

# UTAH STRATEGIC ENERGY FRAMEWORK

## Prepared by the Utah Energy Strike Team

### Background

H.B. 426, passed in the 2023 General Legislative Session, requires the development of a strategic plan to achieve the state's energy policy of adequate, reliable, affordable, sustainable, and clean energy resources. The Utah Energy Strike Team prepared this **Utah Strategic Energy Plan Framework** under the leadership and direction of the Utah Office of Energy Development (OED) and the Utah Department of Natural Resources. The Strike Team, which consists of representatives from the Legislature, state agencies, energy companies, research universities, and other partners, met throughout summer and early fall 2023 to provide input and technical information to OED. This Strategic Energy Plan Framework provides a summary of the Strike Team's work. A compendium also presents valuable supporting data.

### Strategic Energy Framework and Process

The Strike Team recommends a human-centric energy plan that supports the well-being of all Utahns. The keystones of this human-centric approach are adequate, reliable, affordable, sustainable, and clean energy. Any disruption to supply diminishes living standards and puts human lives at risk.

The Strike Team reviewed data and analysis, listened to industry experts and researchers, and consulted with policymakers. Consumer preferences were represented indirectly through customer survey responses. The framework includes five major findings and nine recommendations for the 2024 General Legislative Session.

## FINDINGS

**Opportunity** – Utah's diverse energy and mineral portfolio sets Utah apart from other states. We face an exciting opportunity to harness Utah's energy strengths in fossil fuels, nuclear, geothermal, wind, solar, salt/hydrogen storage, critical minerals, and other assets to support Utah's long-term prosperity. Utah also continues to benefit from relatively low-cost energy to support an expanding economy.

**Challenge** – Utah faces serious energy challenges related to 1) federal government command and control and inconsistent policies, 2) external policies and market forces outside state control, 3) geopolitical uncertainty, and 4) increased energy demand for Utah's rapidly growing economy and population.

**Imperative for active state role** – To capitalize on the opportunities and address challenges, state government must take a more active role in supporting and safeguarding Utah's energy future.

**Investment** – Significant investment in energy planning, legal protections, research, workforce development, and public policy expertise will pay large dividends to Utahns.

**Holistic energy approach** – Too often, policymakers define energy as electricity. It's critical state leaders recognize all facets of energy, including but not limited to, energy used for transport, heating, and other vital needs.

## RECOMMENDATIONS

We recommend a suite of energy bills and appropriations for the 2024 General Legislative Session. These recommendations include input from the Unified Economic Opportunity Commission:

- 1. State code** – Recodify state energy policy to recognize current technologies, global conditions, and supply and demand realities. Include in state code decision-making principles to inform the implementation of energy policy.
- 2. Legal support** – Continue to aggressively coordinate and fund the state's legal strategy in combating federal environmental and energy overreach and permitting delays.
- 3. San Rafael Research Center** – Provide state support to and leadership over the San Rafael Energy Research Center, leveraging Utah's abundant resources in concert with the Utah Innovation Lab.
- 4. Long-term supply and demand** – Support strategic energy planning by funding the development of rigorous projections of Utah's long-term energy supply and demand future. Include a baseline projection and likely alternative scenarios.
- 5. Research** – Provide state matching grants for research initiatives at Utah colleges and universities in the areas of grid modernization, critical minerals, energy transport, hydrogen, carbon capture, storage, nuclear energy, clean energy sources, and coal innovation (including clean coal, alternative uses, advanced manufacturing, and system engineering).

- 6. Workforce** – Enlist the Utah System of Higher Education’s *Talent Ready Utah* team to meet growth in the energy workforce by means of certificate programs and apprenticeships. Continue to support science, engineering, math, data science, geoscience, and other high-demand degrees that support Utah’s energy sector.
- 7. Incentives** – Continue to fund post-performance incentives in Utah mining, processing, and refining.

- 8. Energy and minerals coordination** – Form an energy and minerals coordinating council to gather issues and ensure coordination among state agencies, legislators, and industry.
- 9. Infrastructure** – Develop state strategy for transportation, transmission line, pipeline, and other infrastructure needs.

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**REVIEW DRAFT ONLY/WORK IN PROGRESS**

**Conceptual Budget: Utah Strategic Energy Plan**

The Strike Team offers this conceptual budget as a starting point for legislative deliberations.

Item	One-Time	Ongoing	Notes
San Rafael Research Center	\$2 million	\$1-2 million	Discuss Emery County investment vis-à-vis state support.
Legal	\$1.5-2 million	\$1-2 million	Critical need for PLPCO, AG, and OED coordination
Long-term supply and demand projections		\$250 thousand	Estimated cost. To be administered by OED.
Research grants	\$1 million		Uncertainty about whether additional funds for FY24 are needed. Consider ongoing support. Tie into deep tech grants.
Workforce development	?	Talent Ready Connections Grants.	Work with USHE and institutions of higher learning to formalize this request.
Government relations (federal)		\$500 thousand	
<b>TOTAL</b>	<b>\$4.5 - \$5.5 million</b>	<b>\$2.75-4.75 million</b>	<b>CONCEPTUAL ONLY</b>



# DATA COMPENDIUM

## Strategic Energy Plan Framework



UTAH OFFICE OF  
**ENERGY DEVELOPMENT**

Prepared by the Utah  
Energy Strike Team  
October 11, 2023

H.B. 426, passed in the 2023 General Legislative Session, requires the development of a strategic plan to achieve the state’s energy policy of adequate, reliable, affordable, sustainable, and clean energy resources. The Utah Energy Strike Team prepared the Utah Strategic Energy Plan Framework under the leadership and direction of the Utah Office of Energy Development (OED) and the Utah Department of Natural Resources.

The Strike Team, which consisted of representatives from the Legislature, state agencies, energy companies, research universities, and other partners, met throughout the summer and early fall to provide input and technical information to OED. The Strategic Energy Plan Framework provides a summary of the Strike Team’s work.

This compendium organizes data and information that informed Utah’s Strategic Energy Plan Framework. The compendium includes a Utah energy overview, workforce development priorities, research priorities, and supporting appendices.

## Table of Contents

Strike Team Members .....	1
Utah Energy Overview .....	2
Utah Energy Workforce Development Priorities .....	10
Utah Energy Research Priorities.....	12
Appendices.....	13

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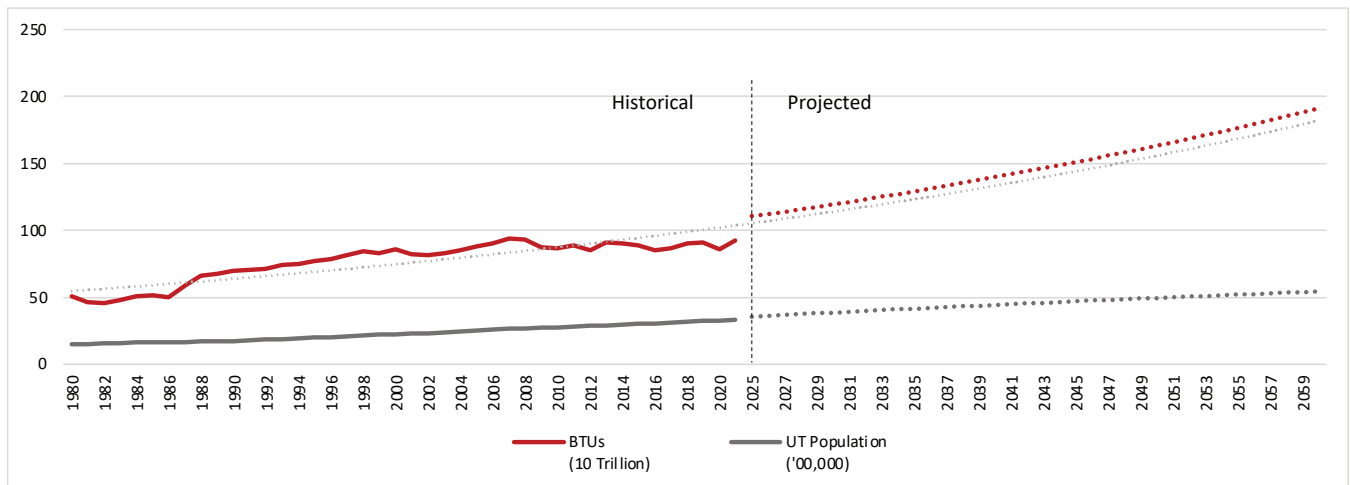
# Utah Energy Overview

Utah is an energy-rich state with vast resources. Utah's diverse energy and mineral portfolio sets Utah apart from other states. Opportunities exist to harness Utah's energy strengths in fossil fuels, geothermal, wind, solar, salt/hydrogen storage, critical minerals, and other assets. Utah benefits from relatively low-cost energy to support its expanding economy. Utah still faces serious challenges related to energy. They include federal government command and control

and inconsistent policies, external policies and market forces outside state control, geopolitical uncertainty, and increased energy demand for Utah's rapidly growing economy and population. It is imperative that the State takes an active role in supporting and safeguarding Utah's energy future by capitalizing on opportunities and addressing challenges. This energy overview provides Utah decision-makers data and analysis to help support and safeguard Utah's energy future.

