OKLAHOMA
State Energy & Environment Plan 2021

OKLAHOMA

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OPPORTUNITY IN CHANGE

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“MESSAGE FROM GOVERNOR STITT”

When I think of Oklahoma’s history as a pioneer in energy, I think of the larger-than-life figures that have literally shaped our state, country and the world’s economies and history. Giants like W.G Skelly, Waite and Frank Phillips, E.W. Marland, J.Paul Getty, Harry Sinclair all set their mark on history in Oklahoma, while modern day titans like T. Boone Pickens, Harold Hamm and the Aubrey McClendon personified the new “wildcatters.” Today, that same pioneering spirit lives on in Oklahoma’s burgeoning energy industry.

We are proud that Oklahoma has always been an energy innovator, starting with the introduction of the first use of hydraulic fracturing in Oklahoma in 1949 by the Oklahoma based Halliburton. Other innovations like the shale revolution were started by Oklahoma companies. We continue the tradition of industry modernization by developing new technologies for the oil & gas industry and embracing new sources like wind, solar, hydrogen, and battery storage. Additionally, implementing sustainable initiatives like carbon capture utilization and storage (CCUS), renewable natural gas and water recycling show our state’s ability to evolve with the industry.

As Governor, I challenged my Secretary of Energy & Environment to develop this plan that highlights our great history and future with traditional energy, but more importantly, charts a path as a premier “all of the above” energy producer for many years to come.

I hope you find Oklahoma’s diverse energy portfolio as diverse and unique as our great state.

An Introduction to the Oklahoma State Energy and Environment Plan.....

There has never been a more exciting time to be pioneers in energy than taking on the world's needs and challenges by providing the cleanest and most affordable in the country.

It has been over a decade since Oklahoma has published an Energy Plan, and I am so excited and proud to share Oklahoma's story and vision of what's next in energy. I have the privilege of serving Governor Kevin Stitt as his chief advisor on matters involving energy and our environment. I am often asked if the areas of energy and environment are naturally in conflict. The answer is simple; sound energy policy cannot exist without a plan for the environmental impacts and, likewise, sensible environmental policy is not possible without a common understanding of a plan to power the state and fuel the world.

The necessity for these two policy areas to work in tandem with one another is precisely why this plan is so important. Most people know of our pioneering legacy as a leader in the production, storage and transportation of oil & gas and traditional fossil energy products. It is no secret that we have always been a leader in providing the country and the world refined petroleum-based products. However, most people are amazed to learn that Oklahoma is a national leader in producing renewable power. In fact, Oklahoma is one of only four states in the United States to receive more than 40% of its power from renewable resources like wind power, hydroelectric power and a growing portfolio of utility scale solar power. We are proud of the fact that we are a net exporter of power and send our clean and affordable energy to our neighboring states.

Oklahoma ranks 4th nationally in oil, 3rd in natural gas, and 2nd in wind production. We have the potential to become a top 10 producer in solar energy. Producing nearly 50% of our power from renewable resources and natural gas making up most of the remainder, our energy mix has allowed us to become a leader in emissions reduction. The remarkable growth of our renewable energy sector has allowed our state to become a national leader in emissions reductions, reducing our carbon dioxide emissions from the power sector by nearly three times the national average since 2005.

The Oklahoma 2021 Energy Plan is meant to highlight Oklahoma's incredible energy story and set a roadmap for the future. Oklahoma stakes its claim as a pioneer in energy as well as the premier "all of the above" energy state in the nation. Oklahoma's position as a leader in both conventional fossil resources as well as

clean renewable energy makes this claim true, but the star of our state's leadership is that we have the most affordable energy in the country. Oklahoma has held the #1 ranking for most affordable power across all sectors (residential, commercial and industrial) for 9 of the last 11 quarters according to the Energy Information Administration (EIA).

Oklahoma's formula for success is allowing the state's strong natural resources to create a dynamic mix of fuel sources to work together create the most affordable and reliable grid. Our diverse energy portfolio provides Oklahomans and our neighboring states with the cleanest and most affordable energy in the United States.

Oklahoma's pioneering spirit can be seen in our constant search for new technologies and devotion to developing better ways to produce energy. This is evidenced by our rankings in electric vehicle infrastructure. We are #1 in the nation for per capita electric vehicle (EV) super charging infrastructure and #3 in the total number of electric vehicle super charging stations. An EV can be driven anywhere in the state and there will be a super charging station within 50 miles. We are the only state with a long-term tax incentive for alternative fuel infrastructure particularly incentivizing the construction of EV charging infrastructure as well as Compressed Natural Gas (CNG) fueling infrastructure. Additionally, Oklahoma is a signatory to the State Carbon Capture Coalition and is actively working towards carbon neutrality in the energy sector by creating advancements in carbon capture technologies, hydrogen and renewable natural gas.

No one could have foreseen the impact and the unprecedented challenges caused by the Covid-19 global pandemic. In Oklahoma, our industry and government leaders have worked incredibly hard to respond to these challenges and keep Oklahoma on a strong economic footing. The pioneering spirit of the people of Oklahoma continues to bring me great optimism that our state will be stronger than ever despite difficult times.

You will notice that this plan does not set specific numeric goals for one particular fuel source versus another and Oklahoma tries to avoid picking winners and losers. We achieved our status as energy leaders and energy pioneers by following the trends of consumers and investors while following demand. Unnecessary regulation and mandates serves only to penalize the consumer by making all forms of energy more expensive while not following demand. One of our main objectives is to ready our state to take on whatever new challenges arise and to lead in whatever's next in energy that fits our diverse natural resources and human capital.

Divided into four sections: Energy, Environment, Power, and Technology – this plan provides a detailed view of the current landscape in Oklahoma with an exciting look into Oklahoma's future.

EXECUTIVE SUMMARY

Oklahoma's energy sector continues to be a dynamic leader for the entire nation. Our wonderful state is at the forefront of both conventional fossil energy production and is leading the way with new renewable energy technologies. Since the release of Oklahoma's First Energy Plan in 2011, energy markets have gone through a remarkable transformation as a result of advancements in technology and changing consumer demand.

Energy

Our state is an energy powerhouse. We remain among the Top Ten states in the nation in several major categories:

- Oklahoma ranks #2 in the nation for wind generation
- Oklahoma ranks #3 in the nation for natural gas production and #3 in proved natural gas reserves
- Oklahoma ranks #4 in the nation for oil production

Oklahoma has bold energy goals for the future:

- Remain in the top 5 in conventional fossil fuels
- Remain a top 5 producer of clean renewable energy
- Partner with new technologies to maximize our immense solar potential and grow the use of natural gas liquids into new products for consumers
- Foster a climate where new technologies and alternative fuels can drive environmental change while maximizing all of Oklahoma's resources

Power

Oklahoma's vast energy resources enable our state to offer some of the most affordable and clean electricity in the nation. As technology continues to improve, we will continue to provide low cost electricity which enables our communities to thrive.

Oklahoma is a leader in power generation, transmission, and affordability:

- Oklahoma ranks #1 in the nation for the lowest price of electricity
- Oklahoma is the #1 provider of power in the Southwest Power Pool
- Oklahoma ranks #2 in the nation for wind generated electricity

Looking forward, Oklahoma will:

- Continue to be a leader in affordable clean power
- Work with our Southwest Power Pool partners to ensure that our state electricity costs remain some of the lowest in the country
- Continue the development of our transmission capacity to allow Oklahoma to remain a leader in exported power and continue to improve on our already well-developed pipeline system

Environment

Oklahoma is blessed with a rich and diverse environment. Protecting our precious environment and natural resources is of the utmost importance. Oklahoma is a testament to the fact that environmental protection does not have to be sacrificed for economic growth.

- Oklahoma is home to 12 distinct eco-systems, making our state one of the most ecologically diverse in the nation
- Oklahoma has achieved significant emissions reductions in the past ten years
- Oklahoma's Water for 2060 Plan and our partnership with the Environmental Protection Agency (EPA) under the National Water Reuse Action Plan solidifies our commitment to remain responsible stewards of the State's water resources
- Oklahoma ranks #1 in the nation per capita for electric vehicle charging infrastructure

Oklahoma will continue to value and protect our environment:

- Pursue environmental regulatory policies that are protective of our valuable natural resources but also ensure a prosperous Oklahoma
- Pursue management practices that will ensure that Oklahomans have access to abundant and clean water for years to come consistent with the state's Water for 2060 Plan
- Reduce emissions from all sources to provide Oklahomans with healthy clean air by growing alternative fuels, renewable energy and alternative transportation infrastructure

Technology

Oklahoma must continue to be a leader in technological innovation and responsibly stewarding our abundant natural resources. This will provide the technology that powers our future.

- Support investments into battery storage technology to better utilize our abundant clean energy sources
- Support and promote the growth of carbon capture technologies in Oklahoma that will improve our environment and grow our economy
- Support development of hydrogen as a major fuel stock in the ever-growing decarbonized economy
- Strengthen and enhance our status as a hub for research and development that provides future improvements in technology benefitting our economy and our environment

Energy

Oklahoma has always been a global leader in energy. Traditionally, we have led in the production of oil and gas and more recently wind energy and renewables. As the nation goes through an energy transition, Oklahoma continues its leadership by embracing the diversity of our resources and imagining possibilities through technology. The nurturing of these various resources and technologies has resulted in Oklahoma leading the way with some of the cleanest and most affordable energy in the nation.

The global energy landscape has experienced a wide range of tremendous change and expansion in the last decade. However, recent policy directives are aimed at accelerating even greater changes in a much more aggressive timeline.

Advancements in technology and production techniques from hydraulic fracturing and enhanced oil recovery (EOR) have transformed traditional fossil energy production and taken it from scarcity to abundance. At the same time, similar advancements have been made to make renewables more price competitive and more readily available. Oklahoma maintains its leadership position in fossil energy production by ranking #3 in the nation in natural gas and #4 in oil. Impressively, we have quietly become a national leader in renewable energy, as we receive nearly 50% of our power from renewable resources. Oklahoma ranks #2 in the nation for wind generation with a growing solar and storage portfolio as well as an impressive fleet of valuable hydropower assets.

Our goal is to continue to be a leader in energy for generations to come. To meet this goal, we will continue to embrace new technologies and advancements and look to be early adopters of those things that bring environmentally beneficial progress. Current changes in the energy market have created tremendous opportunities to improve how traditional and renewable energy work together to lower emissions and make energy more efficient and affordable.

Photo Courtesy Oklahoma Department of Commerce

OKLAHOMA TOP TEN

#2 in the nation for wind generation

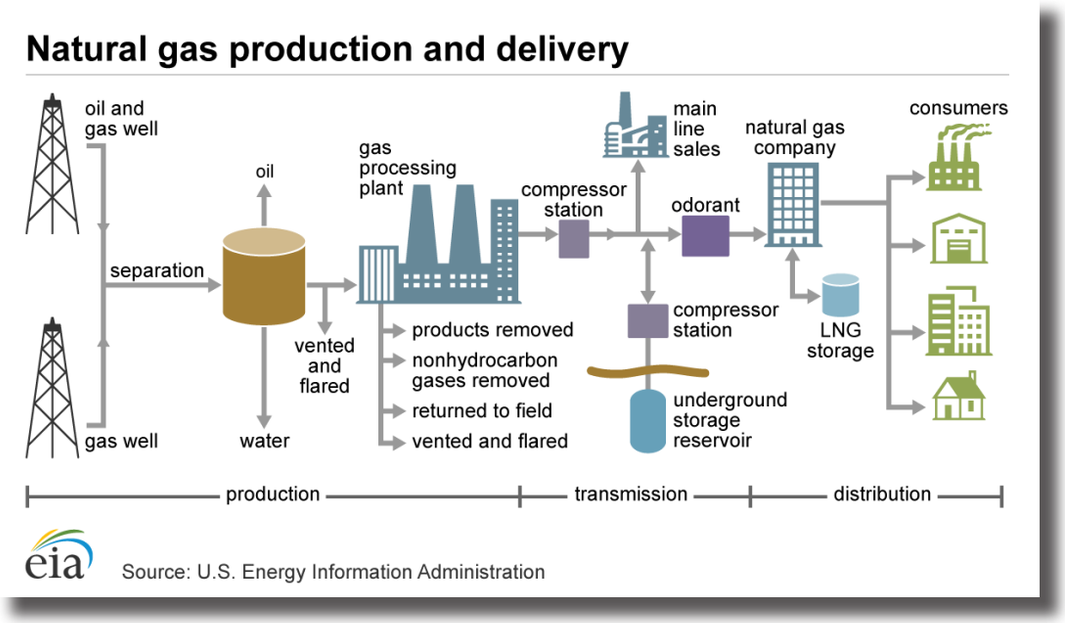
#3 in the nation for natural gas production

#4 in the nation for oil production


ATLAS RIG 1


GRDA

Natural Gas



Natural gas is essential for Oklahoma's dynamic energy mix and stabilizing a grid with a substantial amount of renewable resources. Natural gas allows the flexibility to produce power quickly and affordably when the sun is not shining, and the wind is not blowing. The combination of natural gas and renewables has made Oklahoma's power the most affordable and cleanest in the country.

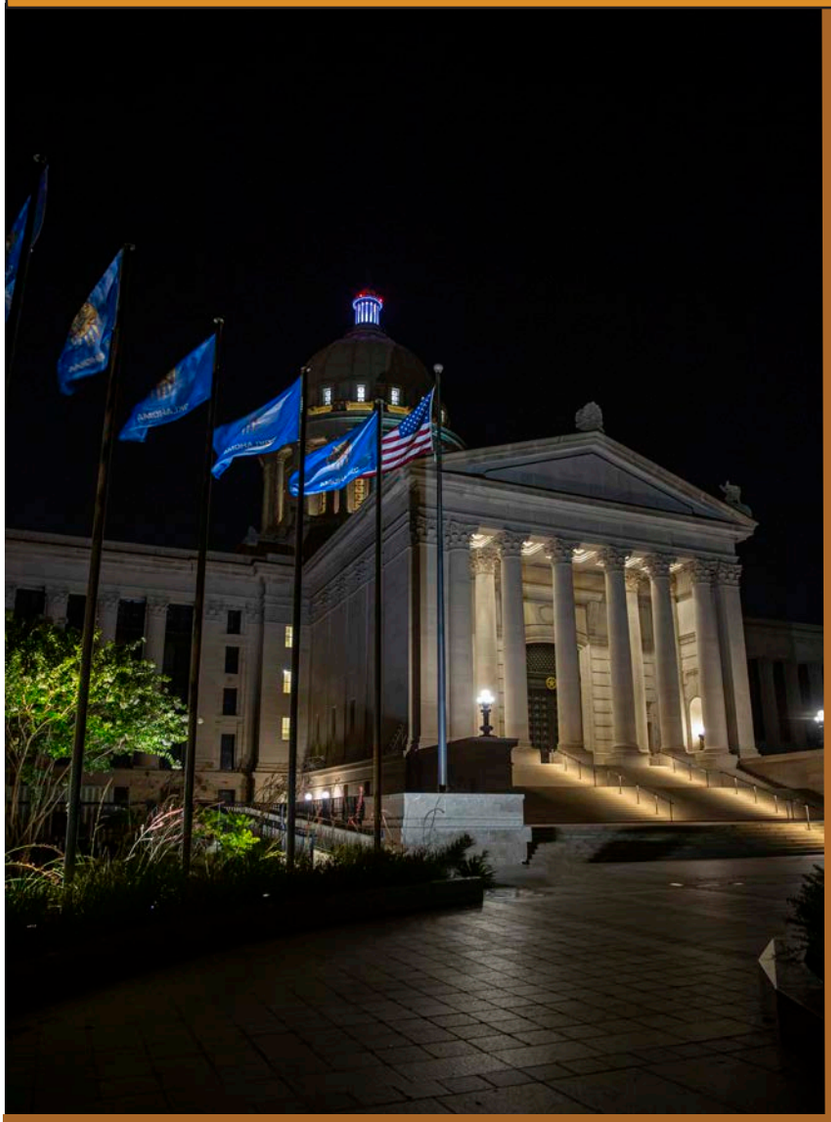
For many years there was thought to be a shortage of natural gas, however it was the pioneering spirit of Oklahoma industry leaders and their ideas to use advanced hydraulic fracturing operations and horizontal drilling which led to this age of abundance. Their actions sparked the natural gas boom and the Shale Revolution that followed. Oklahoma is not only the third largest producer of natural gas in the country, but also home to the third largest proved natural gas reserves in the nation.

The 37 trillion cubic feet (tcf) of reserves in Oklahoma accounts for nearly 8% of the nation's total volume. We produced more than 8 trillion cubic feet (tcf) of natural gas between 2007 and 2018.

Oklahoma is a major exporter of natural gas which is demonstrated by our state producing 3.17 trillion cubic feet (tcf), but only consuming 25% of the natural gas the state produces annually and exports about 2.36 tcf, resulting in additions to emissions around the world.

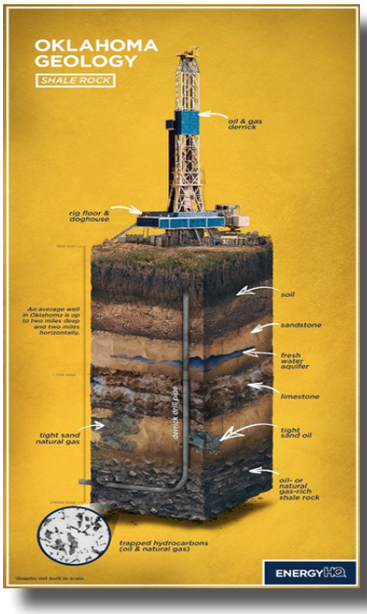
"Natural gas has had the single greatest measurable impact of emissions reductions in the United States since the removal of lead from gasoline."

