal, Carbon Capture, and Sequestration

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Utah Leadership: Energy and Minerals Development



- ▶ The Governor's Office of Energy Development (OED) serves as the "primary resource for advancing energy and mineral development in the state" through a variety of means including incentives and other forms of industry assistance, implementation of the state's energy policy (63M-4-201) and the Governor's energy sector goals and objectives, and engagement in energy and mineral education and outreach to K-12 and the broader public, including workforce development and research initiatives. (63M-4-401)
 - ▶ **Advancing energy policy solutions**
 - ▶ **Protecting affordable energy costs**
 - ▶ **Developing infrastructure and business opportunities**

Powering Utah's Economy

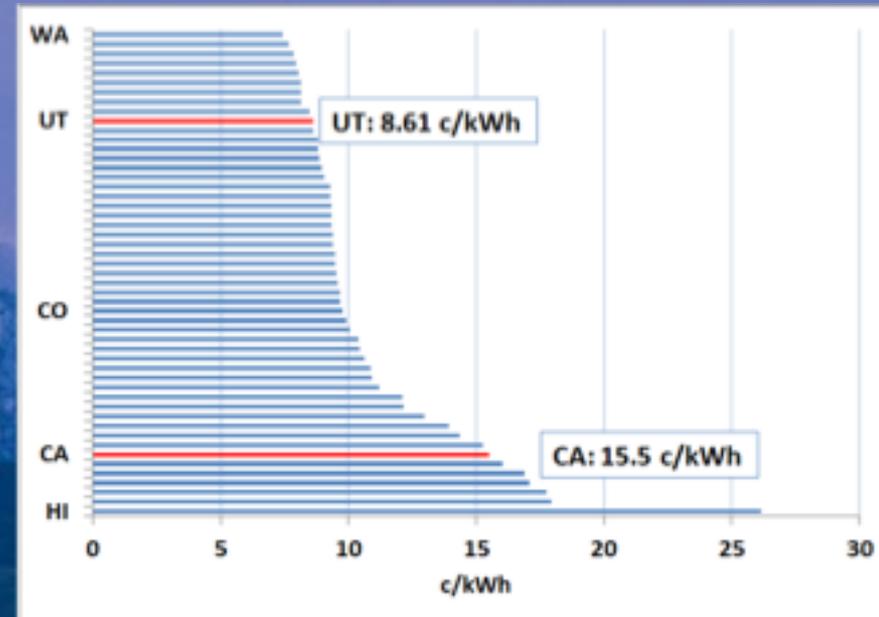
Energy & Minerals

- \$20 billion Industry
- 50K high paying jobs
- \$656 million in taxes, fees to local and state government

Exports

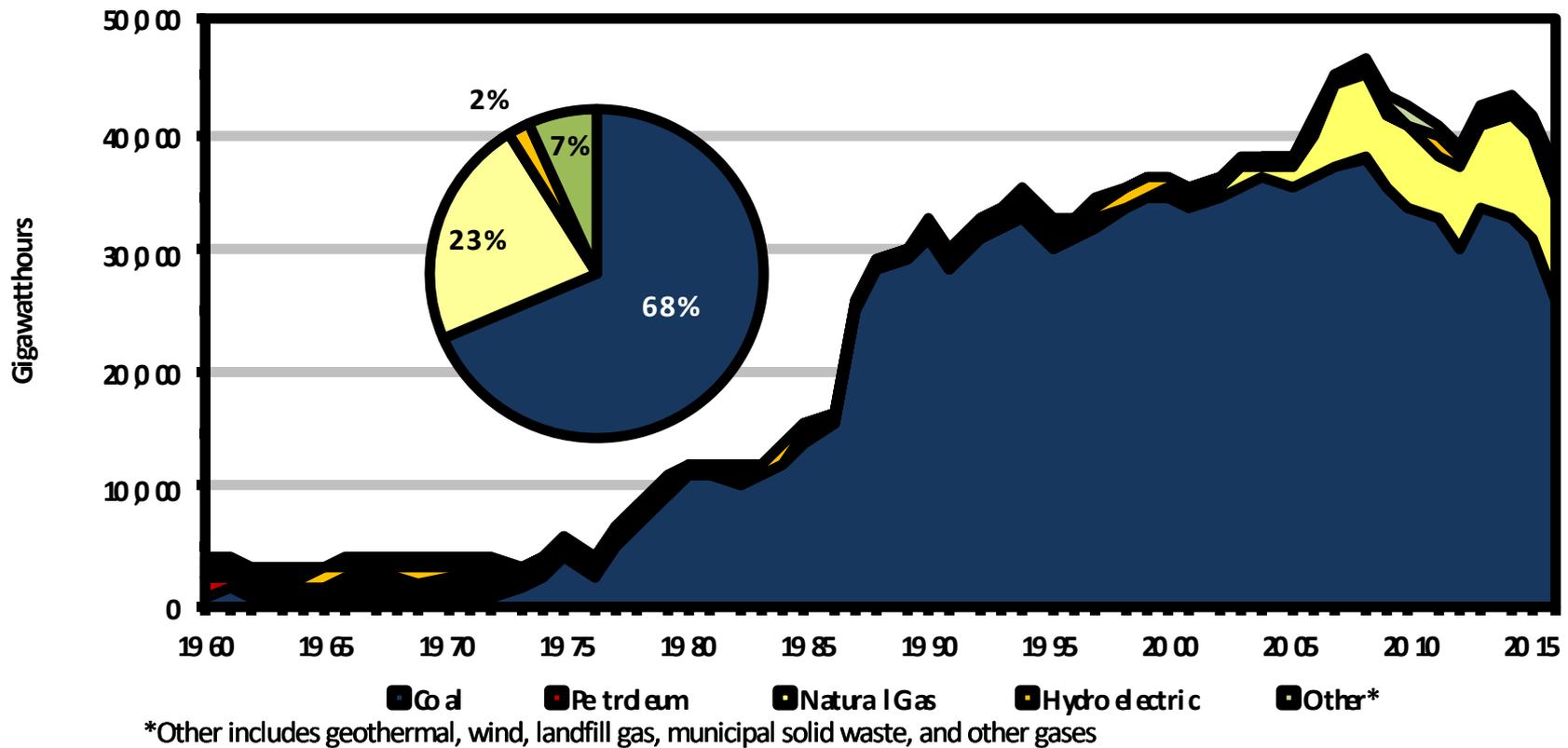
- 18% of energy produced
- Nearly 100% of non-fuel minerals produced

