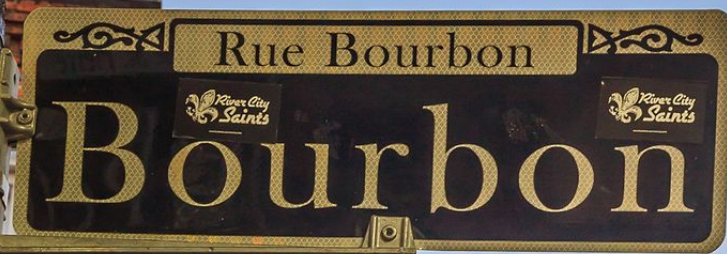


US Green Economy Report Series

Case Study - Louisiana



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SUSTAINABILITY

Louisiana State Profile

Governor John Bel Edwards, a Democrat, signed two executive orders in August 2020 to address climate change.

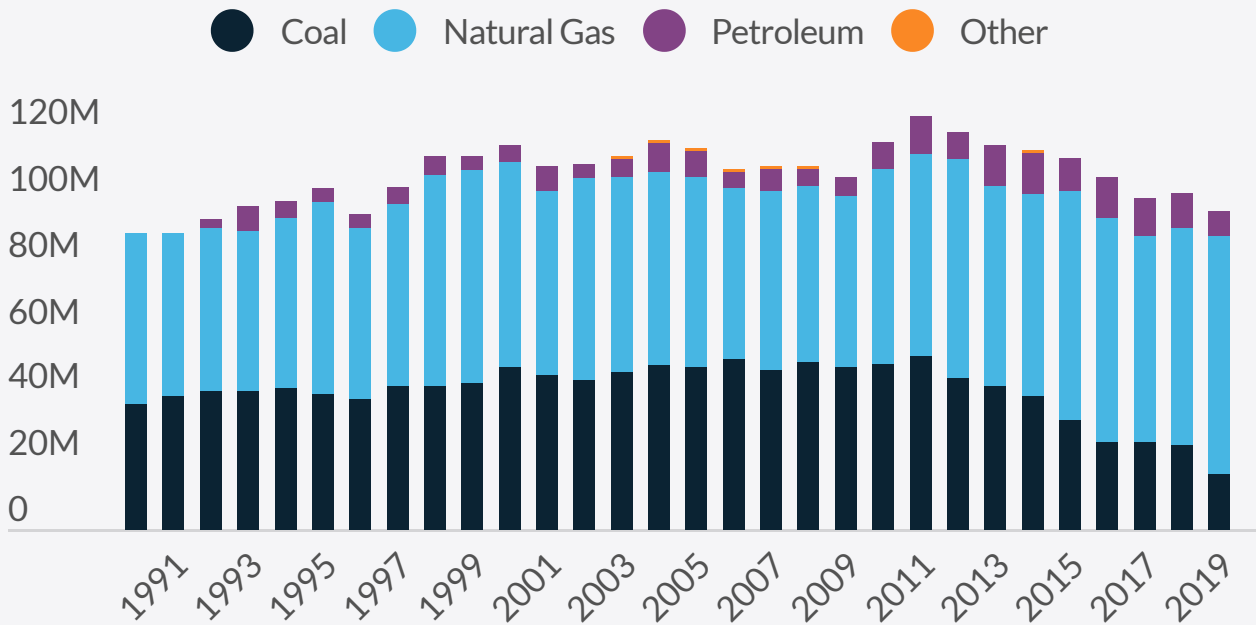
One executive order set the state's emission-reduction targets at 28 percent by 2025, 50 percent by 2030 and 100 percent by 2050. The order does not provide any details or a plan to achieve these goals, and Louisiana does not yet have a renewable or clean energy portfolio standard. Instead, a task force is putting together a long-term climate strategy, which will be finalized by February 2022.

The other executive order focuses specifically on the state increasing its actions on adaptation and resilience to climate disasters. Louisiana has been hit by destructive climate-related natural disasters on an annual basis. Governor Edwards set up a Chief Resilience Officer to coordinate activities to support coastal protection against climate threats.

Despite the executive orders, the state will likely have difficulty implementing its strategies and increasing funding and incentives for climate-related projects as the legislature is controlled by Republicans. Moreover, Governor Edwards' second term will end before the 2025 target, which means his executive order could be overturned by his successor, and the state's economy is heavily reliant on the fossil fuel industry.

An overwhelming majority of the state's electricity comes from natural gas. Edwards hopes to get industry players to voluntarily reduce emissions as he sees climate as an urgent issue since the state ranks in the top five in emissions despite ranking 25th in population.

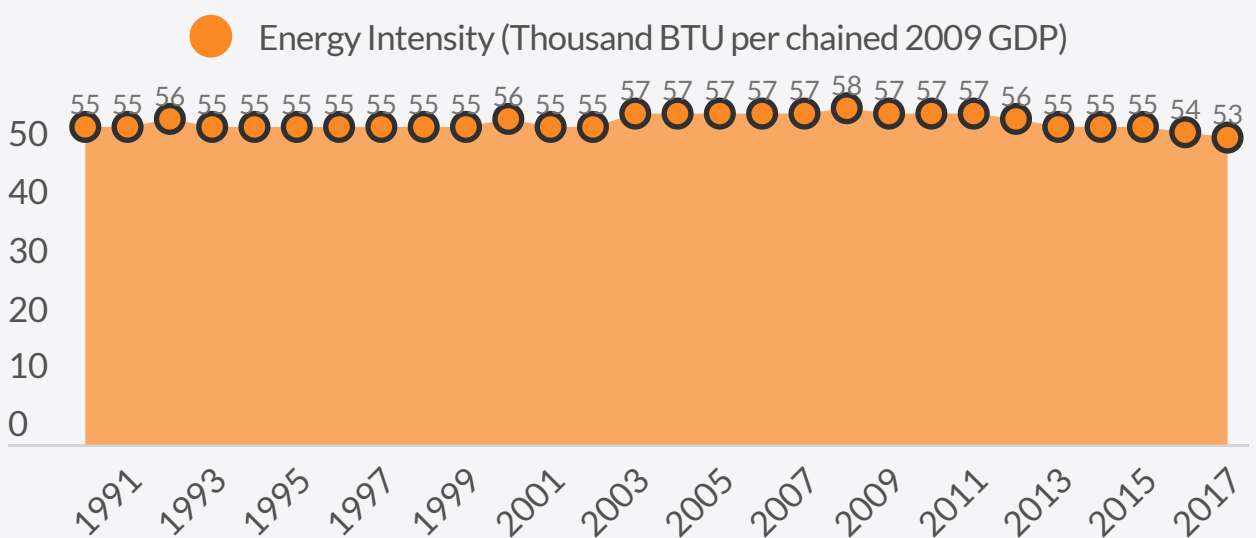
ENERGY-RELATED GREENHOUSE GAS EMISSIONS



[Download data](#)

Carbon Dioxide emissions over time by energy generation source, according to the Energy Information Administration. Note: other includes non-biogenic municipal solid waste, batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, tire-derived fuels, and miscellaneous technologies; other Gases includes blast furnace gas, propane gas, and other manufactured and waste gases derived from fossil fuels.

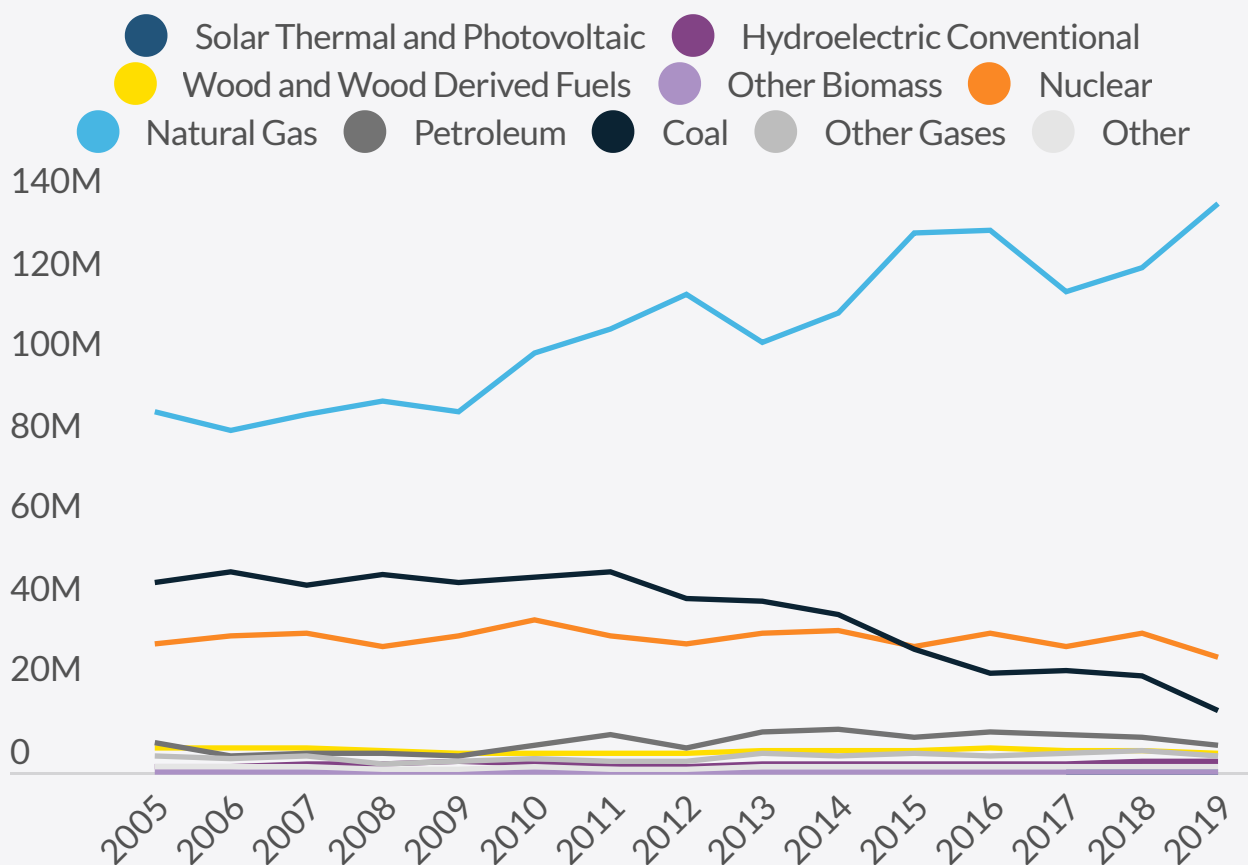
ENERGY INTENSITY OVER TIME



[Download data](#)

Source: Energy Information Administration

ELECTRICITY GENERATION BY SOURCE



[Download data](#)

Generation over time, according to the Energy Information Administration. Note: other includes non-biogenic municipal solid waste, batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, tire-derived fuels, and miscellaneous technologies; other Gases includes blast furnace gas, propane gas, and other manufactured and waste gases derived from fossil fuels.

