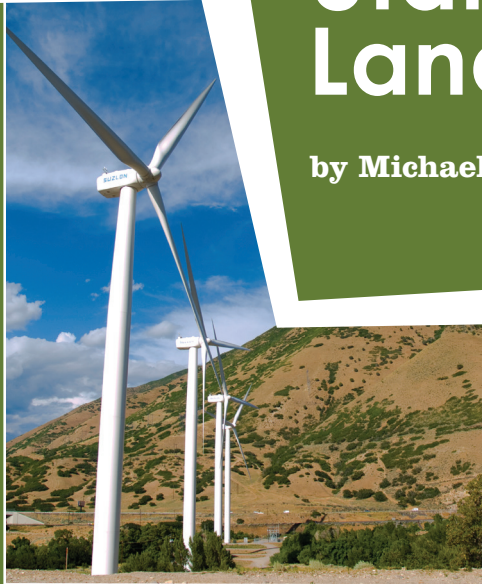


Utah's Energy Landscape

by Michael D. Vanden Berg

5th
Edition



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2020

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Advancing Utah's Energy Future

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Background photo: Milford 2 solar farm, Beaver County.

INTRODUCTION

Utah is fortunate to have abundant and diverse energy resources including large reserves of conventional fossil fuels, several areas suitable for renewable resource development, and vast quantities of untapped unconventional oil shale and oil sand resources. This publication, *Utah's Energy Landscape*, now in its fifth edition, was created to offer a complete, visual-based description of Utah's diverse energy portfolio.

The graphs within this document were created using data compiled by the Utah Geological Survey (UGS) from several sources, including the U.S. Department of Energy's Energy Information Administration (EIA), the Utah Division of Oil, Gas and Mining (DOG M), the Utah Governor's Office of Energy Development (OED), the Utah State Tax Commission, and the Utah Department of Workforce Services, as well as surveys and conversations with individuals and companies.

Utah Energy and Mineral Statistics (UEMS) is a web-based data clearinghouse located on the UGS website that contains all the energy data used to create the graphs in this report. Each graph includes a reference table number, indicating where the data can be found and downloaded either as a Microsoft Excel® file or an Adobe® PDF file.

Utah Energy and Mineral Statistics website: <http://geology.utah.gov/resources/energy/utah-energy-and-mineral-statistics/>

STATEMENT ON THE COVID-19 PANDEMIC

The fifth edition of *Utah's Energy Landscape* was created before the current COVID-19 crisis. While this report focuses on data through 2018 (with some updates for 2019), we fully understand that the COVID-19 pandemic has and will significantly alter Utah's energy landscape going forward. To this end, we look forward to revising this report in late 2020 or early 2021 with new data and analysis related to the current situation.

SUMMARY (of data through 2018/2019)

Utah's energy landscape continues to evolve as the balance between fossil fuels and renewable energy changes—some related to worldwide trends, whereas others are more specific to Utah and the western United States. The most noteworthy trends include: 1) the weakening of crude oil prices plus operator turnover in the Uinta Basin has led to reduced drilling activity resulting in a plateau in Utah's crude oil production, 2) low natural gas prices have resulted in the continued erosion of Utah's natural gas production, 3) the exponential growth in residential rooftop solar capacity plus energy efficiency measures have changed Utah's electricity demand growth, and 4) increases in renewable and natural gas-generated electricity have led to a reduction in Utah's coal-fired power generation.

After significant volatility in Utah's crude oil price between 2014 and 2016—with swings from a high of \$100 per barrel to a low of \$20 per barrel—prices stabilized in a range between the low \$40s and high \$50s, averaging \$48 per barrel in 2019. After two years of steady increase (2016 to 2018), crude oil production in Utah plateaued in 2019 at 36.5 million barrels. Natural gas prices have remained low for the past five years due to oversupply from the country's prolific shale reservoirs. As a result, drilling for natural gas in Utah has virtually stopped and production has declined by 45% since the 2012 peak.

Between 2015 and 2019, 914 megawatts (MW) of new utility-scale solar capacity came online in Utah—more capacity than wind, hydroelectric, geothermal, and biomass combined. This surge in solar also occurred in the residential sector; the total installed residential PV capacity in Utah has increased from just 7 MW in 2013 to more than 212 MW in 2018.

Coal production in Utah rebounded to 14.3 million tons in 2019 as the foreign export market continued to grow, offsetting lower demand at regional power plants and industrial facilities. Production of electricity in Utah has decreased 15% in the past 10 years, mostly from coal-fired power plants, while natural gas-fired power plants and renewable resources have greatly increased their share of total generation.

Consumption of petroleum products is expected to reach record levels in 2019 as prices remain relatively low, and consumption of natural gas is expected to increase to record highs. Electricity consumption has grown at a modest 0.5% per year for the past six years in contrast to the historical 3–4% annual growth rate. This reduction in growth is partially attributed to the increase in rooftop solar installations, which offsets electric demand from power plants, but more significant is an increase in implementation of energy efficiency measures. Utah will continue to be a net-exporter of energy by producing more natural gas, coal, and electricity than is used in state. However, Utah will remain reliant on other states and Canada to satisfy its demand for crude oil and petroleum products.

OUTLOOK

Starting in March 2020, demand for petroleum products fell sharply due to travel restrictions put in place amid the COVID-19 pandemic. This drop in demand, coupled with an oil price and supply war between Saudi Arabia and Russia, has greatly eroded the global price of crude oil. This price decline will have dramatic consequences for Utah in the second half of 2020 and into 2021. This price decline will result in reduced drilling (most likely all rigs will be laid down in Utah by May 2020) and several current wells could be shut-in. Overall crude oil production in Utah could drop by 20% in 2020 with a further decline of 10% in 2021. Natural gas production, already in decline, will continue to fall as production of associated gas (gas produced from oil wells) decreases. Demand for petroleum products in Utah could also decline by 20% or more, resulting in lower refinery receipts and production. A positive for consumers, motor gasoline and diesel prices will significantly decline starting spring 2020. In addition, Utah will most likely see minor increases in residential electricity use as Utah's workforce is directed to stay home and telecommute, but these increases will probably be offset by decreased demand in the commercial and industrial sectors.

Looking beyond the COVID-19-related downturn, large oil- and gas-related infrastructure projects are in various stages of planning and development and could someday boost Utah production. Plans have been proposed to build a railway into the Uinta Basin; the federal Surface Transportation Board recently started the needed National Environmental Policy Act (NEPA) Environmental Impact Statement (EIS) process. If successful, the proposed railway could open new out-of-state markets for Utah's crude oil and could create significant potential for increased drilling rates. Concerning natural gas, several groups have sought new markets for Rocky Mountain natural gas to help alleviate the oversupply, including access to proposed liquefied natural gas (LNG) facilities in Oregon and Baja California, Mexico, to tap into Asian markets.

Despite the COVID-19 crisis, coal production in Utah is expected to remain in the 14- to 15-million-ton per year range, at least until the Intermountain Power Plant converts to burning natural gas and hydrogen in 2025—removing an additional 3-4 million tons of coal from the market. Utah coal deliveries to the foreign export market have experienced a modest jump in the past few years, and potential remains for access to a strong overseas market which could push production slightly higher in coming years.

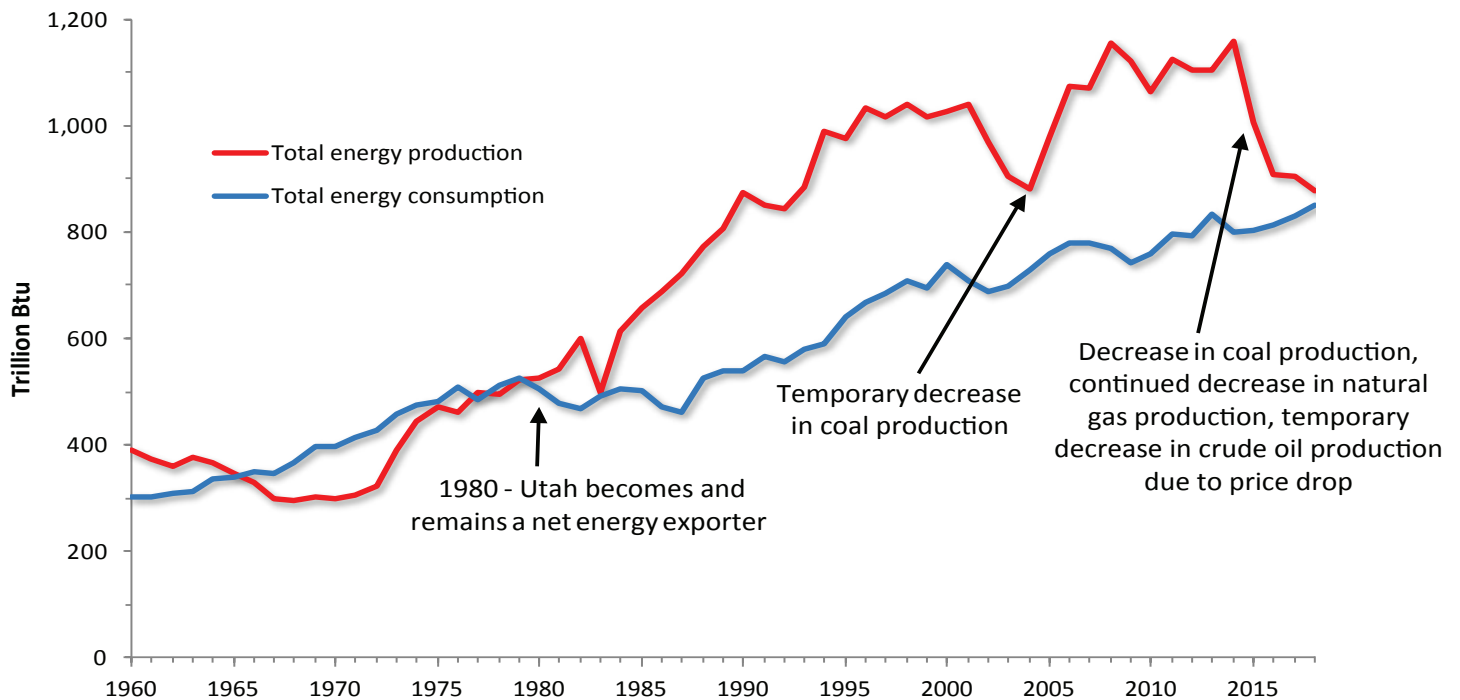
Utah's electric generation portfolio continues to evolve as demand for carbon-neutral electricity increases and several new utility-scale solar farms are installed in 2020 and beyond. This intensified emphasis on carbon-neutral energy has spurred research and development into:

- large-scale electric storage facilities (e.g., banks of lithium-ion batteries or compressed air storage in salt domes near Delta, Utah),
- the generation of electricity from “renewable” natural gas sources (e.g., large-scale anaerobic digesters),
- the continued development of Enhanced Geothermal Systems at the Frontier Observatory for Research into Geothermal Energy (FORGE) site in central Utah,
- the production of carbon-neutral hydrogen (e.g., using excess renewable energy) for electricity generation (as proposed at the Intermountain Power Plant) or vehicle fuel,
- the continued research into carbon capture, utilization, and storage at fossil-fuel power plants (including the Hunter coal-fired power plant in Utah), and
- the development of small module nuclear reactors.

Background photo: Book Cliffs outside Price, Utah

Utah Energy Balance

Production and Consumption, 1960–2018



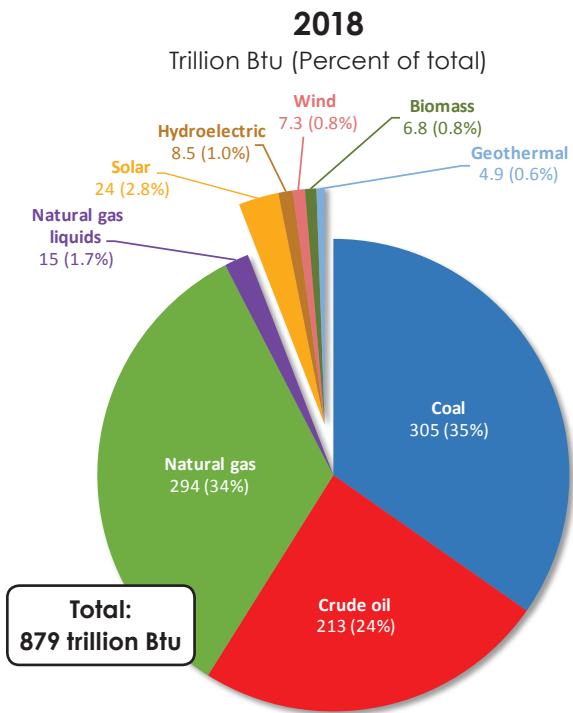
UEMS website table: Table 1.2

Source: EIA, UGS

Note: Consumption data for 2018 are preliminary.

Utah has been a net energy exporter since 1980, producing on average 26% more energy than was consumed. However, in 2018, this percentage dropped to only 3% as Utah production from coal and natural gas decreased significantly. Since the early 1990s, and until recently, the majority of excess energy was in the form of exported natural gas and coal, but Utah also exports electricity produced from both fossil fuels and renewable sources.

Energy Production in Utah by Source

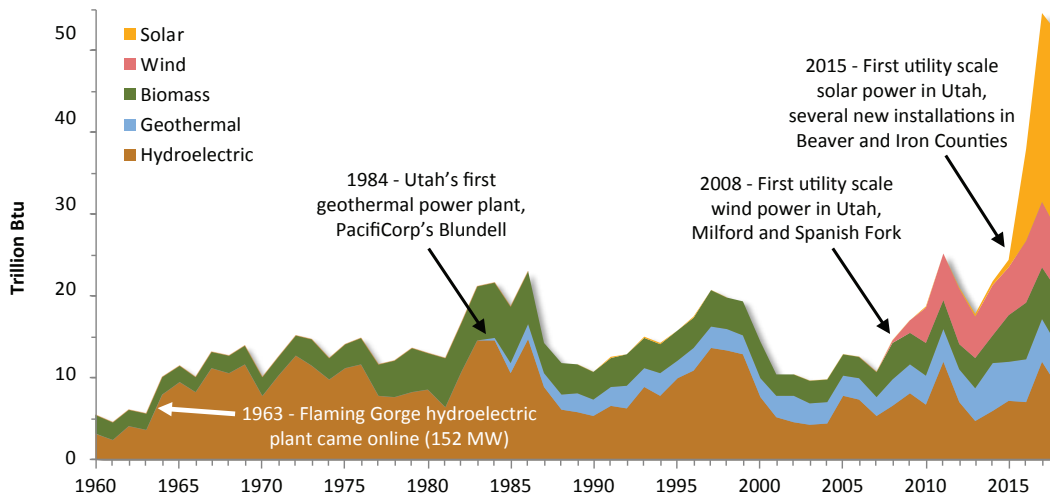


Fossil fuels made up 94% of Utah's total energy production in 2018, while renewable sources accounted for 6% of Utah's production portfolio. Coal has historically dominated Utah's energy production (in terms of Btu), but from 2012 to 2016, natural gas became the dominant annual energy production source—coal took the title again in 2017 and 2018 as natural gas production declined. Renewable energy has historically been dominated by hydroelectric power, but geothermal and wind have grown in significance over the past two decades. Nearly 1 gigawatt of utility-scale solar was built in 2015 and 2016, more capacity than hydroelectric, geothermal, and wind combined, creating a large spike in renewable energy production in recent years (but still only enough to increase renewables' share from about 2% to 6%).

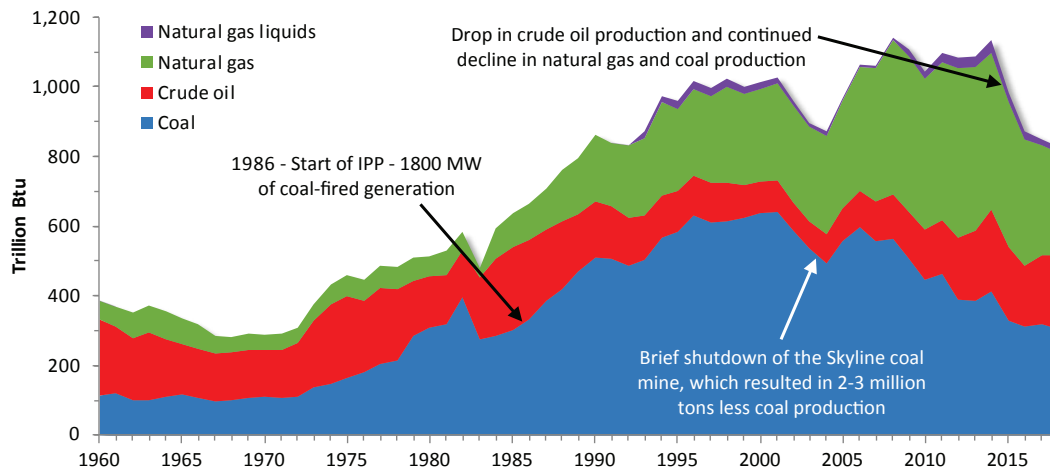
UEMS website table: Table 1.4
Source: EIA, UGS

Note: Natural gas liquids included with natural gas prior to 1993.
IPP = Intermountain Power Plant.

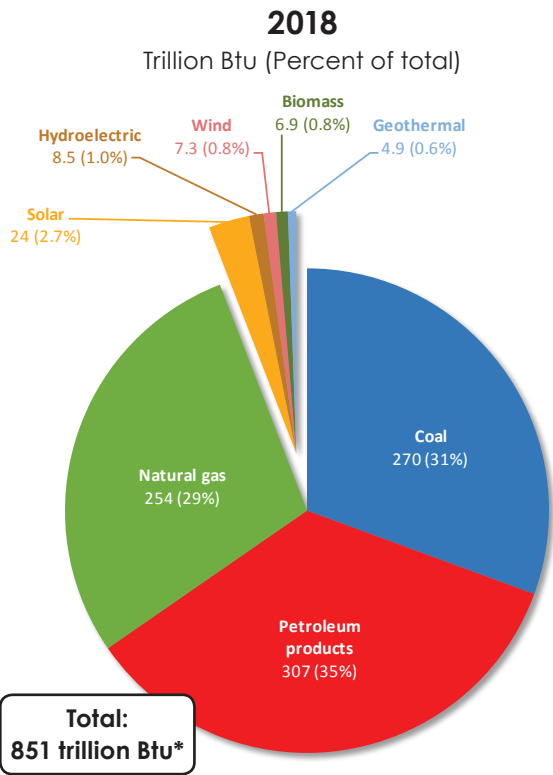
Renewables, 1960–2018



Fossil Fuels, 1960–2018



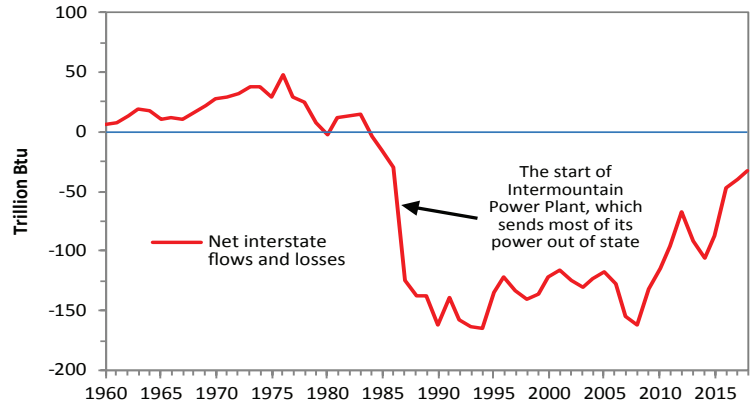
Energy Consumption in Utah by Source



*Total includes net interstate flows and losses. Net interstate flow of electricity is the difference between the amount of energy in the electricity sold within a state (including associated losses) and the energy input at the electric utilities within the state. A positive number indicates that more electricity (including associated losses) came into the state than went out of the state during the year; conversely, a negative number indicates that more electricity (including associated losses) went out of the state than came into the state.

Fossil fuels made up 94% of Utah's total energy consumption in 2018, while renewable sources only accounted for 6% of Utah's consumption portfolio. These graphs do not include net interstate flows and losses (see inset graph); Utah exported 32 trillion Btu of electricity (including losses) in 2018, resulting in a net total consumption of 851 trillion Btu.

Net Interstate Electricity Flows and Losses in Utah, 1960–2018

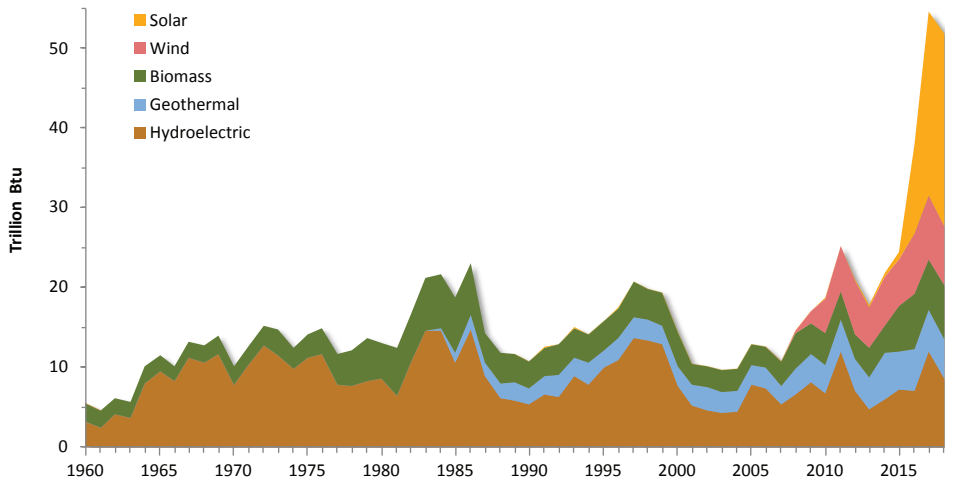


UEMS website table: Table 1.7

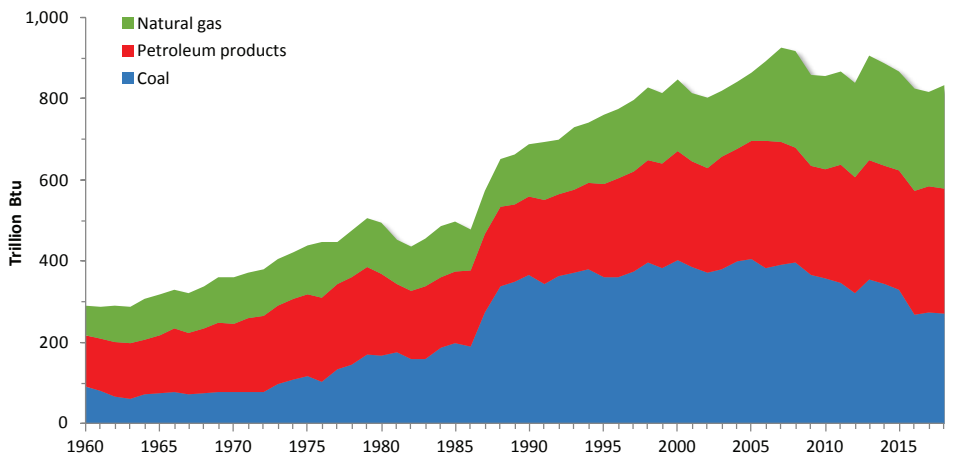
Source: EIA, UGS

Note: EIA assumes that all renewable electric generation originating in Utah is also consumed in Utah, but this is not always the case (e.g., electricity from the Milford wind farm is sold to California). 2018 data are estimated.

Renewables, 1960–2018



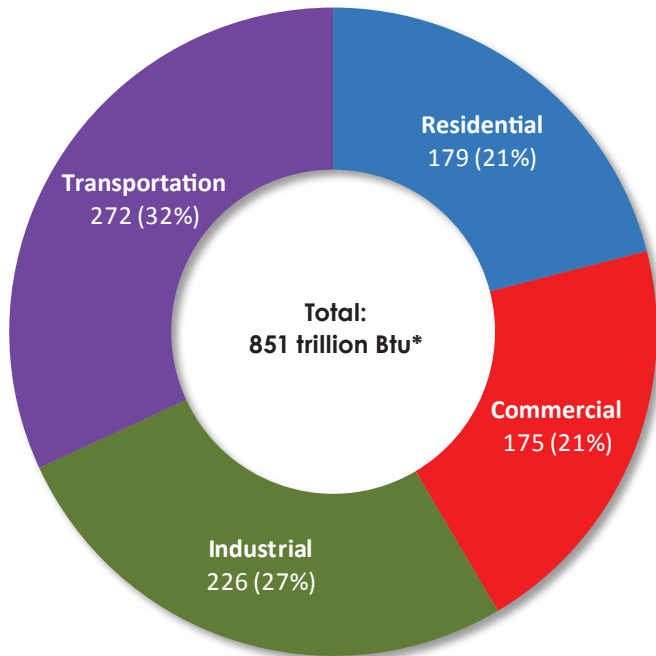
Fossil Fuels, 1960–2018



Energy Consumption in Utah by Sector

2018

Trillion Btu (Percent of total)



The transportation sector, mostly gasoline and diesel for vehicles, was the largest consumer of energy in Utah in 2018 (32%). The residential, commercial, and transportation sectors have all gradually increased over time, consistent with increasing population and increasing energy consumption per capita, whereas the industrial sector follows a pattern more closely tied to the national economy (e.g., economy-related dips in the mid-1980s, early 2000s, 2009–2010, and 2016–2017).

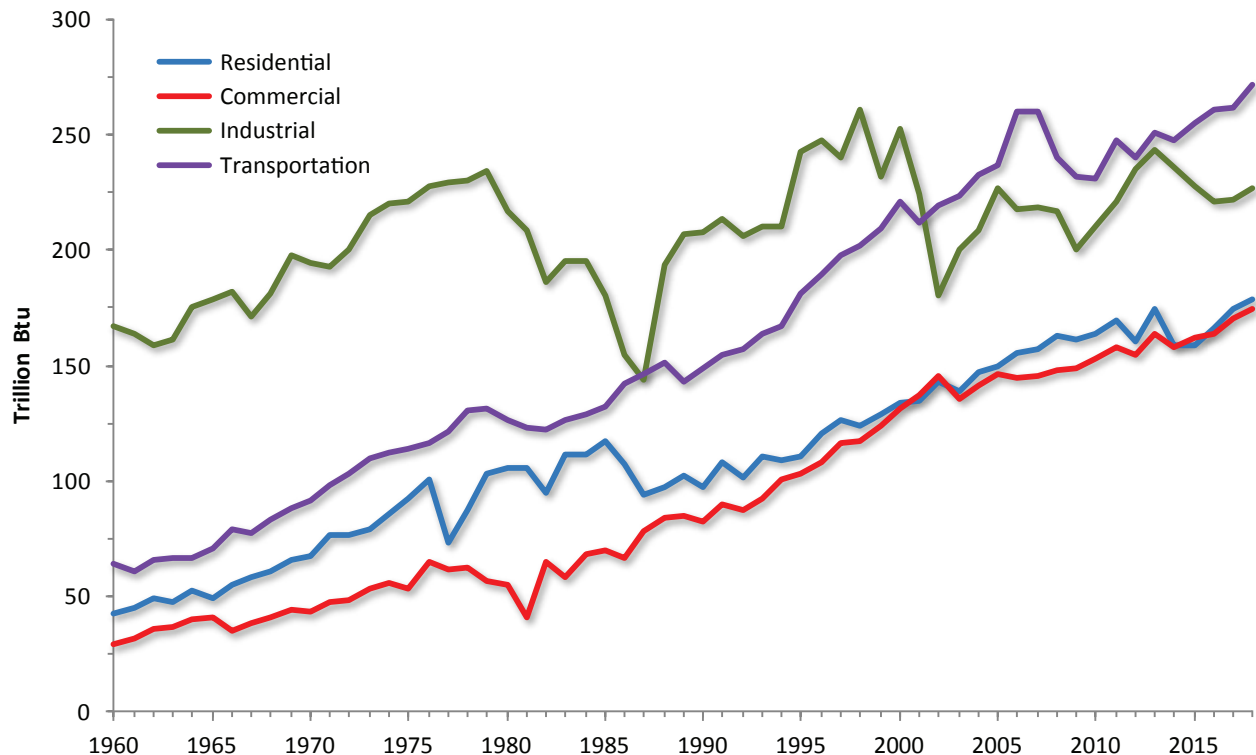
UEMS website table: Table 1.8

Source: EIA

Note: 2018 data are estimated.

