Oklahoma's Evolving Energy Landscape

by: and Courtney Shupert

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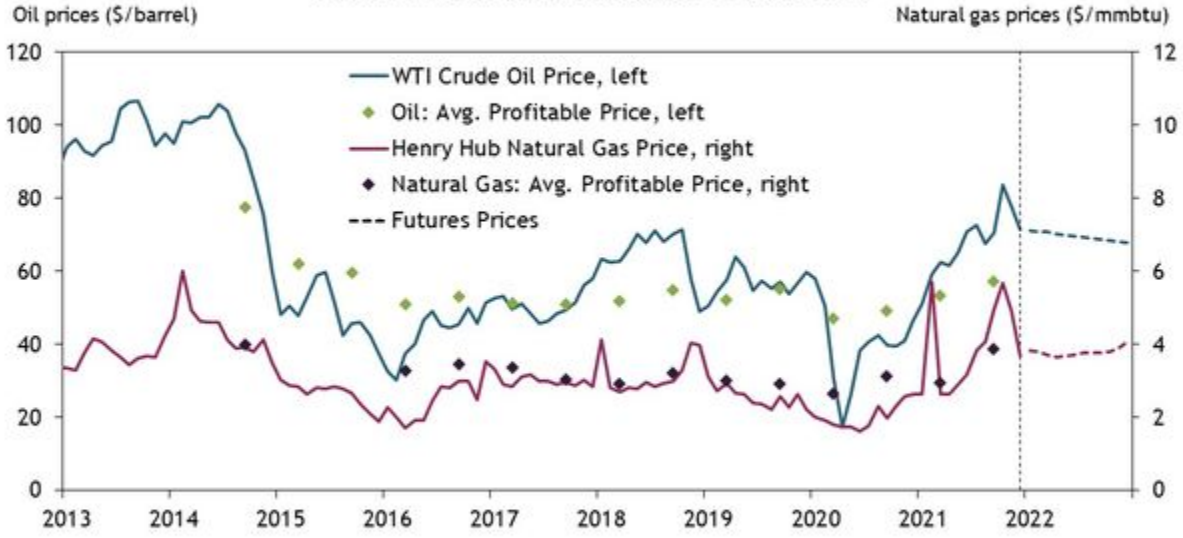
This edition of the Oklahoma Economist investigates recent trends and the longer-term evolution of the state's energy sector.

Oklahoma is known as an energy state. Its natural resources—including oil and gas reservoirs and winds "sweeping down the plains"—make it a unique energy producer.[1] This edition of the *Oklahoma Economist* investigates recent trends and the longer-term evolution of the state's energy sector. In 2020, the pandemic-induced collapse in oil prices led to less oil and gas drilling, production, and jobs, and tighter fiscal discipline among exploration and production (E&P) firms. While the sector rebounded considerably in 2021, employment has lagged as firms have continued to become more efficient. Meanwhile, renewable energy in the state has steadily grown and will continue to make up a larger portion of Oklahoma's energy landscape.

