New Mexico Energy Landscape: Overview and Analysis 2025

Presented by New Mexico Energy Initiatives

Led by New Mexico Institute of Mining and Technology

Petroleum Recovery Research Center

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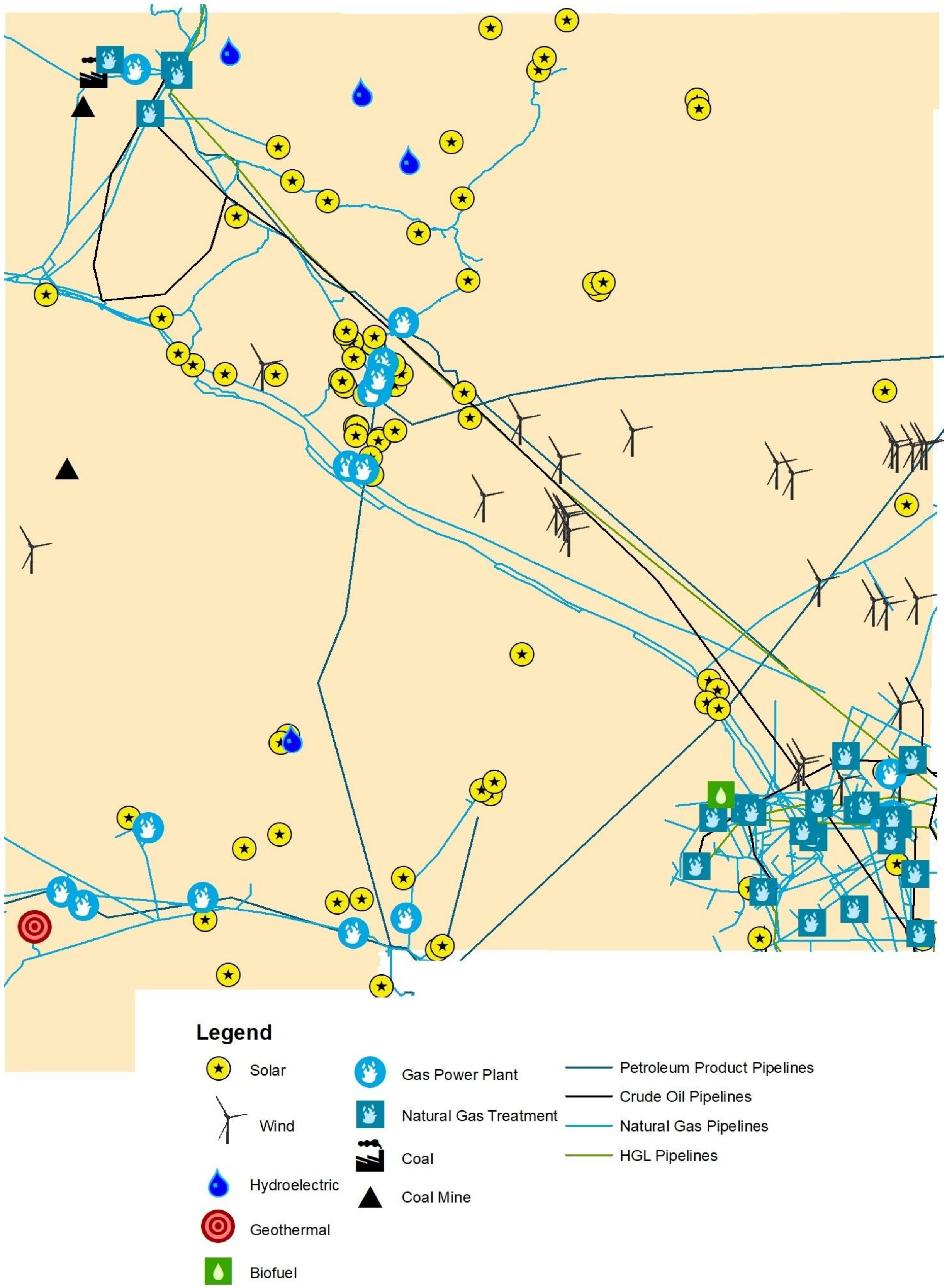
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HGL Pipelines

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DATA SOURCE

Unless stated otherwise, all data is sourced from the **State Energy Data System (SEDS), the U.S. Energy Information Administration's (EIA)** comprehensive database for state energy statistics. The link for the data source is: https://www.eia.gov/state/seds/

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1. EXECUTIVE SUMMARY

New Mexico's energy sector is defined by a mix of traditional fossil fuel industries and a growing renewable energy market. The state ranks among the top oil and natural gas producers in the U.S., with the Permian Basin playing a key role in national energy security. At the same time, wind and solar power are expanding rapidly, positioning New Mexico as a leader in renewable energy deployment. The state also plays a crucial role in electricity exports, transmitting power to neighboring states such as Arizona, California, and Texas. However, significant challenges remain, including reliance on fossil revenues, grid modernization, energy efficiency improvements, and greenhouse gases management.

Purpose of the Baseline Assessment

This report provides a comprehensive assessment of New Mexico's current energy production, consumption, emissions, and infrastructure. Establishing an accurate baseline is essential for informed policymaking, planning, and achieving the state's long-term decarbonization goals. The study evaluates key energy trends, sectoral demands, carbon management efforts, and economic implications to guide future energy strategies.

Key Findings:

- **Natural gas dominates** New Mexico's energy consumption, with major uses in electricity generation, industrial processes, and heating.
- Recently, the **state's electricity demand has grown steadily, driven primarily by the industrial sector.**
- The state remains **heavily reliant on oil and gas revenues**, making economic diversification a critical priority for long-term stability.
- Wind and solar power now account for a significant share of electricity generation, but their integration into the grid requires enhanced grid and **storage solutions.**
- **Geothermal energy and Biomass remain untapped opportunities**, increased initiatives in these sectors would support New Mexico's sustainable energy and decarbonization goals.
- **Small Modular Reactors** could represent an opportunity, leveraging the state's experience with nuclear R&D and existing uranium resources.
- **Low-carbon hydrogen** presents a potential opportunity for the transportation sector, particularly for heavy-duty vehicles and industrial applications
- Grid Modernization & Energy Exports: New Mexico has a strategic **opportunity to balance regional energy supply**. Its wind power can supply the West when solar output declines, and solar can be exported eastward when wind generation is low. Expanding transmission infrastructure, including projects like SunZia and Riosol, will support this role. New Mexico natural gas is also set to play an important regional role.
- **Energy Reliability & Security**: Rising CAIDI (Customer Average Interruption Duration Index) suggests that New Mexico's **grid reliability is declining**, highlighting the need for

investment in resilient energy systems. Strengthening **Independent System Operator participation** and modernizing transmission networks could improve grid stability.

- **Energy prices continue to rise steadily**, particularly for commercial and residential, highlighting the need to reduce the energy burden on households and businesses.
- Coal-related emissions have declined due to plant closures, but coal, oil and gas remain major contributor to greenhouse gases.
- **Carbon capture, utilization, and storage** projects, along with **initiatives reducing methane** emissions, will be critical to achieving long-term GHG emission reductions along with sustainable and equitable energy production.

Next Steps for Developing a Roadmap to Carbon Neutrality

Achieving carbon neutrality requires an integrated approach that balances economic growth, energy security, and environmental sustainability. Future efforts should focus on:

1. Improving data acquisition and management to enable a more granular county- and regional-level analysis, complementing the statewide approach and accounting for regional disparities.
2. Accelerating sustainable energy deployment, notably geothermal and biomass, while investing in storage solutions to mitigate renewables intermittency challenges.
3. Enhancing grid reliability and resilience through infrastructure modernization.
4. Advancing carbon capture and sequestration and emissions reduction initiatives, particularly in the oil and gas sector.
5. Expanding workforce training programs to prepare for the transition toward sustainable energy jobs.
6. Strengthening policy frameworks to support permitting, electrification, energy efficiency, and public-private partnerships for sustainable development.

New Mexico is at a pivotal juncture in its energy transition. With the right investments and policy support, the state can solidify its position as a leader in clean energy innovation while maintaining economic stability and regional energy leadership.

2. INTRODUCTION

New Mexico's energy landscape is characterized by distinct regional dynamics, reflecting a complex interplay between traditional fossil fuel industries and emerging renewable energy opportunities. While the southeastern part of the state, particularly the Permian Basin, continues to experience an increase in oil and gas production, the northwestern San Juan Basin is witnessing a steady decline in coal and fossil fuel operations. Concurrently, other regions offer significant potential for renewable energy expansion. The High Plains provide strong wind energy prospects, while the Basin and Range region holds substantial geothermal energy potential. Solar energy development, coupled with advancements in storage technologies, further enhances the state's trajectory toward a diversified energy future.

In addition to energy production, the state's mineral resources will play a crucial role in the state's future and beyond. For example, the southwestern region of New Mexico is well known for its copper extraction, an essential component for the energy transition. However, regions in New Mexico that are neither energy-rich nor resource-rich, and that do not serve as major urban centers or research hubs like Los Alamos, often face significant economic challenges. Many of these areas have high concentrations of disadvantaged communities, reflecting disparities in economic opportunities, infrastructure, and access to resources. Recognizing these regional differences is crucial for developing policies that promote an equitable and sustainable energy transition across the state.

This complex energy landscape is further impacted by the energy sector's unprecedented transformation at both the international and national levels, shaped by the dual forces of energy transition and energy expansion. The Biden administration prioritized decarbonization and clean energy, but this direction shifted on January 20, 2025, when President Donald Trump declared a national energy emergency, citing high energy costs. His administration has since redirected federal priorities toward accelerating energy development and security, moving away from environmental justice and sustainability frameworks. These sudden policy shifts introduce uncertainties in sustainable energy project development and complicate long-term strategic planning.

New Mexico's diverse energy landscape and regional disparities provide a valuable framework for examining the broader implications of energy transition, policy shifts, and expansion efforts at different scales. The state's varied economic and social dynamics offer critical insights into the challenges and opportunities of the evolving energy systems. With its mix of traditional and renewable energy resources, New Mexico is well-positioned to lead in the development of integrated energy systems, leveraging diverse energy production methods, advanced storage technologies, and carbon management strategies to support sustainable energy development.

Toward that end, establishing a robust baseline assessment of New Mexico’s current energy production, consumption, and emissions is critical. Without accurate and regionally specific data, policymakers and industry stakeholders will lack the tools necessary to strategically guide energy investments, balance local and regional economic priorities, and ensure equitable energy development for all communities.

This report serves as a starting point in that direction, offering an overview evaluation of New Mexico's energy production, consumption, and emissions profile.

The importance of this work was highlighted during the Consortium for Energy Sustainability and Advanced Management (CESAM) workshop, now known as the New Mexico Energy Initiatives (NMEI), held at New Mexico Tech (NMT) on November 7–8, 2024. This workshop marked the launch of a broader initiative to connect New Mexico's energy stakeholders and foster sustainable energy research, development, education, outreach, and policy support. One of the key takeaways from the discussions was the critical need for comprehensive and reliable data to serve as the foundation for informed decision-making and strategic energy planning. Without a clear understanding of New Mexico's current energy landscape, the state will lack the necessary tools to define a strategic pathway toward 100% carbon-free electricity by 2045.

While achieving net-zero emissions by 2045 seems distant, the long development timelines of energy projects, and the policy challenges, make it an imminent challenge. Every decision made today will have long-term implications for environmental sustainability, energy affordability, and security. Ensuring a just and effective transition requires integrating economic, technical, and policy perspectives to balance New Mexico's role as a major fossil fuel producer with its ambitious clean energy goals.

This report presents a quantitative and qualitative analysis of New Mexico's energy landscape. The research team used the latest available data from the U.S. Energy Information Administration (EIA), state agencies, and industry reports to construct an accurate picture of the current situation. The methodology includes:

- **Energy Production Analysis**: Examining fossil fuel and renewable energy contributions to the state's electricity mix;
- **Consumption and Demand Trends**: Evaluating sectoral energy use and trends;
- **Economic Considerations**;
- **Greenhouse Gas (GHG) Emissions Baseline**: Assessing sector-specific emissions to identify reduction opportunities.

By consolidating and interpreting these data sources, this report aims to inform policymakers, industry stakeholders, and researchers on the first steps toward an actionable roadmap for New Mexico's energy future. While this document represents an initial effort, it underscores the need for ongoing data collection, monitoring, and verification refinement to ensure New Mexico is well-positioned to meet its decarbonization objectives.

3. NEW MEXICO'S ENERGY LANDSCAPE

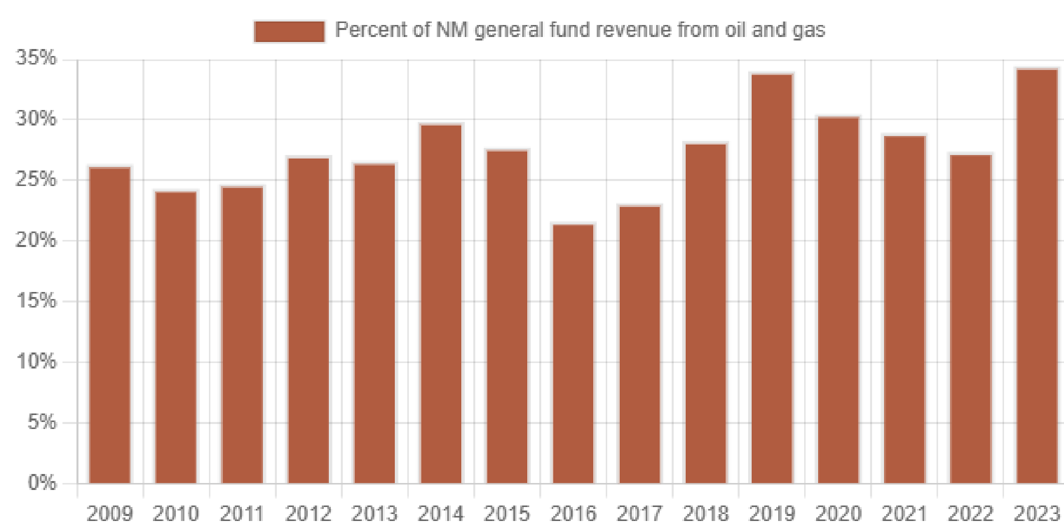
FOSSIL FUELS

Fossil fuels have long been the backbone of New Mexico's energy economy, shaping its industrial landscape and contributing significantly to state revenues. As a leading U.S. producer of oil and natural gas, New Mexico plays a key role in national energy security, while coal has historically been a significant energy source.

OIL

Oil plays a crucial role in New Mexico's economy, making the state the second-largest oil producer in the U.S. since 2023, with revenues from oil production significantly contributing to state funding, particularly for education, infrastructure, and public services. In 2023, oil and gas revenues reached a record high, accounting for 34.5% of the state's total revenue (Figure 1)[1] and the state accounted for 14% of total U.S. crude oil production[2][3]. While the oil and gas (O&G) industry brings substantial economic benefits to New Mexico, it also faces challenges related to market volatility and environmental impact. The state's heavy reliance on fossil fuels makes its revenue highly susceptible to the boom-and-bust cycles of the industry. To achieve long-term economic stability, New Mexico must strategically invest its current surplus to diversify revenue sources and reduce its dependence on oil and gas.

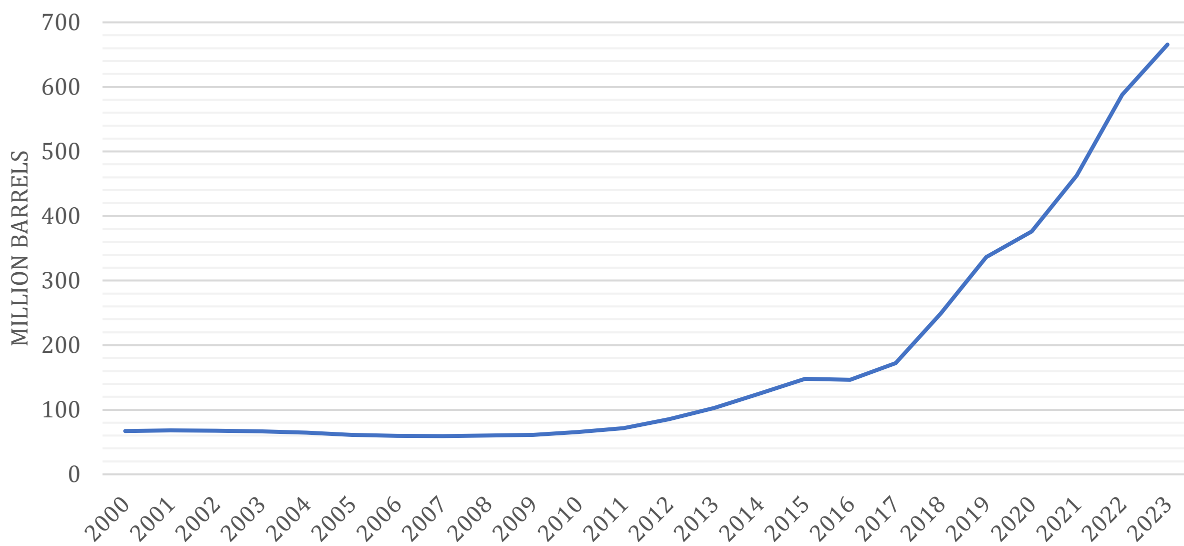
Figure 1: New Mexico dependence on revenue from oil and gas, source: New Mexico Economic Development Department State Plan and Legislative Finance Committee.



[1] https://edd.newmexico.gov/state-plan/
[2] https://www.eia.gov/state/print.php?sid=NM
[3] https://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=mcrfpnm1&f=a

The production trend for New Mexico crude oil has shown remarkable growth, particularly after 2010. From 2000 to around 2010, production remained relatively flat, fluctuating just below 100 million barrels annually. However, after 2010, production began to rise steadily, with a notable acceleration from 2017 onward. By 2020, production had surged past 300 million barrels, and the trend continued to skyrocket, reaching over 665 million barrels in 2023, and around 745 million barrels in 2024 (**Error! Not a valid bookmark self-reference.**).

Figure 2: Production of crude oil in New Mexico (2000-2023), modified based on EIA SEDS data.



Oil prices rose steadily until 2008, peaking at $25–30 per Million British Thermal Unit (MBTU), before dropping in 2009 due to the financial crisis. Prices remained high from 2010 to 2014, then fell sharply in 2015–2016 due to oversupply. After 2017, prices recovered, surging in 2022 amid supply chain disruptions and geopolitical events like the Russia-Ukraine war (Figure 3).

Production value remained low until 2004, then rose moderately, peaking in 2014. A major growth trend began in 2017, driven by shale oil advances and new drilling techniques, culminating in a sharp surge from 2021 to 2022, reaching ~$110 billion.

Despite price fluctuations, production value has trended upward since 2017, highlighting New Mexico's expanding role in U.S. oil production, especially in the Permian Basin (Figure 4). The 2022 peak reflects both higher prices and record production, but past downturns (2009, 2015) underscore the industry's volatility.

One should note that refining capacity did not experience the same growth in New Mexico. In 2000, 52% of the extracted crude oil was refined within the state, but by 2023, this figure had dropped to just 6%, leading to New Mexico's oil exports becoming almost entirely crude oil.

Figure 3: Crude oil price trends and estimated total production value for the state of New Mexico, modified based on EIA SEDS data.