Affordable Electricity Rates



Utah Energy Mix: Electricity

Utah Electricity Generation 1960 - 2016



Forward Looking Policy



- **SB 115 Sustainable Transportation and Energy Plan Act**

This bill allowed the Utah Public Service Commission to authorize a large-scale electric utility to implement tariffs to provide funding for a sustainable transportation and an energy pilot program. The legislation directed the commission to authorize a large-scale electric utility to implement a clean coal program.

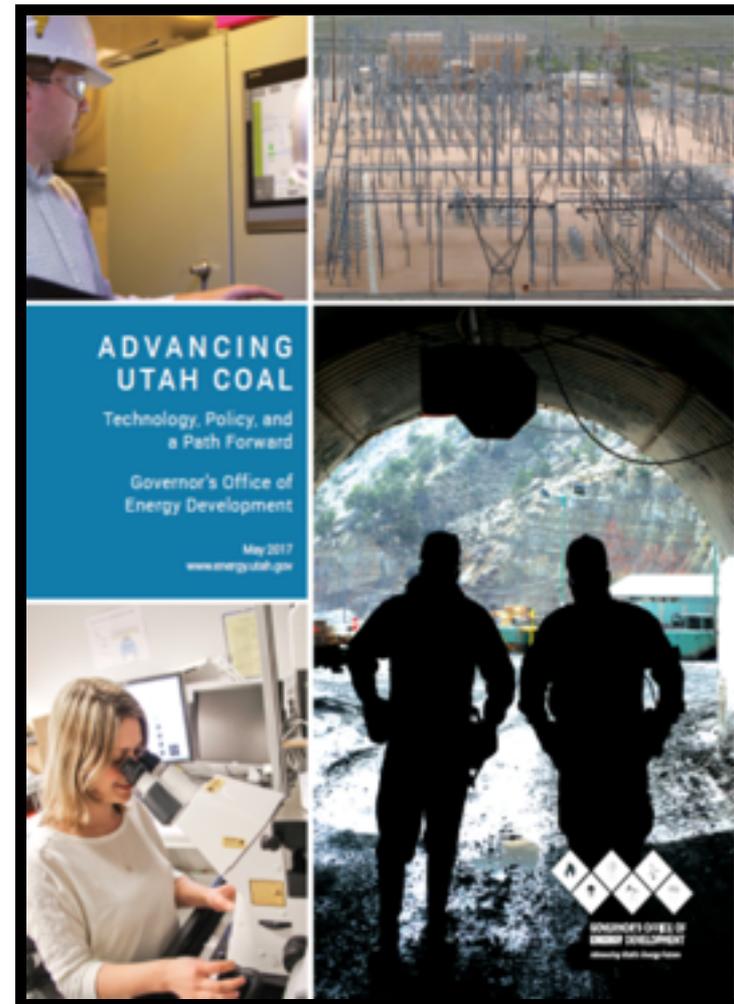
- **H.C.R. 7 Concurrent Resolution on Climate Change**

This resolution acknowledges that average global temperature and average Utah temperature have increased over recent decades and that there is some scientific consensus that a cause for these increases may be human-caused emissions; and states that the Legislature and Governor will continue to base decisions regarding state energy policies on the best scientific evidence available and will continue to urge individuals and corporations to conserve energy.