ENERGY FACTS AND FIGURES

ENERGY LOSSES	532,824	BBTU
ELECTRICITY PRICES	23.40	USD per MBTU
ENERGY PER GDP	17.90	Thousand BTU per 2012 USD
CONSUMPTION PER CAPITA	912	MBTU
NET-INTERSTATE FLOW	173,287	BBTU

Facts and figures, according to the Energy Information Administration. Note: negative net interstate flow of electricity and associated losses indicates flow out of state.

LOUISIANA'S LARGEST GENERATING PLANTS

Largest generation facilities by capacity, according to the Energy Information Administration



2,363 MW

Natural gas: Nine Mile Point



1,165 MW

Nuclear: Waterford 3



1,723 MW

Coal: Big Cajun 2



1,165 MW

Coal: R S Nelson



1,542 MW

Petroleum: Brame Energy Center

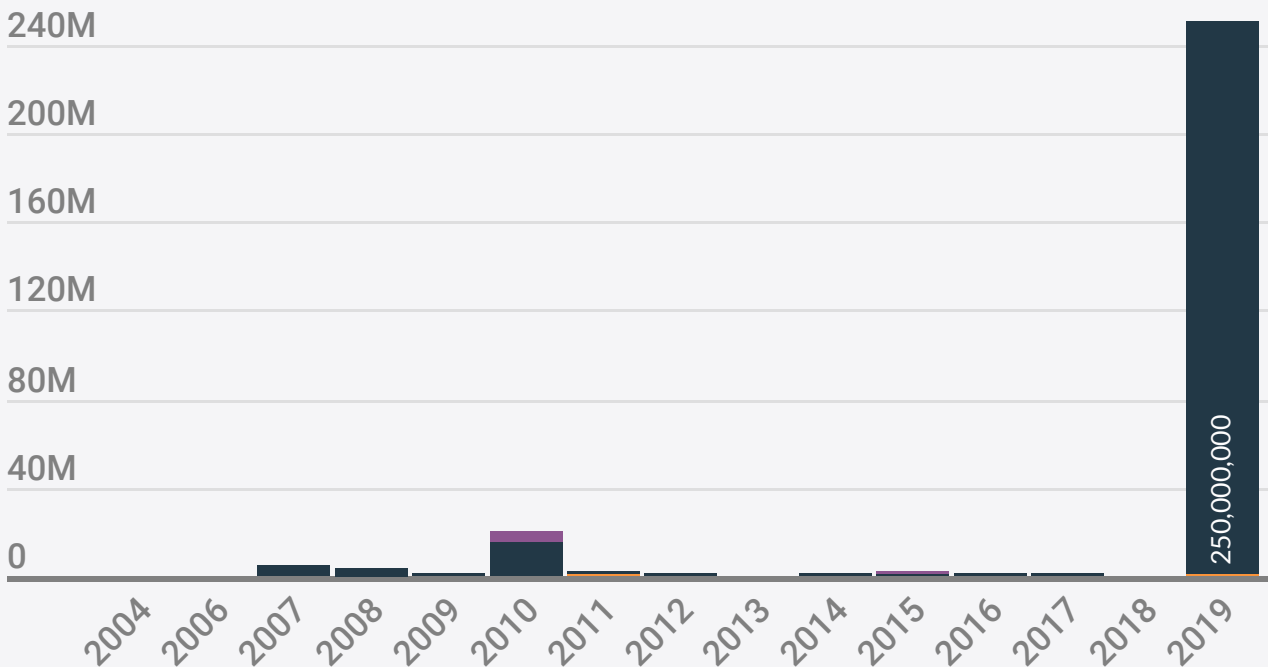


1,081 MW

Natural gas: Acadia Energy Center

PUBLIC INVESTMENT BY GENERATION TYPE

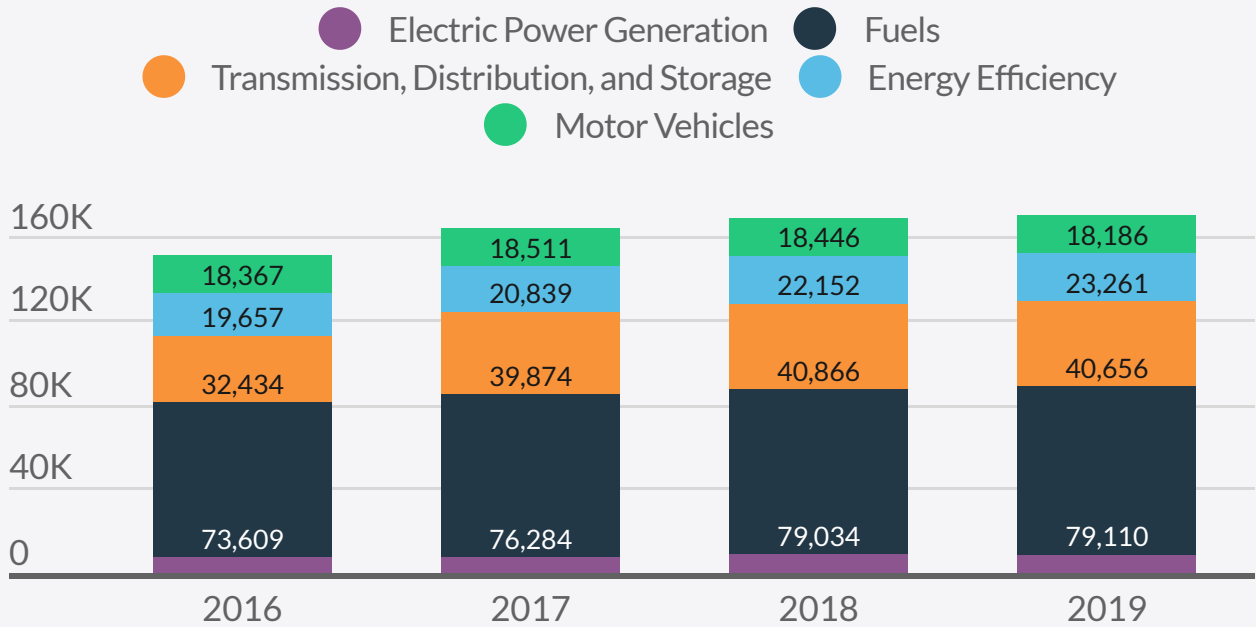
● Energy Efficiency
 ● Renewable Biomass
 ● Solar



Download data

Public investment by energy type from 2002 to 2020, according to the United States Department of Agriculture. Data includes all investments made through Department of Agriculture programs.

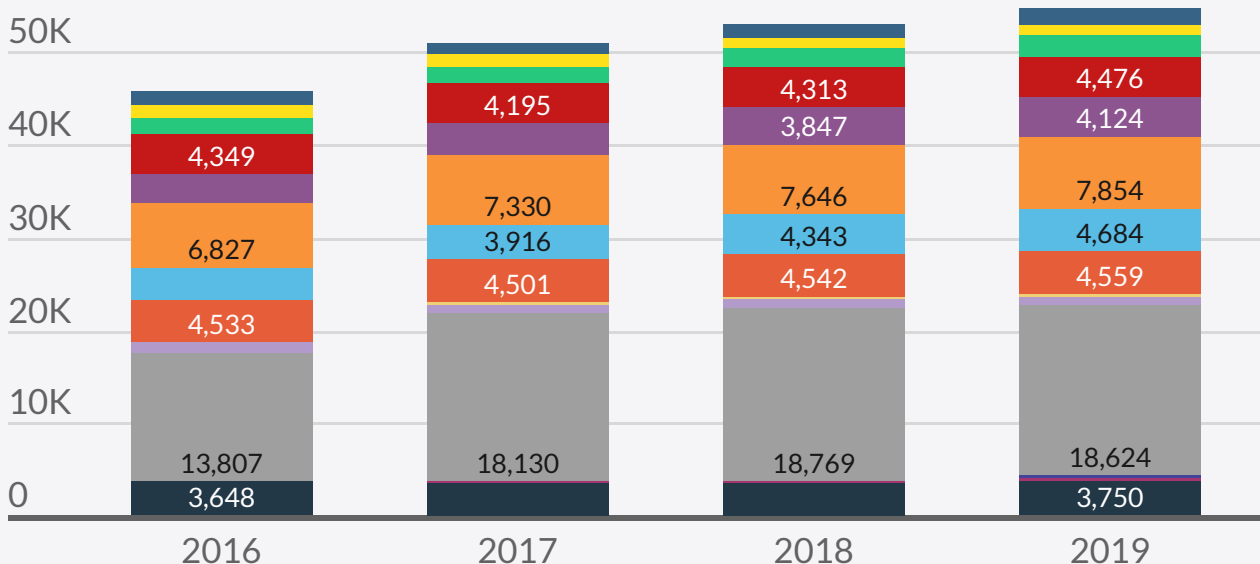
TRADITIONAL ENERGY SECTOR JOBS



[Download data](#)