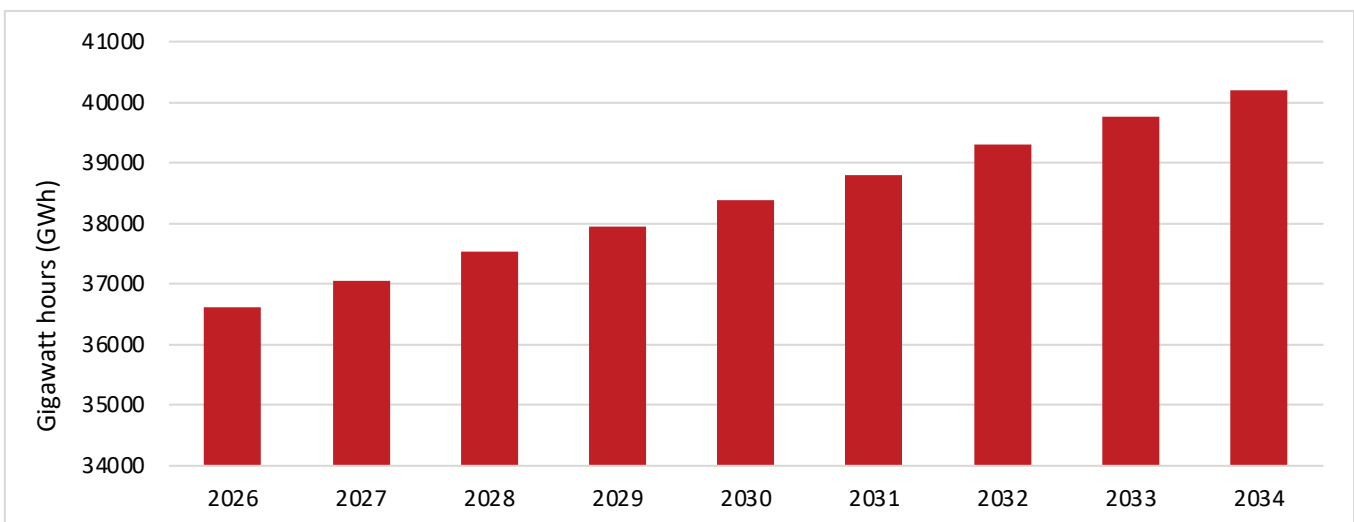
## DEMAND, PRODUCTION, AND CONSUMPTION

**Figure 1. Historical and Draft Projected Energy Demand and Population of Utah, 1980-2060**



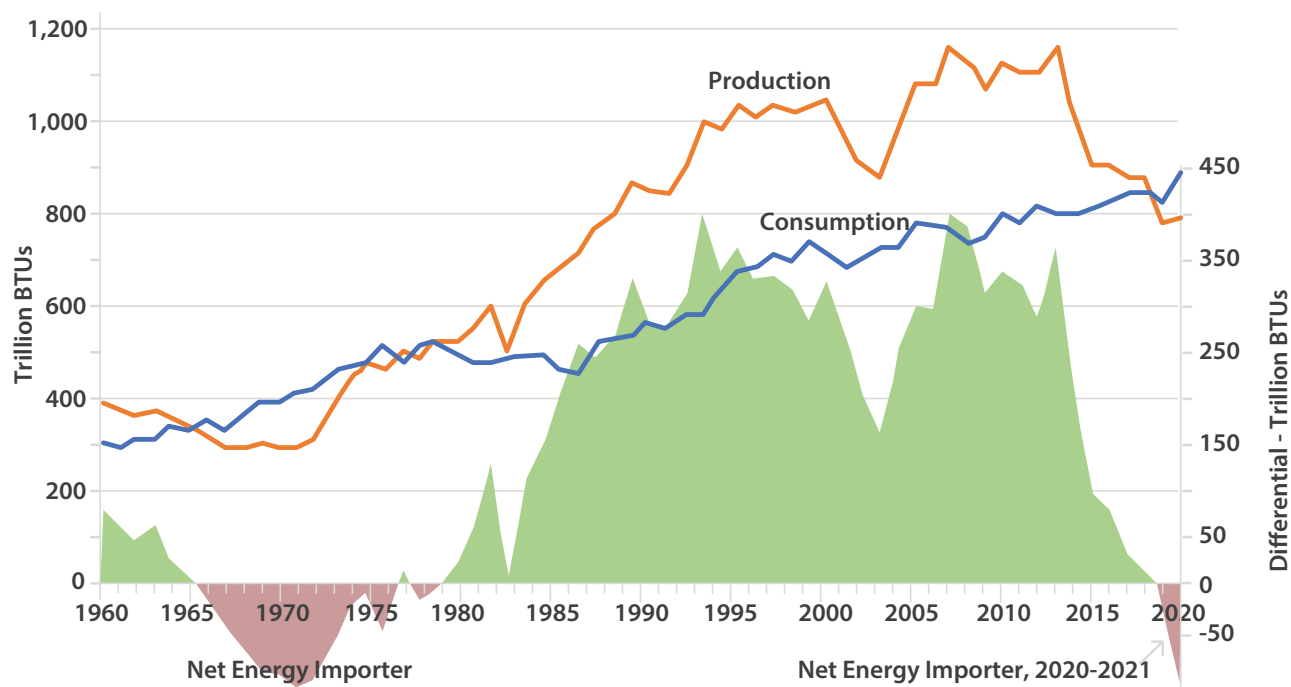
Source: Gardner Institute

**Figure 2. Projected Annual Electricity Demand for Utah Portion of PacifiCorp East BA, 2026-2034**



Source: Western Electricity Coordinating Council

**Figure 1. Historical and Draft Projected Energy Demand and Population of Utah, 1980-2060**



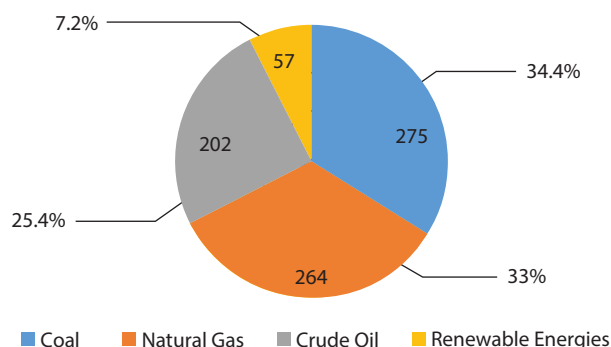
Source: Utah Geological Survey

**Insight 1:** Utah has become a net energy importer for the first time in 40 years.

**Insight 2:** US oil & gas production increased in response to the Saudi oil embargo in the 1970's, the Iran-Iraq war (1981), and Iraq's invasion of Kuwait (1991).

**Insight 3:** Utah coal production ramped up to supply the Intermountain Power Project, commissioned in 1986.

**Figure 4. Utah Primary Energy Production by Source, Trillion BTUs, 2021**

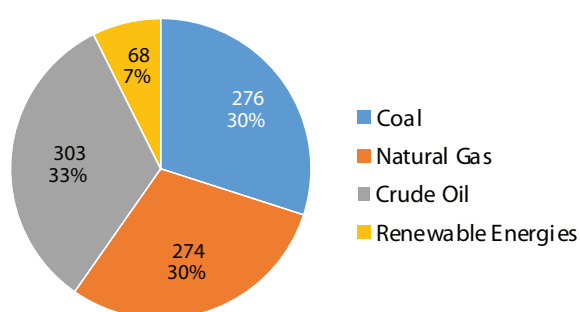


Source: United States Energy Information Administration

**Insight 1:** Primary energy is defined as state energy production plus energy imports, minus energy exports.

**Insight 2:** Renewable Energy accounted for 7.2% of Utah's Energy Production: Solar (4.7%), Wind (0.9%), Geothermal (0.5%), Hydro (0.5%), Biomass (0.5%).

**Figure 5. Utah Primary Energy Consumption by Source, Trillion BTUs, 2021**

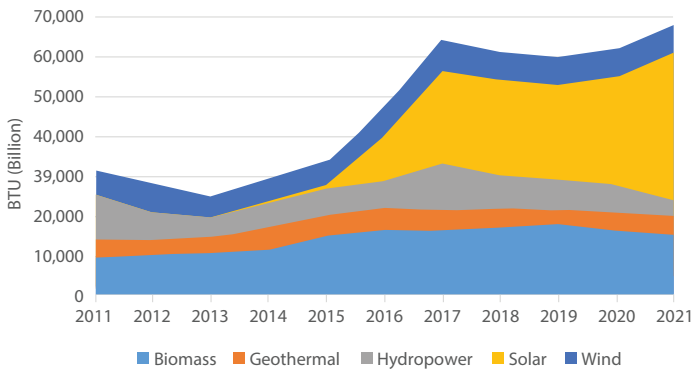


Source: United States Energy Information Administration

**Insight 1:** Primary energy is defined as state energy production plus energy imports, minus energy exports.

**Insight 2:** Renewable energies accounted for 7% of Utah's energy consumption: Solar (3.9%), Wind (0.79%), qGeothermal (0.48%), Hydro (0.47%), Biomass (1.6%).