-Secretary Kenneth E. Wagner

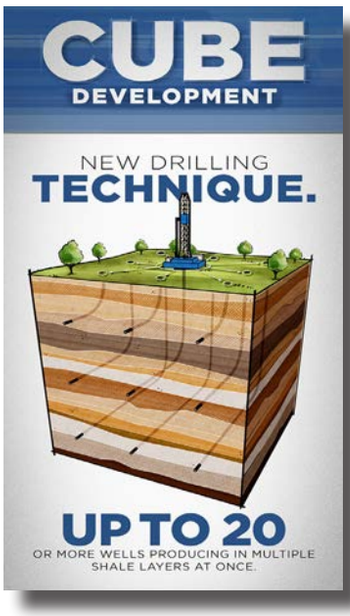



AHOMA

OKLAHOMA ENERGY & TECHNOLOGY COMBINE



The substantial increase in production of Oklahoma's natural gas resources is due to the advancement in the technology of production techniques such as horizontal drilling and advanced hydraulic fracturing. These advanced methodologies enable access to more natural gas resources with a lower environmental footprint.

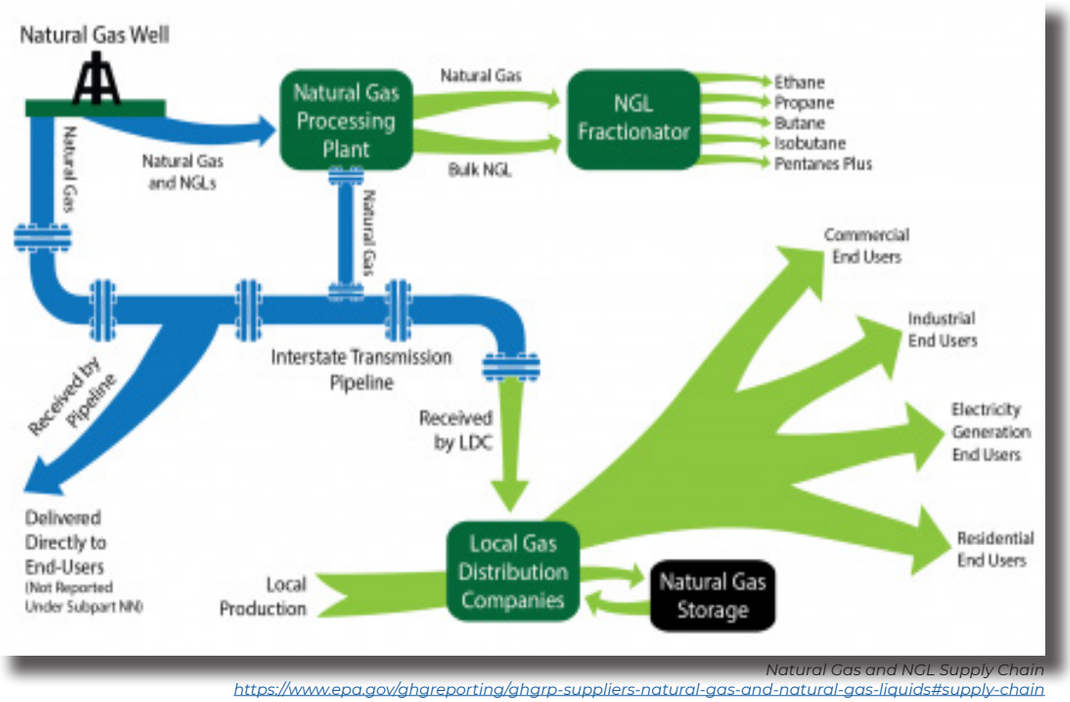


Extraction of oil and natural gas resources from the ground has evolved and become more efficient through time and technology innovation. What started as vertically drilled wells that would access underground resources from a single point when that particular layer was reached has evolved to have a smaller ground footprint on the surface while enabling access to more resources underneath. Drilling rigs drill horizontally out for thousands of feet after reaching ideal depths.

This dramatically improved production of drill sites while reducing the surface footprint. These efforts continue to advance now with a technique known as "cube" development. This technique employs up to 20 or more horizontal wells expanding out from a single drill pad surface site utilizing a three-dimensional and multi-layered approach. These techniques, all come together to enable access to energy resources across Oklahoma.

Photo Courtesy Encana

Natural Gas Liquids

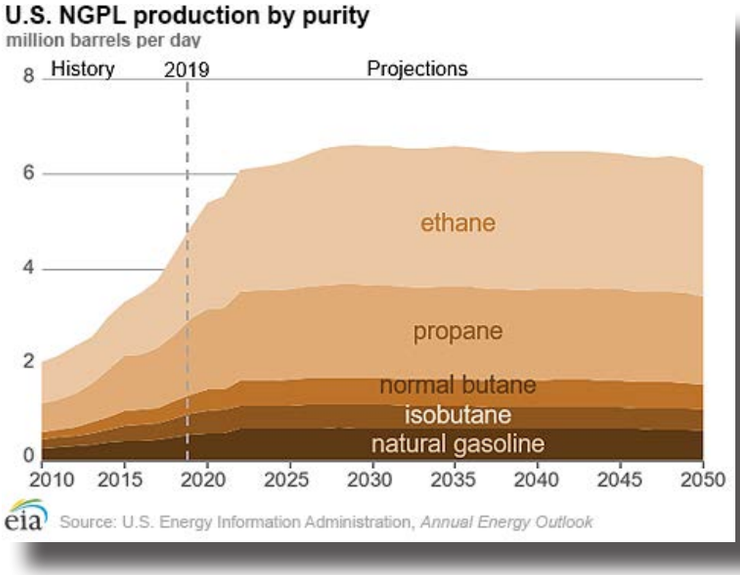


Natural Gas and NGL Supply Chain
https://www.epa.gov/ghgreporting/ghgrp-suppliers-natural-gas-and-natural-gas-liquids#supply-chain

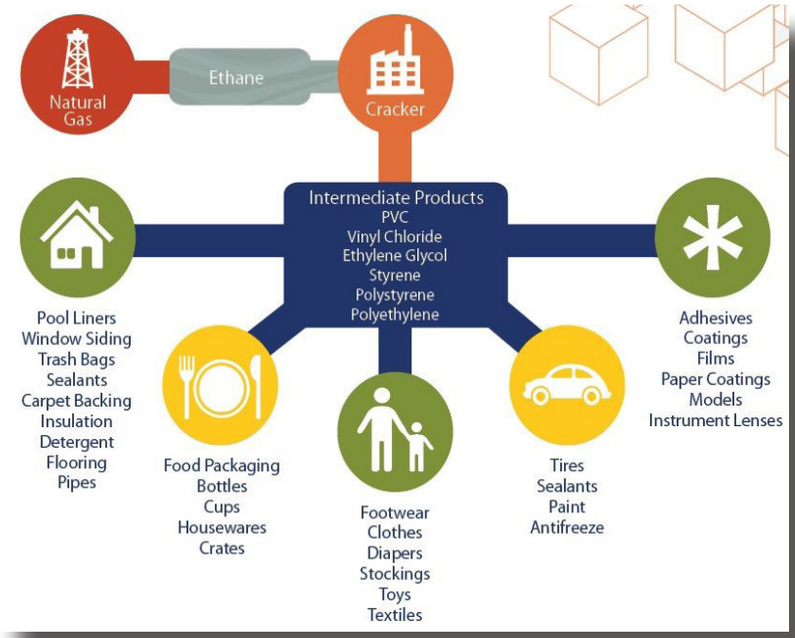
Natural Gas Liquids (NGLs) are a mystery to most people. While not widely known, these resources are a major building block for many everyday products. NGLs include ethane, propane, normal butane, isobutane, and natural gasoline. It is estimated that Oklahoma contains 2.429 billion barrels of NGLS within its borders. Since 2013, our state has produced 1.408 billion barrels showing significant growth in this sector.

This growth to our economy is becoming more important than ever in Oklahoma and throughout the nation. Products derived from NGLs are part of our everyday life. These items include fabrics, tires, toys, paints, adhesives, food containers, trash bags and shampoo bottles. If transportation and storage capabilities are maximized, Oklahoma is set to capitalize on the opportunities posed by our vast NGL resources. Oklahoma is home to one of the largest pipeline networks in the world, but additional pipeline capacity will be needed to ensure adequate transport of NGLs to processing centers.

NGLs may be less known in Oklahoma's energy economy, but they provide one of the most exciting opportunities for growth in the coming decade.



Natural Gas Liquids



Ethylene Value Chain: American Chemistry Council

ETHANE

Ethylene is created through a cracking process. It is a critical component of products from plastic bottles to tires and food packaging.

BUTANE

Normal butane is a fuel additive in gasoline and a petrochemical processing feedstock.

Isobutate is a fuel for lighters and camping stoves. Also is a high-octane fuel additive.

PENTANES

Natural gasoline. A blending fuel for refineries. A component of fuel ethanol to make it undrinkable. A diluent for heavy crude oil transport.

PROPANE

A critical fuel for residential heating. Also a transportation fuel that emits 60% less carbon monoxide and 20% less nitrous oxide compared to gasoline.

Photo Courtesy Oklahoma Department of Commerce

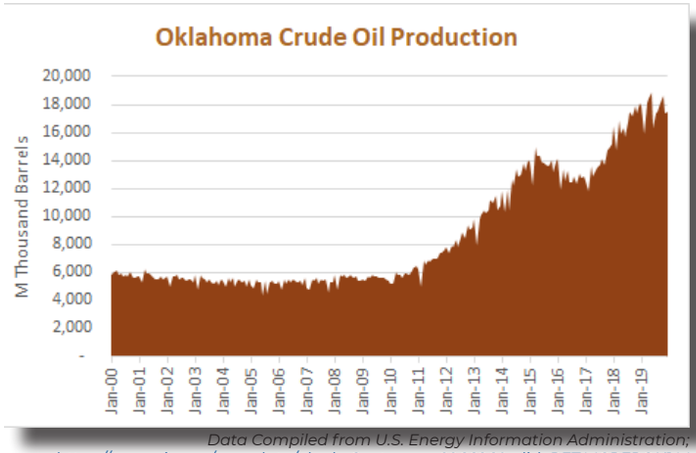
Oil

The story of Oklahoma cannot be told without the story of oil in our state. Our histories are inextricably intertwined and are filled with colorful characters like Frank and Waite Phillips, E.W. Marland, T. Boone Pickens and Harold Hamm. These leaders possessed the pioneering spirit that is written on the very character of all Oklahomans and literally changed the world and its economies.

Leading by example, early industry leaders built the oil practices and organizations that trace their roots to our great state. For example, the Interstate Oil and Gas Compact Commission (IOGCC) was created in 1935 and continues to be headquartered in Oklahoma City. This organization's original mission was to ensure the responsible development of oil and natural gas resources. Today, there are 31 member states and seven associate members compared to the founding of six member states.

Oklahoma has abundant resources of oil. Our state is home to 5% of the nation's proved oil reserves which amount to an estimated 2.12 billion barrels. Oklahoma ranks 4th in the nation in overall oil production with 211.8 million barrels produced in 2019 alone.

We are not only a powerhouse in the upstream exploration and production, but we also lead in downstream refining of petroleum products. Our state is home to five refineries with the ability



Data Compiled from U.S. Energy Information Administration; https://www.eia.gov/opendata/qb.php?category=296686&sdid=PET.MCRFPOK1.M

to refine 523,000 barrels of oil per day. This accounts for 3% of the nation's total refining capacity. These refineries produce various important products including gasoline, fuel distillates, petroleum coke, residual fuel oils, and more.

Impressively, Oklahoma is home to nearly 15% of the country's commercial crude oil storage capacity. Our world-famous hub in Cushing sets the benchmark price for the West Texas Intermediate (WTI) domestic spot market. This gives our state a major strategic advantage in the oil industry.

Due to the cyclical nature of oil markets, the state continues to find ways to diversify our energy portfolio. Oklahoma is now more than ever working to find ways to use our rich conventional resources in tandem with our readily available renewable resources to achieve a vibrant forward-looking economy.

Photo Courtesy Oklahoma Historical Society

Pictured here is the Oklahoma City Field, opened in 1928. Marking the first developments occurring in an urban area, it brought the learning experience of determining regulations for drilling restrictions. During the early 1930's, production in the field peaked with a range of 51 million to 67 million barrels annually.

Liquefied Petroleum

We are proud of our advancements toward a low-carbon future , however acknowledging the increasing energy needs of the world makes this problem harder than what's being reported.

Propane is one solution. Its low-carbon, high-energy output makes it a perfect fuel for vehicle fleets, agriculture, shipping, industrial work and landscape management, just to name a few. In fact, propane fuels everything from the rides at Disney World to the Olympic Torch. Propane's versatility is why nearly 12 million U.S. households use it for energy-intensive appliances, like water heaters and furnaces.

Here in Oklahoma, propane is an important heating and power source especially in rural communities. It is a safe, clean, and efficient energy source used both inside and outside of your home. Propane is used in Oklahoma to keep your family warm, protect you and your loved ones during a storm, and even dry your clothes all at the same time. Propane remains the leader in serving the residents of rural Oklahoma with cleaner fuel. Propane also supplies about 4% of Oklahoma's total energy needs.

After it leaves the processing plant, propane is stored in a liquid form underground until it is needed. Then it travels around the country through a network of pipelines, railroad tank cars, tractor-trailers, and barges. Along the way, it creates about 80,000 American jobs. The propane is then sent to distributors, known as LPG dealers, from regional storage sites across the nation. Oklahoma has LP distribution in most every county with almost 200 registered Class 1 dealers. The safety and direction of those dealers is governed by the Oklahoma LP Gas Administration. The network of dealers, abundance of supply, ease of handling, and the fact it is a clean energy make propane a clear choice for many individuals and businesses.

Photo Courtesy Fronk Oil & Farmers Oil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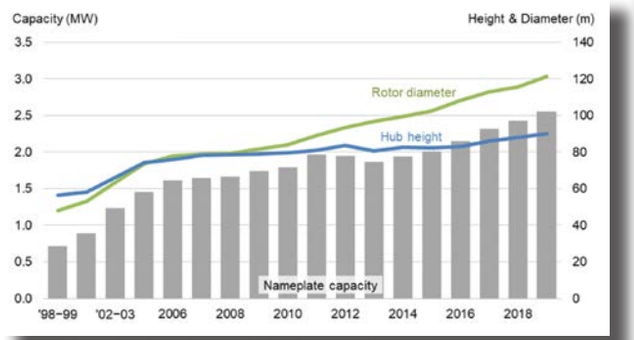
Wind Energy

While the world has been discussing how to embrace and increase renewable energy, Oklahoma has been quietly deploying it for decades. In the past decade, our state has experienced remarkable growth in renewable energy and is now ranked number 2 in the production of wind energy.

The substantial growth of Oklahoma's renewable energy footprint is easily attributed to Oklahoma's abundant wind resources. This fact is even canonized in our state song!

Minco Wind Energy Center Photo Courtesy Kylah McNabb

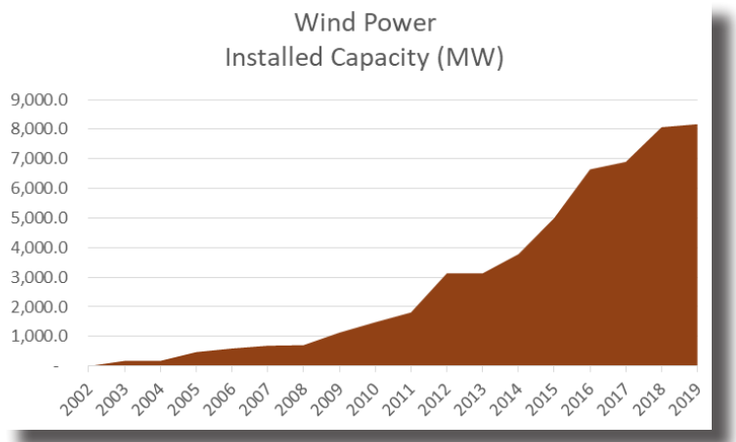


From Wind Technology Data and Trends: Land-Based Focus, 2020 Update; Lawrence Berkeley National Laboratory, August 2020

As wind energy continues to develop in Oklahoma and corporate purchasers are seeking renewable sources for business operations, Oklahoma is uniquely positioned to meet this demand.

The wind energy sector has grown from 1,400 MW of installed capacity in 2010 to over 8,173 MW in 2019. This represents the third most installed capacity in the nation. In recent years, Oklahoma has vacillated between second and third in the nation in wind generation. Advanced turbine technology has led to lower installation costs and increased capacity, helping to fuel the growth in the wind industry in Oklahoma.

Oklahoma's position as a leader in this sector of power generation is evident by the 40% of electricity in the state produced by wind. In comparison, wind only accounts for 7.2% of the electricity supply nationwide.



Data Compiled from EIA Oklahoma Electricity Trends and From Wind Technology Data and Trends: Land-Based Focus, 2020 Update Lawrence Berkeley National Laboratory, August 2020

Coal

Coal remains an important part of Oklahoma's energy sector. Historically, coal has played a major role in Oklahoma in the generation of electricity at our state's power plants. Coal has a unique ability to provide grid stability, both in generation and onsite storage as fuel stock at our power generation plants.

Oklahoma coal has been used in carbonization as coke to make steel, conversion for gasification, liquefaction, and industrial processes for heat. Currently, Oklahoma coal is used primarily for electricity generation by out of state utilities and by the lime and cement industries within the state.

An opportunity for diversification of Oklahoma's coal resources is seen in the utilization of coal bed methane. With an estimated 318 billion cubic feet of reserves, this resource provides an interesting opportunity for growth within our state.