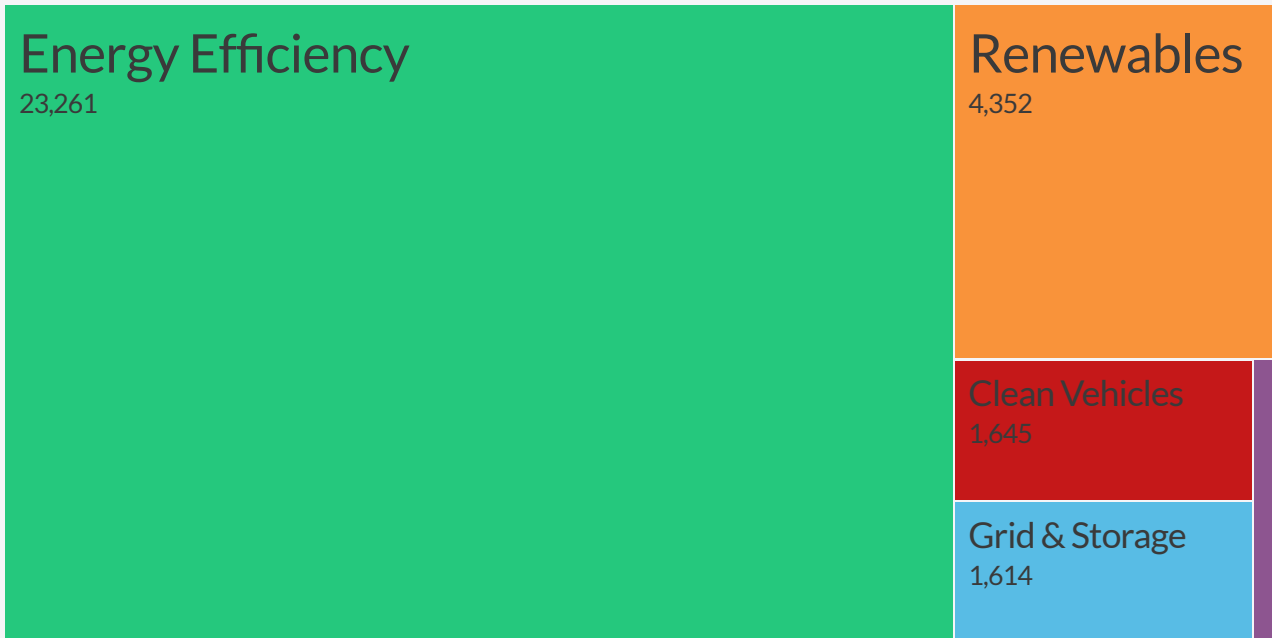
Traditional energy sector jobs over time, according the United States Energy and Employment Report (USEER).

CLEAN ENERGY JOBS BY TYPE



Clean energy jobs over time by type, according to the USEER. See Appendix for definitions and methodology.

OVERVIEW OF CLEAN ENERGY JOBS BY CATEGORY



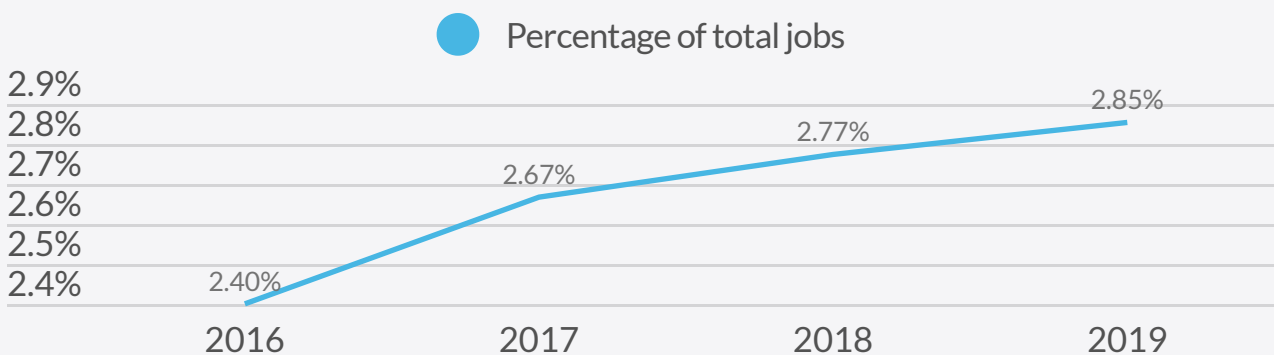
Clean energy jobs over time by technology, according to E2 Clean Jobs America.

CLEAN ENERGY COMPENSATION

Average state clean energy wage	\$20.98
Percent above/below median state wage	24.9%
#1 most difficult to hire occupation	Electrician/construction workers
#2 most difficult to hire occupation	Sales, marketing, or customer service

Clean energy jobs compensation and hiring, according to E2 Clean Jobs America and the USEER.

CLEAN ENERGY JOBS AS PERCENTAGE OF OVERALL JOBS



Clean energy jobs as a percentage of Bureau of Labor Statistics employment total numbers.

CARBON CAPTURE, UTILISATION, AND STORAGE



Although there are no state-level incentives for CCUS projects in Louisiana, the state has 61 facilities, accounting for 75 percent of all emissions, which qualify for the national 45Q tax credit. In 2009, the state passed the Geologic Sequestration of Carbon Dioxide Act, which created a regulatory system for injection, storage, management and monitoring of CO₂. The state is at the forefront of this technology and has lobbied the EPA for primacy, which would allow the state to permit CCUS facilities themselves, thereby expediting the process. Louisiana's existing pipeline infrastructure, dense industrial corridor and trained workforce make it especially well-suited to the development of CCUS. As infrastructure in neighboring states, including Texas, comes online, the potential for CCUS in Louisiana will continue to increase.

Key Players: Department of Natural Resources, Gulf Coast Sequestration, Lake Charles Methanol LLC

GREEN CONSULTANCY



In Louisiana, there are currently 1,110 environmental consultants employed, earning an average salary of \$59,840.

Louisiana's renewable energy consultancy sector is promised moderate growth by the state's renewable energy potential of 5,887,844 GWh, driven primarily by rural utility-scale PV and offshore wind. Louisiana ranks 26th in the nation for renewable energy potential.

Key proposed projects in the state include 3 small solar PV facilities proposed by Iris Solar, LA3 West Baton Rouge, St. James Solar, along with a conventional hydroelectric installation to be run by Rye Development.

Given the moderate policies and technical potential of the state, Climate Advisers expects growth in Louisiana's green consulting sector to be around the national average of 11 percent (2016 to 2026).

OFFSHORE WIND



While the federal waters off the coast of Louisiana in the Gulf of Mexico present ample opportunities for offshore wind development, Louisiana's offshore wind industry has progressed at a slow pace. The Bureau of Ocean Management (BOEM) and the National Renewable Energy Laboratory (NREL) have identified several development challenges Louisiana must overcome to realize the full offshore wind potential. Firstly, because the Gulf is in "Hurricane Alley," offshore wind turbines deployed in the area must be able to withstand strong hurricane winds. Furthermore, power prices in Louisiana are low, making it difficult to justify the capital intensive construction of offshore wind turbines. In November 2020, Governor Edwards submitted a request to BOEM to establish the Intergovernmental Renewable Energy Task Force with federal, state and local officials, to explore offshore wind potential and coordinate commercial leasing proposals. The Task Force would focus on promoting aggressive offshore wind technology research and creating a business path for offshore wind development off Louisiana's coast despite the many challenges.

Key Players: LM Wind Power's Technology Center for the Americas, The Wind Coalition; Clean Energy States Alliance, Alliance for Affordable Energy; 25x25 Alliance, Bureau of Ocean and Energy Management (BOEM)

WASTE TO ENERGY



Biogas: Louisiana is ranked 38th for biogas production potential with an estimated 6.46 billion cubic feet of renewable methane per year. The highest potential is in wastewater (77 systems), food waste (29 systems), landfill (16 systems) and manure (1 system). These systems would result in a combined \$368 million in capital investments, 3,070 construction jobs and 204 permanent jobs. Furthermore, estimated emissions reductions would be equivalent to having 638 million cars fewer cars on the road. Louisiana currently operates 8 wastewater and 9 landfill biogas systems.

Transport: Louisiana offers nonrefundable income tax credits of 30 percent of the cost of qualified clean-burning motor vehicle fuel property and 10 percent of the cost of a new alternative fuel vehicle (up to \$2,500). In addition, the state requires the Louisiana Division of Administration to purchase alternative fuel vehicles.

Biomass: Electricity generated from wood and wood waste accounted for about three-fifths of Louisiana's renewable generation in 2019, although renewables made up only 4 percent of total generation. The state's 2 wood pellet manufacturing plants use wood waste and sugarcane residues to produce almost 1 million metric tonnes per year, the majority of which is exported internationally for electricity generation.

