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Introduction

In wind and solar resource potential, New Mexico is among the most endowed of the 50 states. While the state's electricity sector has historically been dominated by coal, the passage of New Mexico's first Renewable Portfolio Standard (RPS) in 2000, along with other increasingly supportive policies and plummeting renewable energy prices, has resulted in rapid growth in utility-scale renewable (primarily wind) development over the past two decades. The state continues to be progressive in its efforts to transition away from coal while supporting the communities that rely heavily on the industry for economic stability. Looking forward, a strong relationship with tribal communities, utilization of public lands, replacing oil and natural gas as a primary economic driver, and overcoming transmission constraints will be key to New Mexico's renewable energy transition. This report focuses on state-level policies in New Mexico that impact solar and wind development within the state. While the primary focus is on utility-scale renewables, distributed-scale policies are discussed at a high level as well. We first set the stage with the state's demographic, economic, and political background, as well as an overview of the electricity sector and dominant perceptions of renewable energy across New Mexico. We then analyze distinct policy areas related to renewable energy deployment and conclude with commentary on the synergies and gaps in existing policies.

Background

Demographics

New Mexico, also known as the Land of Enchantment, is located in Southwestern United States between Texas, Colorado, and Arizona. The state's estimated 2019 population was 2,096,829, approximately 1.8% higher than 2010.[1] As of 2014, a majority (46.4%) of the state's population was Hispanic whereas 41.4% of the population was White. The remainder of the state's population was 8.8% American Indian/Alaska Native, 2.0% Black/African American, and 1.5% Asian/Pacific Islander.[2] Figure 1 illustrates the percentage of population that is non-White by county. Between 2014 and 2018, the state was home to approximately 150,000 veterans and ~10% of the population was foreign born. In the same timeframe, the state had ~775,000 households, with approximately 2.64 persons per household. Within this timeframe, the median household income in the state was $48,059 in 2018 dollars, per capita income over last 12 months was $26,085 in 2018 dollars, and approximately 18% of the population lived below poverty level.[3] The average energy burden for the state is 3% of median income, but there is variation in this burden between counties, as denoted in Figure 2.[4]

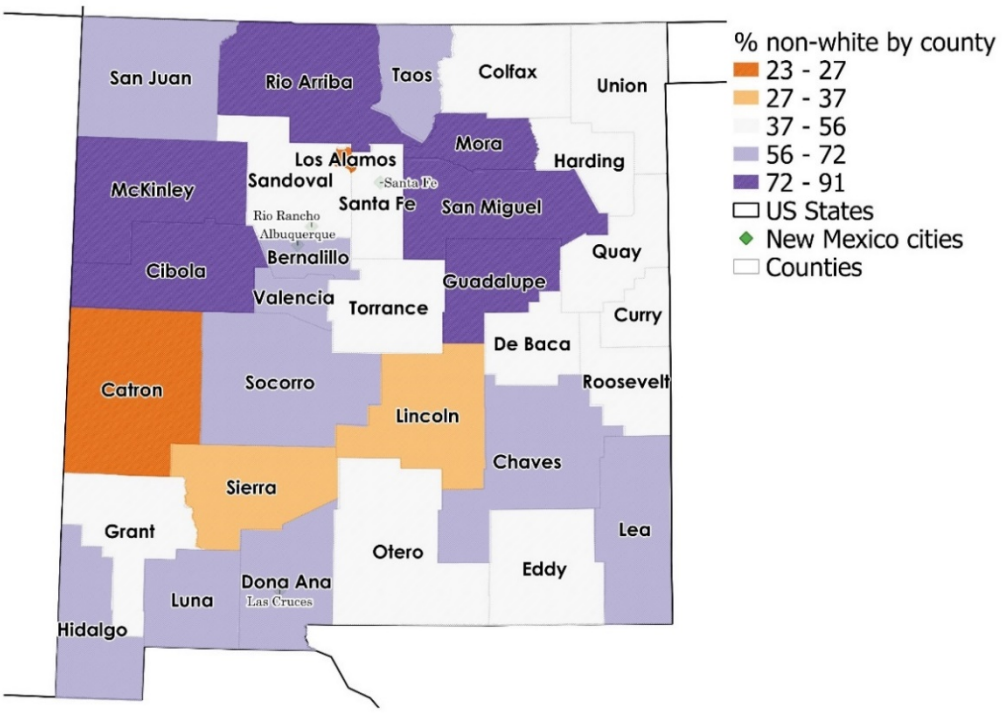

Figure 1. % of county populations who are American Indian, Asian, Black, or Hispanic as a percentage of the total population[5]

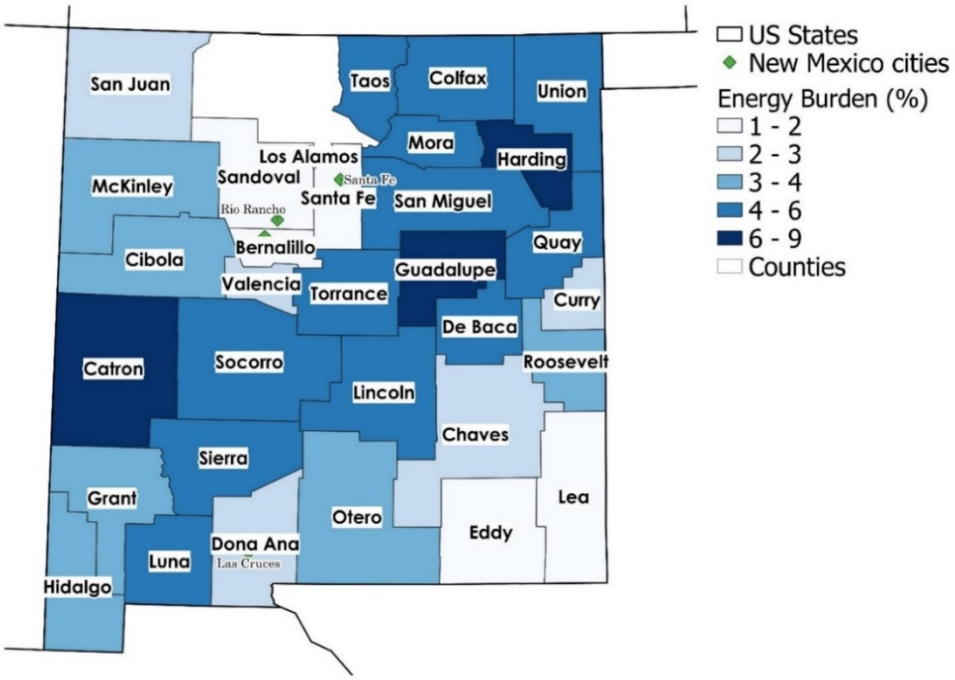

Figure 2. Energy burden as % of county median income for New Mexico[6]

The state's median age increased from 36.5 in 2011 to 37.2 in 2016.[7] Between 2010 and 2016, New Mexico's population growth has been the slowest in Southwest U.S. at 1.1% (compared to Oklahoma at 4.6%, Arizona at 8.4%, and Texas at 10.8%). This contrasts with New Mexico being one of the fastest growing states in the U.S. between 2000 and 2010, at 13%. People in the age group of 30-59 are moving out of New Mexico along with their children and are unlikely to return, thus shrinking the state's tax base.[8] The state also has experienced "brain-drain," where people with bachelors or advanced degrees are moving to nearby states like Colorado, Texas, and Arizona because of factors like more vibrant cities.[9]

Economics

In 2018, the state was home to 43,830 economic establishments where approximately 631,000 people were employed.[10] The following industries together form the economic base of the state of New Mexico: mining, utilities, agriculture and related industries, accommodation and food services, federal government employment, and state government employment.[11] The state ranks among the top in mining for resources like potash, copper, uranium, and coal.[12] Due to the large available of energy sources, there are large powerplants in the state.[13] The Four Corners Power Plant and the San Juan Power Plant, both located in San Juan County, as well as the Cunningham Power Plant, located in Lea County, are notable employers.[14]

The accommodation and food service industry is related to tourism and is focused around tourist destinations such as Albuquerque, Santa Fe, ski areas, and national parks.[15] The federal government is a large employer in the state both for military employment (Kirtland AFB) and civilian employment (Sandia National Lab) and Los Alamos National Lab. The state itself employs a sizeable population of New Mexico, specifically in numerous state colleges and universities.[16]

The state of New Mexico has a wide variety of surface land ownership, as seen in Figure 3. About 31% of the state is owned by five federal government agencies: Bureau of Land Management (BLM), Forest Service, Fish and Wildlife Service, National Park Service, and the Department of Defense.[17] As shown in Figure 3, a large percentage of the state's Tribal lands are in the northwestern corner and around Albuquerque, with a smaller parcel in Otero county in southern New Mexico. [18]

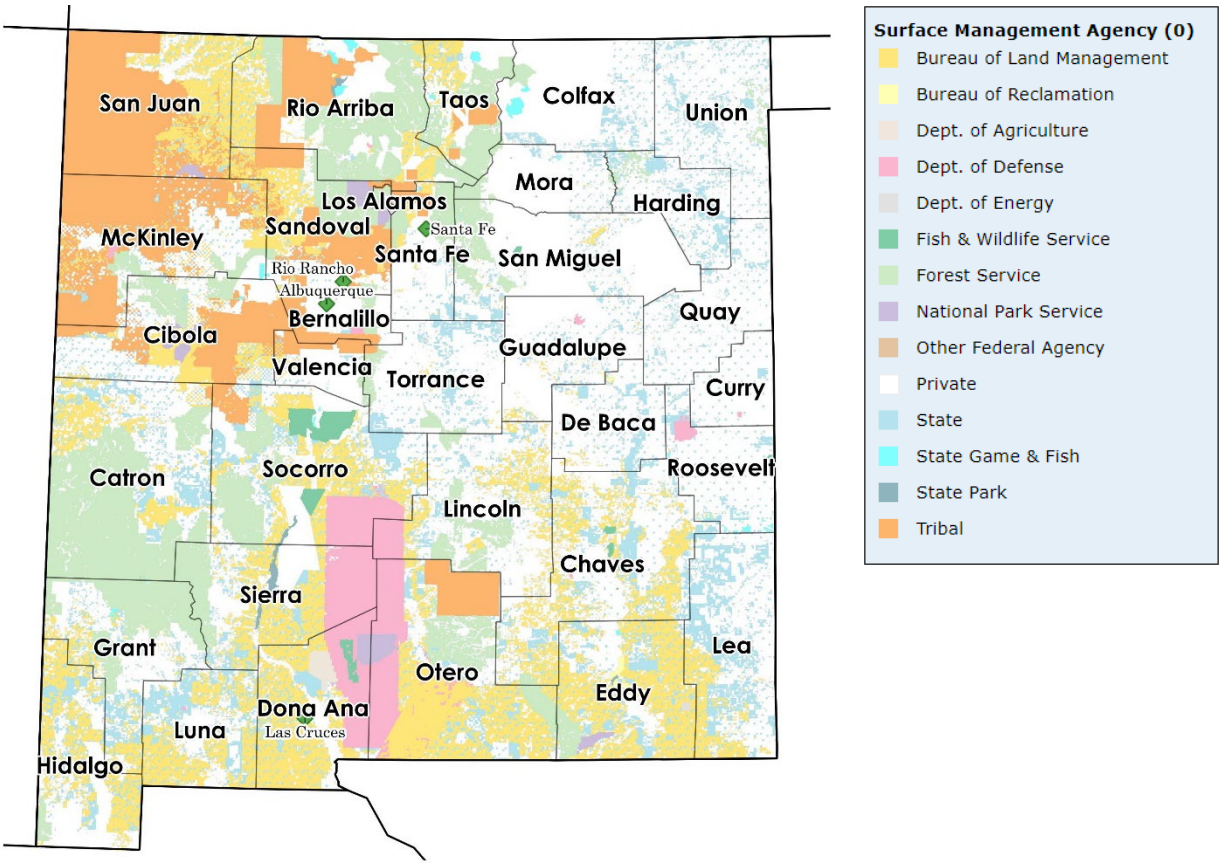

Figure 3. Surface management agencies of New Mexico land parcels.[19]

Politics

In the past, New Mexico was a typical swing state, having picked 12 Republican and 15 Democratic Presidential candidates since 1900.[20] More recently though, the state has been won by Democratic Presidential candidates in the 2008, 2012, 2016, and 2020 races.[21] Table 1 shows a breakdown of party affiliation of registered voters as of November 30, 2020. Figure 4 shows county-level election results for the 2020 Presidential election.