*Includes net interstate flows and losses

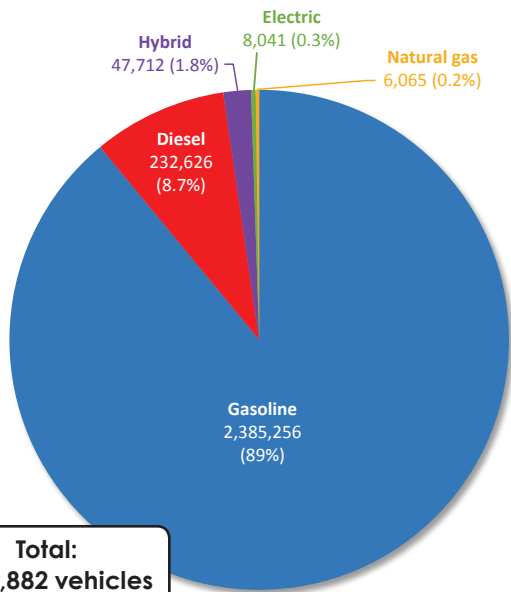
1960–2018



Vehicle Registrations in Utah by Fuel Type

2020

Number of vehicles (Percent of total)



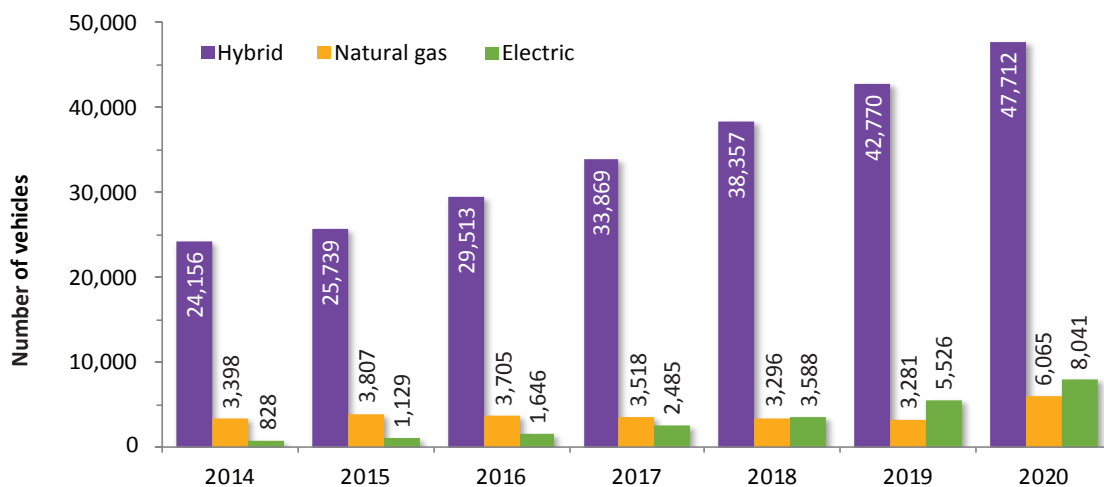
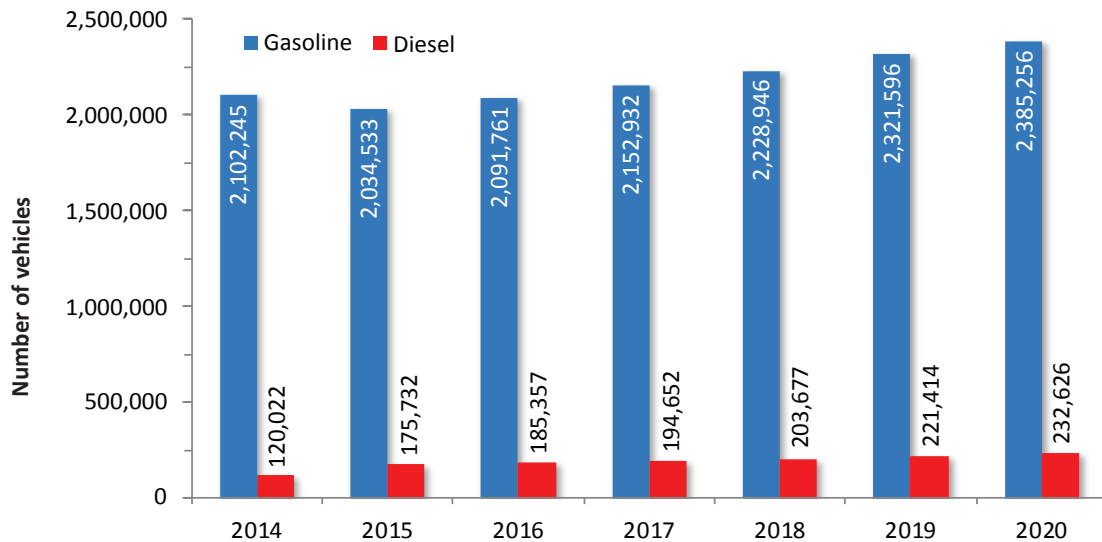
Gasoline powered vehicles are still the dominant choice for transportation needs in Utah, accounting for 89% of total vehicles in 2020 (as of January 2020), whereas diesel vehicles account for 8.7%. The number of hybrid vehicles, including plug-in hybrids, has nearly doubled since 2014 and currently accounts for 1.8% of all vehicles. Electric vehicles have received considerable attention in the past few years as technology has improved and costs have come down. The number of electric vehicles in Utah increased 10-fold since 2014, but still only accounts for 0.3% of total vehicles.

Source: Utah State Tax Commission, Utah Department of Motor Vehicles

Note: "Hybrid" includes plug-in hybrids. "Gasoline" includes flexible fuel and converted vehicles that can run on part ethanol.

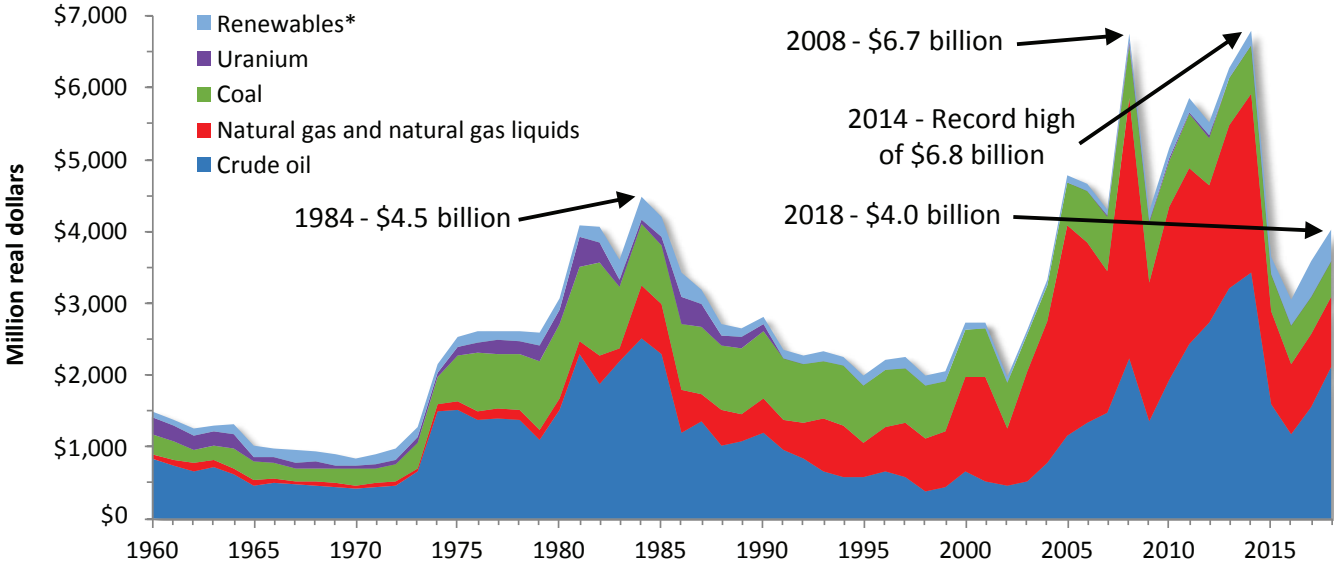
**Total:
2,679,882 vehicles**

2014–2020



energy economics

Value of Energy Production in Utah, 1960–2018

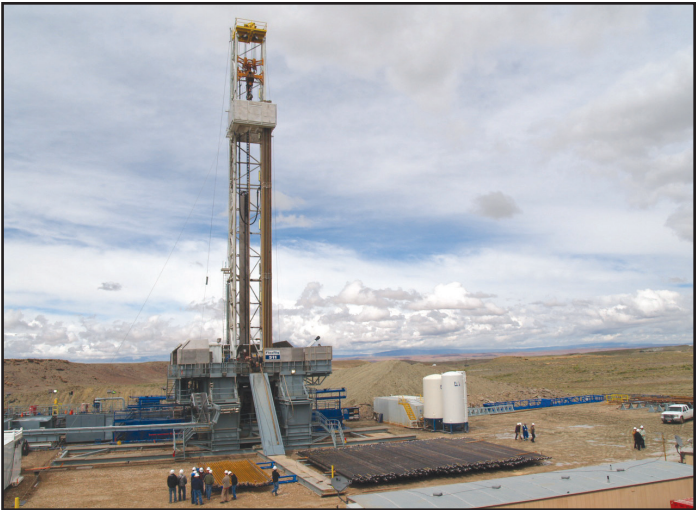


Source: UGS

Note: Real = inflation-adjusted dollars calculated using the Consumer Price Index from the U.S. Bureau of Labor Statistics.

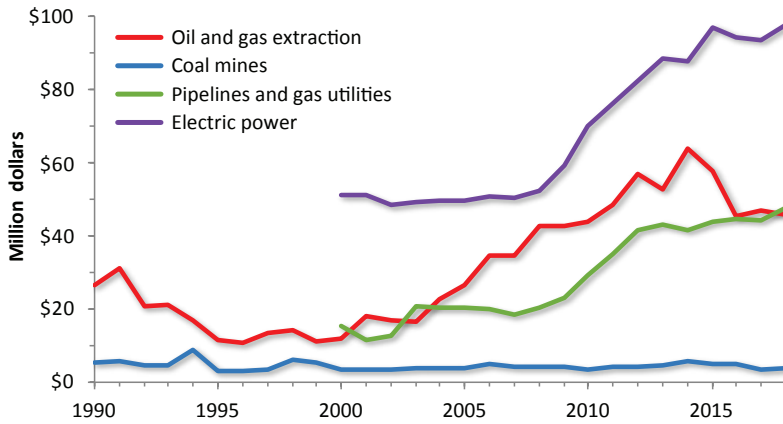
*Calculated using an average electricity price for all sectors; includes solar, wind, biomass, hydroelectric, and geothermal

The value of energy-related production in Utah totaled \$4.0 billion in 2018, rebounding from a low of \$3.0 billion in 2016, but still 41% lower than the inflation-adjusted record-high of \$6.8 billion achieved in 2014. Energy production values were high between 2005 and 2014 when crude oil and natural gas prices surged to levels not seen since the early 1980s.



Drill rig in the Natural Buttes natural gas field.

Property Taxes Charged Against Select Energy-Related Activities, 1990–2018



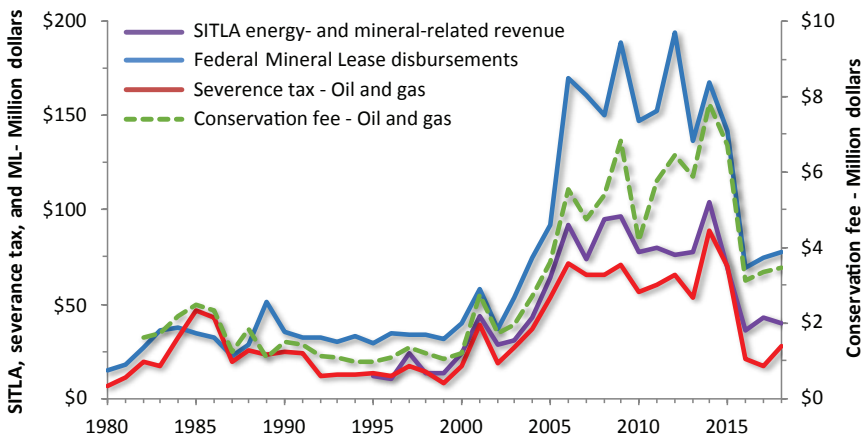
Source: Utah State Tax Commission

Note: Calendar year, presented in nominal dollars.

Property taxes charged against Utah oil and gas activities peaked at \$64 million in 2014 thanks to high prices before retreating to \$46 million in 2018. Property taxes charged against coal mines have remained nearly steady for the past 10 years, averaging about \$4.5 million. Property taxes charged to electric power and energy-related transportation have continued to increase as demand for electricity and home-heating natural gas climbs with growing population.

SITLA revenue, severance tax, conservation fees, and federal Mineral Lease payments are all closely related to oil and gas prices, increasing significantly in the mid-2000s, but down in 2016–2018.

Select Energy-Related State Revenues, 1980–2018



Source: Utah State Tax Commission

Note: State fiscal year, presented in nominal dollars.

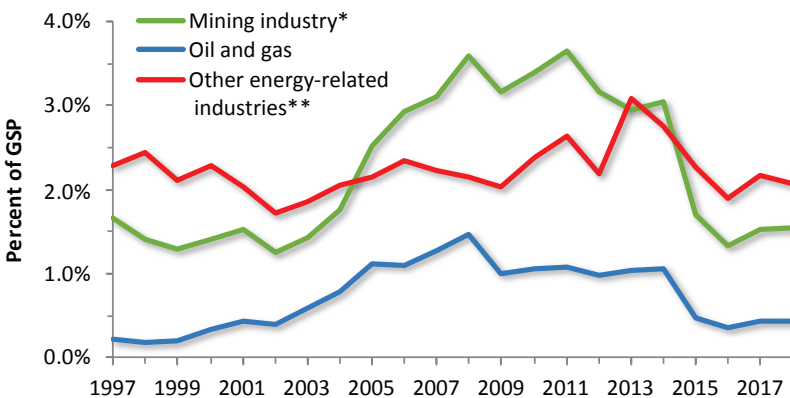
SITLA (School and Institutional Trust Lands Administration) collects royalties for all minerals extracted on their lands and distributes profits to Utah schools and other trust beneficiaries. Minerals include oil, natural gas, coal, oil shale, oil sands, uranium, geothermal, and other non-energy-related commodities.

The **oil and gas severance tax** is based on the value at the well of oil and gas produced and saved, sold, or transported from the field where it is produced. The Utah tax rate ranges from 3% to 5%, based on the value of the oil or gas, and is 4% for natural gas liquids.

The **oil and gas conservation fee** is 0.2% of the value at the well of oil, gas, and natural gas liquids produced and saved, sold, or transported from the production sites.

Mineral Lease (ML) disbursements from the federal government to Utah are roughly 50% (less administrative costs) of the value of minerals produced (includes minor non-energy minerals) on federal lands within the state.

Percentage of Utah's Gross State Product from Energy-Related Activities, 1997–2018



According to the U.S. Bureau of Economic Analysis, the mining industry as a whole (including non-energy minerals) in Utah accounts for about 1.5% of the gross state product (GSP), of which the oil and gas industry accounts for about 0.4%. Utilities (including some non-energy sectors), refineries, and pipeline transportation and maintenance account for an additional 2.1% of Utah's GSP.

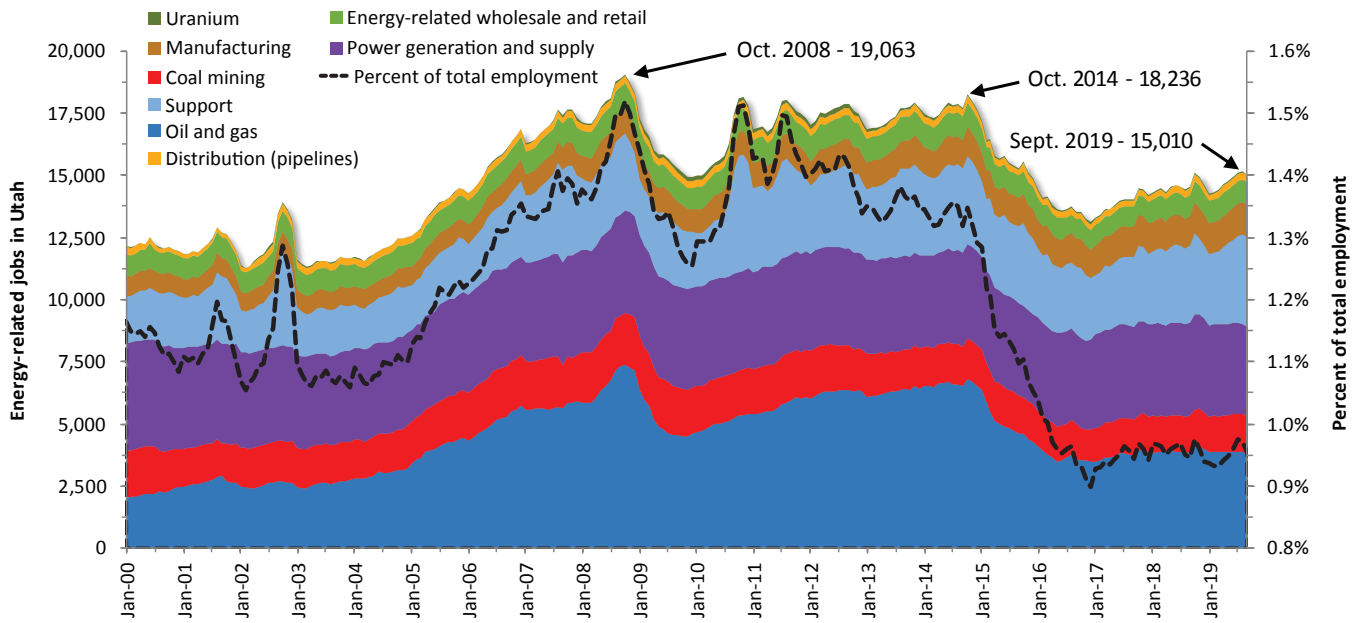
Source: U.S. Bureau of Economic Analysis

Note: 2018 data are preliminary.

*Includes oil and gas, coal, and nonfuel mining

**Includes utilities (including non-energy-related water and sewer), pipelines, and refineries

Energy-Related Employment in Utah (monthly data), January 2000–September 2019

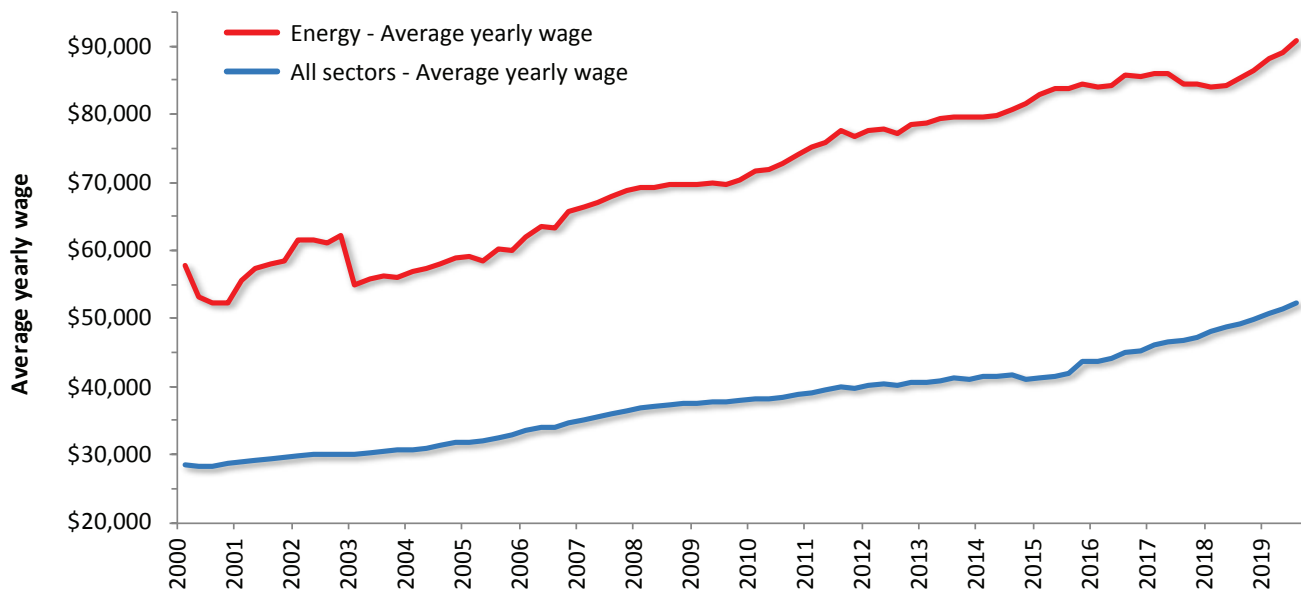


Source: Utah Department of Workforce Services

Note: Employment statistics are based on the North American Industry Classification System for businesses. While these statistics accurately capture many types of energy-related employment, they do not include employment related to renewable energy construction and energy efficiency, or employment in other industries that only exists because of the energy sector. For example, many renewable energy and energy-efficiency jobs are instead classified as part of a larger “construction” category. For this reason, the statistics above are a conservative estimate of energy-related employment in Utah; actual energy-related employment will be larger.

Energy-related employment in Utah climbed to 15,010 in September of 2019 after experiencing a near-term low of 13,096 in December 2016. The majority of energy-related employment (25%) came from the oil and gas sector. Power generation and support industries both made up 24% of the total. Total energy employment peaked in October 2008 at 19,063 and again in October 2014 at 18,236 during times of high prices. Overall, energy-related jobs account for about 0.95% of total employment, decreasing in recent years as the oil and gas sector contracted with decreasing prices.

Annual Average Wages in Utah (quarterly data), Q1 2000–Q3 2019



Source: Utah Department of Workforce Services

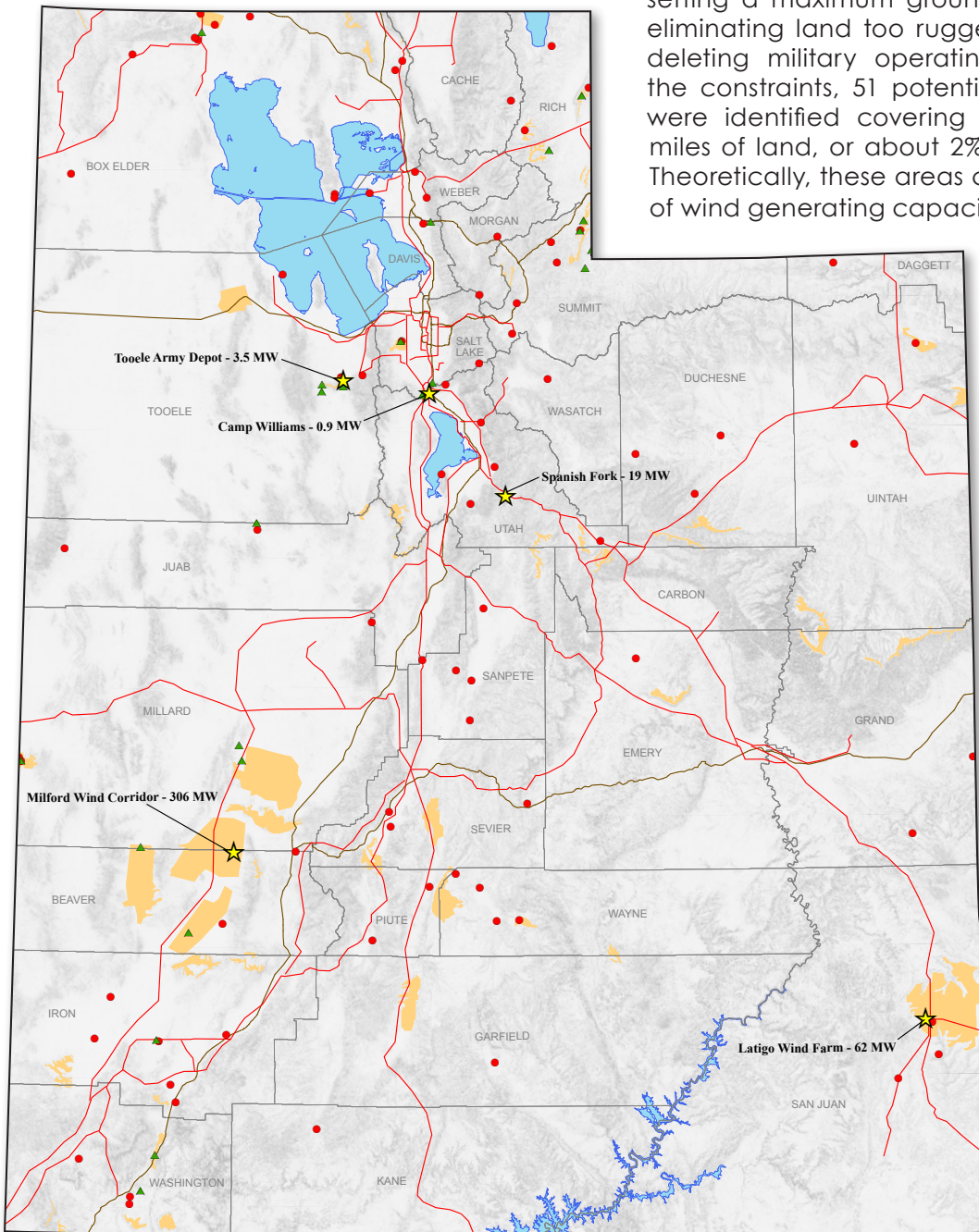
Average yearly wages in the energy sector (\$89,300, first three quarters of 2019) are nearly double the statewide average annual wage (\$51,500, first three quarters of 2019).



renewable resources

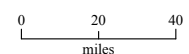
wind

Utah's extreme diversity in landscape and climate is well known, and this factor significantly affects Utah's wind resources. As a result, Utah has a wide array of locations that may be viable for wind energy development. The resource analysis used to identify favorable wind energy zones was based upon wind data collected from 109 anemometer towers stationed throughout the state. The wind resource analysis incorporated several constraining criteria, including: 1) screening out environmentally sensitive areas, 2) setting a maximum ground elevation of 9500 feet, 3) eliminating land too rugged for development, 4) and deleting military operating airspace. After applying the constraints, 51 potential wind development zones were identified covering approximately 1838 square miles of land, or about 2% of the state's surface area. Theoretically, these areas could support up to 9145 MW of wind generating capacity.



- Wind energy zone
- 20 meter anemometer site
- 50 meter anemometer site
- Wind facility
- Transmission (>138 kV)
- County boundary
- Interstate highway

Data Source: UGS

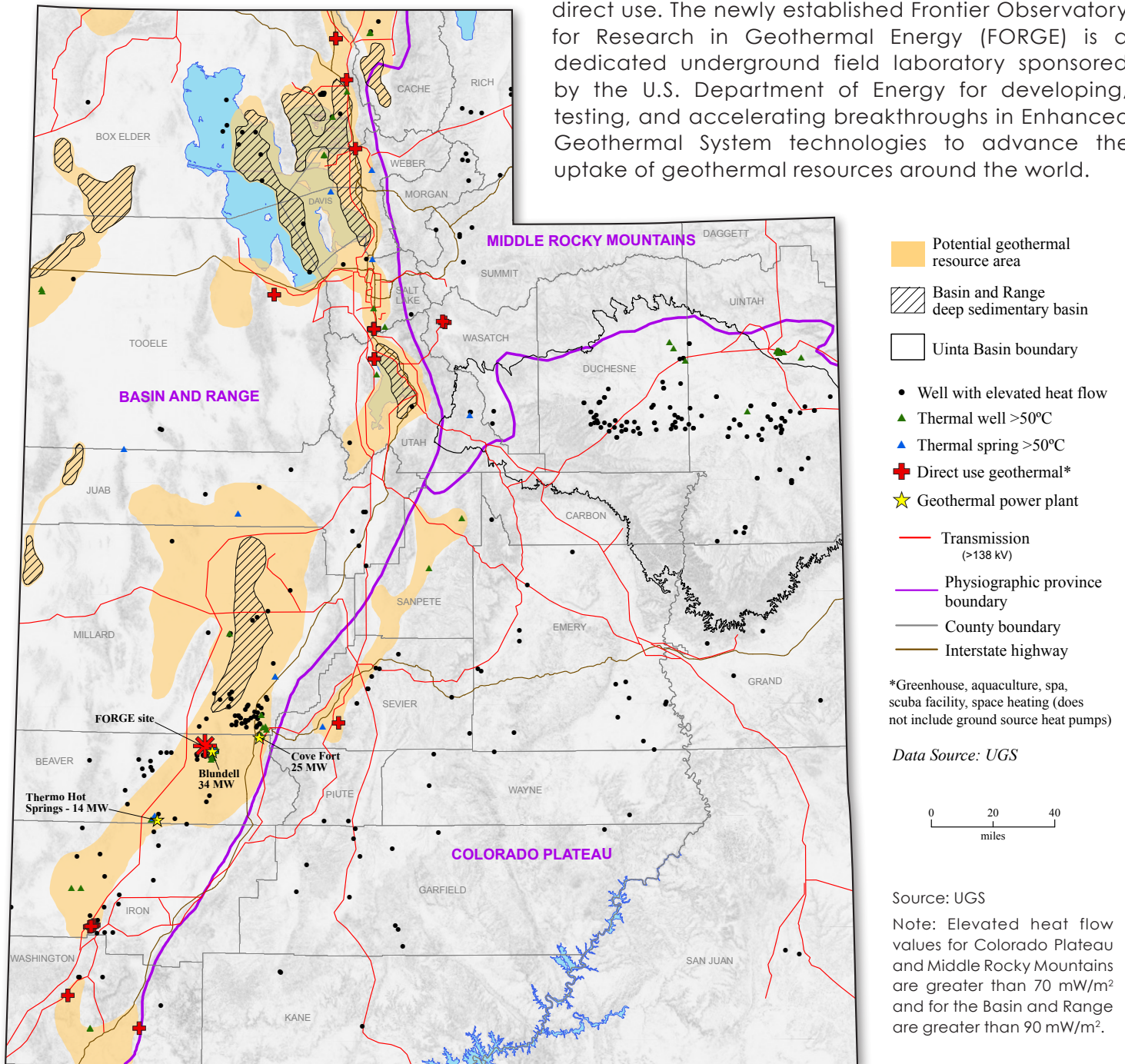


Source: Utah Renewable Energy Zones Task Force - Phase I and II

geothermal

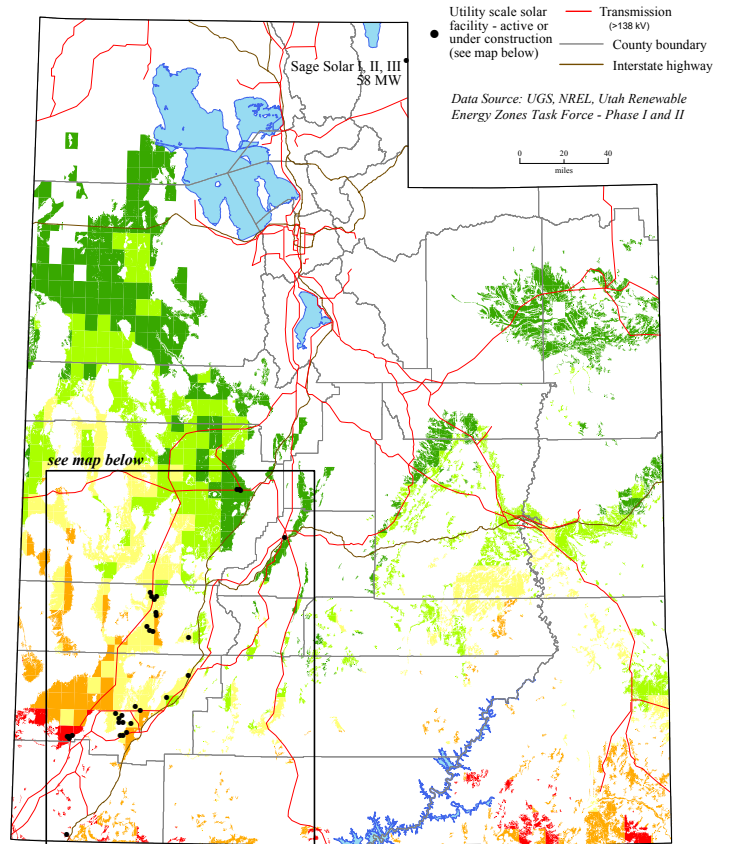
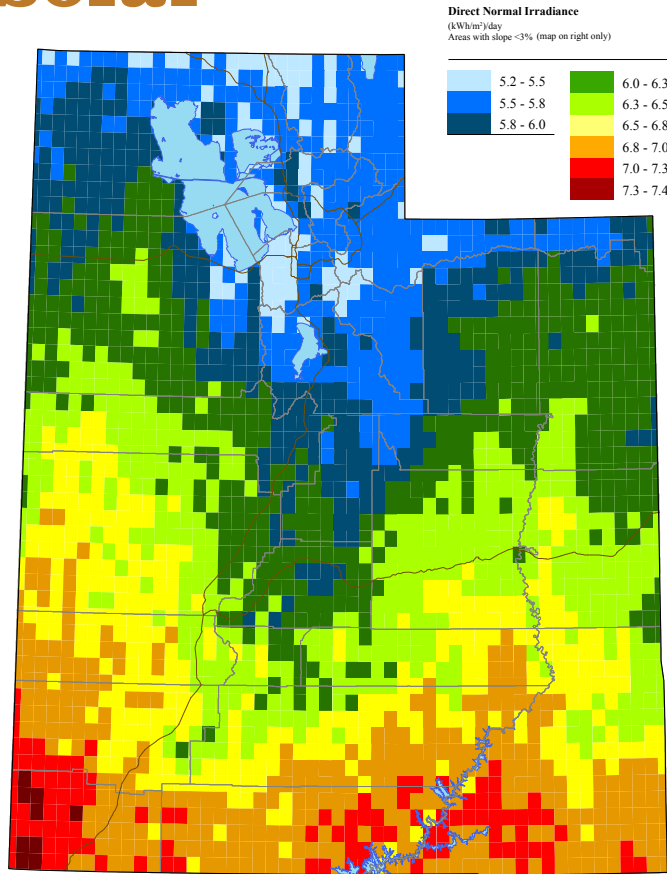
The geothermal energy resource potential of Utah has been evaluated on the basis of information extracted from various types of thermal data throughout the state. Heat-flow data, thermal spring and well temperatures, and fluid chemistries are typically used as a first step in the screening for geothermal resources. Recent studies indicate deep (>10,000 ft) sedimentary basins within the Basin and Range physiographic province of western Utah may have significant geothermal potential. The Uinta Basin also has a potential geothermal resource due primarily to the existence of well infrastructure from the oil and gas industry combined with favorable data on co-produced fluid temperatures and production rates. Utah is home to a variety of geothermal resource utilization projects for both direct applications (greenhouses, spas, space heating, aquaculture) as well as electric power generation. Potential geothermal resources of the Basin and Range would likely include both types of geothermal applications,

whereas those of the Uinta Basin would mostly be direct use. The newly established Frontier Observatory for Research in Geothermal Energy (FORGE) is a dedicated underground field laboratory sponsored by the U.S. Department of Energy for developing, testing, and accelerating breakthroughs in Enhanced Geothermal System technologies to advance the uptake of geothermal resources around the world.