Oil and Gas Sector Update and Outlook

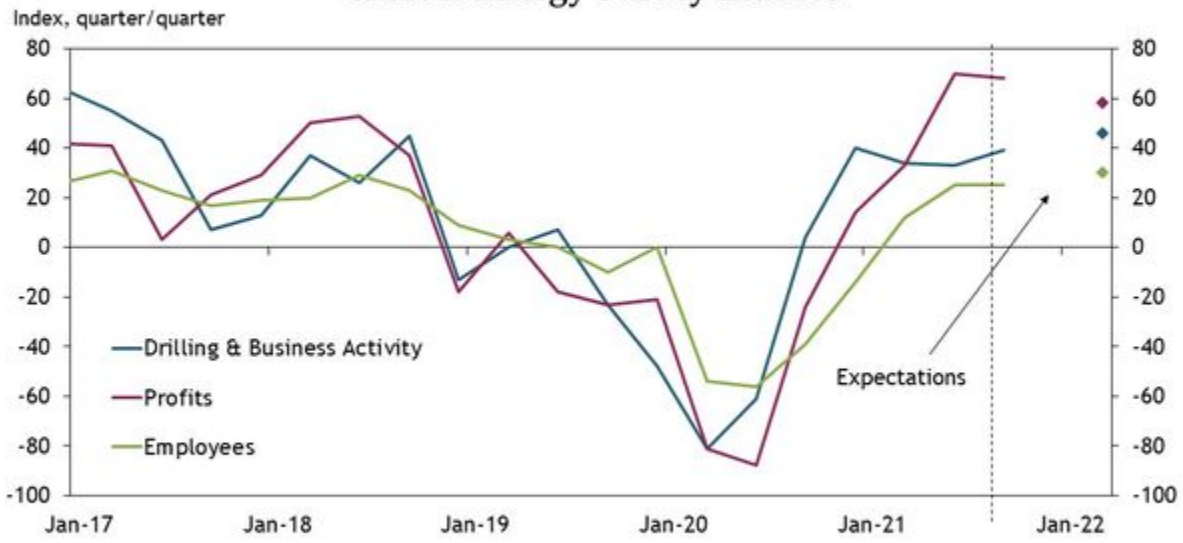
Oil prices fell sharply in early 2020 with the onset of COVID-19 and, despite recovering somewhat in the summer, remained below profitable levels through year-end (Chart 1). Natural gas prices also steadily declined in the first half of 2020 and likewise remained unprofitable for the rest of the year. This led to a major curtailment in energy companies' business activity, profits, and employment last year, as evidenced by indexes in the Kansas City Fed's quarterly energy survey (Chart 2).