Party Affiliation	**% of Registered NM Voters**
Democratic	45.1
Republican	31.4
Independent	21.5
Others (Libertarian etc.)	2

Table 1. Voter registration share by political affiliation[22]

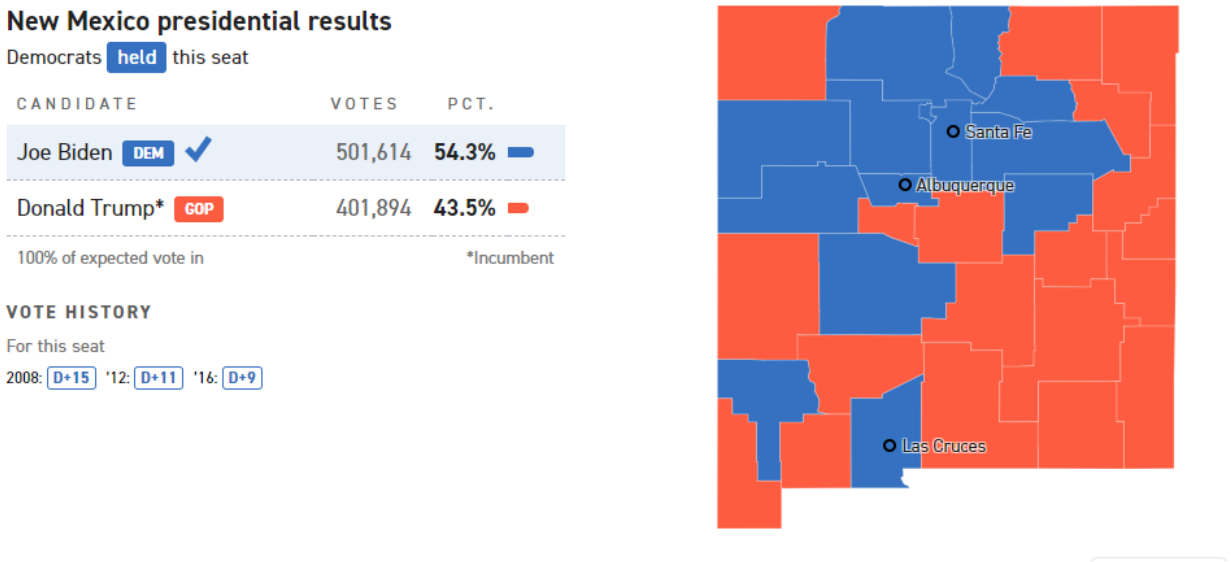

Figure 4. 2020 General Election winner by county in New Mexico[23]

During the 2018 Gubernatorial elections, renewable energy was a key topic for now Governor Michelle Lujan Grisham. Her campaign platform focused on utilizing the potential of wind and solar energy and allowing communities to pick their sources of power through community choice agreements.[24] The New Mexico House of Representatives' House Energy, Environment & Natural Resources Committee Chair Rep Matthew McQueen supports the state's transition towards renewable energy sources, citing the threat of climate change and inaction from the federal government on this issue.[25]

Key Actors in Electricity Generation

New Mexico has three investor-owned utilities (IOUs)—Public Service Company of New Mexico (PNM), Xcel Energy, and El Paso Electric (EPE)—and sixteen rural electric cooperatives (co-ops).[26,27] PNM is the state's largest IOU, serving over 525,000 New Mexico customers, largely in the Albuquerque area.[28] Xcel Energy's New Mexico subsidiary, Southwestern Public Service, serves approximately 119,000 customers.[29] EPE mainly serves southern New Mexico and had 95,000 customers as of 2015.[30] Figure 5 shows the 14 co-ops that are members of the New Mexico Rural Electric Cooperative Association.[31] These cooperatives are owned by 211,000 families and serve 80% of state land area in total.

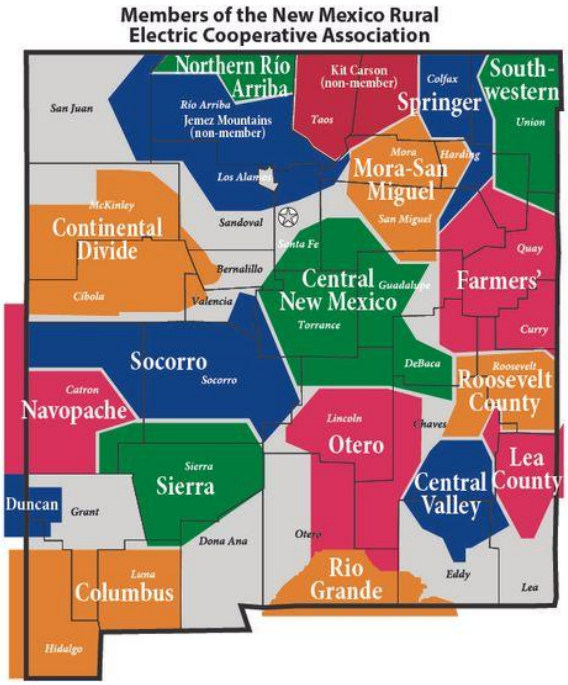

Figure 5. Members of New Mexico Rural Electric Cooperative Association[32]

The New Mexico Public Regulatory Commission (NMPRC) regulates the state's IOUs and co-ops, reviewing and approving their integrated resource plans (IRPs) and renewable procurement plans. Prior to the November 2020 election, the five commissioners were directly elected by the state's residents and the panel consisted of a 4-1 Democratic majority. While the results of the election left the party ratio unchanged, a separate ballot initiative codified a major shift in the process to appoint commissioners. The confirmed Constitutional Amendment 1 made the NMPRC an appointed committee of three members beginning in January 2023. Members will be nominated by a bipartisan committee, which will include a Native representative, selected by the Governor and approved by the state's Senate.[33] Commissioners will serve six-year terms, limited to two terms, and no more than two may be of the same party.[34] The move, supported by the National Resource Defense Council and Governor Grisham, was motivated in part by the PRC's attempt to circumnavigate a portion of the Energy Transition Act (see Explicit Climate and Renewable Energy Policy section) as well as frustration over high electricity rates and slow adoption of renewables.[35] The change is expected to depoliticize the commission and increase expertise, though critics of the amendment say it gives too much power to too few individuals.[36, 37, 38]

Current Electricity Mix

Per the EIA, in 2018 New Mexico had a net summer capacity of 8,431 MW and electricity generation in the state was 32,673,682 MWh (approximately 21,000 GWh from electric utilities and 11,500

GWh from Independent Power Producers (IPPs) and Combined Heat and Power (CHP)).[39] As of 2019, 41% of the state's electricity generation was derived from coal, 34% from natural gas, 19% from wind, and the remainder from solar, hydroelectric, and other sources (Figure 6).[40] Due to its low population and abundant sources of electricity, New Mexico exported 7,070,578 MWh of electricity across state lines in 2018, and had zero net domestic electricity imports.[41] The state hosts 122 electric generation systems, the locations of which are shown in Figure 7.[42]

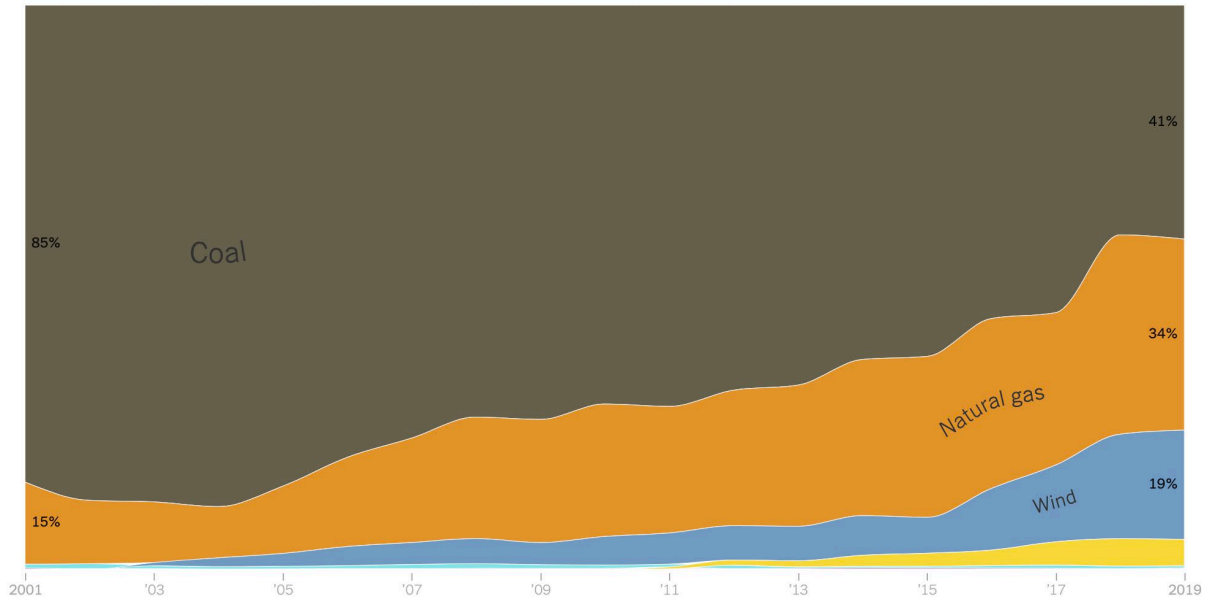

Figure 6. Electricity generation mix from 2001 to 2019, as a percentage of power produced from each energy source.[43]

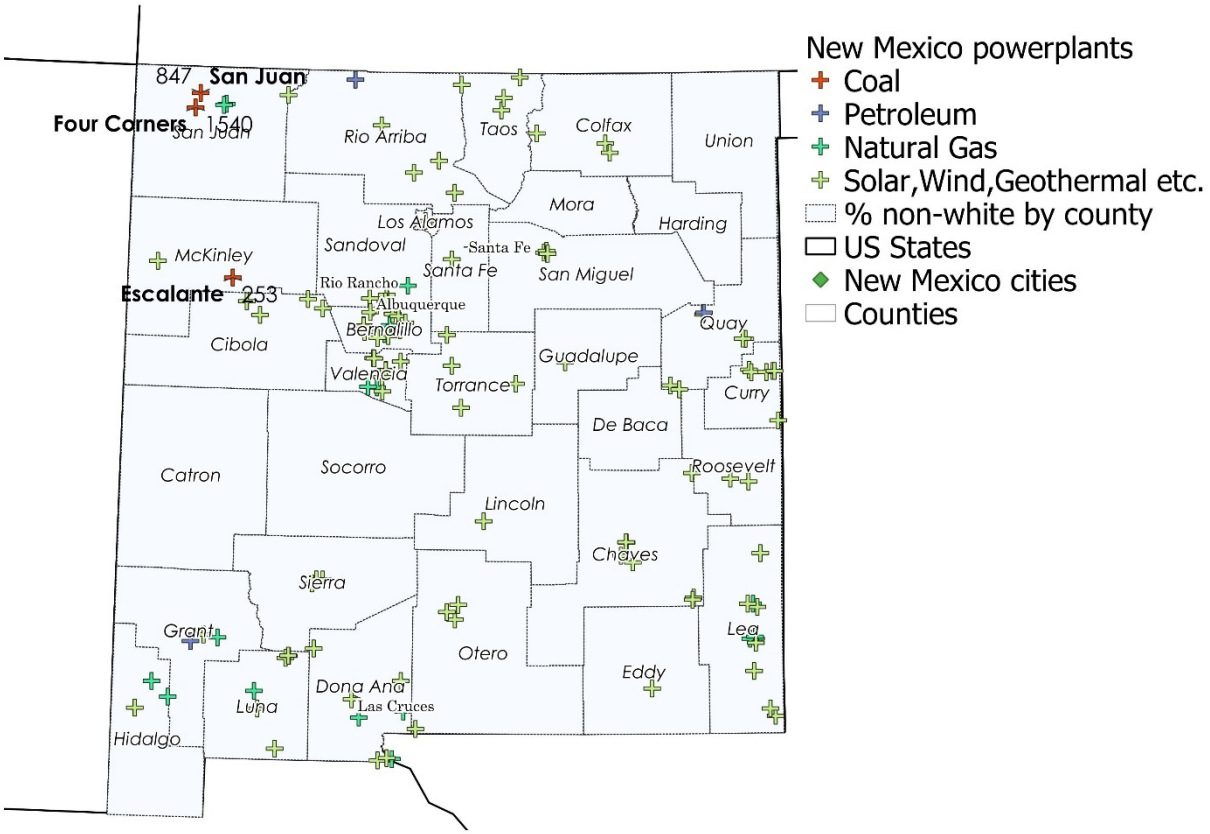

Figure 7. Powerplants in New Mexico by type with total MW capacity and names of coal power plants.[44]

As recently as 1990, New Mexico derived as much as 90% of its electricity from coal.[45] Due to factors such as clean air quality regulations, competitive prices of natural gas, and California's decision to stop importing coal-based power in 2014, New Mexico's coal-fired power generation has declined by 44% between 2013 and 2018, largely replaced by natural gas and wind.[46] Of particular note, in 2017 PNM shut down two units of the San Juan Generation Station, amounting to a reduction of 836 MW of coal-fired generation capacity.[47]

Renewable Energy Potential

Retail sales and direct use of electricity in New Mexico in 2018 was 24.2 terawatt hours (TWh).[48] An analysis of the generation potential of renewable resources in the state shows that it is technically feasible for renewable energy to produce an annual 33,600 TWh—or approximately 1,400 times the total 2018 demand.[49] This potential represents an upper bound based on resource availability, system performance, topographic limitations, and environmental and land-use constraints, but does not consider market constraints or the time variability of demand. As shown in Figure 8, the majority of this estimated

capacity is from concentrating solar power (CSP), with utility-scale photovoltaics (PV) and land-based wind as the next-highest potential producers based on technical feasibility. While the remaining technologies—floating PV, hydropower, rooftop PV, biopower, and geothermal—have significant potential relative to the state's current demand, this section will focus on the three technologies with the greatest generation potential.