Source: UGS
 Note: Elevated heat flow values for Colorado Plateau and Middle Rocky Mountains are greater than 70 mW/m² and for the Basin and Range are greater than 90 mW/m².

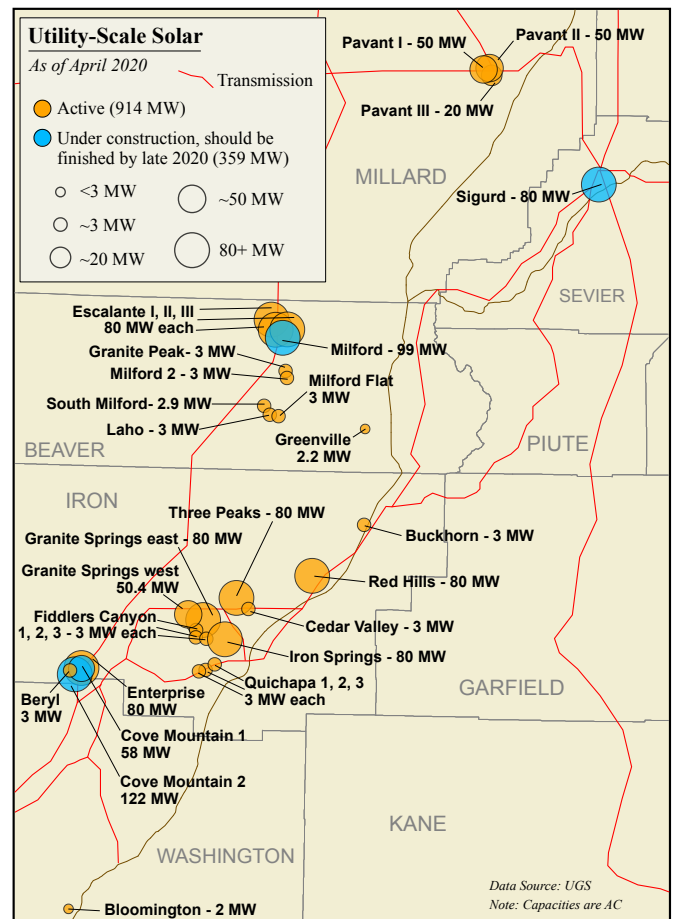
solar



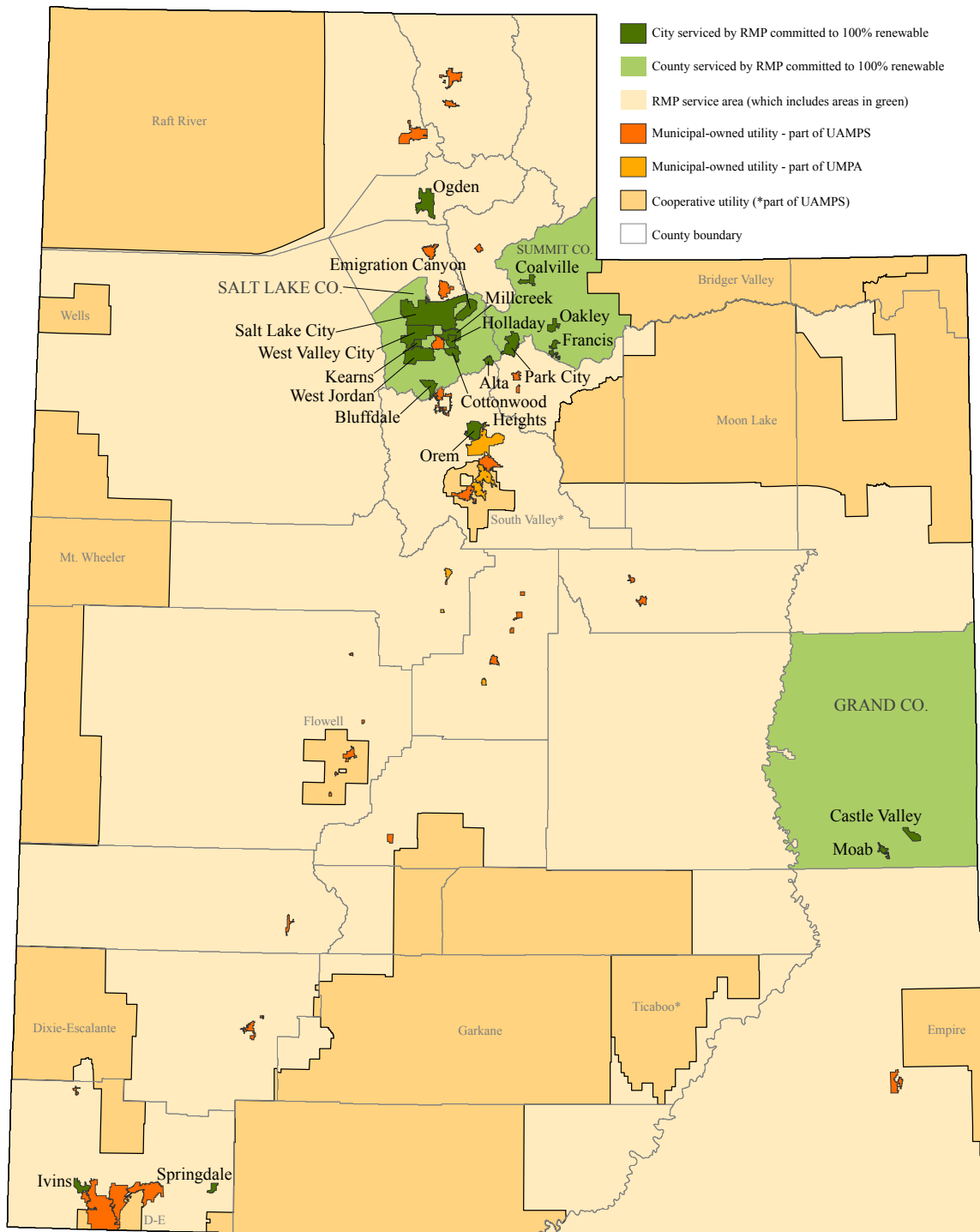
Utah's solar resources are clearly abundant (map at upper left, no screening applied), but to estimate a theoretical solar resource potential, several constraining criteria were used, including: 1) measurements of Direct Normal Irradiance (DNI), with a threshold value of 6.0 kilowatthours per meter squared (kWh/m²)/day or greater, 2) screening out steeper areas (slopes of 3% or greater) unable to accommodate a large solar collection field, and 3) screening out environmentally sensitive areas such as national parks, wilderness areas, wetlands, etc., that are not available for development. After applying the constraints, approximately 6371 square miles of land (7.5% of the state's surface area) are suitable for solar power generation at the utility scale (map at upper right). Theoretically, this land could support up to 826 gigawatts (GW) of solar generating capacity.

Source: Utah Renewable Energy Zones Task Force - Phase I and II

As of April 2020, 914 MW of solar generating capacity is online in southwestern Utah (with one large farm in northern Utah's Rich County). In addition, approximately 359 MW of capacity is currently under construction and up to 1000 MW (and maybe much more) of capacity is under development. By the end of 2020, Utah's utility-scale solar capacity will total 1273 MW, more than wind, geothermal, biomass, and hydroelectric combined.



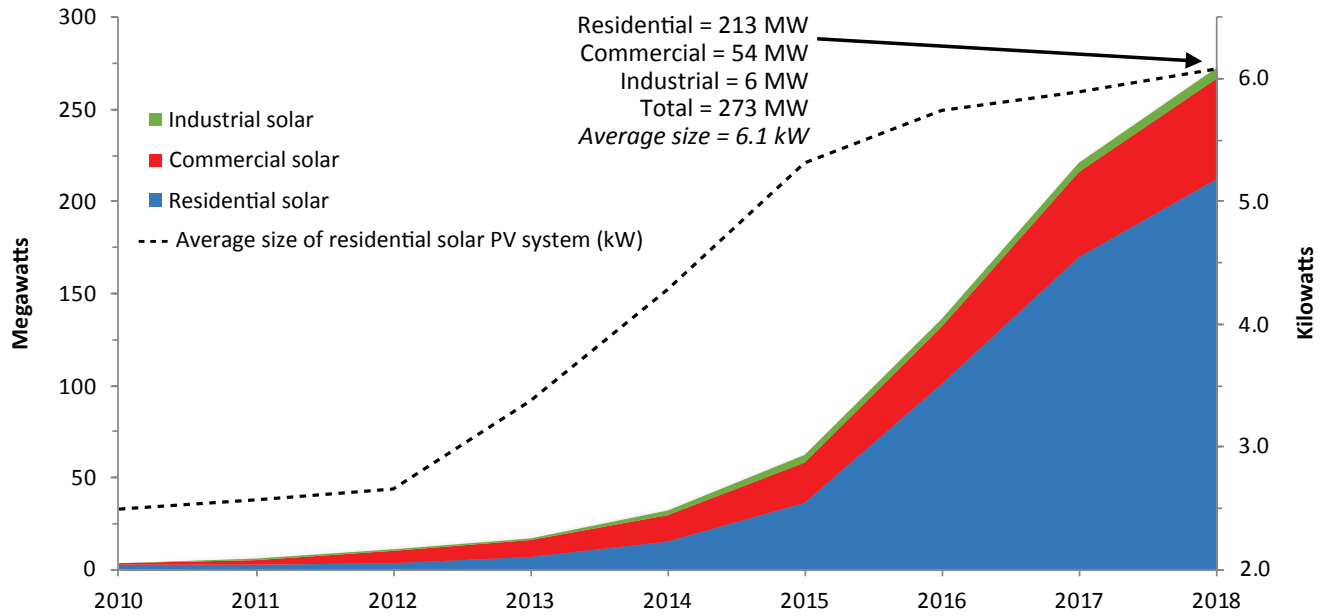
Communities Committed to 100% Renewable Energy



Source: Utah Clean Energy, AGRC

Taking advantage of the Community Renewable Energy Act (HB-411), a total of 24 Utah cities, townships, and counties that are serviced by Rocky Mountain Power (RMP) have committed to achieving 100% net-renewable energy use by 2030. In total, these communities represent 860,000 residents in Utah, about 27% of total population. Under the bill, these municipalities and counties will work with RMP and the Utah Public Service Commission to determine the most cost-effective, straightforward path of achieving their renewable energy goals. Cities represented by the Utah Associated Municipal Power Systems (UAMPS) and the Utah Municipal Power Agency (UMPA), as well as areas serviced by the several electric power cooperatives, will need to determine their own path forward regarding adding renewables or other carbon-neutral resources to their electricity portfolios.

Net-Metered Installed PV Solar Capacity in Utah by Sector, 2010–2018



UEMS website table: Table 6.6
Source: EIA

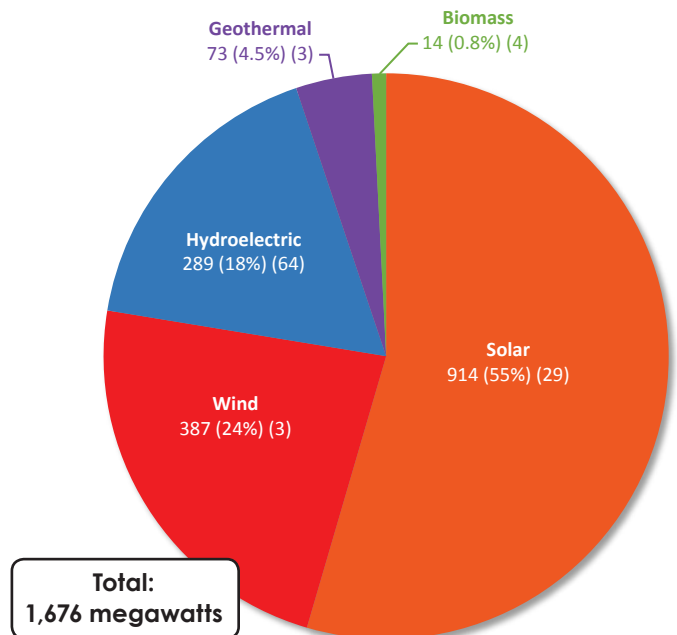
The total capacity of net-metered PV solar installations (i.e., roof-top solar) in Utah has increased exponentially in the past few years, from a total of 3.4 MW in 2010 to 273 MW in 2018, 78% of which was in the residential sector. Also of note, the average size (capacity) of residential solar PV systems has more than doubled in the past 8 years from 2.5 kilowatts (kW) in 2010 to 6.1 kW in 2018. This increase is most likely due to decreasing installation and equipment costs as well as a shift towards the desire to cover nearly 100% of a household’s electricity usage. With the massive increase in net-metered systems, utility companies are re-evaluating net-metering agreements (the price paid by the utility for excess electricity). In addition, federal and state tax credits are starting to be phased out. These factors will most likely result in a slower rate of new installations in the near future.

Utah’s Total Utility-Scale Renewable Capacity by Energy Source, 2019

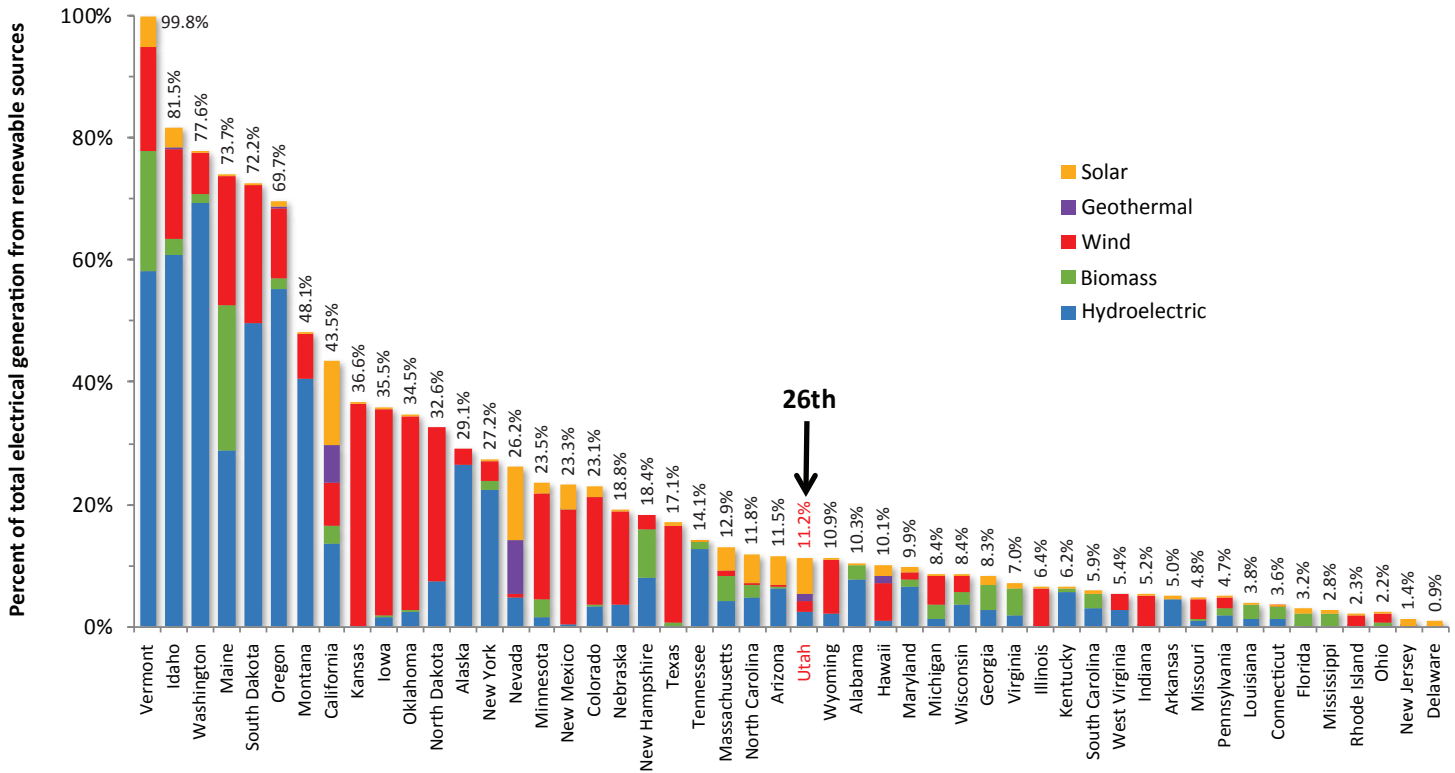
Megawatts (Percent of total) (Number of facilities)

Utah’s renewable electric capacity is dominated by 29 (as of early 2020) utility-scale solar installations (914 MW, 55% of total renewable capacity), all of which have been installed since 2015 (see map on previous page). Utah also hosts three large wind farms, Milford (306 MW), the Latigo (62 MW), and Spanish Fork (19 MW), and 64 hydroelectric plants, the largest being Flaming Gorge at 152 MW. Utah’s geothermal electric generation consists of PacifiCorp’s Blundell plant (34 MW), Thermo Hot Springs (14 MW), and Cove Fort (25 MW), whereas the biomass portion is mainly from Wasatch Front landfill gas operations and a “biogas” facility in Beaver County.

UEMS website table: Table 6.4
Source: EIA, UGS



Renewable Electric Generation by State, 2018



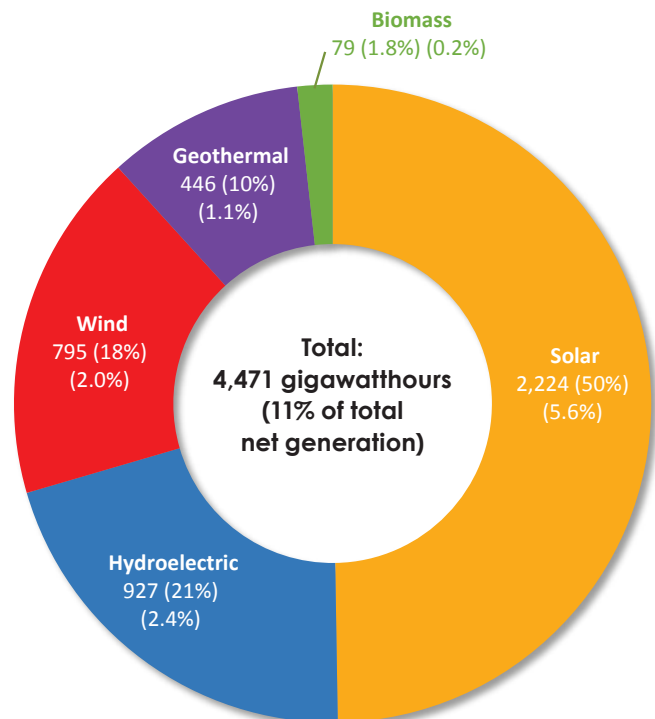
UEMS website table: Table 6.2
Source: EIA

In 2018, Utah ranked 26th in the nation in percent of total net electric generation from renewable resources (11.2%). Of particular note, Utah is one of only seven states where electricity is generated from geothermal resources.

Renewable Electric Generation in Utah, 2018

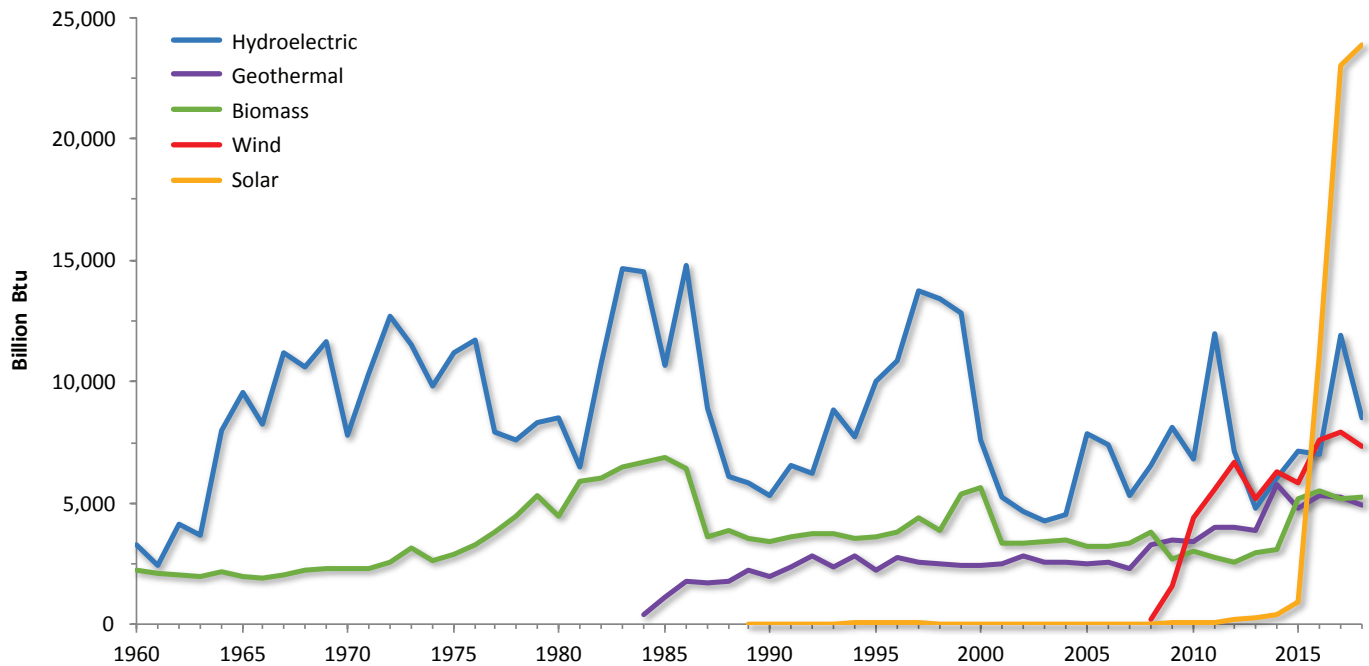
Gigawatthours
(Percent of total renewables)(Percent of total net generation)

Utah's renewable electric generation is dominated by 914 MW of newly installed utility-scale solar farms (50%), followed by hydroelectric (21%), wind (18%), and geothermal (10%) power. The biomass portion is mainly electricity generated from burning landfill gases. Renewable energy sources now account for 11% of Utah's total electricity generation.



Renewable Energy Consumption in Utah

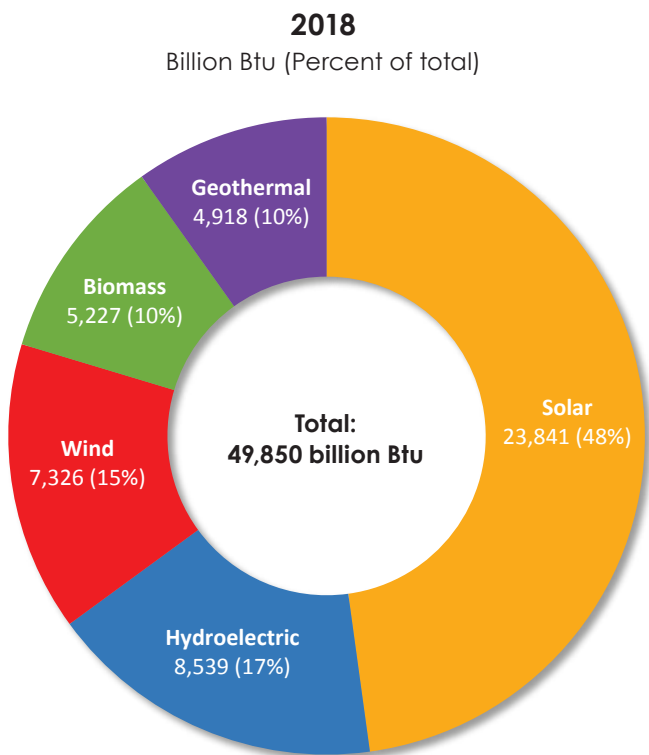
1960–2018



UEMS website table: Table 6.3

Source: EIA

Note: EIA assumes that all renewable electric generation originating in Utah is also consumed in Utah, but this is not always the case (e.g., electricity from the Milford wind farm is sold to California). 2018 data are estimated. Includes the electric utility sector.

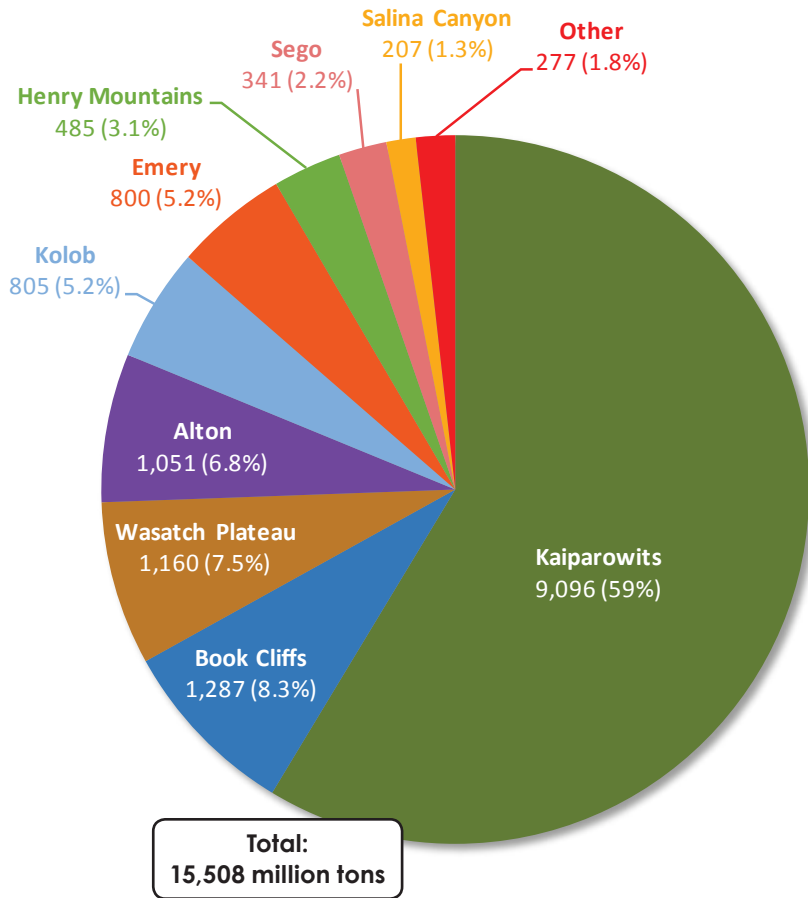


Cove Fort geothermal power plant

The recent installation of several utility-scale solar farms, as well as a significant increase in roof-top PV systems, has pushed solar into the dominant renewable energy source in Utah. Hydroelectric power will continue to fluctuate according to reservoir water levels; wind energy will remain steady as no new wind farm installations are planned; and biomass and geothermal will remain fairly steady sources of baseload power.

Utah's Recoverable Coal Resources by Coalfield, 2018

Million tons (Percent of total)



The majority of Utah's potentially recoverable coal resources are located in the Kaiparowits coalfield (59% of Utah's estimated recoverable coal, as of 2018). Since 1996, these resources were locked within the Grand Staircase–Escalante National Monument until recent presidential orders reduced the monument's size, making some areas potentially accessible to new mining. Currently, only the Wasatch Plateau, Book Cliffs, Emery, and Alton fields contain active mines.