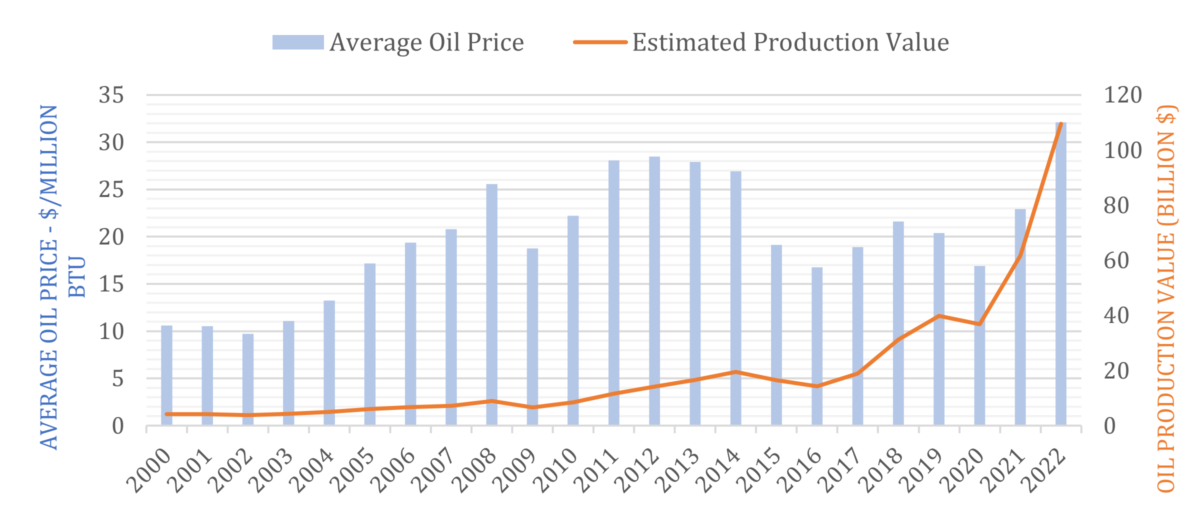


Figure 4: New Mexico oil and gas assets: wells, pipelines and main producing basins, modified based on EIA data.

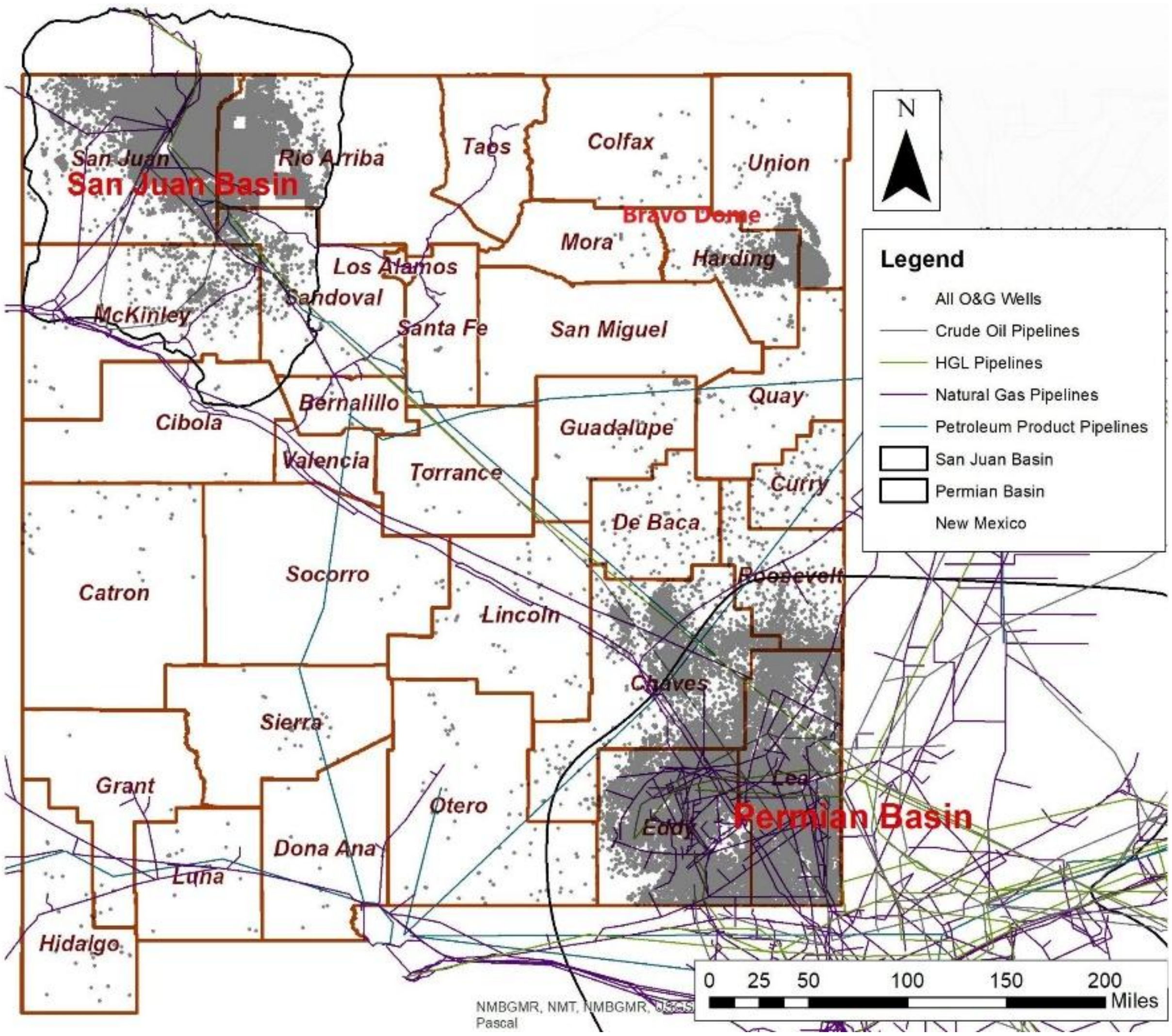


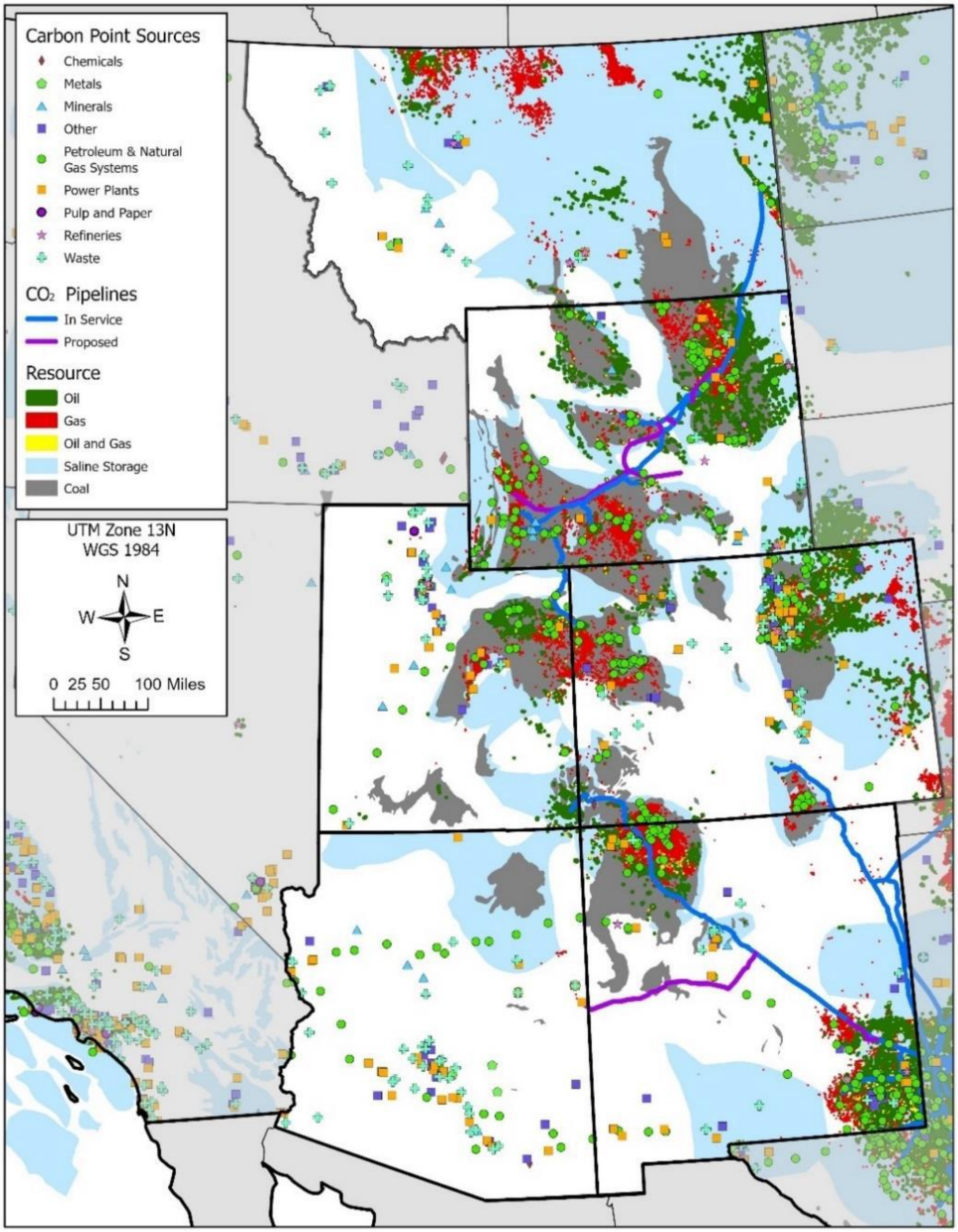
Figure 4 provides a spatial representation of New Mexico's oil and gas infrastructure, highlighting key assets such as wells, pipelines, and major producing basins: the Permian Basin, San Juan Basin, and Bravo Dome.

The Permian Basin, located in southeastern New Mexico, is the state's most prolific oil and gas-producing region. It features a dense concentration of wells and an extensive pipeline network, supporting ongoing production growth driven by advancements in hydraulic fracturing and horizontal drilling.

The San Juan Basin, in northwestern New Mexico, has historically been a major natural gas-producing area, though production has declined in recent years. Its infrastructure primarily consists of gas wells and pipelines transporting natural gas to regional markets.

The Bravo Dome, in northeastern New Mexico, is distinct from the other basins as it primarily contains naturally occurring CO_2 rather than oil or gas. This CO_2 is extracted and transported via pipelines for use in enhanced oil recovery (EOR) operations in the Permian Basin (Figure 5)

Figure 5: CO2 sources, geological storage areas and CO2 pipeline in the region, I-West[4]



[4] D. Vikara, J. Eppink, R. T. Vactor, T. Warner, B. Chen, S. Matthews, D. Morgan, A. Guinan, M. Marquis, M. Ma, A. Bulbul, R. Pawar, and L. Cunha. "Pathways to CO_2 Utilization and Storage for the Intermountain West Region," National Energy Technology Laboratory, Pittsburgh, October 31, 2022.

NATURAL GAS

Natural gas plays also a crucial role in New Mexico's energy economy, serving as both a major source of revenue and a key component of the state's energy mix. As one of the top natural gas-producing states in the U.S. (top 10), New Mexico benefits from vast reserves concentrated in the San Juan Basin and the Permian Basin. These regions have historically supplied natural gas for domestic consumption, power generation, and export to national and international markets.

The San Juan Basin, historically a major source of conventional natural gas, has played a crucial role in the state's energy economy since its first commercial discovery in 1921. The basin became a global leader in coalbed methane (CBM) in the 90s. However, production in the San Juan Basin declined after the early 2000s, reflecting market and industry focus shift[5].

Despite this decline, New Mexico's total natural gas production has rebounded sharply since 2017 (Figure 6), driven primarily by shale production from the Permian Basin. This resurgence positions New Mexico as a critical player in the evolving U.S. natural gas market, with the state now holding nearly 7% of the nation's proved natural gas reserves[6].

Figure 7 highlights the fluctuations in gas prices and production value over time in New Mexico. Between 2000 and 2008, natural gas prices increased significantly, peaking during the mid-2000s. However, after 2008, gas prices dropped, leading to a period of lower revenues. Prices remained volatile for over a decade but began rising again after 2020, driven by increased demand and geopolitical events. By 2022, New Mexico's natural gas production value surged to over $25 billion, reflecting both higher gas prices and increased output.

Beyond its economic significance, natural gas is a key transition fuel as the state moves toward cleaner energy solutions. It is widely used for electricity generation, industrial applications, feedstock, and residential heating, contributing to grid stability as renewable energy sources like wind and solar expand.

Looking forward, New Mexico remains a key contributor to the U.S. natural gas supply, especially with its coalbed methane production (second only to Colorado) and the rapid growth of shale gas extraction in the Permian Basin. While market volatility and environmental concerns pose challenges, the state's expanding infrastructure and technological advancements suggest that natural gas will continue to be a major driver of economic growth in the region.

[5] https://explorer.aapg.org/story/articleid/61974/the-san-juan-basin-at-100-years
[6] https://www.eia.gov/state/print.php?sid=NM

Figure 6: New Mexico natural gas production, modified based on EIA SEDS data.

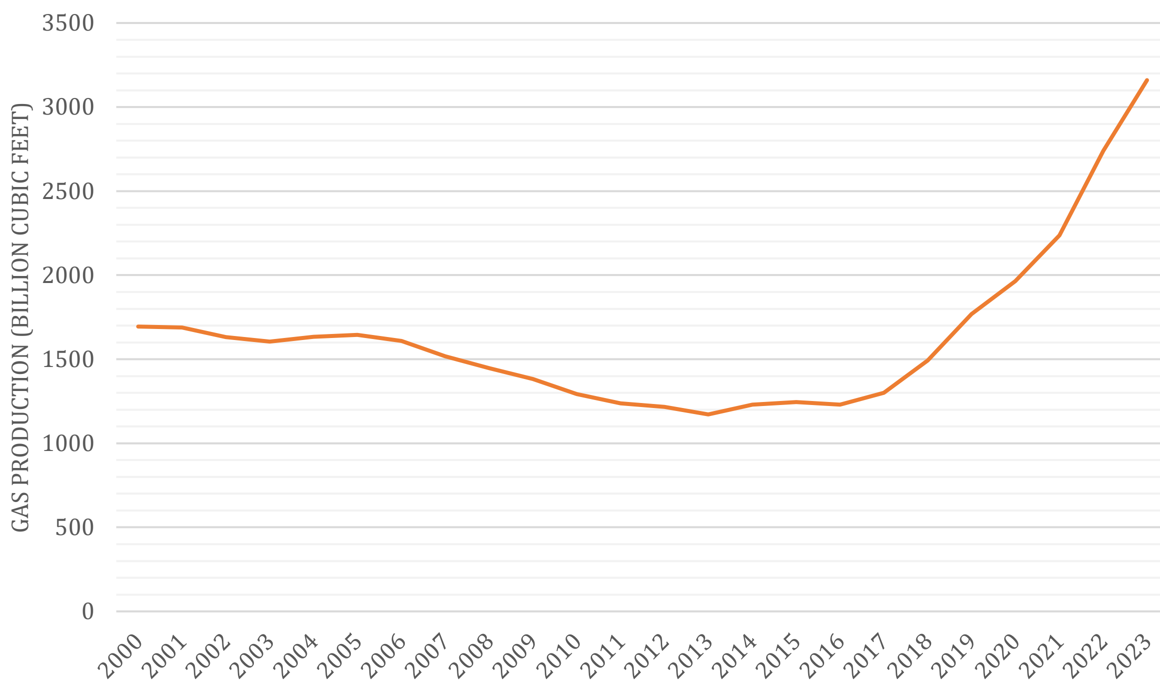


Figure 7: Average natural gas price and production value in New Mexico, modified based on EIA SEDS data.

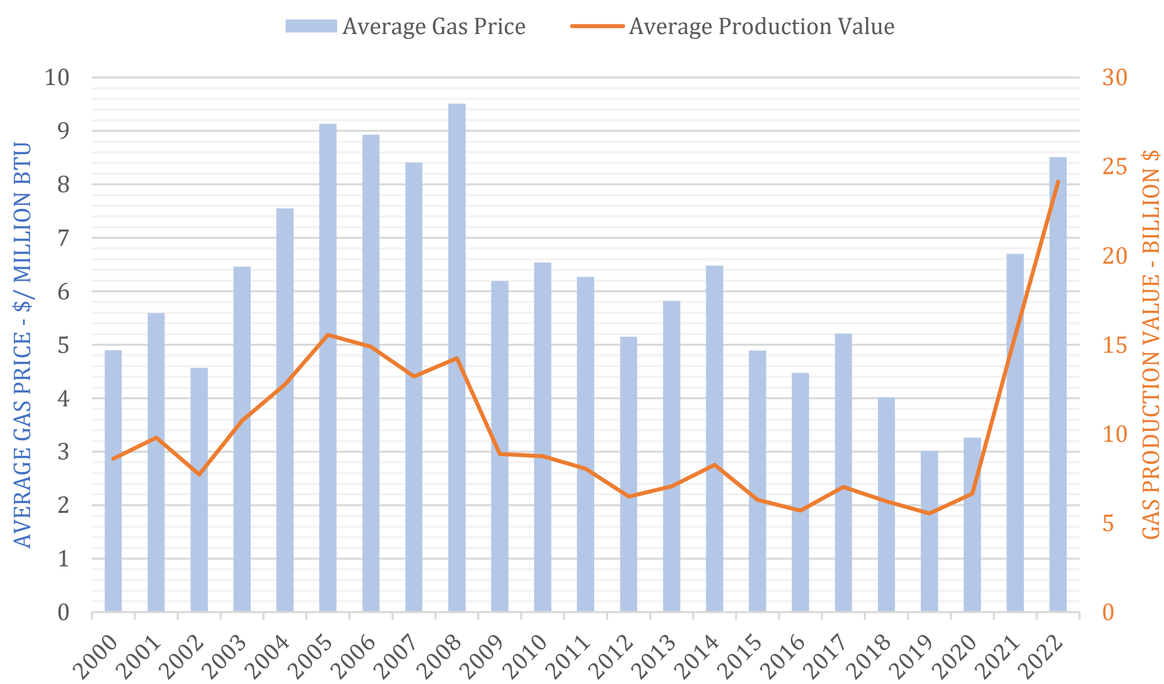
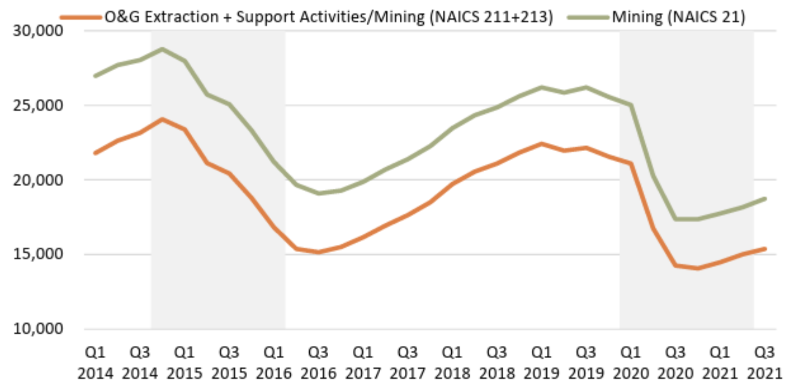


Figure 8: Mining, Oil and Natural Gas Workers in New Mexico[7]



Since 2017, the annual growth rate for oil production in New Mexico has been approximately 26.3% per year, while the growth rate for natural gas production has been around 16.2% per year. However, employment in the sector has remained volatile, peaking at nearly 30,000 workers in late 2014 before a sharp decline following a price crash (Figure 8)[7]. A similar downturn occurred in 2020, when geopolitics and the COVID-19 pandemic pushed crude oil prices to historic lows, leading to another wave of job losses. While the industry provides significant economic benefits, its inherent instability highlights the challenges of relying on fossil fuel production as a long-term economic driver for New Mexico.

PRODUCED WATER

Produced water, a byproduct of oil and gas extraction, plays a significant role in New Mexico's energy landscape. The management of produced water is crucial not only because of the large volumes requiring disposal or reuse but also due to New Mexico's water scarcity and the growing demand for water-intensive technologies like carbon capture and storage (CCS), which could benefit from alternative water sources.