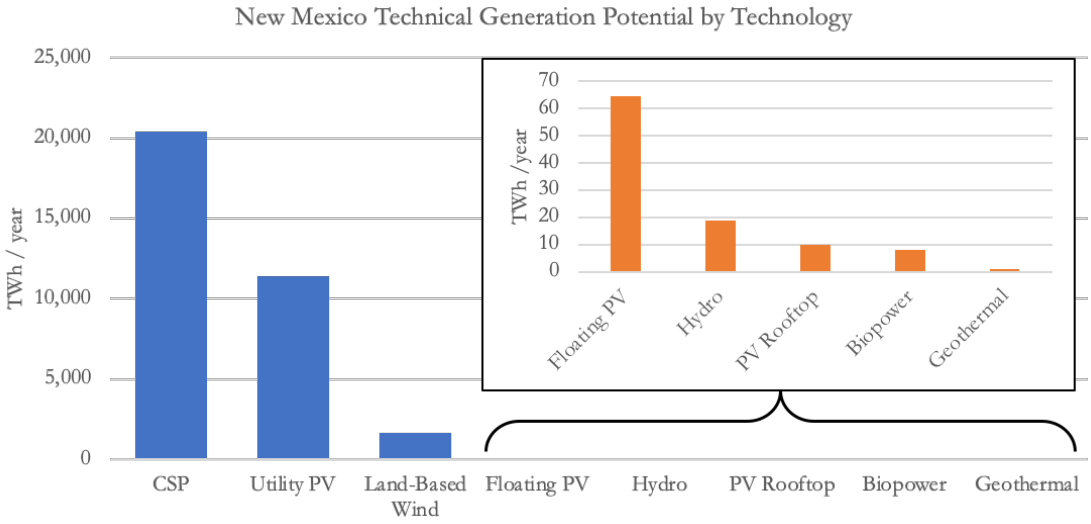

Figure 8. Technical generation potential in New Mexico by renewable technology type.[50]

Concentrating Solar Power

The direct normal solar irradiance (DNI) in New Mexico is among the highest in the U.S. (Figure 9). CSP projects are typically only considered in areas with a DNI of at least 5.0 kWh per square meter per day; the entire state has a DNI resource that meets that minimum.[51] Despite the estimated 20,400 TWh of CSP technical potential, New Mexico currently does not have any CSP plants.[52,53] Figure 10 shows potential CSP plant locations, identified by researchers at the National Renewable Energy Laboratory (NREL) primarily for their proximity to load and access to transmission. [54] One of the plant sites would serve the Las Cruces and El Paso population centers, and the other the city of Albuquerque and surrounding areas.

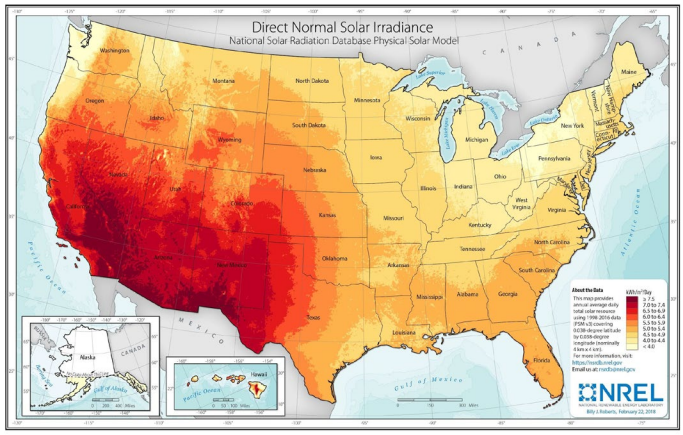

Figure 9. Available solar resource for concentrating solar in the United States.[55]

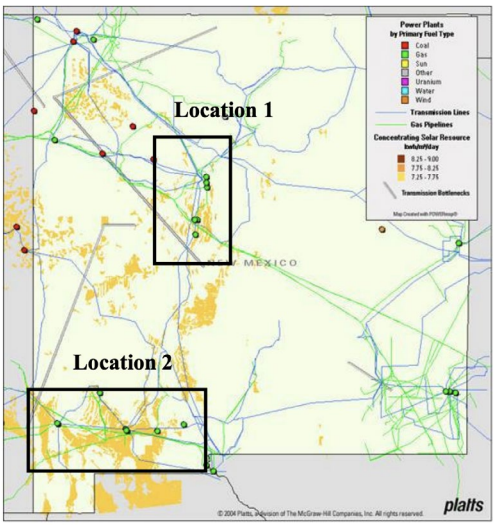

Figure 10. Potential locations for siting CSP plants of 50 MW capacity and greater in New Mexico.[56]

Utility-scale Solar PV

The solar PV resource in New Mexico is among the strongest in the U.S. From a resource availability perspective, all areas of the state are suitable for solar development, with the southwestern portion of the state receiving the most solar radiation (Figure 11). While NREL estimates the annual technical potential of utility-scale solar PV in New Mexico to be 11,410 TWh, the 2019 utility-scale electricity generation was only 1.36 TWh, or 0.012% of the technical potential.[57,58] By comparison, the neighboring state of Arizona, with similar land area and solar resource, had 5.1 billion kWh of utility-scale solar generation in 2019. Nearby Colorado and California had 1.2 billion kWh and 28.6 billion kWh, respectively.[59]

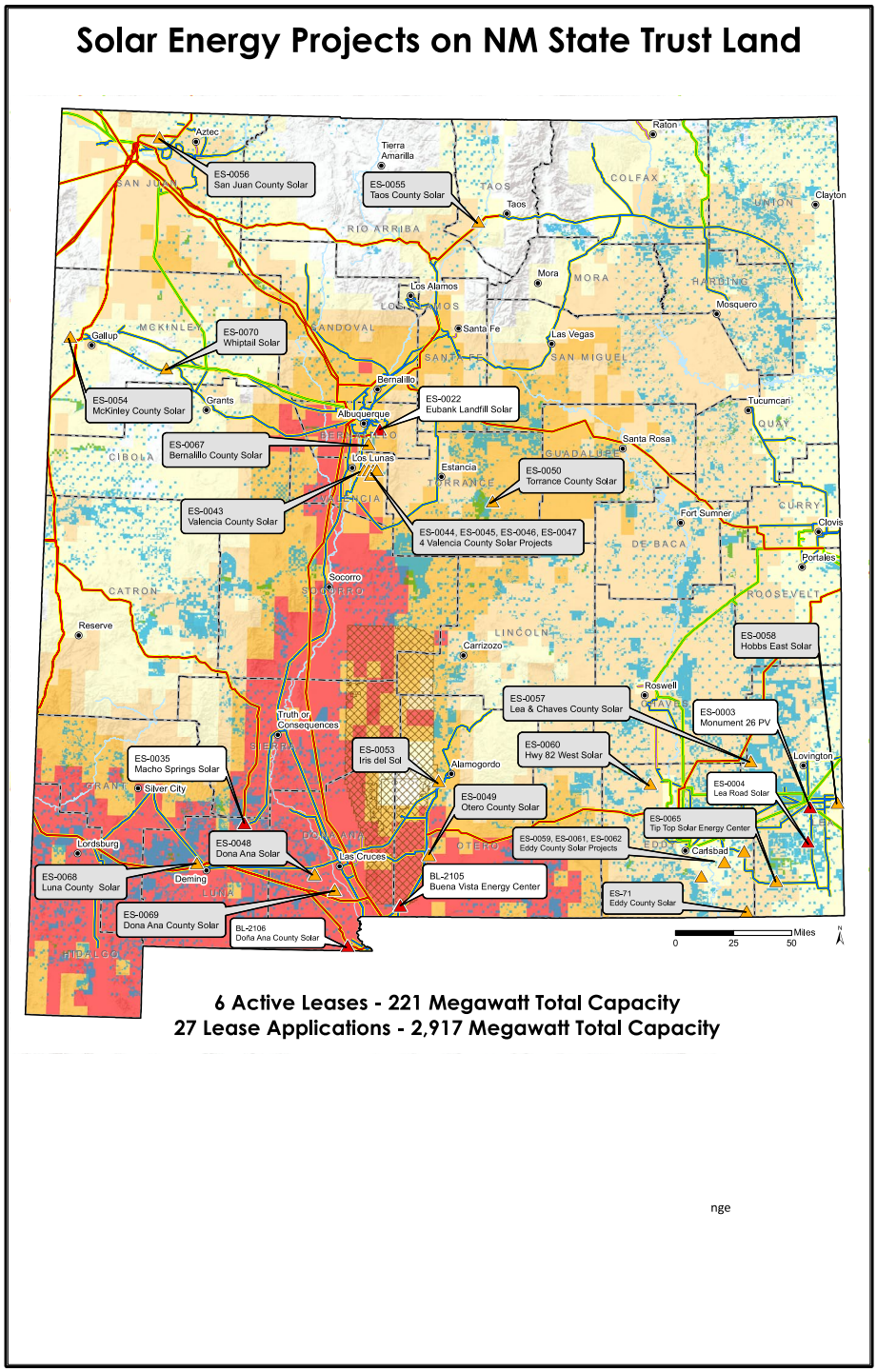

Figure 11. Solar resource [Wh/m2/day] available to panels with a title angle equal to their latitude and solar energy projects on state trust land.[60]

Land-based Wind

Figure 12 shows the wind resource in New Mexico at a height of 80-meters. At this height, areas with wind speeds 6.5 meters per second and greater are generally considered to be suitable for wind development. As shown in the map, the eastern half of the state, particularly in the high plains, holds significant wind energy potential. The technical potential for wind power in New Mexico is 653 gigawatts (GW) at 80 meters above ground or 2,000 TWh annually, assuming 2020 technologies.[61] As of Q3 2020, the total installed wind capacity in New Mexico was 1,953 MW—just 0.3% of the total technical capacity.[62] This installed wind capacity is approximately seven times that of neighboring Arizona's and just two-fifths that of Colorado's installed capacity.[63] As expected, the large majority of existing turbines are sited near the eastern border with Texas, where the wind resource is strongest. [64]

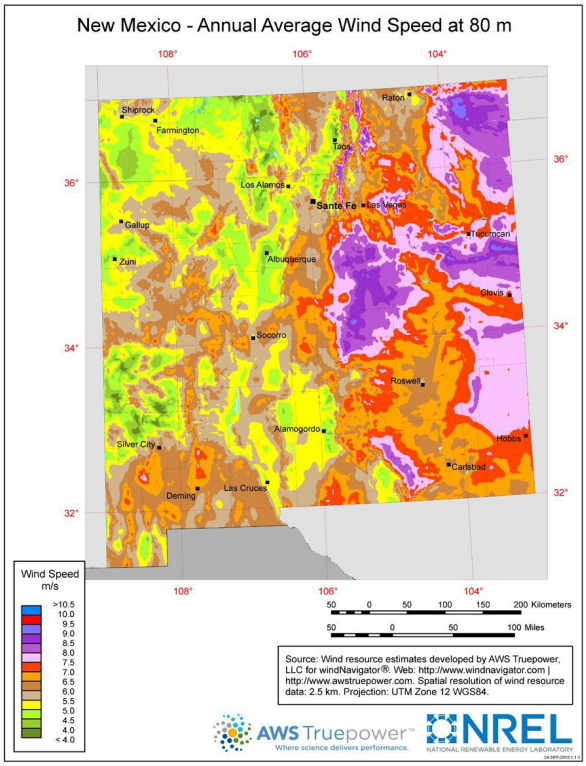

Figure 12. Average wind speeds at 80-meter hub height.[65]

Existing Land Uses in High-Potential Areas

The windy Eastern Plains region is largely rural and agricultural and is sparsely populated. Most of this High Plains area does not host public lands, with the exception of the southwestern corner, in which some BLM land is located. Although there are few protected areas or biodiversity hotspots in the highest wind resource area of New Mexico (Figure 13), the range of the Lesser Prairie Chicken does extend into this region. The Lesser Prairie Chicken is a candidate for addition to the Federal endangered and threatened

species list and has been included in the "Great Plains Wind Energy Habitat Conservation Plan."[66] With this exception, and the possibility of conflicts with agricultural landowners, there seems to be minimal conflicting land use for wind energy development in the High Plains region.