UEMS website table: Table 2.3

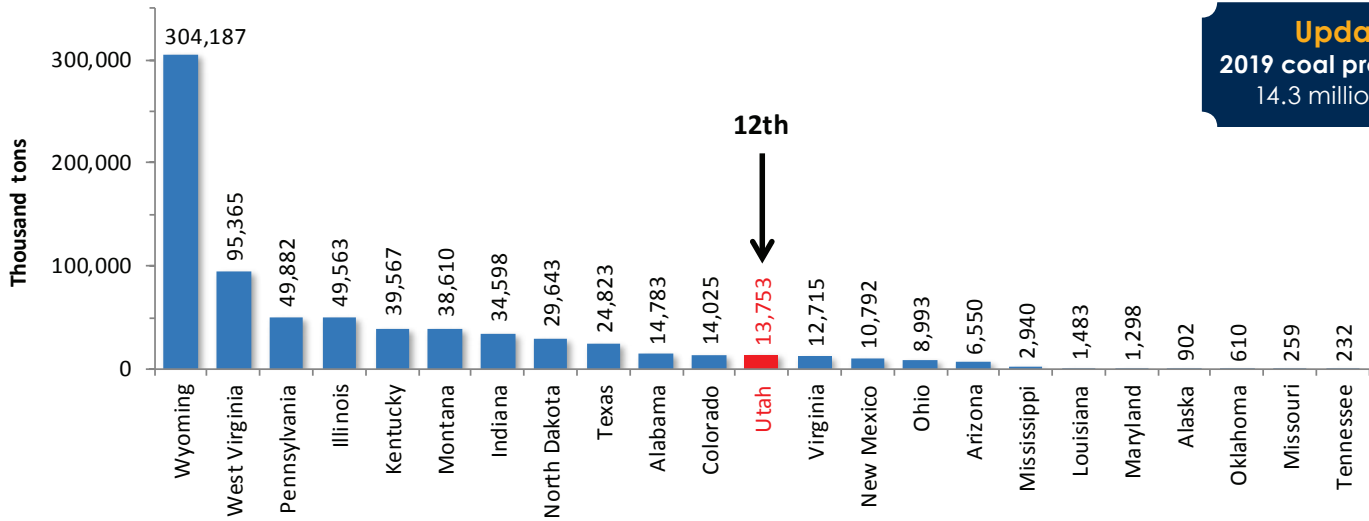
Source: UGS

Note: For Wasatch Plateau, Alton, Emery, Book Cliffs, and Henry Mountains, resources were constrained by a seam height minimum of 4 feet, with no more than 3000 feet of cover. For the remaining fields, resources were constrained by an estimated resource factor ranging from 30% to 40% of principal (unconstrained) resources. These resources do not take into account economic or land use constraints.



Utah coal

U.S. Coal Production by State, 2018

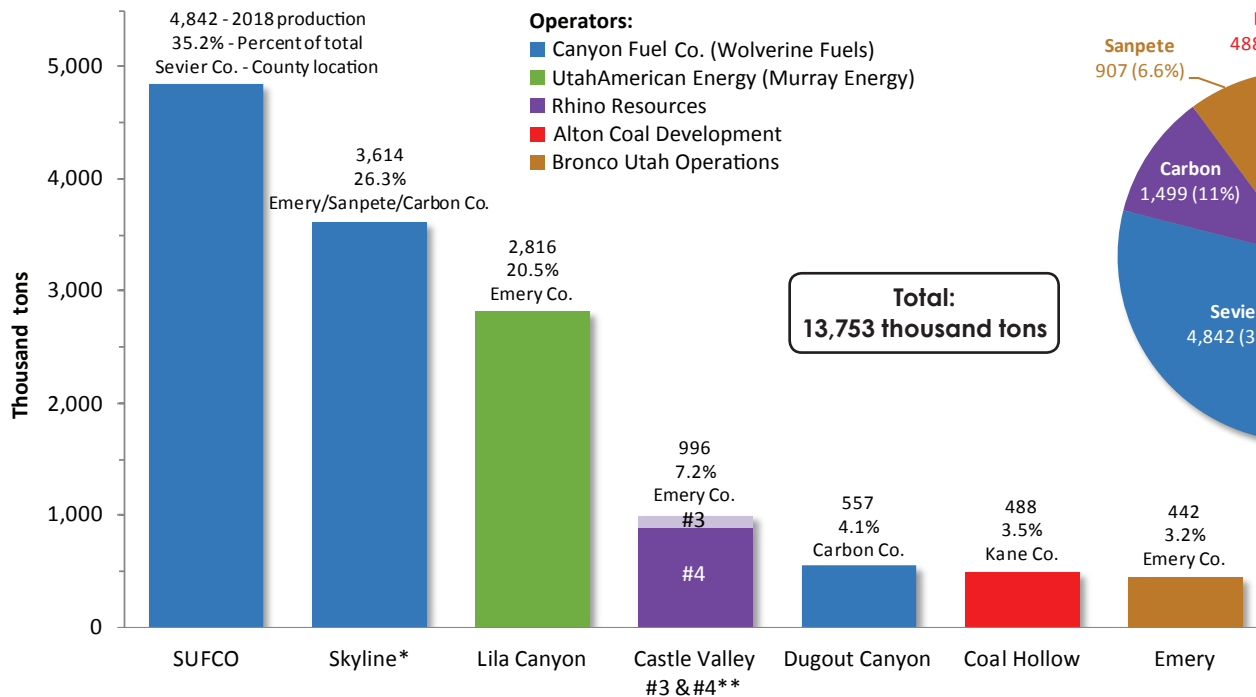


Update
2019 coal production
14.3 million tons

UEMS website table: Table 2.7
Source: EIA, UGS

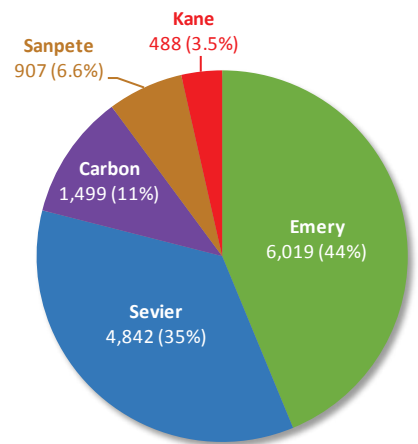
In 2018, Utah ranked as the 12th largest producer of coal in the United States.

Utah Coal Production by Mine, 2018



Utah Coal Production by County, 2018

Thousand tons (Percent of total)



In 2018, 66% of Utah's coal production came from three Canyon Fuel Company mines (Wolverine Fuels) and 20% came from UtahAmerican's Lila Canyon mine, which ramped up production after the closure of the West Ridge mine in 2015. The Skyline mine recently shifted operations to the southern Flat Canyon lease at the intersection of Emery, Carbon, and Sanpete Counties. The Emery mine, which closed in 2010, was sold to Bronco and reopened in 2017 and should reach full production in 2019 of about 1 million tons per year. The Coal Hollow surface mine is also expected to increase production as operations move to adjacent federal leases.

UEMS website table: Table 2.8 | Source: UGS

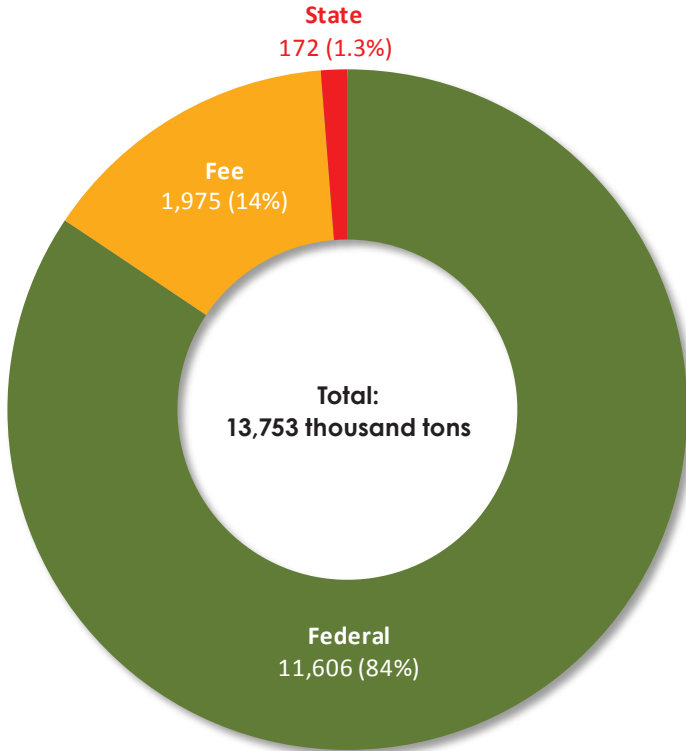
*The Skyline mine produced coal in three different counties in 2018: Emery = 1,765,410 tons; Carbon = 941,447 tons; Sanpete = 906,716 tons.

**Castle Valley #3 (102,240 tons produced) and #4 (893,376 tons produced) are part of the same facility but are listed as two separate mines because they operate in two different seams.

Utah Coal Production by Landownership

2018

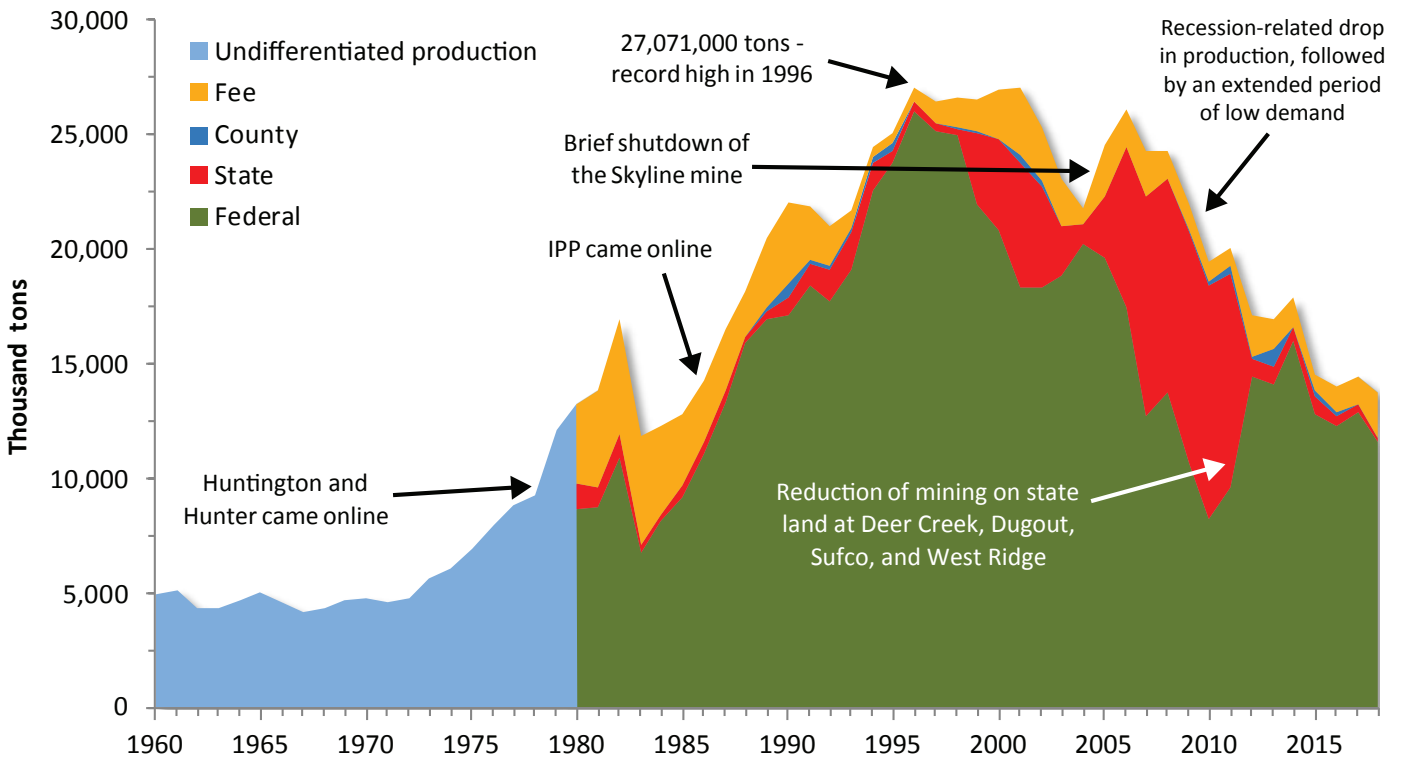
Thousand tons (Percent of total)



Declining Utah coal production started during the 2008 recession and has continued as coal has dropped out of favor as a fuel for electric and industrial needs. The large increase in state land production that started in 1998 was the result of lands given to Utah after the designation of the Grand Staircase–Escalante National Monument. By 2012, those state lands had been mined out, once again increasing federal coal production to over 80%. Currently, Utah production is mostly supplying in-state markets and minor amounts of coal is going to other states.

UEMS website table: Table 2.12
Source: UGS

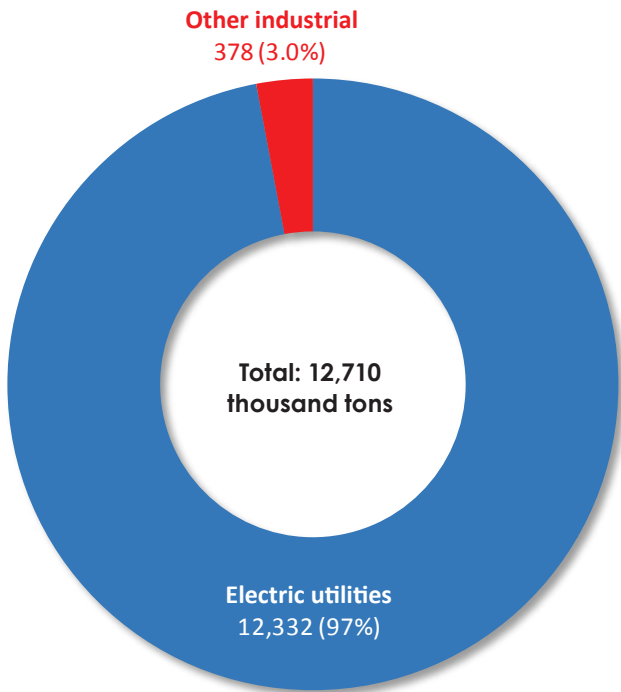
1960–2018



Utah Coal Consumption by Sector

2018

Thousand tons (Percent of total)



Approximately 12.3 million short tons of coal was consumed in Utah in 2018, 97% of which was burned at electric utilities. Demand for coal in Utah has remained steady in recent years after a dramatic 17% decline between 2015 and 2016. Coke consumption in Utah ended in 2001 when Geneva Steel went out of business, and coal sales for industrial use (mostly cement and lime companies) has dropped to roughly 375,000 tons per year, which is only a quarter of peak demand of 1.4 million tons reached in 2005. Consumption in the residential and commercial sectors has been negligible for years.



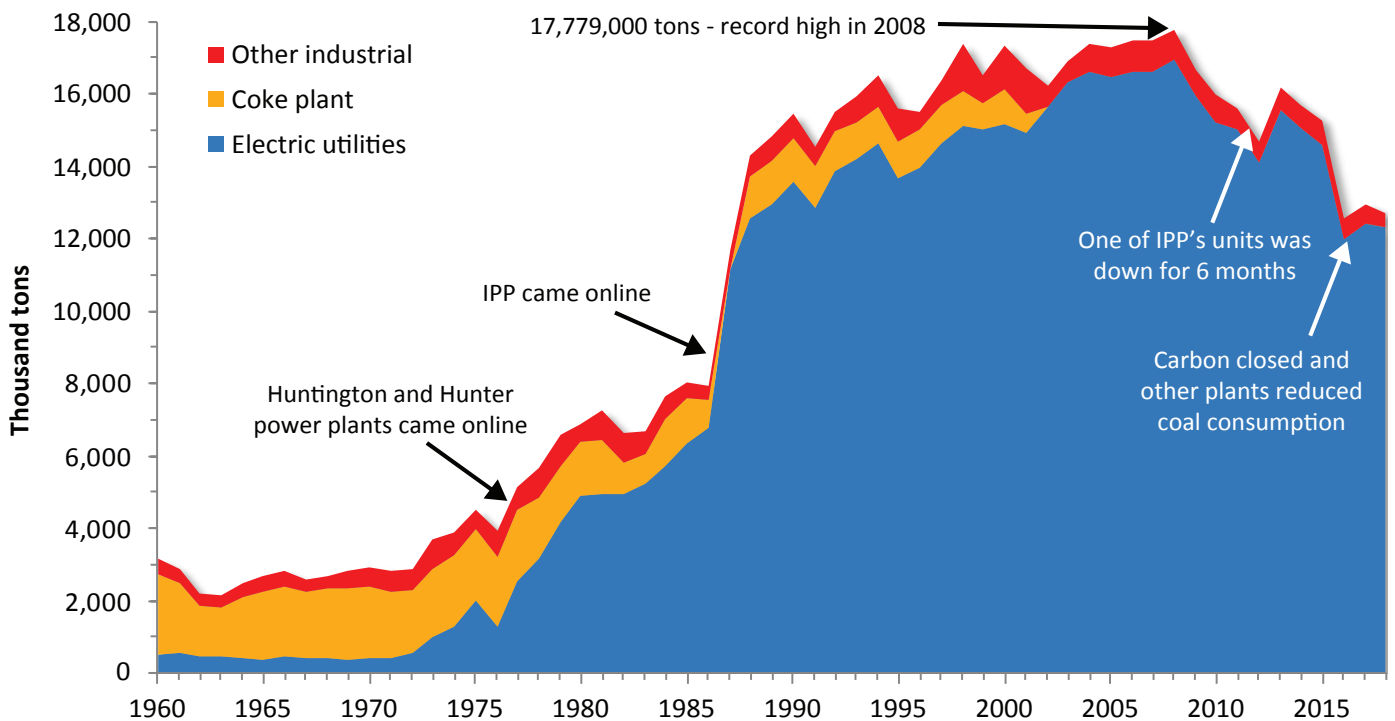
Hunter coal-fired power plant

UEMS website table: Table 2.21

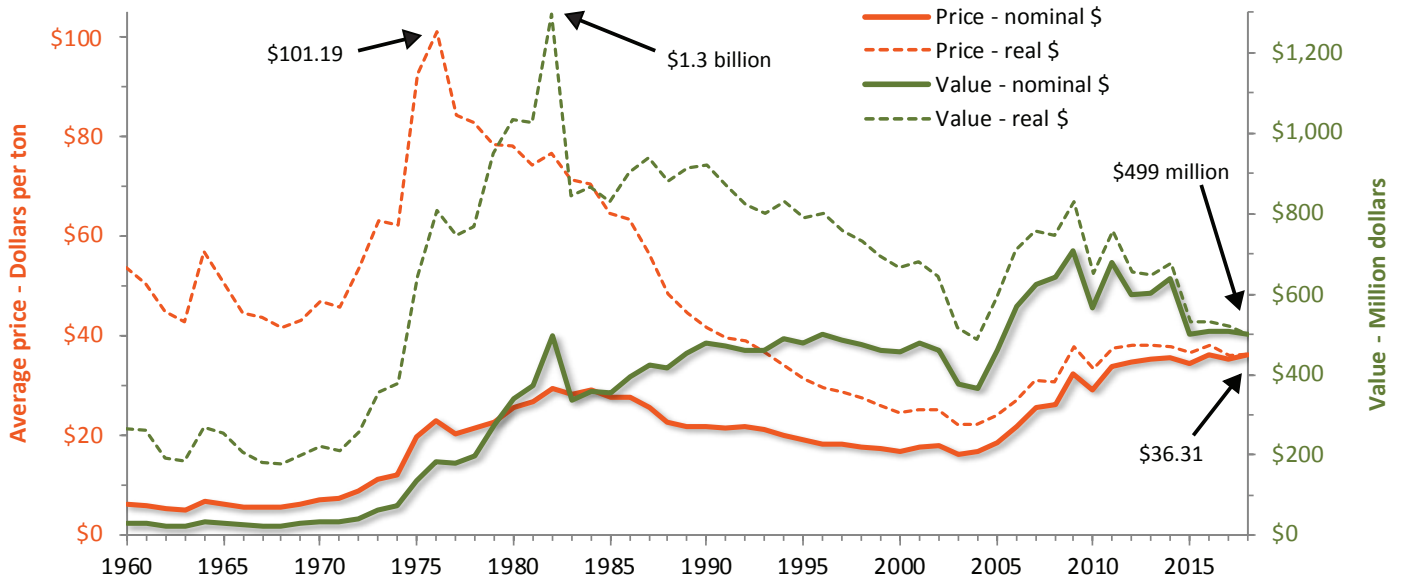
Source: EIA, UGS

Note: Residential and commercial are too small to be seen on graph.

1960–2018



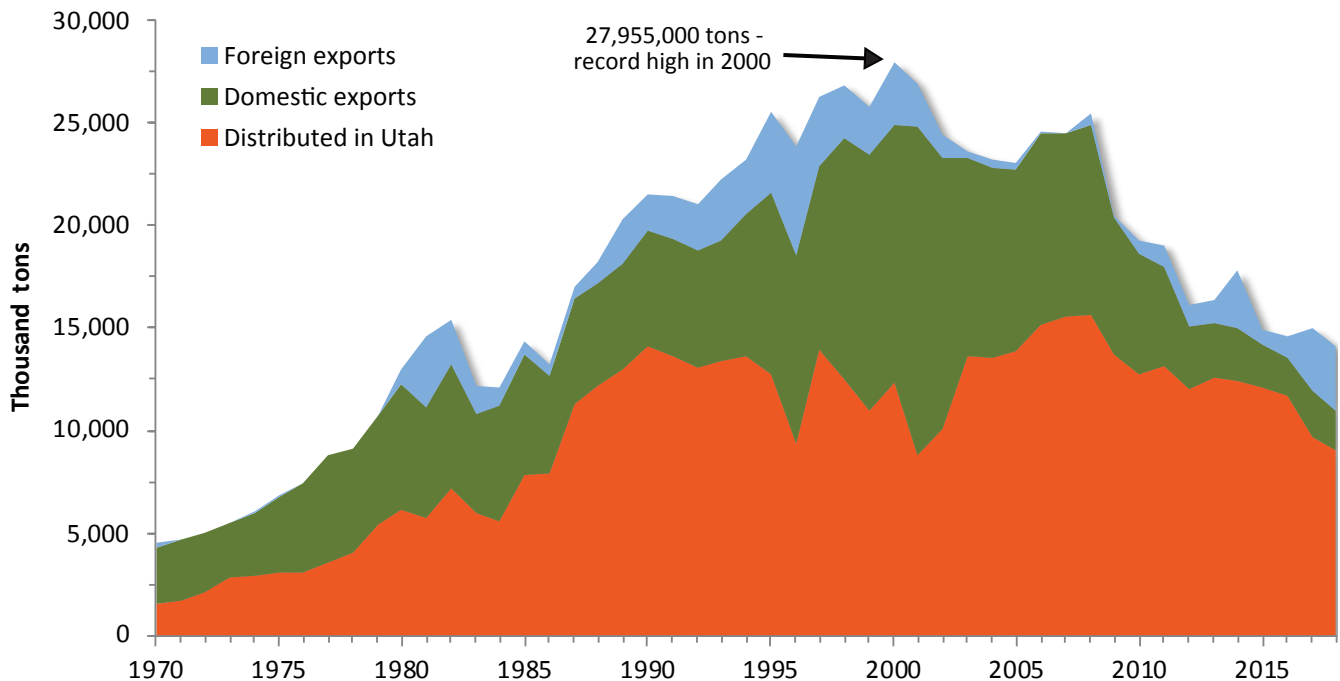
Average Minemouth Price and Value of Utah Coal, 1960–2018



Utah's minemouth price (the price at the mine) of \$36.31 per ton in 2018 was well below the real (inflation-adjusted) high of \$101.19 reached in 1976. The 2018 value of produced Utah coal dropped to \$499 million, much less than the inflation-adjusted value of \$1.3 billion recorded in 1982.

UEMS website table: Table 2.22 | Source: EIA, UGS

Distribution of Utah Coal, 1970–2018



The majority of Utah coal, 64% in 2018, was used in state. In the past, Utah was a significant net exporter of coal, but out-of-state domestic demand has decreased from a high of 16 million tons in 2001 down to only 1.9 million tons in 2018 as coal has dropped out of favor as a fuel for electric and industrial needs. Utah's foreign exports peaked in the mid-1990s at about 5 million tons, then dropped to near zero in the mid-2000s. However, the foreign export market has seen a resurgence in the past few years, increasing to 3.1 million tons in 2018.

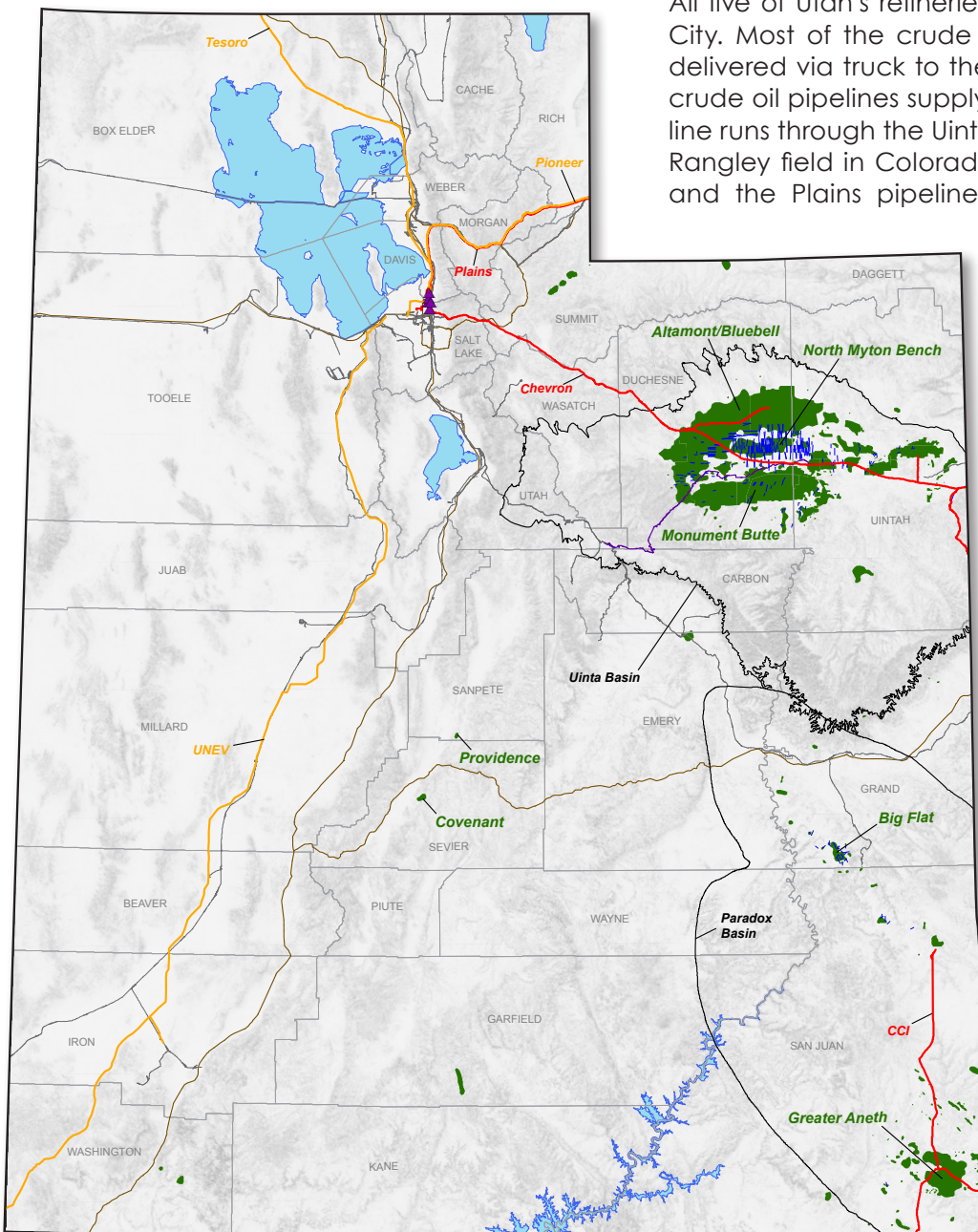
UEMS website table: Table 2.19 | Source: EIA, UGS



crude oil & petroleum products

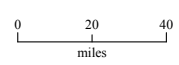
Utah's crude oil production is mostly concentrated within Duchesne and Uintah Counties (Uinta Basin) to the north and San Juan County (Paradox Basin) to the south. The 2004 discovery of the Covenant field, and later the Providence field, in central Utah opened this previously undeveloped area to new production. Horizontal drilling in the Uinta Basin's Green River Formation has proven very successful, especially in the North Myton Bench field and surrounding area. Production from these new wells, most of which have been drilled since the early to mid-2010s and are up to 10,000 feet in lateral length, are on par with some of the most successful unconventional wells in the country. The Cane Creek shale in the Paradox Basin, centered around the Big Flat field, has also been successfully drilled with horizontal wells.

All five of Utah's refineries are located just north of Salt Lake City. Most of the crude oil production in the Uinta Basin is delivered via truck to the Salt Lake City refineries, while two crude oil pipelines supply additional feedstock; the Chevron line runs through the Uinta Basin delivering crude oil from the Rangley field in Colorado (with minor inputs of Utah crude) and the Plains pipeline delivers crude oil from Wyoming and Canada. With the recent large increase in Uinta Basin production, some crude oil is also being loaded onto trains near Price for shipment to refineries out of state. In addition, most crude oil produced in southeastern Utah is shipped via pipeline to New Mexico. The Pioneer petroleum product pipeline carries refined fuel to Salt Lake City from the Sinclair refinery in Wyoming, while two product pipelines carry refined petroleum product out of Utah: the Tesoro line supplies markets in the northwest and the UNEV line delivers product to Cedar City and Las Vegas.