The rapid expansion of unconventional drilling, particularly in the Permian Basin, has led to a dramatic increase in produced water volumes, which have grown by approximately 15% annually since 2016 (Figure 9)[8]. Traditionally considered a waste product, produced water has primarily been disposed of through deep subsurface injection in saltwater disposal wells (SWDs, Figure 9) or reused in EOR operations to maintain reservoir pressure.

Nowadays, with water scarcity concerns intensifying, produced water is increasingly being explored as a potential resource rather than a liability. Efforts to treat and reuse produced water could alleviate pressure on

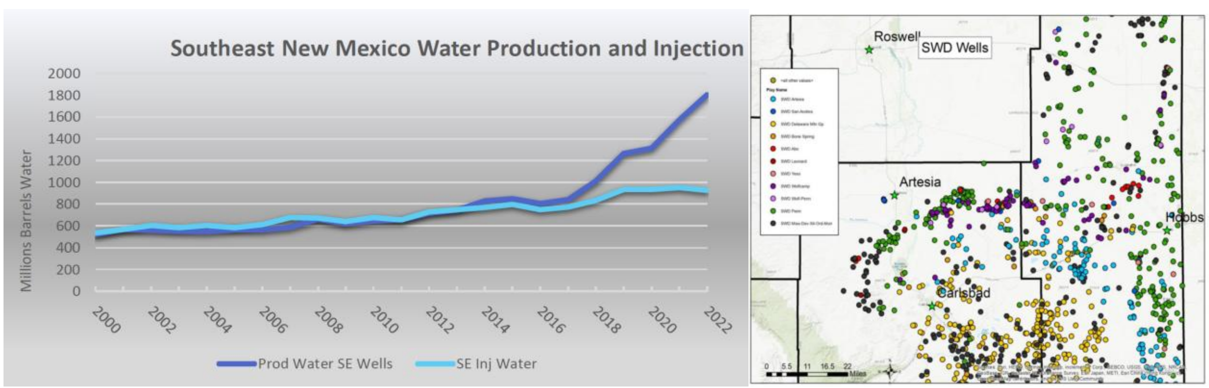
[7] Quarterly Census of Employment and Wages (QCEW) Special Article: A Profile of Oil and Natural Gas Workers in New Mexico, Rachel Moskowitz, Bureau Chief, Labor Market Review, February 2022.
[8] Cather, M., Simmons, J., & Fonquergne, J. (2023). Building a Produced Water Budget for New Mexico: Phase III – Well Activity Data Analysis and Basin Model Construction. PRRC, NMT.

New Mexico's freshwater supplies[9]. To fully integrate produced water into the state's water management strategy, a deeper understanding of its production, quality, and potential applications is required. This includes mapping its sources, analyzing disposal methods, and assessing the feasibility of treatment technologies.

As New Mexico navigates the challenges of energy and water sustainability, the management of produced water stands at the intersection of energy production, environmental stewardship, and policy development.

The high cost of treating produced water compared to its disposal is the main barrier to its widespread treatment and reuse. Disposal through underground injection typically costs between $0.30 to $10.00 per barrel, making it a more economical option than treatment, which can range from $3.00 to $30.00 per barrel, depending on the technology used[10]. While advancements in water treatment technologies are lowering costs, disposal remains the preferred industry practice due to its lower upfront and operational expenses. Additionally, transportation costs further impact economic viability. However, as water scarcity worsens, rural communities in arid regions like New Mexico are considering treated produced water as an alternative source[11].

Figure 9: New Mexico Permian Basin produced water production and injection evolution and Saltwater Disposal Wells (SWD) locations in Lea and Eddy Counties, NM.



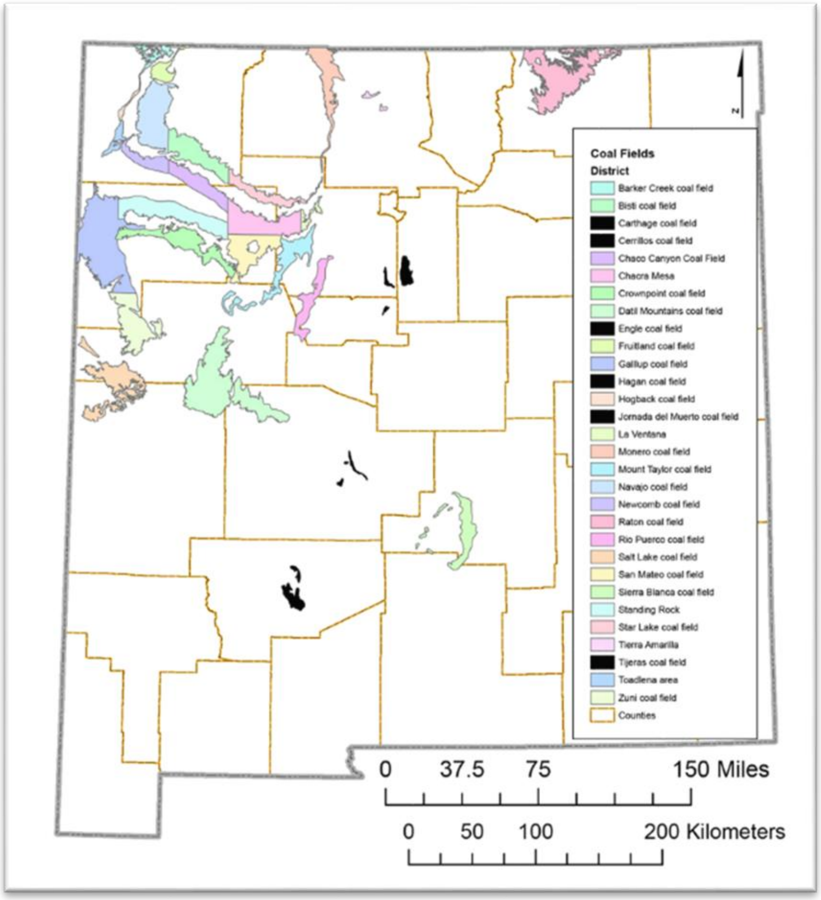
[9] New Mexico Strategic Water Supply Roadmap: https://www.env.nm.gov/strategic-water-supply/

[10] Sanchez-Rosario, R.; Hildenbrand, Z.L. Produced Water Treatment and Valorization: A Techno-Economical Review. Energies 2022, 15, 4619. https://doi.org/10.3390/en15134619

[11] https://www.reuters.com/business/environment/arid-new-mexico-rural-towns-eye-treated-oil-wastewater-solution-drought-2024-09-11/

COAL

Figure 10: Coal fields in New Mexico[4]



Coal has historically been a major energy source and economic driver in New Mexico, particularly in the Four Corners region[12], where the San Juan Generating Station and Four Corners Power Plant have provided electricity and long-term employment for decades[13] (Figure 10).

These facilities have been central to the state's energy production, supplying electricity to western states, including Arizona and California. However, they also have released a significant amount of carbon dioxide to the atmosphere, and the New Mexico Energy Transition Act of 2019 has accelerated the shift away from coal, mandating emissions reductions that coal plants cannot meet without costly carbon capture upgrades.

Figure 11 and Figure 12 highlight New Mexico's ongoing transition away from coal, reflected in the declining coal production. Figure 11 shows that New Mexico's coal production has dropped from around 30 million short tons in 2001 to below 10 million short tons in 2023, effectively a two-thirds decline over 23 years. Figure 12 illustrates that while the average coal price has increased, the overall coal production value peaked around 2012 before entering a long-term decline, reflecting both reduced demand and plant closures.

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[12] Virginia T. McLemore and Evan J. Owen, New Mexico Bureau of Geology and Mineral Resources, NMT; Consortium for Energy Sustainability and Advanced Management (CESAM) Workshop; Nov. 6-8, 2024. https://nm-secm.org/wp-content/uploads/2025/01/Mineral_Potential_inNewMexico_McLemoreNMT.pdf

[13] Corbell, A. (2023). I-WEST Phase One Final Report: Case Study on Workforce Transition in the Four Corners. San Juan College

The decline in New Mexico's coal production is closely linked to the shutdown of coal-fired power plants within the state and in neighboring Arizona:

- The Four Corners power plant's total generation capacity was originally 2100 megawatts, but following the shutdown of Units 1, 2, and 3 (which occurred on December 30, 2013) the capacity is now 1540 megawatts. This reduced the demand for coal from the San Juan and Navajo mines.
- In 2017, two units at the San Juan Generating Station (NM) were decommissioned, further decreasing coal consumption.
- Additionally, in 2019, the Navajo Generating Station in Arizona, but a major consumer of coal from the Kayenta (AZ) and Navajo (NM) mines, was permanently closed.
- The Escalante Power Plant (NM) followed in 2020, eliminating another major source of coal demand.
- The most significant closure came in 2022 when the San Juan Generating Station fully shut down, marking a major shift away from coal-fired power.
- 2031 (Projected): The Four Corners Generating Station (NM) is scheduled for full retirement, which will further impact coal production in the region.

These closures reflect broader economic and policy shifts, including the declining competitiveness of coal, state renewable energy mandates, and the transition to natural gas and renewables.

Figure 11: Production of coal in New Mexico, modified based on EIA SEDS data.

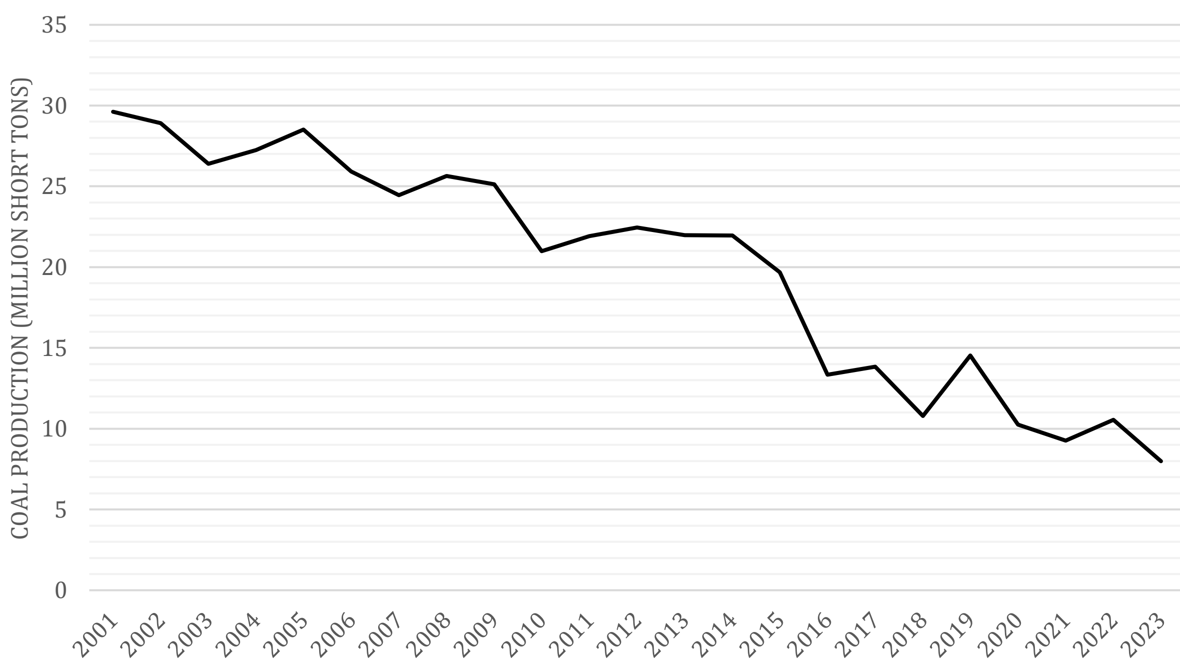
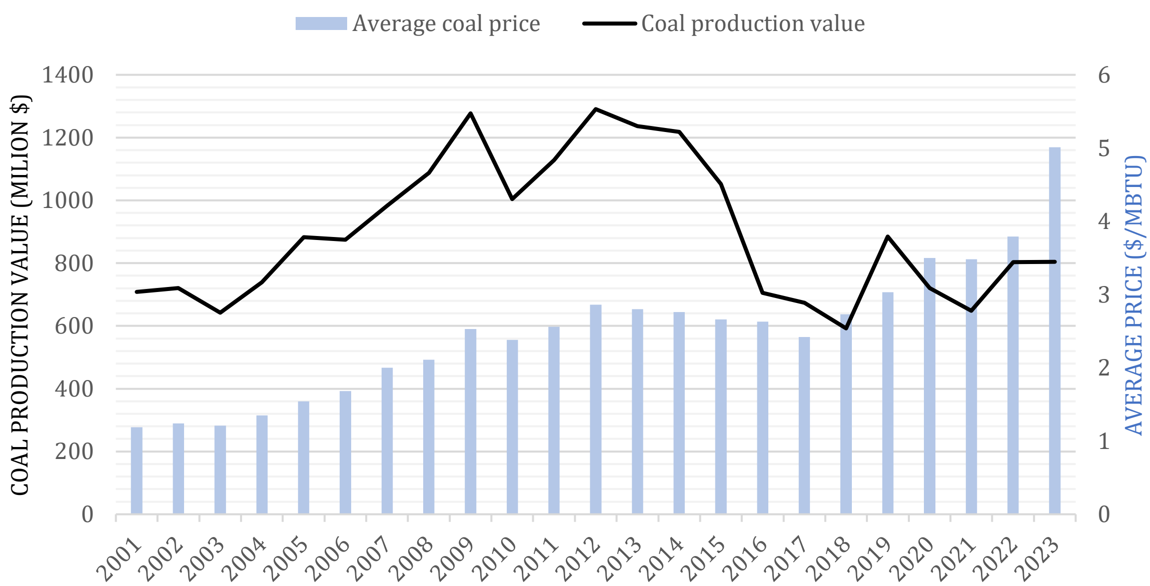


Figure 12: Average coal price evolution and New Mexico coal production value, modified based on EIA SEDS data.



The closure of coal-fired power plants and associated mines has resulted in significant economic and social impacts, particularly for tribal communities that make up a large portion of the workforce. The shutdown of the San Juan Generating Station and San Juan Mine alone has led to thousands of job losses, with ripple effects on local businesses, school funding, and tax revenues. Programs like the Four Corners POWER Initiative and San Juan College workforce transition efforts have sought to retrain displaced workers for jobs in renewable energy, carbon capture, and hydrogen production. However, challenges remain in providing comparable wages and long-term employment stability for those affected.

As New Mexico transitions toward other energy solutions, the decline of coal presents both opportunities and hardships. The state faces the challenge of balancing economic recovery, workforce retraining, and energy security while ensuring a just transition for communities historically dependent on coal. This further underscore the need for economic diversification and support for displaced workers in transitioning to new employment opportunities.

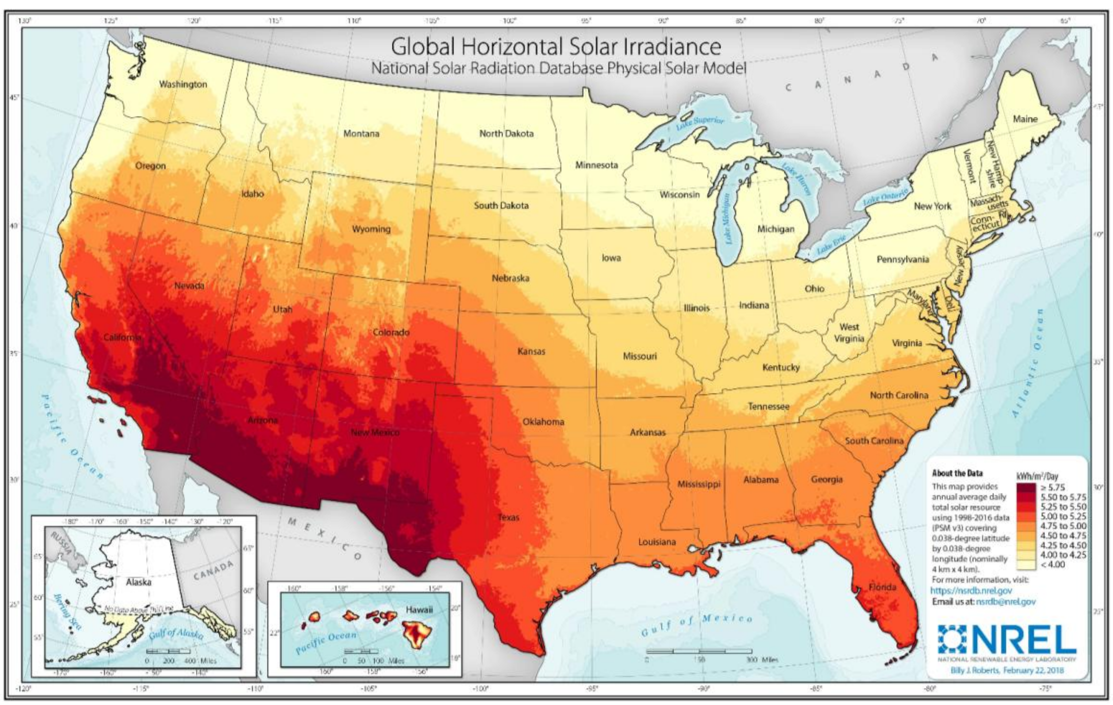
RENEWABLE ENERGY

In 2019, New Mexico updated its 2004 **Renewable Portfolio Standard (RPS)**[14], significantly increasing the state's renewable energy targets. The revised law mandates that investor-owned utilities generate 50% of their electricity from renewable sources by 2030, 80% by 2040, and 100% by 2045. Rural electric cooperatives have until 2050 to achieve full renewable energy compliance. The legislation defines renewable energy as electricity produced from low- or zero-emission sources with substantial long-term production potential, explicitly excluding nuclear power and fossil fuel-based generation.

SOLAR

New Mexico is emerging as a leader in solar energy development, leveraging its abundant sunlight and supportive policies[15]. For a comprehensive look at New Mexico's solar development potential (Figure 13), you can explore the National Renewable Energy Laboratory's (NREL) Solar Resource GIS tool[16]. This platform provides interactive maps and detailed data on solar irradiance, system performance estimates, and regional resource assessments. By leveraging this tool, stakeholders and developers can gain valuable insights into the solar potential across different parts of the state, helping to inform investment decisions and project planning for large-scale solar installations.

Figure 13: Solar potential in the U.S. (NREL)



14 https://www.nmlegis.gov/Sessions/19%20Regular/bills/senate/SB0489.pdf
15 https://www.prc.nm.gov/utilities/renewable-energy/
16 https://www.nrel.gov/gis/solar

Figure 14: Solar PV electricity production in New Mexico, modified based on EIA SEDS data.