**Figure 6. Utah Renewable Energy Consumption by Source, 2011-2021**



## NATIONAL RANKINGS

**Table 1. Grid Reliability Ranking of Top 15 States, 2021**

	System Average Interruption Duration Index SAIDI (minutes per year)		System Average Interruption Frequency Index SAIFI (times per year)		Customer Average Interruption Duration Index CAIDI (minutes per interruption)	
Ranking	State	Year 2021	State	Year 2021	State	Year 2021
1	Delaware	64	Nevada	0.84	Delaware	67
2	Florida	81	New York	0.85	Florida	87
3	North Dakota	85	North Dakota	0.88	Arizona	87
4	Nevada	102	Connecticut	0.90	North Dakota	97
5	South Dakota	106	Illinois	0.91	South Carolina	104
6	Arizona	106	Iowa	0.92	South Dakota	105
7	<b>Utah</b>	<b>116</b>	Florida	0.93	Georgia	111
8	Minnesota	121	<b>Utah</b>	<b>0.93</b>	Minnesota	116
9	South Carolina	121	Maryland	0.96	Nevada	122
10	Illinois	127	Delaware	0.96	<b>Utah</b>	<b>124</b>
11	Maryland	127	New Jersey	1.00	Oklahoma	128
12	Iowa	133	South Dakota	1.01	Maine	131
13	New Jersey	139	Wisconsin	1.01	Maryland	132
14	New York	142	Minnesota	1.04	New Jersey	139
15	Connecticut	145	Colorado	1.10	Illinois	140

Source: U.S. Energy Information Administration, *Annual Electric Power Industry Report*, Table 11.3

Definitions	SAIDI = (Minutes of Power Outage) x $\frac{\text{\# Customers Affected}}{\text{\# Customers in System}}$ = System Average Interruption Duration Index	
	SAIFI = $\frac{\text{\# Customers Affected}}{\text{\# Customers in System}}$ = System Average Interruption Frequency Index	
	CAIDI = Minutes of Power Outage = $\frac{\text{SAIDI}}{\text{SAIFI}}$ = Customer Average Interruption Duration Index	



**Table 2. Average Price of Electricity to Ultimate Customers by End-Use Sector, Top 20 States, April 2023**  
(cents per kilowatt-hour)

	State	Residential	State	Commercial	State	Industrial	State	Transportation
1	North Dakota	10.2	North Dakota	7.7	Louisiana	5.4	Ohio	5.6
2	Idaho	10.2	Texas	8.3	New Mexico	5.6	Georgia	5.8
3	<b>Utah</b>	<b>10.9</b>	Idaho	8.5	Texas	5.9	Illinois	6.1
4	Washington	11.0	<b>Utah</b>	<b>8.6</b>	Iowa	5.9	Texas	7.4
5	Louisiana	11.2	Oklahoma	8.6	Tennessee	5.9	Massachusetts	7.5
6	Wyoming	11.2	Nebraska	9.0	Oklahoma	5.9	Missouri	7.9
7	Nebraska	11.3	Virginia	9.1	Arkansas	6.3	North Carolina	8.0
8	South Dakota	11.8	North Carolina	9.4	Idaho	6.4	Pennsylvania	8.9
9	Tennessee	11.9	Missouri	9.4	Georgia	6.4	Arizona	9.4
10	Missouri	12.0	Iowa	9.6	South Carolina	6.4	Colorado	9.9
11	Montana	12.3	South Dakota	9.7	Alabama	6.5	Washington	10.4
12	Arkansas	12.3	Wyoming	9.8	Washington	6.5	Louisiana	10.5
13	Oklahoma	12.4	Washington	10.1	Kentucky	6.5	Maryland	11.2
14	Oregon	12.5	Louisiana	10.1	North Dakota	6.6	Oregon	11.5
15	Iowa	12.5	Arkansas	10.3	Mississippi	6.7	<b>Utah</b>	<b>12.2</b>
16	Kentucky	12.6	New Mexico	10.3	New York	6.7	Florida	12.2
17	North Carolina	13.2	South Carolina	10.5	<b>Utah</b>	<b>6.9</b>	Minnesota	12.4
18	Georgia	13.3	Oregon	10.5	North Carolina	7.0	Nevada	13.2
19	Colorado	13.6	Ohio	10.7	Wyoming	7.0	New Jersey	13.5
20	New Mexico	13.8	Kansas	11.0	Ohio	7.2	Michigan	13.6

Source: United States Energy Information Administration, <https://www.eia.gov/electricity/monthly>

**Table 3. Price of Natural Gas to Ultimate Customers by End-Use Sector, April 2023**

Rank	Residential Consumers		Commercial Consumers	
	State	April 2023	State	April 2023
1	New Mexico	5.1	New Mexico	3.3
2	Wisconsin	8.0	Wisconsin	6.0
3	North Dakota	8.1	North Dakota	7.0
4	South Dakota	9.4	Ohio	7.4
5	Montana	9.7	Vermont	7.6
6	Indiana	9.9	Indiana	7.8
7	Idaho	10.2	South Dakota	7.8
8	Illinois	10.5	Nebraska	8.5
9	Alaska	11.2	New Jersey	8.8
10	Iowa	11.2	Iowa	8.9
11	Colorado	11.3	Illinois	9.2
12	Nebraska	11.3	Idaho	9.3
13	Michigan	11.5	Texas	9.4
14	Minnesota	12.7	Montana	9.5
15	Ohio	12.8	Colorado	9.7
16	<b>Utah</b>	<b>13.0</b>	New York	9.8
17	Wyoming	13.1	Georgia	9.8
18	New Jersey	13.3	Michigan	9.9
19	Arkansas	14.0	Alaska	10.1
20	Pennsylvania	15.1	Arkansas	10.3
21	Nevada	15.3	Virginia	10.7
22	Washington	15.4	New Hampshire	10.8
23	New Hampshire	15.5	Minnesota	11.0
24	Oklahoma	15.7	North Carolina	11.2
25	New York	15.8	Louisiana	11.3
26	Oregon	15.9	South Carolina	11.5
27	Maryland	16.0	Wyoming	11.7
28	Vermont	16.1	Mississippi	11.8
29	Louisiana	16.3	Arizona	11.9
30	West Virginia	16.6	<b>Utah</b>	<b>11.9</b>

Source: United States Energy Information Administration, [https://www.eia.gov/dnav/ng/ng\\_pri\\_sum\\_a\\_epg0\\_prs\\_dmcf\\_m.htm](https://www.eia.gov/dnav/ng/ng_pri_sum_a_epg0_prs_dmcf_m.htm)

## ECONOMIC CONTRIBUTIONS

**Table 4. Total Economic Contributions of Energy and Mining Industries to Utah's Economy, 2019**

Sector	Category	Total Contribution from Sector	% of Utah's Total Economy
<b>Energy</b>	State GDP	\$12.1 billion	6.3%
	Jobs	74,200 jobs	3.3%
	Earnings	\$5.3 billion	5.2%
	State Tax Revenue	\$1.5 billion	14.4%
	Output	\$31.6 billion	8.6%
<b>Mining</b>	State GDP	\$7.7 billion	4.0%
	Jobs	56,700 jobs	2.7%
	Earnings	\$3.6 billion	3.5%
	State Tax Revenue	\$0.6 billion	5.6%
	Output	\$17.6 billion	4.8%

Source: Utah Department of Natural Resources and USU Department of Applied Economics

**Table 5. Total Contributions of Utah Energy and Mining Industries by Sector, 2019**

Energy and Mining Industry	Output (\$ million)	State GDP (\$ million)	Earnings (\$ million)	Employment (jobs)	State Tax Revenue (\$ million)
<b>Energy</b>	<b>31636</b>	<b>12049</b>	<b>5330</b>	<b>74199</b>	<b>1536</b>
Oil and gas extraction	2263	898	485	7807	145
Oil and gas support	1645	756	466	7784	77
Power generation	8872	3924	1436	15474	636
Gas distribution	1429	737	337	4023	78
Construction related to energy	3110	1883	1017	17033	108
Refinery	12543	3083	1159	15515	364
Oil and gas manufacturing	1079	352	180	2472	32
Wholesale-petroleum	57	46	7	99	32
Retail-gas	398	212	130	3007	37
Pipeline	240	154	116	987	27
<b>Mining</b>	<b>17556</b>	<b>7743</b>	<b>3575</b>	<b>56681</b>	<b>595</b>
Coal mining	1368	749	234	3896	53
Metal mining	1950	916	364	6042	83
Nonmetal mining	1113	576	219	4018	49
Mining support	1130	469	271	4032	56
Nonmetal manufacturing	3615	1585	859	13775	109
Metal manufacturing	6661	2552	1083	16295	159
Wholesale-mineral	1722	895	546	8625	86
<b>All Energy and Mining</b>	<b>49192</b>	<b>19792</b>	<b>8905</b>	<b>130880</b>	<b>2131</b>

Source: Utah Department of Natural Resources and USU Department of Applied Economics

## CRITICAL MINERALS

**Table 6. Critical Minerals in Utah**

Mineral	Mineral Utilization	Energy Supply Chain Status	
		(2020-2025)	(2025-2035)
Lithium	Electric vehicle batteries	Near Critical	Critical
Beryllium	Aerospace and automotive guidance systems	-	-
Magnesium	Laptops, cameras, and power tools	Near Critical	Critical
Platinum	Catalytic converters for cars & trucks	Near Critical	Critical
Palladium	Catalytic converters for cars & trucks	-	-
Fluorspar	Manufacture of insulating foams, and refrigerants	-	-
Tellurium	Solar cells, semiconductors.	Not Critical	Not Critical

Sources:

Utah Mining 2022, Utah Geological Survey, Utah Dept. of Natural Resources.

The United States Dept. of Energy subdivided the 2023 Critical Minerals List into:

- 1) 18 Critical Materials for Energy, including non-minerals such as electrical steel and silicon carbide.
- 2) 50 Critical Minerals

US Dept of Energy, <https://www.energy.gov/cmm/what-are-critical-materials-and-critical-minerals>

Critical Materials Definition:

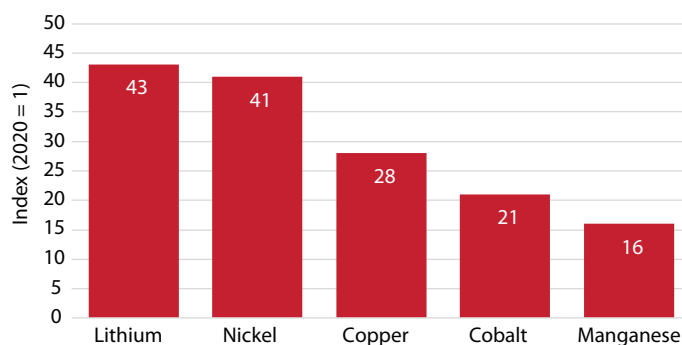
- 1) Minerals necessary for economic or national security.
- 2) Minerals vulnerable to a supply chain disruption.