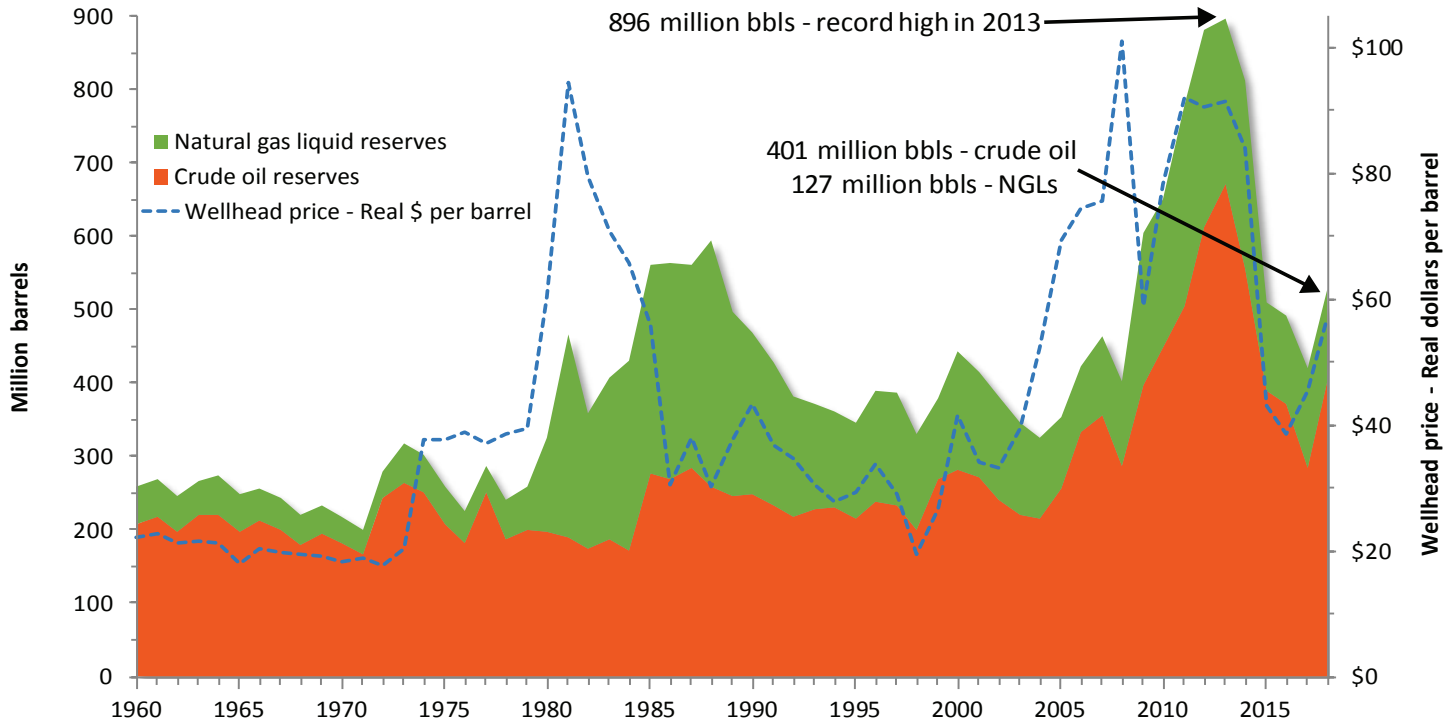


- Crude oil field
- Horizontal well
- Petroleum refinery
- Crude oil pipeline
- Petroleum products pipeline
- County boundary
- Interstate highway
- Railway
- Proposed railway

Data Source: UGS, DOGM



Crude Oil and Natural Gas Liquid Reserves in Utah, 1960–2018



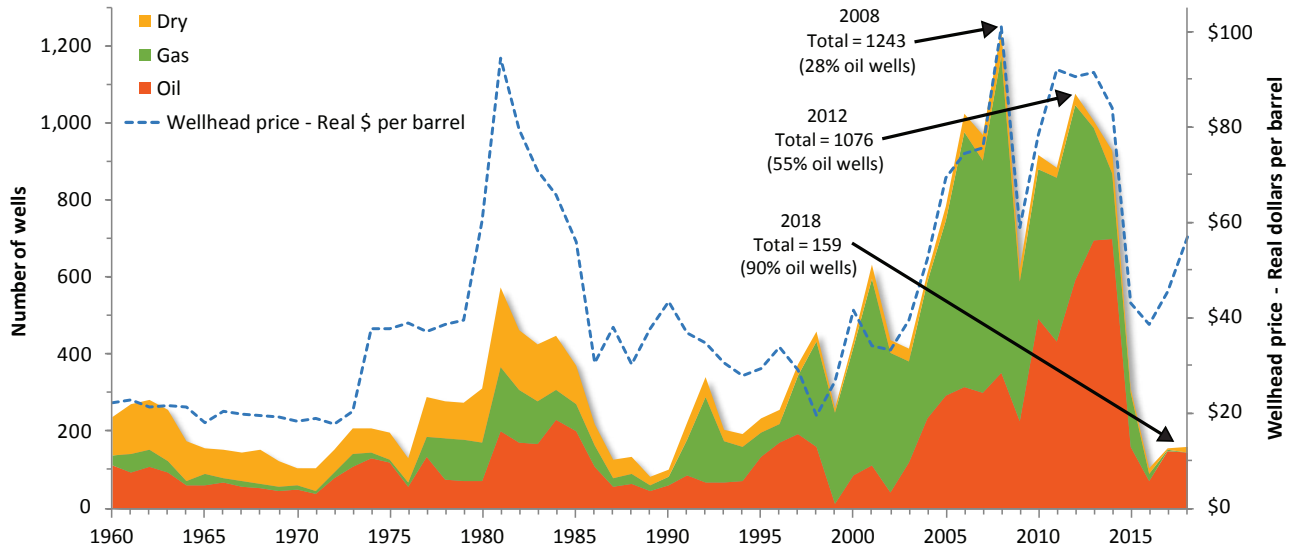
UEMS website table: Table 3.2 and Table 3.19
Source: EIA

Crude oil and natural gas liquids reserves mostly correlate with oil prices but with a several year lag after major price spikes. After peaking in 2013 at 896 million barrels, reserves retreated with falling prices, but bounced back to 528 million barrels in 2018.



Pumpjack in the Aneth oil field, Utah's largest producing oil field, San Juan County

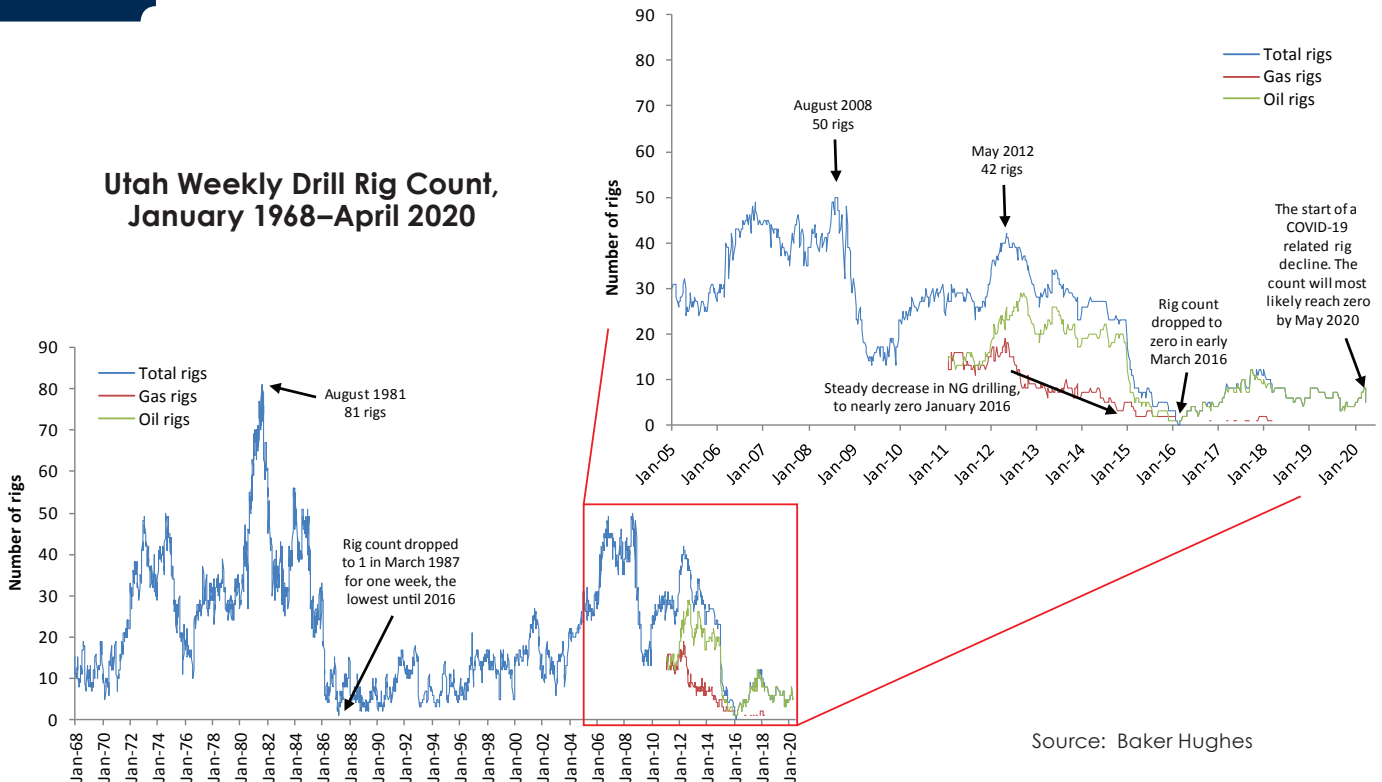
Oil and Gas Well Completions in Utah, 1960–2018



UEMS website table: Table 3.4 and Table 3.19 | Source: DOGM, EIA

The number of well completions (both oil and gas) has tracked closely with wellhead price, both peaking in the early 1980s and again between 2005 and 2013. Of particular note is the massive drop (90%) in the number of wells drilled between 2012 (1076) and 2016 (105) due to a large decrease in crude oil (and natural gas) price (57%). Also noteworthy is the decrease in the number of dry wells through the years as drilling and exploration techniques have improved and high-risk wildcat drilling has decreased.

Utah Weekly Drill Rig Count, January 1968–April 2020



Source: Baker Hughes

After the price of oil crashed in early 2015, drill rigs began leaving the state, culminating in a short period in March 2016 when no rigs were drilling wells, a situation not seen in the last 50 years—the previous low was one rig running for one week in March 1987. Drilling for natural gas has steadily declined since 2012 as prices never recovered from the 2008 price crash. Rigs drilling for crude oil have returned mostly to the Uinta Basin, drilling horizontal wells in the Green River Formation. The dramatic decrease in crude oil prices in March 2020 related to the COVID-19 pandemic and global oversupply will most likely result in all rigs drilling in Utah being released by early summer 2020.

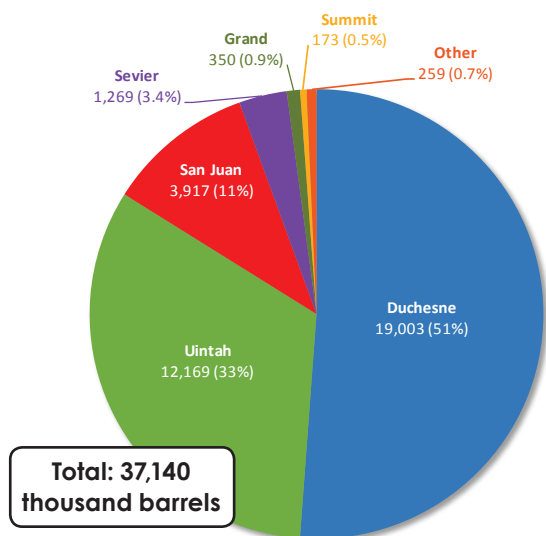
Utah Crude Oil Production by County, 2018

Thousand barrels (Percent of total)

Crude oil production in Utah is mostly concentrated in Duchesne, Uintah, and San Juan Counties. Sevier County production started in 2004 with the discovery of the Covenant field.

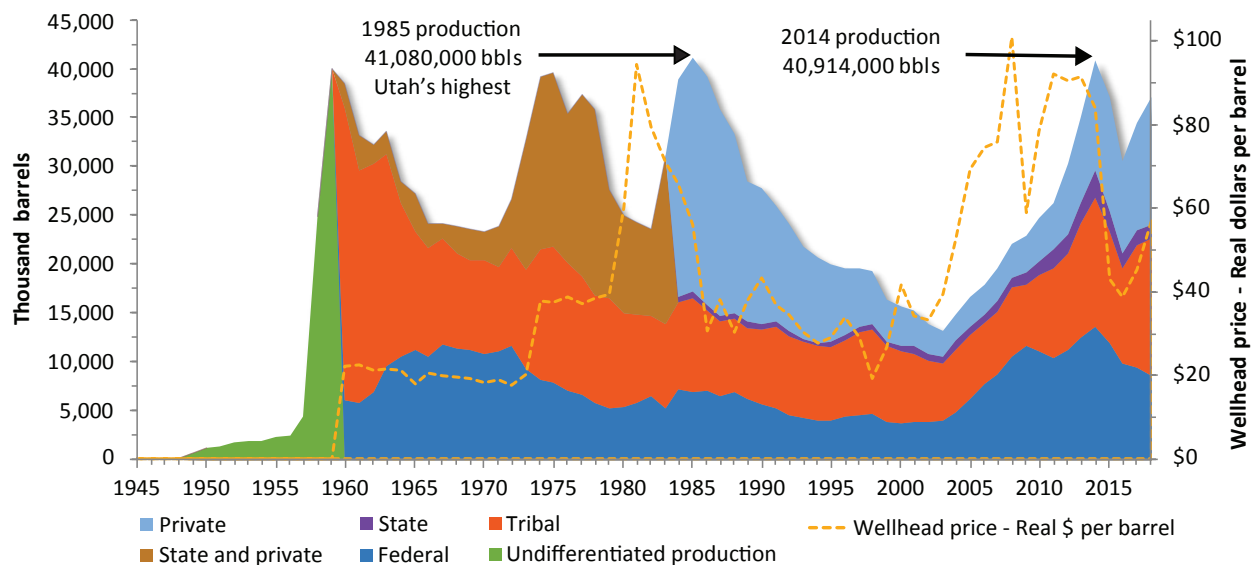
UEMS website table: Table 3.7 | Source: DOGM

Note: "Other" includes Garfield, Sanpete, Carbon, Emery, and Daggett Counties.



Update
2019 oil production
36.5 million barrels

Utah Crude Oil Production by Landownership, 1945–2018

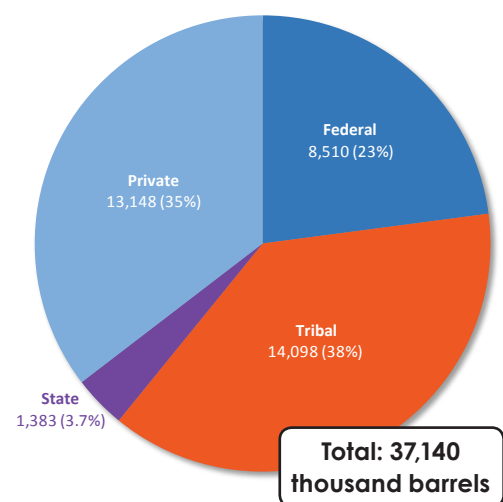


Utah has experienced three oil booms in the past 60 years and is currently defining a fourth. The first spike in crude oil production followed the discovery of the very large Bluebell and Greater Aneth fields (mostly tribal lands) in 1955 and 1956, respectively. The second spike coincided with a 1971 increase in wellhead price and the discovery of the Altamont field (mostly private land). The third peak in production resulted from the price spike of the early 1980s and followed the 1980 discovery of the Anschutz Ranch East natural gas field, which also produced large amounts of crude oil (again, most new production was from private land). The most recent production peak is again related to higher prices which resulted in higher production from existing fields, new field discoveries in the Uinta Basin, and the discovery of the Covenant field in central Utah. The price drop in early 2015 resulted in a temporary production decline, but new horizontal drilling in the Uinta Basin has reversed the decline and increased production back to 37.1 million barrels in 2018.

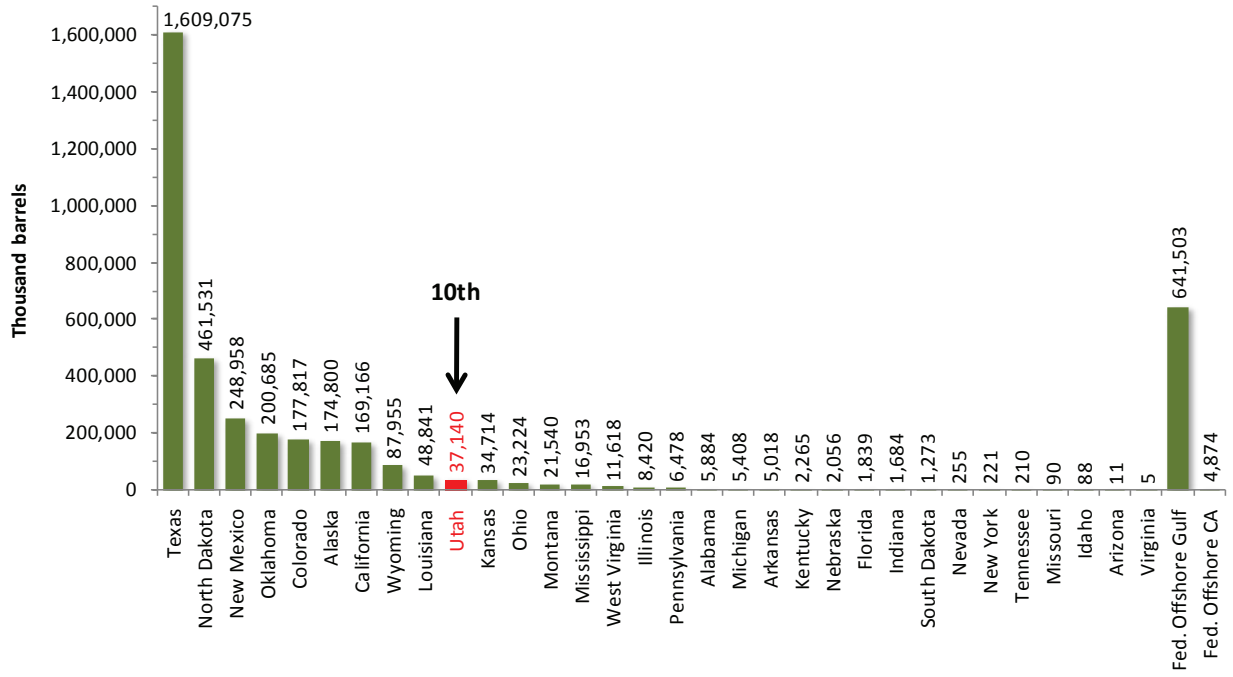
UEMS website table: Table 3.10 and Table 3.19 | Source: DOGM, EIA

2018

Thousand barrels (Percent of total)



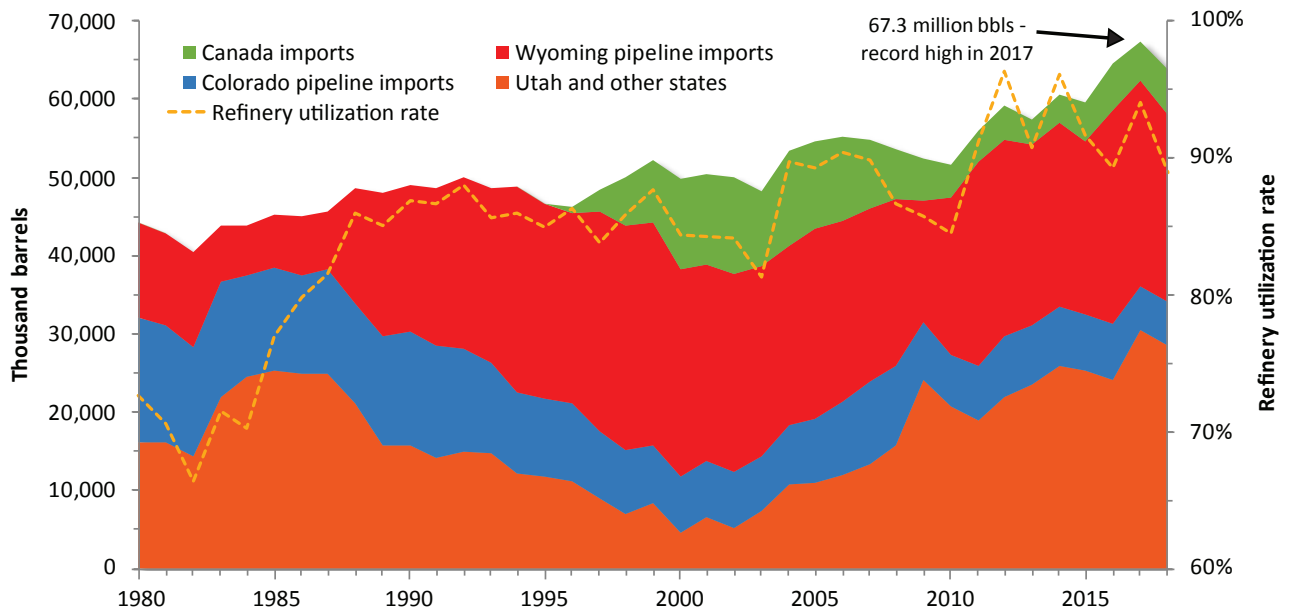
U.S. Crude Oil Production by State, 2018



UEMS website table: Table 3.5 | Source: EIA, DOGM

In 2018, Utah ranked as the 10th largest producer of crude oil in the United States (not including federal offshore Gulf of Mexico).

Origin of Crude Oil Shipped to Utah Refineries, 1980–2018



UEMS website table: Table 3.14 and Table 3.16 | Source: EIA, UGS

Note: Pipeline imports are known; however, deliveries via truck are difficult to track.

Utah refineries received a record 67.3 million barrels of crude oil in 2017 from four main sources: Utah, Colorado, Wyoming, and Canada. Despite increases in refinery capacity, receipts dropped in 2018 due to a fire at the Holly refinery that reduced capacity for several months. In 2004, 23% of refinery receipts came from Canada, but with the recent increase in Utah crude oil production, the percentage from Canada has dropped to 9%. Utah's refinery utilization rate, the average ratio of crude oil inputs to total refinery capacity, has averaged 89% over the past 20 years.

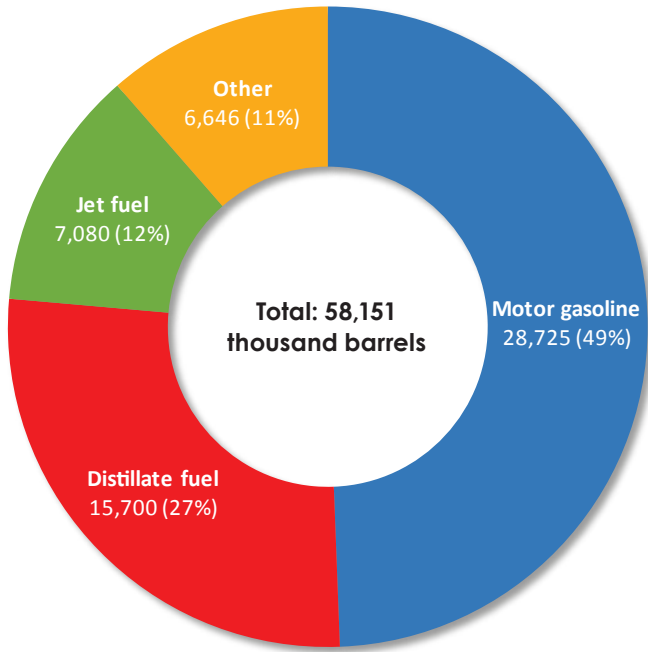
Update
2020 refinery capacity
 203,494 barrels per day

2019 refinery receipts
 69.1 million barrels
 new record high

Consumption of Petroleum Products in Utah

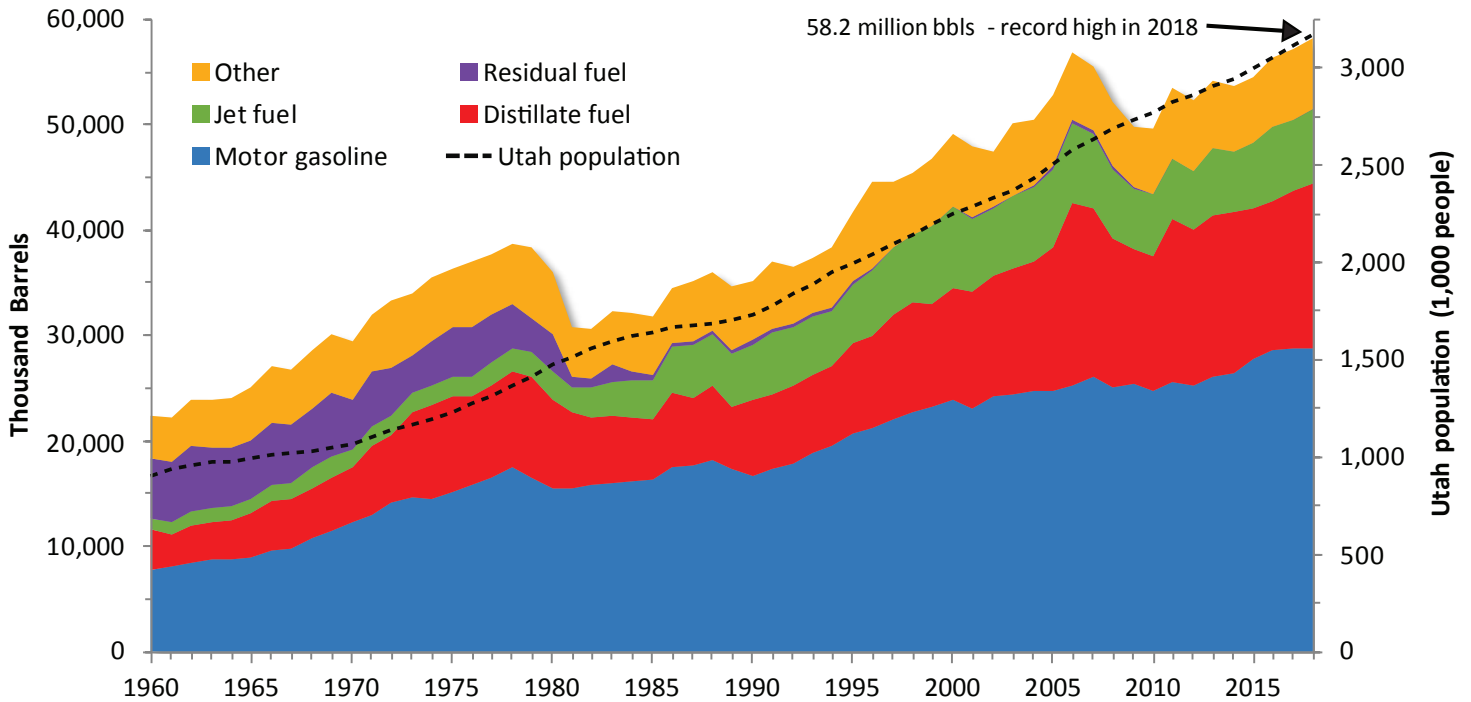
2018

Thousand barrels (Percent of total)



Total petroleum product consumption reached a new record in 2018 at 58.2 million barrels. Motor gasoline was the most used petroleum product, accounting for 49% of all consumption. Distillate fuel ranked second at 27%, followed by jet fuel at 12%. Residual fuel use has declined greatly since the mid-1980s since it is no longer used as a fuel in power plants. Historical petroleum product consumption tracks well with Utah's population growth.

1960–2018

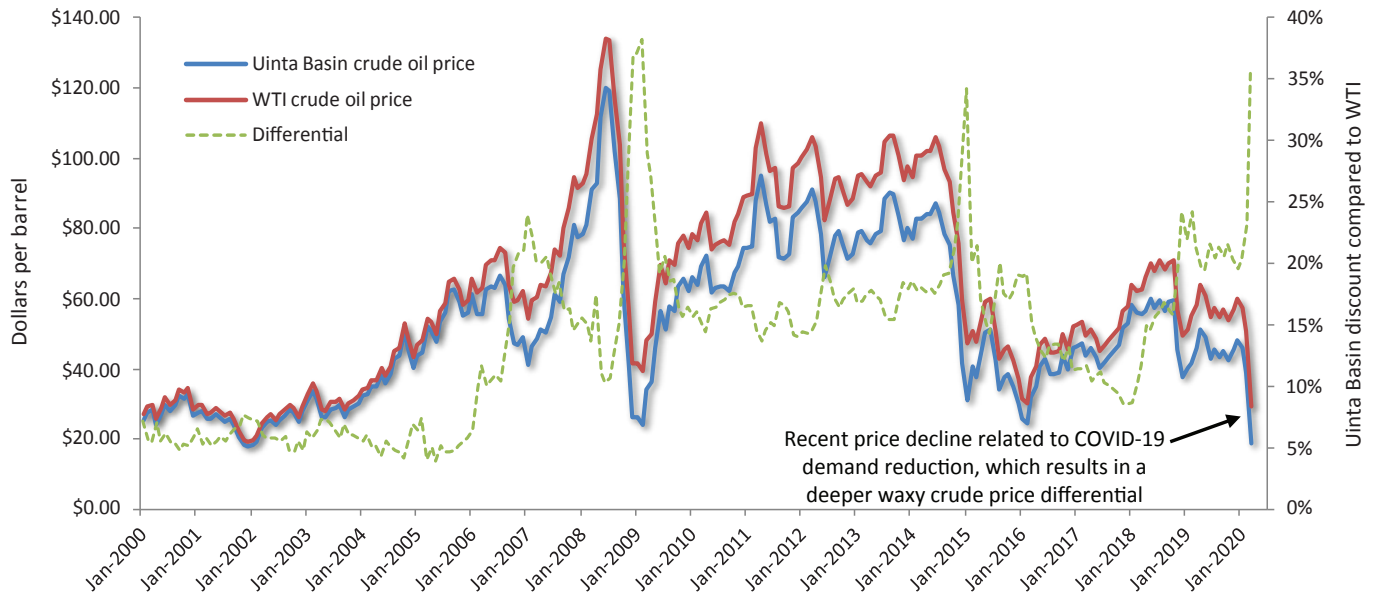


UEMS website table: Table 3.17

Source: EIA

Note: "Other" includes asphalt and road oil, aviation gasoline, kerosene, liquefied petroleum gases, lubricants, among others.