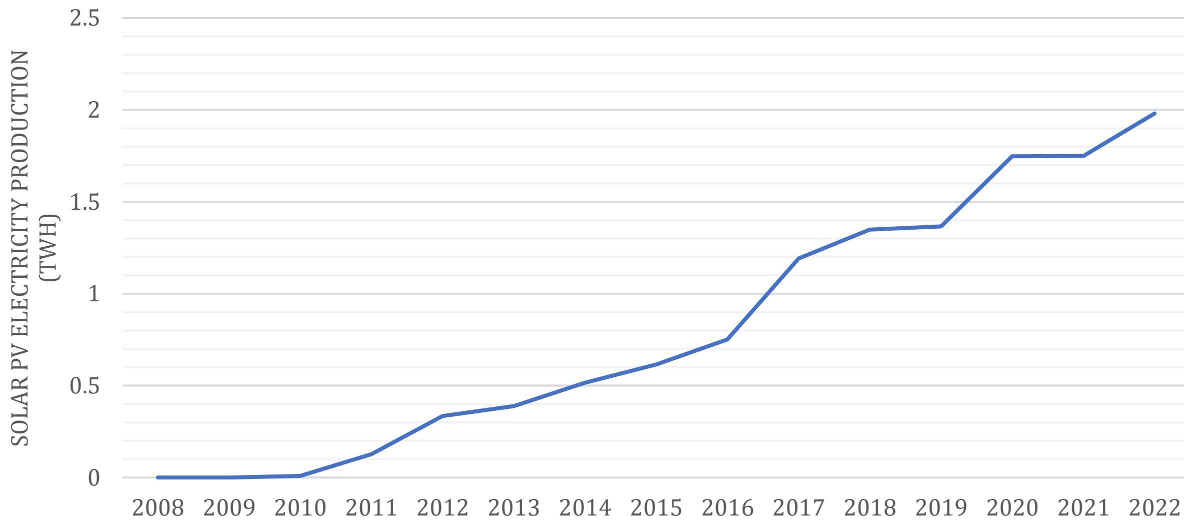


Figure 14 illustrates the steady and substantial growth of solar photovoltaics (PV) electricity production in New Mexico from 2008 to 2022, measured in terawatt-hours (TWh). Initially, production began rising gradually around 2010, followed by periods of accelerated growth and brief slowdowns, but the overall trend remains upward, demonstrating New Mexico's expanding solar capacity. The installed capacity of solar energy was 855.7 MW in 2022 and it reaches 2,854 MW in 2024[17]. Given the state's strong solar resources and continued policy support, solar PV production is expected to keep growing in the coming years.

The state does not have concentrating solar power (CSP) facilities for electricity production. However, the National Solar Thermal Test Facility (NSTTF) at Sandia National Laboratories (SNL) is a unique research site dedicated to CSP technologies. As the only facility in the U.S. capable of testing large-scale CSP systems, NSTTF provides crucial data for developing solar thermal energy storage, high-temperature receivers, and other related technologies. It supports industry, academia, and government agencies in advancing CSP testing and validation. Through its work, NSTTF plays a key role in improving the viability of CSP for grid-scale clean energy production[18].

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[17] U.S. Energy Information Administration, Form EIA-860, Annual Electric Generator Report. U.S. Energy Information Administration, Form EIA-861, Annual Electric Power Industry Report. U.S. Energy Information Administration, Form EIA-923, Power Plant Operations Report and predecessor forms.

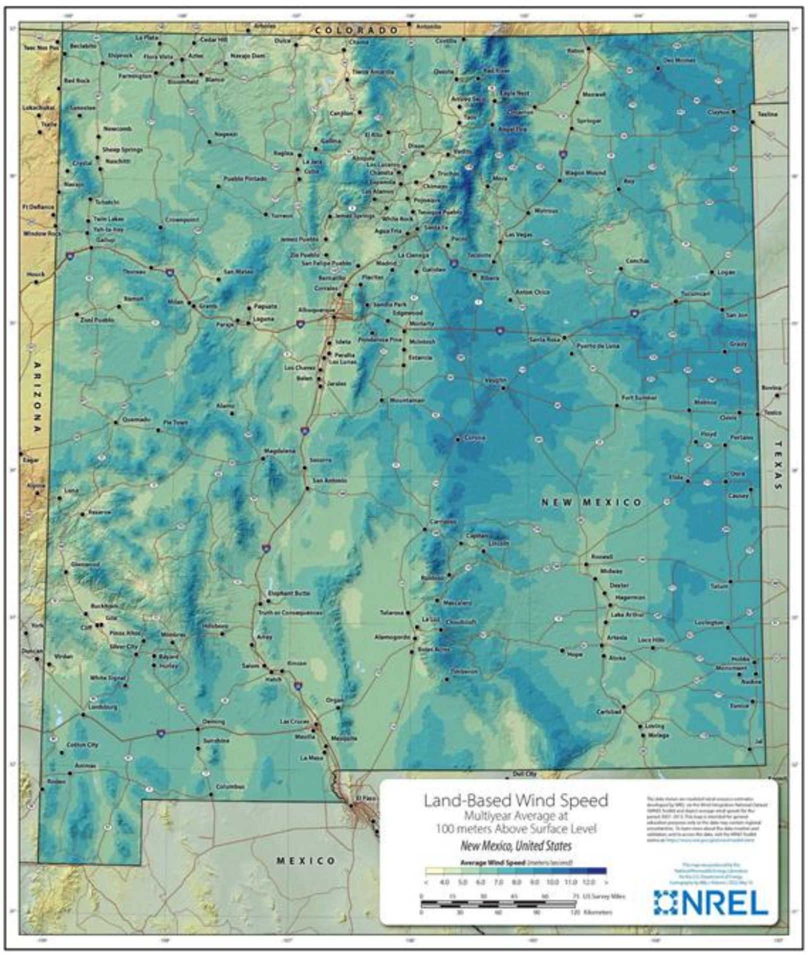
[18] https://energy.sandia.gov/programs/renewable-energy/csp/national-solar-thermal-test-facility/about-us/

WIND

New Mexico is a leader in wind energy and ranks among the **top five U.S. states** in wind energy potential. Wind power plays a crucial role in the state's energy landscape, contributing 38% of total in-state electricity generation in 2023. By the end of 2023, New Mexico had about 4,400 megawatts of installed wind capacity, **ranking ninth in the nation**. With abundant resources, wind energy is a key driver in New Mexico's transition to clean energy and a significant contributor to the regional power grid.

Notably, the SunZia project is a major initiative designed to transport wind-generated electricity from New Mexico to Arizona and beyond. It consists of two key components: SunZia Wind, a 3,515-megawatt wind farm in central New Mexico, and SunZia Transmission, a 550-mile high-voltage direct current (HVDC) transmission line that will deliver clean energy to western markets. Developed by Pattern Energy, SunZia is expected to become the largest renewable energy infrastructure project in U.S. history.

Figure 15: Wind speed at 100m above surface in New Mexico[19]

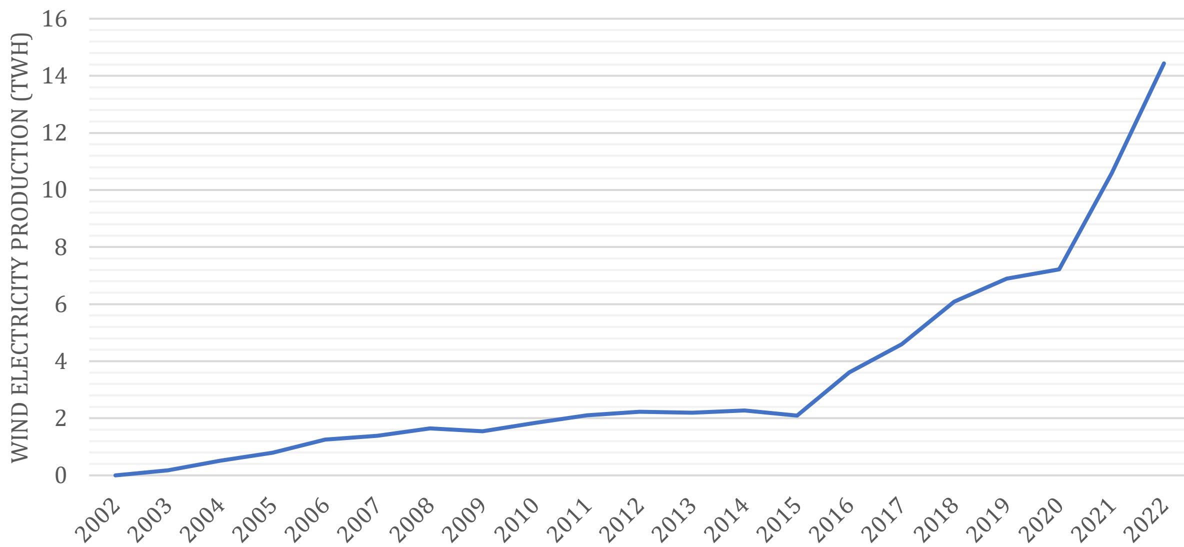


[19] https://windexchange.energy.gov/maps-data/378

The state has some of the strongest and most consistent wind patterns in the United States, particularly in the eastern and central regions. These areas have wind speeds averaging more than 9 meters per second, which is ideal for generating wind power.

Error! Not a valid bookmark self-reference. llustrates the rapid growth of wind electricity production in New Mexico from 2002 to 2022. Wind power generation started at a low level but experienced steady increases through the early 2010s, followed by a sharp rise from 2016 onward, reflecting the expansion of large-scale wind farms. By 2022, wind energy production exceeded 14 TWh, making it the dominant source of renewable electricity in the state.

Figure 16: Wind electricity production in New Mexico, modified based on EIA SEDS data.



New Mexico hosts several large-scale wind farms that are among the top 10 largest plant by capacity in New Mexico[20]:

- El Cabo Wind (298 MW) – Commissioned in 2017, operated by Avangrid Renewables LLC.
- La Joya Wind (306 MW) – Phase 1 (166 MW) began in 2020, and Phase 2 (140 MW) came online in 2021, developed also by Avangrid Renewables LLC.
- Sagamore Wind (522 MW) – Came online in December 2020 and is the largest wind farm to date in New Mexico, operated by Southwestern Public Service Co.
- Red Cloud Wind (350 MW) – Began operations in December 2021, developed by Pattern Operators LP.
- Clines Corners Wind Farm (325 MW) – Commissioned in 2022, another major Pattern Operators LP project.

These projects play a vital role in New Mexico's energy landscape and supporting economic growth in the region.

[20] U.S. Energy Information Administration, Form EIA-860, Annual Electric Generator Report.

GEOTHERMAL ENERGY

New Mexico's geothermal sector holds significant potential, **ranking 6th in the nation for geothermal resources[21]**. The state's high heat flow and advantageous geology make it an ideal location for geothermal energy development. However, despite this ranking, much of New Mexico's geothermal resources remain underdeveloped. The Lightning Dock Geothermal Plant, the only operational geothermal facility in the state, has a capacity of 15 MW and supplies power to the Public Service Company of New Mexico (PNM).

Academic and Research Initiatives

Strong interest in New Mexico's geothermal potential is reflected in key initiatives. New Mexico Tech, backed by state funding, is leading efforts in geothermal development. NMT hosts an annual geothermal workshop, bringing together a diverse range of stakeholders to foster collaboration between industry, academia, and government. Events such as the 2023 and 2024 Geothermal Workshops[22] emphasize this collaboration. Additionally, NMT's Geothermal Center of Excellence focuses on resource mapping, research, and workforce training. To further strengthen workforce development, NMT is also developing a Geothermal Certificate program.

Industry-Led Development

On the industry side, the recent drilling of a highly productive geothermal well by Zanskar Geothermal & Minerals, Inc. at the Lightning Dock geothermal field showcases the state's untapped geothermal potential. This single well is estimated to have a thermal capacity exceeding 200 MWth, enough to power the entire 15 MW Lightning Dock power plant, positioning it among the most productive geothermal wells in the United States[23].

Beyond Electricity Production

Geothermal energy in New Mexico is not limited to electricity generation; it is already being utilized for heating applications. For example, Masson Farms relies on geothermal heating for its greenhouses. Additionally, geothermal energy supports aquaculture and other thermal applications.

Workforce and Technology Integration

New Mexico's oil and gas workforce, which includes approximately 20,600 workers, possesses transferable skills in drilling, well management, and subsurface geology. With targeted training programs, this workforce could play a crucial role in accelerating geothermal development.

Technological advancements such as Enhanced Geothermal Systems (EGS) and Advanced Geothermal Systems (AGS) have the potential to unlock previously inaccessible resources. In a groundbreaking

[21] New Mexico Energy, Minerals and Natural Resources Department, Seizing our Energy Potential: Creating a More Diverse Economy in New Mexico, New Mexico Energy Policy & Implementation Plan (2015), New Mexico Energy Background, p. 7-8.
[22] https://www.nmt.edu/academics/petreng/Geothermal.php
[23] https://www.zanskar.com/blog/betting-on-an-underperforming-geothermal-resource-zanskars-new-step-out-production-well-at-lightning-dock-is-a-world-beating-gusher

endeavor, Eavor Technologies Inc. successfully completed the Eavor-Deep™ project in New Mexico, drilling in 2022 the deepest and hottest directional geothermal well in history. Positioning New Mexico at the forefront of next-generation geothermal energy development.

In addition, district heating and geothermal heat pumps provide alternative applications for residential, industrial, and agricultural use. For example, New Mexico has implemented the Geothermal Heat Pump Tax Credit Act. The act aims to encourage the adoption of energy-efficient heating and cooling solutions.

These developments highlight New Mexico's commitment to harnessing its geothermal resources and providing financial incentives to accelerate the transition to sustainable energy solutions.

Challenges

Despite its promise, geothermal development in New Mexico faces key challenges, including high upfront costs and permitting processes. Policy support, such as financial incentives and streamlined permitting, will be necessary to encourage private sector investment. Increased state and federal support can help reduce risks, facilitating New Mexico’s emergence as a leader in geothermal energy.

With growing interest in energy security and diversification, geothermal energy represents a largely untapped but highly promising clean energy source that could play a key role in New Mexico’s renewable energy portfolio and economic development.

HYDROPOWER

Hydropower plays a limited role in New Mexico's energy mix, primarily through small-scale hydroelectric plants and water management systems. The state's arid climate and variable water availability restrict hydropower development, but existing facilities, such as those on the Rio Grande and other river systems, contribute to the renewable energy generation.

Figure 17: Hydroelectric electricity production, modified based on EIA SEDS data.

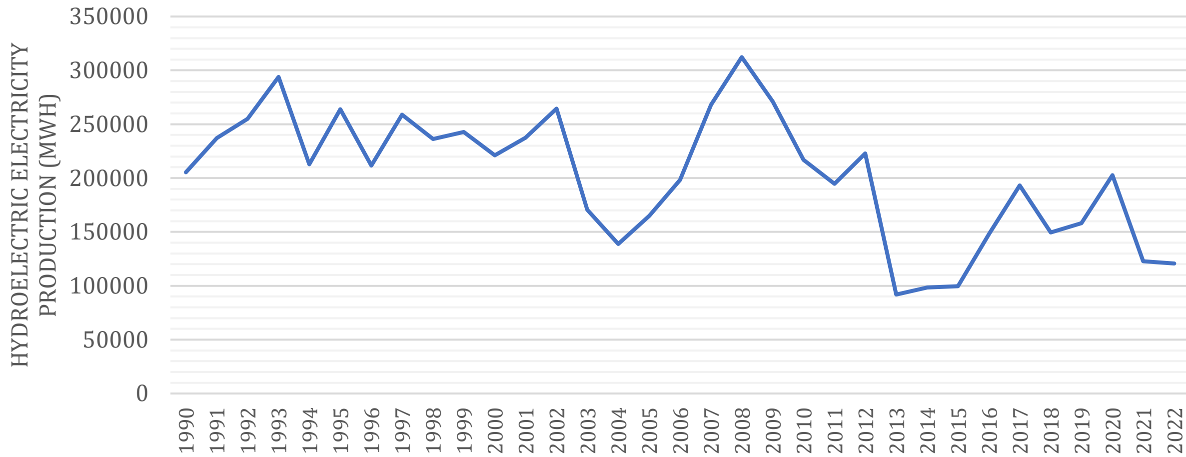


Figure 17 shows that hydroelectric electricity production in New Mexico has shown significant fluctuations over the past three decades. Production peaked at around 300,000 MWh in the early 1990s and again in the late 2000s, but has experienced multiple periods of decline, particularly in the early 2000s and post-2012. Since 2013, production has remained relatively low and inconsistent, averaging between 100,000 and 200,000 MWh. This variability is likely influenced by changing water availability, drought conditions, and hydrological constraints in the state. While hydropower continues to play a small role in New Mexico's energy mix, its contribution is diminishing, reinforcing the need for alternative sources such as geothermal to ensure energy security.

However, pumped-storage hydropower could be explored as a potential solution for energy storage and grid reliability, complementing intermittent renewable sources like wind and solar.

Overall, while New Mexico has potential for pumped hydro storage (PHS) development, project success hinges on thorough planning, community engagement, and compliance with regulatory frameworks. Notable projects include the 600 MW Sweetwater Pumped Storage Project in San Juan County and the 1,500 MW Carrizo Four Corners Pumped Storage Project, but they remain in early development. Additional PHS projects proposed on Navajo Nation lands faced setbacks after the Federal Energy Regulatory Commission (FERC) denied preliminary permits due to a lack of tribal consultation and support.

BIOMASS

Biomass energy remains a small but underdeveloped part of New Mexico's renewable energy sector, with resources derived from forest residues, agricultural waste, and municipal solid waste. The state's abundant forest biomass, particularly in northern and central regions, presents an opportunity for woody biomass utilization. A recent Feasibility Study for a Woody Biomass Production Facility in Cimarron highlights efforts to establish biomass processing infrastructure, aiming to support forest restoration, wildfire prevention, and local job creation[24].

One of the key potential applications of biomass in the state is biochar production, which has multiple environmental and economic benefits. Biochar production can reduce CO_2 emissions, improve soil health, enhance composting, and provide a profitable solution for biomass disposal. It also offers a sustainable way to utilize liability biomass, supporting forest thinning projects and reducing wildfire risks.

While biomass energy development remains limited in New Mexico, initiatives like the one in Cimarron highlight the potential for growth. State-backed projects could help expand biomass energy's role in New Mexico's clean energy transition and rural economic development.

[24] Engelman, N., & West, G. (2023). Woody Biomass Production Facility Feasibility Study. Prepared for the Village of Cimarron. Gila WoodNet.

NUCLEAR

Nuclear energy could play a strategic role in New Mexico's energy landscape, primarily through uranium resources, research facilities, nuclear waste management, and potentially commercial nuclear power generation. While New Mexico does not currently have any operational nuclear power plants, it has been a major hub for nuclear development due to its rich uranium deposits, national laboratories, and storage facilities.

The state was once a leading producer of uranium, particularly in the Grants Uranium District, which supplied much of the U.S. demand during the Cold War. Although uranium mining has stopped, recent interest in small modular reactors (SMRs) and advanced nuclear technologies has reignited discussions about exploration and the future role of nuclear energy.

In addition, New Mexico is home to two of the country's most prominent nuclear research institutions: Los Alamos National Laboratory (LANL) and Sandia National Laboratories (SNL). These facilities conduct advanced research on nuclear energy, reactor technology, national security, and waste management, contributing to innovations in fusion energy.

The state also plays a crucial role in nuclear waste storage and disposal. The Waste Isolation Pilot Plant (WIPP) near Carlsbad, southeast NM, is the only operational deep geological repository in the U.S. for radioactive waste, primarily from defense-related nuclear programs. Additionally, New Mexico has been a key location in discussions regarding high-level nuclear waste storage, including proposed sites for spent fuel from commercial reactors.

While New Mexico does not currently generate electricity from nuclear power, its expertise in research, resource management, and waste disposal ensures that it remains a critical player in the national and global nuclear energy landscape. As the U.S. explores next-generation nuclear reactors and SMRs, New Mexico's legacy in nuclear science positions it as a potential leader in this field.

However, the state is still burdened by the legacy of wrongful mining practices that contaminated areas and shaped public opinion, creating challenges for new nuclear developments despite its technical expertise and strategic importance in the sector.

HYDROGEN

In 2023, New Mexico has collaborated with neighboring states to establish the Western Interstate Hydrogen Hub (WISHH) that includes New Mexico, Colorado, Utah, and Wyoming, focusing on developing a clean hydrogen economy in the region. Despite not being selected for federal funding during this Department of Energy (DOE) Hydrogen Hub initiative, New Mexico remains committed to establishing itself as a key player in the emerging hydrogen economy. The state is actively pursuing public-private partnerships to advance hydrogen production, storage, and utilization, leveraging its existing energy infrastructure, natural gas resources, and renewable energy potential.

