

Renewable energy development as a job creation mechanism: Lessons from New Mexico

C Hadjilambrinos¹

¹Department of Geography and Environmental Studies, University of New Mexico,
Albuquerque, New Mexico, USA

E-mail: hadjilam@unm.edu

Abstract. In addition to the environmental benefits from renewable energy development, a variety of reasons are also offered as justifications for government policies to promote these energy resources. These reasons include the creation of new jobs, often in geographic regions that face adverse employment conditions, such as remote and rural areas. It is important, therefore, that in order to assess the societal impact of renewable energy development, the impact of such development on employment be studied. This paper uses the U.S.A. state of New Mexico as a case study to examine the trends and role of green (renewable) energy employment and highlight some key methodological issues that create significant difficulties for studies of the impacts of renewable energy development on employment.

Keywords: *Renewable energy industries, employment, green jobs.*

1. Introduction

Renewable energy sources are “already the world’s second largest source of electricity”. [1] This development is the result of several factors, including as a response to climate change, as a consequence of significant drops in the prices of these energy sources, and because of innovations in digital and communication technologies that allow better integration of these sources in the electricity grid. The pace of development of renewable energy sources, however, is still greatly dependent on government policies. [2] In the United States of America, both national and state policies play significant roles. Furthermore, in the U.S.A., fluctuating political support for responding to global climate change has meant that different rationales must be used to sustain political support for policies that promote renewable energy development. One rationale used frequently by the renewable energy industry, environmental groups, labour organizations, and many politicians, is the presumed positive impacts of such policies on national and local employment. [2]

The idea that renewable energy development could be an important engine of job creation is based on a variety of studies and reports, which produced findings to this effect. A study produced by the International Renewable Energy Agency (IRENA) estimates that the renewable energy sector, at the end of 2018, employed about 11 million people. While most of these jobs were in China, the U.S. and the European Union, other countries in Asia, North Africa, and Latin America also experienced significant growth of employment in this sector. [3]

A meta-study compiling the findings of thirteen independent reports analysing the economic and employment impacts of clean energy industries in the U.S.A. and Europe arrived at the conclusion that these industries had a much higher job creation rate than the conventional fossil-fuel-based energy sector. [4] Another study, which built a simulation model to explore job creation in the U.S. energy sector, also concluded that renewable energy and energy-efficiency improvements would create jobs at a faster pace than fossil-fuel based energy industries. [5]

However, the literature on the impacts of policies promoting renewable energy development also includes studies that show a more complicated effect on labor markets. For example, a study analysing the impacts of the growth of renewable energy in the North Rhine-Westphalia region of Germany indicated a loss of employment in the region, due to the decrease in the conventional energy sector, but a gain in overall employment in Germany because of the substitution of imported fossil fuel by renewable energy systems whose components and plants were primarily manufactured within the country. [6]

Similar conclusions are drawn by a study focusing on the Asturias region of Spain. Renewable energy development is predicted to lead to a gradual loss of employment in fossil-fuel reliant industries. While the employment gains in the renewable energy industries are expected to be greater than these losses, these gains will be in two different areas: construction and installation, and operation and maintenance. Jobs in the first area will be involved in the process of building the infrastructure which may, or may not be long lasting. [7]

Projections in the literature of the impact of renewable energy development on employment range from strongly positive (significant job gains) to moderately negative (some job losses). [8][9] This divergence of findings is difficult to reconcile. There is some indication that it is primarily driven by the methodology applied in the various studies. The authors conclude that “outcomes seem to depend very much on the methodology. The estimations that include induced effects are generally less optimistic about net employment creation in the wake of the energy transition. Partly because policy reports tend to use methodologies that do not include induced effects, they generally report more positively about net employment creation related to renewable energy than do academic studies.” [10] Because most studies do not include induced effects, the current literature might be too optimistic about the size of the net employment gains from renewable energy and energy efficiency. Nevertheless, the emerging consensus seems to be that the net effect on employment from increased use of renewable energy will be positive. [10]