Key players: Drax Biomass

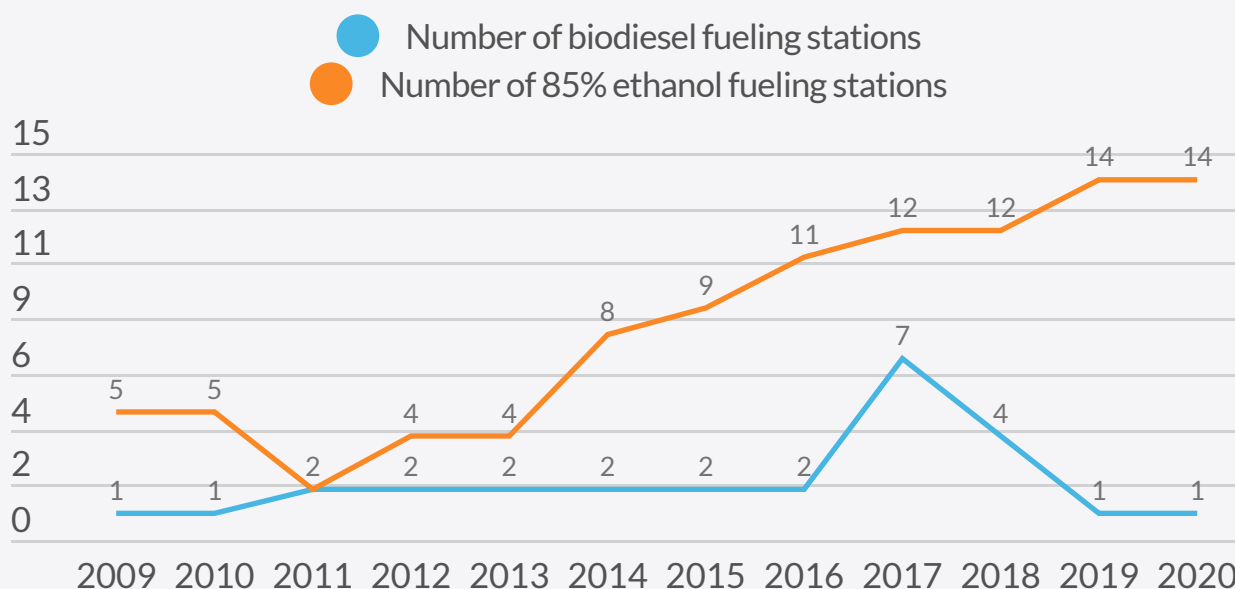
WASTE TO ENERGY: BIOMETHANE POTENTIAL

Biomethane Type	Output (Tonnes/Year)	National Rank
Methane Emissions from Landfills	47,107	13th
Biogas Generation Potential from Wastewater	38,835	22nd
Biogas Generation Potential from Industrial, Commercial and Institutional Organic Waste	16,153	25th
Biogas Generation Potential from Animal Waste	6,650	33rd

Biomethane generation potential and biomass feedstocks, according to the National Renewable Energy Laboratory's Biofuels Atlas..

WASTE TO ENERGY: BIOFUEL LAWS AND INFRASTRUCTURE

	Strength	Number	Compared to National Average
Number of biodiesel laws & incentives	Medium	5	-14%
Number of ethanol laws & incentives	Medium	4	-27%



Download data

Fueling stations and applicable laws and incentives, according to the United States Department of Energy's Alternative Fuels Data Center.

WASTE TO ENERGY: CAPACITY BY PLANT TYPE

Biopower Plant Type	Production Capacity (MW)	National rank
Landfill Gas	-	-
Municipal Solid Waste	-	-
Wood/Wood Waste Biomass	296	10th
Other Waste Biomass	14	7th
Co-Firing Biomass	140	1st

Production capacities, according to the National Renewable Energy Laboratory's Biofuels Atlas.

HYDROGEN



Louisiana has no policies regulating or incentivizing the use of hydrogen as an alternative fuel. However, hydrogen is an important part of Louisiana's economy due to its use in oil refineries. The state can produce up to 118 million cubic feet per day, mostly grey hydrogen. There is potential for green hydrogen production, and one potential major project has been announced. Grön Fuels has selected Haldor Topsoe's technology, which would combine carbon capture and storage (CCS) H2bridge hydrogen technology with the HydroFlex technology. This would allow the proposed facility to produce renewable bio-hydrogen equivalent to the production of a 1,000-MW hydrolyser plant at the company's Port of Baton Rouge location.

Key Players: Praxair, Louisiana Mid-Continent Oil & Gas Association, Grön Fuels, Haldor Topsoe

HYDROGEN PRODUCTION POTENTIAL NATIONAL RANKING



14th

Rank of hydrogen production potential in the wind sector



28th

Rank of hydrogen production potential in the solar sector



14th

Hydrogen production potential in the biomass sector



23rd

Hydrogen production potential across renewable technologies

Hydrogen potential, according to the National Renewable Energy Laboratory's Hydrogen Demand and Resource Analysis Atlas.

HYDROGEN PRODUCTION COST AND RANK BY PROCESS

Hydrogen Electrolysis Costs	USD/kg	Rank (Low to High)
Commercial	483	26th
Industrial	433	29th
Residential	467	24th

Hydrogen Steam Methane Reforming Costs	USD/kg	Rank (Low to High)
Commercial	284	24th
Industrial	259	24th
Residential	302	24th

Hydrogen costs, according to the National Renewable Energy Laboratory's Hydrogen Demand and Resource Analysis Atlas.

HYDROGEN FUELING STATION POLICY AND INFRASTRUCTURE

	Strength	Number	Compared to National Average
Number of hydrogen fuel laws & incentives	Low	0	-100%

Fueling stations over time and state laws and incentives, according to the United States Department of Energy's Alternative Fuels Data Center.

ENERGY STORAGE



Installed Capacity: Louisiana currently has very limited storage capacity. The state has 0.5 MW of battery storage at the New Orleans Solar Power Plant. This is operated by Entergy New Orleans, LLC, an electric utility.

Policies: Louisiana has demonstrated some efforts to stimulate energy storage growth. Despite the few policies and financial incentives the state has for energy storage, Louisiana has some promising energy storage projects underway. The state has an energy storage and solar systems demonstration project in Shreveport, Louisiana. The project will deploy storage technologies by SimpliPhi Power, with support from energy management systems and battery management systems by Heila Technology. The Southwestern Electric Power Co. (SWEPCO), an American Electric Power company, is supporting the demonstration project. The project has the potential to serve as a model for future decentralized energy generation and storage projects in Louisiana.

Project Pipeline: Louisiana has no projects planned.

Key Players: Entergy New Orleans

ENERGY STORAGE: POLICIES AND CAPACITY INSTALLED



0.5 MW

Capacity installed



859

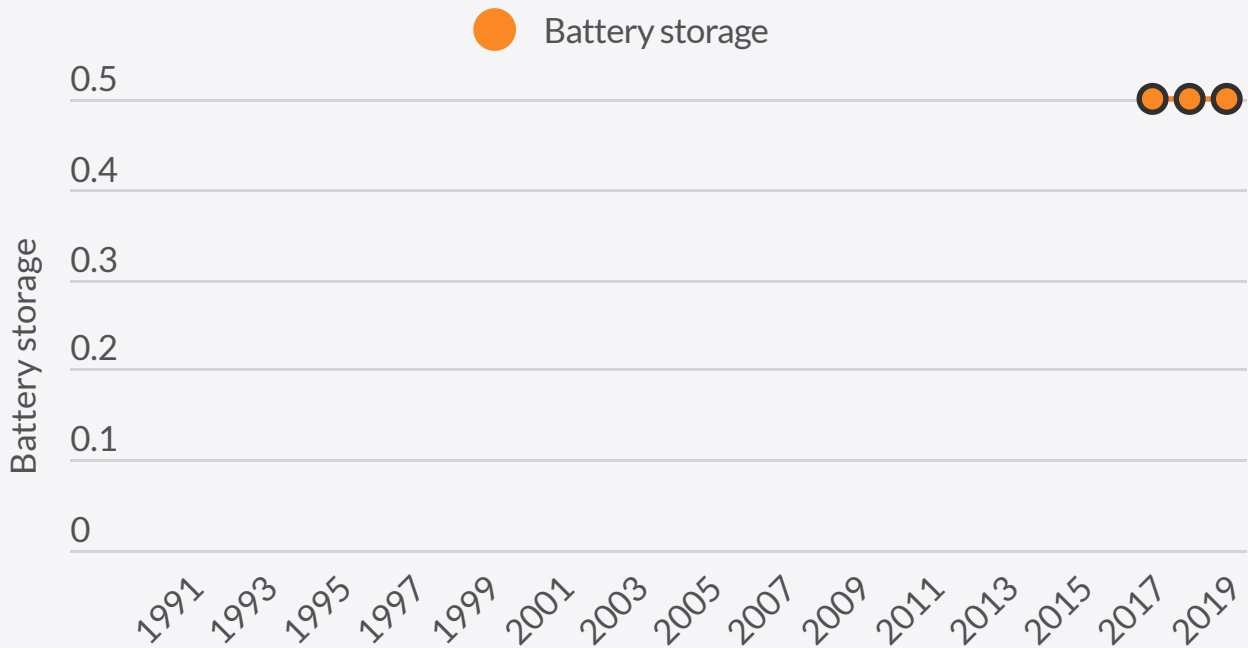
Energy storage jobs

Yes/No

Procurement Targets	No
Regulatory Requirements	No
Demonstration Programs	No
Financial Incentives	No
Consumer Protection	No

Targets, policies and incentives maintained by the Pacific Northwest National Laboratory through the United States Department of Energy. Capacity installed sourced from EIA and jobs from USEER.