Chart 1: Oil and Natural Gas Prices



Sources: EIA/Haver Analytics, FRBKC Surveys, YahooFinance

Chart 2: Energy Survey Indexes

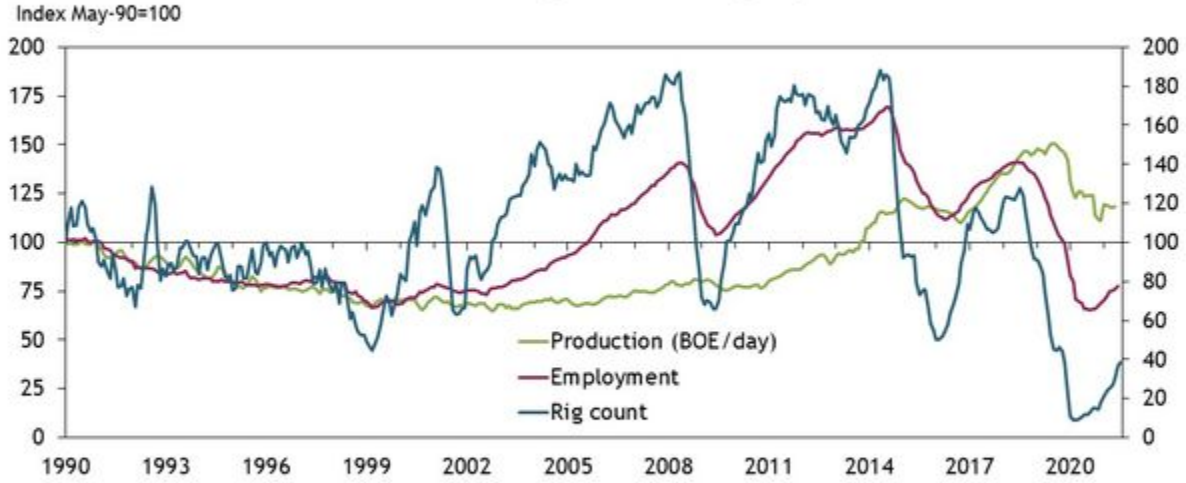


Sources: EIA/Haver Analytics, FRBKC Surveys

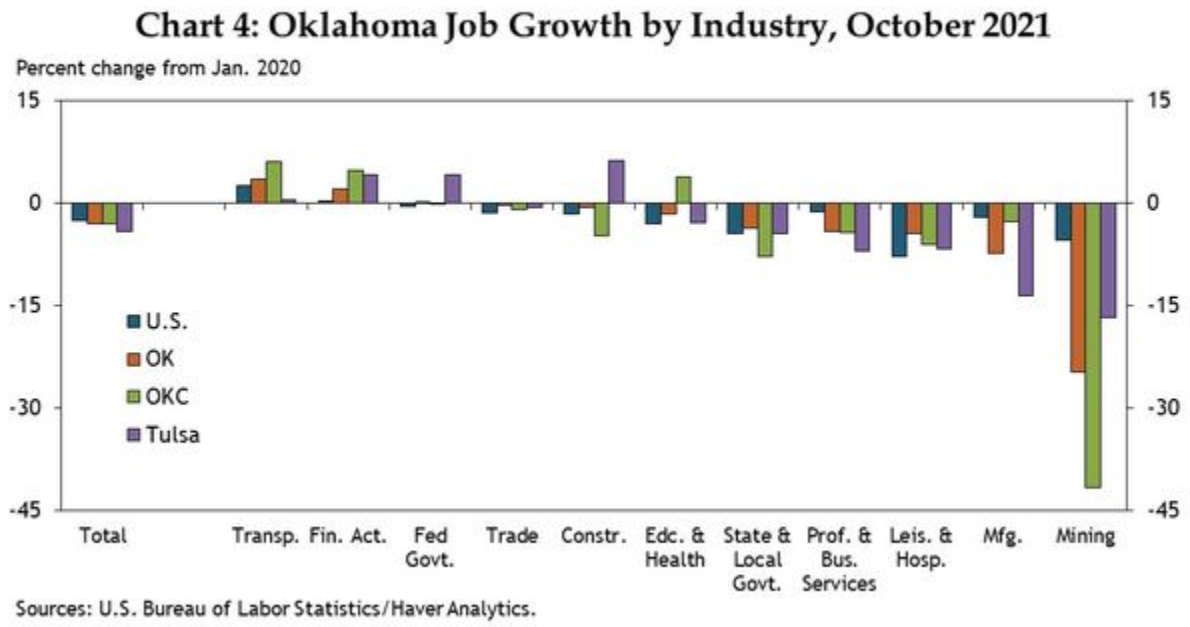
But with greater availability of COVID-19 vaccines and a rapidly recovering economy in 2021, oil and gas prices surged, reaching their highest level in seven years this fall before retrenching slightly in recent months. Firms subsequently increased drilling and employment during the year, though profits increased by even more as companies remained cautious about the long-term outlook and were constrained by investors from expanding too rapidly. As 2021 comes to a close, firms anticipate continued moderate increases in activity through the first half of 2022.

The rebound in Oklahoma oil and gas activity in 2021, however, has not been enough to raise production or employment back to pre-pandemic levels. Indeed, oil and gas production in the state remains about 20% below its all-time peak reached in early 2020 (Chart 3). And employment in the mining sector (consisting almost completely of oil and gas in Oklahoma) remains nearly 25% below early 2020 levels, much more than any other sector of the state's economy (Chart 4). Oklahoma oil and gas jobs were also already declining during 2019, as firm profitability was squeezed even before COVID-19, and are down over 40% from early 2019 highs. Oil and gas jobs remain especially weak in the Oklahoma City metro area.