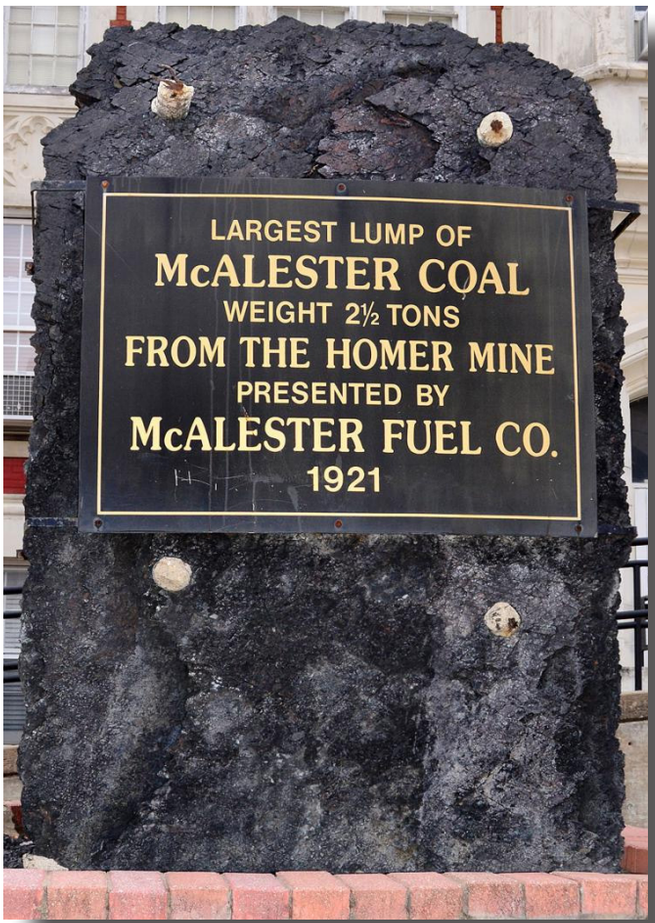
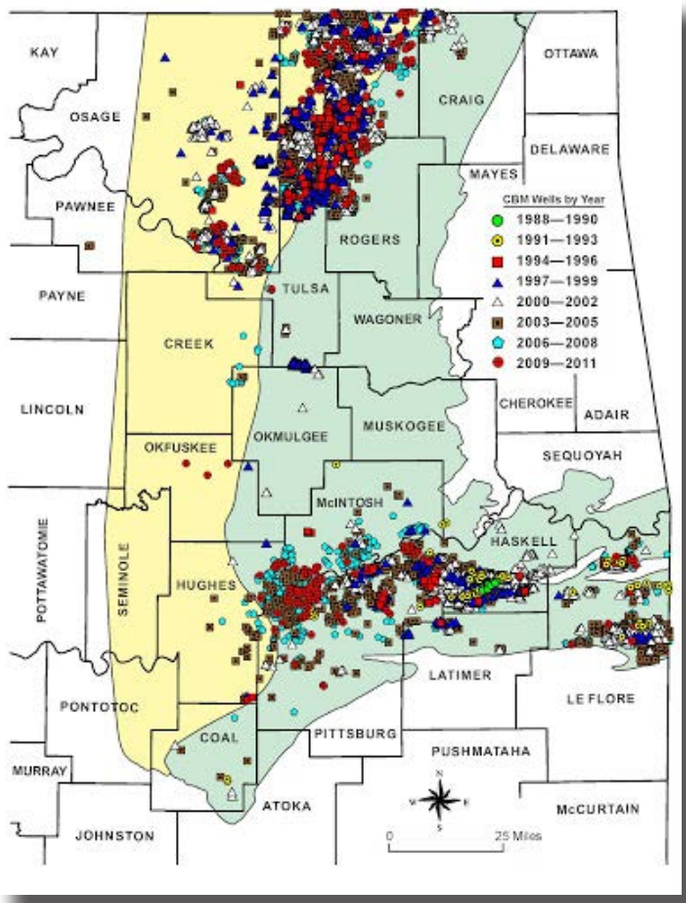


Photo From Kevin Harvison, McAlester News Capital



Oklahoma Coal Region and Coalbed Methane Wells
Map Courtesy Oklahoma Geologic Survey

Biomass Energy

An exciting and emerging part of the energy sector in Oklahoma is biomass energy. Biomass energy sources are classified as a renewable source of energy that involves using organic material that comes from plants and animals. It can be burned directly, as in the case of wood or wood waste, and then converted to liquid biofuels or biogas that can then be burned as fuel. Renewable natural gas (RNG) can be viewed similarly as traditional fossil fuels in that the feedstock comes from organics converted into energy.

Currently, Oklahoma has a small amount of electricity generated from biomass resources. This electricity primarily comes from wood, municipal solid waste and landfill gas. These resources provided just over 70 MW of generation capacity in 2018.

The Renewable Natural Gas Coalition lists three operational renewable natural gas facilities in Oklahoma and one additional facility under construction. Two production facilities in Oklahoma City utilize landfill gas for renewable compressed natural gas and liquefied natural gas. Additionally, a facility in Guymon produces 45 million gallons of biodiesel from animal feedstock. These are exciting examples of how RNG can be a major part of Oklahoma's energy portfolio moving forward.

Image from Renewable Natural Gas Coalition

Oklahoma's extensive pipeline network provides an advantage for the distribution of RNG. This combined with the state's experience in the utilization of natural gas as a fuel source lends RNG a leading place in Oklahoma's energy resource portfolio. By utilizing existing landfill solid waste, as well as our abundance of agricultural sources, our state can continue the expansion of this clean and developing resource.

Located in Guymon, Seaboard Energy Oklahoma owns and operates a biodiesel plant with an annual production of 45 million gallons. The plant is co-located with a processing plant, enabling the use of pork fat and other local animal fats as a feedstock. Seaboard Energy also produces renewable natural gas from its wastewater systems, compressed natural gas, and by-products of glycerin and distillate bottoms as part of their larger operations.

SEABOARD™ ENERGY

Solar Energy

Photo Courtesy Oklahoma Department of Commerce

Installers place a solar panel as part of the rooftop installation at the University of Tulsa Tennis Center. The installation incorporates 936 panels for a total project size of 300kw.

"These initiatives have helped reduce our carbon footprint and have opened the door for research opportunities for students and faculty here at the university,"

- Susan Neal, TU Vice President for Public Affairs, Research and Econ. Dev.

Oklahoma is starting to tap into its solar energy potential. Our unique geography gives Oklahoma the sixth best solar resource in the nation. The potential for growth is a very exciting component for the future of our energy sector.

The primary markets for solar installations are rooftop solar, commercial scale, community solar and utility scale. Each of these markets have unique policy considerations given the scale of the installations.

Residential and commercial projects typically range from 1KW up to 1MW in size. At this scale, projects are subject to net metering, allowing for the flow of electricity both to and from a customer. When the generation by the customer exceeds the usage by the customer, the excess electricity flows back to the grid.

Net metering in Oklahoma is governed by the Oklahoma Corporation Commission (OCC). In May of 2019, new rules were adopted for net metering customers removing the 25,000 KWh annual generation limit. The rules also raised the system size from 100 KW to 300 KW and required utilities to compensate any net excess generation at the utility's avoided cost rate. This creates a fair and reasonable framework which will allow for the continued growth of rooftop solar.

The Solar Energy Industries Association (SEIA) estimates around 5,800 homes in Oklahoma have installed solar. At the end of 2019, Oklahoma net metered projects accounted for 8.564 MW. Small scale solar installations across residential, commercial, and industrial customers across Oklahoma totaled 12.592 MW.

The real growth in solar appears to be in utility scale solar installations which are typically developed and built by a project developer, and then the power generated by the project is sold under a power purchase agreement (PPA) to a utility. This power becomes part of the utility's generation mix of electricity provided to its customers. Oklahoma utilities manage 41 MW of installed solar projects for their customers in the state.

Solar Energy

One area of emphasis in the coming years will be to support and promote the growth of community solar projects through the use of existing brownfields to help underserved and rural communities. This will have the benefit of putting previously contaminated land onto the tax rolls as well as lowering energy costs for the municipal utility and providing better energy independence.

Until recently, cost has been the biggest challenge for producing solar in Oklahoma at utility scale because of our low costs of electricity. As costs lower with advancements in technology and changing consumer demand, Oklahoma is seeing remarkable growth in the industry. There are over 6 GW of solar projects currently in the queue for construction in Oklahoma. The presence of solar energy is growing at an unprecedented rate, which helps to bring more renewable energy to our state.

Photo Courtesy Solar Power of Oklahoma

Hydroelectricity

Oklahoma has a great history of using its water resources for energy. Utilizing the power of our numerous rivers and streams, Oklahoma is home to more man-made lakes than any other state in the United States. Dams are constructed on the rivers to create lakes and provide the source of hydroelectricity utilized for power generation by our state since the 1930s.

Webbers Falls Lock and Dam; US Army Corps of Engineers

Much like harnessing Oklahoma's natural wind resource, the water innate to Oklahoma's geography provides a natural and renewable source for electricity generation. These resources not only take advantage of our natural geography, but they are great for our environment. Unlike other parts of the country, Oklahoma's dams do not threaten or impair our native fisheries. In fact, the lakes formed with these dams have created some of the greatest fishing lakes in the United States.

Oklahoma is home to 10 hydroelectric plants located across the state. These generation plants accounted for 863 MW of electric generation capacity in 2018. Generally, hydroelectricity provides on average 3% of the state's electricity generation and has been known to provide upwards of 6% of the state's total electrical generation, including during the polar vortex storm of 2021.

Additionally, hydropower resources have the unique ability to be harnessed as energy storage through pumped storage. This process is an energy storage technique that has been used for over 100 years. During this method, two water reservoirs at different elevations generate power as water flows from the upper reservoir down through a turbine. This is done during times of high electricity demand. Then, during times of low electricity demand, power is used to pump water back to the upper reservoir. These facilities are remarkable and are considered to be the world's largest batteries.

The success of hydropower in Oklahoma is seen in the Grand River Dam Authority's (GRDA) installation of the Salina Pumped Storage Project. Located on the Saline Creek Arm of Lake Hudson, six hydroelectric turbines are used to generate electricity and move water from the Saline Creek into the upper reservoir of the W.R. Holway Reservoir.

Salina Pumped Storage Project

Hydropower has been part of Oklahoma's energy story for many decades and will remain an important piece of our renewable energy portfolio.

Oklahoma C-PACE

Commercial Property Assessed Clean Energy Financing (C-PACE) is a financing mechanism that encourages energy and water efficiency improvements for commercial buildings. C-PACE programs allow property owners to finance the upfront cost of energy or other eligible improvements on a property and then pay the costs back over time through a voluntary assessment. Participation in C-PACE is voluntary, and the projects are secured by the building it benefits with a special assessment. C-PACE programs are currently active in over 22 states across the country.

C-PACE was enabled in Oklahoma through legislation effective in 2019. Oklahoma's C-PACE program requires county government approval and enactment.

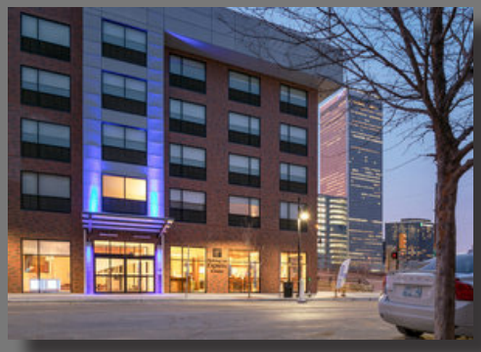
The program allows for all incentive programs to be stacked with financing, leading to shorter paybacks and a lower cost of capital. For counties, it improves the taxable property base and drives private sector investment in local communities.

Oklahoma's C-PACE program will allow commercial and industrial facilities to take advantage of the low cost of capital for energy improvements that can ultimately save energy and money. Commercial property owners will be able to apply for C-PACE financing from private lenders for up to 100% of all soft or hard costs of the project. Following project completion, the county then levies the special assessment, and the property owner is responsible for the assessment with the property taxes each year.

C-PACE is just another exciting development in Oklahoma's energy story.

Two pilot C-PACE projects recently closed on $4.9 million of financing for projects in January of 2020. The projects involved two hotel properties in Tulsa - the Historic Tulsa Club and the Holiday Inn Express & Suites Downtown Tulsa. Sustainable design elements for each of the properties including efficient heating and cooling, plumbing and lighting systems as well as building envelope improvements were performed.

Holiday Inn & Suites Downtown Tulsa (right) and the Tulsa Club renovated front desk lobby (below).



Department of Environmental Quality: A Savings Success Story

When it comes to reducing their environmental footprint through energy and water reduction, the Oklahoma Department of Environmental Quality (DEQ) is committed to do by leading by example. Part of the 2011 Oklahoma First Energy Plan set an ambitious goal of reducing cumulative energy use in state office buildings by 20% by 2020. As the primary state environmental agency, DEQ believed in not just meeting this goal but exceeding it. This leadership approach led to DEQ being the first state agency to meet the 20x2020 goal with DEQ achieving it in the first year!

To achieve these results, DEQ took the following actions:

- Retrofit of over 2,700 fluorescent light fixtures to utilize LED tubes. In addition, 7,800 fluorescent tube lights were replaced with 5,400 LED tubes.
- Replacement of parking garage light fixtures with LED fixtures, reducing garage consumption by 75%.
- Removal of all electrical exit signs and replaced them with photo-luminescent fixtures that use no electricity.
- Numerous HVAC upgrades to reduce electrical use during power up along with fine tuning of HVAC zones, improving comfort throughout the agency.
- Upgrade of conference room and cubicle lights to dimmable LEDs, reducing energy use in conference rooms by 63% and cubicles by 90%.
- Window tinting installed on 1st floor entry doors, reducing solar energy into building by 71% and blocking 97% of UV rays.

40% reduction in electricity usage

55% reduction in natural gas usage

34.5% reduction in water usage

Looking forward, DEQ is excited to build upon their success with plans to do additional actions including:

- Upgrading lighting fixtures to advance lighting control systems.
- Install rooftop solar panels to produce enough energy to offset lighting costs.

$1.5 million

in utility bill savings!

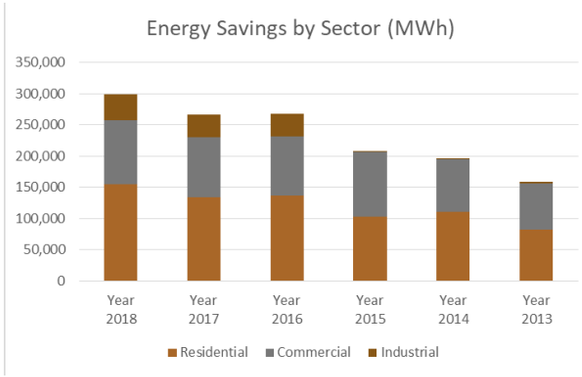
Energy Efficiency

Energy efficiency is a concept and philosophy that is embraced across Oklahoma. It is a complex system that provides diverse opportunities for improvement through advanced technologies and practices. Commercial buildings can waste up to 30% of energy consumed due to inefficient products and operations.

The American Council for an Energy-Efficient Economy (ACEEE) is an organization focused on improving energy efficiency through state environmental policies. Our state has remained steady in the ACEEE annual report through Oklahoma's efforts in energy efficient programs across state government.

Energy efficiency programs for both the residential and commercial markets are primarily operated by Oklahoma utility partners. For both electricity and natural gas services, programs offer various rebates to consumers for the installation of newer and more efficient appliances and equipment improvements. Eligible actions include insulation, weather stripping, lighting and lighting fixture upgrades, variable frequency drives, and more.

Importantly, Oklahoma electricity and energy unit costs remain some of the lowest in the country. Ensuring energy related expenses remain low has far reaching benefits for our state's businesses and citizens. Oklahoma had an average retail price for electricity across all sectors of 7.86 cents/KWh in 2019. This price was among the lowest in the nation, in fact, Oklahoma has had the lowest cost of electricity across all sectors for 8 of the last 10 quarters according to the Energy Information Administration.



Data compiled from EIA.

One newer area of emphasis within the energy efficiency program is focusing on reducing the power needed and upping the efficiency of drinking water and waste water systems. This is an emphasis in the Stitt Administration, and it is bolstered by the historic Water Alliance Agreement between the Governor, Secretary of Energy & Environment, Oklahoma Water Resources Board, Oklahoma Department of Environmental Quality, Oklahoma Municipal League and the Oklahoma Rural Water Association. This partnership combines the energy audit and leak audit program that will save billions of gallons of water and countless amounts of energy for the small, financially-strapped communities.

The development of energy efficiency programs in Oklahoma will continue to provide opportunities for cost savings and reduce our energy footprint.

Photo Source: U.S. Department of Energy, Dennis Schroeder, NREL

Energy Vision

The state of Oklahoma and the energy industry are often considered synonymous. In the years to come, our state will continue to lead the way in conventional energy, renewable energy, and advanced technologies.

Our extensive history as an oil and gas rich state will continue as we still boast some of the largest proven reserves in the nation. We will continue to support the use of natural gas liquids in various products that create markets for this abundant natural resource. Our focus will be on meeting the nation's and the world's demand for traditional fossil energy in the most sustainable and environmentally friendly ways possible.

Oklahoma will continue to grow its dominance as a leader in the nation in wind power generation. Our top ten solar potential coupled with advances in battery storage technology will allow our renewable portfolio to grow even larger.

We will continue to support the growth of Property Assessed Clean Energy ("PACE") programs which offer incentives to create energy efficient buildings. We will promote energy efficiency programs within our state that lower costs for these occupants and improve our environment.