**Table 7. Utah Mineral Production, 2020**

Mineral	Production	Location
Copper	417 million lbs. per annum	Bingham Canyon Mine, Salt Lake County; Lisbon Valley, San Juan County
Lithium	By-product of magnesium recovery in Great Salt Lake brine	Great Salt Lake; Grand County
Nickel	Less than 100 tons per annum	Wells Canyon Nickel and Clay Pits, Utah County
Manganese	Less than 100 tons manganese ore per annum	Manganese King Mine, Kane County
Cobalt	By-product in copper and uranium deposits	Copper Ridge, Grand County

Source: Utah Geological Survey; *Utah Mining 2020*

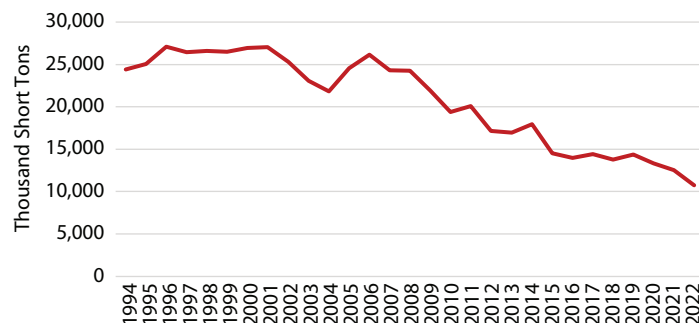
**Figure 7. Projected Demand Growth of Selected Minerals, 2040 relative to 2020**



Source: International Energy Agency

## COAL

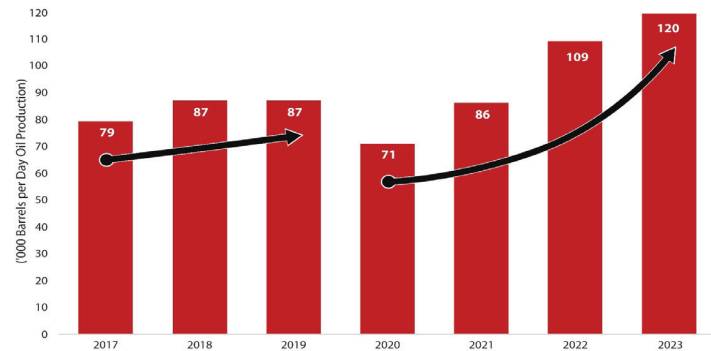
**Figure 8. Utah Coal Production Over Time, 1994-2022**



Source: Utah Geological Survey; *Utah Mining 2020*

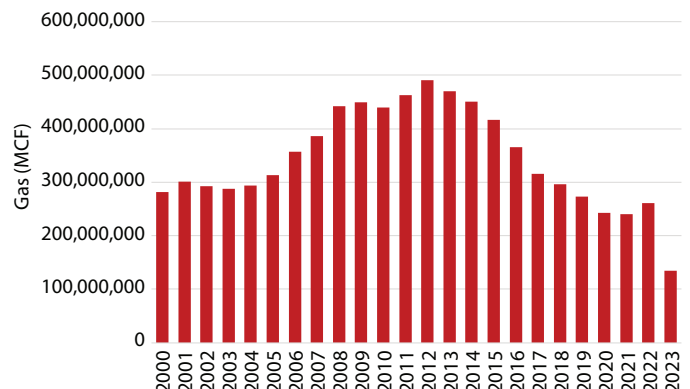
## OIL AND GAS

**Figure 9. Uinta Basin Crude Oil Production, 2017-May 2023**



Source: Utah Geological Survey; *Utah Mining 2020*

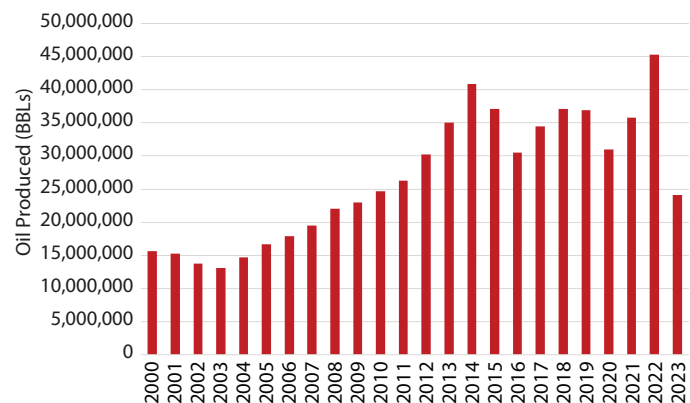
**Figure 10. Utah Oil Production per Year (BBLs), 2000-Oct 2023**



Source: Utah Geological Survey; *Utah Mining 2020*

**Insight: One barrel (BBL) is equal to 42 US gallons or 160 liters.**

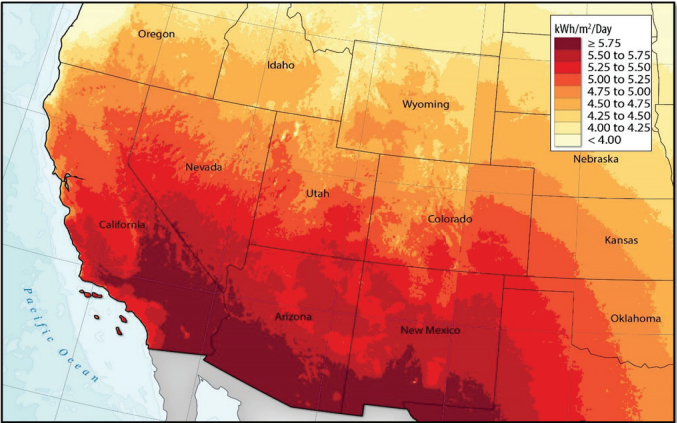
**Figure 11. Utah Gas Production per Year (MCF) 2000-Oct 2023**



Source: Utah Geological Survey; *Utah Mining 2020*

SOLAR

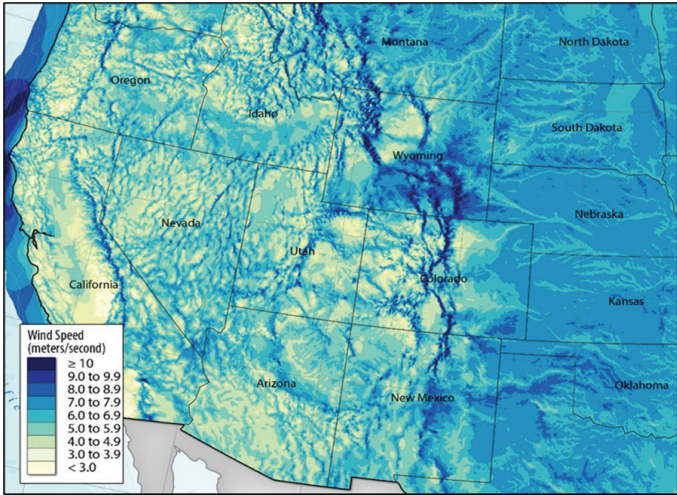
Figure 12. Global Horizontal Solar Irradiance for United States



Source: National Renewable Energy Laboratory

WIND

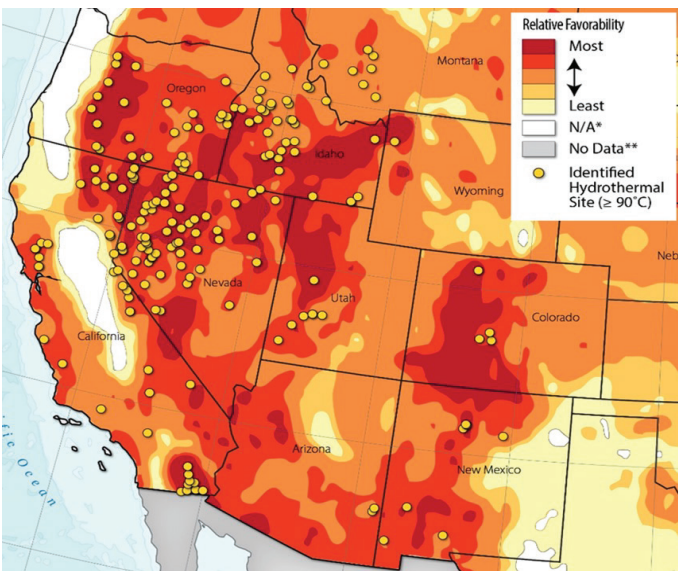
Figure 13. Annual Average Wind Speed at 80 Meters Above Surface Level



Source: National Renewable Energy Laboratory

GEOTHERMAL

Figure 14. Identified Hydrothermal Sites and Favorability of Deep Enhanced Geothermal Systems



Source: National Renewable Energy Laboratory

Table 8. Status of Transmission Projects in Utah

	Distance (miles)	Transmission Origin	Transmission Endpoint	Start Date	End Date	Cost	States Crossed	Transmission & Source	Project Sponsor
Gateway South	416	Medicine Bow, WY	Mona, UT	2007	2024	\$2.2B	WY, CO, UT	2000 MW Nuclear & Renewables	PacifiCorp
TransWest Express	732	Rawlins, WY	Las Vegas, NV	2005	1	\$3.0B	WY,UT, NV	3000 MW Wind	Anschutz Corp
Gateway Central2	249	Downey, ID	Mona, UT	-	2026	-	WY, UT	345 KV	PacifiCorp

1. The transmission line from Rawlins to Mona Substation (UT) has a projected 2027 completion date. Completion date of the Mona UT-to-Las Vegas NV transmission line has not been disclosed.
2. Two Gateway Central transmission segments totalling 235 miles were placed in-service in in 2010 and 2013. A 14-mile segment pends right-of-way acquisition and will be placed in-service in 2026.