Hydrogen Development Initiatives
Several initiatives are ongoing at the state level:

- Tallgrass Energy is leading efforts to repurpose the decommissioned Escalante Station, a former coal-fired power plant in McKinley County. The project involves converting the plant into a hydrogen production facility. Producing hydrogen via steam methane reforming (SMR) and using carbon capture and storage (CCS) to make the operation sustainable[25].
- Kit Carson Electric Cooperative (KCEC) has secured substantial funding to develop a green hydrogen facility in Questa, New Mexico[26]. In January 2025, KCEC was awarded $231 million by the U.S. Department of Agriculture's Empowering Rural America Program to construct a 104 MW renewable energy facility utilizing green hydrogen and solar.
- An Australia-based company, Star Scientific, has announced plans to expand hydrogen research in New Mexico. The company intends to build a campus dedicated to advancing hydrogen fuel as a heat source for industrial applications[27].

Challenges
Despite its potential, hydrogen development in New Mexico faces several challenges. One key concern is water usage, as electrolysis-based green hydrogen requires substantial water resources, which is a significant issue in the state's arid climate. Additionally, public opposition has emerged, particularly against blue hydrogen, which relies on natural gas and carbon capture. Environmental groups and local communities have raised concerns about methane leakage and the overall climate impact of such projects.

However, New Mexico remains committed to low-carbon hydrogen development, aligning with decarbonization goals and focusing on hard-to-abate sectors like heavy industry and transportation as part of its clean energy transition.

[25] https://sourcenm.com/2024/06/28/like-it-or-not-a-hydrogen-ecosystem-is-coming-to-new-mexico/
[26] https://www.utilitydive.com/press-release/20250114-kit-carson-electric-cooperative-awarded-231-million-for-construction-of-10-1/
[27] https://www.governor.state.nm.us/2023/10/25/australian-based-star-scientific-chooses-new-mexico-for-north-american-expansion-albuquerque-to-be-center-for-clean-hydrogen-research-and-manufacturing-create-200-jobs/

4. ELECTRICITY GENERATION AND CONSUMPTION

4.1 ELECTRICITY GENERATION PROFILE

New Mexico's electricity generation mix has undergone a significant transformation over the past two decades, shifting away from coal and toward renewable energy sources, particularly wind and solar.

Long-Term Trends (2000-2022)

Figure 18 highlights New Mexico's electricity generation mix (2000-2022) and shows a gradual decline in coal generation, which once dominated the state's electricity production. In contrast, natural gas and wind power have steadily increased, particularly since 2010, while solar PV has seen more recent growth. Hydroelectric, geothermal, and biomass have remained minor contributors throughout the period.

Figure 18: New Mexico Electricity Generation Mix (2000-2022), modified based on EIA SEDS data.

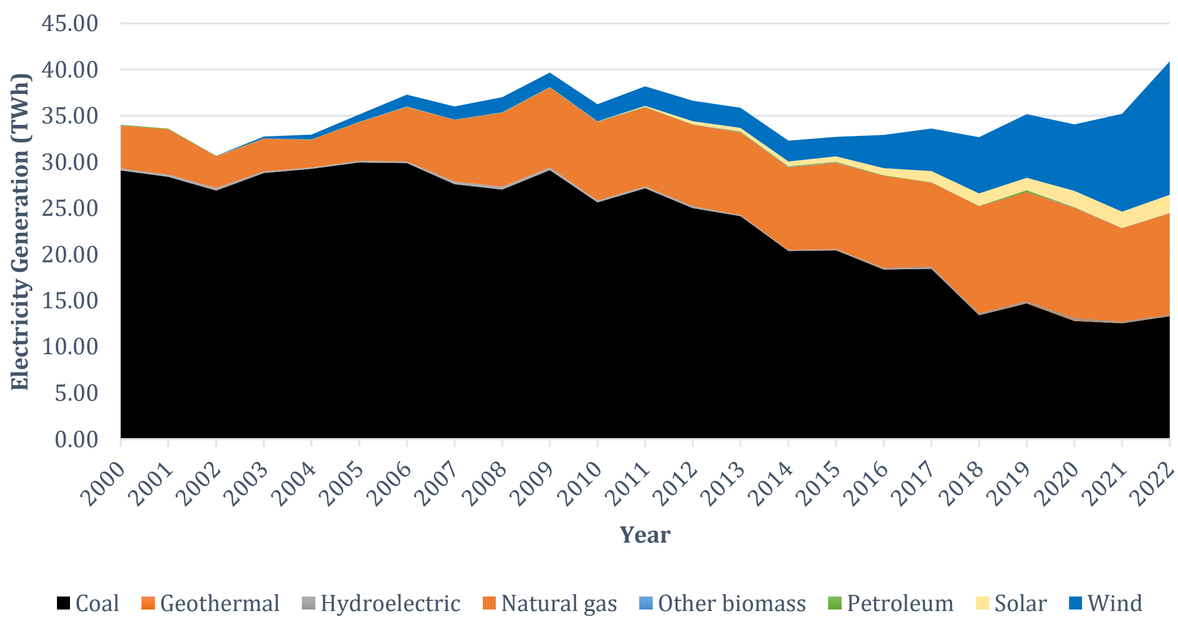


Figure 19 illustrates the yearly percentage change in electricity generation by source, highlighting key trends:

- Coal generation has experienced consistent declines, with major drops in 2018 and 2023, reflecting plant retirements.
- Wind energy has seen substantial growth, with particularly large increases in 2016, 2017, 2018, 2021 and 2022, driven by new wind farm developments.

- Solar PV has also expanded significantly following increased investment in utility-scale solar projects.
- Natural gas has fluctuated but has remained a reliable transition fuel, growing in some years while declining in others.

An interesting fact is that the sharp decrease in coal-based power in 2018 and 2023 was compensated by a significant increase in natural gas generation, highlighting its role as a transitional energy source in maintaining grid stability.

Figure 19: New Mexico electricity generation yearly rate of change (2010-2022), modified based on EIA SEDS data.

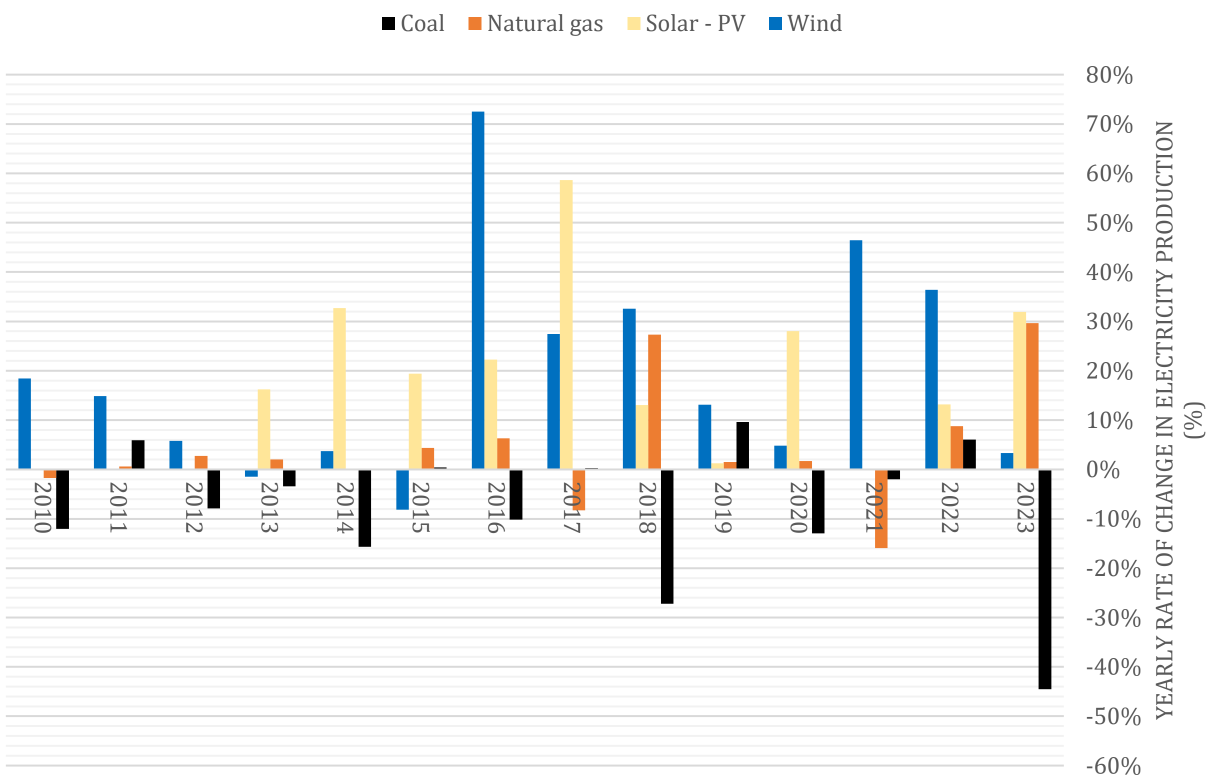
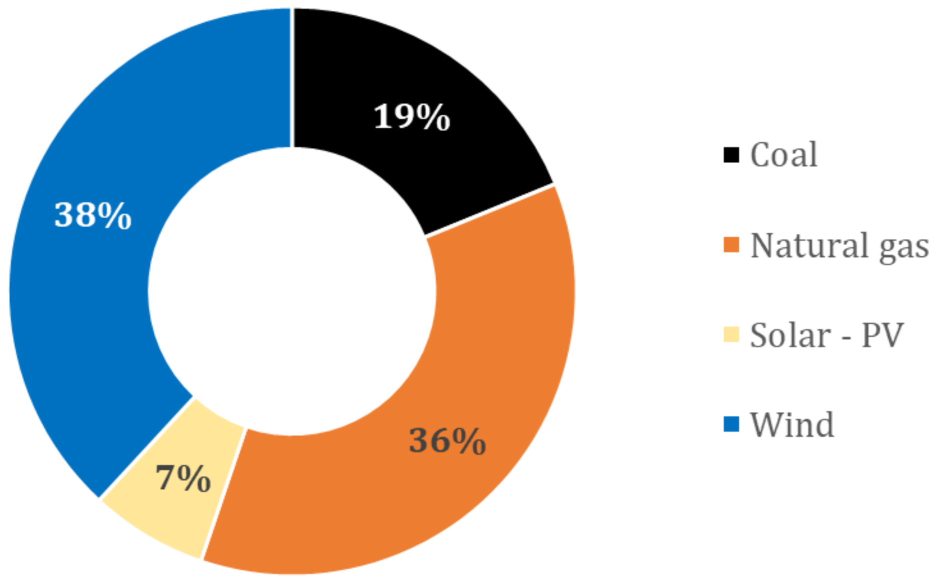


Figure 20, representing New Mexico's 2023 electricity production mix, shows that:

- Wind power is now the largest source of electricity (38%), highlighting its dominant role in the state's renewable energy transition.
- Natural gas (36%) remains a key part of the energy mix, likely serving as a balancing source for grid stability.
- Coal (19%) has significantly declined but still contributes to the grid, though further reductions are expected in the coming years.
- Solar PV (7%) continues to grow, with additional installations likely to increase its share in the future.

Figure 20: New Mexico 2023 electricity production mix, modified based on EIA SEDS data.



Type	Electricity Generation (GWh)	Total share (%)
Coal	7371.8	18.8%
Geothermal	35.9	0.1%
Hydroelectric	107.8	0.3%
Natural gas	14230.8	36.2%
Biomass	13.1	0.0%
Petroleum	1.4	0.0%
Solar - PV	2613.0	6.7%
Wind	14914.5	38.0%

New Mexico's electricity generation has shifted away from coal and toward a mix dominated by wind and natural gas, with solar PV playing an increasing role. The state's strong renewable energy resources, along with policy incentives and industry investments, are expected to accelerate the transition toward renewables in the coming years.

However, the state will need to carefully strategize the deployment of these renewables to ensure grid stability and security, while also addressing equity and economic stability for fossil fuel-dependent communities, notably those in the Four Corners region, where coal plant closures have had significant economic and social impacts. Thoughtful planning and targeted workforce transition programs will be essential to support these communities during the energy shift.

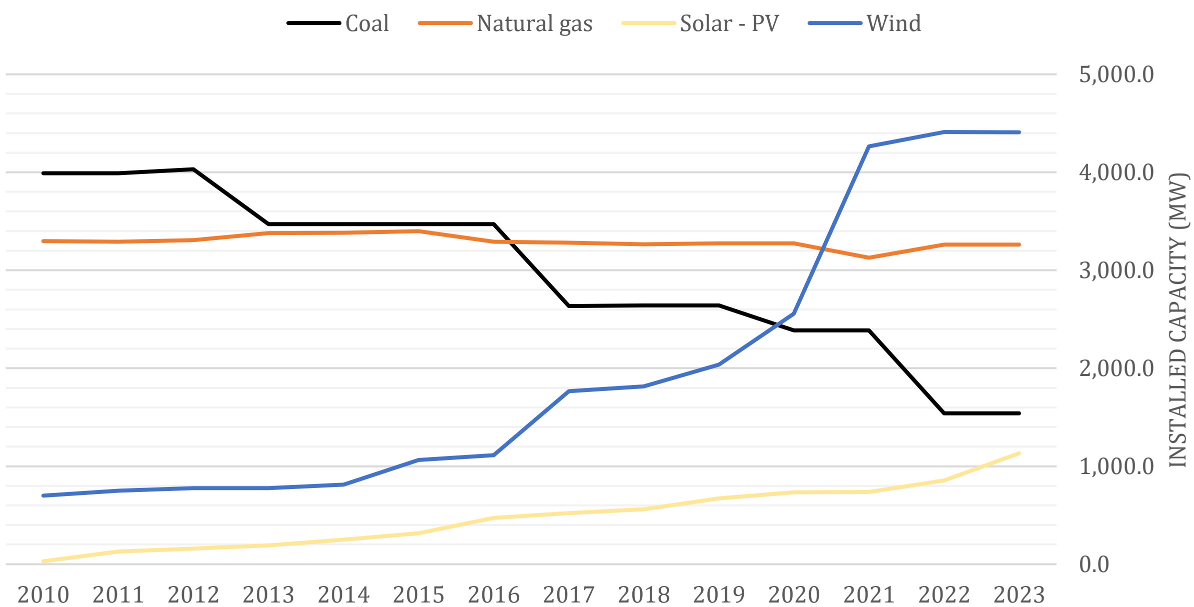
4.2 INSTALLED CAPACITY AND CAPACITY FACTORS

New Mexico has seen significant shifts in installed capacity and energy system performance trends over the past decade, largely driven by the transition from coal to renewables and natural gas.

Figure 21 shows the installed capacity trends for coal, natural gas, wind, and solar between 2010 and 2023:

- Coal capacity has sharply declined since 2010.
- Wind capacity has increased significantly, surpassing coal in 2020, and natural gas in 2021, and making it the dominant energy source in the state with natural gas.
- Solar PV capacity has grown steadily since 2010.
- Natural gas installed capacity has remained relatively stable with a very small decline.

Figure 21: Evolution of installed capacity for different energy sources in New Mexico (2010-2023) , modified based on EIA SEDS data.

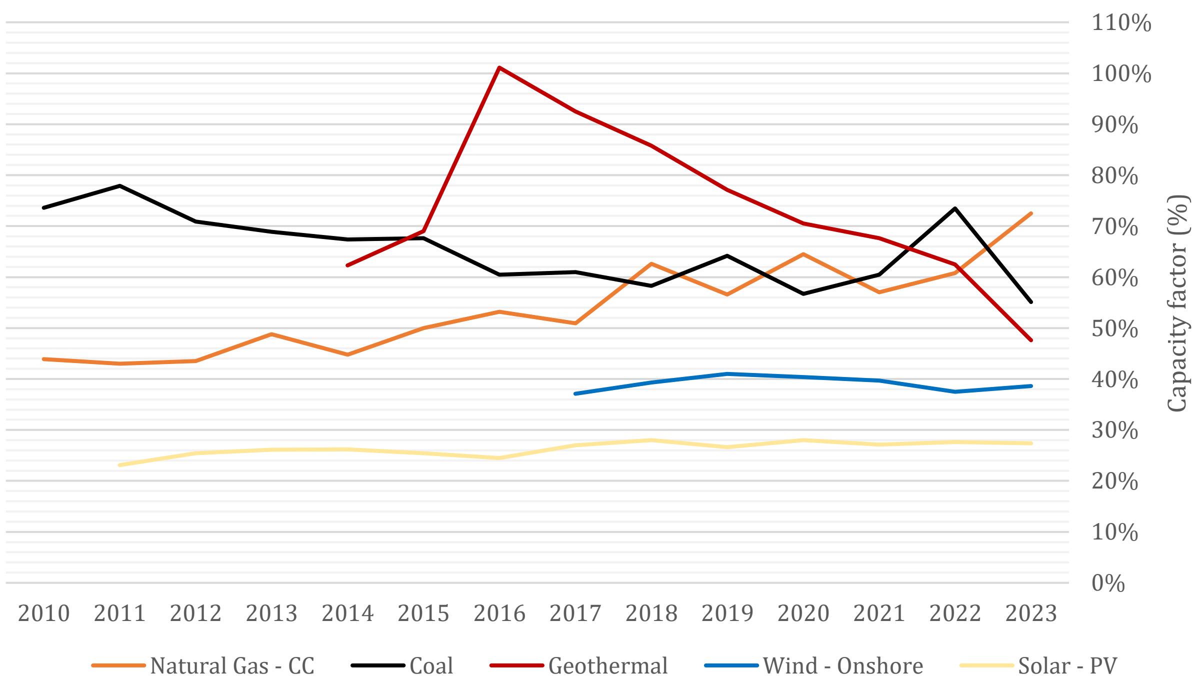


	Installed Capacity (MW) 2023
Coal	**1,540.0**
Natural gas	**3,263.1**
Solar - PV	**1,131.9**
Wind	**4,409.0**

Figure 22 illustrates capacity factor trends, which indicate how efficiently each energy source operates:

- Coal's capacity factor has declined, reflecting lower utilization, aging, and retirements of plants.
- Natural gas (combined cycle) capacity factor has steadily increased, highlighting the greater need for it as a reliable baseload source and covering intermittent renewables.
- Wind's capacity factor has remained moderate, showing steady performance improvements but still limited by its intermittent nature.
- Solar PV has the lowest capacity factor, reflecting the inherent variability of solar resources.
- Geothermal briefly surged in 2016 but has since declined, indicating operational inconsistencies in New Mexico's geothermal facilities.

Figure 22: Evolution of capacity factors for different energy sources in New Mexico (2010-2023), modified based on EIA SEDS data.



In 2023, New Mexico's capacity factors by energy source highlighted the state's evolving energy mix. Natural gas combined cycle had the highest capacity factor, reinforcing its role as a stabilizing energy source. Despite a decline in overall capacity and capacity factor, coal maintained a relatively high capacity factor, showing that the remaining plants are still operating efficiently. Geothermal capacity factor performance highlights its potential to be a reliable and sustainable baseload power source for New Mexico. Wind and biomass had moderate capacity factors between 30-40%, while solar PV and hydroelectric had the lowest efficiency in terms of utilization, less than 30%.