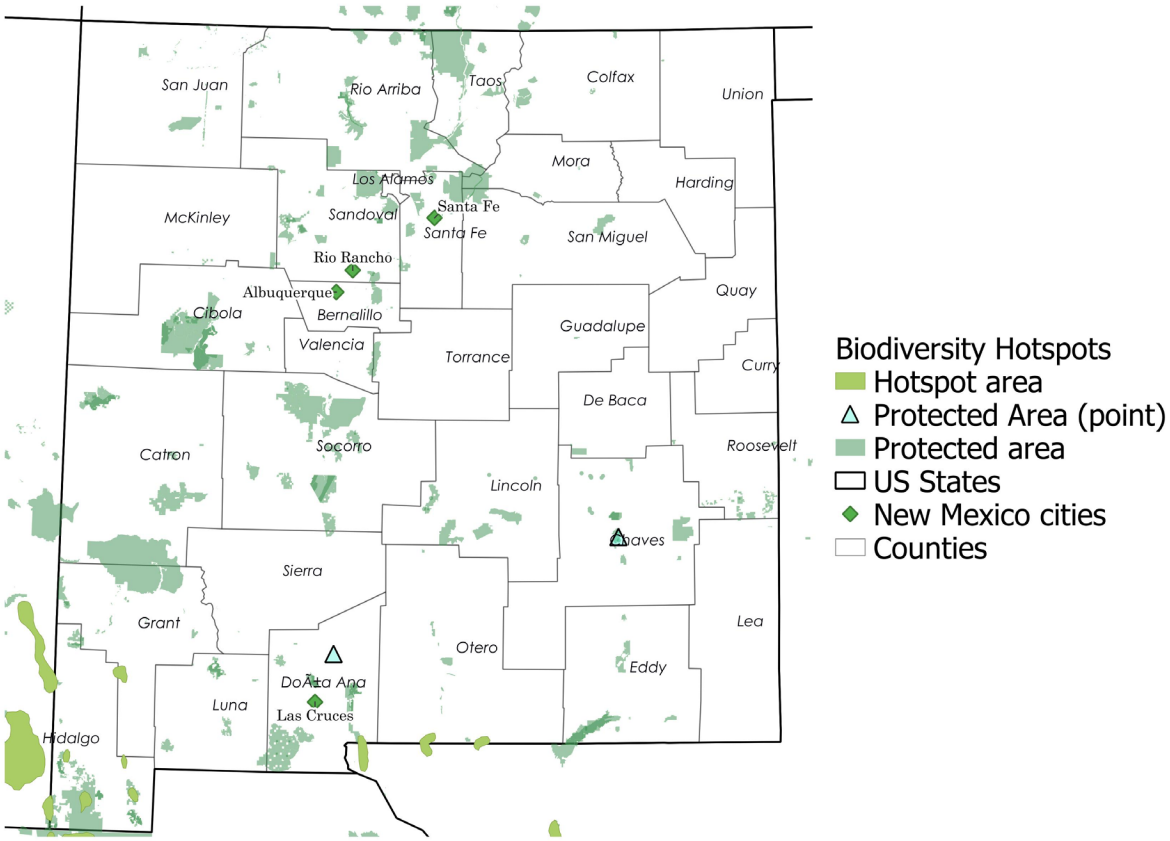

Figure 13. Biodiversity hotspots and protected areas in New Mexico.[67, 68]

The highest-resource area for both solar PV and CSP lies within the southeastern corner of the state and extends up to the city of Albuquerque. As shown in Figure 3, this region contains a significant amount of BLM land, as well as several smaller protected areas and biodiversity hotspots. The 8,300 km^2 White Sands Missile Range also extends from the central southern border up towards Albuquerque. Aside from the protected areas and the potential for limited development in the Missile Range, there appears to be limited conflicting land use for solar development in the southeastern and central portion of New Mexico. In addition, it should be noted that most of New Mexico has sufficient solar resource to host utility-scale solar PV.

As shown in Figure 3, many U.S. Indian Reservations are also within the state border of New Mexico, the largest being that of the Navajo Nation. A majority of these reservations are concentrated in

northwestern New Mexico. The wind and solar resources in this area are not as strong as the rest of the state but are nonetheless strong enough to host technically-viable projects.

Local Narratives

Media narratives related to renewable energy provide insight into public perception of renewable energy and the resulting political support of or pushback against renewable energy projects and policies. The energy news landscape in New Mexico consists of a variety of media but in this section we focus on four newspapers, with a goal of identifying the narratives about renewable energy that are present on the state and local level. These are the *Albuquerque Journal*, the *Santa Fe New Mexican*, the *Navajo Times*,[a] and the *Las Cruces Sun-News*.[b]

Narrative analysis was conducted by identifying simplified narratives about renewables in news articles published in 2019 and 2020. Eleven renewables-focused articles were chosen at random from each newspaper using LexisNexis and NewsBank, including both opinion and news articles. Analysis was not based on relative strength of narratives but merely on whether the narrative was used at least once in the article. The narratives identified can be seen in Table 2.

	Renewables as...
Positive	economic opportunity and/or job production
	climate change mitigation
	progress for state/city energy goals
	reliable
	beneficial to local community
Negative	threat to fossil fuel industry
	threat to economy and/or jobs
	disruption or damaging to communities
	unreliable

Table 2. Positive and negative narratives about renewable energy

Articles were coded based on their overall framing of renewables. Framing was evaluated on a negative-positive scale based on the presence of negative and positive narratives within each article. The coding scheme can be seen in Table 3.

[a] The Navajo Nation extends beyond the borders of New Mexico, and thus the coverage of the Navajo Times does, as well. Articles for this sample were chosen based on their relevance to the portions of the Navajo Nation that overlap with the state of New Mexico.

[b] Several of the articles sampled from the Las Cruces Sun-News were simultaneously published in the Carlsbad Current Argus; the cities of Las Cruces and Carlsbad are 150 miles apart as the crow flies but seem to share a media market.

Points	Type of Frame
0	Neutral or absent
1	Negative
2	Mostly negative, somewhat positive
3	Mostly positive, somewhat negative
4	Positive

Table 3. Types of frames, with points assigned based on negativity and positivity. Neutral/absent frames (0 points) were excluded from data analysis.

The *Albuquerque Journal*, which is the state's largest newspaper and located in its largest city, had more instances of positive narratives than negative narratives; the same is true of the *Santa Fe New Mexican*, another major newspaper based in the state capital. The *Navajo Times* had a fairly even representation of positive and negative narratives. The *Las Cruces Sun-News*, located in a media market near the Permian Basin, had more instances of negative narratives than any of the other newspapers. These findings are supported by Figure 14, which shows the average score from 1 to 4 across the sample for each newspaper.

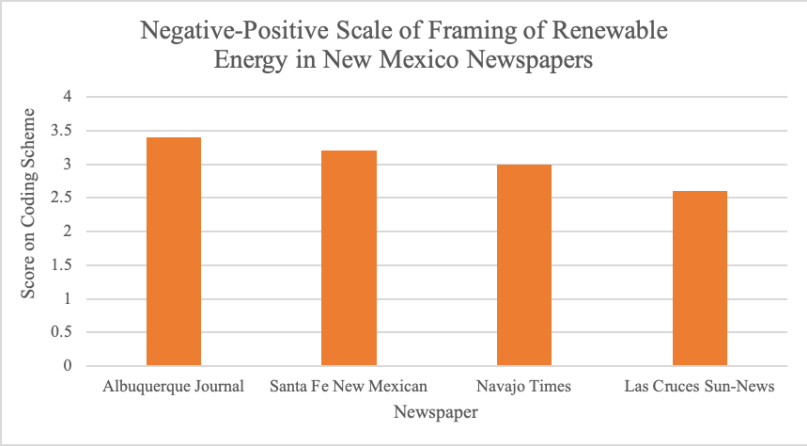

Figure 14. Average results of negative-positive scoring of renewable energy narratives in New Mexico newspapers. A higher value indicates a more positive framing.

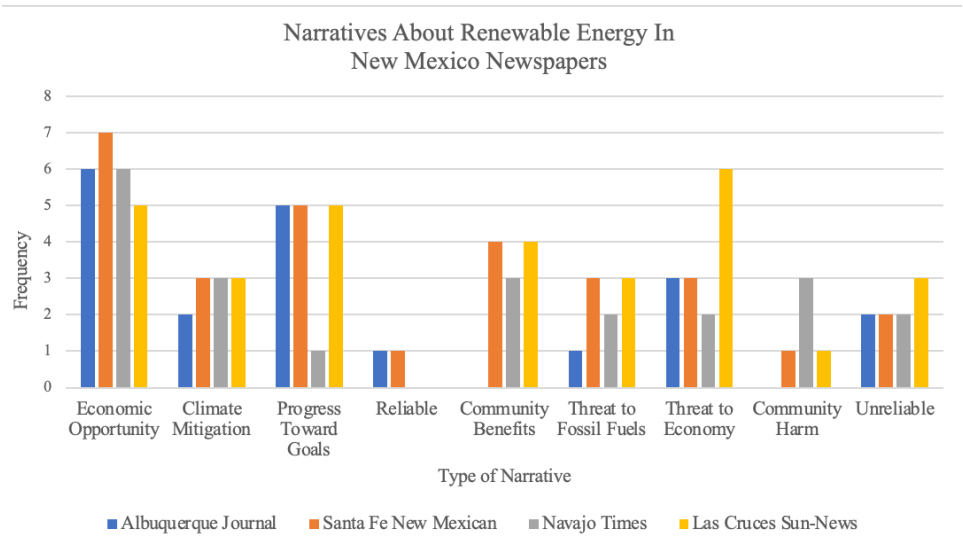

Figure 15. Frequency of appearance of specific narratives regarding renewables in state newspapers.

The most common narrative across all four newspapers, as shown in Figure 15, was "renewables as economic opportunity and/or job production." Another common narrative was "renewables as progress toward state goals," although this was uncommon in the *Navajo Times* (perhaps because the Navajo Nation has a different government and energy goals than the state). Notably, "renewables as climate mitigation" was found only two to three times per newspaper; the broader concept of "the environment" was alluded to often as a beneficiary of renewable energy, but climate change was rarely mentioned. The narrative "renewables as threat to economy and/or jobs" had twice as much representation in the *Las Cruces Sun-News* compared to the other three newspapers. Generally, the narratives occurring with the lowest frequency were "renewables as reliable" and "renewables as disruption or damaging to communities."

Several of the op-eds in this analysis were written by members of lobbying/trade groups, namely Power the Future and Consumer Energy Alliance. Power the Future is a national 501(c)(4) organization that promotes the fossil fuel industry; notably, one of the directors at Power the Future (and one of the op-ed authors present in this analysis) is Larry Behrens, who previously served as communications director for former New Mexico Governor Susanna Martinez. Consumer Energy Alliance is a Houston-based nonprofit pro-fossil fuel organization. Each of the four newspapers sampled had at least one op-ed (out of eleven total articles sampled) that was placed by one of these two organizations. The influence of these organizations and other oil/gas groups was particularly noticeable in the *Las Cruces Sun-News*.

In conclusion, newspapers in New Mexico's largest city and its capital city had more positive narratives and framing of renewable energy than two of the state's more rural newspapers. Conflicts are seen throughout the coverage of renewable energy in New Mexico; renewable development is viewed simultaneously as an economic opportunity and an economic disaster, as a gift to communities and a threat

to their lifestyles. At times, these conflicting narratives were present within just one article, demonstrating a lack of consensus on the purpose and influence of renewables in New Mexico.

Existing Energy Policy Research

There is little academic literature analyzing the influence of energy policy in New Mexico. One 2020 study assesses the strength of distributed wind markets across the U.S. based on the policy environment, electricity prices, and wind resources.[69] The analysis identifies New Mexico as having untapped market opportunities for distributed wind potential. A separate study notes that implementing New Mexico's RPS in a legal rather than regulatory framework has made it more durable to changes in state-level political climates.[70]

McLaren et al. (2019) explore the impacts of location, technology cost, load shape, utility rate structure, and policies on the economic viability of commercial-scale solar-plus-storage projects.[71] They determine that the untapped potential for solar-plus-storage in New Mexico is among the highest in the U.S., and that this potential will emerge as technology prices drop. They find that systems are more economical under time of use and demand charge rates, and when electricity prices are high.

Delving further into state-specific policy, a 2019 study examined whether, under the state's net energy metering (NEM) rules, utility customers with distributed generation (DG) units pay their "fair share" of existing system-wide fixed costs.[72] They find that, across the three major IOUs in New Mexico, the 67% of residential NEM customers who are net buyers of electricity cover 90% of their full cost of electric service, while the net sellers (those exporting more electricity than they purchase) cover 0%. They also show that NEM users are high electricity consumers, and prior to installing DG, covered 154% of the cost of service. The authors suggest consideration of segmenting net sellers from net purchasers when developing NEM rules.

Groups such as ACEEE, EnergyStar, and NREL provide overviews of the energy policy landscape in New Mexico. [73, 74, 75] The Center for the New Energy Economy comments on the lack of policies around utility customer data access and privacy protections as well as the lack of grid modernization metrics reported in utility IRPs.[76] They also note the success of the NMPRC's mandate requiring energy storage be included in IRPs as a commercially-feasible energy resource, which led to PNM's investment in 456 MW of energy storage.[77] The state does have policies in place allowing companies to purchase renewable energy through a variety of different mechanisms, which meet the Corporate Renewable Energy Buyers' Principles and has led to substantial investment from companies such as Facebook.[78]

A 2018 study modeled the impacts of an RPS that would achieve 50% renewable penetration by 2030—which aligns with the updated RPS requirements codified by Senate Bill (S.B.) 489 in 2019.[79] Their

results show that the new target, coupled with higher energy efficiency savings, would result in 8,830 new jobs and $4.6 billion investment in clean energy, 3.96 GW of new solar and wind capacity by 2030, lower monthly energy bills, and avoided investment in new gas plants.[80]

Explicit Climate and Renewable Energy Policy

S.B. 489, signed into law in March 2019 by Governor Michelle Lujan Grisham, is the most prominent state-level, climate-related legislation passed in New Mexico. This bill contains amendments to the state's RPS as well as the "The Energy Transition Act," which establishes financial mechanisms for the retirement of coal-fired power plants. The revised RPS requires 100% of retail electricity sales within the state to be supplied by zero carbon resources by 2045 and increases the state's intermediary renewable energy supply requirements to 45% by 2025, 50% by 2030, and 80% by 2040.[81] The RPS applies to public utilities regulated by the NMPRC and is codified in the Renewable Energy Act, N.M. Statute §§ 62-16-4 et seq. NMSA 1978.[82]

The renewable energy resources that qualify under the public utility RPS include solar, wind, geothermal, biomass that meets particular specifications, non-fossil fuel cells, landfill gas, anaerobically digested waste biogas, and hydropower facilities brought online on or after July 1, 2007. While nuclear is excluded from the list of renewable energy resources, analysts have noted that the language of S.B. 489 implies that advanced nuclear and carbon capture could be used to move from the 2040, 80% renewable energy requirement to the 2045, 100% "zero carbon resources" requirement.[83] Within S.B. 489, a zero-carbon resource is defined simply as "an electricity generation resource that emits no carbon dioxide."