# Utah Energy Workforce Development Priorities

The Utah Energy Strike Team relied on input from businesses, higher education, government, and Talent Ready Utah to identify workforce development priorities. Talent Ready Utah is an industry facing department of the Utah System of Higher Education. Their purpose is to convene and engage with industry and education partners, and any other stakeholders to create, expand, and align short-term and long-term workforce training and education solutions.

Potential problems presented by workforce partners and other stakeholders include volume of workers, low unemployment rates, inner cluster talent thievery, external cluster talent demands, low volume of talent pipeline, and the perception of energy cluster jobs.

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## Talent Ready Utah identified jobs and industry roles related to Utah's energy industry, which include:

- General and Operations Managers
- Industrial Production Managers
- Construction Managers
- Electrical Engineers
- Solar Photovoltaic Installers
- Rotary Drill Operators, Oil and Gas
- Service Unit Operators, Oil, Gas, and Mining
- Excavating and Loading Machine and Dragline Operators, Surface Mining
- Roustabouts, Oil and Gas
- Helpers--Extraction Workers
- Earth Drillers, Except Oil and Gas; and Explosives Workers, Ordnance Handling Experts, and Blasters
- Underground Mining Machine Operators and Extraction Workers, All Other
- First-Line Supervisors of Mechanics, Installers, and Repairers
- Electrical and Electronics Repairers, Powerhouse, Substation, and Relay
- Mobile Heavy Equipment Mechanics, Except Engines
- Power and Communications Systems Construction
- Mechanical Engineers
- Mining and Geological Engineers, Including Mining Safety Engineers
- Petroleum Engineers
- Geoscientists, Except Hydrologists and Geographers
- Mechanical Engineering Technicians
- Chemical Technicians
- Electrical and Electronics Repairers, Powerhouse, Substation, and Relay
- Heavy and Tractor-Trailer Truck Drivers
- Chemical Technicians
- First-Line Supervisors of Construction Trades and Extraction Workers
- Construction Laborers
- Operating Engineers and Other Construction Equipment Operators
- Electricians
- Pipelayers
- Mining and Oil and Gas Field Machinery Mfg.
- Turbine and Power Transmission Equip. Mfg.
- Pipeline Transportation for Natural Gas
- Petroleum Refineries
- Control and Valve Installers and Repairers, Except Mechanical Door
- Industrial Machinery Mechanics
- Maintenance Workers, Machinery
- Electrical Power-Line Installers and Repairers
- Telecommunications Line Installers and Repairers
- First-Line Supervisors of Production and Operating Workers
- Welders, Cutters, Solderers, and Brazers
- Power Plant Operators
- Petroleum Pump System Operators, Refinery Operators, and Gaugers
- Heavy and Tractor-Trailer Truck Drivers
- Conveyor Operators and Tenders
- Industrial Truck and Tractor Operators
- Wellhead Pumps
- Oil and Gas Extraction
- Coal Mining
- Support Activities Mining
- Power Generation and Supply
- Natural Gas Distribution
- Oil and Gas Pipeline Construction

Solutions include the expansion of apprenticeship programs, enhancing STEM skills in K-12 education, especially in rural areas, developing professional driver programs that offer chemical transportation endorsements, participating in integrated planning for job transitions, and recognizing that

all energy jobs are high priority. Additional recommendations include developing a stakeholder steering committee, developing intuitive education pathways for energy jobs, developing a workforce response plan, and intentional energy cluster workforce alignment and pipeline expansions.



## Workforce Development Certificate Programs in Utah

Name	Locations	Certificate Program Examples	Enrollment (2022)
Bridgerland Technical College	Logan Brigham City	IT & Cybersecurity Automated Manufacturing Controls Engineering	2,828
Clearfield Job Corps Center	Clearfield	Information Technology	1,125
Davis Technical College	Kaysville	Cybersecurity Information Technology	3,885
Dixie Technical College	St. George	Parametric Modeling and 3D Printing Security Technician	1,279
Mountainland Technical College	Orem Lehi	Web Programming & Development Automated Manufacturing	4,034
Ogden-Weber Technical College	Ogden	Computer Programming Computer Aided Design	4,041
Salt Lake Community College	Salt Lake City	Solar Installation Energy Management	N/A
Snow College	Ephraim	Computer systems networking Networking and Cybersecurity	N/A
Southern Utah University	Cedar City	Data Science	N/A
Southwest Technical College	Cedar City	Software Development	1,390
Tooele Technical College	Tooele	Composites Cybersecurity Software Development	855
Uintah Basin Technical College	Roosevelt Vernal	Automation Technician Training Commercial Driver's License program Information Technology	1,771
University of Utah	Salt Lake City	Resilient Energy Engineering Certificate Secure Computing Project (Cybersecurity)	N/A
USU Eastern	Price	Powerplant Instruments and Controls	N/A
Utah State University	Logan	Advancing Sustainability through Powered Infrastructure for Roadway Electrification (ASPIRE) has pre-college and pathways partners: 1) Insights El Paso Science Center 2) Granite School District, Salt Lake City 3) Logan City School District	N/A
Utah Tech University	St. George	Computer Forensics/Cyber Crime	N/A
Utah Valley University	Orem	Electrical and Control Technology Information Systems and Technology	N/A
Weber State University	Ogden	High-Voltage Safety Certification (EV's & Hybrids) Hybrid & Electric Vehicle Systems Certification	N/A
18 Institutions	22 Locations		21,208

Source: USHE, Clearfield Job Corps Center

Note: Larger universities/colleges do not track certificate enrollment

# Utah Energy Research Priorities

The Utah Energy Strike Team worked with institutions of higher education that are participating in energy-related research to determine research priorities that can help achieve the state's energy policy.

## **The research priorities include:**

- Leveraging partnerships with researchers and industry groups
- R1 institutions (universities with the highest levels of research activity e.g., U of U and USU) should partner together to help address state needs with federal funding priorities.
- Capitalizing on existing state and institutional assets.
- Developing a strategy for the introduction of carbon emission reducing technology into different areas of energy and industry to best meet the needs of Utah and its residents.

Representatives also introduced potential research priorities that allow for high impact in economic development, workforce development, sustainability, and quality of life. Research priorities potentially have an impact in one or many of these areas. Research priorities include:

## **- Grid Modernization**

- Artificial Intelligence (AI), cyber security and control solutions can improve utilization, resiliency, and security of the grid system and the communities that rely on its security.
- Integration of multiple sources of power.
  - Dispatchable power sources like coal and solar.
  - Non-dispatchable power sources such as wind and solar power
- Integration of resources to shape non-dispatchable power sources.
  - Distributed energy resource (DER) and distributed grid management.
  - Energy storage opportunities such as batteries and hydrogen.
- Integration of transportation and building electrification.
- Workforce development for design, operation, and maintenance of the grid system.

## **- Critical Minerals**

- Research priorities include critical mineral identification and extraction, the reduction of pollutants throughout the mining and refinement process and how to reduce the quantities of minerals needed. Additionally, research must be done around investing in and creating a circular economy focused on critical materials.

## **- Transportation and Energy**

- Various transportation and energy projects with high potential impact exist throughout the state. One project for example, the Uinta Railroad Project stands to greatly benefit rural communities through infrastructure and economic development. Research can be positioned to expand projects further and increase their impact throughout the state.

## **- Nuclear Energy Development**

- Opportunities exist for microreactors and research collaboration throughout the state with industry partners.
- Simulation systems and trainers for workforce development.
- Nuclear research can also be used to advance critical mineral analyses.

## **- Coal Innovation**

- Developing and investing in technology to make coal cleaner and discovering alternative uses for coal mines.
- Advanced manufacturing growth opportunities through partnerships with research centers like the San Rafael Energy Research Center.
- System engineering education and development.

Strategic research priorities help to encourage innovation, kickstart industry growth, maximize economic development and benefits, and strengthen the energy economy throughout the state.



# Appendix A

## State Energy Policy UTAH CODE 79-6-301

- (1) It is the policy of the state that:
- (a) Utah shall have adequate, reliable, affordable, sustainable, and clean energy resources;
  - (b) Utah shall promote the development of:
    - (i) nonrenewable energy resources, including natural gas, coal, oil, oil shale, and oil sands;
    - (ii) renewable energy resources, including geothermal, solar, wind, biomass, biofuel, and hydroelectric;
    - (iii) nuclear power generation technologies certified for use by the United States Nuclear Regulatory Commission including molten salt reactors producing medical isotopes;
    - (iv) alternative transportation fuels and technologies;
    - (v) infrastructure to facilitate energy development, diversified modes of transportation, greater access to domestic and international markets for Utah's resources, and advanced transmission systems;
    - (vi) energy storage, pumped storage, and other advanced energy systems, including hydrogen from all sources;
    - (vii) electricity systems that can be controlled at the request of grid operators to meet system load demands, to ensure an adequate supply of dispatchable energy generation resources;
    - (viii) electricity systems that are stable and capable of serving load without accelerating damage to customer equipment; and
    - (ix) increased refinery capacity;
  - (c) Utah shall promote the development of resources and infrastructure sufficient to meet the state's growing demand, while contributing to the regional and national energy supply, thus reducing dependence on international energy sources;
  - (d) Utah shall promote the development of resources, tools, and infrastructure to enhance the state's ability to:
    - (i) respond effectively to significant disruptions to the state's energy generation, energy delivery systems, or fuel supplies;
    - (ii) maintain adequate supply, including reserves of proven and cost-effective dispatchable electricity reserves to meet grid demand; and
    - (iii) ensure the state's energy independence by promoting the use of energy resources generated within the state
  - (e) Utah shall allow market forces to drive prudent use of energy resources, although incentives and other methods may be used to ensure the state's optimal development and use of energy resources in the short- and long-term;
  - (f) Utah shall pursue energy conservation, energy efficiency, and environmental quality;
  - (g) Utah shall promote the development of a secure supply chain from resource extraction to energy production and consumption;
  - (h)
    - (i) state regulatory processes should be streamlined to balance economic costs with the level of review necessary to ensure protection of the state's various interests; and
    - (ii) where federal action is required, Utah will encourage expedited federal action and will collaborate with federal agencies to expedite review;
  - (i) Utah shall maintain an environment that provides for stable consumer prices that are as low as possible while providing producers and suppliers a fair return on investment, recognizing that:
    - (i) economic prosperity is linked to the availability, reliability, and affordability of consumer energy supplies; and
    - (ii) investment will occur only when adequate financial returns can be realized;
  - (j) Utah shall promote training and education programs focused on developing a comprehensive understanding of energy, including:
    - (i) programs addressing:
      - (A) energy conservation;
      - (B) energy efficiency;
      - (C) supply and demand; and
      - (D) energy related workforce development; and
    - (ii) energy education programs in grades kindergarten through grade 12; and
    - (k) Utah shall promote the use of clean energy sources by considering the emissions of an energy resource throughout the entire life cycle of the energy resource.
- (2) State agencies are encouraged to conduct agency activities consistent with Subsection (1).
- (3) A person may not file suit to challenge a state agency's action that is inconsistent with Subsection (1).