State Focus on Coal Innovation

- Advanced Combustion
- Carbon Management Systems
- Coal to Products



University Research Programs

- **University of Utah (U of U)**

The Clean and Secure Energy (CASE) from Coal program mission is to generate scientific and technical breakthroughs that utilize the vast energy stored in our domestic coal resources and to do so in a manner that will capture CO₂.

Technology development includes:

- ▶ Oxy-coal Combustion
- ▶ High-Pressure, Entrained-Flow Coal Gasification
- ▶ Chemical Looping Combustion

The Carbon Science & Engineering Research Group at the U of U undertakes research that investigates carbon capture and sequestration

- **Brigham Young University (BYU)**

BYU's Advanced Combustion Engineering Research Center (ACERC) supports research in the areas of pyrolysis of coal and low-grade fuels.



Utah's Tech Sector: Process Innovation

Utah's high-tech sector has successfully moved the needle forward in several coal technology development areas that have resulted in multi-million dollar programs. Two companies leading out are:

Sustainable Energy Solutions – Orem, Utah

Develops innovative solutions to sustainability problems within the energy industry. Their Cryogenic Carbon Capture™ technology eliminates most emissions from fossil fuel combustion while enabling better use of intermittent renewables through grid-scale energy storage. This carbon capture technology is projected to cost half as much as alternatives and can be designed for coal, natural and fossil-fueled cement plant operations.

Reaction Engineering International – Murray, Utah

- ✓ Designed and constructed a dry pulverized coal feeding and firing system for an entrained flow pressurized reactor and determined how dry feeding affects overall performance. <http://energy.gov/fe/articles/doe-announces-more-10-million-advanced-combustion-systems-research>
 - ✓ Investigated the recovery of Rare Earth Elements (REE) from coal and coal byproducts. <http://energy.gov/fe/articles/doe-selects-projects-enhance-its-research-recovery-rare-earth-elements-coal-and-coal>
 - ✓ Modeled tools and mechanisms capable of describing high-temperature and -pressure oxy-coal combustion. <http://energy.gov/fe/articles/advanced-combustion-systems-projects-selected-funding>
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Utah Coal: A High Quality Natural Resource

- ▶ Technological improvements and environmental concerns are changing the mix of primary energy demand but oil and gas, together with coal, are predicted to remain the main sources of energy to 2035. (1)
- ▶ Utah's high BTU, low sulfur, low mercury, low-ash, and low-moisture coal, as an export product, will support global market capabilities to meet cleaner coal combustion goals.
- ▶ Utah has significant quantities of high-BTU (British thermal unit), low-sulfur and low-moisture coal. The average heat content for coal mined in Utah ranges from 10,000 – 11,966 BTU/lb. (2)



Coal-fired Power Generation

- Despite the roll back of the Clean Power Plan the state's coal-fired power plants are on track to reduce emissions.
- State officials support realization of full economic life of Utah's coal-fired power plants.
 - Huntington (1,037 MW) scheduled to be retired after 2036
 - Hunter (1,577 MW) expected end of life 2042



"The Clean Power Plan was already a reflection of what we were doing," Paul Murphy, spokesman for Rocky Mountain Power

Advanced Coal Resource Group

Purpose: To create a technology and energy policy group that will help its members identify future opportunities for their coal resources.

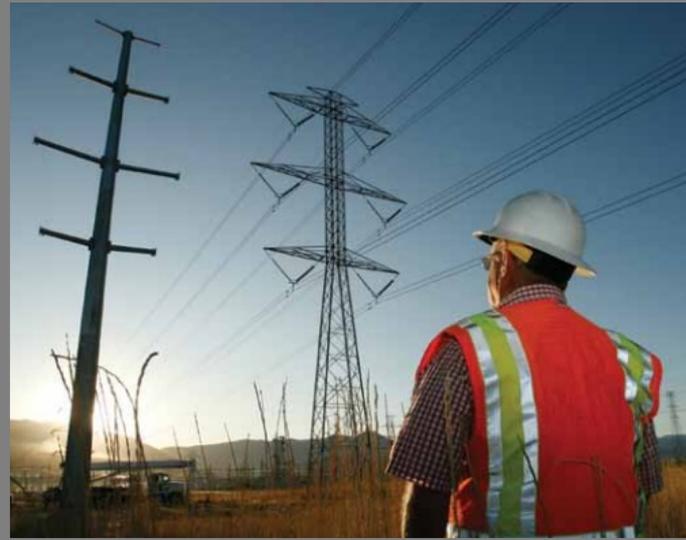
- ❖ Formed in 2017
- ❖ Over 50 stakeholders
- ❖ Meets regularly
- ❖ Facilitated by the Office of Energy Development



Bronco Coal Mine, Emery County, Utah



High Cost Infrastructure Tax Credits: *Advancing Clean Energy Development*



Powering Utah's Clean Energy Future

QUESTIONS?



GOVERNOR'S OFFICE OF
ENERGY DEVELOPMENT

Advancing Utah's Energy Future