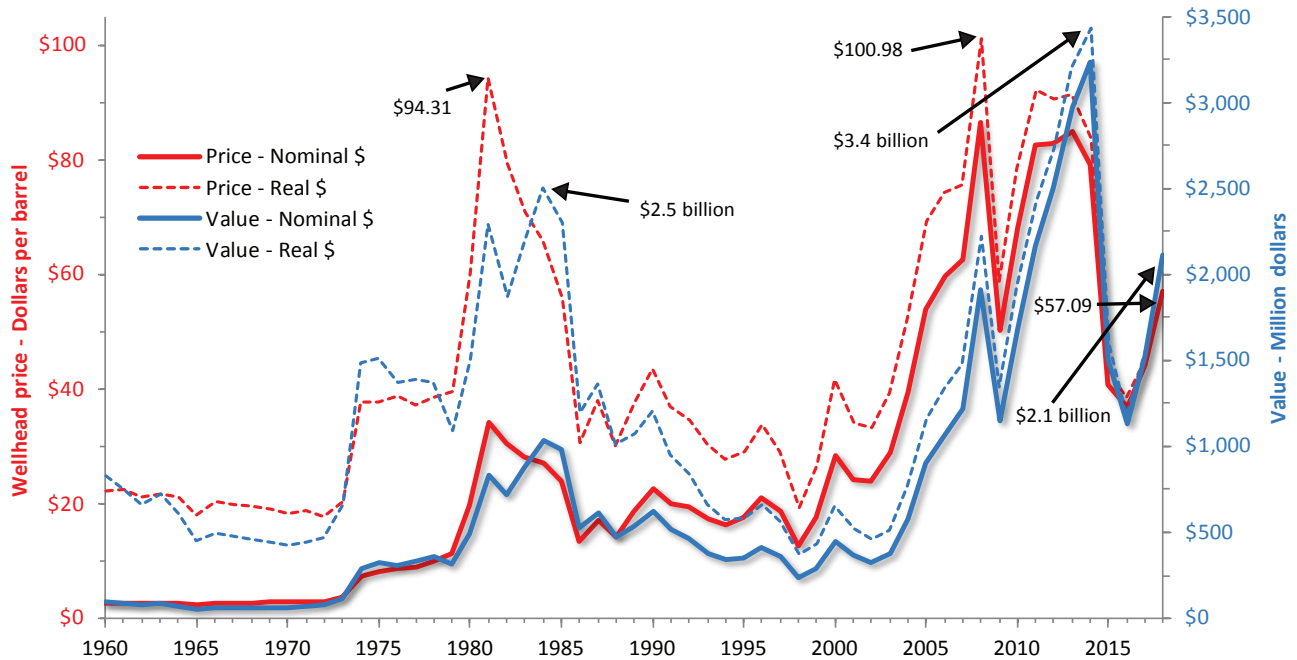
Uinta Basin Waxy Crude Prices Verses WTI Benchmark, January 2000–March 2020



Source: Several crude oil price bulletins, EIA

The price of crude oil in the Uinta Basin has always sold at a discount to the national benchmark (WTI). This lower price is the result of the waxy nature of the basin's oil, the difficulty in transporting the oil, and the limited market (mostly only Salt Lake City refineries). Over the past two years, on average, Uinta Basin waxy crude has sold at an 18% discount to national prices.

Average Wellhead Price and Value of Crude Oil in Utah, 1960–2018



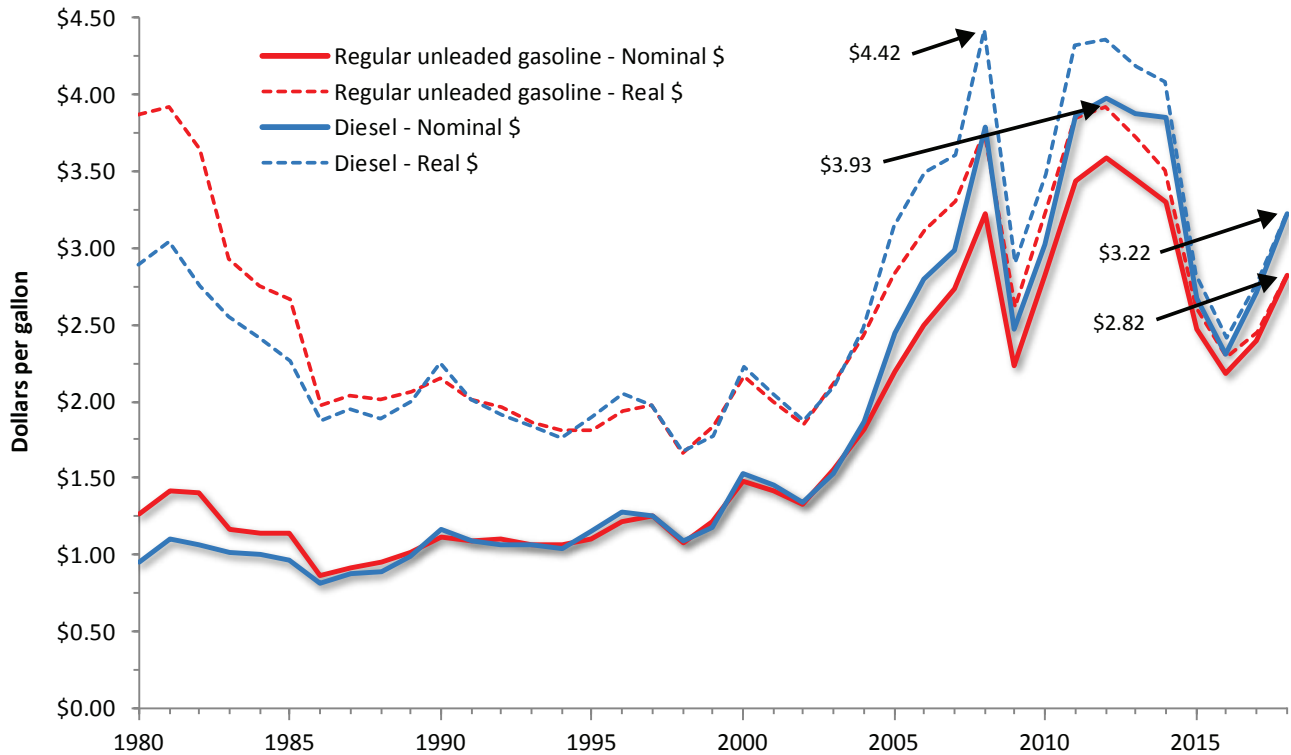
UEMS website table: Table 3.19 | Source: EIA

Utah's crude oil wellhead price hit an all-time, inflation-adjusted high of \$100.98 per barrel in 2008. After a recession-related drop in 2009 and 2010, prices rebounded back into the low \$90s between 2011 and 2013 before plunging 49% to \$43.11 per barrel in 2015, and then down to \$38.63 per barrel in 2016. Prices have rebounded the past two years and averaged \$57.09 in 2018. The value of Utah's crude oil reached a peak of \$3.4 billion in 2014 as a result of high prices and near record production, but retreated to \$1.2 billion in 2016 before rebounding to \$2.1 billion in 2018.

Update
2019 Utah
oil price
 \$48.32

2019
Estimated
value
 \$1.8 billion

Utah Price of Motor Gasoline and Diesel, 1980–2018



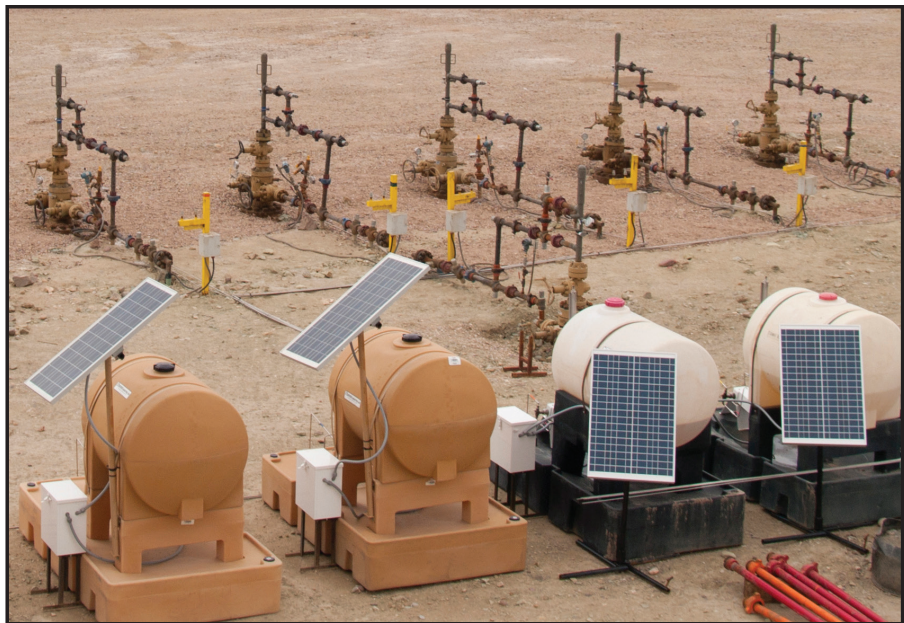
Source: EIA

Regular unleaded gasoline and diesel prices dropped in 2016 commensurate with crude oil prices, averaging \$2.19 and \$2.31 per gallon, respectively. In 2018, gasoline and diesel prices rebounded to \$2.82 and \$3.22 per gallon.

Update

2019 Utah gasoline price
\$2.74

2019 Utah diesel price
\$3.04

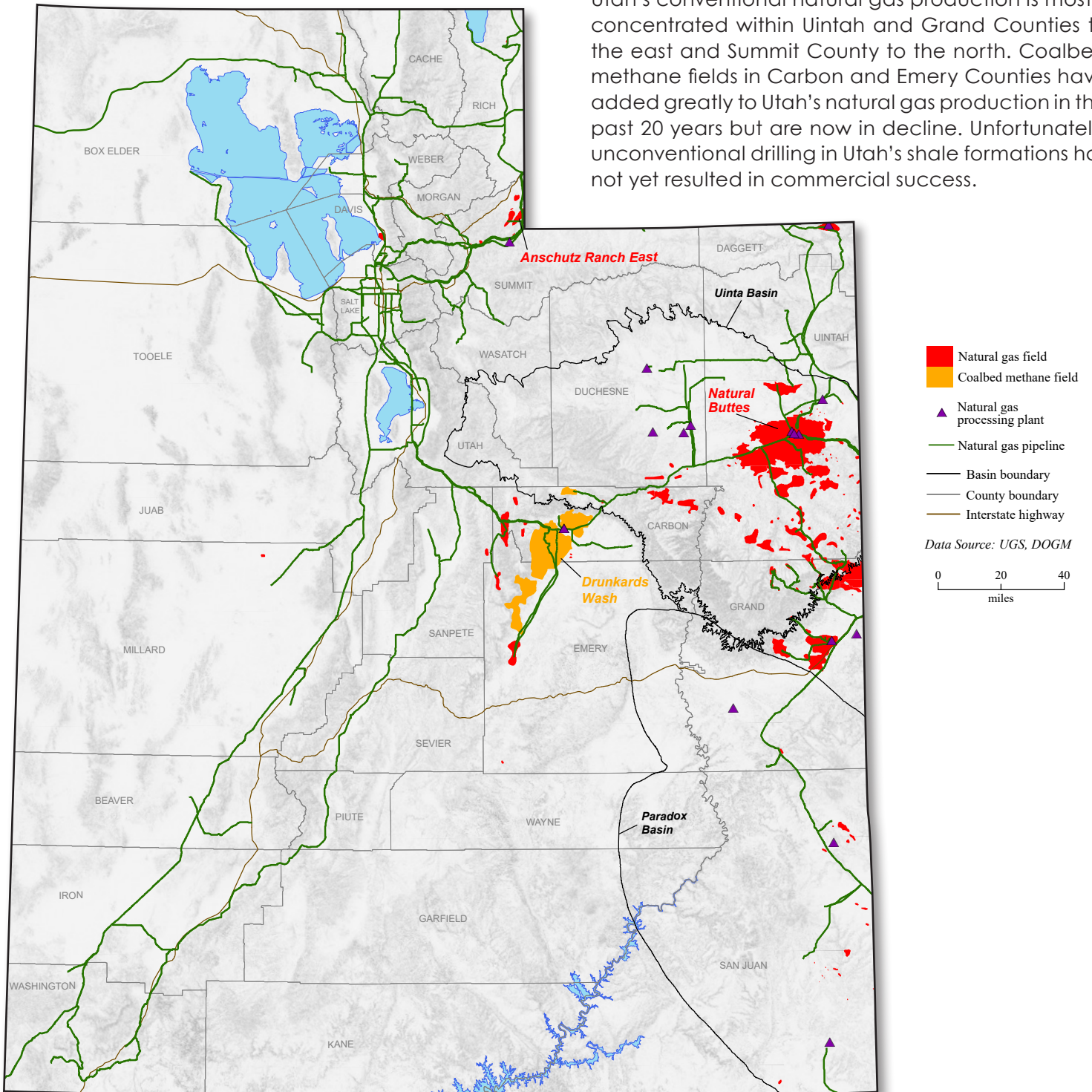


Five natural gas wellheads on one drill pad, Natural Buttes natural gas field, Uintah County

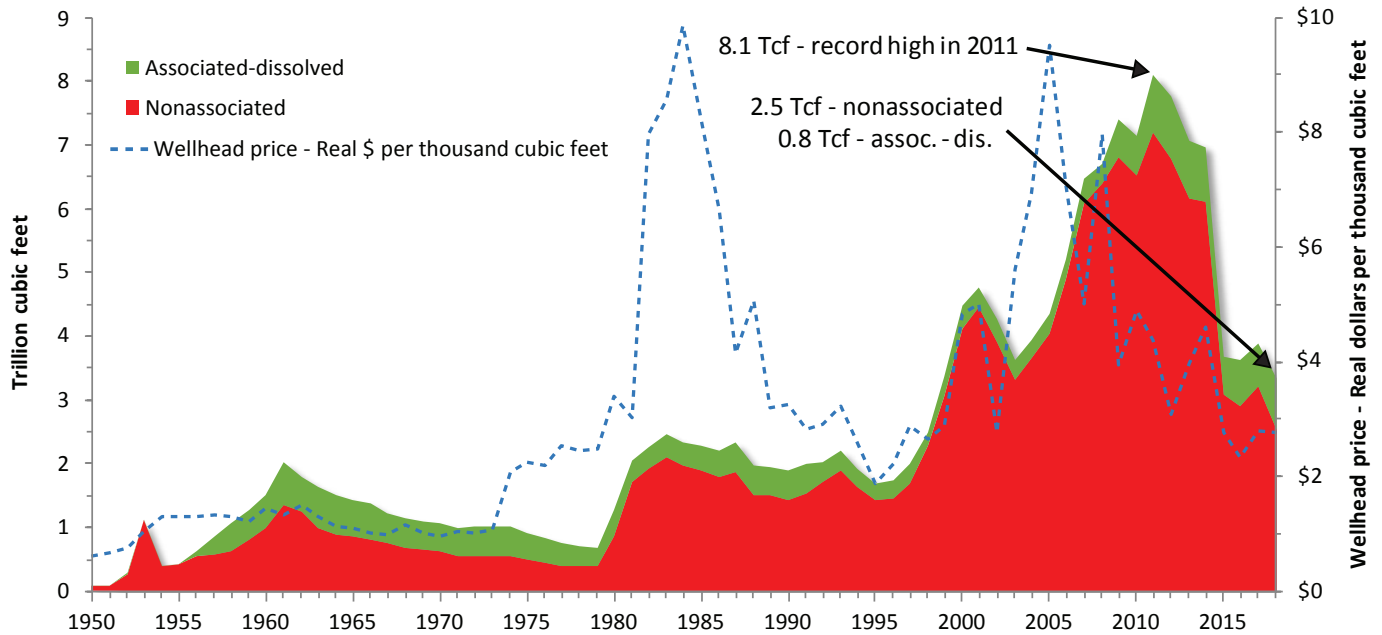


natural gas

Utah's conventional natural gas production is mostly concentrated within Uintah and Grand Counties to the east and Summit County to the north. Coalbed methane fields in Carbon and Emery Counties have added greatly to Utah's natural gas production in the past 20 years but are now in decline. Unfortunately, unconventional drilling in Utah's shale formations has not yet resulted in commercial success.



Natural Gas Reserves in Utah, 1950–2018

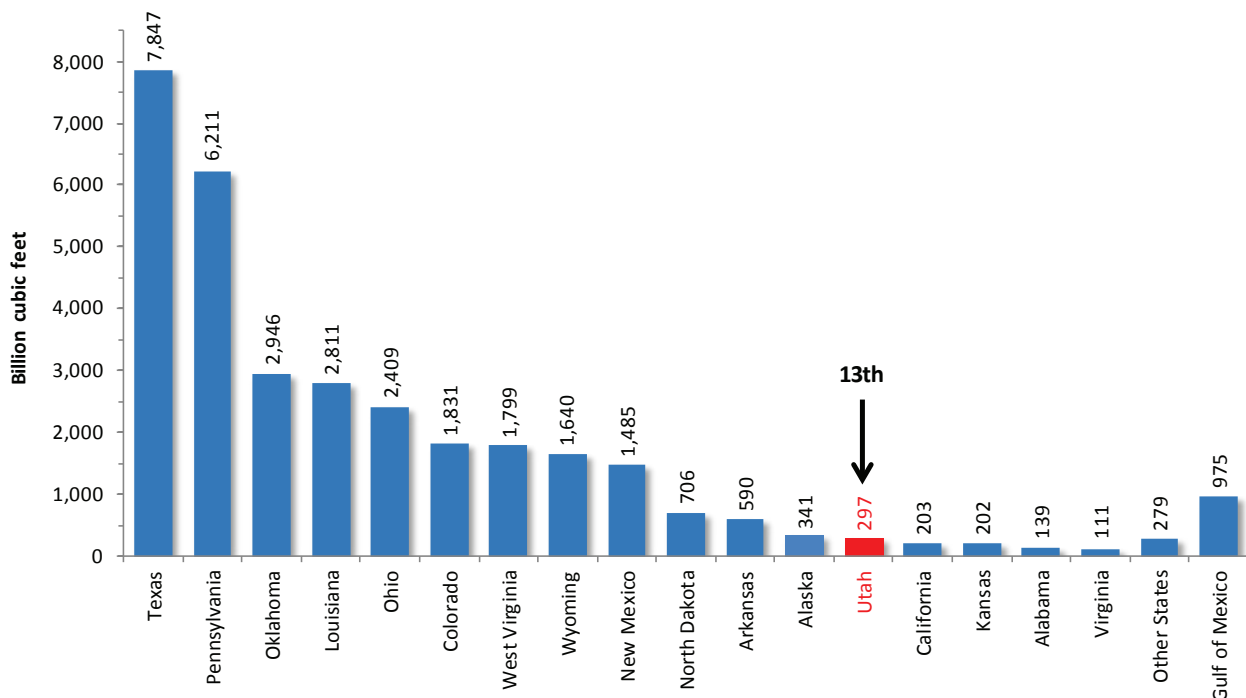


UEMS website table: Table 4.2 and Table 4.15 | Source: EIA, UGS

Note: Nonassociated natural gas is not in contact with significant quantities of crude oil in the reservoir; associated-dissolved natural gas occurs in crude oil reservoirs either as free gas (associated) or as gas in solution with crude oil (dissolved gas).

Natural gas reserves surged in 1980 and 1981, coinciding with an increase in wellhead prices, and a second reserve surge occurred in the late 1990s, coinciding with new development of coalbed methane fields. Price spikes in 2005 and again in 2007 resulted in the record high reserve estimates in 2011 of 8.1 trillion cubic feet, but as prices decreased, reserves followed suit, plunging to 3.3 trillion cubic feet in 2018.

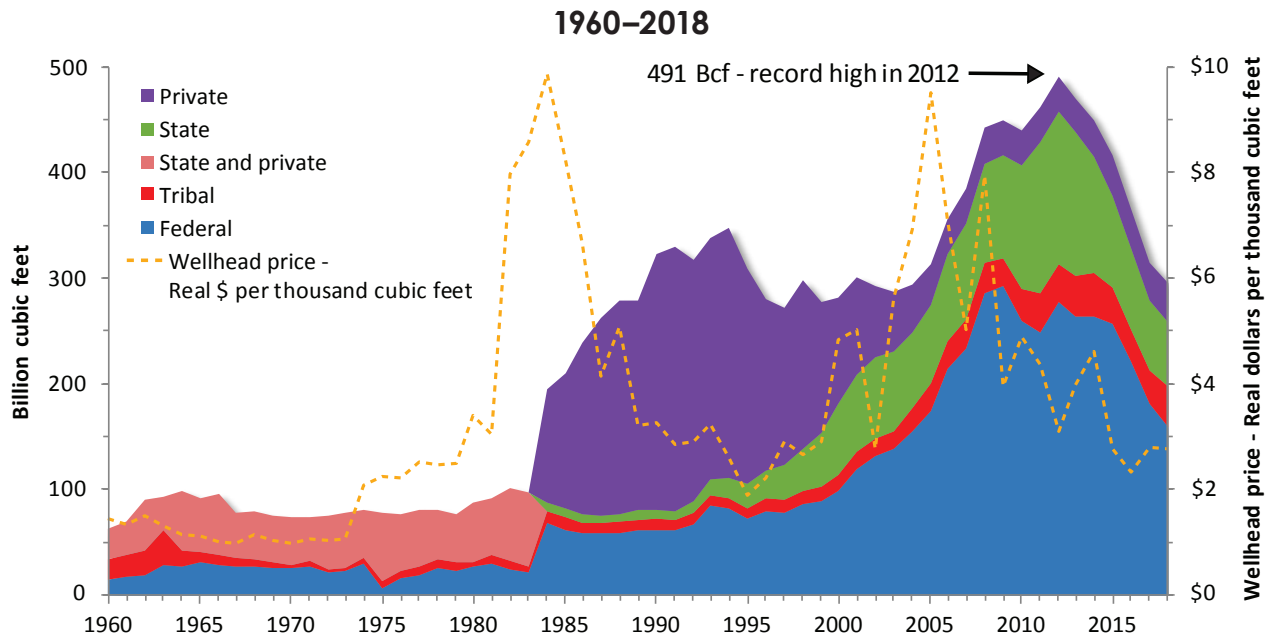
U.S. Natural Gas Production (Marketed) by State, 2018



UEMS website table: Table 4.3 | Source: EIA, DOGM

In 2018, Utah ranked as the 13th largest producer of natural gas (marketed) in the United States (not including production in the Gulf of Mexico).

Utah Natural Gas Production (Gross) by Landownership

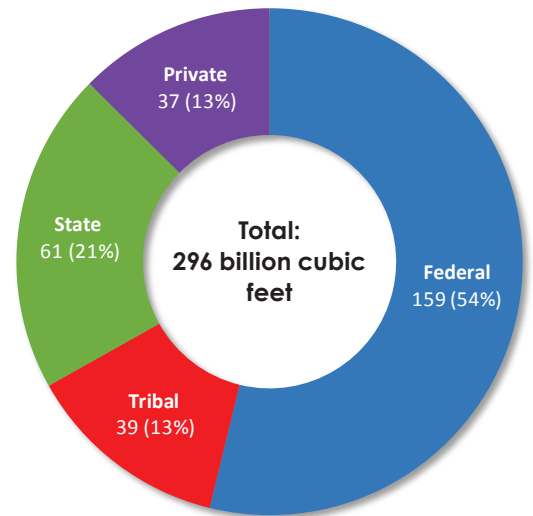


UEMS website table: Table 4.8 and Table 4.15 | Source: DOGM, EIA, UGS

The first major increase in natural gas production occurred in the mid-1980s, coinciding with a large spike in prices and the discovery of fields in the Utah-Wyoming thrust belt (Anschutz Ranch East, mostly on private land). The mid-2000s surge in production was also price related, with production increasing on federal land mostly in Uintah County. As prices decreased in recent years, down over 71%, production has also declined from a peak of 491 billion cubic feet in 2012 to 296 billion cubic feet in 2018, a 40% reduction.

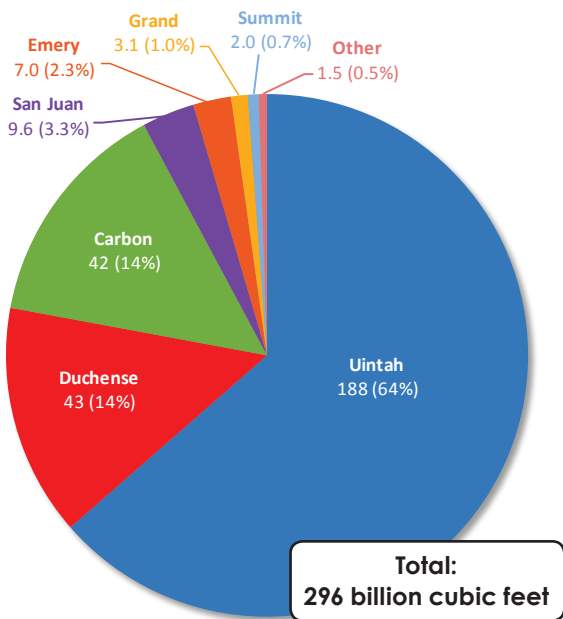
2018

Billion cubic feet (Percent of total)



Utah Natural Gas Production (Gross) by County, 2018

Billion cubic feet (Percent of total)



Update
2019 NG production (gross)
272 billion cubic feet

Utah's largest portion (64%) of gross natural gas production occurred in Uintah County, which contains Utah's largest natural gas field, Natural Buttes. Duchesne County production (14%) is associated with crude oil production, whereas Carbon County production (14%) is dominated by coalbed methane fields, which are currently in decline.

UEMS website table: Table 4.5 | Source: DOGM

Note: "Other" includes Daggett, Sanpete, and Garfield Counties.

Consumption of Natural Gas in Utah

Natural gas is mostly used for home heating (residential, 28%), but starting in mid-2004, over 2300 MW of new natural-gas-fired electric generating capacity has come online, greatly increasing the amount used by the electric utility sector (from 8% in 2005 to 25% in 2018). Consumption of natural gas in Utah peaked in 2013 at 247 billion cubic feet and after declining for a few years, increased again to 244 billion cubic feet in 2018.

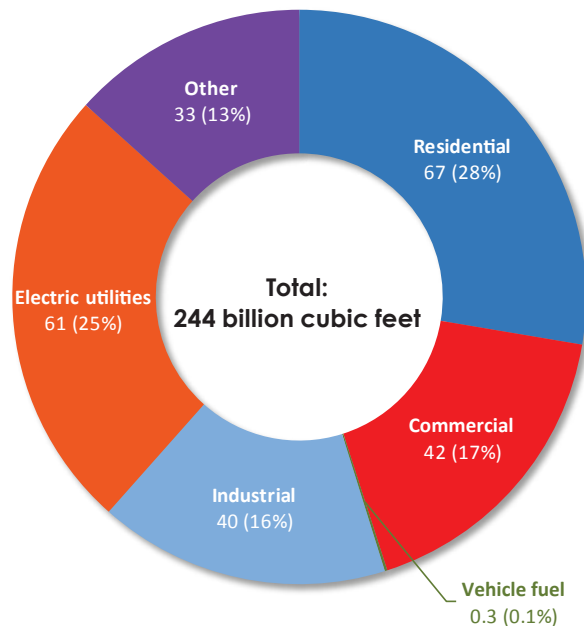
UEMS website table: Table 4.14 | Source: EIA

Note: "Other" includes lease use, plant use, and pipeline fuel. In graph below, "other" also includes vehicle fuel.