## STATEWIDE ENERGY POLICY AMENDMENTS

2023 GENERAL SESSION

STATE OF UTAH

### Excerpt:

9(a). The office shall prepare a strategic energy plan to achieve the state's energy policy, including:

- (i) technological and infrastructure innovation needed to meet future energy demand including:
  - (A) energy production technologies;
  - (B) battery and storage technologies;
  - (C) smart grid technologies;
  - (D) energy efficiency technologies; and
  - (E) any other developing energy technology, energy infrastructure planning, or investments that will assist the state in meeting energy demand;
- (ii) the state's efficient utilization and development of:
  - (A) nonrenewable energy resources, including natural gas, coal, clean coal, hydrogen, oil, oil shale, and oil sands;
  - (B) renewable energy resources, including geothermal, solar, hydrogen, wind, biomass, biofuel, and hydroelectric;
  - (C) nuclear power; and
  - (D) earth minerals;
    - (iii) areas of energy-related academic research;
    - (iv) specific areas of workforce development necessary for an evolving energy industry;
    - (v) the development of partnerships with national laboratories; and
    - (vi) a proposed state budget for economic development and investment.

9(b). In preparing the strategic energy plan, the office shall consult with stakeholders, including representatives from:

- (i) energy companies in the state;
- (ii) private and public institutions of higher education within the state conducting energy-related research; and
- (iii) other state agencies.

9(c). On or before the October 2023 interim meeting, the office shall report to the Public Utilities, Energy, and Technology Interim

Committee and the Executive Appropriations Interim

Committee describing:

- (i) progress towards creation of the strategic energy plan; and
- (ii) a proposed budget for the office to continue development of the strategic energy plan.

# Appendix C

## UEOC ENERGY PRIORITIES AND POLICIES

Energy plays a critical role in a thriving economy. In April of 2023, the Unified Economic Opportunity Commission formed the Working Group on Water, Energy, & Natural Resources. Since its creation, legislative leaders, industry, local leaders, and subject matter experts have met in an effort to bridge the energy gap as we transition from coal to other energy sources; advance nuclear energy development in Utah; and maintain Utah's energy affordability, reliability, and dispatchability. Below is a summary of the working group's policy recommendations.

### **Invest in Energy Solutions and Research**

Global energy solutions require the best possible information. The working group supports the Office of Energy Development's building block for additional funding of the San Rafael Energy Research Center. This request includes \$2 million in one-time funding and \$941,000 in ongoing funding.

### **Bolster Utah's Ability to Influence Federal Regulations**

Federal regulations can impair a state's ability to secure energy. In order to amplify Utah's voice, the working group recommends creating a robust process for addressing governmental actions that would negatively affect Utah's resources. With additional funding, the state can do more to comment on rulemaking, support pre-litigation, and undertake litigation when necessary.

### **Enhance GIS Asset Mapping**

Utah is home to abundant natural resources that are critical to the energy sector and the economy. In order to not only know where Utah's resources are, but also understand their value, the working group recommends bolstering GIS asset mapping capabilities within the Utah Geological Survey.

### **Incentivize Mineral Development**

Minerals such as copper, beryllium, lithium, nickel, lead, vanadium, and uranium are all important to future energy technologies; they are also all available in Utah. To secure Utah's energy future, the working group supports incentivizing mineral extraction and processing in the state. Specifically, the working group recommends expanding the Mineral Exploration Tax Credit and the High Cost Infrastructure Tax Credit.

### **Change Statute to Emphasize Clean Energy**

Currently in Utah code, language in many sections values "renewable" energy; while this terminology was typical in the past, most governments – including the U.S. Department of Energy – now prioritize "clean" energy. By simply updating terminology within code, Utah demonstrates that it is open for additional energy development, including nuclear.

### **Value Nuclear and Pumped Hydropower Energy**

The working group recommends adding nuclear energy and pumped storage hydropower in the Community Renewable Energy Act (54-17-902) and the Energy Resource Procurement Act (54-17-601).

### **Incentivize Nuclear Energy Development**

Current Utah code prevents nuclear energy projects from being eligible for the Production Tax Credits. To further encourage nuclear energy development in Utah, the working group recommends adding nuclear energy in 59-7-614.

# Appendix D

## OFFICE OF ENERGY DEVELOPMENT DYNAMIC ENERGY PLAN

Affordability, reliability, and sustainability are Utah's priorities for all its energy-related work. Taking a thoughtful, measured approach to energy policy keeps Utah's energy prices some of the lowest in the country, enables planning and investment towards helping communities survive and thrive, and puts Utah in a leadership position for developing the resources and technology necessary to power the country in the future.

Utah is an energy-rich state with vast traditional and renewable resources. The opportunities to explore and develop new technologies will help maintain and grow Utah's position as an energy leader. We are in the top 15 states for producing coal, crude oil and natural gas and have an increasing amount of solar, wind, hydroelectric and geothermal capacity, which make up the bulk of Utah's renewable energy generation. Utah is also committed to expanding the tools in its energy toolbox including investment and research into technologies and resources such as battery storage, hydrogen, nuclear, carbon capture, biogas and others.

Ongoing conflicts across the globe shine a spotlight on the importance of energy independence and the geopolitical challenges of relying on energy resources produced in countries where economies and relationships are often unstable. In addition to far-reaching energy security benefits and price stability, domestic energy production supports local jobs, strengthens state and national economies, and ensures higher standards of development.

A resource-rich state like Utah plays an important role in America's energy independence now and in the future as this country's energy mix continues to evolve.

Energy independence and market pressures to transition to lower-carbon and carbon-free energy sources are also increasing the demand for infrastructure such as transmission lines and minerals such as lithium. Utah plays an important role for the country and world as a producer of critical and rare earth minerals that are key to environmentally responsible energy technologies. Utah is also primely located for new transmission infrastructure to move energy across the region from more remote generating facilities to larger population centers.

Utah has incredible natural resources that support diverse wildlife populations, draw tourists to explore, and attract new businesses and residents. Protecting Utah's air, water and land is critical to maintaining the health and quality of life for the people and wildlife that call the state home. Utah's largest utility, Rocky Mountain Power and its parent company PacifiCorp, continues to transition its generation to more renewable and carbon-free energy, with a goal of reducing greenhouse gas

emissions by 74 percent from 2005 levels by 2030. Utah is also focusing on the transportation sector. In 2021, the state released a Statewide EV Charging Network Plan that prioritizes filling EV charging gaps within key corridors, including rural communities, and adding additional EV chargers over time to accommodate increased EV adoption and users.

### Commitments

The Utah Energy and Innovation Plan identifies several key commitments around which the state will conduct its energy work. Through offices such as the Office of Energy Development, the Public Lands Policy Coordinating Office, the Division of Air Quality, and others, Utah is committing to funding, research, planning, monitoring, and partnerships that will enable Utah to keep affordable, reliable energy for its citizens while maintaining a thriving energy economy and healthy environment.

- Utah is committed to an "any of the above" energy future, supporting efforts and policies that provide a variety of tools and resources that citizens, communities, businesses, and industries can choose from to deliver or obtain affordable, reliable energy.
- Utah is committed to American energy independence, pursuing policies and actions that will enable more domestic energy development and enhance global energy security.
- Utah is committed to pragmatic, market-driven climate solutions that enable innovative energy production. This includes a focus on supporting Utah-based research and development, ensuring we stay good stewards of our environment for future generations of Utahns.
- Utah is committed to supporting rural communities through economic development and diversification efforts, infrastructure investment, and workforce training and development.
- Utah is committed to supporting an environmentally responsible energy future through a strong and sensible mining program for critical minerals; investment in emerging energy technology such as hydrogen, storage, and energy efficiency; and air quality research and incentive programs.
- Utah is committed to collaboration with its local, regional, and federal partners to pursue infrastructure and innovation projects such as EV charging, transmission, emerging fuel hubs, and coal community support and diversification.

# Appendix E

## OFFICE OF ENERGY DEVELOPMENT UTAH ENERGY PRIORITIES

The Office of Energy Demand developed 18 energy priorities based on the Utah Energy Strike Team's conversation and input. Each priority identifies objectives that have been developed from the State code or Office of Energy Development directive. Additionally, action steps are identified to provide a plan to accomplish each priority. These priorities all contribute to achieving the state's energy policy of adequate, reliable, affordable, sustainable, and clean energy resources. These priorities were eventually used to help develop the Utah Strategic Energy Plan Framework.

### The Thriving Protocol

Objective: Develop a strategic energy plan to achieve the state's energy policy.