Chart 3: Oklahoma Oil & Gas Rig Count, Employment, and Production

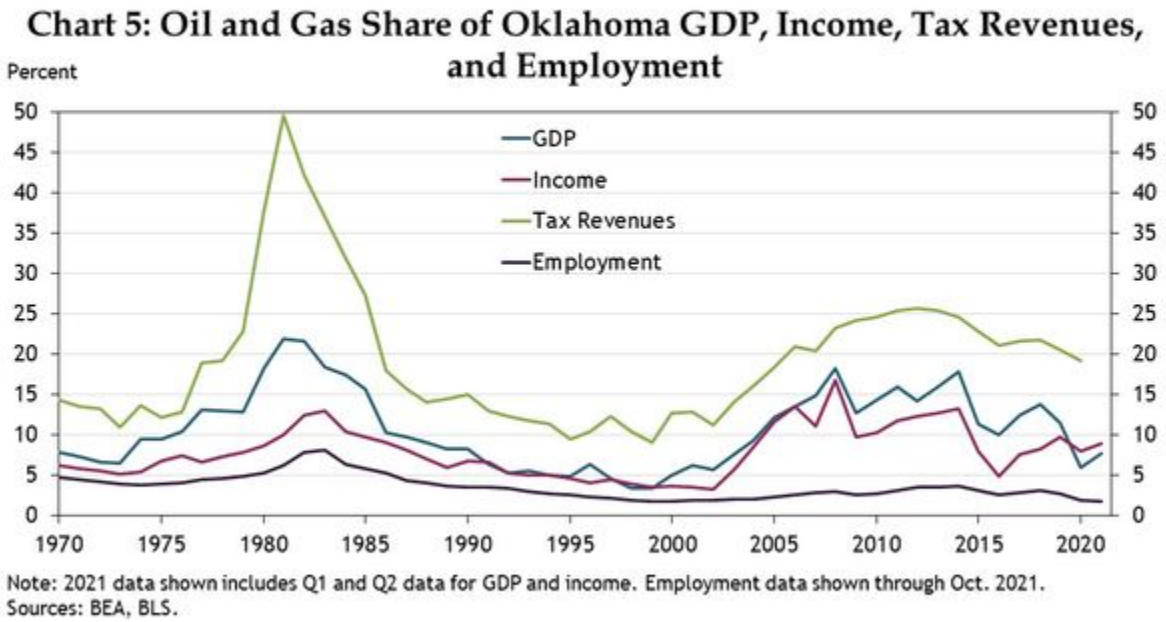


Note: Employment is for total mining and logging, which in Oklahoma is almost completely oil and gas related.
Production is shown as a 3-month moving average.
Sources: Baker Hughes, U.S. Bureau of Labor Statistics, EIA/Haver Analytics.



Recent history suggests that Oklahoma oil and gas employment may have a difficult time returning to pre-pandemic levels. For about the past decade, firms have been able to increasingly produce more oil with fewer employees, driven by technological and other efficiency gains. Past industries that experienced a doubling of labor productivity over a short time—as oil and gas did from about 2012 to 2017—never returned to their prior levels of employment.

Still, even with fewer people employed in the sector in recent years, oil and gas remains a much more important sector in Oklahoma than in almost any other state. As of mid-2021, the sector accounted for over 7% of the state's gross domestic product (GDP) and nearly 9% of personal income (Chart 5). Nationally, mining makes up only 1.1% of both GDP and personal income. In addition, oil and gas still accounts for nearly 20% of Oklahoma tax revenues, keeping it of high interest to state policymakers.[2]