2. Renewable energy development in New Mexico

The economy of the state of New Mexico is quite dependant on revenues from energy production. New Mexico has more than 6% of U.S. total proved crude oil reserves, more than 4% of the nation’s natural gas reserves and 2.5% of the estimated recoverable coal reserves. In 2017, it produced 5% of the crude oil, 4% of the natural gas, and 2% of the coal produced in the U.S. [11] Because most of these reserves are in lands owned by government (Federal, State, and Native American Tribal lands), their development is an important source of public revenue. However, the price volatility of fossil fuels, and especially oil and natural gas, has resulted in significant fluctuations in the revenue from these resources. In the period 2006 to 2017, oil and gas extraction produced between a low of \$4.6 billion (2016) and a high of \$8.8 billion USD (2014). [12] These fluctuations have had a deleterious effect on the state’s economy and, as a result, have led political leaders to seek diversification.

Fortunately, New Mexico has a very significant renewable energy potential, particularly for wind and solar energy: “The state has some of the highest rates of solar irradiance and best wind conditions in the United States.” [12] Consequently, in the past two decades, there has been a shift in energy production in the state. This shift initiated in 2000, when the state’s Public Regulation Commission (NMPRC) passed a renewable portfolio standard, obligating investor-owned electric utilities operating in the state to produce a certain portion of their electricity from renewables. Following legal challenges to this NMPRC action by some of the utilities, the state’s legislature codified the standard into law, the New Mexico Renewable Energy Act (first enacted in 2004).

As a result of these actions, renewable energy development in the state accelerated. Especially during the past ten years several renewable energy projects have come online and many more are in the pipeline. [13] Taken together, all of these projects have stimulated growth in the renewable energy sector of New Mexico’s economy. Some of the greatest strides in renewable energy efforts took place in 2010 and 2011, when over the course of only one year, New Mexico’s solar energy sector tripled, going from 43 megawatts to 116 megawatts, placing New Mexico firmly among the leading U.S. states in solar energy efforts – in fact, New Mexico was fourth among the states for the production of solar photovoltaic power in 2011. [14] Photovoltaic energy development continued to grow rapidly and, as of 2017, the state had a total installed solar capacity of 750 megawatts (See figure 1). [12]