S.B. 489 similarly expands the RPS for rural electric cooperatives, requiring renewables to constitute 40% of retail sales by 2025 and 50% by 2030. It also establishes a target of achieving a zero-carbon resource standard by 2050, composed of at least 80% renewable energy.[84] For the purposes of the rural cooperative RPS, renewable energy resources include those included for IOUs, as well as renewable "useful thermal energy" and smaller hydropower facilities brought online prior to July 2007.

The passage of S.B. 489 follows a lineage of similar renewable energy policies extending back to 2000, when the NMPRC established the state's first RPS.[85] Prior to that time, renewable energy was largely and ineffectively promoted through fiscal policies such as tax credits.[86] In 2004, Governor Bill Richardson worked to codify the RPS in state law by passing the Renewable Energy Act (REA) (S.B. 43), requiring IOUs to generate 20% of total retail sales from renewables by 2020.[87] In 2009, he expanded the REA through an executive order, "Expanding New Mexico's Clean Energy Economy."[88] The subsequent Republican governor, Susana Martinez, was not supportive of the REA, but was unable to repeal or amend the Act due to the opposition of the Democratic-controlled state legislature.[89]

The Energy Transition Act (ETA) within S.B. 489 further authorizes utilities to take out low-cost "energy transition bonds" to cover 100% of stranded costs associated with closing coal facilities.[90] This financing mechanism, known as "securitization," allows repayments to be secured through to ratepayers, and is speculated to result in lower costs to customers as compared to alternative financing mechanisms.[91] The ETA was designed specifically in anticipation of the retirement of portions of the San Juan Generating Station (SJGS) in 2022 and the Four Corners Power Plant in 2031.[92] Some see this act as a public bailout for utilities. For example, PNM is expected to be a beneficiary of the ETA by recovering ~$300 million through utility surcharges for retiring their portions of the SJGS, despite the fact that their recent investment in the plant was worth ~$500 million and was made as late as 2015, with the knowledge of coal's environmental and economic downsides.[93]

In addition to energy transition bonds, the ETA creates funds across three state agencies (Workforce Solutions, Economic Development, and Indian Affairs), enables the NMPRC to issue bonds, and creates resources for workforce retraining, all for the purpose of providing economic relief for communities negatively affected by coal plant closures.[94, 95] These provisions, which have requirements regarding support for and representation by tribal communities, have also garnered support from tribal communities for the ETA.[96,97] However, energy justice issues within the ETA have been highlighted in an open letter from Indigenous People and Southwest Allies to Governor Michelle Lujan Grisham and state legislators. The ancestral native American lands near the Four Corners region of New Mexico have seen fossil resource extraction since the 1970s. Over time, multiple coal power plants, coal mines, and oil and gas drill pads have been sited on these lands, which has directly impacted local indigenous community health and environmental conditions. The bill does not address concerns of indigenous communities related to restoration of impacted areas and vital water resources, as well as health impacts caused by fossil extraction and burning activities.[98] Concern also remains that the economic revitalization provisions of the ETA will not be sufficient to fill the "$117 million-per-year hole" left by the closure of the San Juan Generating Station (the state's largest coal-fired power plant).[99] Worry remains in the Four Corners region of New Mexico that their future will mirror the economic blow to the Navajo and Hopi Tribes following the closure of the Peabody coal plant in Arizona.[99] Despite its shortcoming, the explicit and financially-supported focus on revitalization of local fossil-fuel based economies is seen as a major success of the ETA.

S.B. 489 is notably limited to the electricity sector and does not address New Mexico's growing crude oil and shale gas production and export, largely from the Permian Basin.[100] However, this gap is partially addressed by the "Executive order on addressing climate change and energy waste prevention" (E.O. 2019-003), passed by Governor Michelle Lujan Grisham in 2019. The Executive Order commits New Mexico to the 2015 Paris Climate Agreement goals of reducing statewide greenhouse gas emissions by

45% by 2030 compared to 2005 and directs the Energy, Minerals, and Natural Resources Department (ENMRD) and Environment Department (NMED) to develop an enforceable regulatory framework to reduce oil and gas methane emissions. The order further creates a Climate Change Task Force that will, among other tasks, evaluate policies to reduce emissions from light-duty vehicles, adopt building codes, and bolster transmission to support the development of renewable energy. Lastly, it requires state agencies to incorporate climate change impacts into their operations.[101] S.B. 489 fleshes out and supports many aspects of E.O. 2019-003 although the bill makes no explicit mention of climate change and fails to codify specific emissions reductions targets in the oil and gas sector.

S.B. 489 has already shown to have impacted investment decisions. In July 2020, the NMPRC approved a plan that will replace a portion of the San Juan Generating Station with an all-renewables portfolio.[102] While PNM, who owns the portion of the plant in question, had proposed a replacement scenario that included gas-fired power, NMPRC Commissioner Cynthia Hall commented that only the 100% replacement option (including 650 MW of new solar and 300 MW of battery storage) would fully satisfy the state's ETA, and thus this plan was selected.[103] Looking forward, the evolution of the NMPRC will be influential in the implementation of the ETA, as this body ultimately approves utility resource plans and investment decisions.

From 2019 onwards, there have been several failed bills related to climate in the New Mexico legislature. These include bills that attempted to evaluate emissions trends and reduce CO_2 emissions (House Bill (H.B.) 293), establish a less-ambitious RPS for rural electric cooperatives (H.B. 15), support the Green New Deal (House Memorial (H.M.) 84), price carbon (S.B. 393), power state facilities with renewables (S.B. 51), and require clean energy for new generation facilities (S.B. 475).[104. 105, 106, 107, 108, 109]

Siting Authority

Siting authority for power plants in New Mexico rests primarily with local governments through their implementation of zoning and land use regulations.[110] The general zoning authority of counties and municipalities is established through N.M. Statute § 3-21-1. [111]

However, Section 62-9-3 NMSA 1978 of the Public Utility Act ("PUA") (§ 62-9-3) requires NMPRC review and approval for generating plants over 300 MW and transmission lines over 230 kV.[112] The statute dictates that the commission shall approve siting applications for generating plants unless they are not in compliance with air and water pollution control standards, and it will approve transmission lines unless their location "unduly impairs important environmental values." The NMPRC will not approve an application that violates an existing local land use regulation unless it is found to be "unreasonably restrictive" and "not in the interest of the public convenience and necessity."[113] In the case that the local

legislation is found to be overly restrictive, the appropriate local body would be given an opportunity to respond to the issue, but the commission's decision would ultimately take precedence. Notably, the statute states that the NMPRC shall grant or deny applications within six months of receipt.

The statute § 62-9-3 was updated by H.B. 406 in 2019.[114] The previous version of the statute limited the NMPRC's statutory authority over transmission line locations to only those lines of 230 kV or higher that transmit electricity from a new generating plant of 300 MW or greater and for sale of electricity to the public. H.B. 406 also amends Section 62-9-5(F) to allow the NMPRC to deny a transmission line application if a substantially similar line is able to be constructed in an alternative location with similar costs and less environmental impact.[115]

It is unclear how many local jurisdictions have explicit renewable siting and zoning ordinances, or how many renewable projects have been blocked by local opposition. Although strong local opposition to wind and solar projects does not appear to be common (see Local Narratives section), there have been several instances of local opposition to transmission projects. In one instance, the Valencia County Commission voted unanimously to oppose the high-voltage Western Spirit Transmission Line that would "spoil their rural quality of life by obstructing pristine vistas, impacting wildlife, and undermining tourism-related income and property values."[116] The vote is said to be largely symbolic, in support of residents who are hesitant to grant the developer right-of-way, as the county did not know of a way to stop the line.[116] It is unclear whether the NMPRC overruled local ordinances in order for the project to continue. In the case of another major transmission project, SunZia Southwest, opposition from local politicians is cited as a major threat to the project's ability to win state and federal approval.[117] The executive director of the state Renewable Energy Transmission Authority admitted that more outreach to communities was needed to convince them of the value of these projects in spurring clean economic growth.

Public Lands & Renewable Energy Policy

Public lands represent about 43 percent of New Mexico's total land area, with 33.6 million acres of land managed by federal agencies and the State Land Office.[118] Federal agencies that manage land in New Mexico include the BLM, Bureau of Reclamation, Department of Agriculture, Department of Defense, Department of Energy, Forest Service, Fish and Wildlife Service, Bureau of Indian Affairs, and National Park Service. These agencies' land holdings can be seen in Figure 16. Energy development on public lands in New Mexico has traditionally been in the form of fossil fuel extraction, a multibillion-dollar industry in the state. However, the state's current leaders have demonstrated strong support for renewable development on public lands; Governor Michelle Lujan Grisham and State Land Commissioner Stephanie Garcia Richard have both voiced support for increased renewable development on state trust lands.

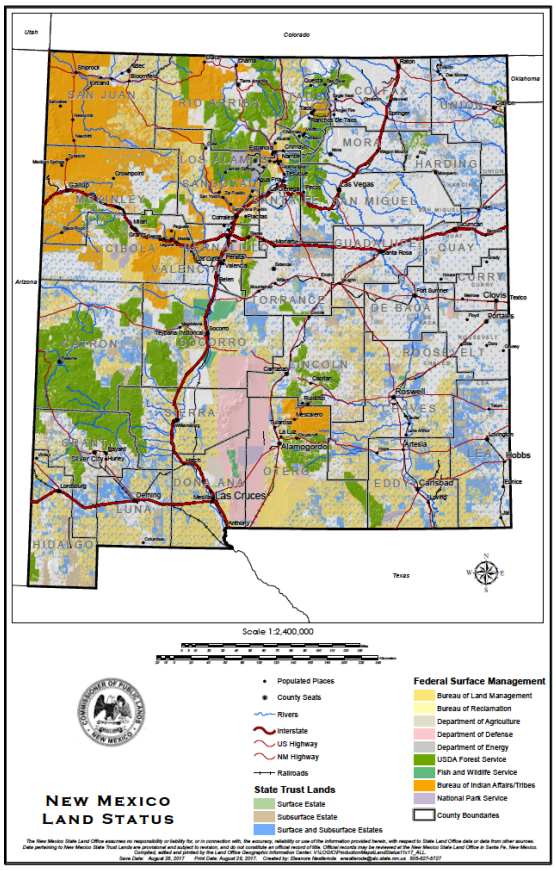

Figure 16. Land held by federal agencies and the State Land Office in New Mexico.[119]

The New Mexico State Land Office has 9 million acres of state trust land available for renewable energy leases.[120] Currently on state trust land, there are 6 active solar leases totaling 221 MW and 9 active wind leases totaling 245 MW.[121] Lease applications for solar projects and wind projects on state trust land total 2,917 MW and 1,835 MW, respectively.[122] The locations of solar and wind leases on state trust lands, as well as transmission lines, can be seen in Figures 17 and 18 respectively. One of the largest wind projects in the United States will soon be found in New Mexico; Iberdrola Renewables has broken ground on the 1,000 MW "El Cabo" wind project, which will stretch across 80,000 acres of land (about half of which are state trust land). State trust land can be sold or leased by the state with very few restrictions. Oil and gas developments are the largest revenue source for the State Land Office, accounting for most of the $1 billion in revenue that the office made in the last fiscal year.[123] In contrast, wind energy contributed a mere $885,000 in revenue to the State Land Office in the same fiscal year, although this did represent a 118 percent increase from the previous year.[124]

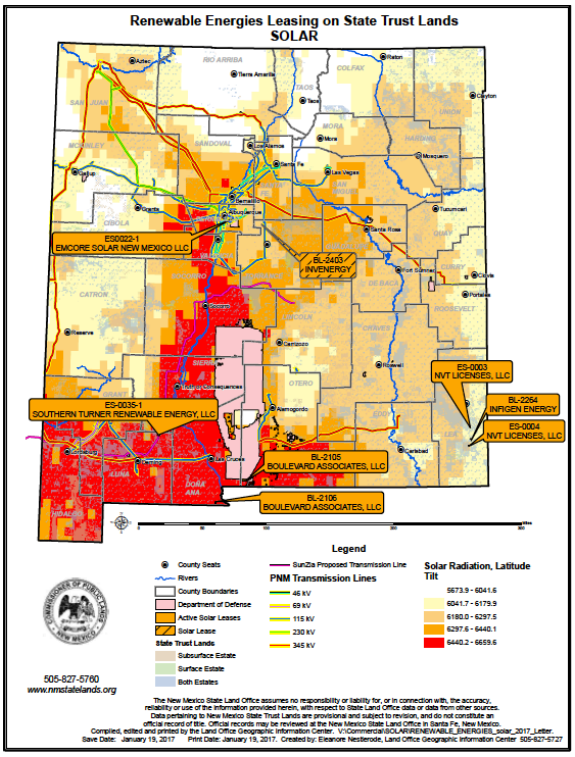

Figure 17. Solar energy leases on state trust lands, as of 2017.[125]