- **Remain a Top 5 producer of conventional fossil fuels.**
- **Remain a Top 3 producer of wind energy in the nation.**
- **Remain a top 10 producer of renewable energy in the nation.**
- **Grow opportunities for Renewable Natural Gas, biomass and other renewable fuels to lower greenhouse gases in the U.S.**
- **Partner with new technologies to maximize our immense solar energy potential.**
- **Support research and partner with industry to continue to grow the use of natural gas liquids in new products for consumers.**

Oklahoma will remain an energy state for generations to come!


OKLAHOMA

Environment

Oklahoma has a rich history of stewardship of our beautiful land and natural treasures. From the 39 federally recognized native American tribes to our rich history of agriculture, we have always strived to protect our native lands and water resources. Oklahoma is home to twelve distinct ecosystems that cover our state from east to west. These unique ecosystems make our state among the most biodiverse in the United States. The 98th meridian splits our state nearly in half, making the eastern half of the state rich in an abundance of water resources, while the western half of the state is more arid and shares characteristics with our western state neighbors.

This state has it all! With the foothills of the Ozarks in the northeastern part, home to some of the most beautiful scenic rivers and luxurious lakes; to the mountains, pines and rivers of the southeast; as you move westerly, the world's largest Tallgrass Prairie that is home to one of the largest herds of Bison in the world. We have our own "little sahara" complete with incredible sand dunes; to our own great salt plains; to the Arbuckle Mountains towards south central; and the elevation climbs as you head westward to the highest point in the state at nearly 5,000 feet and is known as a "geologic wonder" in the United States.

Regardless of what part of the state, these are resources and cultures that deserve protection and conservation for future generations to enjoy just as we do now. In today's world, sound energy policy cannot exist without considering the environmental impacts. Here in Oklahoma, our environment is a major

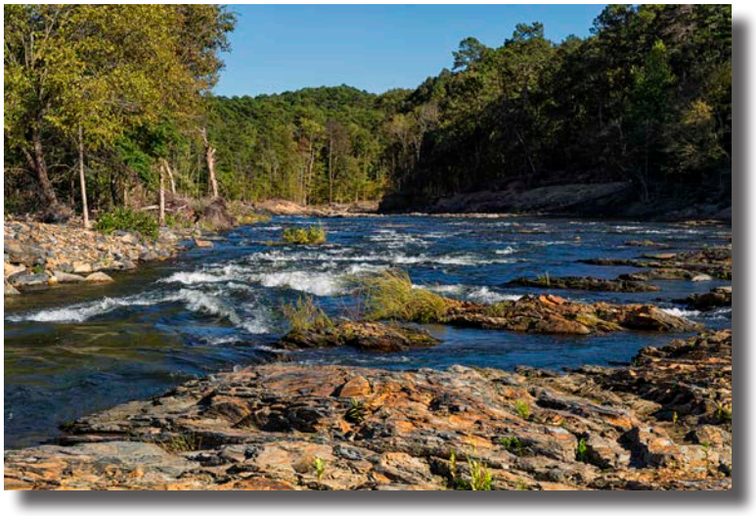


Photo Courtesy GH Photography

OKLAHOMA TOP TEN

#1 for the number of man made lakes

#2 freshwater shoreline

#1 in EV supercharging stations per capita

#3 in total EV supercharging stations

building block of our energy story. The natural environment that surrounds us is the basis of the energy resources utilized in all of our daily lives. Protecting this environment is paramount as it ensures that our most valuable resource, the people of Oklahoma, remain healthy and our economy remains strong.

Whether it is hiking an outdoor trail or working out in a field on the high plains, Oklahomans interact with our environment on a daily basis. Oklahoma's environment has seen significant improvements in the past decade, which proves that a robust energy economy can exist without sacrificing environmental protection.

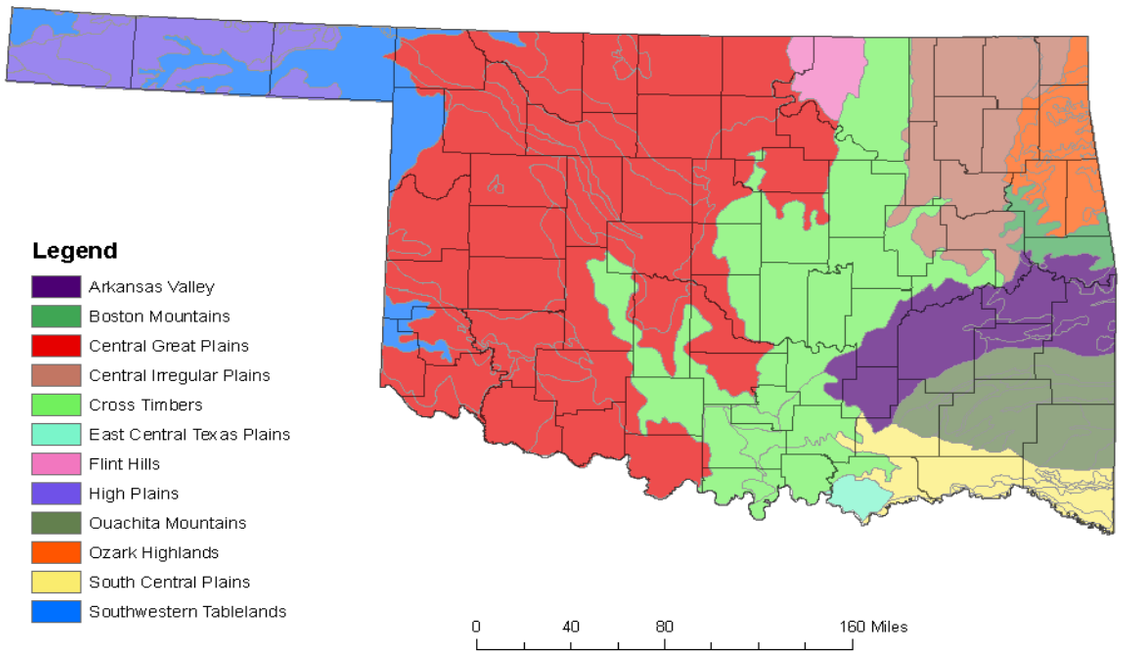
Oklahoma's state environmental agencies are tasked with ensuring that the air we breathe, the water we drink, and the land that we live on remains safe for all of our citizens to prosper.

In our state, we strive to create a consistent, predictable and fair regulatory framework that protects our environment and allows our industries to thrive and listening to all stakeholders throughout the process. We look forward with great optimism as our industry leaders continue to make great technological advances which lessen the impact on the environment and continue to grow our economy.

As the world looks to the challenges ahead and combats the effects of climate change, Oklahoma will continue to lead the nation in lowering carbon energy. Since 2005, the state has lowered carbon emissions in the power sector by nearly three times the national average. Oklahoma plans to continue carbon reduction, and also find ways to adapt to changing weather, along with becoming more resilient to the effects of extreme weather events like drought, flooding, polar vortex, ice storms, and tornadoes.

Although the obstacles are great, Oklahoma's place as energy pioneers makes the state's future as bright as its past for Oklahoma's environment.

12 DISTINCT ECOSYSTEMS



An ecoregion comprises of an area with general similarities of the type, quality, and quantity of environmental resources. These resources include characteristics such as physiography, geology, climate, soils, land use, wildlife, fish, hydrology and vegetation. As one moves from west to east across Oklahoma, Black Mesa in the western panhandle portion at an elevation of nearly 5,000 feet and a drier climate regime transitions to great plains for the bulk of the western portion of the state. The approach to central Oklahoma brings a continued increase in precipitation and mean annual temperatures which leads to the Crosstimbers ecoregion plant growth finally moving to the High Plains, Ouachita Mountains and South Central Plains. At the southeastern point of Oklahoma, the elevation is only about 300 feet.

Photos Courtesy GH Photography

Ecosystem Map Adapted From Oklahoma Forestry Services

Water

There is no other environmental subject that evokes more raw emotion or territorialism than when discussing Oklahoma's water resources. Its impact upon our economy, culture, aesthetics, and health are immeasurable. It is essential for sustaining human health, wildlife, habitat, ecosystem, and virtually every part of our economy. The saying "Water is Life" has never rung more true than today. The challenge is to put differences aside to build partnerships that focus on conserving the resources in the most sustainable ways while balancing the needs of all Oklahomans. We must conserve and sustain these resources to ensure that ALL Oklahomans have access to clean and safe water.

Water is a critical component of the major industries that drive Oklahoma's economy. The agricultural sector requires a consistent supply of our water resources for livestock and crops. Likewise, our energy sector requires that water be available for the extraction of our oil and natural gas resources. Water also provides enjoyment through leisure activities and tourism for everyday Oklahomans and our visitors. Oklahoma's lakes and waterways help form the State's third largest industry of tourism and recreation. These assets are some of the greatest treasures in the United States and are an economic engine as well as a major source of pride and enjoyment for our citizens.

Oklahoma is home to over 200 lakes that encompass more than 1 million surface acres of water. Additionally, Oklahoma's rivers and streams are equally valuable and a remarkable resource. As part of the Red River and Arkansas River basins, our stream systems cover over 67,000 square miles of drainage area with 167,000 miles of rivers and streams. Each year, approximately 10.5 million acre-feet of water flow into the state through these two river basins with an average of 36 million acre-feet of water flowing out of the state each year.

Photo Courtesy GH Photography

Another major water resource for Oklahoma is its numerous aquifers. These aquifers store vast amounts of groundwater that are used for consumption, agriculture, electrical generation and energy production. Aquifers in Oklahoma are incredibly unique, consisting of varied water table levels, overlapping boundaries and unique geologic characteristics and rock compositions.

There are ten major bedrock aquifers in the state and eleven major alluvial aquifers. Combined, these basins hold nearly 390 million acre-feet of water, though only half of that amount may be considered recoverable. The largest of these, the Ogallala Aquifer, is located across western Oklahoma. This basin alone contains 90 million acre-feet of water - or enough to cover the entire state two feet deep in water!

Protecting our precious water resources is always one of the highest priorities for the state as we meet today's needs and look to the future. Having clean and abundant water is necessary for a pristine environment, healthy citizens and a growing economy.

In 2012, the Water for 2060 Act was enacted. This Act set a bold statewide goal that we would consume no more fresh water in 2060 than was consumed in 2010. Oklahoma was the first state in the nation to set such an audacious goal. The Water for 2060 program emphasizes the use of education and incentives, rather than regulatory mandates, to achieve this goal.

The Act created an Advisory Council made up of 15 members and chaired by the Oklahoma Water Resources Board (OWRB). This group was tasked with studying and recommending water conservation practices, incentives and educational programs. All actions considered by the Advisory Council were to preserve and account for Oklahoma's population growth and economic development goals.

Recommendations were divided into four major categories: Energy and Industry, Crop Irrigation, Public Water Supply and All Water Use Sectors. Resulting actions included the development of best practices guides, access to financing and funding, and encouragement and facilitation of information and supply sharing.

One groundbreaking recommendation from the Water for 2060 Advisory Council was for the energy and industrial sectors to develop and expand the use of marginal quality water, including produced water. In 2015, the Produced Water Working Group (PWWG) was formed to investigate and develop ways for water produced from oil and natural gas operations to be recycled or reused rather than being reinjected into underground disposal wells.

The work of the PWWG produced many successes including grant funding for feasibility studies, technical workshops regarding pipeline transfer and evaporation solutions and a multi-state agreement with New Mexico and U.S. EPA to review energy field wastewater regulations.

During the 2020 Legislative Session, the Oklahoma Legislature passed the Oil and Gas Produced Water and Waste Recycling and Reuse Act. This Act clarifies the ownership elements of produced water when extracted from energy operations and further encourages the efforts for recycling and reuse of produced water in Oklahoma. This issue was a major obstacle identified by the PWWG, and this legislation will further enable the recycling and reuse of produced water in Oklahoma.

NATIONAL WATER REUSE ACTION PLAN

In February of 2020, U.S. EPA, along with federal, state, and local water leaders as well as national and regional NGO's released the National Water Reuse Action Plan (WRAP). The WRAP is a coordinated effort to advance and develop water reuse practices in order to ensure the security, sustainability, and resilience of the water sources across the United States. Oklahoma strongly supports this effort and prioritizes the efforts undertaken to develop these resources.

Clean and reliable water supplies are needed across various sectors of Oklahoma's economy including agriculture, industry, energy, recreation, and human consumption. Water reuse is a critical component in considering the security, sustainability, and resilience of water sources across the nation and in our great state. The more ways we can find to creatively reuse water, the more we will protect this pivotal resource.

Key actions identified in the WRAP for developing water reuse include:

- Financial support
- Integrated research and watershed action
- International collaboration, outreach and communications
- Policy coordination
- Science and specifications
- Technology development and validation
- Water information availability, and
- Workforce development

An online platform was developed to house the actions related to these identified areas. The platform also identifies the progress towards implementation of those actions taken. It also provides an opportunity to expand the partner network for contributions to the Action Plan.

Our state strongly supports this EPA led effort to ensure Oklahoma has the water resources it needs for a prosperous future.

"This action plan [National Water Reuse Action Plan] promotes a growing collaboration among federal, state, local, and private sector reuse efforts. It seeks to identify and address the critical technology, policy and programmatic issues we fact as a nation to enhance the security, sustainability and resilience of our water resources through enhanced consideration of reuse."

-David Ross, Assistant Administrator for Water, U.S. EPA

Photo Courtesy ODEQ

FEDERAL REGULATORY UPDATES

EPA has recently taken a flurry of regulatory actions affecting many areas of the environment. Below are brief summaries of some of the major actions.

Waters of the United States (WOTUS)[1]

On October 22, 2019, EPA and the Department of the Army published the repeal of the 2015 Rule defining the "Waters of the United States". On June 22, 2020, the Navigable Waters Protection Rule was finalized which replaced the 2015 rule in an effort to clarify what are the jurisdictional "waters of the United States". The new rule identifies four categories of jurisdictional waters, provides clear exclusions for many water features not traditionally regulated and defines terms in the regulatory text not defined previously. The Biden Administration has announced its intention to replace the 2020 rule.

Coal Combustion Residuals (CCR)[2]

In April of 2015, EPA finalized regulations regarding the safe disposal of coal combustion residuals from coal-fired power plants. These requirements are geared to prevent the leaking of contaminants into groundwater, the blowing of contaminants into air, and catastrophic failure of coal combustion residuals surface impoundments. In 2016, the passage of the Water Infrastructure Improvements for the Nation (WIIN) Act enabled EPA to approve a permit program for states to implement the CCR requirements. In 2018, Oklahoma became the first state permit program approved by the EPA. There is expected to be new rule-makings under the Biden EPA that could undo much of the Trump EPA Rule.

EPA Self-Disclosed Violation Policy Emphasis[4]

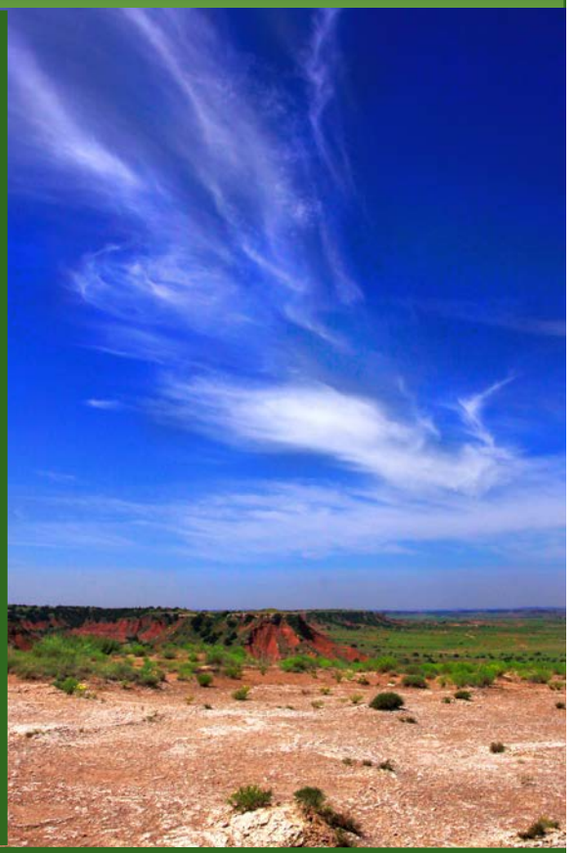
In May of 2018, EPA announced a renewed emphasis to encourage regulated entities to voluntary discover, disclose, correct and prevent recurrence of environmental violations. This initiative was promoted through the enhancement of the online "eDisclosure" program, additional flexibility provided to new owners of facilities who self-disclose violations and opportunities to increase compliance using existing self-disclosure policies and programs.

Affordable Clean Energy (ACE)[3]

The Biden Administration has withdrawn the Affordable Clean Energy (ACE) Rule. The ACE rule replaced the Clean Power Plan that was issued by EPA in 2015. ACE provided guidelines to inform each state's development of standards of performance to reduce carbon dioxide (CO_2) emissions from existing coal fired electricity generating units. Promulgated under the Clean Air Act (CAA) Section 111(d), the ACE rule requires each state to establish unit-specific "standards of performance" representative of emissions limitations achievable through the application of identified best systems of emissions reduction technologies. Under ACE, plans developed by the states are due to the EPA within three years.

Given that the Biden EPA has pivoted off of ACE, we are sure to see some new plan that will be controversial given the history of the Clean Power Plan and ACE.