Natural gas capacity factors have steadily increased since 2010, rising from 40-50% to around 60% on average and 72.5% in 2023. This trend highlights the greater reliance on natural gas as a baseload source, replacing coal and covering intermittent renewables. Comparing these values to national averages reported by the U.S. Energy Information Administration[28] (EIA) provides further insight:

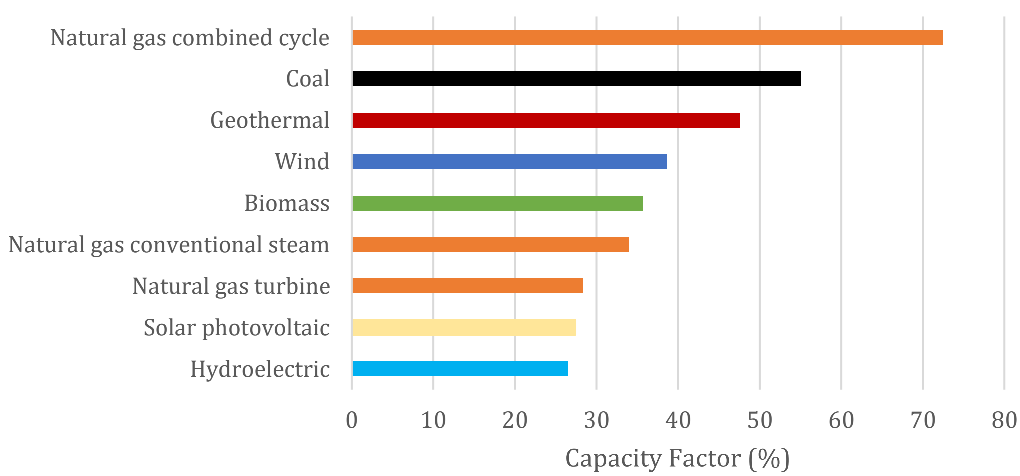
- Natural Gas Combined Cycle: Typically achieves 56% to 57% capacity factor.
- Coal: Averages 48% nationally.
- Geothermal: Maintains higher capacity factors, often around 73% to 74%.
- Wind: National average ranges from 34% to 37%.
- Solar PV: Generally, has a 25% to 26% capacity factor.
- Hydroelectric: Typically ranges between 35% and 43%, depending on water availability.

These comparisons show that New Mexico's natural gas and coal plants operate at or above national averages, reflecting efficient utilization. Wind and solar PV are slightly above but align with national trends, while geothermal's inconsistent capacity factor suggests room for improvement. The lower hydroelectric capacity factor in New Mexico could be explained by regional water constraints and water scarcity.

Overall, New Mexico's energy transition is evident in capacity factor trends, with natural gas filling the reliability gap left by coal retirements and renewables growing but still constrained by intermittency challenges.

Moving forward, grid stability strategies will be crucial to integrating more renewables while managing their limitations and relying on dispatchable sources like natural gas. This imply that the natural gas industry will have to adapt to these changes.

Figure 23: 2023 Capacity factors for different energy sources in New Mexico, modified based on EIA SEDS data.



[28] https://www.eia.gov/electricity/data/browser/

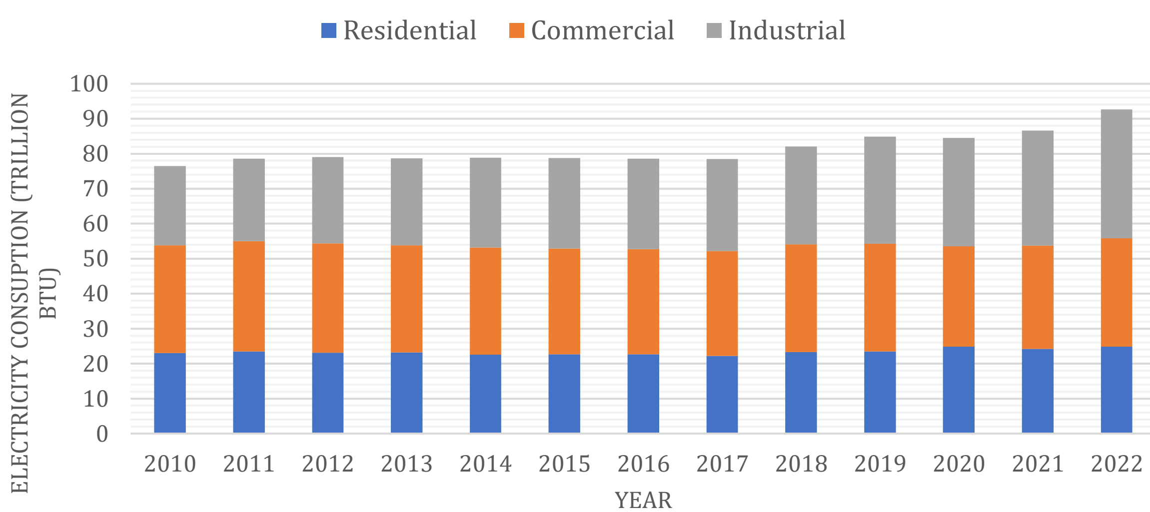
4.3 ELECTRICITY CONSUMPTION PATTERNS

New Mexico's electricity consumption has shown gradual growth and has been influenced by industrial demand, residential usage, and exports. The state's electricity consumption trends reflect its economic activity and role as an energy-exporting state.

Figure 24 shows the evolution of electricity consumption by sector. Over the years:

- Industrial consumption has been the largest and fastest-growing sector, with an increase after 2017. By 2022, industrial electricity use had reached its highest level, reflecting growth in energy-intensive industries such as manufacturing and energy production.
- Residential and commercial consumption have remained stable, with minor fluctuations but no drastic increases.
- The overall trend indicates electricity demand growth across all sectors.

Figure 24: Electricity consumption by sector (2010-2022), modified based on EIA SEDS data.



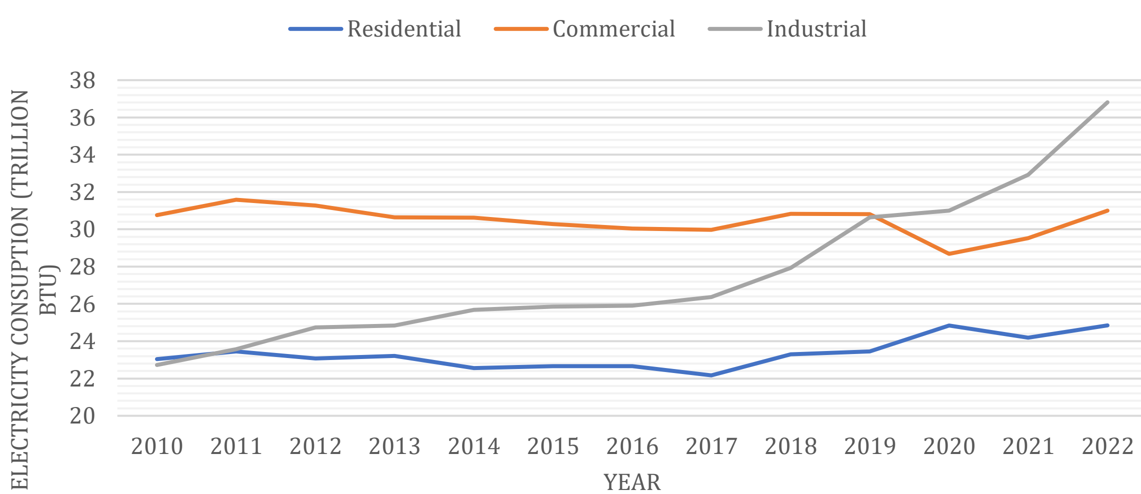
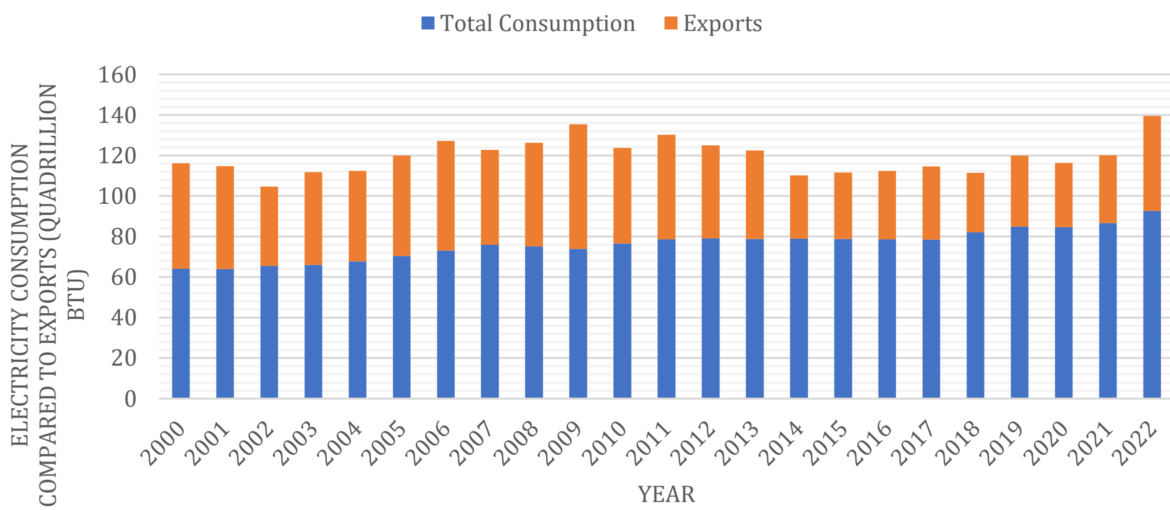


Figure 25 compares New Mexico's total electricity consumption and exports:

- Exports have increased significantly since the mid-2000s, peaking in 2009 before declining to a stable average of 30-35 Quadrillion BTU until 2022. This trend reflects the reduction in energy generation, surely due to the transition away from coal, followed in the 2020s by a recent surge in exports driven by the expansion of wind and solar power. This shift highlights New Mexico's evolving role as a key energy supplier, adapting to changing generation sources while maintaining its export capacity.
- Total consumption has remained relatively stable, suggesting that increased production is primarily feeding external markets rather than meeting rising local demand. However, a slow growing trend is notable since 2018.
- The high export levels recorded in 2022 reflect New Mexico's growing renewable energy sector and its contribution to regional energy grids.

Figure 25: New Mexico electricity consumption vs. exports (2000-2022) , modified based on EIA SEDS data.



The pie chart Figure 26 illustrates the breakdown of electricity consumption in New Mexico in 2022. Industrial users accounted for the largest share (40%), highlighting the significance of manufacturing, energy production, and other heavy industries in driving electricity demand. Commercial consumption made up 33%, reflecting the role of businesses, institutions, and service sectors in the state's energy use. Meanwhile, residential consumption represented 27%, indicating a smaller but still significant portion of total electricity demand, influenced notably by heating and cooling.

Figure 26: Share of New Mexico electricity consumption in 2022 by sectors, modified based on EIA SEDS data.

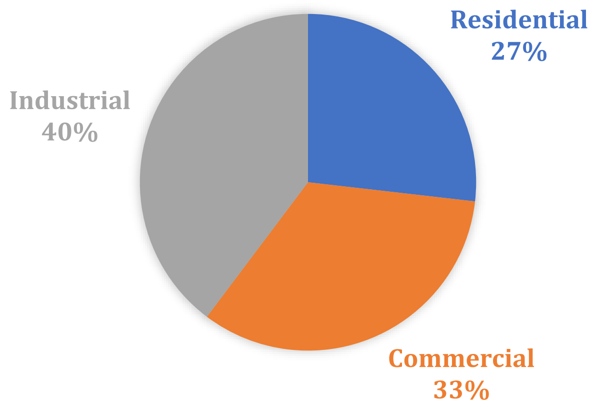
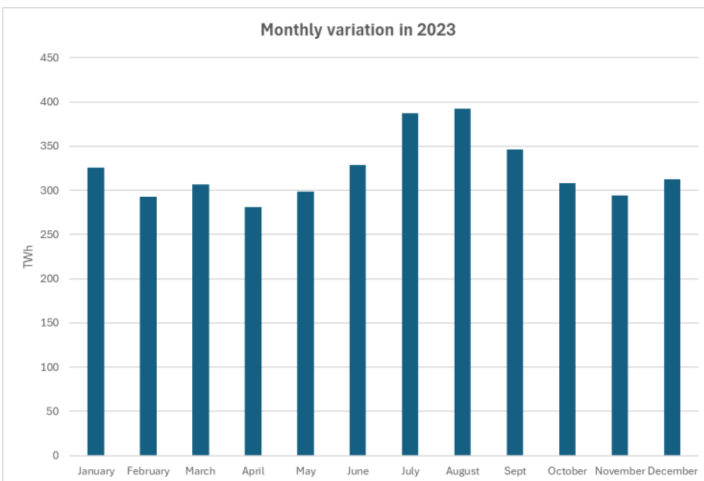


Figure 27 illustrates monthly electricity consumption trends in 2023 in New Mexico:

- Electricity use peaked in the summer months (July and August), likely due to increased space cooling demand.
- Winter months (January and December) also showed relatively high consumption, suggesting the influence of heating needs in colder periods.
- Spring and fall months had lower consumption, aligning with milder weather conditions and reduced heating/cooling requirements.

Figure 27: Monthly variation of electricity consumption in 2023 in New Mexico, modified based on EIA SEDS data.



New Mexico's electricity consumption patterns highlight a relatively stable demand across sectors until 2018, with industrial users leading consumption. The state's rising electricity exports, particularly in 2022, showcase its increasing role as a regional clean energy provider, likely due to the expansion of wind sources.

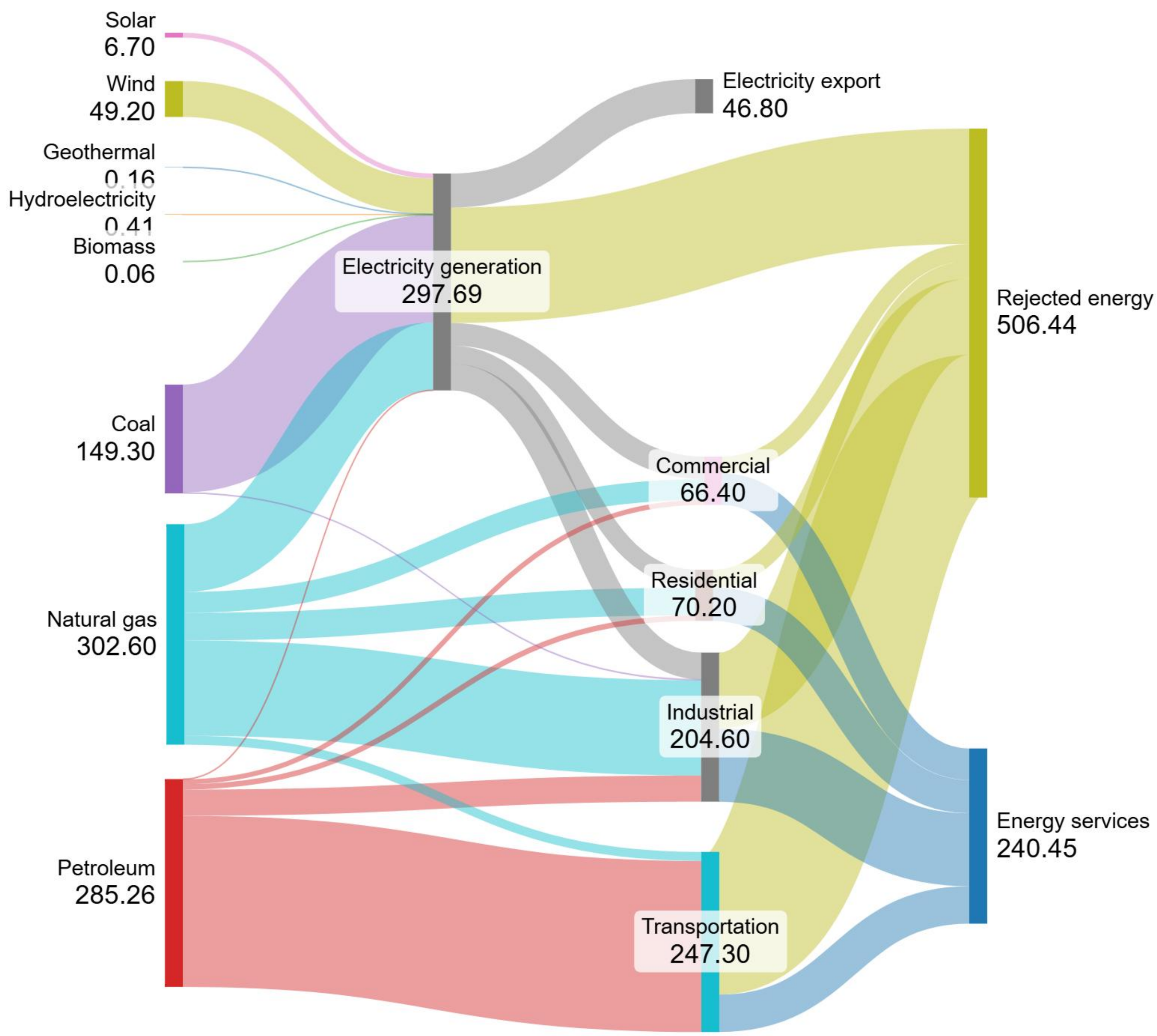
Seasonal variations further emphasize the influence of climate on electricity demand, with peaks in summer (cooling needs) and winter (heating needs). Moving forward, grid stability, energy storage, and sustainable electricity production will be key factors in managing New Mexico's growing energy footprint.

4.5 SANKEY DIAGRAM

This Sankey diagram (Figure 28: Sankey diagram for energy consumption in New Mexico in 2022 (Total 746.89 trillion Btu).Figure 28) provides a visual representation of energy consumption, generation, and losses in New Mexico for 2022, highlighting the flow of energy from primary sources to end-use sectors and rejected energy (waste). The total primary energy supply is 746.89 trillion Btu, with 67.3% being rejected as waste heat and 32.7% used as energy services.

Natural gas remains the primary energy source in New Mexico, supplying multiple sectors, while renewables like wind and solar still represent a smaller share. Energy efficiency improvements are crucial, especially in transportation and electricity generation, where significant losses occur. The state also serves as an electricity exporter, supporting regional energy needs.

Figure 28: Sankey diagram for energy consumption in New Mexico in 2022 (Total 746.89 trillion Btu).



Note on Data Sources and Assumptions for Sankey Diagram 2022[29,30]:

- *The total primary energy consumption amounts to 746.89 trillion Btu, with 32.7% used for energy services and 67.3% rejected as waste energy.*
- *Primary energy consumption data by fuel type (coal, natural gas, petroleum, renewables) and sectoral breakdown (industrial, residential, commercial, transportation) were obtained from the EIA website.*
- *End-use efficiency ratios were derived from flowcharts.llnl.gov, assuming:*
    - *65% efficiency for the commercial and residential sectors*
    - *49% efficiency for the industrial sector*
    - *21% efficiency for transportation*
- *Electricity generation data by source were taken from EIA, and total electricity consumption by sector was also retrieved.*
- *Rejected energy was calculated by subtracting useful electricity output from total fuel input in the electric power sector, representing conversion losses in fossil fuel-based generation.*

[29] https://sankeymatic.com/
[30] https://flowcharts.llnl.gov/

4.5 ENERGY PRICE

Figure 29 shows the evolution of natural gas prices for residential, commercial, and industrial consumers in New Mexico. Prices increased significantly from 2000 to 2008, peaking before the financial crisis, followed by a decline and stabilization until 2020. However, a sharp spike occurred in 2022, likely due to global energy market disruptions, before dropping again in 2023.

Figure 29: Average price of natural gas according to the type of consumer, modified based on EIA SEDS data.