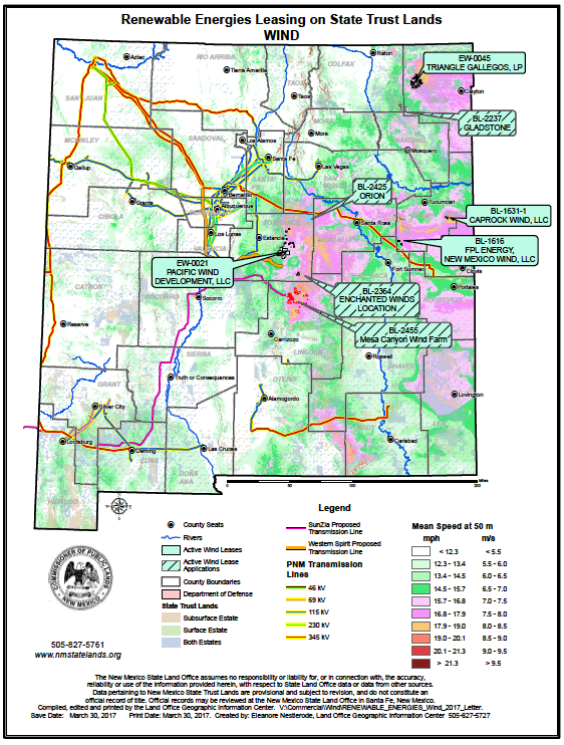

Figure 18. Wind energy leases on state trust lands, as of 2017.[126]

The Bureau of Land Management is the largest land manager in the state, overseeing 13.5 million acres. BLM allows wind and solar projects to be authorized as rights-of-way (ROWs) under Title V of the Federal Land Policy and Management Act (FLPMA) if the project is in step with the Bureau's land management planning.[127] All projects require National Environmental Policy Act (NEPA) review. BLM has made efforts in the past decade to ramp up renewable development, notably through the Western Solar Plan and the Solar and Wind Energy Rule. The Western Solar Plan, created in 2012, identifies Solar Energy Zones located on BLM land that would be well-suited for utility-scale solar development. The sole SEZ in New Mexico, called Afton, is located near Las Cruces, but despite its potential, there were no pending solar project applications within the Afton SEZ as of 2018. [128, 129] The Solar and Wind Energy Rule of 2017 introduced new leasing processes to smooth the way for renewable development on BLM lands; it "brings down the near-term rates and fees paid by solar [and wind] developers on BLM-managed land, ensures transparency and predictability, and allows for competitive bidding processes."[130]

Despite the potential for renewable development on BLM lands, there has been very little movement on this in New Mexico; as of December 2019, there were no wind installations and one small solar installation on BLM land in New Mexico. However, there is potential for this to change if oil, gas, and coal production continues to decrease on federal lands in New Mexico. Payments to the state of New Mexico for fossil fuel production on federal lands within the state plummeted from $1.2 billion in 2019 to $707 million in 2020.[131] This 40% decrease in revenues from fossil fuel production will likely produce budget problems that the state could seek to solve through advocating for renewable energy development on federal land.[132]

Renewable Energy Infrastructure

The New Mexico Renewable Energy Transition Authority (RETA) was created by state lawmakers in 2007 to support the development of renewable transmission and storage infrastructure. RETA published a study in July 2020 which found that there is currently insufficient transmission to support the state's renewable energy goals. With better transmission infrastructure and full realization of the state's renewable potential, RETA argues that New Mexico could provide power to western states like California and Washington. Private investment could help fill this infrastructure gap; RETA found $9.3 billion to $11.2 billion in investment opportunities in new transmission and energy projects through 2032, plus $155 million to $190 million in annual operations and maintenance investments.[133] Investment in transmission could produce "5,000–9,000 short-term construction job-years" and 45-65 permanent jobs in the state.[134] RETA's action plan for facilitating transmission development in New Mexico includes the following steps: expanding public outreach, supporting existing transmission developers and projects, developing new

transmission projects, prioritizing transmission corridors to ease the siting process, evaluating resilience, and monitoring advances in storage technology.[135]

The state is actively investing in transmission lines so it can take full advantage of its unique position at the edge of three U.S. electrical grids and the Four Corners power trading hub. Several new transmission projects are currently in development, as shown by Figure 19. Construction began in fall 2020 on the Western Spirit Project, a 155-mile transmission line that could connect up to 800 MW of renewable energy to the grid.[136] Another proposal is the controversial SunZia line that would stretch 520 miles between Arizona and New Mexico and could carry up to 3,000 MW of electricity.[137] The SunZia project was proposed in 2006 and has been bogged down by permitting issues and local conflicts since then (see Siting Authority section for additional details).[138] Towers could be as tall as 175 feet, another issue for residents concerned about aesthetics. An ambitious project by the name of Tres Amigas interconnection (Figure 20) aims to be the first interconnection between the Eastern, Western and Texas grids and is to be situated in Clovis, NM.[139] This interconnection aims to open the power markets in states like Texas and New Mexico to secure PPAs from customers across the nation.[140]

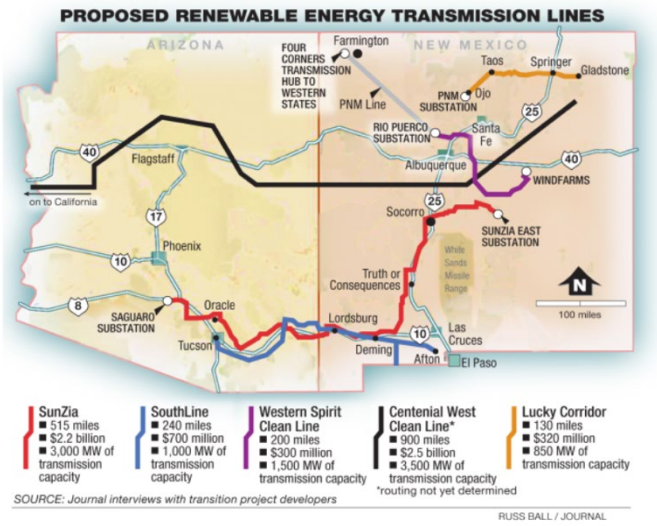

Figure 19. Several proposed transmission lines crossing between Arizona and New Mexico.[141]

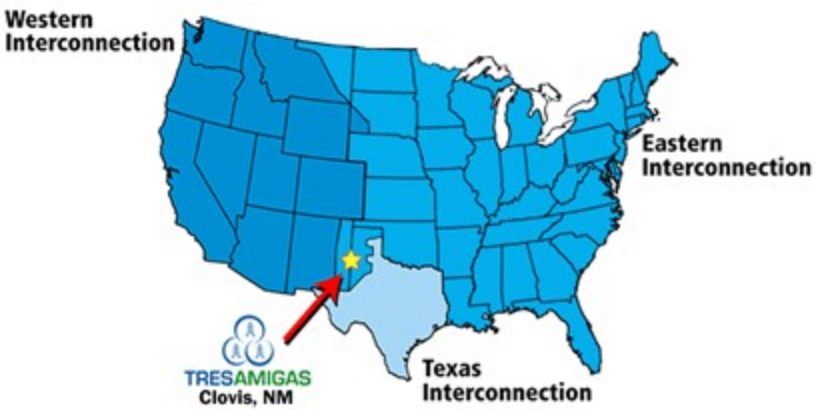

Figure 20. The Tres Amigas SuperStation will be constructed in Clovis, New Mexico[142]

Siting has been a major barrier for these transmission projects, especially since they generally must cross through public lands that may hold value to New Mexico residents. Conservationists are concerned about the effects the lines could have on migratory birds, especially near the Rio Grande River, and have pushed for the lines to be placed underground.[143] In some cases, transmission lines may also need to cross through tribal lands, which would require approval by and coordination with tribal governments. Since the 1970s, the NMPRC has had the power to approve or deny most transmission projects, and part of this deliberation is weighing the environmental consequences of a project against its utility. The state recently gave the NMPRC permission to deny transmission projects if another project can provide the same utility with more environmental benefits and with equal costs, which supports the state's interests in preserving its environment and lands.

Currently, there are 2.4 MW of energy storage installed in New Mexico – far less than neighboring states like Colorado and Arizona, which have about 534 MW and 488 MW of storage respectively.[144] Storage on the utility and distributed scales can play a key role in grid resilience and rural electrification on reservations, but it has generally received less attention than transmission aside from a few recent regulatory and legislative decisions. Utilities are required to include storage in their IRPs due to a 2017 amendment to the state PRC's IRP rule.[145] In July 2020, the NMPRC approved a plan for 650 MW of solar and 300 MW of battery storage to replace generation from the partially-shuttered San Juan Generating Station.[146] A bill incentivizing energy storage on residential and commercial properties was introduced to the state legislature in 2019 but did not advance to a vote.[147] The Sandia National Laboratories and the Los Alamos National Laboratory, both in the Albuquerque region, conduct research on energy storage that could help increase deployment of storage in the state.

Renewable Energy on Tribal Lands

Renewable energy offers an opportunity for New Mexico's tribes to take steps toward achieving electrification and to gain economic benefits like taxes and employment without many of the health and environmental threats posed by fossil fuel industries. About 11% of New Mexico's population is Native American,[148] with 23 tribes located in the state.[149] Tribal lands make up 10.5% of the state's land area, making New Mexico second only to Arizona in terms of proportion of tribal lands.[150] The largest reservation by land area in New Mexico is the Navajo Nation, which stretches across several states in the Four Corners region. The majority of the reservations are located in the state's northwest and northern central regions, around the major cities of Albuquerque and Santa Fe; the locations of the reservations, as well locations of the state's power plants, can be seen in Figure 21.

Many Native Americans in New Mexico have historically been employed by the energy industry, particularly coal-burning power plants and uranium mines. In part, this is because tribes have utilized Indian Preference laws that require companies operating on tribal lands to give preference to qualified native employees. While 1.9% of New Mexico's total population is employed in the mining industry, employment in the mining industry is significantly higher for tribes like the Jicarilla Apache (3.6%) and the Navajo (3.4%).[151] When the Navajo Generating Station, located across the border in Arizona, closed permanently in 2019, more than 90% of the 400 employees who lost their jobs were members of the Navajo Nation, and the Navajo Nation lost an estimated $30 to $50 million in annual revenue.[152] Oil and gas industry activities are also common on tribal lands; as of 2017, there were 2,762 completed oil and gas wells and 245 oil and gas leases on tribal lands in New Mexico.[153] The Jicarilla Apache tribe in particular has over 2,700 wells drilled on its land, making the tribe the "largest mineral royalty owner in the San Juan Basin after the federal government."[154] While fossil fuel industries have brought employment and revenue to New Mexico's tribes, they have also brought great damage to public health and the environment and made Native American communities vulnerable to economic downturn when oil prices drop or coal is phased out.

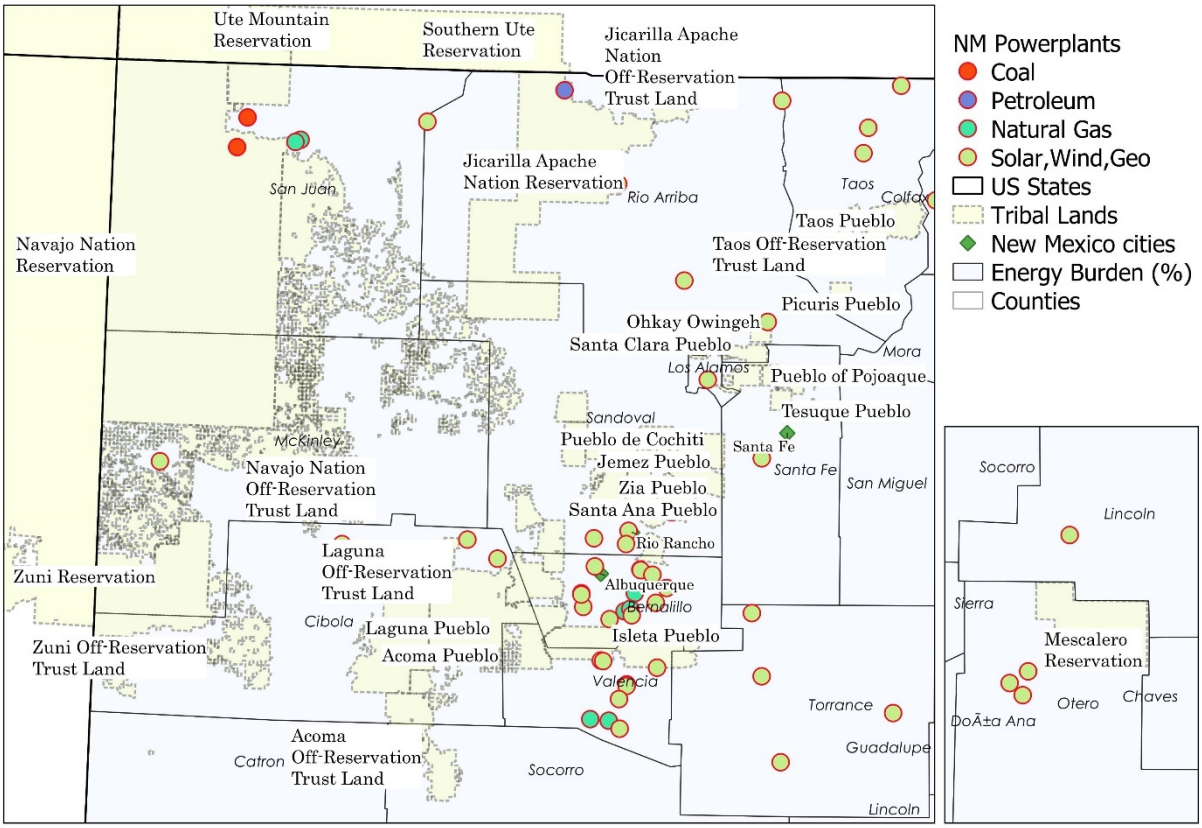

Figure 21. Powerplants in/around Native American lands in New Mexico[155,156]

Despite being home to a significant amount of fossil fuel infrastructure, the Navajo Nation faces massive rural electrification issues. Across the tribe's entire territory (not just within New Mexico), there are 15,000 homes without electricity; these homes represent 75 percent of all homes in the United States without electricity.[157] Organizations like Native Renewables work to bring electricity to rural homes on the Navajo reservation through distributed solar generation, as well as offering training and workforce development in the solar industry to help soften the blow of lost jobs in the coal industry. One potential benefit of the transition to renewables is that the Navajo Nation and other New Mexico tribes will have greater control over their grids and energy infrastructure, allowing for electrification beyond what can be achieved by nongovernmental organizations.