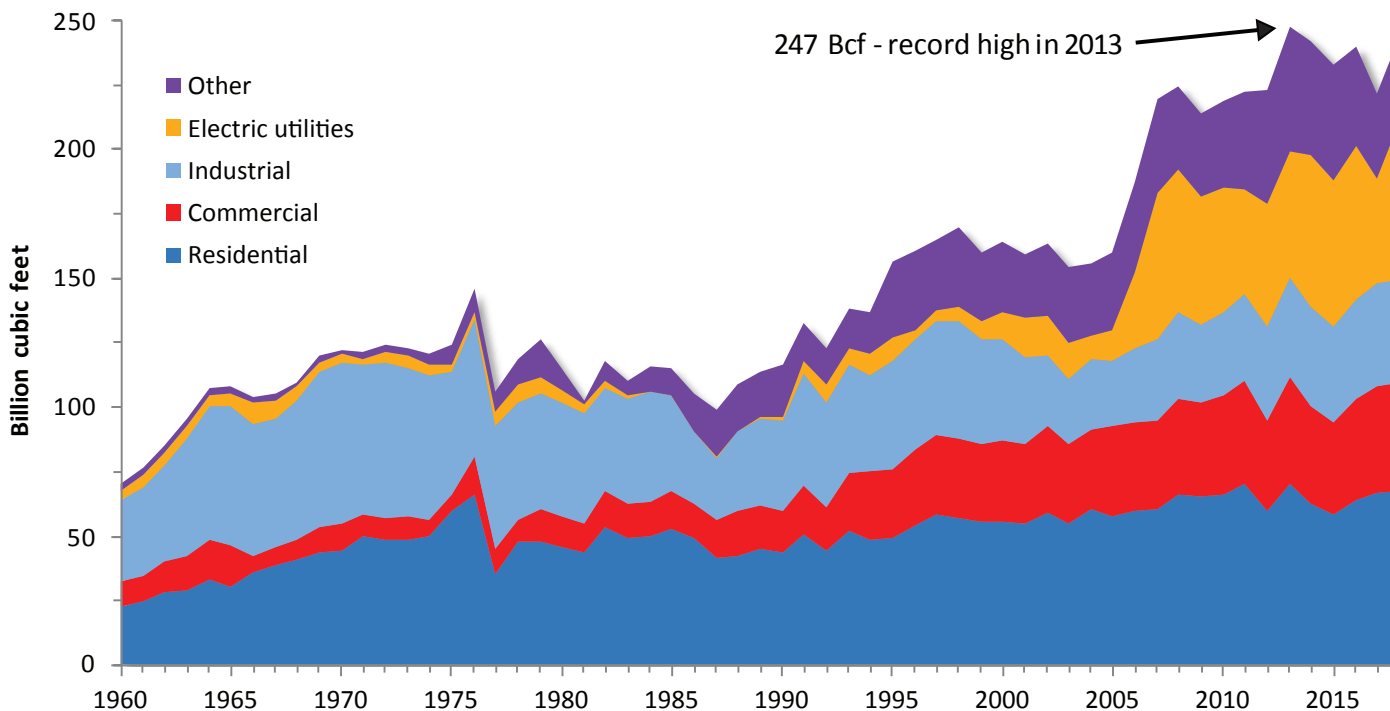


Natural gas wellhead at the Lisbon field, southeast Utah

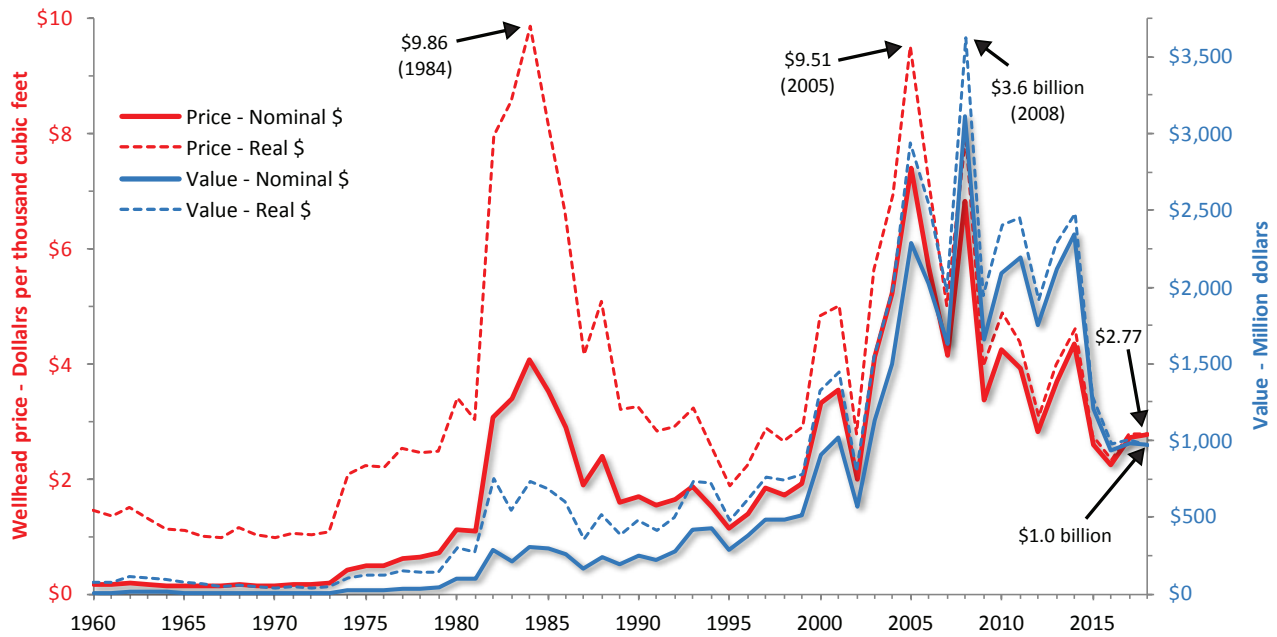
2018
Billion cubic feet (Percent of total)



1960–2018



Average Wellhead Price and Value of Natural Gas in Utah, 1960–2018

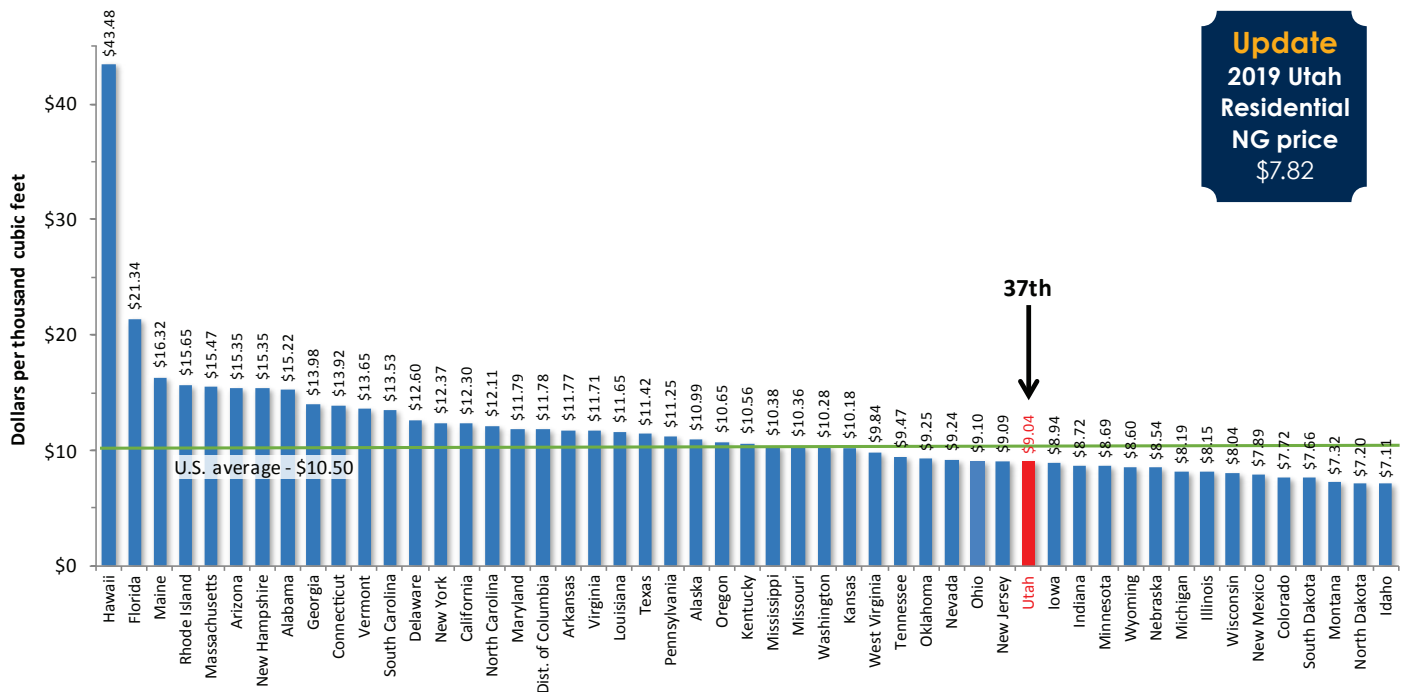


UEMS website table: Table 4.15 | Source: EIA, UGS

The price and value of natural gas produced in Utah in the past ten years have fluctuated dramatically, peaking in 2005 (due to high prices related to Hurricane Katrina) and again in 2008, before a steady decline to \$2.77 per thousand cubic feet in 2018, translating to a value of \$1.0 billion.

Update
2019 Utah
NG price
\$2.50

Average Price of Residential Natural Gas by State, 2018



Update
2019 Utah
Residential
NG price
\$7.82

UEMS website table: Table 4.17 | Source: EIA

In 2018, Utah had the 15th-lowest price for residential natural gas in the country. From 2004 to 2011, Utah's natural gas price was one of the lowest in the nation (ranked 49th or 50th), but starting in 2012, Utah's price began to climb relative to the rest of the nation due to new pipelines connecting Utah's once captive natural gas resources to other areas of the country.

unconventional petroleum resources

oil shale

In 2008, the Utah Geological Survey completed a comprehensive oil shale resource assessment for deposits in the state of Utah. Not to be confused with the headline-dominating "shale oil," which is oil produced via horizontal wells and hydraulic fracturing (e.g., the Bakken shale in North Dakota), oil shale must be heated to high temperatures to convert the organic matter (kerogen) into usable oil. The UGS oil shale assessment answers the questions of "where" and "how much" that many people ask regarding Utah's largest unconventional resource by providing detailed basin-wide resource maps and estimates of potential in-place oil.

- A continuous interval of oil shale that averages **50 gallons of oil per ton of rock (GPT)** contains an in-place resource of **31 billion barrels** of oil.
- A continuous interval of oil shale that averages **35 GPT** contains an in-place resource of **76 billion barrels** of oil.
- A continuous interval of oil shale that averages **25 GPT** contains an in-place resource of **147 billion barrels** of oil (see included map).
- A continuous interval of oil shale that averages **15 GPT** contains an in-place resource of **292 billion barrels** of oil.

After calculating in-place resource numbers, the UGS imposed several constraints on the total endowment to offer a more realistic impression of Utah's potentially economic oil shale resource. The constraints used were:

- deposits having a richness of at least 25 GPT (assumed minimum grade),
- deposits that are at least 5 feet thick (assumed minimum mining thickness),
- deposits under less than 3000 feet of cover (maximum underground mining depth),
- deposits that are not in direct conflict with current conventional oil and gas operations, and
- deposits located only on U.S. Bureau of Land Management, state trust, private, and tribal lands.

Accounting for these constraints, the UGS estimates that the potential economic oil shale resource in Utah is approximately **77 billion barrels**.

Currently and within this low-crude-oil environment, only a few companies are pursuing oil shale development in Utah, all focusing on near-surface deposits in the southeastern part of the resource.

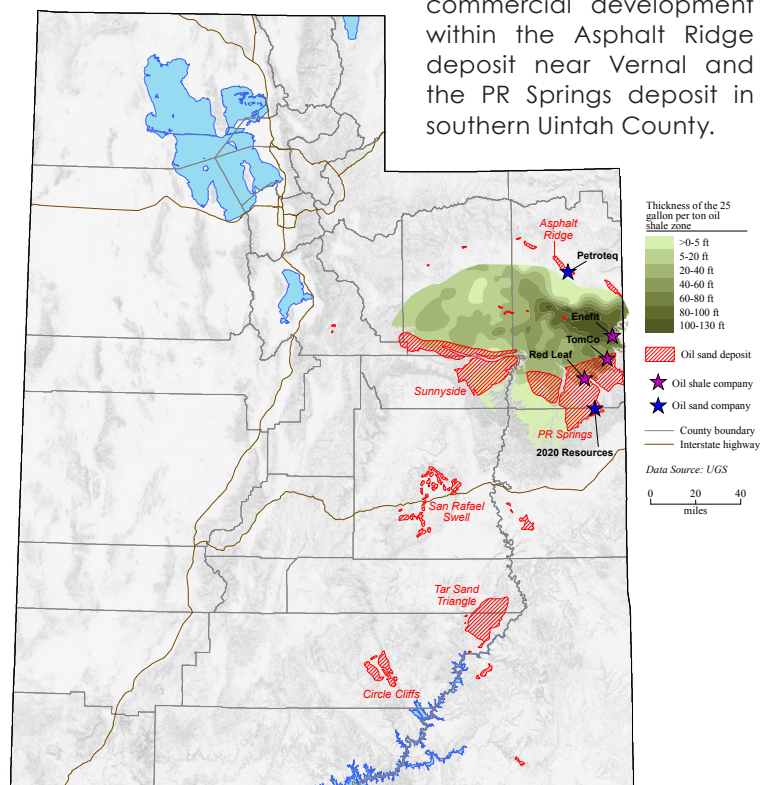
The most prospective unconventional fossil fuel resources are located in the Uinta Basin in northeastern Utah.

oil sands

North America has the greatest oil sand resources in the world, the majority of which are in Canada. Utah's oil sand resource, though small in comparison to that of Canada, is the largest in the United States. Utah's oil sand deposits contain **14 to 15 billion barrels** of measured in-place oil, with an additional estimated resource of **23 to 28 billion barrels**. Twenty-four individual deposits exist in the Uinta Basin, mainly around its periphery, and an additional 50 deposits are scattered throughout the southeastern part of the state. Utah's major oil sand deposits individually have areal extents ranging from 20 to over 250 square miles, as many as 13 pay zones, gross thickness ranging from 10 to more than 1000 feet, and overburden thickness ranging from zero to over 500 feet.

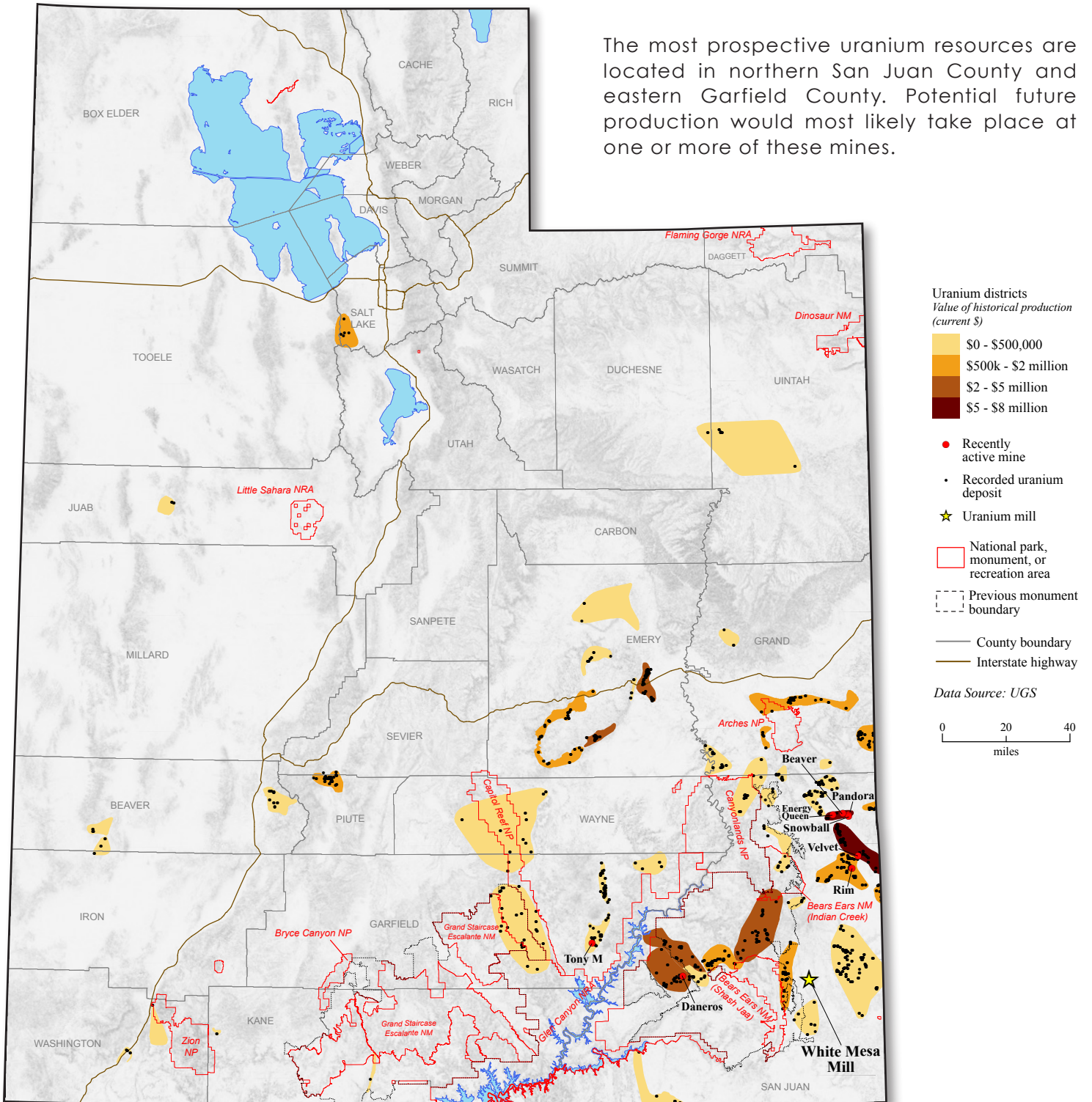
New drilling, bitumen extraction, and upgrading techniques developed in Canada may provide the necessary knowledge for successful and sustainable development of oil sand in Utah, but significant new development will be dependent on a return of higher crude oil prices. In addition, factors such as site accessibility, adequate infrastructure, water availability, environmental concerns, land access and permitting, and the problems associated with the heterogeneity of reservoir sands must be resolved before economically viable oil sand development can become a reality in Utah.

Currently, a few oil sands companies are in various stages of commercial development within the Asphalt Ridge deposit near Vernal and the PR Springs deposit in southern Uintah County.

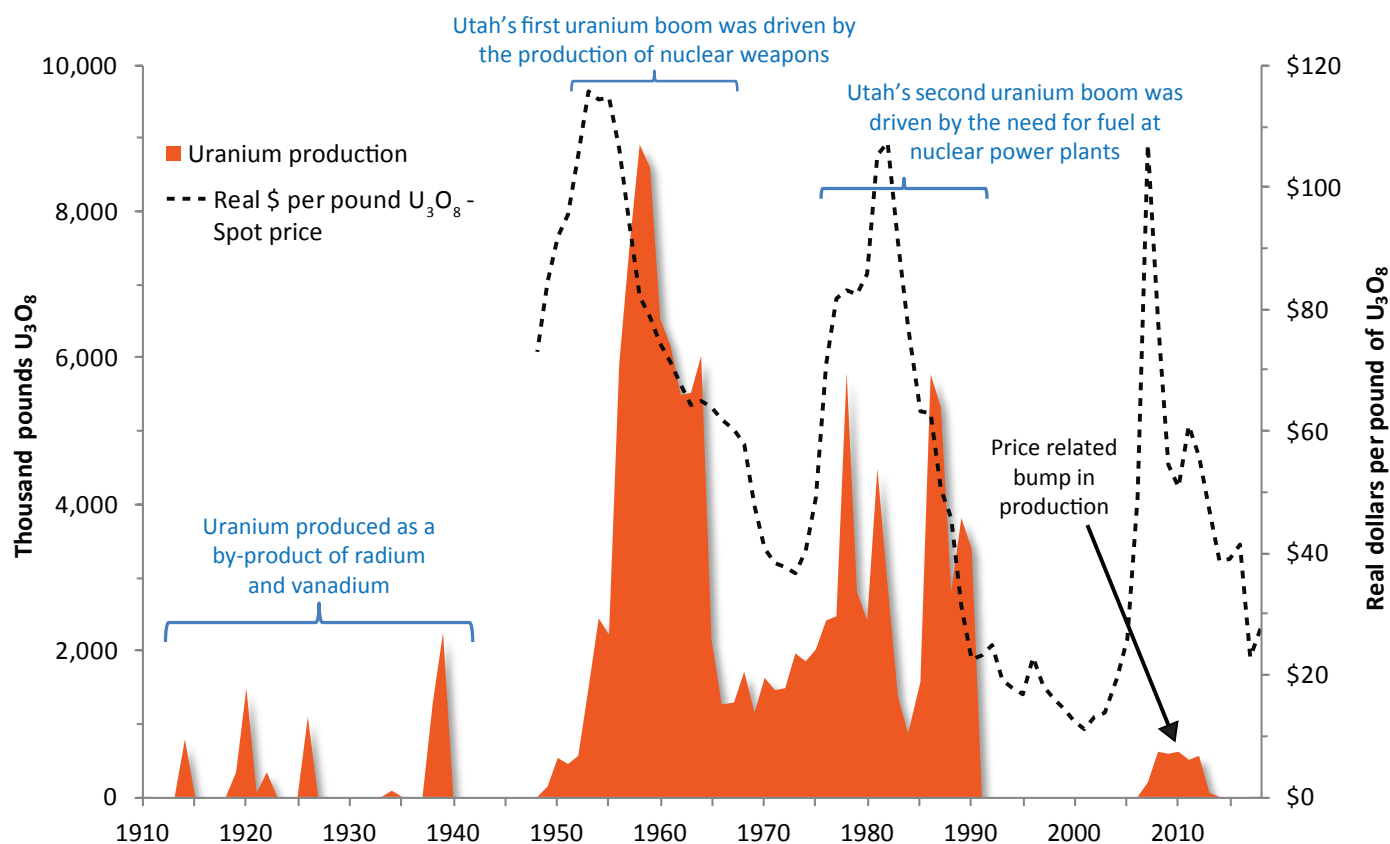


uranium

The most prospective uranium resources are located in northern San Juan County and eastern Garfield County. Potential future production would most likely take place at one or more of these mines.



Uranium Production in Utah, 1910–2018



UEMS website table: Table 9.1

Source: EIA, UGS

From 1910 to 1940, uranium was produced as a by-product of first radium, then vanadium. Utah's first big uranium boom started in 1948 when the U.S. Atomic Energy Commission set a guaranteed price and bonus schedule for domestic uranium ore, driven by the requirements of nuclear weapons production. Utah's uranium production grew rapidly during the late 1940s and 1950s, peaking in 1958 at 8.9 million pounds of U_3O_8 before declining in the mid-1960s. During this time, production occurred at over 500 individual mines.

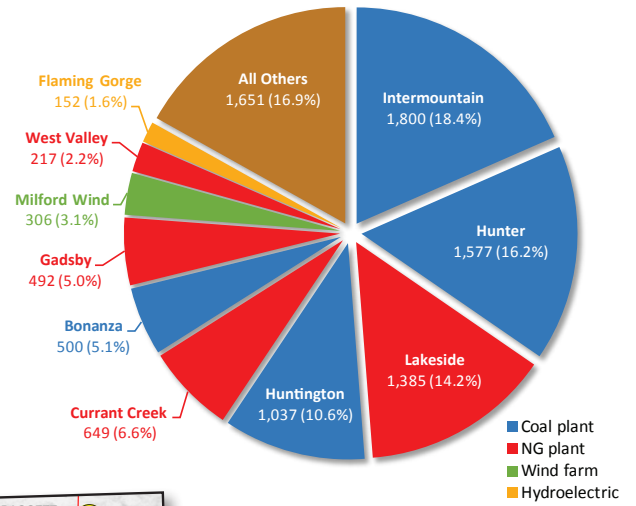
A second period of increasing uranium production began in the early 1970s with the development of the U.S. nuclear power industry, peaking in 1978 at 5.8 million pounds U_3O_8 . Since the mid-1980s, Utah's underground ores have had difficulty competing with other lower cost operations, exacerbated by the discovery of very large, high-grade, near-surface uranium ore in Canada and Australia. By 1991, all of Utah's uranium production had ceased and within a few years there were no longer any underground uranium mines operating in the United States.

Beginning in 2004, the price of uranium began to rise, reaching an inflation-adjusted record high of \$107 per pound in 2007. This resurgence in uranium price resulted in the reopening of several Utah uranium mines which produced 3.1 million pounds between 2007 and 2013. In addition, the White Mesa uranium mill, the only operational uranium mill in the United States, once again began processing uranium ore. Operations continue today, but only with ore from other states, mainly Arizona. All uranium production in Utah stopped in 2014 as prices again declined, but several mines are on "stand-by," ready to go back into production if prices were to rebound.

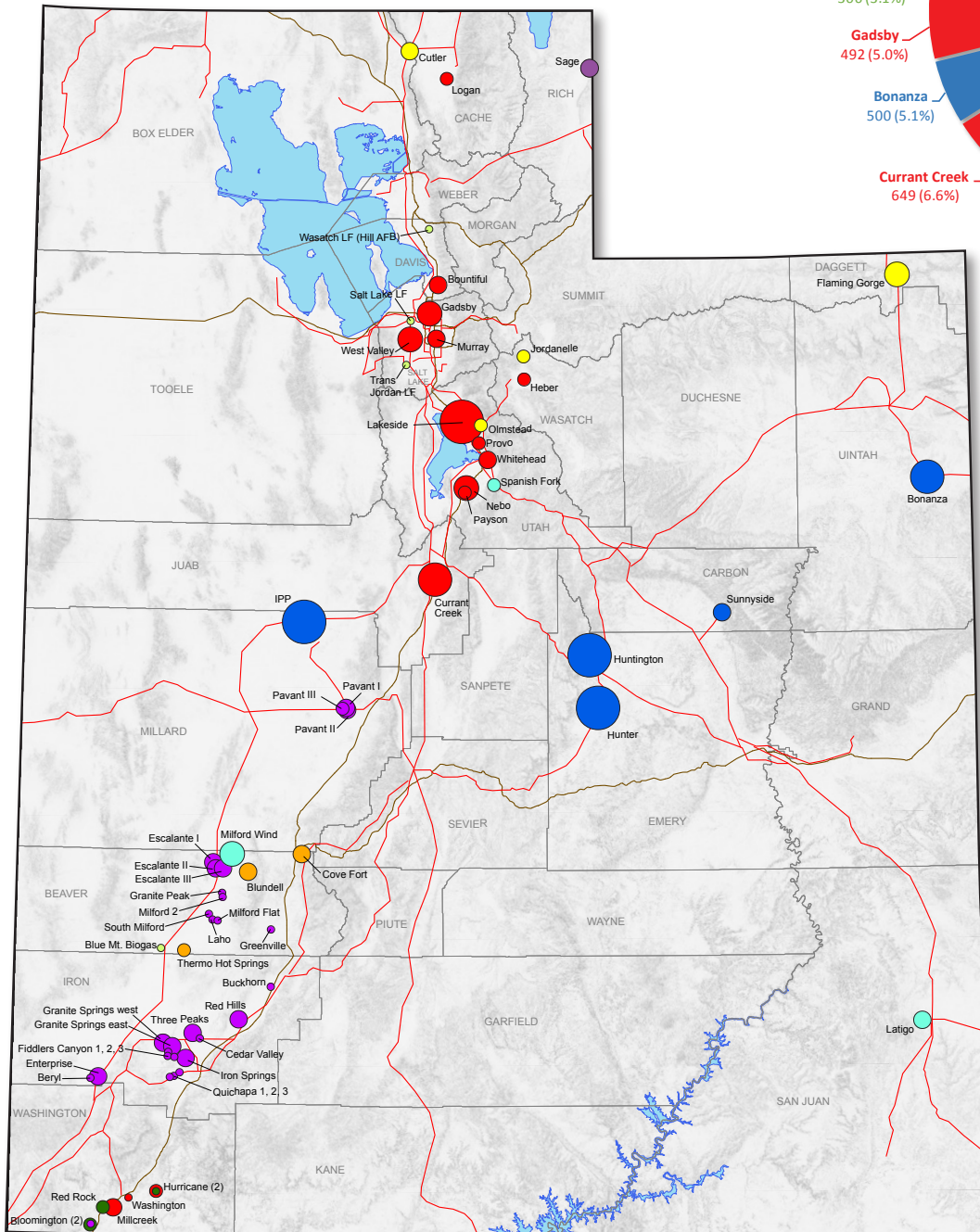
electricity

Utah's electric generation is dominated by five large coal-fired power plants (blue) and several natural-gas-fired power plants (red) located near population centers along the I-15 corridor. Since 2015, 914 MW of new utility-scale solar capacity (purple) has been built, mostly in Beaver and Iron Counties, with many more solar farms slated for construction in coming years. Renewable resources like geothermal, wind, and solar found in Beaver, Iron, and Millard Counties will play an increasingly important role in Utah's electricity generation future.

Utah's 10 Largest Power Plants
Capacity in megawatts (Percent of total)



**Utah's Total Electric Capacity:
(utility only) 9,765 megawatts**

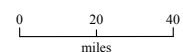


Utility plants >10 MW
>1 MW for wind, solar, & biomass

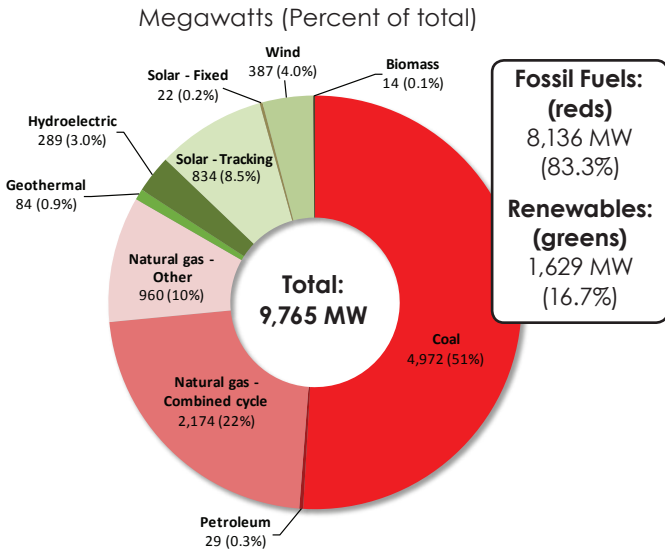
- Coal
 - Natural gas
 - Petroleum
 - Hydroelectric
 - Geothermal
 - Biomass
 - Wind
 - Solar
-
- <10 MW
 - 10-25 MW
 - 25-100 MW
 - 100-500 MW
 - 500-1000 MW
 - >1000 MW

- Transmission (>138 kV)
- County
- Interstate

Data Source: UGS, EIA



Total Electric Capacity in Utah by Source - Utility Only, 2018

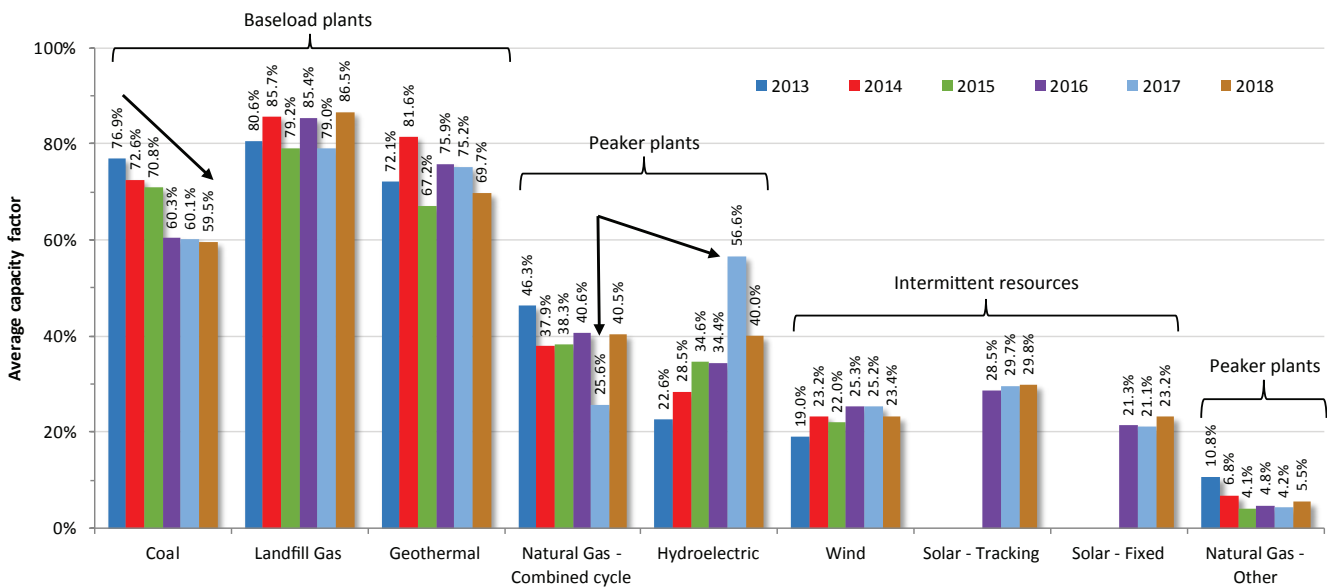


Utah's electricity portfolio continues to be dominated by coal-fired power plants (51% of total capacity), but with the planned conversion of the Intermountain Power Plant to natural gas in 2025, the future will be dominated by natural gas and renewables. Several large natural gas plants have been built in the past 15 years (Lakeside – 2007/2014; Currant Creek – 2005–2006; West Valley – 2002; and three new units at Gadsby – 2002) increasing natural gas capacity to 32% of total. The largest renewable facilities are the Milford wind farm, which added 306 MW of capacity in 2009/2011, and the venerable Flaming Gorge hydroelectric plant (152 MW), which came online in 1963–1964. Starting in 2015, 857 MW of new solar capacity came online and now accounts for nearly 9% of total capacity (the new Sage solar farm is not included in the 2018 total, it was commissioned in late-2019). In total, renewable resources account for nearly 17% of Utah's total electric generating capacity.