LOUISIANA CURRENT ENERGY STORAGE CAPACITY

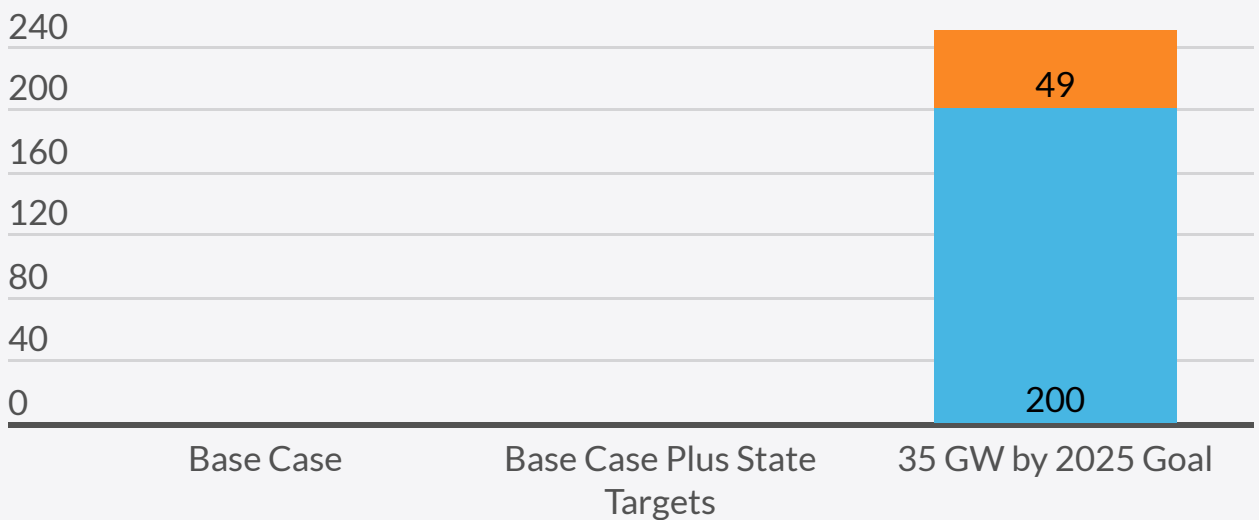


 [Download data](#)

Energy storage generation capacity over time available through the Energy Information Administration.

PROJECTED ENERGY STORAGE FTE ADDITIONS (2021-2025)

● Battery Construction
 ● Battery O&M
 ● Battery Manufacturing
 ● Pumped Hydro Storage



Methodology: Battery construction, battery O&M, and Pumped Hydro Storage jobs per MW rates based on historical data and Navigant estimates through 2025; manufacturing based on NAICS 335911 with manual adjustments. Base case capacity forecasts from the EIA pipeline; base case plus state targets includes announced state targets and the 35 GW by 2025 goal is based on an Energy Storage Association vision report. Additional information available in the Appendix.

ELECTRIC VEHICLES



Louisiana is unranked according to the ACEEE EV Scorecard, indicating the state's very low level of progress on EV policies, practices and investments. Although state's Vehicle Emissions Reduction and Electric Vehicle Supply Equipment (EVSE) Project Funding provides funds for a portion of the cost of an EV and associated charging infrastructure – up to 80 percent for government and up to 75 percent for non-government – the state's Alternative Fuel Vehicle (AFV) and Fueling Infrastructure Tax Credit precludes EVs. EVs accounted for 0.28 percent of vehicle sales in Louisiana in 2018. There are 1,110 EVs and a total of 362 charging stations in the state. Looking forward, there are no currently planned policies and/or projects on the horizon, which indicates that the potential for EVs in Louisiana will likely remain unchanged in the short term.

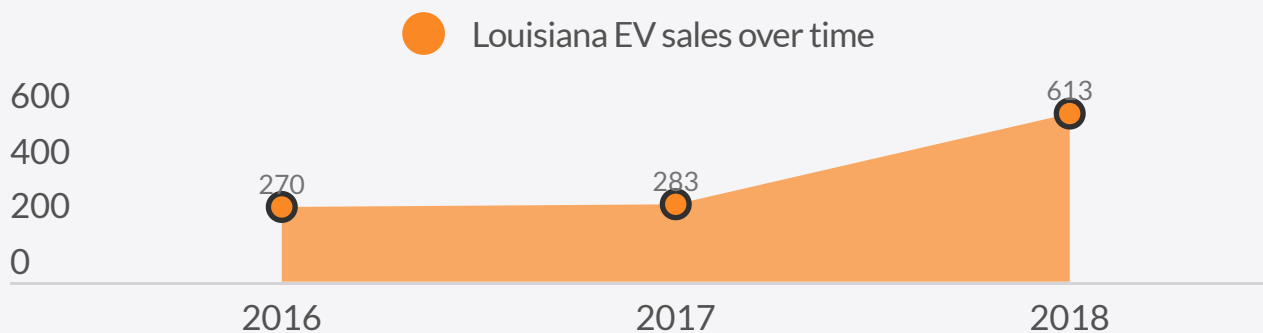
Key players: Southwestern Electric Power Company, Entergy, Cleco

ELECTRIC VEHICLE FACTS AND FIGURES

National rank based on EV sales	41
Percentage of national EV sales	0.2%
Market share within state	0.3%
Market share within state (year over year growth)	87%
EV sales as a percentage of motor vehicle sales	0.2%
Number of people per charging station	41,091
Number of people per charging station (rank)	48
EV Fuel Cost per eGallon (2018)	\$0.87
EV Fuel Cost per eGallon (% above/below national average)	-31%
Fuel cost savings per gallon versus gasoline	\$1.70
Most popular EV (search volume)	BMW i8

Electric vehicle quick facts based on data from EVAdoption.

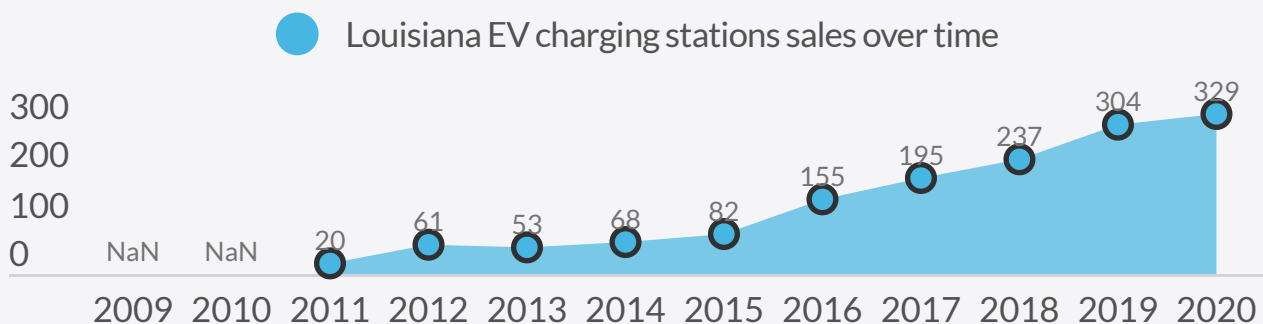
ELECTRIC VEHICLE SALES OVER TIME



[Download data](#)

Electric vehicle sales over time, according to EVAdoption.

ELECTRIC VEHICLE CHARGING STATIONS OVER TIME



[Download data](#)

Charging stations over time, according to the United States Department of Energy's Alternative Fuels Data Center.

ELECTRIC VEHICLE LAWS AND INCENTIVES

	Strength	Number	Compared to National Average
Number of EV laws & incentives	Low	5	-66%
Number of HEV laws & incentives	Medium	1	-51%
Number of PHEV laws & incentives	Low	4	-70%
Number of NEV laws & incentives	Medium	1	-4%
Number of fuel economy/efficiency laws & incentives	Medium	1	-14%

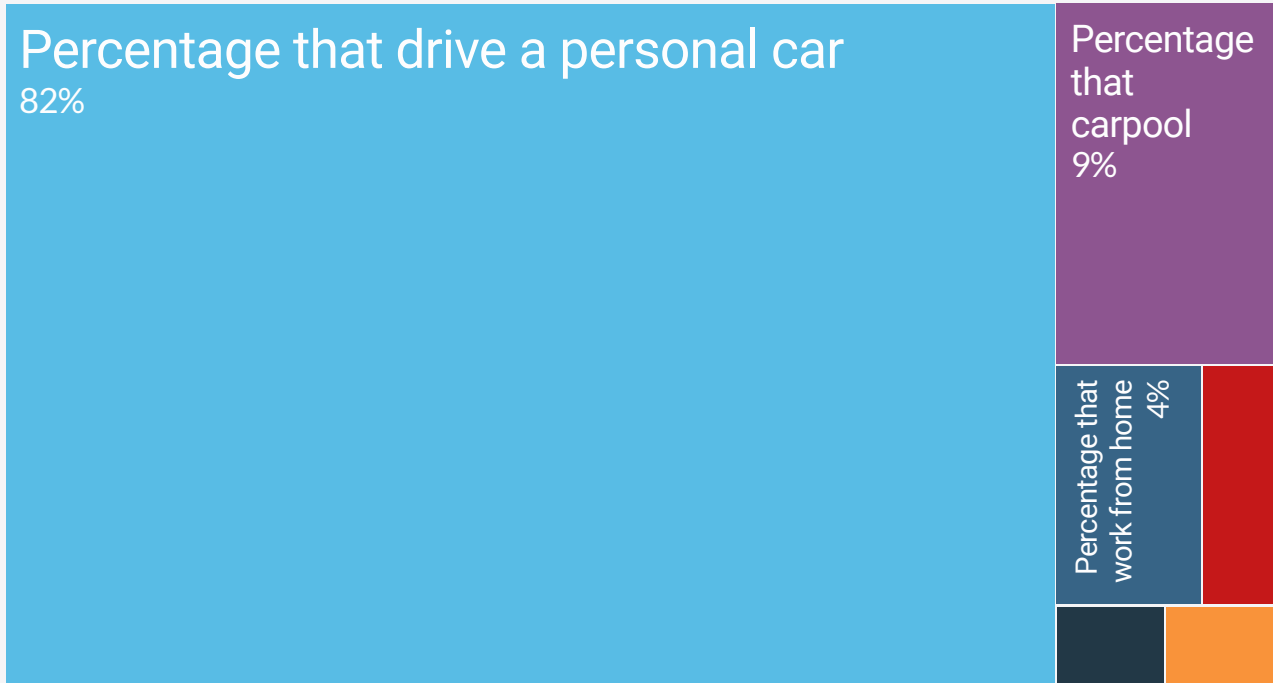
Quantity of state laws and incentives on electric vehicles, in comparison to national average, according to the Alternative Fuels Data Center.