Most of New Mexico's tribal lands have "enormous potential" for renewable energy development.[158] There is potential for solar, wind, and geothermal energy development on many of the state's reservations. Solar energy in particular seems to be a popular choice amongst tribes, both on the utility scale and the distributed generation scale. State and federal policies and programs have increasingly begun popping up in support of renewable development on New Mexico's tribal lands; one possible reason

for this trend may be that the state government has realized tribal lands will play a key role in meeting the state's RPS and other renewable energy goals. Other motivations for these policies and programs may be working toward environmental justice and ensuring that tribes avoid major economic disruption from the transition away from fossil fuels. For example, to offset the loss of the San Juan Generating Station near the Navajo Reservation, the ETA directs up to 450 MW of renewable energy to be developed in San Juan County, as well as offering resources for workforce development.[159] The ETA also provides funds for tribal communities affected by the renewable energy transition and requires that tribal representatives be included in advisory committees.[160] Grants from the Department of Energy and other federal agencies have helped tribes in New Mexico develop renewable projects, especially ones that help with rural electrification; for example, the Department of Energy's Tribal Energy Program awarded $1.37 million in clean energy grants to four New Mexico tribes in 2012.[161]

Tribal sovereignty gives tribes the ability to set their own taxation and siting policies in many cases, a quality which helped attract fossil fuel development and can do the same for renewables; "a Tribe's ability to set specific tax rates and extend tax incentives through formal legislation can make Indian Country an attractive place for industry to do business."[162] Furthermore, projects sited on tribal lands are eligible for state tax incentives regardless of their financial agreements with the host community. Partnerships with outside developers and statewide utilities have produced several utility-scale renewable projects on New Mexico tribal lands. In partnership with the PNM, the Jicarilla Apache reservation will soon be home to the country's third largest solar project on tribal lands – a 50-MW solar project that will provide power to users like Western New Mexico University and the City of Albuquerque.[163] The Jicarilla Apache tribe will receive 2 MW of power from the project and has created a utility authority and put in place the transmission infrastructure necessary to connect this and other planned solar projects to the tribe's grid.[164]

In addition to working with outside developers, some tribes have created their own utilities, energy companies, and renewable projects. The Navajo Tribal Utility Authority's 55-MW Kayenta Solar Projects are located on the Arizona side of the Navajo reservation, not the New Mexico side, but it is still worth noting that Kayenta Solar represents a meaningful step forward for the tribe in terms of energy sovereignty. NTUA frames the significance of owning its own renewable projects in this way: "The Navajo Nation was NEVER the owner and operator of the coal-fired power generation plants on the Navajo Nation… None of the power generated was provided to the Navajo Nation to power our economy, homes or businesses. The owners of the Navajo Generating Station made the decision to shut down, the lease payments, coal royalties and more importantly the jobs will disappear. Now is the time for the Navajo Nation and its enterprises to take the lead and establish solutions that will provide long-term benefits for the Navajo Nation and its people. Now is the time for the Navajo people to become the owners and long-term decision makers of

power generation, especially within their traditional homeland."[165] It is evident that renewable energy transition, if done equitably and justly, can provide New Mexico's tribes with opportunities to break ties with more exploitative energy industries and regain control over energy decisions that impact their communities.

Taxation Policies for Renewable Energy

New Mexico offers many tax incentives and policies that support renewable energy development. These incentives range from Renewable Energy Production Tax Credit (REPTC), property exemption based on financing through Industrial Revenue Bonds (IRBs), gross receipt tax deductions on solar and wind energy generation equipment, tax credits for distributed solar power systems, and special property assessments for renewable energy financing. This section dives deeper into such tax policies.

IRBs can be issued by any county or municipality in New Mexico and can exempt renewable energy projects from property taxes. Per the state statutes, local governments do not pay property tax. Therefore, any facility that has local government-issued IRBs outstanding against it can be exempt from property taxes for up to 30 years. Issuers may require payments-in-lieu-of-taxes (PILOTs) from the borrowers and provisions can also be put in place for compensation in cases where a facility closes earlier than anticipated or does not generate as much economic benefit as expected.[166] For example, in case of Lea County, IRBs were used to finance $215 million for a 200 MW solar project. In return, the county negotiated annual PILOTs of approximately $638 thousand for the county and approximately $195 thousand for the county schools.[167]

New Mexico is a gross receipt tax state (GRT), where businesses are taxed on the gross amount of business receipts each year prior to expense deductions.[168] The first gross receipt tax deduction for renewables was offered for sale of wind energy generation equipment to government agencies (US Government or State Government) in 2002 via H.B. 373.[169] In 2007, H.B. 996 created the Solar Energy System Gross Receipts tax deduction for receipts from the sale and installation of solar energy systems, and this deduction was to be effective from July 1, 2007 to June 30, 2017.[170] In 2010, H.B. 202 was passed, allowing GRT deduction from the sale of solar generation equipment to a government entity. Any privately-developed energy project would only qualify for these tax deductions if they had received financing in the form of IRBs from a host community.[171] Currently, GRT deductions are allowed on the sale of wind or solar energy equipment to state, local, or federal governments.[172] In 2007, H.B. 430 was incorporated into a Comprehensive Clean Energy Legislative Agenda and passed. This bill provided Alternative Energy Product Tax Credit against combined reporting taxes for manufacturing of alternative energy products such

as fuel cell vehicles, carbon sequestration equipment, etc. This tax credit was limited to 5% of qualifying expenditure value and came with job creation requirements.[173]

The REPTC was introduced in New Mexico in 2002 via S.B. 187 and provides a tax credit against corporate and personal income tax to a New Mexico taxpayer.[174] The current statute indicates that qualifying energy sources must have a capacity of 1 MW or more and utilize solar light, solar heat, wind, or biomass to qualify for the credit. A New Mexico taxpayer who files an individual tax return and can't be claimed as a dependent can qualify for this tax credit if they either hold the title to a qualified energy generation facility or lease the land via IRBs from the county or municipality on which the energy generation facility operates[175] If an energy system uses wind or biomass to generate the renewable electricity, it may qualify for a $0.01/kWh tax credit for the first 400,000 MWh of electricity generated during a tax year. Similarly, a qualifying powerplant using solar-based energy systems to generate renewable electricity may qualify for REPTC starting at $0.015/kWh for the first year, gradually increasing up to $0.04/kWh in the sixth year of production, after which the credit decrements to $0.02/kWh until the 10th year of production, due to the higher costs of solar.[176,177] A qualified solar plant can receive production tax credit for the first 200,000 MWh of electricity produced in a year. There is no credit available after 10th year in production for any qualified energy system. If the REPTC exceeds a person's total tax liability, the excess amount can be carried forward for five taxable years. If the qualified energy system associated with taxpayer started energy generation on or after October 1, 2007, the excess tax credit may be refunded.[178]

	Production tax credit by qualifying energy source (in $/kWh)	
Year of production	**Solar PV/Thermal**	**Wind/Biomass**
1	0.015	0.01
2	0.02	0.01
3	0.025	0.01
4	0.03	0.01
5	0.035	0.01
6	0.04	0.01
7	0.035	0.01
8	0.03	0.01
9	0.025	0.01
10	0.025	0.01
10+	0	0

Table 4. Summary of REPTC tax credits by year of production[179]

The maximum allowable statewide tax credit in a tax year for wind and biomass is $20 million (for 2 million MWh of electricity produced), while for the maximum limit for electricity from solar plants is between $7.5 – 20 million (for 500,000 MWh) in a tax year. Due to abundant energy sources, the statewide cap on REPTC has been met in several tax years, which has resulted in formation of a waitlist of projects waiting to receive the REPTC. The tax credit was initially set up to be non-refundable, so the entities

receiving credit could only claim the credit against taxes owed to state and any surplus credit could not be refunded. This was altered in 2007, where tax credit awarded after October 1, 2007 was made refundable for qualifying projects commencing operations after October 1, 2007.[180,181] Per the New Mexico Department of Energy, Mineral, and Natural Resources (EMNRD), the REPTC applies to qualifying energy systems that were producing electricity on or before January 1, 2018.[182,183]

Any qualifying energy system that starts producing electricity after January 1, 2018 is not eligible to receive REPTC or be added to the REPTC waitlist. Since a number of existing/new qualifying powerplants fall into this category, many attempts have been made to change the REPTC over the last few years. Primarily, these attempts try to increase tax credits for renewable energy developers or amend the laws to allow waitlisted/new qualifying powerplants to become eligible for the tax credit. For example, H.B. 440 was proposed in 2017, but it did not pass the legislature. This bill would have included geothermal as a qualified energy source for REPTC. This bill also sought to increase the annual qualifying energy cap for wind and biomass energy systems from 2 million kWh to 2.5 million kWh on January 1, 2021. The tax credits would go from $0.01/kWh to $0.005/kWh for plants that start to produce energy between December 31, 2017 and January 1, 2020. The tax credit would then go down to $0.003/kWh for plants starting production between December 31, 2019 and January 1, 2023 with no credits for qualifying wind/biomass plants starting generation after January 1, 2023. For solar energy systems, the bill proposes the annual solar cap go up from 0.5 million kWh in 2017 to 1 million kWh by 2022. The bill also proposes a reduction in production tax credit for solar to $0.012/kWh if the plant started generation before January 1, 2017. The credit would go down to $0.008/kWh if the plant started production between December 31, 2016 and January 1, 2019 and would go down to $0.004/kWh if the plant started production between December 31, 2018 and January 1, 2023. Plants starting production after January 1, 2023 will not qualify for tax credits. Lastly, this bill would have guaranteed REPTC payments to renewables developers for 10 years of production, irrespective of when a qualifying plant's production started.[184]

Despite the presence of a waitlist or restrictions on powerplants to qualify for REPTC, new projects have not been discouraged from coming to New Mexico as they may still be eligible for federal and other state incentives.[185] Any extensions to or changes in qualification criteria for the state's REPTC program will have to be approved by both the state legislature and the governor's office.[186] When the REPTC program was passed in 2002, wind and solar industries were represented by organized lobbying groups whereas geothermal energy lacked the presence of such a group. This resulted in geothermal energy systems' absence from the REPTC. Over time, the geothermal energy lobby has grown, although it is not as large as wind and solar.[187] Despite the growth in lobbying, geothermal power plants do not qualify for the current REPTC.[188]

In New Mexico, the REPTC program has been considered not only an environmental success, but also an economic success. Although no requirements were put into place to show job creation as a result of the REPTC, every dollar that has been given as a tax credit has resulted in approximately $5 generated in labor income.[189,190,191] The REPTC incentive can also influence what energy sources replace retiring fossil electric power stations, as seen in the retiring of San Juan Generation Station (SJGS) in 2022.[192] Other states have also started to use the New Mexico REPTC as an example of success. For example, Virginia is considering creation of Commonwealth Wind Credits based on the economic performance of REPTC in NM.[193]

In 2010, H.B. 171 was passed to establish tax credits against personal and corporate income tax for using biomass to either generate electricity or create fuels for commercial use. The tax credit was set at $5/ton of biomass and capped at $5 million per year for the entire state. This tax credit was available from January 1, 2011 to the tax year ending on January 1, 2020.[194] In 2020, the New Mexico legislature passed H.B. 146, which extended the time period to be eligible for agricultural biomass income tax credit to the tax year ending prior to January 1, 2030 and added reporting requirements for the credit recipient as well as the state authorities.[195,196] The geothermal tax credit (New Mexico Geothermal Ground-Coupled Heat Pump Tax Credit) was introduced via H.B. 375 in 2009 and offered up to $9,000 tax credit for installation of a qualifying geothermal system for residential, business, or agricultural use. The maximum allowable tax credit for entire state is $2 million. The tax benefit is set to expire on December 31, 2020.[197] Several unsuccessful attempts have been made to pass legislation on these tax credits (such as S.B. 584 in 2015[198]).