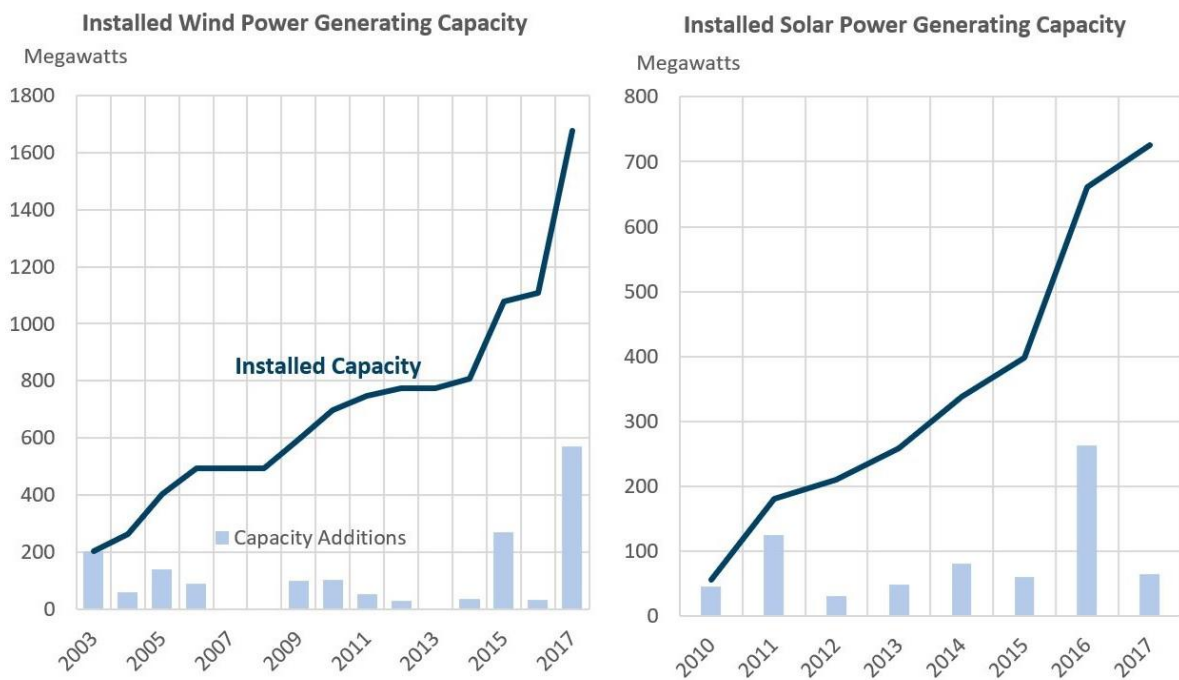


Figure 1. Growth of wind and solar electricity generating capacity in New Mexico

Wind power remains the largest contributor of renewable energy in the state, accounting for more than half of total renewable energy production in 2017. [12] The installed wind electricity-generating capacity was about 1.7 gigawatts, with more than 1000 operating wind turbines as of 2017 (figure 1). Together, wind and solar accounted for 18 percent of electricity generation in the state, setting it well on track for meeting its Renewable Energy Portfolio Standard, which requires investor-owned utilities to obtain 20 percent of the electricity they sell in the state from renewable energy sources by 2020. [12]

3. Employment in the renewable energy sector

Considerable difficulties exist in measuring employment in the renewable energy sector in the U.S.A. as a whole and, therefore, in New Mexico as well. The Bureau of Labor Statistics of the U.S. Department of Labor is the main source of employment data for the U.S.A. The Bureau uses a three-digit numerical code to classify the sectors of employment within the U.S. economy. This system, however, does not assign any specific codes to the renewable energy industry (nor, as a matter of fact, for energy efficiency improvement jobs or any other “green” energy employment). In addition, the U.S. Department of Energy does not offer any definition of “clean” or “green” energy. [15]

A secondary source for statistics on employment in the renewable energy sector are the trade associations representing different portions of the industry. These have their own different ways for defining what “clean” energy is, and what employment positions qualify for counting as jobs in the sector. Nevertheless, a reasonable estimate, based on the best data available, would be of about three million jobs nationwide. [15]

The best methodology for enumerating jobs in renewable energy is to directly survey the employers that make up the sector. For example, a study of the wind energy workforce in the U.S., conducted by the National Renewable Energy Laboratory, identified specific wind energy employers and educational institutions offering degrees or certificates in wind energy. It then surveyed these employers about the numbers of people they employ, the types of employment, compensation, etc. [16] The problem with this approach is that it requires that all possible employers in the sector be identified and contacted, that a significant majority report their data, that they report data accurately, etc. Also, this method identifies only those directly employed in the industry and not those whose jobs depend on the economic activity engendered by those directly employed in the sector (indirect employment effect).

Whatever estimates exist concerning employment in the renewable energy sector in the U.S. however, do not break down such employment by state. It is, therefore, very difficult to obtain employment statistics which pertain specifically to New Mexico. The only source of these data we were able to identify dates from 2007 and studies “green” jobs in the Rocky Mountain States (one of which is New Mexico). The report indicates that while the number of total jobs in New Mexico in the period 1995 to 2007 grew by 13 percent, jobs in clean energy grew by 152 percent and in energy efficiency by 241 percent. [17]

Because renewable energy sources continued to be developed at a fast pace in the decade from 2007 to 2017, one can fairly safely assume that employment in this sector also continued to increase at a fast pace. Furthermore, in regard to the future, although there are no estimates available of the overall growth of employment in the renewable energy sector in the state of New Mexico, there are some indicative predictions for specific jobs in this sector.