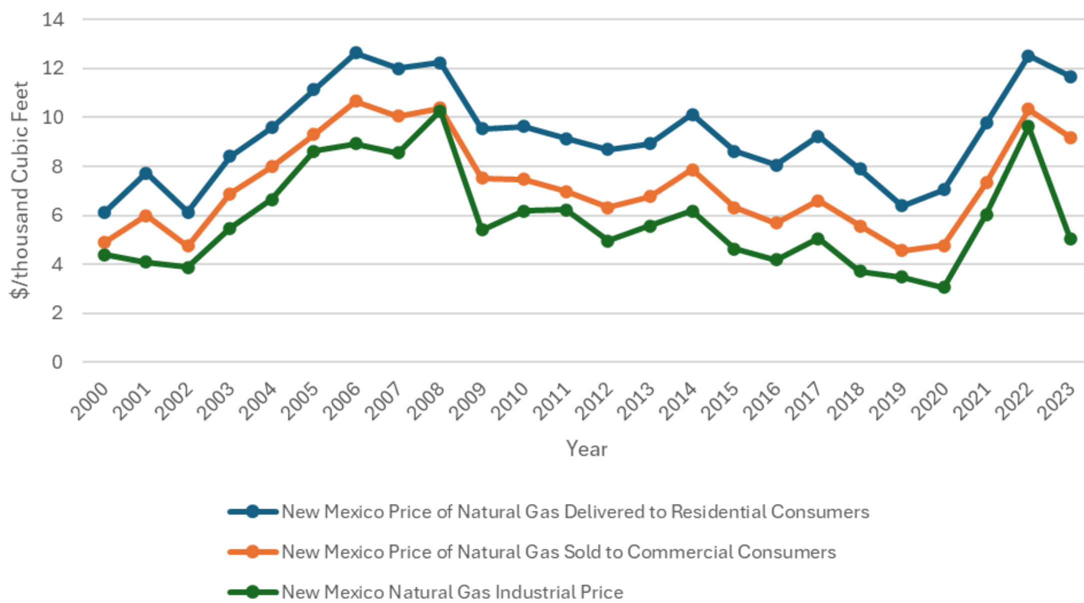
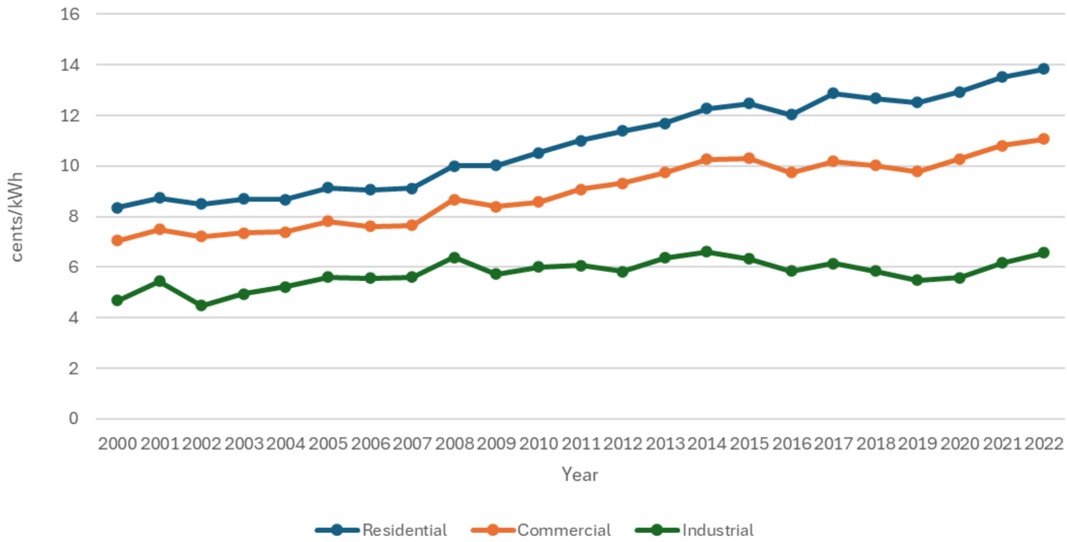


Figure 30 shows electricity price trends for residential, commercial, and industrial sectors. Unlike natural gas, electricity prices have steadily increased, without major declines. Residential electricity prices (blue line) have risen the most, reaching around 14 cents/kWh by 2022. Commercial prices (orange line) have followed a similar upward trend, while industrial prices (green line) have remained the lowest.

When compared to electricity consumption data, industrial users, who consume the largest share (40%), pay the lowest electricity rates, while residential consumers, who use only 27% of electricity, face the highest costs.

Overall, electricity prices continue to rise across all sectors, whereas natural gas prices are more volatile, responding to market conditions and global disruptions. With ongoing grid expansions and a transition toward renewables, the future of New Mexico's energy prices will depend on market stability, regulatory decisions, and infrastructure investments.

Figure 30: Evolution of the average price of electricity to ultimate customer in New Mexico, modified based on EIA SEDS data.



6. GRID INFRASTRUCTURE AND ENERGY SECURITY

New Mexico faces several challenges regarding reliability and resilience in energy production, especially given its heavy reliance on fossil fuels and the rapid growth of renewable energy sources. As New Mexico increasingly incorporates solar and wind energy into its grid, the intermittency of these resources presents challenges. Solar energy production is limited to daylight hours, and wind energy can be unpredictable, creating periods where energy production does not meet demand. New Mexico is also experiencing worsening drought conditions, which could affect the cooling processes of fossil fuel power plants and impact the state's hydropower production. In general, transition to renewable energy faces 3 major issues: grid stability, storage, peak power supply. Grid concerns will be explored further in this document. Storage concerns are classified by energy stored and time needed to unload. Some technologies like capacitors and flywheel represent solutions for peak power demand over a few seconds, then batteries and hydro storages represent solutions for a few hours and lastly solutions like Power-to-Gas can represent solutions for longer periods. Lastly, demand supply needs to be met under every condition which implies to keep power plants able to start quickly in case weather conditions do not provide enough electricity.

6.1 THE STRUCTURE OF NEW MEXICO'S ELECTRIC GRID

The electric grid in New Mexico is managed by multiple utility companies, transmission operators, and regional grid organizations, ensuring the reliable delivery of electricity across the state. The state's transmission infrastructure is critical for both local consumption and energy exports, particularly as renewable energy generation and export expands.

As of today, New Mexico does not have a dedicated Independent System Operators (ISOs) or Regional Transmission Organizations (RTOs) managing its entire grid[31]. However, parts of the state are associated with larger regional entities. Notably, the Southwest Power Pool (SPP), an RTO that oversees portions of New Mexico's transmission infrastructure, integrating them into a broader regional network. New Mexico Public Regulation Commission (NMPRC) has been exploring the feasibility and implications of the state's utilities participating in an RTO or ISO[32]. Such integration would aim to enhance grid reliability, facilitate renewable energy integration, and ensure cost-effective electricity delivery to consumers.

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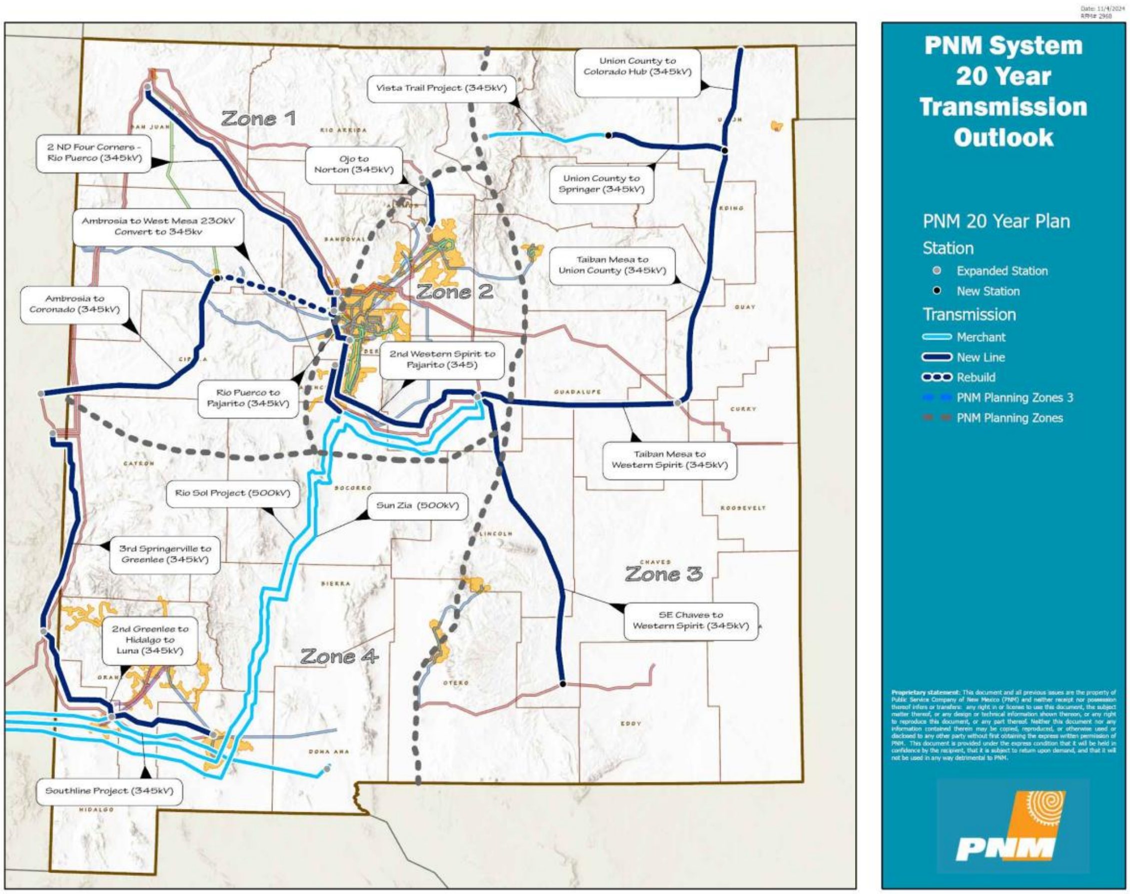
[31] https://www.ferc.gov/power-sales-and-markets/rtos-and-isos

[32] https://www.prc.nm.gov/wp-content/uploads/2023/09/Press-Release_NMPRC-to-hold-workshop-to-determine-RTO-ISO-viability-for-PNM-and-EPE.pdf

1. **Public Service Company of New Mexico (PNM)** is the largest electric utility in the state. It owns and operates a major portion of New Mexico's transmission and distribution network (Figure 31) and is part of the Western Electricity Coordinating Council (WECC), connecting it to regional power markets[33].
   WECC is a regional reliability entity responsible for ensuring the reliability and security of the bulk power system in the Western Interconnection, which includes New Mexico, 13 other U.S. states, parts of Canada, and northern Mexico.

Figure 31: PNM System 20 Year Transmission Outlook



2. **Southwestern Public Service Company (SPS – Xcel Energy)** operates in eastern New Mexico, primarily serving customers in Texas and New Mexico. It is part of the SPP RTO.
3. Several municipal utilities and electric cooperatives manage local grid operations and electricity distribution.

New Mexico's grid expansion and modernization efforts are driven by large-scale transmission projects aimed at integrating renewable energy, enhancing reliability, and increasing electricity exports. Table 1: Grid expansion and modernization efforts highlights key projects like SunZia (550

[33] https://www.wecc.org/

miles, 525 kV, 3,000 MW) and Riosol (550 miles, 500 kV, 1,500 MW) that represent significant investments in high-voltage infrastructure, facilitating the transport of wind and solar power across the region.

Table 1: Grid expansion and modernization efforts[34]

Project	Length (miles)	Voltage (kV)	Capacity (MW)	Investments (millions $)	Status	Due date
High Lonesome Mesa	32	115	100	50	Done	/
Western Spirit	155	345	800	400	Done	/
SunZia	550	525	3000	1.8	In progress	Work started
Crossroads-Hobbs-Roadrunner	125	345	1792		In progress	Commercial use by end of 2026
Mora	47+69	345+115	182	83	In progress	Seeking for real property
Riosol	550	500	1500	2.4	In progress	Based on SunZia end: planned for end in 2028
North Path	400	525	4000		In progress	Expected end in 2032

With billions of dollars in investments and completion timelines extending through 2032, these upgrades aim to position New Mexico as a key energy hub, capable of exporting large volumes of renewable power.

New Mexico's strategic location and diverse renewable energy resources enable it to balance regional energy dynamics by exporting wind energy when solar generation declines in the West and supplying solar power when wind generation is low in the East.

6.2 RESILIENCE AND RELIABILITY

Reliability refers to the ability to consistently deliver electricity to consumers without interruptions to meet the demand at all times.

Resilience refers to the ability to recover quickly from disruptions caused by extreme events.

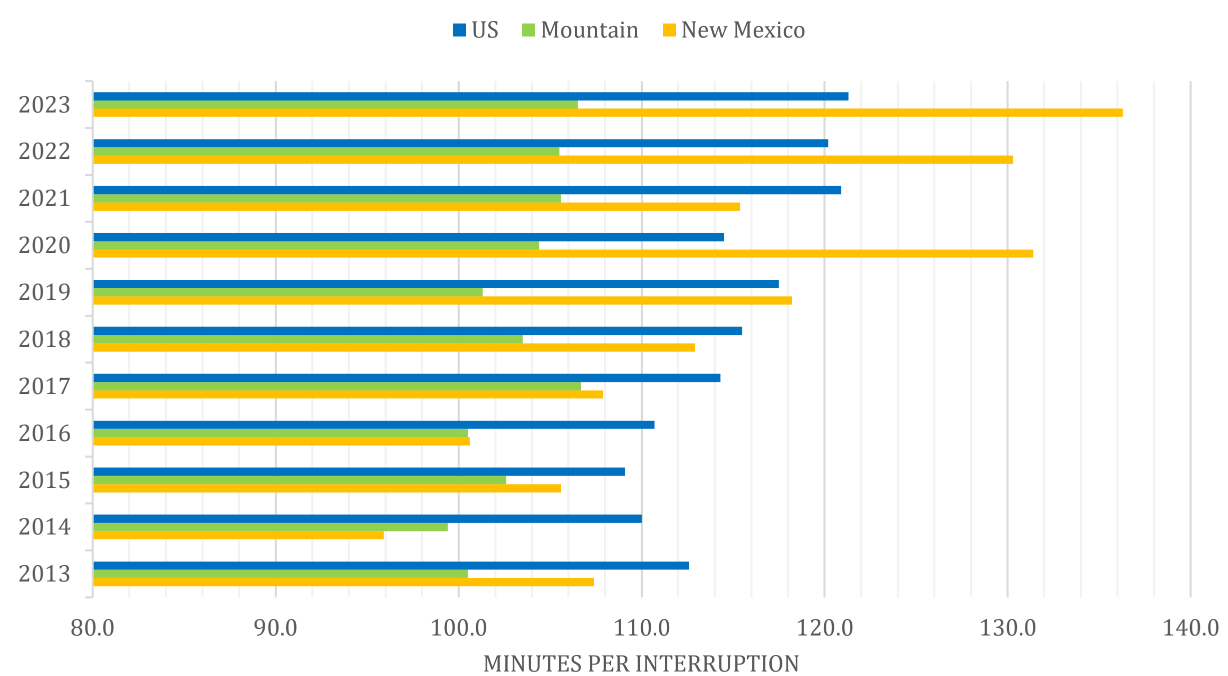
To estimate the reliability and resilience of the present grid in New Mexico, a few indicators exist to quantify and compare the disruptions. The Customer Average Interruption Duration Index (CAIDI)

[34] https://nmreta.com/reta-projects/

measures the average duration of power outages per customer affected, providing insight into the efficiency of power restoration efforts. Figure 32 presents CAIDI without major event days, meaning it excludes extreme weather events and grid-wide failures, offering a more typical representation of grid reliability. Key observations from the graph:

- Initially, New Mexico's outage duration was lower than the national averages.
- However, from 2016 onward, CAIDI in New Mexico has trended upward, surpassing both the Mountain region and U.S. averages, reaching over 130 minutes per interruption by 2023.
- New Mexico surpassed the U.S. average in 2018 and has continued rising.
- This trend suggests growing challenges in outage response time, possibly due to aging infrastructure, increased strain on the grid, or workforce limitations in utility operations.

Figure 32: CAIDI indicator without major event days (2013-2023)[35]



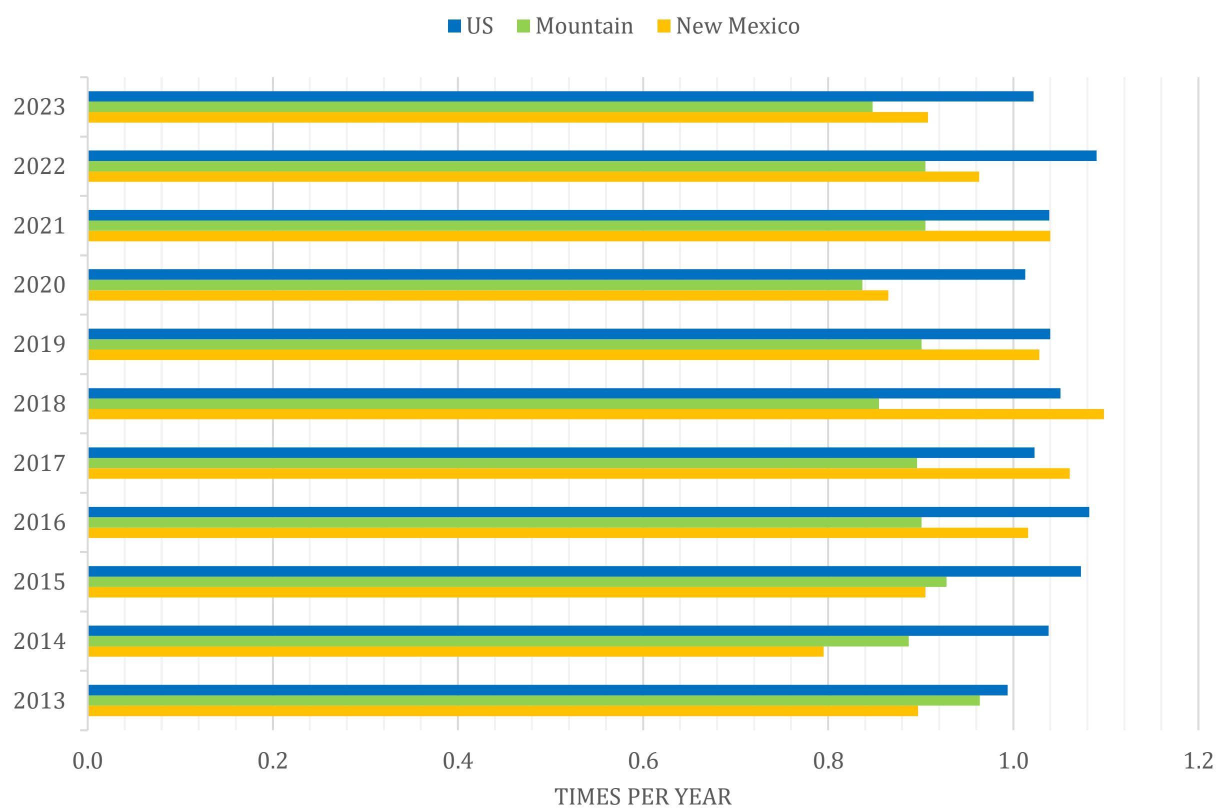
This indicates that the state's utilities may need to invest in grid modernization, enhanced maintenance, or improved outage response strategies to reverse this trend.

The System Average Interruption Frequency Index (SAIFI) measures the average number of power interruptions per customer per year. Figure 33 presents SAIFI without major event days, meaning it excludes extreme weather events and large-scale grid failures, focusing on routine grid reliability. It shows that the state generally experiences fewer outages per customer per year compared to the

[35] https://www.eia.gov/electricity/annual/

U.S. average but remains close to the Mountain region's performance. While outage frequency has remained relatively stable from 2013 to 2023, there have been fluctuations, particularly in 2017 and 2018, where New Mexico's SAIFI was slightly higher than the national average. However, by 2023, New Mexico showed improvement, with fewer outages compared to the national level. This suggests that grid reliability in New Mexico is relatively strong, but continued infrastructure improvements will be essential to maintain and enhance performance.

Figure 33: SAIFI indicator without major event days (2013-2023, EIA)



7. GREENHOUSE GAS EMISSIONS

Understanding baseline greenhouse gas (GHG) emissions is essential for assessing New Mexico's progress toward decarbonization. Historically, the state's emissions have been dominated by coal-fired electricity generation, oil and gas production, and transportation, with industrial and residential sectors playing smaller roles. However, recent shifts in the energy mix, including the retirement of coal plants and increased deployment of renewables, have significantly altered the state's emissions profile. This chapter examines GHG emissions trends by sector and fuel type, highlighting the historical drivers of emissions, the impact of energy transition policies, and the challenges ahead for achieving net-zero goals.