The Solar Market Development Tax Credit was passed via S.B. 29 in 2020 and provides a non-refundable income tax credit up to 10% of the cost of equipment and installation for a solar thermal or solar photovoltaic system installed for use in residential, business, or agricultural settings. The maximum allowed credit is $6,000 for one system and can be carried forward for 5 tax years only. Total annual credits are limited to $8 million in a tax year and are offered in a first-come first-serve basis. The qualifying system has to be purchased and installed between March 1, 2020 and December 31, 2027 to qualify for this tax credit.[199] These credits were introduced against personal income tax liability via H.B. 295 in 2006, but it was substituted and passed as S.B. 269 in 2006. The legislation allowed for tax credits for solar installations in residential, business, or agricultural settings where the total federal and state tax credit combined could not exceed 30% of the total purchase and installation costs. The total tax credit for a system was capped at $9,000, and system purchase and installation had to be done between January 1, 2006 and December 31, 2015.[200] In 2009, S.B. 257 changed the credit to cover 10% of eligible costs irrespective of federal credits availed for a qualifying system up to $9,000 and extended the purchase and installation deadline by a year to December 31, 2016.[201] Several attempts that were made to re-instate this tax credit around its expiration

were vetoed by then governor Susana Martinez, who maintained close ties with the oil and gas industry.[202, 203] There is hope that S.B. 29 will help revive New Mexico's solar industry, which saw a 31% decline in number of jobs between 2016 and 2019.[204] Additional incentives for distributed solar installation include H.B. 233, which allows roof top-scale solar systems to be exempt from property taxes in the state from the time of installation to the time property is sold.[205]

The Renewable Energy Financing District Act (S.B. 647 in 2009) allows counties and municipalities in New Mexico to form renewable energy financing districts in order to fund renewable energy development. A county or municipality can form the financing district with its boundaries after holding a public hearing. Once the district has been established, properties with the district can be assessed for their property values and this assessment can then be used to secure bonds for renewable energy improvements on assessed properties.[206] This helps counties work together to secure Property Assessment Clean Energy Bond (PACE) financing.[207] This method of financing allows renewable energy to be installed at reduced up-front costs and participants in this program instead pay for the costs of energy improvement over many years through their property taxes. As a result of this act and PACE financing, counties can now create opportunities in energy upgrade work in New Mexico.[208] Tax credits from state and federal government further reduce the cost to be paid back, allowing renewable energy technologies to become more accessible. Similarly, the Solar Energy Improvement Special Assessment Act (passed via H.B. 572 in 2009) authorizes counties to identify financial institutions to provide upfront financing of up to 40% of assessed property value for solar energy related improvements. The counties work with the financial institution to provide accurate property values and no counties can pass additional provisions than those defined in the law.[209]

Distributed Energy Generation Incentives

New Mexico has numerous other laws and policies related to distributed-scale renewable energy.[210] For example, the New Mexico Energy Efficiency and Renewable Energy Bonding Act was passed in 2005 to reduce operating costs for state universities and public schools.[211, 212] This act sets up the New Mexico Finance Authority, which can allocate up to $20 million in renewable energy revenue bonds to fund renewable energy projects at these facilities for a contract of 10 years. The long-term goal is to save New Mexico's taxpayers money. The Distributed Generation Consumer Protection legislation was passed in 2017 via H.B. 199 to establish rules for selling or buying a distributed energy systems. PNM, one of New Mexico's major utilities, has been operating the Customer Solar REC Purchase Programs for almost a decade. Through this program, PNM allows its residential and business customers to install qualifying solar

energy systems on-site and in return the utility purchases RECs from the owner for energy produced and consumed on-site. The RECs are purchased for $0.0025/kWh up to a predetermined REC capacity.[213]

In 2008, the NMPRC enacted net metering in the state. Under this program, all qualifying energy systems under 80 MW capacity are to be compensated for net excess generation (NEG). If the system capacity is 10 MW or less, the utility can either pay the customer monthly for NEG at the avoided cost rate, or the customer can accrue credits indefinitely and get paid at the avoided cost rate when they leave the utility system.[214] The net metering rules apply to state's IOUs and electric cooperatives, but not municipal utilities.[215]

Analysis and Conclusions

The amalgamation of New Mexico's renewable energy-related policies, along with strong solar and wind resources, creates a largely positive climate for utility-scale renewable energy development. However, despite the pro-renewable policies in place, progress toward the state's highly ambitious RPS could be slowed by influential coal and natural gas interests, local siting authority, lack of transmission infrastructure, and taxation and financing policies. Given their geographic footprint within the state and historical context, renewable energy development on public and tribal lands will likely be key to achieving a transformative shift in the electricity sector.

Over the past two decades, New Mexico has shifted from an electricity generation mix dominated by coal to one derived of a mix of coal, natural gas, and wind power.[216] Currently, the state is prioritizing the equitable closure of its largest coal-fired power plants—the San Juan Generating Station. The Energy Transition Act of 2019 establishes financing measures ("energy transition bonds") and funds intended to facilitate the low-cost retirement of these stranded assets while supporting the communities that rely upon these plants and associated coal mines as their economic engines. This act has been largely seen as a success and will remain crucial in the coming years as additional coal capacity is retired.

Despite a dramatic shift away from coal, significant steps are still needed for the state to meet its ambitious decarbonization goals. New Mexico's renewable energy goals are among the most aggressive in the U.S. and will require massive deployment of additional renewable energy. If 2045 electricity consumption mirrors that of 2018 (a conservative estimate considering increased electrification of vehicles and buildings), New Mexico will need to supply an additional 69,500 GWh of annual electricity from renewable sources to replace existing coal, natural gas, and petroleum-powered electricity generation.[217] If this required generation is split evenly between solar and wind, this would entail approximately 10 GW of

additional wind capacity and 20 GW of additional solar capacity.[c] These capacities equate to land requirements of approximately 492,000 acres for wind and 150,000 acres for solar power plants, or a combined 0.8% of New Mexico's land area.[d] This significant land requirement could prove to be an issue when considering that local authorities, who may be less favorable towards renewable development than state legislators, maintain siting authority for any generation project under 300 MW. Although local pushback against renewable energy siting has not been prominent thus far, as utility-scale projects become more common, it is possible that local resistance may increase, and the state may look to delegate greater siting authority to the NMPRC in order to reach its RPS goals.

While local jurisdictions may present future challenges to renewable energy siting, public lands in New Mexico represent a vast opportunity for renewable energy deployment. Public lands make up over two-fifths of land within the state and will inevitably be utilized to help the state to meet its renewable energy goals. Thus far, there has been far more renewable energy production on state trust lands than on BLM lands, which may be because the State Land Office is aligned with the state's renewable energy requirements and goals, while the BLM is not beholden to the state government and has historically had a strong quid pro quo relationship with fossil fuel developers. If there are changes made to federal policy concerning oil and gas leases on public lands, BLM may seek renewable development in place of fossil fuel development. As additional solar and wind projects are deployed on state and federal lands, public land managers must balance protection of landscapes and wildlife with their need for revenue from energy developers. This balance presents an opportunity for renewable energy developers to demonstrate that they can give public land agencies a steady revenue stream while causing less environmental harm than fossil fuel developers.

Transmission and storage infrastructure also presents both a significant challenge to and opportunity for accelerated renewable energy development in New Mexico. Without transmission lines to transport energy to the state's population centers and to nearby states such as Texas and California, there is little incentive to increase renewable generation. The state's Renewable Energy Transmission Authority has outlined areas where there is potential for investment in transmission infrastructure, in the range of $9 billion to $11 billion through 2032, but investment can't overcome the barriers of public opposition or regulatory differences between public, private, and tribal lands. Significant coordination with public land

[c] Solar generation was estimated using PVWatts assuming a standard, fixed (open rack) system tilted at 20 degrees in Albuquerque. Wind generation per installed capacity was estimated using the reported total installed wind capacity and net wind generation in New Mexico, as reported by U.S. DOE's Wind Technology Office (https://windexchange.energy.gov/states/nm).

[d] Area requirements based on assumptions of 7.5 acres / MW solar and 50 acres / MW for wind (both reasonable assumptions based on NREL reported national averages). While the disturbed footprint of wind turbines is much lower than their total land requirement, the land requirement value represents the amount of land for which lease agreements would need to be entered.

managers, tribes, and the public will be necessary to advance the many proposed transmission lines. Energy storage could present another potential bottleneck in renewable energy development, as storage infrastructure is significantly underdeveloped in New Mexico compared to neighboring states. However, the increased legislative and regulatory attention paid to storage in recent years suggests the state recognizes its importance for improving grid operations and expanding renewable energy generation.

In the realm of taxation, New Mexico has an array of policies which, on the whole, have strongly supported renewable energy development. Most prominently, the Renewable Energy Production Tax Credit (REPTC), started in the 2000s, has proved extremely successful in spurring renewable energy growth in the state. Although new renewable energy systems cannot qualify, this program is expected to continue paying tax credit to existing qualifying renewable energy systems over the next 8 years. The impact of REPTC has been such that over the last few years legislation has been introduced to extend these benefits for existing and new energy systems.[218] Renewables developers who work with their host county or municipality can choose to finance their projects through Industrial Revenue Bonds. This gives the projects exemption from property taxes since government property is not taxed in the state. The developer and local governments can work out PILOT payments amongst each other, allowing for flexible arrangements to be made. This method of financing also qualifies the energy system for financial incentives like Gross Receipt Tax Deduction, which allow receipts related to sale of equipment for wind, solar thermal and solar PV technologies to be exempted, thereby reduce the state tax liability for developers.

The state also offers Alternate Energy Product Tax Credit, which incentivizes manufacturing products such as fuel cells, thereby promoting development within the state. The Solar Market Development Tax Credit further supports the expansion of solar energy systems within the state, giving a tax credit for installation of systems in residential, commercial and agricultural settings. Laws such as Renewable Energy Financing District Act and Solar Energy Improvement Special Assessment Act help local communities access financial help for transitioning to renewable energy systems through special property assessments and PACE financing. Owners of distributed energy systems can also take advantage of net metering payments and sell renewable energy credits (RECs) to PNM. However, net metering payments are only done at avoided cost rates, rather than retail rates PNM currently offers just $0.0025/kWh for RECs. It would take a typical 6 kW rooftop system approximately four years to provide $100 of value to the resident.

These policies together have supported the development of renewable energy. Despite their success, some taxation policies risk expiration due to uncertainty around the state's revenue stream. As discussed later in the analysis, reliance on fossil industry activities for tax revenue exposes the state to the fluctuations of the fossil fuel industry, thereby indirectly hindering long term renewable energy planning and development. The situation can be improved if the state takes steps to diversify its tax revenue streams

or earmarks a specific amount of money for renewable energy tax credits and incentives in the future. The state could also take steps to offer a wide range of incentives (such as REPTC, GRT deduction) for geothermal energy systems which have been excluded from some of the active tax incentives.

Native American tribes within the state will likely continue to play a major role in energy production, as they have historically done with oil, gas, coal, and uranium, but it should be the state's priority to ensure that tribes do not suffer economically during the energy transition process. New Mexico tribes have seen fossil fuel activities on their lands for decades, and the industries have employed many indigenous people in mines and extraction sites, processing facilities, and power plants. As PNM transitions away from coal under the ETA, it plans to provide incentives in the form of severance checks worth $17.8 million to affected workers and $8,000 on average per worker for job training.[219] But such incentives do not address the environmental and health damages from fossil fuel and mineral generation over the years (more information in Explicit Climate Policy and Tribal Lands sections).[220] Furthermore, the ETA will allow PNM to provide such compensations by raising money from utility ratepayers through increases in utility bills. As a state with considerable poverty levels and variations in energy burden between counties, it is important to keep electricity prices low for the consumers to prevent further strain on New Mexicans who may be affected by high energy burden or poverty.

Tribal sovereignty allows tribes to set taxation and siting policies on their lands and use of their lands is likely to be sought by the state and developers for renewable energy and transmission infrastructure. Thus, tribes will be influential stakeholders in the state's growing renewable energy industry, with the ability to either block or support major projects. Renewable energy development has the potential to advance rural electrification efforts on reservations and provide employment and income for tribes, without the health and environmental harms of fossil fuel and mineral development. But if the state does not put equity and environmental justice concerns at the forefront of its energy transition efforts, it's possible that renewable energy development on tribal lands could be as exploitative and damaging to tribes as fossil fuel development has been.

The influence of the oil and gas industry may also hinder progress towards the state's overall emissions-reducing goals, as set forth by Executive Order 2019-003. New Mexico remains a major producer and exporter of oil and gas and relies heavily on the industry as an economic engine and tax base. Notably, the state's most prominent climate-related legislation, S.B. 489, does not acknowledge the role of oil and gas emissions in the state's overall climate impacts. An example of oil and gas influence is the blockade of Solar Market Development Tax Credit late in Governor Susana Martinez's term who vetoed legislation that would have extended a tax credit on installation of solar energy systems in the state. This led to a collapse of the tax credit and resulted in loss 13.9% of solar industry jobs in the state, which had the nation's second

highest unemployment rate, while neighboring states saw a bump in that job category.[221] Lobbying groups for the oil and gas industry are actively pushing back against the state's energy transition efforts through opinion articles in the state's newspapers, a visible sign that industry groups feel threatened by the rise of renewable energy.

Looking forward, New Mexico will likely continue to be a net exporter of electricity, particularly as land constrained states such as California increase their renewable energy demand. This may exacerbate siting-related conflicts, particularly regarding large transmission projects, and increase competition in areas with prime resources. Furthermore, oil and gas production continues to be a crucial economic base for the state. Global events such as the oil price war between Russia and OPEC and the Covid-19 pandemic have also impact state's tax revenues during 2020.[222] Between quarter 1 of FY2020 and quarter 1 of FY2021, the oil and gas industry had the largest decline in taxable gross receipts for the industry worth ~$850 million.[223,224] With the oil and gas industry likely to continue to decline, New Mexico may be motivated to take further action to make the state a leader in renewable energy. Although the renewable energy industries are relatively young, the state realizes that over time these industries will mature, allowing it to implement measures such as renewable energy production taxes (S.B. 18, 2020 session) to expand the state's tax revenue.

Despite the challenges highlighted above, New Mexico's overall vision for a renewable energy future, willingness to put funds towards equitable closure of coal plants, strong renewable resources, and low population density in many regions create favorable conditions for continued growth in renewable energy generation.

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