PROFILE OF A LOUISIANA COMMUTER

Percentage that drive a personal car
82%

Percentage that carpool
9%

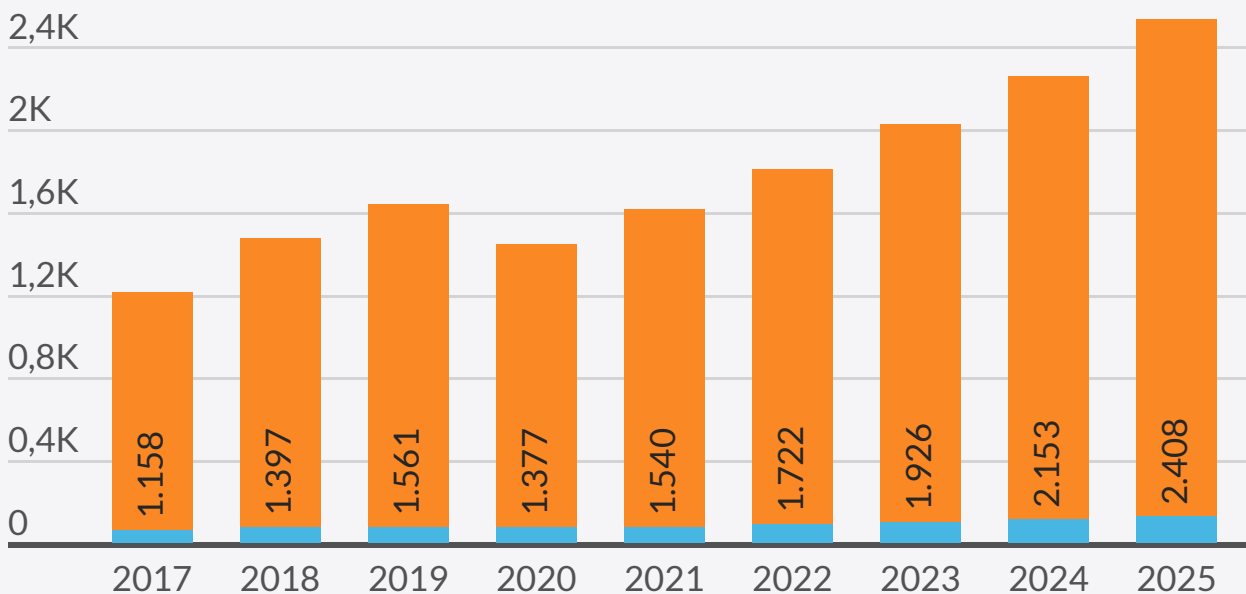
Percentage that work from home
4%



State commuter dynamics, according to the United States Department of Commerce, Bureau of Census.

PROJECTED CLEAN VEHICLE JOBS (2020-2025)

● Manufacturing & Components ● Non-Manufacturing



Methodology: Percentage of manufacturing jobs by state (NAICS codes 3361,3362,3363) of total motor vehicle jobs was applied to total clean vehicle jobs by state (E2) to determine the break down. Forecast based on projected clean vehicles miles travelled. More detail in the Appendix.

GRID MODERNISATION

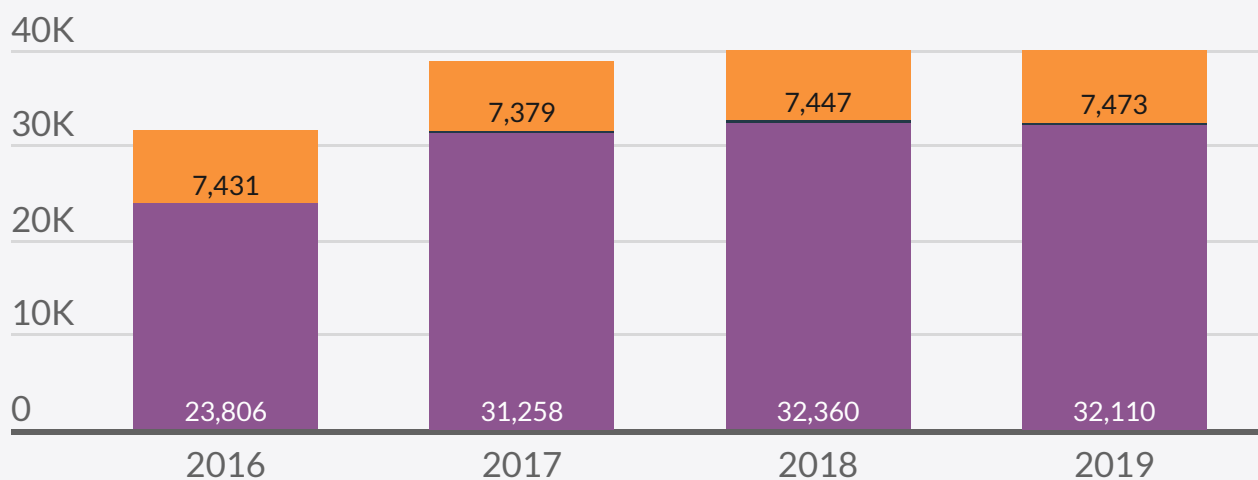


Louisiana ranks 32nd in the 2018 Grid Modernization Index, based on state policy support, customer engagement and degree of grid operations investment. The state is one of eight without a comprehensive energy plan, and the LA Public Service Commission has yet to formally consider adopting customer data access policies. Only 35 percent of customers use smart meters in Louisiana, below the 60 percent nationwide average. Despite the state's limited action, Entergy – the state's largest utility – plans to invest more than \$4 billion through 2021 to modernize the state's electricity infrastructure. In 2020, 20 bills relating to energy infrastructure and regulations were introduced, of which 4 were enacted and 1 was vetoed. With regards to demand response, Louisiana enrolls 1,152 customers, helping save 13 MWh. As it stands, Climate Advisers anticipates below-average growth in this sector, primarily due to the weak policy environment in Louisiana.

Key Players: Entergy Louisiana, Southwestern Electric Power Company, Cleco Power, MISO, Louisiana Public Service Commission, Alliance for Affordable Energy

GRID JOBS BY CATEGORY OVER TIME

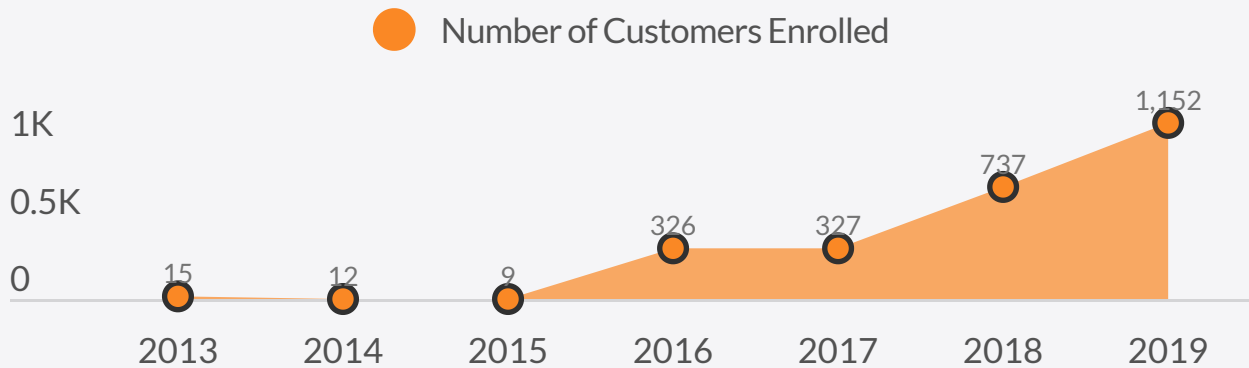
- Electric Power Transmission and Distribution
- Smart Grid
- Micro Grid & Other (including commodity flows)



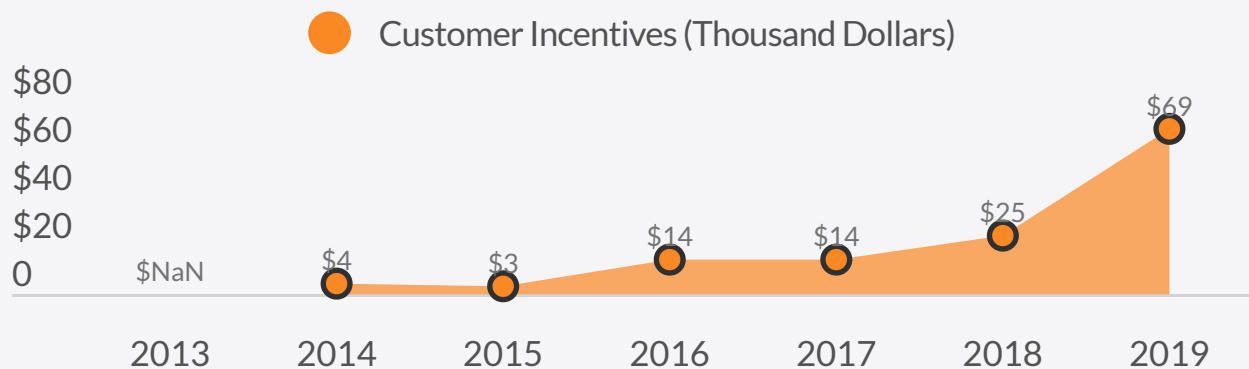
 [Download data](#)

Categories of grid-related jobs, according to the United States Energy and Employment Report.