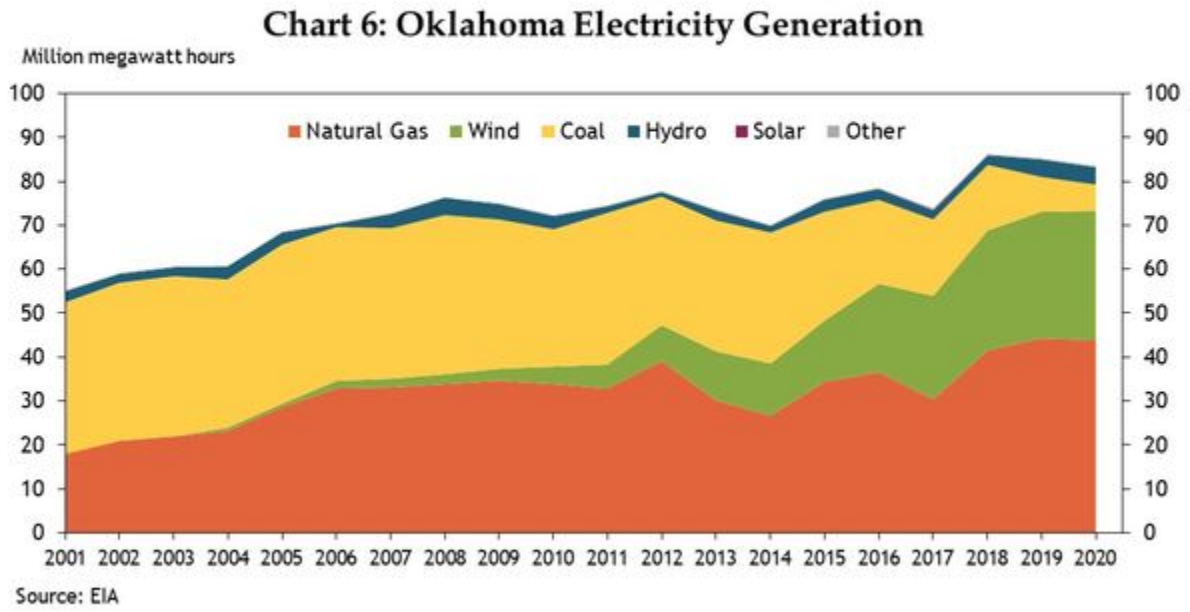
The outlook for U.S. oil and gas production also remains positive for coming years, as the nation and world continue to recover from the COVID-19 pandemic. Recent forecasts by both the U.S. Energy Information Administration and the International Energy Agency attest to that.[3] Forecasts presented at the 6th Annual Joint Energy Conference of the Kansas City and Dallas Feds, on Nov. 5, 2021, also projected strong continued demand for oil and gas in coming years. Alongside this fossil fuel demand, though, were forecasts for even stronger growth in renewable energy production in the years ahead.

Renewable Energy Update and Outlook

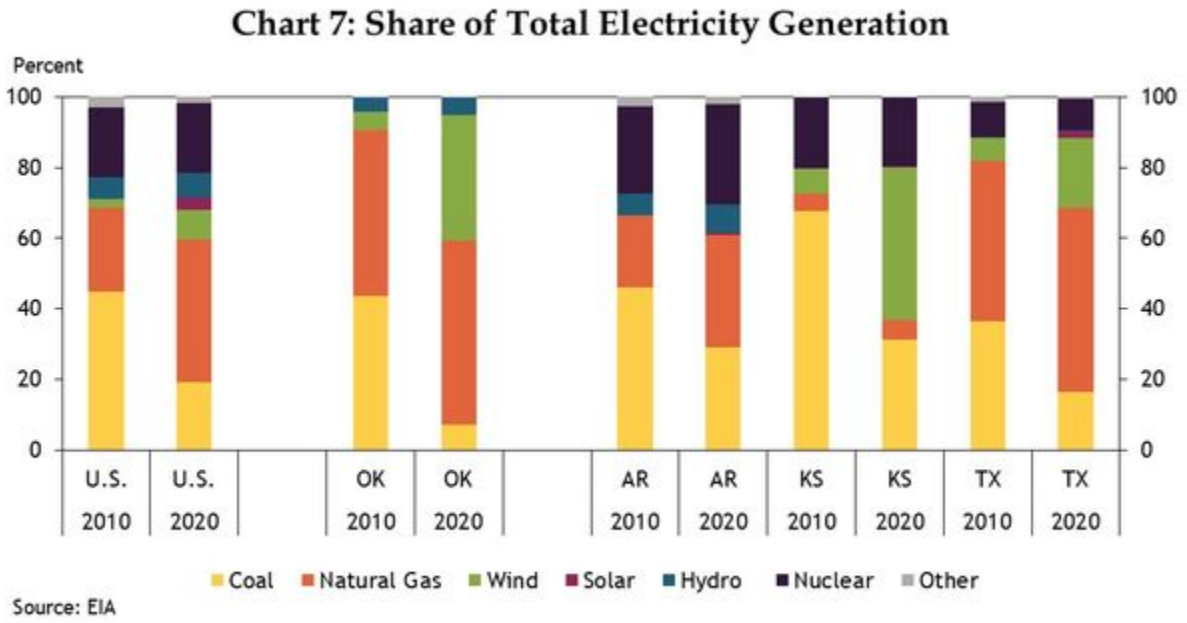
Fueled by a desire for less carbon emissions in the atmosphere, renewable energy has grown in both interest and demand in recent years. To date, renewable energy is primarily used in electricity generation, in combination with fossil fuels like coal and natural gas. Unlike fossil fuels, wind, solar, and other renewable sources do not emit carbon dioxide. Emissions also vary across fossil fuels, creating differing levels of demand among them as states and firms seek to meet reduced emission goals. For example, coal and petroleum both emit over twice as many kilograms of CO2 per million British thermal units as does natural gas.[4]