Action Steps:

1. Utilize societal well-being as a centric objective to establish a common ground for consensus.
2. Develop a strategic approach that recognizes the fundamental role of a thriving society as the foundation of our future endeavors.
3. Apply Utah's "any of the above" approach.
  - a. Employ efficiency to measure the utility of energy resources and their role in achieving Utah's energy objectives.
  - b. Use the principles and tools of efficiency to drive performance, transparency, and rationality.
  - c. Codify a set of decision-guiding principles.

### Pursue Policy Considerations

Objective: Assess state policy alignment with goals and strategic direction. The Governor, Attorney General, and Utah's federal delegation signed a letter stating that Utah will pursue "a responsible energy policy that embraces efficiency and is based in reality."

Action Steps:

1. Define and quantify the value of energy to society.
2. Assess Utah's energy policies, regulations, tax structure, incentives, and regional/federal influences to determine areas of misalignment and provide recommendations for changes necessary to align with any updated energy goals.
3. Review current definitions and refine or define these terms from state code (79-6-301 (1) (a)):
  - a. adequate, reliable, affordable, sustainable, and clean energy resources.
4. Identify potential barriers to affordable and reliable

energy and develop recommendations for changes as necessary.

### Quantify Utah's Current and Future Energy Needs

Objective: Utah shall have adequate energy resources.

Action Steps:

1. Conduct a rigorous and evidence-based assessment of Utah's future energy needs and identify areas where consumer demand will be highest or where there may be potential gaps between supply and demand. Ensure that the assessment accounts for population growth projections.
2. Estimate the amount of capacity that may be available during a range of potential system conditions critical for maintaining system reliability.
3. Compare current and projected energy needs.
4. Identify capacity market values that accurately represent the amount of capacity that a resource can be expected to provide, on average, for each load requirement category and during periods of system stress.
5. Estimate adequate energy reserves to meet real-time demand for a range of potential system conditions (e.g., extreme weather events, cyber threats, and other potential disruptions).

### Consultation with Stakeholders

Objective: Consultation with stakeholders, including: representatives from energy companies in the state; private and public institutions of higher education within the state conducting energy-related research; and other state agencies.

Action Steps:

1. Promote partnerships between the government and private sector to facilitate the sharing of information, resources, and expertise in addressing energy policy challenges and interdependencies with other critical infrastructures.
2. Work with neighboring states and regional organizations to develop and implement coordinated energy policies and infrastructure plans.

## **Assessment of Resource Adequacy**

Objective: Utah shall have adequate energy resources.

Action Steps:

1. Assess resource needs.
  - a. Evaluate the feasibility of a system for regular monitoring and reporting on resource adequacy, interdependencies, and the integration of distributed energy resources.
2. Develop specific evaluation criteria and metrics to measure resource adequacy in the context of evolving energy resources.
3. Address the increasing interdependencies between the gas and electric sectors.
  - a. Assess the need for contingency plans for managing disruptions or challenges arising from these interdependencies.
4. Evaluate the impact of incorporating aggregated distributed energy resources into the bulk power system.
5. Develop initiatives to advance technologies that improve resource assessment, grid reliability, and the integration of renewable energy sources.

## **Elevate the San Rafael Energy Research Center**

Objective: Private and public institutions of higher education within the state conducting energy-related research; and development of partnerships with national laboratories.

Action Steps:

1. With legislative action, acquire the center as a state asset to be managed by OED and elevate the center to be a leader in energy research and innovation.
2. Position the center to be a leader in energy research and innovation.
3. Establish interdisciplinary collaborations across the state, including with local colleges and universities, industry, and community partner organizations.
4. Leverage federal funding opportunities to turn the center into a nationally recognized research and development center that incubates and further develops technological discoveries, advancements, and improvements.

## **Streamline Emerging Technologies, Innovation, and Research within the Office of Energy Development**

Objective: Technological and infrastructure innovations needed to meet future energy demand; and areas of energy-related academic research.

Action Steps:

1. Assess the feasibility and potential impact of implementing these technologies for their economic and environmental impacts at the state and local level.
2. Identify priority areas of energy-related academic research.
3. Investigate Utah's competitive advantages.
4. Ensure emerging technology, innovation, and research align with the state's energy policy goals.
5. Facilitate knowledge transfer and commercialization of research outcomes to drive economic growth and competitiveness.
6. Research and development initiatives that focus on innovative technologies and solutions to address the challenges of bridging jurisdictional lines and managing interdependencies between the energy industry and other critical infrastructures.

## **Study Energy Pricing Impact on Utah**

Objective: Utah shall have affordable energy resources.

Action Steps:

1. Recognize that energy prices determine the affordability of energy supplies and have an impact on the critical needs of society. Energy prices can be influenced by a multitude of factors, including supply and demand dynamics, geopolitical events, government policies, price volatility, and the degree of competition in energy markets.
2. Assess the impact of energy pricing on state and local economies, including: direct and indirect impacts; social and behavioral impacts; and effects on accessibility.



## Enhance Energy Security

Objective: Utah shall have adequate, affordable, and reliable energy resources.

Action Steps:

1. Enhance energy security including energy availability, infrastructure, energy prices, societal effects, environment, data security, and governance.
2. Ensure adequate capacity reserves for various system stress scenarios.
3. Ensure physical grid security (e.g., extreme weather events, sabotage, infrastructure hardening, critical supply chain).
4. Understand and plan for security and critical infrastructure interdependencies.

## Study/Understand Energy Pricing Volatility

Objective: Utah shall have adequate, affordable, and reliable energy resources.

Action Steps:

1. Identify high exposure areas - e.g., 9 out of 10 households heat their homes with natural gas and natural gas is 38% of our power generation.
2. Understand causes and solutions to other regional price volatility challenges, including policy influences.
3. Analyze proposed projects against current and projected energy needs; any studies evaluating new, proposed, or decommissioning energy projects, including infrastructure and energy generation, must analyze energy needs.
4. Study the supply risks to Utah, including causes and its impacts.
5. Research mitigation options and the possible benefits of long duration storage opportunities (e.g., salt domes, pumped hydro, etc.).

## Natural Gas Power Development

Objective: Utah shall have adequate, reliable, affordable energy resources; technological and infrastructure innovations needed to meet future energy demand; and efficient utilization and development of nonrenewable and renewable energy resources.

Action Steps:

1. Recognize natural gas power can contribute to baseload energy and load-following capacities that ensures the reliability of electricity delivered to Utah customers.
2. Support natural gas energy development with strategic investments in research and workforce development.

## Critical Mineral Development

Objective: Efficient utilization and development of nonrenewable and renewable energy resources; technological and infrastructure innovations needed to meet future energy demand; and specific areas of workforce development.

Action Steps:

1. Support outstanding opportunities for the exploration, extraction, and further development of Utah's critical mineral resources.
2. Support critical mineral development with strategic investments in research and workforce development.

## Uinta Basin Railway Project

Objective: Economic development in rural Utah.

Action Steps:

1. The project will create energy and energy-related jobs in Utah and contribute to Utah's diverse energy portfolio.
2. The railway will bring significant economic development benefits to the state.
3. The railway will bring significant economic development and diversification benefits to the Uintah Basin and East Central economic regions.

## Nuclear Power Development

Objective: Utah shall have reliable, clean energy resources; technological and infrastructure innovations needed to meet future energy demand; and specific areas of workforce development.

Action Steps:

1. Nuclear power can contribute to baseload energy that ensures the reliability of electricity delivered to Utah customers.
2. Support nuclear energy development with strategic investments in research and workforce development.
3. Improve public communications and education about nuclear technology.

## **Coal-fired Power Plants and Coal Production**

Objective: Utah shall have adequate, reliable, and affordable energy resources.

Action Steps:

1. Extend plant life of Utah's coal-fired power plants through legal challenges to the federal government.
2. Pursue export opportunities for Utah coal.
3. Support research and development of future coal markets (e.g., nanomaterials, composites, consumer products).
4. Support research and development of future coal energy innovation.

## **Renewable Energy Development**

Objective: Utah shall have adequate, reliable, affordable, sustainable, and clean energy resources; efficient utilization and development of nonrenewable and renewable energy resources; and specific areas of workforce development.

Action Steps:

1. Pursue research and development of Utah's significant solar and geothermal energy resources.
2. Support renewable energy development with strategic investments in research and workforce development.

## **Hydrogen Energy Development**

Objective: Efficient utilization and development of nonrenewable and renewable energy resources; and specific areas of workforce development.

Action Steps:

1. Participate actively in the Western Interstate Hydrogen Hub (WISHH) and recognize that interstate cooperation and investment are essential to the growth of hydrogen.
2. Interstate cooperation and investment are essential to the growth of hydrogen.
3. Understand specific efficient hydrogen opportunities within Utah through research and other resources to develop targeted goals.
4. Access federal funding to support development.
5. Support hydrogen development with strategic investments in research and workforce development.

## **Grid Infrastructure**

Objective: Technological and infrastructure innovations needed to meet future energy demand.

Action Steps:

1. Expand transmission lines that may increase access to diverse energy generation sources.
2. Optimize opportunities presented by new transmission lines.
3. Ensure supportive regulatory and zoning policies for grid infrastructure.
4. Address interconnection hurdles.
5. Address distribution challenges.
6. Assess physical grid security (e.g., extreme weather events, sabotage, infrastructure hardening, critical supply chain).



# Appendix F

## DEFINITION OF TERMS

**Intermittent Energy** – Renewable energy sources such as wind power and solar power are not dispatchable due to their fluctuating nature. Solar fluctuates because of the day-night cycle while wind fluctuates because of unpredictable meteorological conditions.