Express
Clydesdales

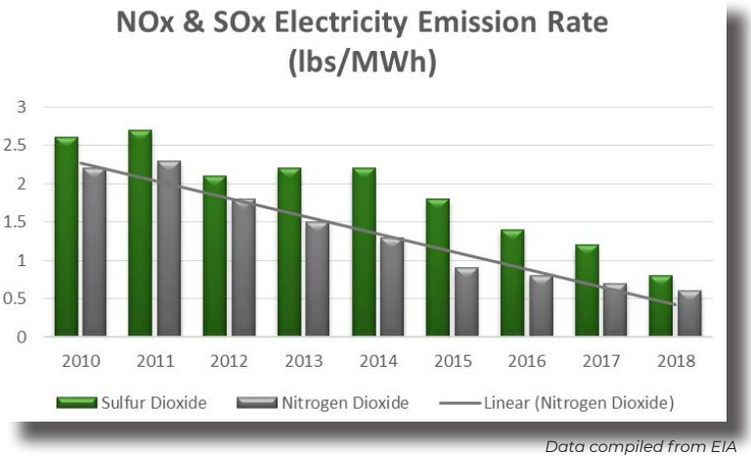


Electric Power Generation

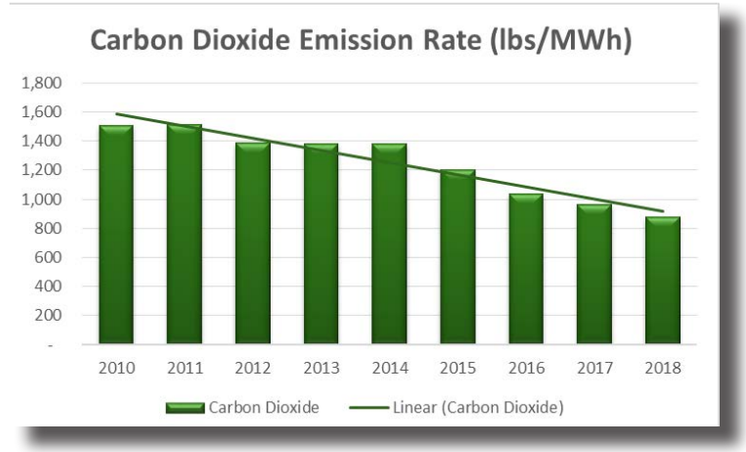
No matter where you live, electric power generation can be a primary driver of the quality of your environment. How power is generated impacts both air quality and how natural resources are managed. In Oklahoma, this sector has seen remarkable environmental improvements over the past decade due to advancements in technology and strategic policy efforts.

In the past decade, Oklahoma has seen a remarkable decrease in air emissions, which has greatly improved our air quality. These improvements are primarily due to changes in our fuel mix as cleaner burning natural gas is more widely utilized along with the addition of renewable generation sources.

Oklahoma has seen a decline year after year since 2011 in total electricity generation emissions rates for carbon dioxide (CO2), sulfur dioxide (SOx), and nitrogen dioxide (NOx). This trend directly creates a net positive effect towards better air quality around Oklahoma.



Data compiled from EIA



Data compiled from EIA

Oklahoma Environmental, Health, and Safety Audit Privilege Act

In 2019, the Oklahoma Environmental, Health, and Safety Audit Privilege Act (Act) was adopted. This Act follows the model of 29 other states by providing incentives for regulated facilities to conduct voluntary audits to evaluate compliance with environmental, health, and safety regulations. The Act covers noncompliance discovered during the audit but also requires that the facility take the necessary corrective actions to correct the noncompliance. Incentives are offered by the Act in the form of limited evidentiary privilege for certain information gathered during a voluntary audit as well as immunity from administrative and civil penalties for certain violations that are voluntarily disclosed resulting from the audit and then corrected. Oklahoma is already seeing many facilities conduct audits under this Act. In the year since the law became effective, Oklahoma DEQ has seen over 1200 facilities reviewed and over 300 environmental violations self-reported and corrected.

Air Quality

There are six specific criteria pollutants as defined by the National Ambient Air Quality Standards (NAAQS) under the Clean Air Act. These specific criteria pollutants include:

- Carbon monoxide (CO)
- Nitrogen dioxide (NO2)
- Ozone (O3)
- Lead (Pb)
- PM10 - Particulate matter and PM2.5 Fine particulate matter
- Sulfur Dioxide (SO2)

Photo by Chris Landsberger, From NewsOK.com; https://oklahoman.com/article/3431288/smog-drilling-proposals-need-measured-scrutiny

Standards for these pollutants are established by EPA and enforced at the state level by the Oklahoma DEQ. The standard levels are set to protect public health and welfare against poor visibility and damage to crops, vegetation and buildings. The regulatory levels of these six pollutants are set without regard to the costs to implement the standards to protect human health and the environment. The Air Quality Division of the DEQ monitors and reports data associated with these criteria pollutants in the annual Air Data Report.

Air quality is a critical factor not only to our environment but also to the health of our citizens. With over a quarter million Oklahoma residents suffering from asthma, efforts related to improving the State's air quality lead to notable benefits and decreased health care expenses. Another important aspect that effects public health is indoor air quality. In fact, these indoor air issues are often the cause of many health issues for many Oklahomans.

Transportation

Photo from Oklahoma Department of Transportation

Oklahoma's transportation sector is linked directly with both the energy industry and our environment. Transportation is a large part of daily life for every Oklahoman. Many Oklahomans equate mobility with freedom to traverse our vast open spaces. The cars and trucks we drive are sources of pride and identity and regardless of fuel choice they are greatly dependent upon our diverse energy resources. The use of certain resources for transportation has a direct impact on the environment based upon the varying emissions levels.

Oklahomans drive more than the average American. The spacious nature of our communities leads to an average of 45 miles per person per day. Oklahomans also commute more than the national average with 82.5% of Oklahoma residents commuting alone and only 9.5% carpooling.

In 2017, Oklahoma carbon dioxide emissions levels that could be attributed to the transportation sector measured 32.6 million metric tons. This level has generally held flat since a slight increase in 2014 that could most likely be attributed to the transportation needed to service the increased energy production activities across the state.

Technology advancement is playing a critical role in emissions reductions from the transportation sector. Vehicles go further now on a unit of fuel with less emissions when compared to 40 years ago. With the advancement of cleaner burning cars, diversification of fuel choices, electric vehicles and new alternative technologies like hydrogen, Oklahomans should expect emissions from the transportation sector to rapidly decrease in the coming decade.

Volkswagen Settlement Actions

As a result of the 2016 settlement between the U.S. Department of Justice and Volkswagen AG (VW) regarding actions taken by VW to disable emissions controls resulting in increased emissions for their vehicles Oklahoma was allocated approximately $21 million to reduce nitrogen oxide emissions from the transportation sector.

Phase I of funding rolled out in late 2018 under three distinct programs: the Alternative Fuel School Bus Program, the Oklahoma Clean Diesel (DERA) Program, and ChargeOK: Oklahoma Electric Vehicle Charging Grant Program.

Results of Phase I of program funding have been remarkable. To date, 27 diesel school buses have been replaced with either compressed natural gas (CNG) or propane. The next round of funding is currently in negotiations with award recipients.

The ChargeOK: Oklahoma Electric Vehicle Program was a resounding success in Phase I funding. This program brought the number of electric vehicle charging stations to 258 - making Oklahoma the #1 state in the country for EV infrastructure.

Compressed Natural Gas

As a leader in the natural gas industry, Oklahoma continues to be a pioneer in the development of the use of compressed natural gas (CNG). Powering over 175,000 vehicles across the U.S., CNG vehicles are offered from original equipment manufacturers (OEMs) as dedicated CNG fueled vehicles for light, medium and heavy-duty vehicles for a variety of industries. Additionally, retrofit aftermarket options are available for several medium and heavy-duty applications.

Natural gas is attractive as an alternative fuel because of its ability to provide a similar fuel range as traditional gasoline powered vehicles, while providing reduced greenhouse gas emissions. Passenger vehicles only represent one segment of CNG applications. The widest use of CNG occurs in medium and heavy-duty applications. Mass transit buses fueled by CNG emit far lower levels of emissions and are a much quieter ride for their passengers.

Currently, the State of Oklahoma has approximately 1,100 vehicles utilizing natural gas as a fuel source for its fleet operations across state agencies. In addition, numerous private fleets of Oklahoma companies utilize CNG fuel resulting in both emissions reductions and cost savings. Oklahoma City based EMBARK operates 19 CNG powered transit buses with plans to increase that number to 50 buses by 2025. The Metropolitan Tulsa Transit Association (MTTA) operates over 25 CNG transit buses and over 40 CNG fueled para-transit buses.

School buses represent another excellent application of CNG as a fuel source. Like the transit buses, CNG fueled school buses offer a quieter and cleaner ride for Oklahoma students. The Tulsa Public Schools transportation department utilizes CNG fuel for a substantial portion of their school bus fleet.

Trash trucks are also joining the CNG application family in wide deployment across the state. Thanks to the fuel cost savings, lower emissions and quieter operation it is more likely to see local trash collection done by CNG than traditional diesel. CNG has emerged as a leading fuel choice for delivery and short route fleets that "nest" at night for refueling. The cost savings of these vehicles is staggering over their liquid fuel counterparts and the emissions reductions are impressive.

EMBARK, the provider of bus, ferry transit, bike share and downtown parking solutions to the City of Oklahoma City was recently awarded funds from the Federal Transit Administration (FTA) with support from the Central Oklahoma Clean Cities Program (COKCC) to purchase one thirty-five foot transit bus. In 2016, EMBARK made a commitment to replace its entire fleet with buses operating on compressed natural gas or electric power by 2025.

The Metropolitan Tulsa Transit Authority (MTTA) has been awarded $2.9 million in funding from the Federal Transit Administration (FTA) to purchase electric transit buses and associated charging infrastructure for the bus terminal.

Oklahoma will continue to pursue opportunities to grow CNG as a viable cost saving and emission reducing transportation fuel.

Electric Vehicles

Oklahoma has planted its flag as being a leader in Electric Vehicles, manufacturing and infrastructure. In fact, Oklahoma recently announced that a major EV manufacturer will produce its ground-breaking line of Electric Vehicles for North America in Oklahoma creating nearly 2,000 new jobs. We are already home to the company responsible for almost every EV manufacturer's (OEM) battery repair, replacement, and recycling. This company is reusing virtually every part of the old batteries to create new industrial batteries for energy storage. Oklahoma has been called by MyEV.com, the best state for EV's in the country.

Electrification is one of the fastest growing technologies for transportation. Light duty vehicle electrification is taking place at a rapid rate with new vehicles and models being introduced almost monthly each year by many different manufacturers. Electrified vehicles generally fall into two categories, a full battery electric vehicle (BEV) or a plug-in hybrid electric vehicle (PHEV).

For the BEV, the vehicle draws power for propulsion and other operating features of the vehicle from on-board batteries that are charged by an external power source, and then work through electric motors.

A PHEV is a vehicle that can draw power for propulsion and vehicle operation by both on-board batteries powered by a power plug and from gasoline. The PHEV typically runs on the battery electric power first and then switches to the gasoline engine when the power from the battery is exhausted.

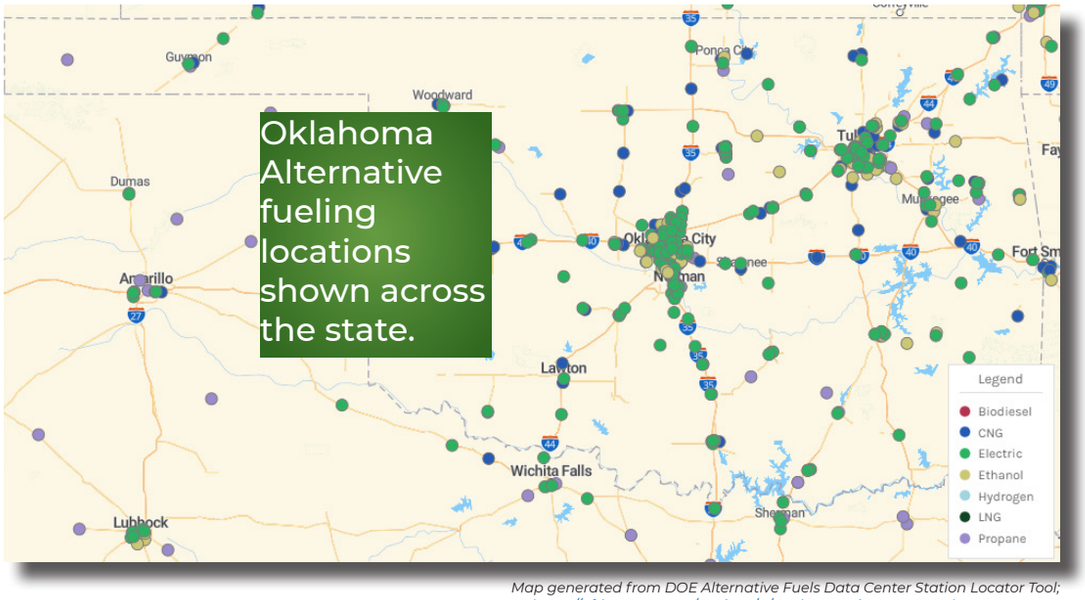
Full BEVs have zero tailpipe emissions and PHEV emissions are proportional to how much the internal combustion engine is utilized. The available range for BEVs is proportionate to the size of the battery within the vehicle and now reaches well over 300 miles on a single charge.

One of the most impactful benefits of an electric vehicle is the substantial reduction in operating costs. It is estimated that the cost of ownership for an EV compared to an internal combustion engine is 70% lower.

At the time of this report, Oklahoma is home to just over 5,000 electric vehicles for light duty usage. With the growing availability and pricing options for EVs, it is anticipated that the number of EVs on Oklahoma's roads will grow significantly in the coming years.

Photo From DOE

Transportation Infrastructure (CNG, EV & H2)



Map generated from DOE Alternative Fuels Data Center Station Locator Tool; https://afdc.energy.gov/stations/#/analyze?region=US-OK&show_map=true

#1

per capita for installed Electric Vehicle Charging Stations

Oklahoma overwhelmingly achieved its goals of expanding CNG fueling and EV charging infrastructure as outlined in the 2011 First Energy Plan. After reaching a high of 125 stations in 2016, CNG has settled at 120 fueling stations.

Infrastructure for EV charging is steadily increasing year over year. The efforts from the first phase of the ChargeOK Program under the VW Settlement funds rocketed Oklahoma to #1 in the nation per capita with installed EV super charging stations and #3 in total numbers of EV super charging stations. We are extremely proud of this accomplishment and intend on continuing this dominance.

As of the spring of 2020, Oklahoma is now home to a total of 258 EV charging locations. These stations are a combination of Level 1, Level 2, and DC Fast Chargers. This number will continue to rise as the efforts from the ChargeOK program will continue to support additional EV charging station installations through funds released in Phase 2 in 2020.

Efforts to ensure that the relevant infrastructure is in place is critical to the growth of alternative fuel transportation markets. Oklahoma has solved the chicken-versus-the egg problem by taking the initiative to encourage and support infrastructure build out of both CNG and electric vehicle charging stations. This has and continues to lead to more individuals and companies to choose alternative fuel options. Oklahoma has committed itself to be a leader in hydrogen as a transportation fuel in both the long-haul trucking sector as well as commuter transportation. This will necessitate a commitment to H2 fueling infrastructure like those efforts with CNG and EVs.

Given our central US location and the crossroads of three of the largest US Interstate Highways (I-40, I-35, and I-44) coupled with our robust Turnpike System, our fueling infrastructure is vital to the US Economy. Oklahoma's emergence as a leader in the infrastructure build-out for alternative fuels is not only due to public sector efforts, but also from the work of private sector leaders. Fueling providers like OnCue, Loves, and Francis Energy have shown great dedication to seeing alternative fuels as part of the overall transportation fuel mix. This vision allows all Oklahomans to have multiple options for transportation fueling no matter where in the state you may live or travel.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Environment Vision & Goals

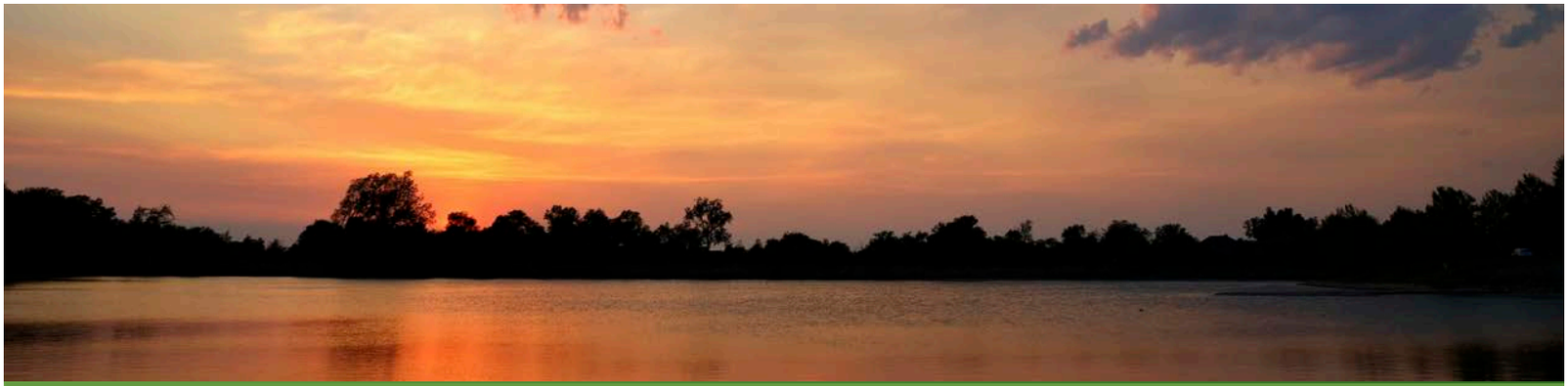
Our Vision is to protect and enhance the natural beauty of the State of Oklahoma. This vision will ensure that the land, air, water and wildlife of our beautiful and ecologically diverse State remain accessible for generations to come.