Demand for electricity in the nation continues to grow—and seems likely to grow further as products such as electric vehicles gain acceptance. Total electricity generation in Oklahoma has increased by over 50% in the past 20 years, from 55.2 million megawatt-hours in 2001 to 83.6 million megawatt-hours in 2020 (Chart 6). To date, this increase has been driven almost completely by a combination of steady increases in natural gas and exponential growth in wind energy. Wind energy had no

presence in Oklahoma electricity generation in the early 2000s but now accounts for over 35% of the total. Natural gas and wind have steadily displaced coal as a generation source for the state in recent decades.

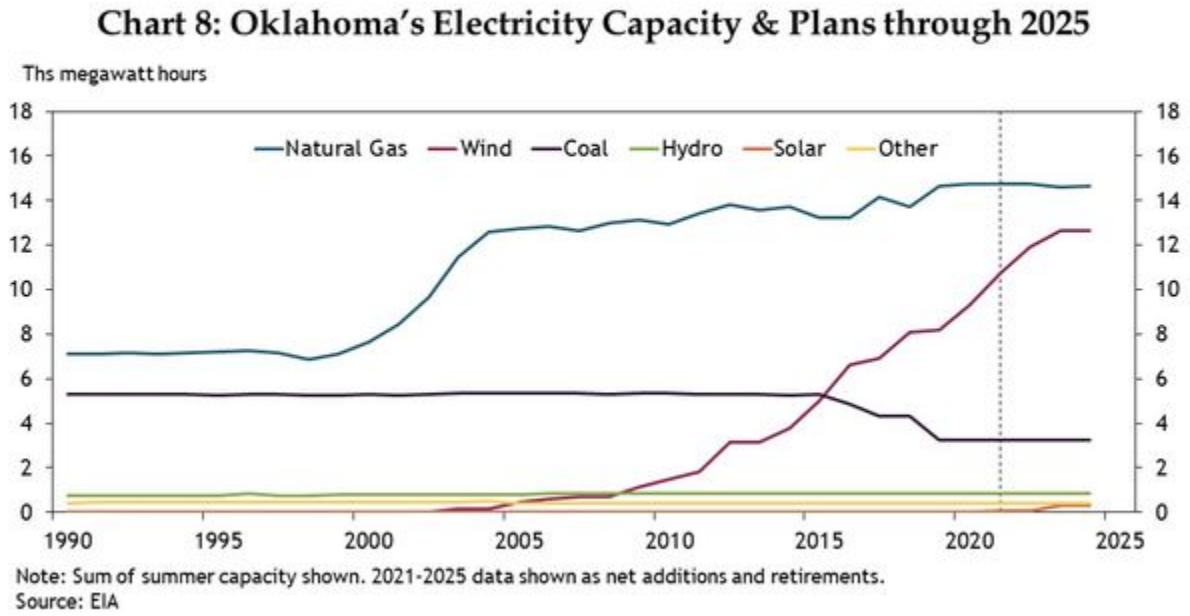


Compared with the U.S., both wind and natural gas play a more significant role in Oklahoma's electricity generation (Chart 7). According to the U.S. Energy Information Administration (EIA), Oklahoma ranked third in the nation in net electricity generation from wind in August 2021.[5] Per capita, Oklahoma also ranks fourth in the nation for consumption of natural gas, with 40% of the consumption being used for electric power generation. Overall, Oklahoma produces more power than it consumes, and remains a net power exporter to other states. While the state has less hydro-electric generation and very little solar generation so far, it also generates substantially less electricity from coal-fired power plants than the nation.



Compared with neighboring states, Oklahoma's electricity generation can be characterized, overall, by more focus on natural gas and wind and less reliance on nuclear and coal. Texas has about the same share of natural gas in its power generation mix but uses less wind, while Kansas has slightly more wind generation but still sizable reliance on coal. Arkansas relies much more on nuclear and hydro-electric power, in addition to coal and natural gas.

Moving forward, Oklahoma's renewable capacity is expected to grow more than 25% between 2021-25. Indeed, nearly all of planned growth in electric generation capacity in the state will come from renewables, compared with about 72% nationally (Chart 8). As such, Oklahoma's growth in renewables is expected to continue to outpace the U.S. in the future. Most of this growth will be the further expansion of wind energy, although solar energy will also begin to make a presence in coming years.