DEMAND RESPONSE ENROLLMENT AND INCENTIVES



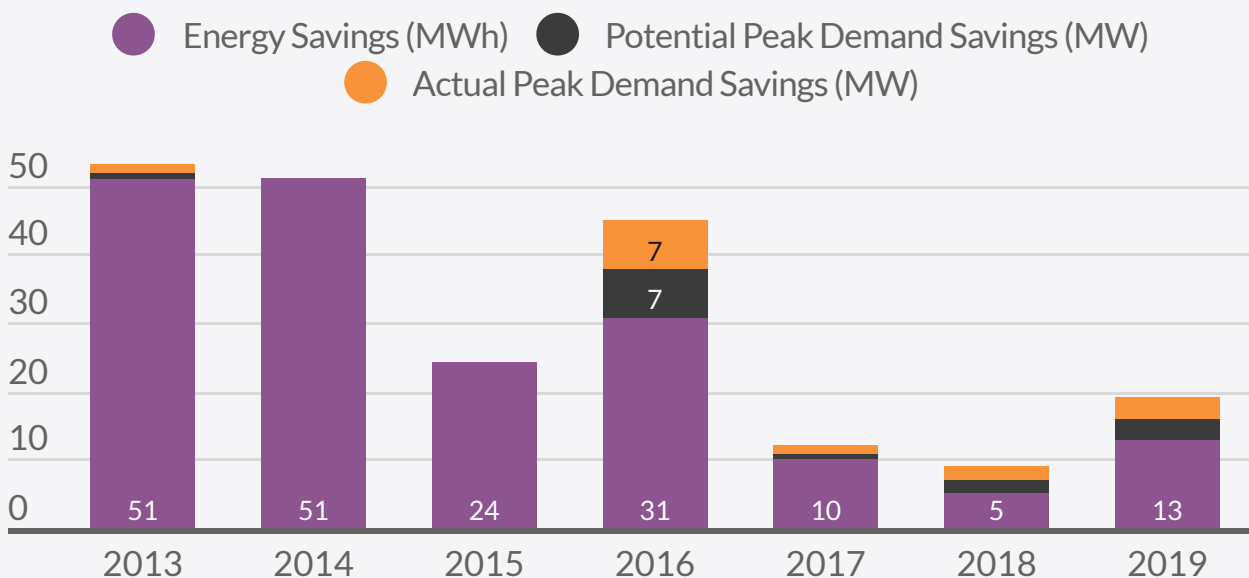
Download data



Download data

Enrollment and incentive data sourced from the Energy Information Administration.

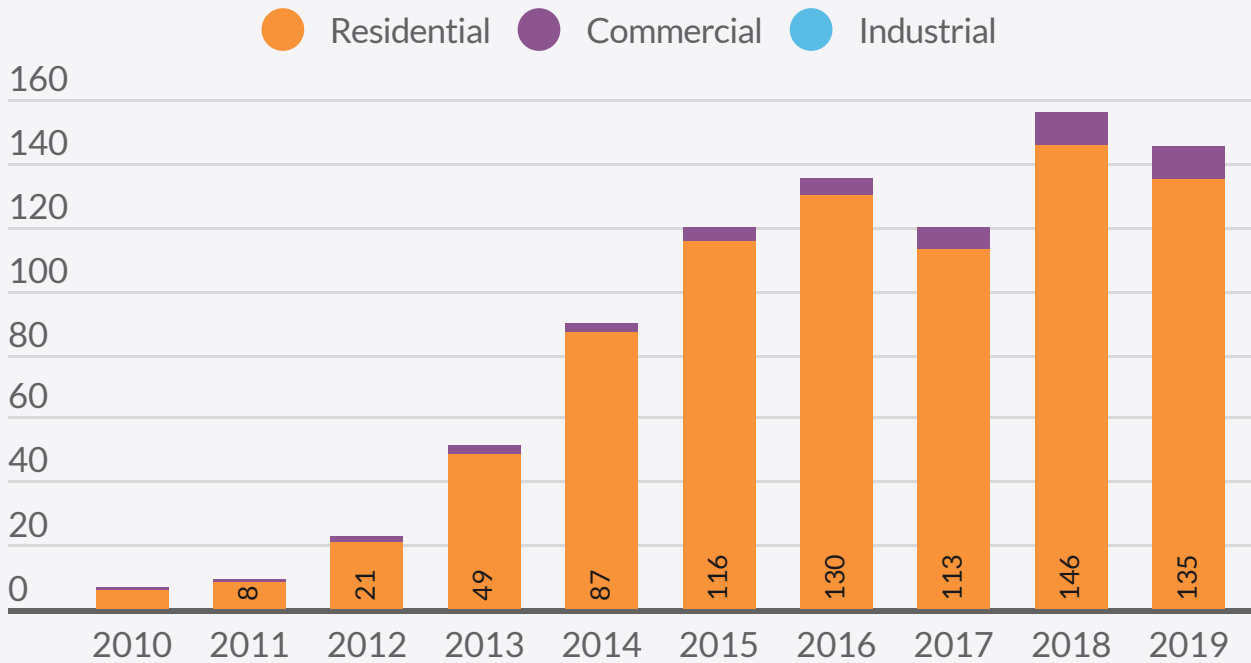
DEMAND RESPONSE ENERGY SAVINGS OVER TIME



Download data

Demand response savings data sourced from the Energy Information Administration.

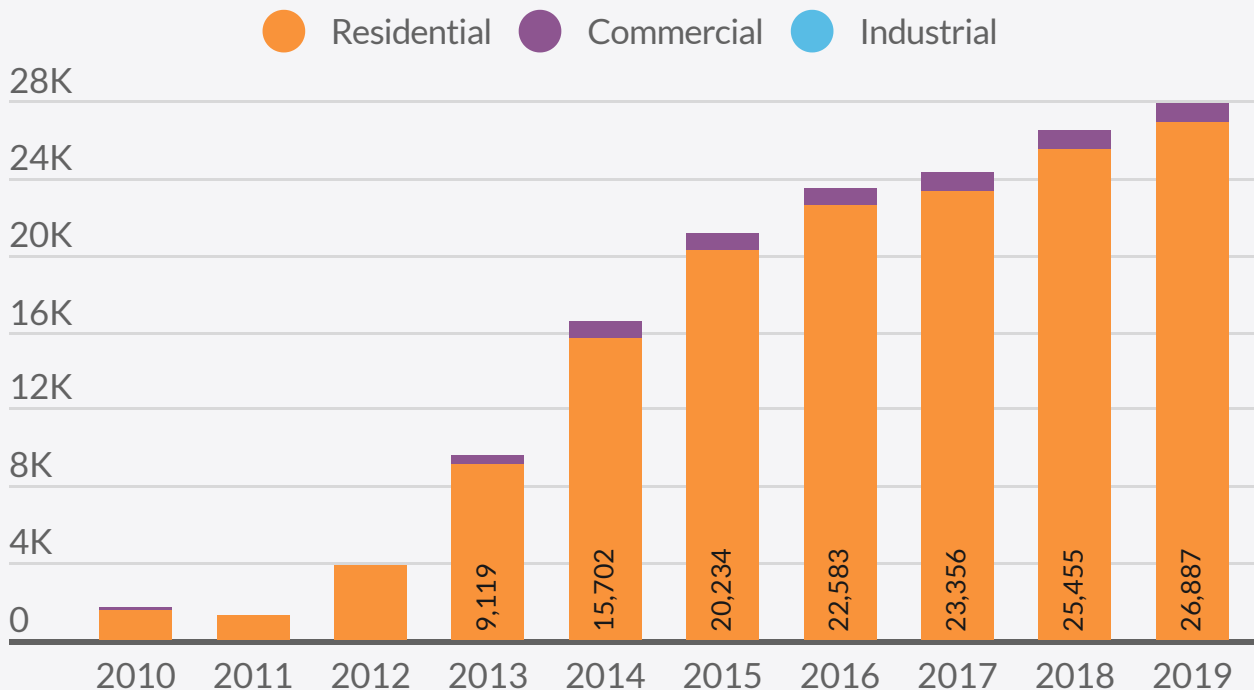
DISTRIBUTED GENERATION: NET METERING CAPACITY



 [Download data](#)

Net metering capacity over time sourced from the Energy Information Administration.

DISTRIBUTED GENERATION: NET METERING CUSTOMERS



 [Download data](#)

Number of net metering customers sourced from the Energy Information Administration.

ENERGY EFFICIENCY



Louisiana is ranked 45th on ACEEE's 2020 State Energy Efficiency Scorecard, reflecting the state's limited efforts to improve energy efficiency. The state has 26 financial incentives for energy efficiency, including an Energy Fund Loan Program that provides low-interest loans for energy efficiency projects in schools and public facilities. The state also has several energy efficiency laws in place, including Senate Bill 240 signed in July 2007, which requires energy efficiency and conservation measures to be incorporated in the construction and renovation of major state-funded facilities. There are currently no mandatory building energy disclosure policies in place.

Key Players: Entergy Louisiana, Entergy New Orleans, Cleco Powers, AEP Southwestern Electric Company (SWEPCO), Southeast Energy Efficiency Alliance (SEEA), Alliance for Affordable Energy