**Load Curve** – Indicates electricity usage at any hour of the day.

- *Base load capacity* meets daily demand around the clock at the off-peak level. Reliability and low variable costs are criteria for generation of base load capacity. Options include nuclear, coal, and natural gas fired electricity generation.
- *Cycling capacity* ramps up and down during the day as demand fluctuates. Cycling capacity is flexible to ramp up or down rapidly. Options include natural gas combined-cycle electricity generation.
- *Peak capacity* runs when electricity demand exceeds the cycling level. The most expensive units generate peak plant electricity. Options include liquefied natural gas and heating oil electricity generation.

**Energy Efficient Dwellings** – Homes designed to conserve and reduce energy use. Features may include: 1) insulated windows and doors, 2) water heaters without tanks, 3) Energy Star certified appliances, 4) energy-efficient lighting, 5) moisture control and ventilation, 6) smart tech appliances, 7) sustainable construction materials, 8) alternative energy solutions such as solar panels.

**British Thermal Unit** – Quantity of heat required to raise the temperature of one pound of liquid water by one degree Fahrenheit.

**Dispatchability** – Ability of a given power source to increase and decrease output quickly on demand.

**Energy Transition** – A shift in energy production and consumption of fossil-based energies (oil, natural gas, and coal) to renewable energies (wind, hydro, solar and battery storage).

**Electrolysis** – A pathway producing green hydrogen using electricity generated from renewable energy sources such as wind or solar to split water into hydrogen and oxygen.

*Feedstock creation process:*



**Hydrogen** – A fuel with no carbon footprint serves as transportation fuel for vehicles. Electricity generation plants utilize hydrogen as a replacement fuel for coal and natural gas. Feedstocks shown in Table 1 produce hydrogen by chemical processes.

### Hydrogen Feedstocks

Feedstock	Process	End Product
Water	Electrolysis	Green Hydrogen
Fossil Fuels	Steam Reforming with carbon sequestration	Blue Hydrogen
Fossil Fuels	Steam Reforming with no carbon sequestration	Gray Hydrogen
Coal	Gasification	Brown Hydrogen

Source: S&P Global Market Intelligence

**Primary Energy** – Fossil fuels (petroleum, natural gas, and coal), nuclear energy, and renewables contribute to primary energy, defined as energy production plus energy imports, minus energy exports. Electricity is a secondary energy because it is generated from primary energy sources such as coal and natural gas. British thermal units (BTU's) measuring heat energy compare primary energies on equal footing.

**Base Load Energy** – The minimum amount of electric power delivered or required over a given period of time at a steady rate.

**Workforce Development** – Postsecondary education, skills training, and apprenticeship programs maintain Utah's sustainable competitive economic environment. The Utah System of Higher Education oversees eight technical colleges offering specialized training certificates. In 2021, technical college enrollment was over 20,000 students.

**Grid Reliability** – A power system's ability to deliver electricity in the quantity and quality demanded by users.

**Grid Resilience** – A power system's timely resumption of normal operations after network disruptions caused by incidents such as extreme weather, malicious physical or cyber-attacks.

# Draft Strategic Energy Plan (Policy)

## Human-Centric Energy Policy

### Foundational Strategic Principles

1. Energy is an essential part of society's survival, and it is critical to fulfilling all essential societal needs
  - This understanding is vital for protecting Utahns. By declaring energy as a basic human need for survival, we build upon a foundation from which we have a solid footing in preserving our energy future.
2. Adopting lifecycle analysis orientation (Evaluate energy resources from cradle to grave.)
  - Utah is resource-rich. We need to examine the entire journey of all energy sources to understand the opportunities and challenges they bring.
  - A comprehensive approach to understanding the full range of environmental, economic, and social impacts associated with all stages of an energy resource, from raw material extraction to end of life.
3. Evaluate each energy technology separately, considering its specific utility values and contributions to our energy goals.
  - Examine each energy technology individually, identifying its benefits and obstacles in assisting Utah to achieve its energy goals.
  - Avoid simplifying a group of energy technologies based on a single utility value.
4. Preserve solutions that are guided by market forces to meet societal needs
  - The market is distorted due to aggressive interference from federal and regional governments. Utah is negatively impacted due to this distortion and is projected to receive a more significant impact in the future.
5. Energy generation shall meet consumer needs
  - The primary goal of producing energy is to fulfill the needs of consumers.
  - Energy generation should meet consumer needs. Production should be tailored to meet demand. It is crucial to align energy generation with consumer requirements rather than expecting consumers to adapt to what is generated.
    - Example - Increased use of variable energy sources is now directing attention toward managing the inconsistencies of this power rather than addressing the specific needs of consumers.
    - Example - Greater reliance on unpredictable energy sources will significantly compromise adequacy and reliability, resulting in a higher frequency of occurrences of energy emergencies.
      - **Risk** - To aggressive demand-side management, crossing into restricting energy use freedom.

- Example - Real-world examples have proven a low or negative ROI when policymakers overlook or fail to prioritize the specific way, times, and quantities people consume energy, resulting in a doubling of installed capacity without any additional production of usable energy (i.e., increased infrastructure with the same or less energy production).
  - **Risk** - Low ROI or net negative ROI for the State of Utah

## Strategic Decision-Making Principles

- Defined Primary Objectives (see objectives below)
  - Clearly defined objectives will prevent a lack of focus and direction while empowering measurable outcomes, better planning, increased adaptability, and better communication across constituency groups.
- Energy Value Efficiency (The Thriving Protocol)
  - The qualitative and quantitative process that drives performance in reaching our energy goals.
  - Focusing on all the critical utility values of each respective energy resource in accomplishing Utah energy objectives.
- Policy that is Firm in Principle but Flexible in Application to Capitalize on a Diverse Range of Opportunities
  - Adaptability allows for taking advantage of a wide variety of opportunities that may arise without straying from the policy's core intention.
- Integrate Ongoing Assessment and Revision
  - Continuous evaluation and improvement are necessary as progress and understanding deepen and as new technologies and citizen and industry needs emerge. This allows Utah's strategies to remain relevant and effective.
- Stakeholder Engagement
  - Informed and holistic decision-making requires stakeholder engagement and the multiple perspectives they provide. This process builds trust, manages risks, and ensures that strategies and projects align with the needs and expectations of those affected.
  - Bridging important jurisdictional lines in energy policy and the interdependencies between industry and other critical infrastructures.
- Regulation, Tax Structure, and Incentives that Align with Goals and Objectives
  - Creating a framework of rules, taxes, and incentives that help guide behavior or actions toward achieving Utah's energy objectives.
- Recognize Consumer Demand Requirements and Prioritize Fulfillment
  - Incorporate strategic elements in policy that concentrate on providing the amount of energy consumers need, at the locations they need it, and at the right times. It's about energy delivery to fit the demands of the users rather than making consumers fit the generation.
- Codify Energy Terms
  - To ensure universal understanding and application

# Core Strategic Objectives

## ● Safeguarding Energy Security (Surviving Level)

### ○ Reliable

- A predictable, consistent, and dependable flow of energy to meet demand in real-time from the citizens, systems, and activities that rely upon it, and includes the ability to withstand uncontrolled or unforeseen events such as cascading failures or loss of system components.
- An uninterrupted supply of energy to maintain the functionality of systems and activities that rely on it.

### ○ Adequate

- The ability of the energy system to supply aggregate energy to meet the demand of end-use consumers within the state at all times, excepting planned and unplanned outages for maintenance and repairs.
- Having a sufficient quantity of energy available to meet the needs of a particular system, region, or societal needs under a range of system conditions. Considers the overall capacity to produce or provide energy without causing shortages or disruptions in service.

### ○ Accessible

- The provision and Availability of energy sources to all individuals, irrespective of their socio-economic status, geographical location, or any other barriers, ensuring that energy is both affordable and obtainable to meet their basic and developmental needs.

### ○ Affordable

- Energy resources that are reasonably priced to a significant portion of the population without causing financial strain or compromising their basic needs, quality of life, and well-being

### ○ Community Environmental Resilience

- Increases the resilience of the public for the protection of life, property, and livelihood against threats of nature.

## ● Guiding Principles (Thriving Level)

### ○ Energy Conservation

- Proactive practices aimed at reducing the consumption of energy or using energy more efficiently, with the objective of preserving resources, minimizing costs, and reducing environmental impact to ensure sustainable energy for future generations.

### ○ Utah Competitiveness

- Enhancing how Utah utilizes its available natural assets, governing rules, and business sectors to boost future sustainability and the state's ability to withstand and recover from energy challenges, ensuring its economic well-being, social harmony, and safety remain intact and robust.

### ○ Energy-Intensive Industries Competitiveness

- Promoting economic growth, strengthening Utah's position in the global market, ensuring reliable and adequate energy supplies, driving technological advancements, increasing

tax revenues, creating job opportunities, to attract both traditional domestic and foreign investments, as well as new, emerging energy-intensive industries.

- Sustainable

- Environmental

- To minimize the negative impact on the environment by analyzing the environmental impact of an energy source, considering factors such as resource extraction, manufacturing, installation, operation, maintenance, waste, and decommissioning. All energy sources have an impact, and the focus is to set appropriate thresholds on minimizing these impacts and striving towards a more environmentally sustainable energy landscape.

- Economic

- Promoting the state's long-term economic stability, supporting local and rural economies and resources, spurring innovation, driving technological progress, attracting investments, ensuring economic resilience, identifying and decreasing unstable energy imports, and prioritizing energy access and inclusivity

- Strategic Innovation

Embrace innovative policy, technology, research, and collaboration to foster economic growth, enhance competitiveness, ensure energy security, improve grid resilience, achieve cost savings, efficiently meet rising energy demands, leverage collaborative benefits, create jobs, establish technological leadership, and adapt swiftly to local, regional, national and global market dynamics.

- Energy goals and targets
  - Policy
  - Technology
  - Research
  - Collaboration