UEMS website table: Tables 5.1–5.8 | Source: EIA

Note: Charts only include utility plants. "Other" natural gas plants include combustion turbine units, internal combustion engines, and steam turbines. "Combined cycle" natural gas plants include both combustion turbine and steam. "Fixed" solar refers to panels that face south and do not move, whereas "tracking" panels rotate as the sun moves across the sky. "Biomass" plants include landfill gas facilities and a bio-gas plant powered by hog farm waste.

Annual Net Capacity Factor for Utah Power Plants, 2013–2018



UEMS website table: Tables 5.2–5.8 and Tables 5.15–5.20 | Source: EIA

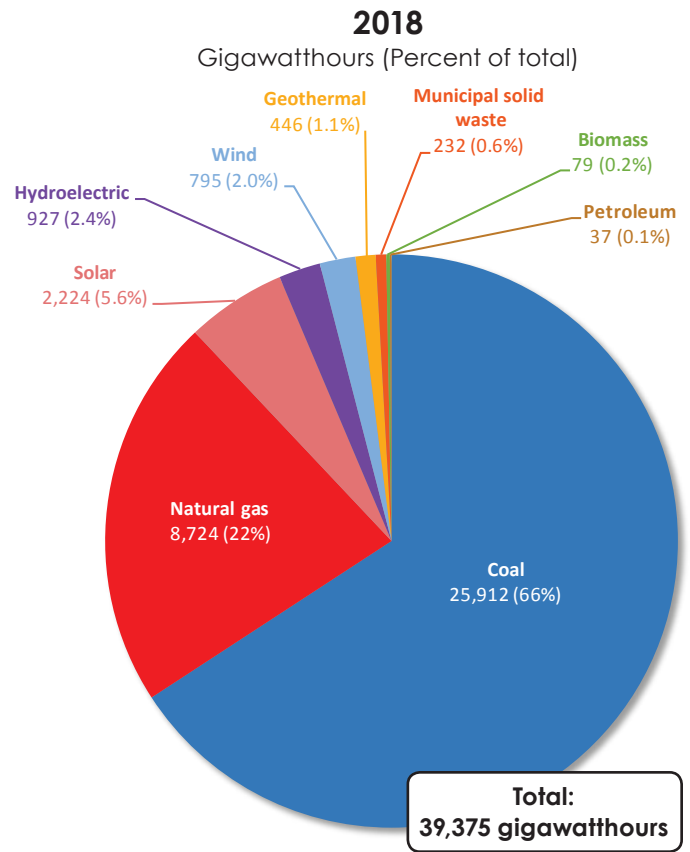
The net capacity factor of a power plant is the ratio of its actual output over a period of time, to its potential output if it were possible for the plant to operate at full nameplate capacity continuously over the same period of time. Capacity factors from 2013 to 2018 in the graph above were calculated using Utah-specific data, and as the graph clearly indicates, not all electric plants utilize their total capacity. For example, plants with higher capacity factors run as base load operations (coal, geothermal, and biomass; but keep in mind, coal plants represent 51% of total capacity whereas landfill gas and geothermal only account for 1% combined), whereas natural gas and hydroelectric plants operate as "peaker" plants, supplying electricity only when demand is high. Hydroelectric can be used more during wet years, when reservoirs are full, and result in a corresponding low capacity factor from natural gas plants (like in 2017). Wind and solar are intermittent resources, only producing electricity when the wind is blowing and the sun is shining, resulting in a capacity factor averaging about 23% for Utah's wind farms, 29% for tracking solar, and 21% for fixed solar plants. Also notice the decrease in coal plant capacity factors starting in 2016 that corresponds to the onset of solar energy (both in Utah and other southwestern states). As new solar farms flood the grid with electricity during the day, coal plant operators in Utah have learned to ramp-down operations, then ramp back up in the evening as solar electricity decreases and peak demand is encountered. This coal plant cycling reduces total electric output as well as coal consumption.

Net Generation of Electricity in Utah by Energy Source

Historically, coal has dominated Utah's electricity generation portfolio, accounting for an average of 94% of Utah's total net generation between 1980 and 2005. However, since 2004, 2319 MW of natural-gas-fired electric capacity was built, helping to decrease coal's overall share to 66% in 2018 and increasing natural gas's share to 22%. Utah's share of electricity generated from renewable resources has jumped to 11% in 2018 with the recent addition of the 306-MW Milford wind farm, the 62-MW Latigo wind farm, and 857 MW of new solar. Electric generation peaked in 2008 at 46,579 GWh, but quickly declined during the recession that followed (the 2012 low was the result of an unexpected six-month maintenance shut-down on one of two units at the Intermountain Power Plant). Electricity generation rebounded in 2013 and 2014 but dropped again from 2016 to 2017, mostly due to mild winter and summer temperatures, before rebounding to 39,375 in 2018.

UEMS website table: Table 5.11 | Source: EIA

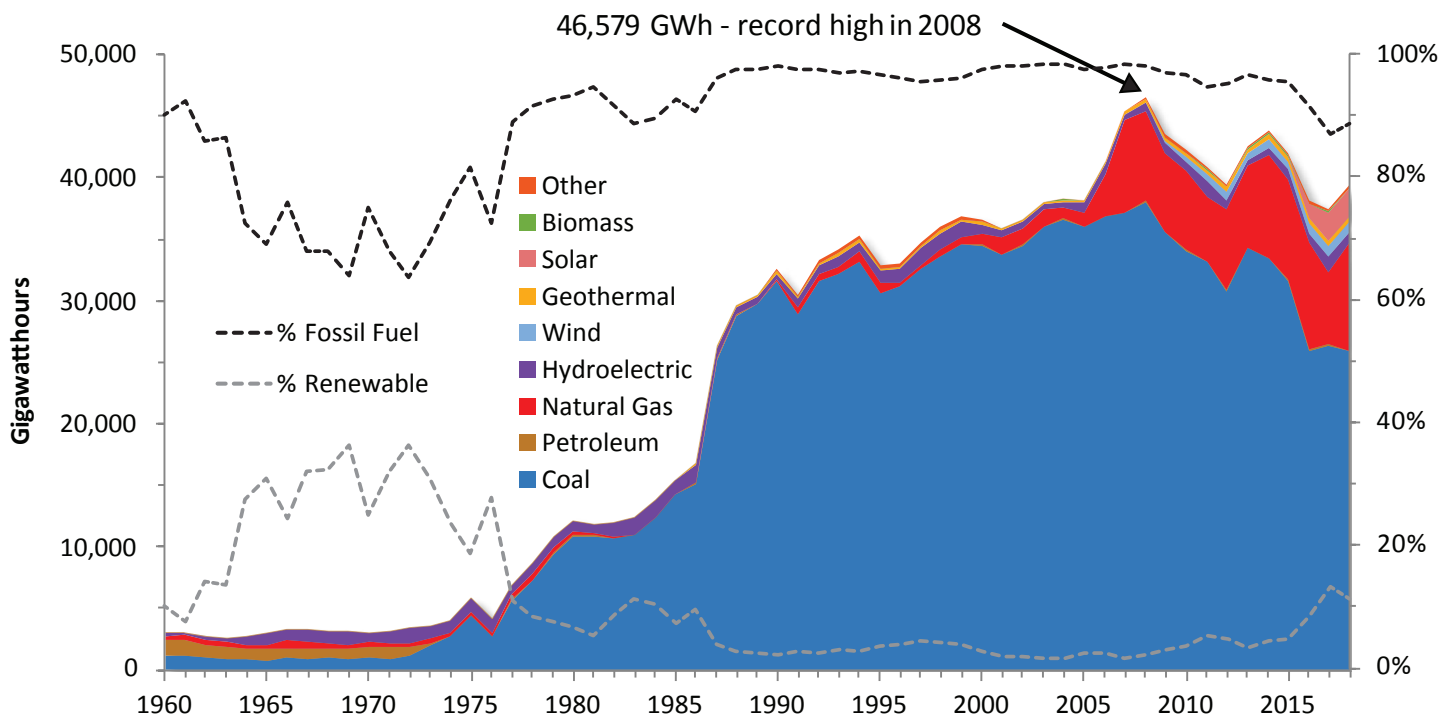
Note: "Other" includes municipal solid waste and other gases derived from fossil fuels.



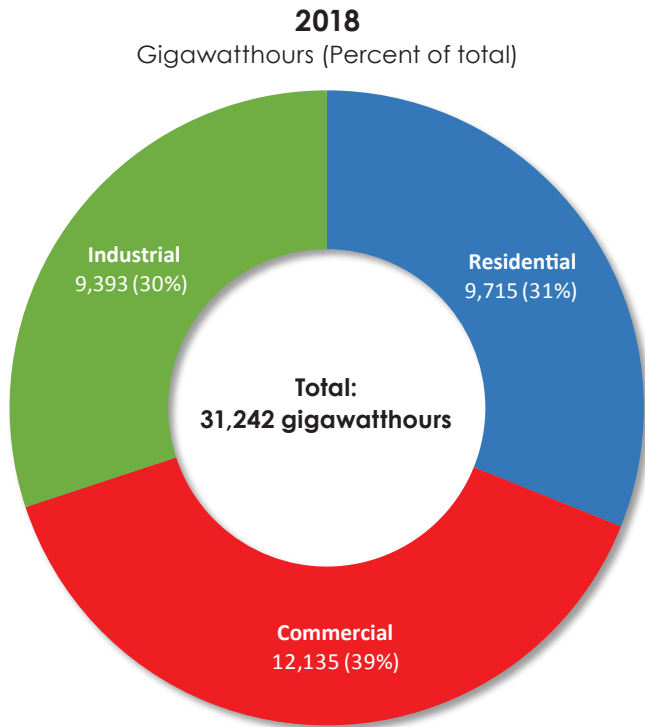
Update
Preliminary 2019 electricity generation in Utah
 39,526 GWh
 89% fossil fuels
 11% renewables

Total:
39,375 gigawatthours

1960-2018



Sales of Electricity in Utah by Sector



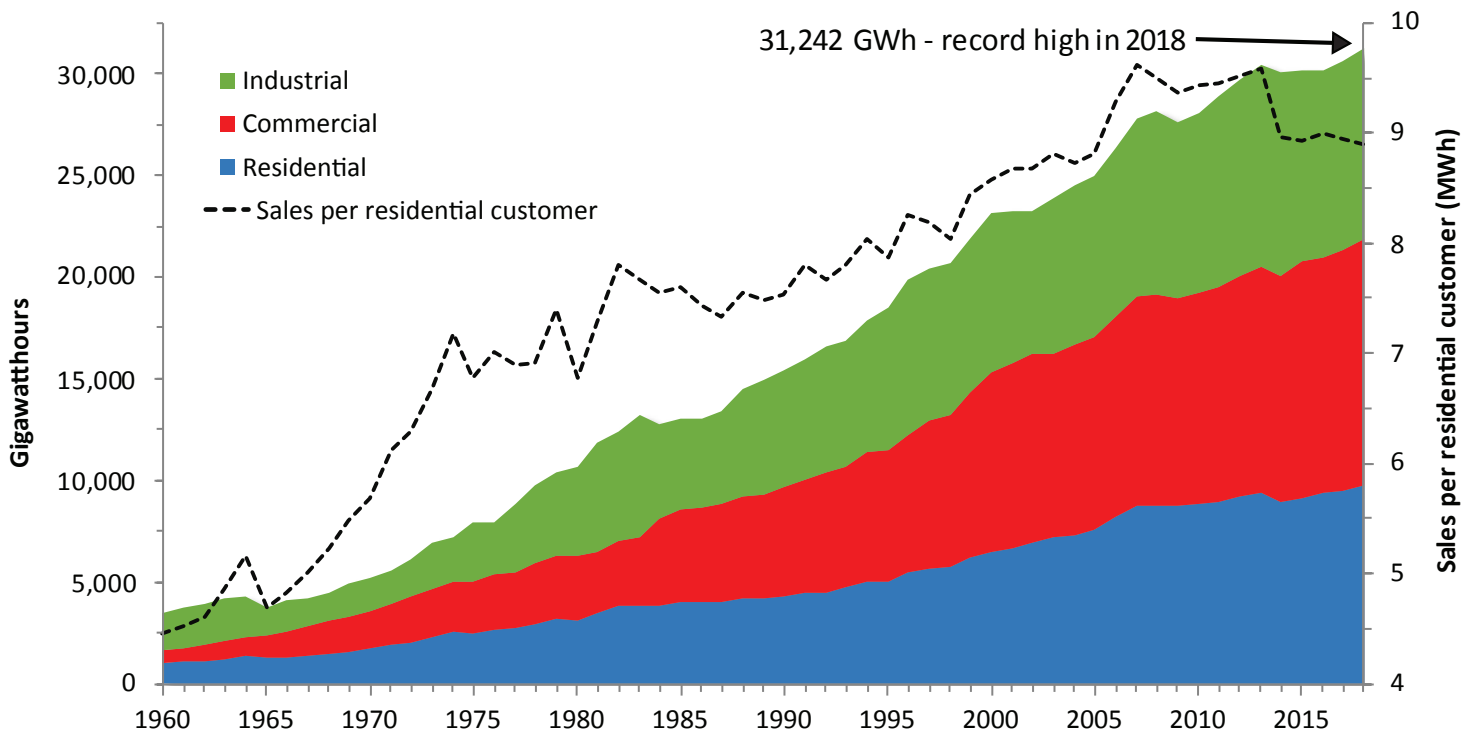
In general, from 1960 to 2013, electricity sales (i.e., consumption) averaged a 4.3% increase annually, mirroring Utah's population rate increase (2.1% per year) combined with the increasing rate of consumption per residential customer (1.5% per year). However, after an initial 1.4% decrease from 2013 to 2014, total electricity sales climbed more slowly to reach a new record high in 2018 of 31,242 GWh, but are projected to fall again in 2019. The recent slow-down in electricity sales is most likely related to the implementation of energy efficiency measures (see next page) combined with a dramatic increase in residential rooftop solar (rooftop solar electric generation and consumption reduces demand; the data are not captured within the consumption totals). In 1960, each residential customer in Utah used about 4.5 MWh annually. Even with a significant decrease in recent years, the average residential customer usage has still more than doubled to 8.9 MWh per year.

UEMS website table: Table 5.22 | Source: EIA

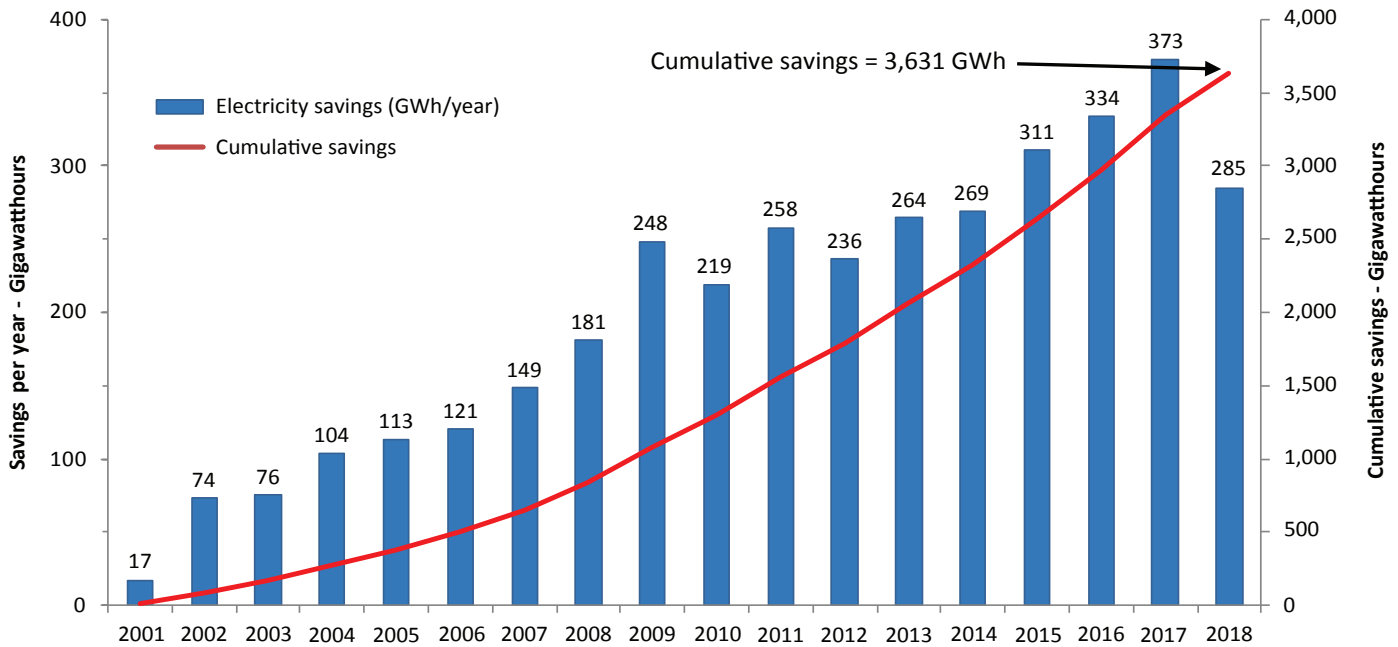
Note: Electricity used by the transportation sector (UTA transit) is very small (51 GWh in 2018) and is included in commercial on the graphs.

Update
Preliminary 2019 electricity sales in Utah
30,664 GWh

1960–2018



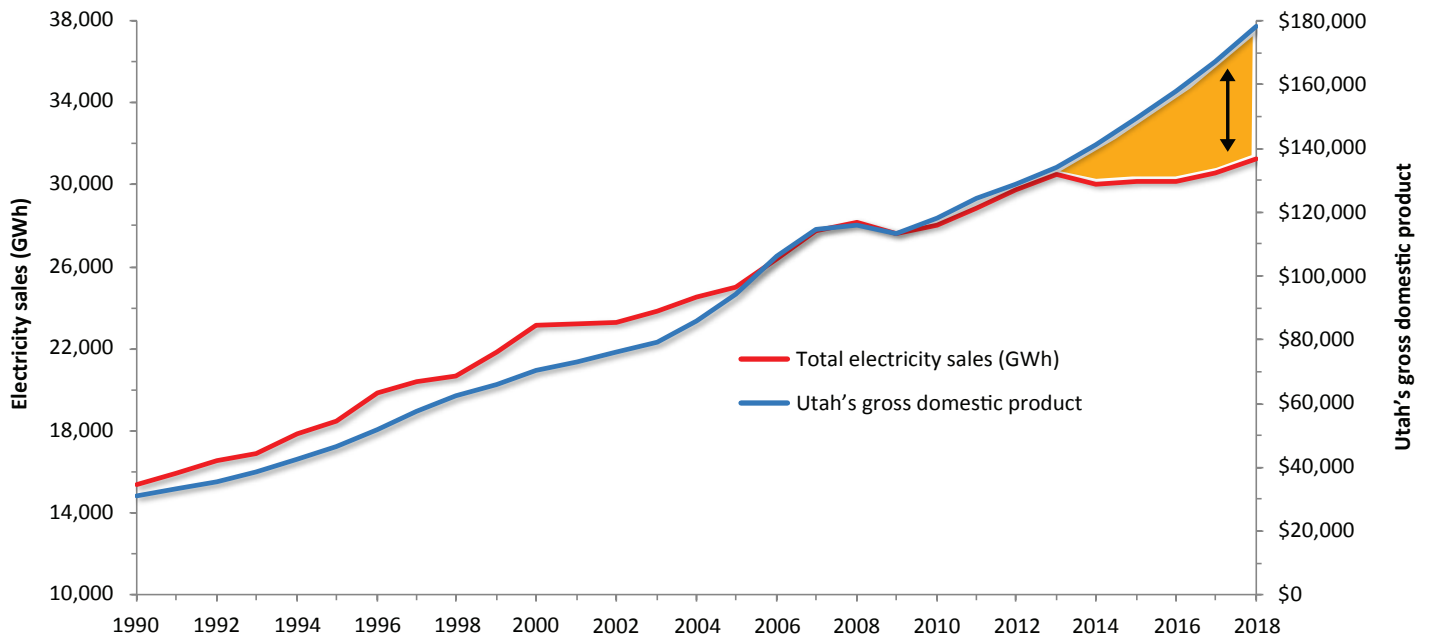
Rocky Mountain Power Demand-Side Management Program Electricity Savings, 2001–2018



Source: Rocky Mountain Power's (PacifiCorp) Utah Energy Efficiency and Peak Reduction Annual Report

The true effects of energy efficiency practices (e.g., switching to LED lightbulbs; installing a new, energy efficient air conditioner; adding insulation in your attic; sealing your windows) on Utah's overall electricity demand is difficult to quantify. However, since 2001, PacifiCorp's Rocky Mountain Power, which serves about 75% of Utah's consumers, estimates that it has saved about 3630 GWh (cumulative total from 2001 to 2018) of electricity through its various energy efficiency programs.

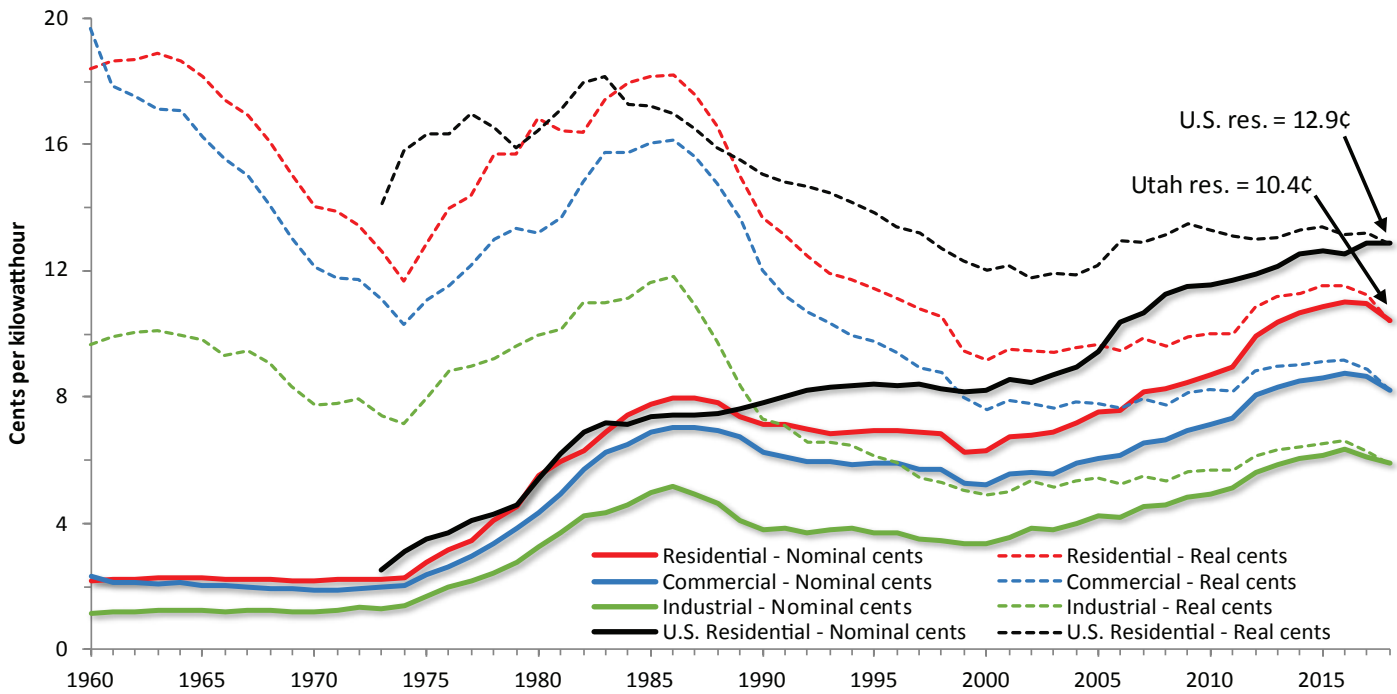
Utah Gross Domestic Product Compared to Total Electricity Sales, 1990–2018



Source: EIA, U.S. Bureau of Economic Analysis

Energy efficiency effects can also be qualitatively examined by studying the relationship between electricity use and Utah's gross domestic product (GDP). Historically, total demand for electricity in Utah has tracked closely with Utah's GDP. However, the two metrics diverged starting in 2013; electricity demand has remained relatively steady, but Utah's GDP continued to show significant annual growth. This comparison suggests that the strong energy efficiency programs being pushed by Rocky Mountain Power, other smaller utilities, and by local and state governments are having a significant effect on Utah's electricity demand.

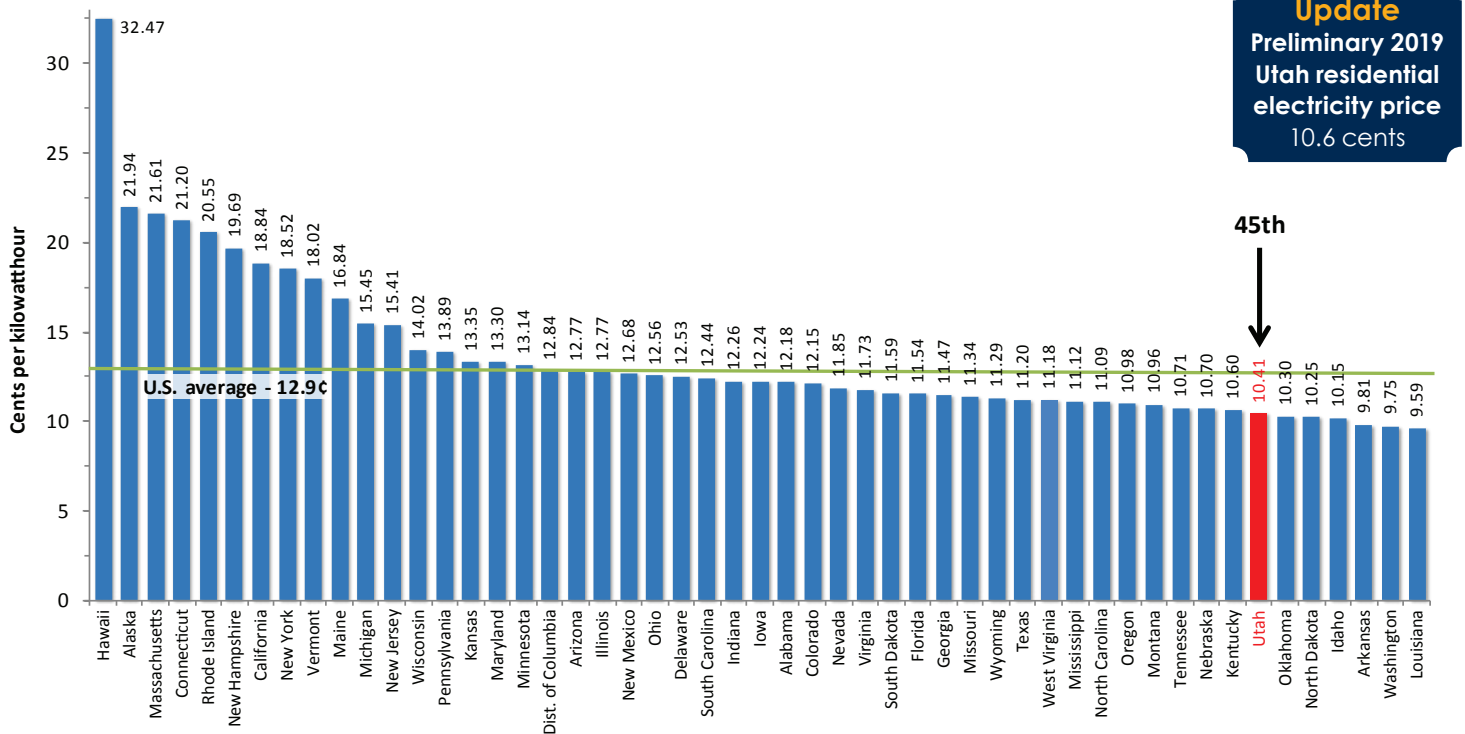
Price of Electricity in Utah by Sector, 1960–2018



UEMS website table: Table 5.23 | Source: EIA

The residential price of electricity in Utah has been on a gradual upward trend since 2000, peaking in 2016 at 11.0 cents per kWh, then declining in 2017 and 2018 to 10.4 cents, well below the national average of 12.9 cents per kWh. Electricity prices for commercial and industrial uses follow the same trend and were 8.2 cents and 5.9 cents per kWh, respectively.

Average Residential Price of Electricity by State, 2018



UEMS website table: Table 5.24 | Source: EIA

Utah's average price of residential electricity ranked 7th lowest in the nation in 2018; lower prices in Utah are attributed to the state's fully amortized coal-fired generation, low natural gas prices, and new cheap solar power.