ENERGY EFFICIENCY RANKINGS BY CATEGORY



45

Energy Efficiency Rank



46

Utilities Rank



37

Government Rank



33

Transportation Rank



47

Buildings Rank

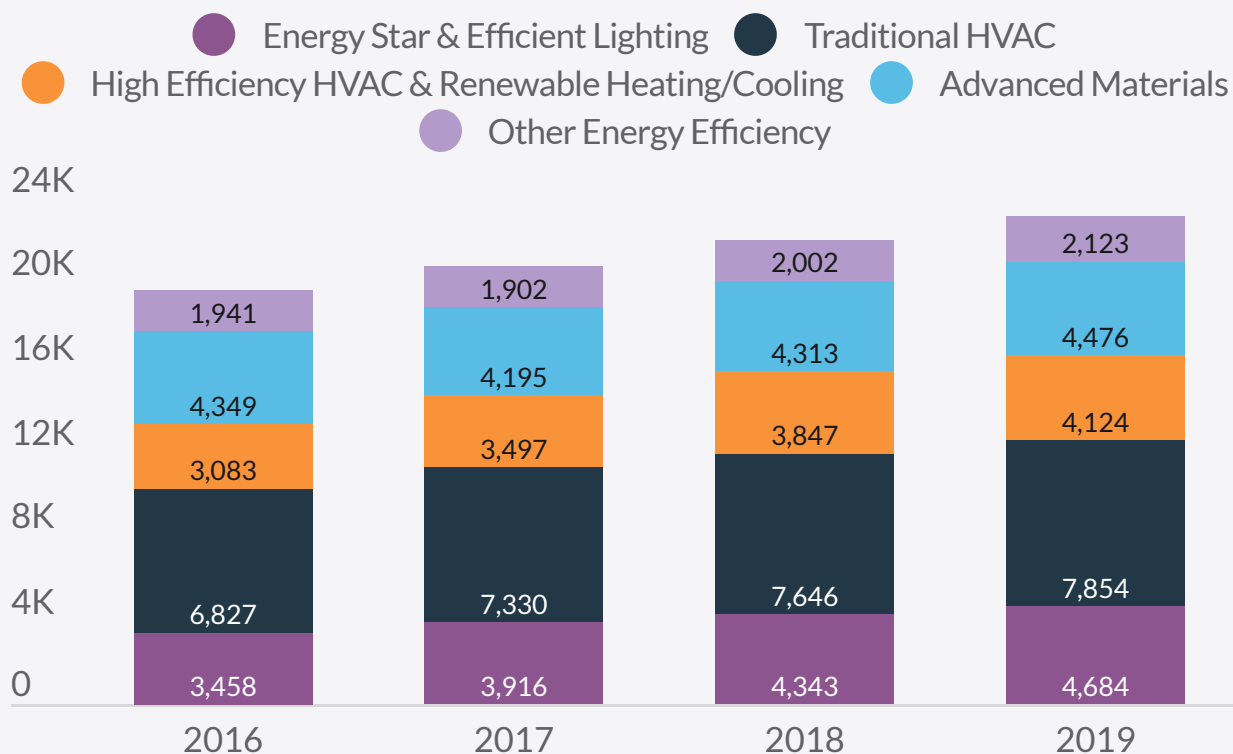


8

Appliances Rank

Each component of energy efficiency was evaluated by state by the American Council for an Energy-Efficient Economy, which is the basis for these national rankings. The ACEEE monitors state policies and programs, which feed into an assessment of 32 energy efficiency metrics.

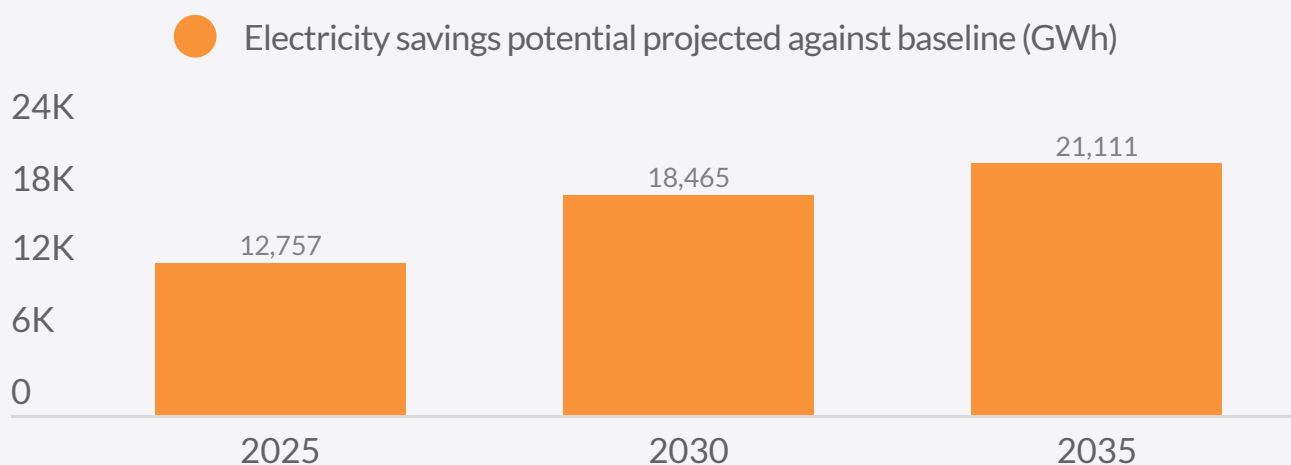
ENERGY EFFICIENCY JOBS BY CATEGORY



[Download data](#)

Categories of energy efficiency jobs, according to the United States Energy and Employment Report.

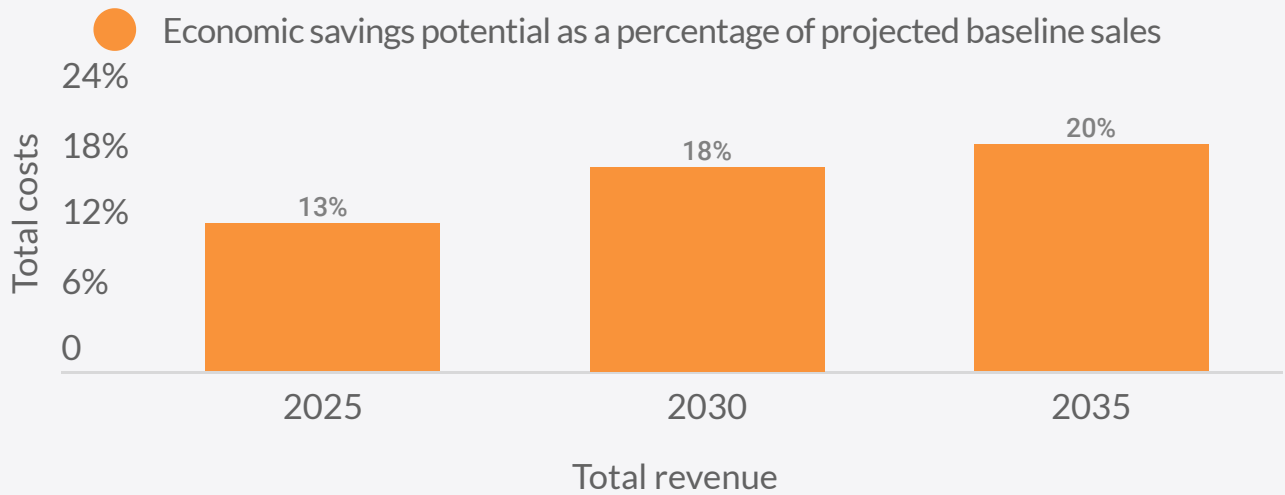
ENERGY EFFICIENCY ELECTRICITY SAVINGS POTENTIAL PROJECTED AGAINST BASELINE



[Download data](#)

Electricity savings projected by the the United States Office of Energy Efficiency and Renewable Energy.

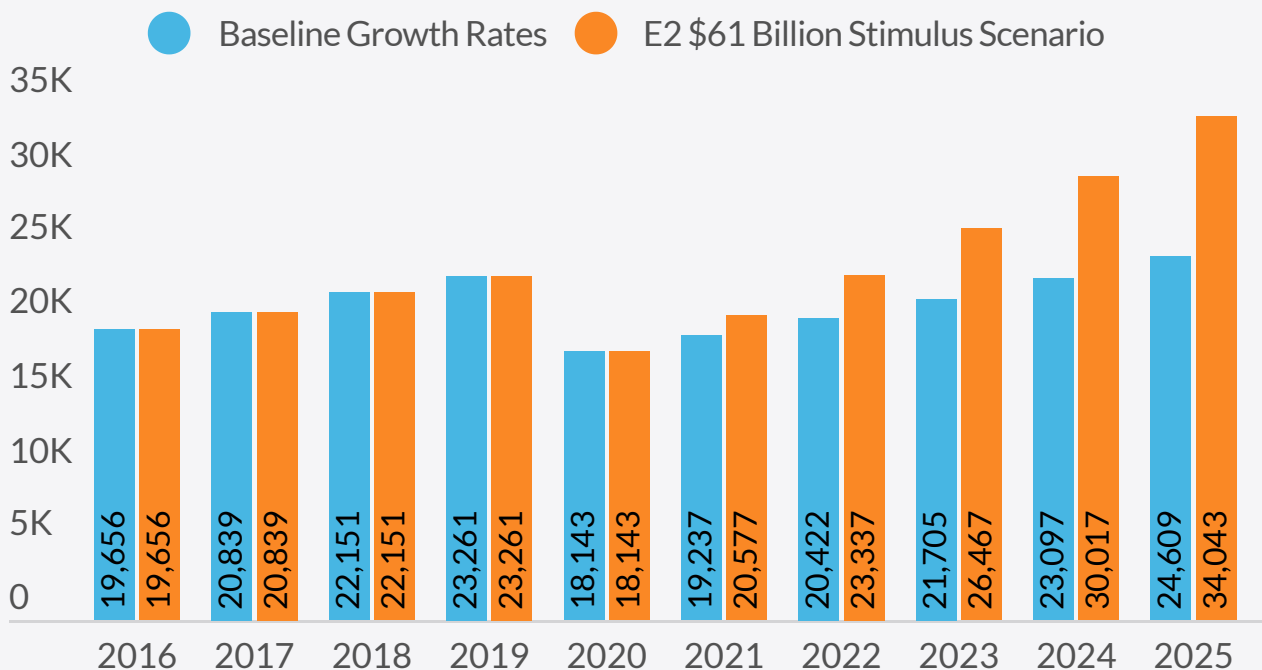
ENERGY EFFICIENCY ECONOMIC SAVINGS POTENTIAL AS A PERCENTAGE OF BASELINE SALES



 [Download data](#)

Electricity savings projected by the the United States Office of Energy Efficiency and Renewable Energy.

PROJECTED ENERGY EFFICIENCY EMPLOYMENT



Methodology: US Energy & Employment actuals for ENERGY STAR and efficient lighting, traditional HVAC, high efficiency HVAC and renewable heating and cooling, advanced materials and other energy efficiency. Current growth rates use historic compound annual growth rate, while the E2 \$61 Billion stimulus scenario uses growth rates based on projected impacts of a federal stimulus bill. Both cases adjust for COVID-19 job loss actuals in 2020. Additional detail in the Appendix.