According to the New Mexico Department of Workforce Solutions, for the period 2016-2026, the top two jobs projected to experience the highest growth rate in the state are “solar photovoltaic installer” and “wind turbine service technician”. The former is projected to grow by 112.6 percent, and the latter by 57.5 percent during this period. Perhaps equally important is the fact that the median compensation for these jobs (\$39,430 for the former and \$45,430 for the latter) is greater than the median compensation for the state, which is projected to be \$33,450. [18] We should note here that the jobs discussed above are easy to identify as “belonging” to the renewable energy sector. Determining the overall employment in the sector, however, is complicated by the fact that many more jobs cannot easily be identified as belonging to the sector—jobs such as in construction (some of which will be due to the expansion of the renewable infrastructure and some not), power line maintenance and repair, etc.

Given the commitment to renewable energy development, which the state of New Mexico has shown through policies it has put in place (a subject we discuss in the following section), there is near certainty that employment in this sector will continue to grow strongly. It is also certain that the jobs in this sector will be relatively well compensated.

The difficulty in determining the *net* impact on employment in the state from the development of renewable energy is in 1) calculating the reduction in employment in the conventional energy sector *attributable* to the expansion of renewable energy and 2) accounting for the possibility that some renewable energy sector jobs may be lost to other countries as a consequence of globalization and international trade. [2] These calculations are extremely difficult, require numerous assumptions, and are, ultimately beyond the scope of this paper.

4. Political context for renewable energy development in New Mexico

4.1 Overview of New Mexico governmental structures

In order to understand the political context for development of renewable energy in the state of New Mexico, it is important to first discuss the relative roles of three key governance entities: the executive branch, specifically the Governor, the legislative branch (bi-cameral, comprised of state senate and house of representatives), and the New Mexico Public Regulation Commission (NMPRC). It is important to note that the role of the latter entity is unusual among the states because it is one of only eleven (out of fifty-one) such bodies (which each of the states, as well as the District of Columbia, has in one form or another) that is directly elected by the people. The direct election of its five commissioners was set forth via an amendment to the state constitution, accomplished by popular vote, on November 5, 1996 (Article XI, Sections 1 and 2, New Mexico State Constitution). [19] Prior to the 1996 constitutional amendment taking effect the commissioners were nominated by the governor and confirmed by the state senate. [20]

The Public Regulation Commission plays a very important role in the development of renewable energy in the state of New Mexico because it exercises oversight of electric utilities. This oversight includes setting parameters for electricity generating facilities and approving the plans of utilities in regard to the resource mix they use for electricity generation. Because by far the most important application of renewable energy technologies is in electricity generation, the role of the NMPRC in this area is direct and significant. The fact that the commissioners are directly elected has meant that the NMPRC is an independent political body, willing and able to exercise policy-making authority.

The governor of the state of New Mexico plays an important role in setting the agenda for energy and environmental policy and regulation in the state. The governor's power is both direct and indirect. It is direct through setting priorities, issuing executive orders, and exercising the legislative veto power to prevent the legislature from acting in ways that would counter these priorities. It is indirect through control by appointment of the leadership of key departments such as the Energy, Minerals and Natural Resources Department (EMNRD) and the Environment Department. These Departments have the power to promulgate rules and regulations, or rescind such, in ways that advance the governor's policy priorities. They also can create or eliminate special programs, which allocate funds, to advance policy priorities. In the case of renewable energy development, because most of the regulatory system that would impact such development concerns the electricity industry, the governor's and broader executive branch's power is limited to tightening or loosening environmental regulatory standards.

By holding exclusive legislative authority, the state legislature, at least in theory, holds the most powerful policy-making tool. In practice, the bi-cameral nature of the legislature disperses and dilutes its power. In addition, the New Mexico legislature is not a full-time legislative body. The state constitution limits regular sessions to 60 calendar days, and that only in odd-numbered years. In even-numbered years, the legislature convenes for a short, 30-day session, which is generally limited in scope to budget issues (Article IV, Section 5, New Mexico State Constitution). [19] So, essentially, the legislature has 60 calendar days every other year to draft, debate, amend, and enact legislation.