Figure 34 shows GHG emissions from various sectors, including electric power, transportation, industry, residential, and commercial sectors. The most notable trend is the sharp decline in emissions from the electric power sector (yellow line), particularly after 20011. This decline aligns with the closure of coal-fired power plants in New Mexico, as previously discussed. In contrast, emissions from transportation (blue line) and industry (gray line) have remained relatively stable or slightly increased, emphasizing the challenge of decarbonizing these sectors. The residential and commercial sectors (orange and light blue lines) contribute the least to emissions.

Figure 34: Evolution of greenhouse gases emissions by sectors in New Mexico (2000-2022) , modified based on EIA SEDS data.

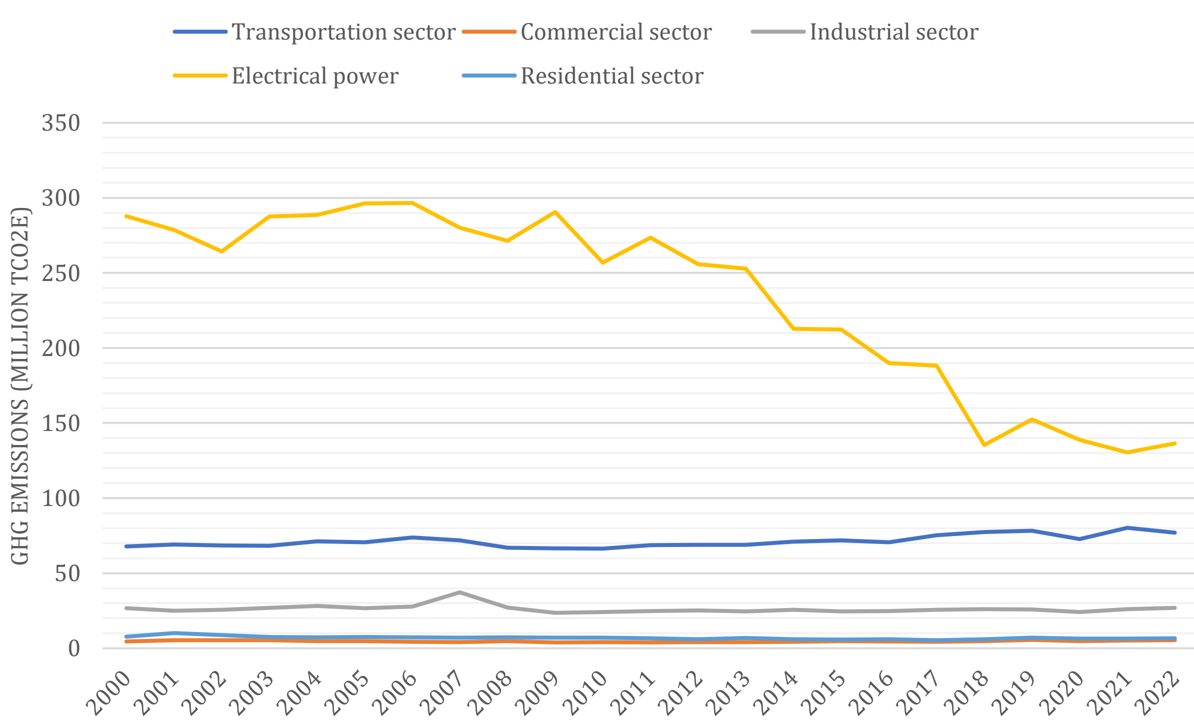
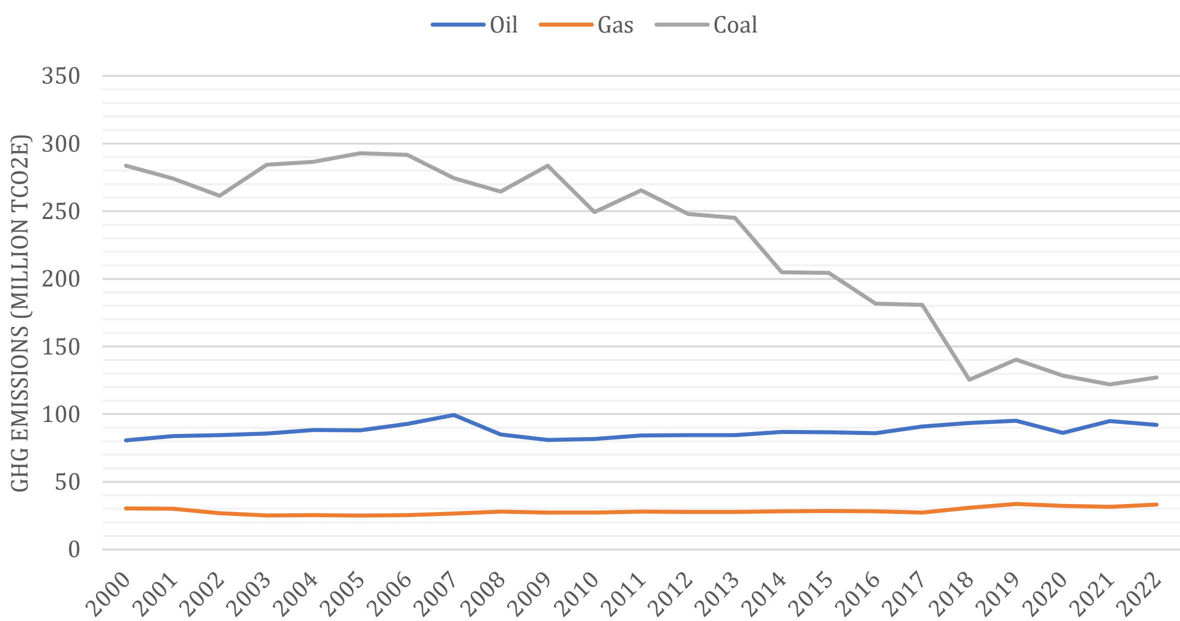


Figure 35 breaks down GHG emissions by fuel type: coal, oil, and natural gas. The most striking trend is the significant decline in coal-related emissions (gray line) since 2011. In contrast, oil-related emissions (blue line) have remained steady or slightly increased, reflecting the growth of New Mexico's oil industry and continued reliance on petroleum for transportation. Natural gas emissions (orange line) have remained relatively low, but the sector must still be decarbonized to meet climate goals.

Figure 35: Contribution of different energy sources to carbon emissions (2000-2022), modified based on EIA SEDS data.



New Mexico's coal phase-out has been a key driver in reducing emissions, with multiple coal-fired power plant closures significantly lowering the state's carbon footprint. By 2031, all coal plants will either be decommissioned or retrofitted with CCS technology to meet emissions reduction targets. However, despite the decline in coal emissions, oil and gas remain major contributors to the state's overall GHG output, necessitating urgent decarbonization efforts.

Therefore, the next major challenge for New Mexico is reducing emissions from the oil and gas sector, which includes implementing stricter methane regulations, improving energy efficiency, and investing in low-carbon and/or carbon capture technologies.

The electrification of transportation and expanding sustainable energy production will also be critical in further reducing emissions from the transportation and industrial sectors.

As coal emissions continue to decline, the focus must shift to reducing emissions from oil and gas, ensuring that New Mexico meets its climate commitments while maintaining energy security and economic stability.

CARBON MANAGEMENT

Often viewed as a burden, CO_2 is also produced as a valuable product used in various industrial processes. New Mexico has one of the largest networks of CO_2 pipelines, primarily transporting carbon dioxide from fields like Bravo Dome in New Mexico and others in Colorado to the Permian Basin for Enhanced Oil Recovery (EOR) operations. This extensive pipeline infrastructure supports CO_2 injection projects, which have been a key method for maximizing oil recovery while also laying the foundation for large-scale carbon storage initiatives.

New Mexico's existing CO_2 network positions the state as a strategic hub for future Carbon Capture, Utilization, and Storage (CCUS) projects, facilitating permanent CO_2 sequestration and advancing the state's decarbonization goals. Current carbon management efforts in New Mexico take two main forms, both regulated by the U.S. Environmental Protection Agency (EPA) Underground Injection Control[36] (UIC) Program:

1. **EPA UIC Class II Wells** – Acid Gas Injection for CO_2 Disposal and EOR

Several CO_2 Acid Gas Injection (AGI) projects are actively sequestering CO_2 emissions from natural gas processing plants in the Permian Basin, NM, playing a crucial role in reducing greenhouse gas emissions from the oil and gas industry. These projects inject CO_2 along with hydrogen sulfide (H_2S) into deep underground formations, preventing their release into the atmosphere. By leveraging the 45Q tax credit, operators receive financial incentives for permanent CO_2 sequestration, making these projects economically viable while contributing to decarbonization efforts. AGI is not a new practice; it has been used for several decades, primarily as a cost-effective and environmentally responsible method for disposing of acid gases. However, its role is evolving beyond waste disposal to become a key component of carbon management and emissions reduction strategies.

2. **EPA UIC Class VI Wells** – CO_2 Sequestration for Industrial and Hard-to-Abate Sectors

Unlike Class II wells, UIC Class VI wells focus exclusively on the long-term disposal of CO_2, supporting emission reductions from industrial processes and hard-to-abate sectors.

These projects are more advanced in the San Juan Basin, which has ideal geological characteristics for CCS. CCS in San Juan could extend the operational life of the coal-fired Four Corners Power Plant, provided that feasibility studies (including life cycle assessments, water use analysis, and National Environmental Policy Act (NEPA) studies) demonstrate economic and environmental viability. NMT is leading efforts to characterize the storage capacity of the basin, with Navajo Transitional Energy Company (NTEC) actively supporting CCS feasibility studies at the power plant.

[36] https://www.epa.gov/uic

NMT is also assisting the state's application for UIC Class VI primacy, ensuring that New Mexico can regulate and approve CCS projects at the state level.

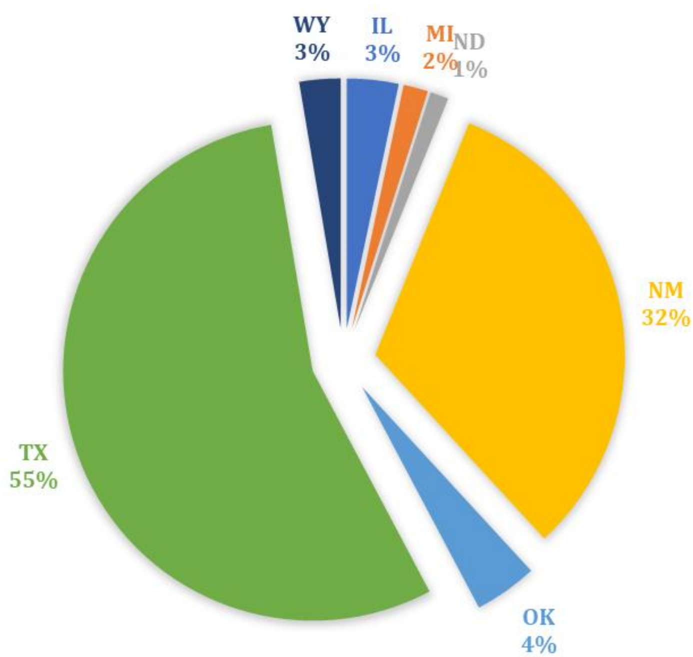
Additionally, other parties are exploring the development of Direct Air Capture (DAC), a different technology that removes CO_2 directly from the atmosphere. The Four Corners region presents an ideal location for DAC, given its proximity to suitable CO_2 storage sites. A similar operational DAC project exists just across the border in the Permian Basin—the 1PointFive project, which is demonstrating the feasibility of atmospheric CO_2 removal combined with secure underground storage[37].

EPA Greenhouse Gas Reporting Program (GHGRP) Data for New Mexico

The EPA Greenhouse Gas Reporting Program (GHGRP) offers valuable insights into major GHG emission sources across New Mexico and the U.S. (Figure 37) The two pie charts showcase the contributions of Class II and Class VI wells, along with locations where CCS was monitored in 2023, providing a snapshot of national trends and underscoring New Mexico's leadership in carbon management efforts.

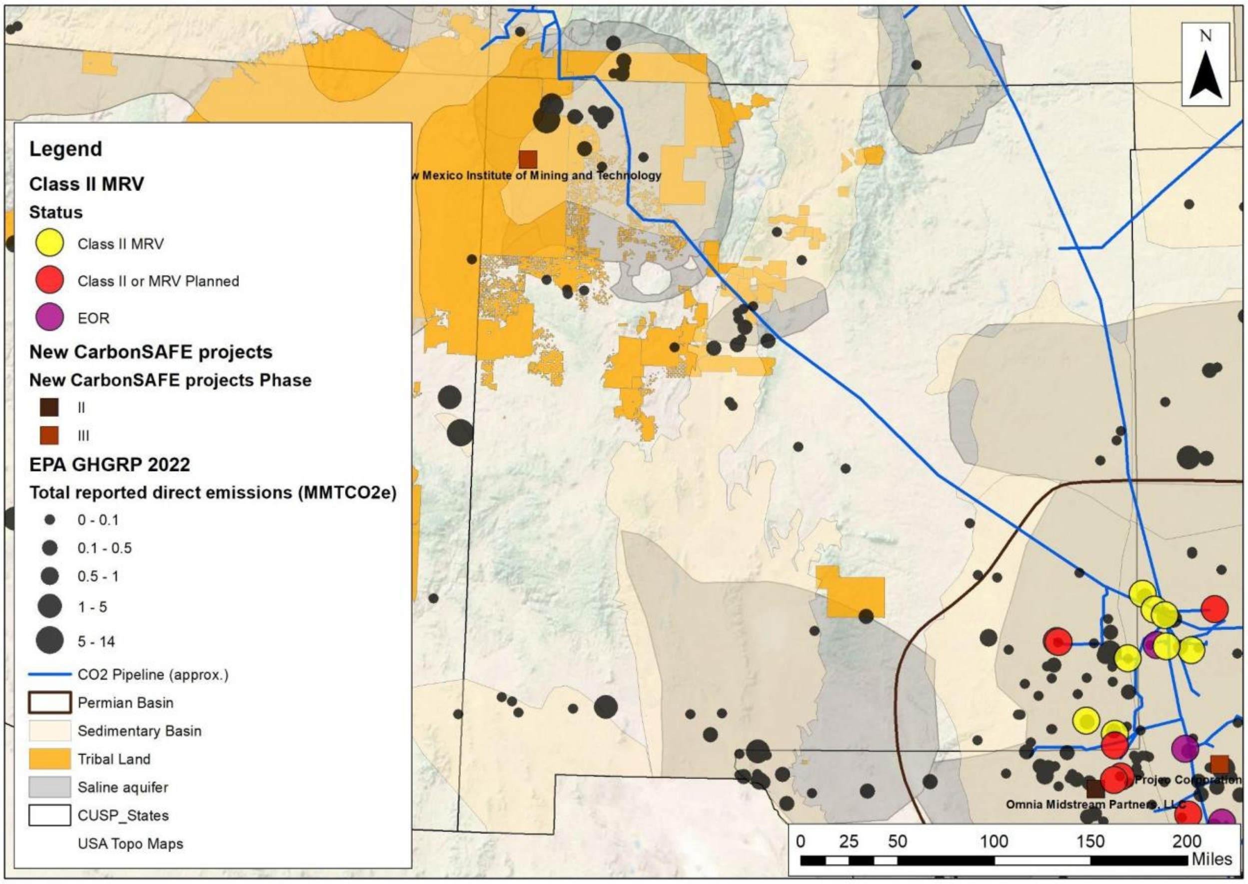
Figure 36 highlights New Mexico's leadership in CCS, ranking second in the U.S. for CO_2 sequestration, just behind Texas. New Mexico accounted for 32% of total CO_2 sequestered in 2023, significantly contributing to national carbon management efforts.

Figure 36: State distribution of CO_2 Sequestration in 2023 (EPA GHGRP)



[37] https://www.1pointfive.com/dac-technology

Figure 37: Map of CO_2 emission sources, CCS projects, and potential storage sites: includes EOR operations, Class II and Class VI wells, CO2 pipelines, tribal lands, and major saline aquifers and basins suitable for CCS development (EPA GHGRP).



8. CONCLUSION AND NEXT STEPS

New Mexico stands at a pivotal moment in its energy transition, balancing its historical reliance on fossil fuels with a growing commitment to renewable energy and carbon management. The state has made substantial progress in diversifying its energy mix, with wind and solar now accounting for a significant portion of electricity generation. At the same time, natural gas continues to play a crucial role in ensuring grid reliability as coal-fired power plants are phased out and the oil and gas sector still represents an important part of the state revenues.

The expansion of transmission infrastructure, including projects like SunZia, positions New Mexico as a key energy supplier to both western and eastern markets. This strategic role is further reinforced by the state's ability to balance regional energy dynamics. However, continued investments in grid modernization and energy storage solutions will be essential to fully integrate renewable energy and maintain system reliability.

While the state has made significant strides in reducing greenhouse gas emissions (primarily due to the retirement of coal plants) decarbonizing the oil and gas industry remains a critical challenge. New Mexico has emerged as a leader in carbon sequestration, ranking second behind Texas in CO_2 storage, thanks to its active deployment of Class II wells. However, more ambitious policies and investments will be required to address methane emissions, improve energy efficiency, and scale up carbon capture, utilization, and storage (CCUS) efforts.

Looking ahead, New Mexico's path to a sustainable energy future will require a different approach. Strengthening renewable energy and its smooth integration, promoting energy efficiency, expanding workforce training in energy technologies, and fostering public-private partnerships will all be key to achieving long-term energy security and economic resilience. By leveraging its abundant renewable resources, existing energy infrastructure, and policy initiatives, New Mexico has the potential to become a national leader in sustainable energy innovation and climate action.

As the state moves toward its carbon neutrality goals, continued collaboration between policymakers, industry leaders, research institutions, and local communities will be essential. With proactive strategies and sustained investment, New Mexico can secure a more resilient, affordable, and sustainable energy future while maintaining its position as a critical energy hub for the region.

ACCRONYMS

BTU: British Thermal Unit

CAIDI: Customer Average Interruption Duration Index

CCS: Carbon Capture and Storage

CCUS: Carbon Capture, Utilization, and Storage

CSP: Concentrating Solar Power

DAC: Direct Air Capture

DOE: Department of Energy

EPA: Environmental Protection Agency

EIA: U.S. Energy Information Administration

EOR: Enhanced Oil Recovery

GHG: Greenhouse Gas

GHGRP: Greenhouse Gas Reporting Program

HVDC: High-Voltage Direct Current

IMT: Institute Mines-Telecom

ISO: Independent System Operator

KCEC: Kit Carson Electric Cooperative

LANL: Los Alamos National Laboratory

MBTU: Million British Thermal Unit

MWth: Megawatts Thermal

MW: Megawatts

NEPA: National Environmental Policy Act

NMT: New Mexico Institute of Mining and Technology

NMSU: New Mexico State University

NMPRC: New Mexico Public Regulation Commission

NREL: National Renewable Energy Laboratory

NSTTF: National Solar Thermal Test Facility

NTEC: Navajo Transitional Energy Company

O&G: Oil and Gas

PHS: Pumped Hydro Storage

PNM: Public Service Company of New Mexico

PV: Photovoltaics

SEDS: State Energy Data System

SNL: Sandia National Laboratories

SPP: Southwest Power Pool

SWD: Saltwater Disposal Wells

TWh: terawatt-hours

RTO: Regional Transmission Organizations

UIC: Underground Injection Control

WIPP: Waste Isolation Pilot Plant

WISHH: Western Interstate Hydrogen Hub