Oklahoma will continue to harness our vast natural resources to allow our economy to thrive while delivering a pristine environment for our citizens. We will pursue regulatory policies that ensure a prosperous Oklahoma without sacrificing environmental protection. Our support for the Environmental, Health, and Safety Audit Privilege Act shows our commitment to this dual purpose.

Oklahoma's Water for 2060 Plan, our partnership with U.S. EPA under the National Water Reuse Action Plan, and our dedication to improve the efficiency of water systems around the state, all show our commitment to remain responsible stewards of our water resources. Our commitment to expand our electric vehicle infrastructure and capitalize on clean burning fuels for our vehicles demonstrates our continued effort to improve our air quality.

- **Pursue environmental regulatory policies that are protective our precious natural resources but also ensure a prosperous Oklahoma**
- **Pursue management practices that will ensure that Oklahomans have access to abundant and clean water for years to come consistent with the principals outlined in the Water for 2060 Plan**
- **Grow renewable energy and the development of electric and alternative fuel vehicles to continue to reduce emissions from all sources which will continue to provide Oklahomans with healthy clean air**
- **Pursue policies and practices focused on waste minimization and sustainability**
- **Continue to improve practices and technology to provide traditional fossil energy as the most responsibly sourced energy in the world while meeting the continuing demands of Oklahoma, the US and the world**

"Our Commitment to the Environment is Non-Negotiable."



Power Generation

As an energy rich state, the power sector is derived from a wide range of energy resources produced and utilized across the entire state. These fuels provide power through generation to residents and people across the country every day. Power providers harness our abundant energy resources to generate an electricity mix that is consistently clean, reliable, and affordable. As technology has evolved throughout the years, the fuel mix has as well. Today, Oklahoma is one of only four states to get more than 40% of its power from renewable resources and is fueled primarily by a combination of natural gas and wind power.

Oklahoma provides one of the lowest prices of electricity in the nation. The transition of the power generation mix from traditional fossil fuels to cleaner burning fuels enables both Oklahomans and residents across the region to access this clean and affordable energy. As part of the Southwest Power Pool (SPP) regional transmission organization, power generated in Oklahoma is serving as a valuable commodity to surrounding regions through a vast network of power transmission lines. In fact, Oklahoma holds a unique place in the SPP as the leading provider of power into the transmission service region. Oklahoma generates 28% more electricity than the state uses, allowing SPP members to take advantage of our abundant, affordable energy resources.

Photo Courtesy Oklahoma Department of Commerce

OKLAHOMA TOP TEN

#1 lowest price of electricity in the nation 9 of the last 11 quarters according to the EIA as of Q2 2021

#1 generating state in the Southwest Power Pool

#2 in the nation for wind power generated


CUSHING OKLA.
PIPELINE CROSSROADS OF THE WORLD
STOP

Electric Power Providers

Electric power generation and delivery is handled by a network of owners, operators, and providers that all aim to provide Oklahoma residents with safe, reliable, and cost-effective electricity. Electricity companies can be operated as investor-owned utilities (IOUs), electric cooperatives, cooperative generation and transmission providers (G&T) or fall under public power ownership.

Investor-owned utilities are for profit corporations that issue stock to shareholders. These utilities can own and operate generation plants for wholesale electricity as well as the distribution transmission lines. Generally, these utilities are rate regulated in exchange for an exclusive service territory. The Oklahoma Corporation Commission (OCC) regulates IOUs in regards to price regulation and service reliability. This protects consumers while ensuring the IOU has the necessary capital to operate their business.

Electric cooperatives are non-profit, member owned organizations. Cooperative members are also the sole customers and consumers of the cooperative. While there are large electrical cooperatives that actually own the power plants that generate the electricity, many only own the distribution transmission lines that connect to the residence or business and allows for delivery of the electricity. Cooperatives have an option to opt-out of oversight and regulation of utility rates and service reliability by the OCC and most choose this option. In the case where the cooperative does not own generation resources, they must purchase their power from wholesale generation and transmission providers. A generation and transmission cooperative owns and operates the electric power generation plants and large-scale transmission lines down to the distribution substation level.

Photo from Grand Lake Online, DaveWagenblattPhotography.com

GRAND RIVER DAM AUTHORITY

The Grand River Dam Authority (GRDA), created in 1935 by the Oklahoma Legislature as an agency of the State, is tasked to be a conservation and reclamation district for the waters of the Grand River. The GRDA manages a wide portfolio of assets to generate, transmit and provide electricity to both Oklahoma residents and off-system customers across four states all while receiving no state appropriations.

Public power utilities are similar to cooperatives, in which municipal utilities must purchase wholesale power from a larger generation and transmission authority to serve their customers from the distribution substation level down. Public power utilities are owned by a government entity from a federal, state or municipal level. These utilities are generally non-profit and regulated by a locally elected or appointed board. In Oklahoma, there are hydroelectric generating sources, gas-fired power plants, coal power plants as well as wind and solar facilities that are publicly-owned and serve these communities. There are currently about 63 municipal-owned electric utilities served.

ELECTRIC POWER GENERATION, TRANSMISSION, & USE IN OKLAHOMA

ELECTRIC POWER GENERATORS

Invester Owned (IOU)

For profit, issues stock to shareholders. Regulated by OK Corporation Commission that sets rates.

Cooperative (Co-Op)

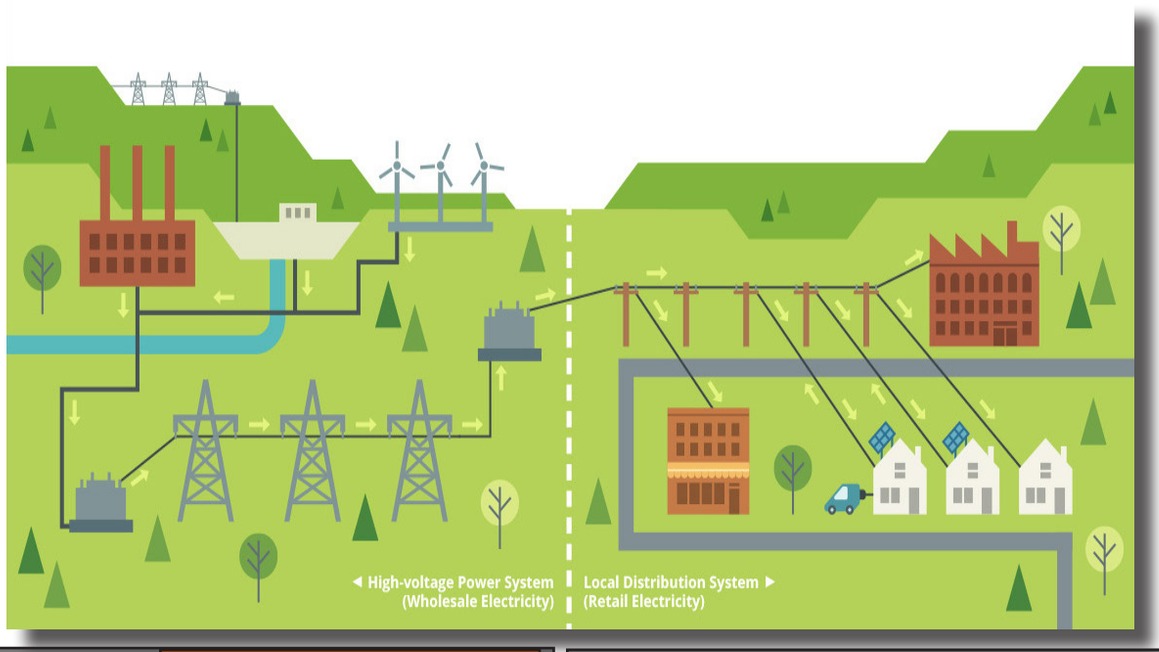
Not for profit, member-owned. Is not regulated by OK Corporation Commission unless volunteered.

Public Power

Federal-, state-, or municipally-owned utilities.

Independent Power Producer (IPP)

An owner/operator of electric generation facilities that is not a utility.



ELECTRIC POWER MOVERS

TRANSMISSION LINES

A system of structures, wires, insulators and associated hardware that carry electric energy from one point to another.

HIGH VOLTAGE TRANSMISSION LINES

Carry power generated from large power plants to distribution stations generally via overhead power lines. Meant to travel long distances, the average power is between 69 volts up to 765 volts.

DISTRIBUTION TRANSMISSION LINES

Carry power from the distribution substation to the end consumer. Meant to run short distances, either above ground or underground, the average power is between 69 volts up to 765 volts.

Source definitions from Energy Information Administration (EIA) at : www.eia.gov

Photo Source: www.iso-ne.com

ELECTRIC POWER END USERS

COMMERCIAL CONSUMERS

Customers using power for heating, air conditioning, cooking, water heating, lighting, refigeration, and other equipment use in service-providing industries and businesses.

INDUSTRIAL CONSUMERS

Customers using power for the assembly, producing or processing of goods. Overall energy use is for machinery and process heat and cooling.

RESIDENTIAL CONSUMERS

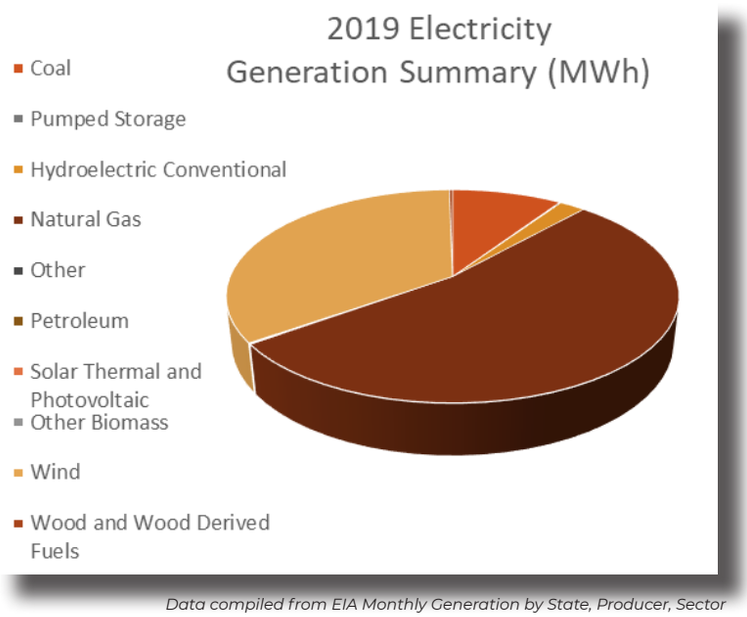
Customers using power for heating, air conditioning, cooking, water heating, and other residential uses in single and multi-family dwellings, apartments, and mobile homes.

Electric Power Generation

Since the first centralized power generation station was powered in 1882, the ability to supply electricity to the masses has allowed for communities to thrive and grow. Power generation stations require resources to turn the generators, and these are sourced from a variety of technologies. While the standard options of coal and natural gas continue to play central roles in power generation, the mix is a growing family as new members in renewable sources such as wind and solar join their hydropower counterpart.

Photo from https://www.wastetodaymagazine.com/article/oklahoma-biogas-facility-upgrades/

The most notable trend over the past years for the electricity generation mix has been the substantial growth of the renewable energy industry through the addition of wind power systems across Oklahoma. This shift, in combination with the expansion of natural gas generation, has created a fundamental market change in how electricity is generated in the state.



Data compiled from EIA Monthly Generation by State, Producer, Sector and Energy Source; EIA-923 Report

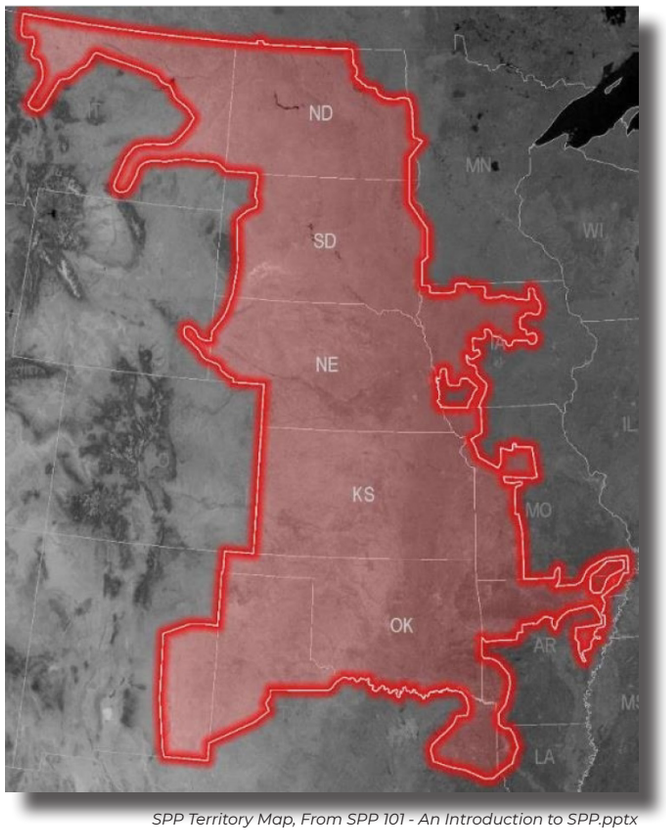
Overall for the year 2018, Oklahoma's utility providers had a net generation of 41,867,567 MWh, setting the state at 26th in the country. In addition, independent power producers contributed 44,356,154 MWh to our net generation, ranking Oklahoma 8th in the nation.

Oklahoma & the Southwest Power Pool - a description of Oklahoma's Electric Transmission Infrastructure and membership in this RTO

Transmission lines are one of the most critical pieces of Oklahoma's overall infrastructure. These provide for a modern life for citizens across the state, making a substantial contribution to the Oklahoma economy. While Oklahoma may have many types of providers, the actual efficiency, generation and distribution of power on any given day or time is controlled solely by the Southwest Power Pool (SPP) in Little Rock, Arkansas. SPP is regulated by the Federal Energy Regulatory Commission (FERC).

As previously mentioned, Oklahoma is part of the Southwest Power Pool (SPP) regional transmission organization (RTO). The SPP serves the role of oversight and balancing of the bulk electric grid and wholesale power market across 14 states in the central region of the U.S. This electricity is dispatched from the generating resources available to the grid where it can be generated the least expensively and the most reliably. The result is that the SPP generally has the lowest cost of any RTO or ISO in the United States. Oklahoma is the SPP's largest generator, generating about 30% more power than is actually consumed by Oklahomans. This is because Oklahoma has the lowest rates in the 14 state SPP. This RTO includes over 66,000 miles of transmission lines 69 kv and larger. It is the responsibility of the SPP to ensure a reliable supply of power, adequate transmission infrastructure facilities and competitive wholesale prices of electricity. Each of Oklahoma's investor owned utilities, generation and transmission cooperatives, Oklahoma Municipal Power Authority and the Grand River Dam Authority are members of the SPP. Any new transmission line 69 kv or larger built by Oklahoma utilities goes through the planning process overseen and managed by the SPP. The state has very little control over the operations or distribution as managed by SPP.

Southwest Power Pool Territory



SPP Territory Map, From SPP 101 - An Introduction to SPP.pptx

In 2014, the SPP moved to launch a market expansion project that fundamentally changed the service SPP provides for electricity balancing. This project was the launch of the Integrated Marketplace. This evolution of the transmission marketplace enables the maximization of cost-effectiveness, enabling greater access to reserve energy, improved regional balancing of the electricity supply and demand, and the ability to facilitate integration of renewable electricity resources. It is efforts such as this that encourages the least expensive resources to generate and balance the costs to ensure electricity prices remain more affordable for the end consumer.

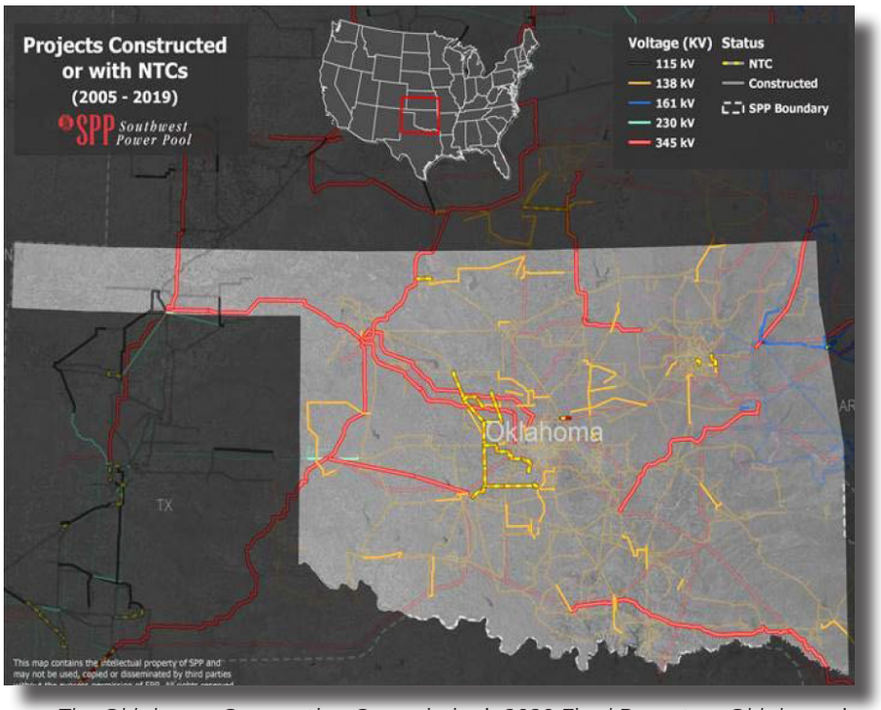
[1] SPP 101 Presentation: https://spp.org/documents/31587/spp101%20-%20an%20introduction%20to%20spp%20-%20all%20slides%20for%20print.pdf

Oklahoma Transmission Capacity Report

In 2010, the Oklahoma Legislature passed HB 3028 which declared that it is in the public interest to support the development of a robust transmission grid in order to improve reliability, facilitate the delivery of renewable energy, and promote wind energy development within the state. This legislation called for the Oklahoma Corporation Commission (OCC) to work with the SPP to develop a plan to achieve these goals.