While Oklahoma's renewable energy future looks bright, the sector employs very few people, especially after the construction phase of wind towers and solar panels finishes, and also in relation to the much larger oil and gas sector. According to the Bureau of Labor Statistics QCEW data, Oklahoma had about 400 workers directly employed in wind electricity generation in June 2021. As a share of total state employment, wind employment is five times higher than in the nation as a whole, but still a very small number of jobs. By comparison, Oklahoma's oil and gas employment in June 2021 was 27,091, also five times the national average share employed in the industry.[6] Indirect jobs from manufacturing goods for renewable energy may also be a potential source of job growth, just as manufacturing of oil and gas equipment and products has been a sizable source of jobs in Oklahoma.

Summary

Demand for energy in Oklahoma and across the world has grown tremendously in recent decades and is projected to continue to grow in the decades ahead. More of this demand is likely to be met by renewable energy, although demand for fossil fuels, especially natural gas, is also likely to grow. Oklahoma has a sizable presence in both traditional and renewable forms of energy and thus seems poised to remain a key player in energy activity regardless of its form. The sector will likely continue to account for sizable portions of the state's GDP and tax revenues. However, with greater labor efficiency in oil and gas and with relatively few jobs needed in renewable energy once installations are in place, energy jobs will also likely remain a smaller part of the Oklahoma economy in the years ahead.

Endnotes

[1] Words from the official song of the State of Oklahoma, "Oklahoma," composed and written by Richard Rodgers and Oscar Hammerstein.

[2] In addition to Oklahoma's Gross Production Tax, which makes up about 10% of the states' tax receipts, the Bureau of Economic Analysis data for state tax revenues from mining includes taxes on support activities for mining, such as pipeline services.

[3] https://www.eia.gov/outlooks/steo/https://www.iea.org/reports/world-energy-outlook-2021

[4] https://www.eia.gov/tools/faqs/faq.php?id=74&t=11

[5] https://www.eia.gov/state/?sid=OK#tabs-4

[6] Employment numbers for wind generation and mining are from NAICS 221115 and 21, respectively.