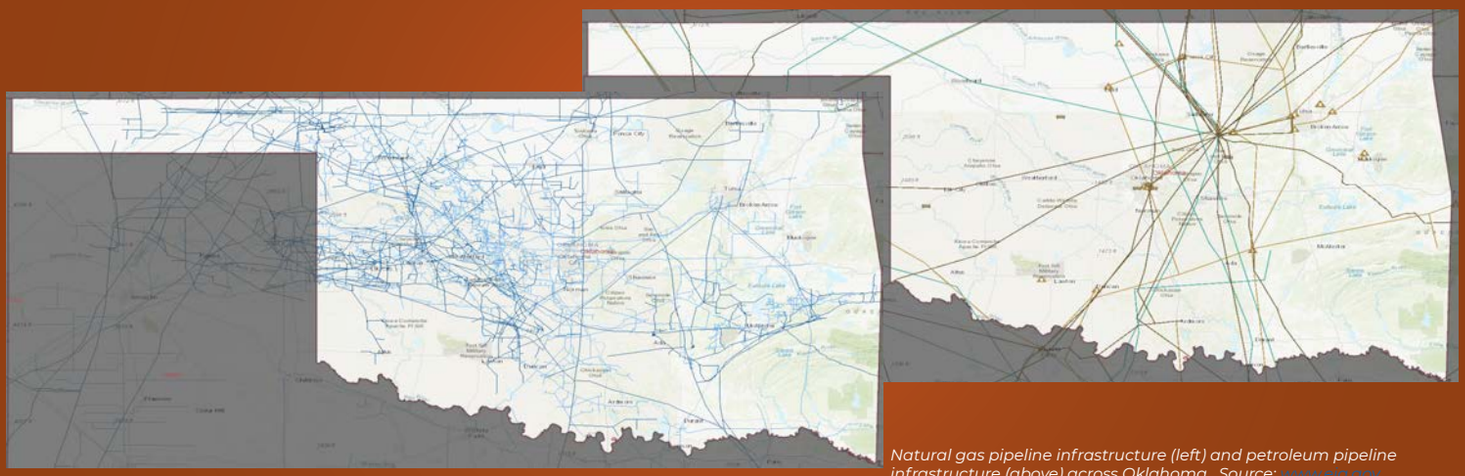
The final report as a result of this effort was issued January 1, 2020 and highlights the numerous accomplishments for the 2009-2019 time period. In all, nearly $2.3 billion of transmission line upgrades were issued or approved by the SPP in Oklahoma since 2010. Projects and upgrades include the following:

- 87 Generation Interconnection upgrades at a cost of approximately $215 million
- 72 Transmission Service upgrades at a cost of approximately $303 million
- 79 Integrated Transmission Planning projects at a cost of approximately $547 million
- 4 Balanced Portfolio projects at an approximate cost of $342 million
- 21 High Priority Upgrades with an approximate cost of $645 million
- 5 Sponsored Upgrades for an approximate cost of $250 million



The Oklahoma Corporation Commission's 2020 Final Report on Oklahoma's Transmission Capacity 17 O.S. Section 287 (2010)

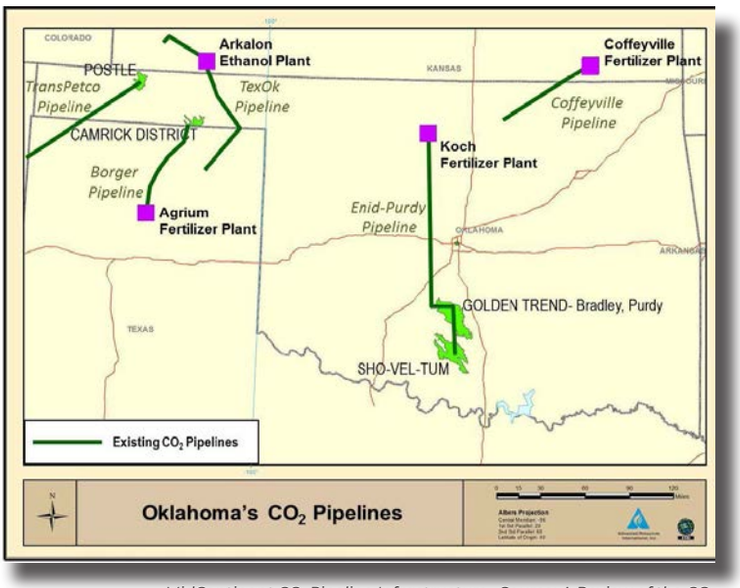
PIPELINE INFRASTRUCTURE



Natural gas pipeline infrastructure (left) and petroleum pipeline infrastructure (above) across Oklahoma. Source: [redacted].

Oklahoma is not only known as the Crossroads of America from the major interstate highways of I-35, I-40, and I-44 intersecting, but also known for the state's extensive network of pipelines that form the basis for the movement of petroleum and natural gas products across the state. Over 60,000 miles of natural gas and petroleum pipelines crisscross the state to distribute Oklahoma's resources to energy markets. As the development of domestic oil resources has grown, the infrastructure required to move product has also grown and adapted through the repurposing of existing pipelines, ensuring product flows through the Cushing Hub which is literally the pipeline crossroads of America.

Pipeline routes are also critical to the movement of carbon dioxide (CO2) across the nation. Currently, Oklahoma has about 335 miles of CO2 pipelines that allows major fertilizer businesses to secure the needed feedstock for production. Additionally, these green pipelines also support the movement, storage, and potential utilization of CO2 to support CCUS efforts including uses like enhanced oil recovery (EOR), supporting food refrigeration or beverage carbonation. With passage of the 45Q tax credit, these companies that capture and utilize CO2 will have significant new opportunities to catalyze this new industry and provide jobs while reducing carbon at the same time.



MidContinent CO_2 Pipeline Infrastructure. Source: A Review of the CO_2 Pipeline Infrastructure in the U.S.pdf.

Energy Assurance Planning

A major priority of the Office of Secretary of Energy & Environment is to update the Energy Assurance Plan for the state. This planning ensures that Oklahoma's energy infrastructure is resilient and secure from all types of interruptions. This entails a coordinated effort of various stakeholders across government and the entire energy industry working together to keep our infrastructure protected. Oklahoma is no stranger to a variety of natural disasters such as ice storms, tornadoes or flooding. Recent years have brought a new threat to energy security with deliberate cyber-attacks, or worse yet, terrorist attacks on the electrical grids and pipeline infrastructure.

Photo from Tulsa World; https://tulsaworld.com/news/local/looking-back-at-2007-ice-storm-in-tulsa/article_35f6ede1-4b8f-50e0-bc23-5afd4ada6c23.html

Oklahoma is home to infrastructure that is vital to our nation's security and well-being. Critical networks of pipelines and storage secure energy flows and distribution throughout the country. These assets are even more critical during times of disaster or extreme weather events. Performing exercises and modelling natural disasters and other interruptions are absolutely essential to real life preparedness. Never was this better illustrated than the polar vortex winter storm of February 2021. This 10-day storm illustrated what can happen when infrastructure and energy supply are not prepared and well-planned. The disaster and subsequent fallout from the same storm in Texas has served as a harbinger to others to have these resources ready, resilient and plentiful in the face of a once-in-a-generation event. By contrast, Oklahoma's grid performed remarkably well given the stresses of the SPP. Our grid remained operational while enduring the stress of losing about one-half of the name plate generating capacity during a new winter peak for energy demand. Questions remain as to how we can be even better prepared for such an event while making sure the costs of resiliency are justified for the potential benefits.

Oklahoma's Energy Assurance Plan (EAP) is intended to complement the existing official Emergency Operations Plan (EOP) maintained by the Oklahoma Department of Emergency Management (OEM). The EOP for Oklahoma defines the roles of local, State, and Federal governmental entities that may provide relief or resources in disaster situations.

Energy Assurance planning categorizes emergencies into two categories: service interruptions and supply shortages. The situations in these categories could be the result of any number of man-made or natural disaster scenarios. It is important to ensure the State's energy system is both proactive in anticipating future events and can be reactive as events occur.
The Oklahoma EAP is managed by the Oklahoma State Energy Office, within the Office of the Secretary of Energy and Environment. An update to the Oklahoma EAP is underway and expected to be complete by the end of summer 2021.

Power Vision

As a national leader in nearly all forms of energy, Oklahoma is uniquely positioned as a true powerhouse and to pioneer new forms of energy that complement our vast resources. We will continue to promote policies that ensure that our power is affordable but also the cleanest and most environmentally responsible.

We have the cleanest and most affordable energy in the nation, which continues to attract diverse opportunities for economic development. With continued growth in transmission infrastructure and new generation being added continually, Oklahoma will continue to supply our Southwest Power Pool partners with reliable and affordable energy. We will work with all of our various power producers to ensure our citizens are served with reliable and clean power.

- **Continue to be a national leader in affordable clean energy by utilizing the diverse and abundant resources and work force available in Oklahoma**
- **Work with our Southwest Power Pool partners to ensure that our state electricity costs remain some of the lowest in the country to our end users**
- **Continue the development of our transmission capacity and the addition of new cleaner and more efficient generation sources to ensure we remain a leader in exported power**
- **Continue to improve on our already well-developed pipeline system and develop new markets and opportunities for this power**

OKLAHOMA IS, AND WILL CONTINUE TO BE, A NATIONAL LEADER IN LOW COST POWER GENERATION.

Technology

Technology and its continuous evolution plays a critical role in the advancement of our energy and environment sectors. Efficiencies gained though technological advancements have led to higher levels of energy production, while lowering environmental impacts. Over the past ten years, new technologies in energy production have meant new opportunities in Oklahoma and have brought many exciting changes to our state.

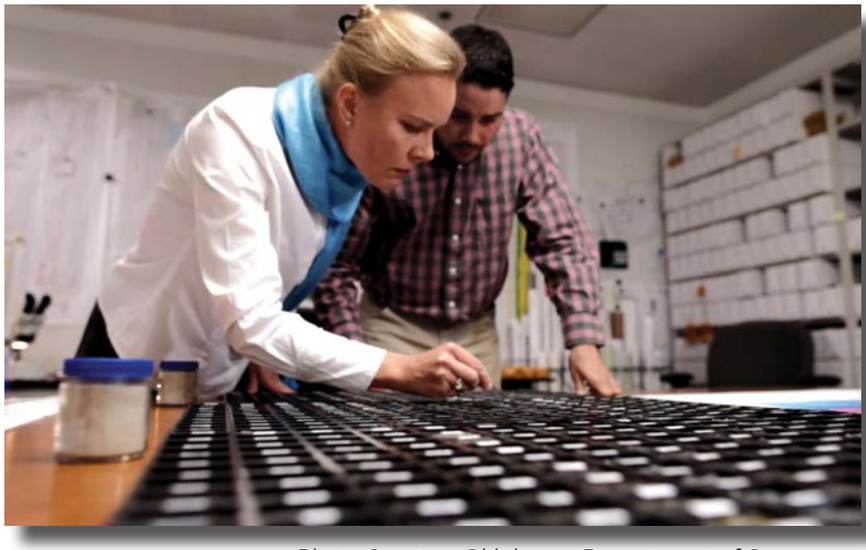


Photo Courtesy Oklahoma Department of Commerce

Oklahomans have always been innovators and pioneers, especially when it comes to advancements in the energy industry. New production techniques, such as hydraulic fracturing, enhanced oil recovery and horizontal drilling all utilize technology to not only capture carbon emissions but also raise production levels for resources otherwise uneconomical to reach.

Looking to seize the opportunity to embrace those technologies that play well to Oklahoma's resources and strengths, hydrogen seems to be the next big thing. To produce hydrogen, you need one or two major resources, abundant renewable energy and low-cost natural gas. Fortunately, Oklahoma has both.

Hydrogen has the potential to play a strong role in the low carbon future energy market while allowing natural gas to continue to provide clean energy well into the future. Oklahoma's top ten status in natural gas reserves provides the resources for hydrogen production through natural gas reforming. In addition, the state's extensive pipeline network and centralized geography and interstate highway assets provide the infrastructure to transport hydrogen from a centralized hub.

Oklahoma will soon be home to the largest combined power project in the nation. The Skeleton Creek Project utilizes wind power, solar power and battery energy storage. Home battery storage is also on the near-term horizon with consumers recognizing the potential of charging at night and discharging at peak. Most people would be surprised to learn that Oklahoma City is at the epicenter of battery technology. There is a homegrown company in South OKC that is the largest Electric Vehicle battery refurbisher and recycler in the United States. In fact, this company has successfully repurposed EV batteries that could not meet OEM specs to meet multiple new opportunities.

"I think one of the opportunities for technology, for innovation, is to give people opportunity to have the life that people want to have but do it in a lower carbon way."

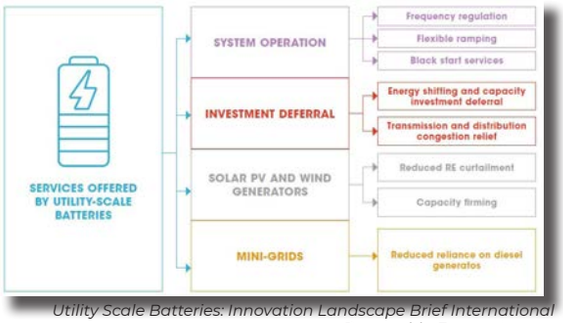
***Lisa Jackson, VP Apple, Inc.*[5]**

Battery Storage

As we continue to be on the forefront of diversifying electricity generation, we are striving to find new ways to stabilize the grid and find solutions to new intermittency challenges posed by the continual addition of more renewables. The ability to store electricity generated from renewables for use when the wind is not blowing is a critical component to diversifying Oklahoma's production of electricity. New battery technologies allow electricity generated from sources with intermittent reliability to be stored in a way that is both reliable and retrievable on demand. Batteries offer Oklahoma's energy grid benefits ranging from increased capacity to flexible distribution.

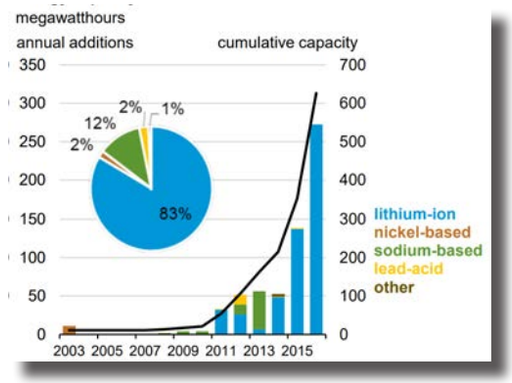
Batteries are measured in two ways, power capacity and energy capacity. Power capacity is the maximum instantaneous power output available and is typically measured in megawatts (MW), while energy capacity is the total maximum energy that can be stored or discharged during a single charge discharge cycle and is typically measured in megawatt-hours (MWh).

As battery chemistry has advanced, both the power capacity and energy capacity of batteries have increased over the last ten years. These technologies have seen the transition from lead-acid based batteries to nickel or sodium based. These advancements in batteries have brought higher energy density, but a lower life cycle. Today, the lithium-ion battery is the primary battery chemistry currently used, striking the balance of size, weight, and life cycle.



Utility Scale Batteries: Innovation Landscape Brief International Renewable Energy Agency

The average cost per-unit of energy capacity has decreased by 61% from $2,153/kwh in 2015 to $834/kwh in 2017. In 2017, lithium-ion batteries represented more than 80% of the installed power and capacity for large scale energy storage in the United States.



U.S. Large-Scale Battery Storage Capacity by Chemistry (2003-2016); EIA, U.S. Battery Storage Market Trends Report, May 2018

Battery storage also provides a range of benefits for electricity management on the transmission grid. It can be used for frequency regulation and voltage or reactive power support, in addition to load following and renewable project support. There are also new and innovative ways for batteries to provide back-up protection and stability in residential applications with new uses appearing daily.

The market for renewable energy continues to expand creating more demand for Oklahoma's wind and solar generated electricity. By leveraging batteries as part of the on-site electrical infrastructure, this is another valuable resource to help keep Oklahoma's grid diversified and energy prices low.

The Southwest Power Pool (SPP) is experiencing a substantial increase in interconnection requests to include battery storage systems. Requests have increased from 40 MW in 2016, to 1,135 MW in 2017 and 4,305 MW in 2018. Like other emerging technologies, batteries represents a great opportunity. Battery storage is an exciting and rapidly developing technology in the energy industry. Oklahoma will look to continue to capitalize on the advancements in battery storage technology.

SKELETON CREEK PROJECT

Announced in 2019, the Skeleton Creek Project joined the long list of pioneering energy projects in Oklahoma. This will be the first project to combine wind, solar and battery storage in the nation. Located across Major, Alfalfa, and Garfield Counties in Oklahoma: 250MW of wind energy, 250 MW of solar energy and 200 MW of battery storage will be installed in this multiple resource project.

The battery storage portion of the project will use lithium ion batteries, the leading battery chemistry at this time. The storage system will work by receiving power from the renewable energy portion of the project and store it in batteries housed in a battery container or building structure. Then, when the energy is needed on the power system, the energy is delivered from the batteries. A Battery Management System (BMS) monitors the individual cells of the batteries and is able to control the voltage, temperature, and current for safe and reliable transport of energy.

Why use battery storage?

- Avoids expensive system upgrades
- Reduces energy loss and waste
- Extends the hours a renewable energy project can operate
- Smooths out fluctuations in frequency and voltage

"Pairing renewable energy with battery storage presents a tremendous advantage for Western Farmers and its customers,"
- John Ketchum, NextEra Energy Resources[6]

"At Western Farmers [Electric Cooperative], we are always looking for ways to better serve our customers with reliable, low-cost and environmentally-friendly energy,"
-Gary Roulet, Western Farmers Electric Cooperative[7]

Source: https://www.nexteraenergyresources.com/skeleton-creek-project/faq.html. Photo of Babcock Ranch Solar Energy Center, www.nesteraenergy.com

Carbon Capture Utilization & Storage

The recycling of CO2 is essential to Oklahoma's plans to continue of a lower carbon trajectory and part of a broader initiative of seeing other uses for traditional streams of waste. Carbon capture is just now beginning to be seen as a real solution to meeting the ambitious goals of reducing carbon and fighting climate change. Most people, including most scientists, believe that Carbon Capture Utilization & Storage (CCUS) is actually essential if these targets are to be met. However, the debate is more centered around the idea of utilization like enhanced oil recovery (EOR) or other beneficial uses is more controversial. It is in the utilization, where Oklahoma finds its greatest potential.

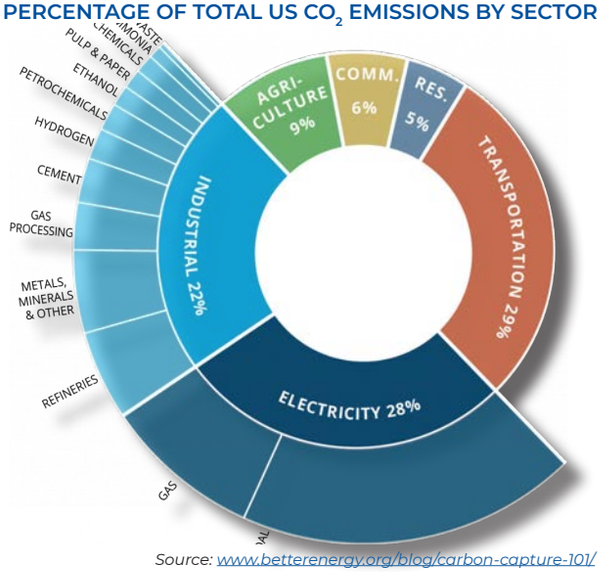
CCUS is the effort pertaining to the separation and capture of carbon dioxide (CO2) from power generation, industrial, and agricultural processes and storing it so that it is not emitted into the atmosphere. These efforts have significant potential to reduce CO2 emissions in energy systems.

For Oklahoma, the most immediate benefits of carbon capture lie in utilization opportunities such as enhanced oil recovery (EOR). By utilizing CO2 from industrial processes, energy producers are able to access additional oil and natural gas resources that would otherwise be trapped in formations. It is estimated that upwards of $80 billion of untapped opportunity lies in existing fields in Oklahoma across legacy wells. With the passage of the 45Q Tax Credit, there are emerging opportunities of how to utilize and securely store this man-made CO2 that ranges from $35 per ton to $50 per ton making these uses much more cost competitive. There is legislation to expand this incentive to a direct payment rather than a tax credit that would further enhance its usability.

In addition to EOR potential for Oklahoma, existing power plants can utilize carbon capture technology for beneficial reuse.

The Shady Point co-generation facility has utilized carbon capture to produce food-grade carbon dioxide for the poultry industry and use in carbonated beverages.

PERCENTAGE OF TOTAL US CO_2 EMISSIONS BY SECTOR



Source: www.betterenergy.org/blog/carbon-capture-101/

As shown in the figure above, there is substantial opportunity for emissions reduction through carbon capture efforts.

For Oklahoma, this environmental benefit comes from multiple industrial sources as well as the increased use of natural gas for electricity generation.

Going forward, Oklahoma can continue to leverage its history and experience in carbon capture technologies to advance EOR efforts and support the transporting of CO2 to other regions for utilization.

CARBON CAPTURE COALITION

The Carbon Capture Coalition (CCC) is a nonpartisan collaboration working to build federal policy support for the deployment of carbon capture, transport, use, removal and storage. The mission of the CCC is to reduce carbon emissions to meet mid-century climate goals, foster domestic energy and industrial production and support a high-wage job base through the adoption of carbon capture technologies.

Oklahoma plays a leading role in the CCC, alongside nearly 80 industry, energy and technology companies, conservation, environmental and energy policy organizations.

In addition to the CCC, Oklahoma plays a strong part in deployment of these technologies through The Regional Carbon Capture Deployment Initiative. This is a growing network of 25 states who work together to help ensure near-term deployment of CCUS projects that will benefit responsible domestic energy production while reducing global emissions and protecting high-paying energy jobs.

The Initiative focuses on modeling, planning, advocacy and support for project deployment, including permitting and regulatory barriers. There is also a great deal of work around infrastructure and innovation to support the industry of CCUS. This effort has been particularly timely with the passage and guidance around the 45Q Tax Credit and other pending legislation.

Oklahoma is proud that Governor Stitt signed on to the Governor's Initiative to help push policy and practices that support our state's manufacturing, energy production and infrastructure. The CCC is staffed and supported by the Great Plains Institute ("GPI") who is focused on a mission to transform the energy system to benefit the economy and environment, GPI partners with businesses, governments, non-profits and other organizations to advance its mission.

INTERNAL REVENUE CODE SECTION 45Q

Section 45Q of the Internal Revenue Code (IRC) provides for a tax credit on a per ton basis for carbon dioxide (CO_2) that is sequestered. This incentive outlaid $20/metric ton of CO_2 in geologic storage and $10/metric ton for CO_2 utilized for enhanced oil recovery (EOR) or enhanced natural gas recovery (EGR).

In February of 2018, this credit was updated with an increase to $35/metric ton for EOR and $50/metric ton for geologic storage by 2026. The credit is also available for non-EOR CO_2 utilization and direct air capture projects.

This foundational policy effort is critical in the reduction of cost and risk for the deployment of carbon capture technologies.

OKLAHOMA CARBON PROGRAM

The Oklahoma Conservation Commission operates the Oklahoma Carbon Program (OCP), a model voluntary program of the Carbon Sequestration Certification Program. The OCP provides verification of geologic sequestration for oil and gas companies that utilize CO_2 for injection use for EOR.

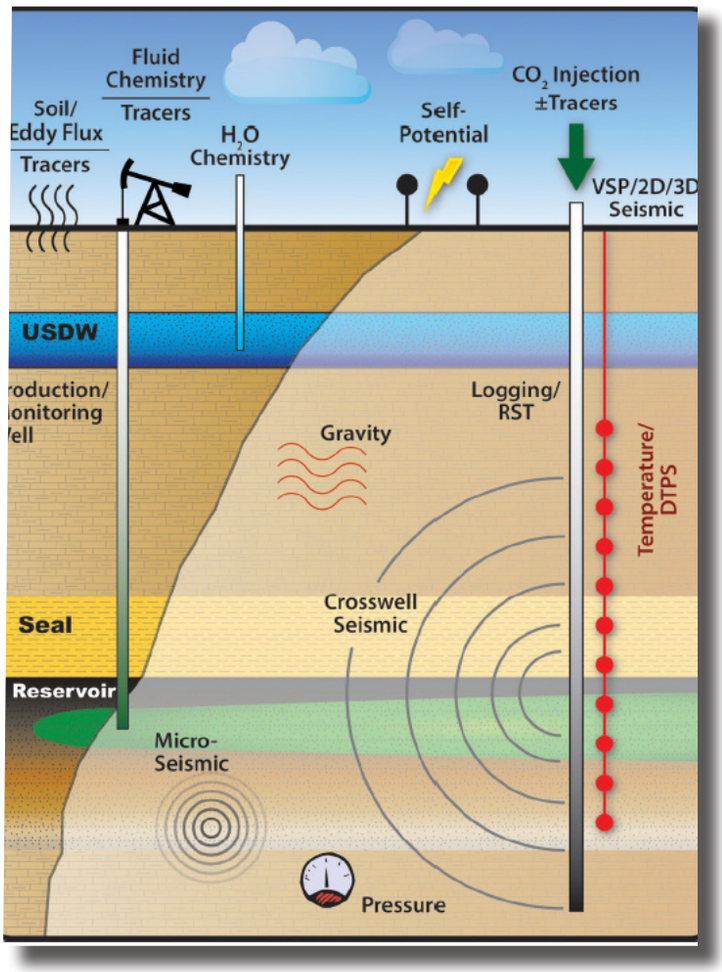
The OCP encourages the voluntary protection of water quality, soil erosion and improvement of air quality through adoption of conservation practices that sequester or avoid emissions of greenhouse gases.

OKLAHOMA CARBON PROGRAM

Photo Courtesy Oklahoma Department of Commerce

Farnsworth Unit Project
U.S. DOE/National Energy Technology Lab

Successful deployment of research and development projects are critical at this stage of CCS technology development. Oklahoma is part of this effort through the work by Chaparral Energy of Oklahoma City with the Southwest Regional Partnership on Carbon Sequestration (SWP). The Farnsworth Unit Project is a collaboration project using anthropogenic CO2 for EOR and gas recovery efforts in the Anadarko Basin by leveraging existing pipeline infrastructure across multiple states. The diagram on the right shows the efforts taking place as part of the project. Preliminary estimates of the Farnsworth Unit exceed 25 million metric tons of CO2. Technical benefits of the project include increase resolution of reservoir characterization, direct and frequent sampling and fluid analyses, collection of core and detailed logging suites, petrophysical, geochemical and geomechanical core testing and optimization of CCS methods through monitoring and simulation.



A CO_2 injection well in Mississippi. Photo courtesy U.S. Department of Energy.

Research & Development

Oklahoma believes that technology has the ability to further economic development and for decades has been investing in the future of Oklahoma's technology industry.

Oklahoma's Innovation Model (OIM) leverages strategic partnerships among Oklahoma organizations to further the development of Oklahoma's technology-based economy.

A gold standard in the nation, the OIM is a unique three-way public-private partnership that coordinates Oklahoma's resources and services to further invention, innovation, and entrepreneurship. OIM propels innovative ideas to successful business solutions.

The three pillars of the OIM are the Oklahoma Center for Advancement of Science and Technology (OCAST), i2E, and the Oklahoma Manufacturing Alliance (OMA). Each partner provides a unique and vital contribution towards the commercialization of our fellow Oklahomans' technology innovations: seed grants are provided by OCAST, concept validation and assistance in securing growth stage capital funds come from i2E, and stability expertise are contributed by OMA beginning with start-up stages to full scale operations.

In addition, the New Product Development Center (NPDC) housed at Oklahoma State University, provides guidance and resources to Oklahoma's inventors.

"For every dollar invested - $22 dollars returned to the state through wages, capital investments and revenue growth."

- C. Michael Carolina, OCAST 2020 Impact Report[8]

ENERGY INNOVATION CENTER

The Energy Innovation Center (EIC) is a state-of-the-art research, development, and venture capital facility located in Oklahoma City's Innovation District. Originally built in 2016 as a global research center for oil and gas by General Electric (GE), the EIC has evolved with energy industry research needs. The Center includes a full lab complete with two wells drilled at 40 and 400 feet. In addition, the EIC housed an enhanced oil recovery lab investigating how industry could better use carbon dioxide injection to increase production in oil and gas fields. Baker Hughes, as a GE company, refocused the EIC in 2018 to the development and deployment of new technologies for the oil and gas industries, along with enabling access to venture capital. Most recently, Baker Hughes donated the EIC to Oklahoma State University (OSU) in July of 2020 as a collaboration effort to bring industry and academia together and enable OSU students to have expanded learning opportunities. OSU and Baker Hughes will also develop diversity and inclusion programs to build the pipeline of talent for the next generation of technologies.

Hydrogen

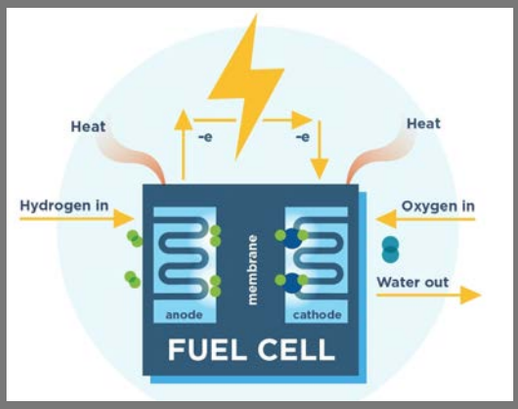
Few other alternative technologies of fuel sources fit Oklahoma's resources better than Hydrogen. Its potential is seen as a driving force to help decarbonize the power generation sector, transportation sector and the important Industrial Sector in a way that renewables cannot.

Hydrogen's fit for Oklahoma is seen in many ways: 1) Oklahoma has an abundance of renewable energy for electrolyzing water to make H2; 2) We have an abundance of low cost natural gas to make Hydrogen using SMR, as well as pore space to store Hydrogen or Carbon Dioxide from making the H2; 3) Oklahoma is home to the greatest pipeline network and storage in the US; 4) We are centrally located with some of the most important interstate highways crossing our state; and, 5) we have a ready-made oil & gas workforce with all the skills necessary to develop, produce, store, transport and distribute Hydrogen in the US.

Hydrogen has a wide range of utilization opportunities that include vehicles, fertilizer, and heating. Fuel cells utilizing hydrogen have excellent potential as stationary power sources to operate as backup power or power for remote locations.

At the end of 2019, 80 fuel cell power plants were in operation in the U.S. for a total of 190MW of electric generation capacity, but we've seen the Biden Administration announce its intention to go "all in" on Hydrogen. Oklahoma is leading the way and prepared to dominate this market.

Electricity is produced from hydrogen through a process using fuel cells. The mechanics of electricity production is similar in design to a battery - with

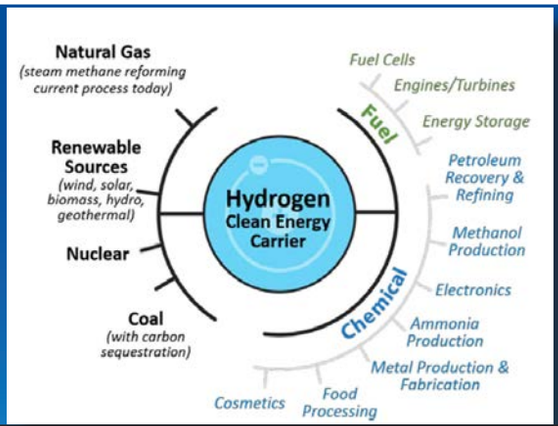


an anode, cathode and a membrane. Hydrogen is used as a fuel stock into the fuel cell with electricity, heat and water as the only byproducts.

Photo Courtesy U.S. Department of Energy

H2@Scale U.S. Department of Energy

The Department of Energy (DOE)initiative H2@Scale is an effort to bring together stakeholders across sectors with the goal to advance hydrogen utilization across the nation. Action include DOE funded projects, national lab and industry research and development efforts, and demonstration of applicable technologies.



Technology Vision

Oklahoma will continue to be a leader in technological innovation. It is our pioneering spirit that leads us to make continued advancements in technology and to fully utilize our state's abundant resources.

The application of carbon capture technology for enhanced oil recovery is critical because it allows for both a reduction in CO2 emissions and an increase in the production in existing fields and legacy wells, leading to a true low carbon economy. To further advance this technology, Oklahoma can complement federal policy initiatives, such as the 45Q program, by supporting infrastructure development to serve the needs of CCS.

Taking part in crucial partnerships, such as the Carbon Capture Coalition, ensures Oklahoma's industries are on the forefront of the latest in technology and policy advances. Oklahoma stands proud of our advancements in technology over the last decade and we are excited for the future here in our state.

- **Support investment in battery storage technology to utilize our abundant clean energy sources**
- **Support and promote the growth of carbon capture technologies in Oklahoma that will improve our environment and grow our economy**
- **Support development for the use of hydrogen as a major fuel stock in the ever-growing lower carbon economy**
- **Remain a hub for research and development providing further improvements in technology benefiting our economy and our environment**

ENDNOTES

1 https://www.epa.gov/nwpr/final-rule-navigable-waters-protection-rule
2 https://www.epa.gov/coalash/proposed-rule-disposal-coal-combustion-residuals-electric-utilities-federal-ccr-permit
3 https://www.epa.gov/stationary-sources-air-pollution/affordable-clean-energy-rule
4 https://www.epa.gov/compliance/epa-announces-renewed-emphasis-self-disclosed-violation-policies
5 *From an interview found on: https://climateone.org/audio/rajendra-pachuri-and-lisa-jackson January 14, 2015*
6 https://reneweconomy.com.au/nextera-to-build-largest-combined-solar-wind-and-storage-facility-in-us-36161/
7 https://reneweconomy.com.au/nextera-to-build-largest-combined-solar-wind-and-storage-facility-in-us-36161/
8 https://www.ok.gov/ocast/documents/2020ImpactReport-web.pdf

Special Thanks

The Secretary of Energy & Environment, Kenneth E. Wagner, would like to give a special thanks to the following individuals for their contribution to this report:

- Deputy Secretary, Carly Cordell
- Senior Counsel, Stephen Baldridge
- Policy Advisor & Legislative Affairs, Katie DeMuth
- Senior Counsel and Policy Advisor, Victoria Tran
- Administrative Director, Jodi McKee
- Kylah McNabb, Principal - Vesta Strategic Solutions, LLC
- Department of Environmental Quality for their assistance with graphics, especially Tabby King

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