4.2 Evolution of renewable energy policy from 2000 to 2019

A clear starting point for a discussion of the evolution of renewable energy policy in New Mexico is the passage of the Renewable Portfolio Standard (RPS) by the NMPRC in 2000. Prior to that time renewable energy development was being promoted through fiscal policy, such as tax credits, which had resulted in only a few distributed wind and solar installations. This action by the NMPRC had two important outcomes. The first was the decision by PNM, the largest investor-owned electric utility in the state, which is also based in New Mexico, to pursue the RPS and to contract for the building of the New Mexico Wind Energy Center, a 200 megawatt facility, which was not only by far the largest renewable energy project in the state but also one of the largest such projects in the world at

that time. The second outcome was the decision of the rest of the investor-owned electric utilities operating in New Mexico, all of whom were based in Texas, to bring a lawsuit against the NMPRC in an attempt to overturn the RPS.

The election of Bill Richardson as governor (in office Jan. 1, 2003-Jan. 1, 2011) was a second important time point in the development of renewable energy in the state. Richardson, a Democrat who had served as U.S. Secretary of Energy under president Clinton, brought considerable knowledge and interest in energy policy broadly and renewable energy development specifically. He immediately set out to enact policies that would promote the expansion of renewable energy sources in the state. One of his first priorities was to put the NMPRC's RPS objectives into state law, thus nullifying the legal challenges to the Commission's rule. Working with a Democrat-controlled state legislature, he succeeded in this objective and the New Mexico Renewable Energy Act (REA), was enacted in 2004. From that point on, state law required all investor-owned electric utilities operating in the state to supply an increasing portion of their electricity sales from renewable sources. [21] Following that, governor Richardson issued Executive Order 2009-002 *Expanding New Mexico's Clean Energy Economy*, which declared New Mexico as a "Clean Energy State" and set it on a path to expand significantly the share of renewable energy in the state's economy. [21]

In 2011, Richardson was succeeded as governor by Republican Susana Martinez. The Martinez administration was not inclined to continue promoting renewable energy development. However, because at no point during the eight years she served as governor was there a Republican-controlled state legislature, governor Martinez was not able to repeal or amend the REA. As a result, her efforts to roll back the intensive pursuit of renewable energy focused on curtailing environmental regulations that disadvantaged fossil fuels. Governor Martinez cited economic reasons for repealing strict environmental regulations, such as cap and trade rules for carbon emission reductions, calling such regulations "job killing." [22] Ultimately, the REA proved to be a very effective vehicle for promoting renewable energy development, even in the face of strong opposition from the executive branch. As figure 1 shows, additions to the state's wind and solar electricity generating capacity continued at a rather fast pace during the Martinez administration. Despite its concerted efforts to promote fossil fuels, the Martinez administration failed to secure a future for the aging coal-fired electric generating stations, which are primarily concentrated in the north-western corner of the state. More stringent federal environmental regulations raised the price of coal-generated electricity. At the same time, steep declines in the price of natural gas, wind, and solar-generated electricity effectively rendered the coal-fired plants uneconomical. [12] Of the nine coal-fired units operating in this part of the state in 2000, five have already shut down. Two more are scheduled to close by 2022. [12] This process has adversely affected employment in the area, with job losses that have not been locally replaced by new jobs created by renewable energy sources.

5. Conclusions

As with any policy efforts to advance employment and stimulate the economy, the promotion of renewable energy presents a complex picture, which policy-makers need to consider carefully. The review of the literature supports the argument that renewable energy development has a positive impact on employment—both by creating more jobs than it replaces, and by creating jobs that offer relatively higher wages. However, these impacts are not distributed evenly in space and time. As the case of New Mexico illustrates, jobs lost in one geographic area, particularly an area with a high concentration of fossil-fuel related industry, may not be replaced sufficiently by renewable energy jobs in the same area. Furthermore, as a significant proportion of these jobs are in construction, they may not persist once the renewable energy infrastructure has been built.

When trying to estimate the number of jobs created by renewable energy sector, several significant methodological issues need to be resolved. For an accurate accounting of the impacts on employment, both direct and indirect jobs need to be counted. However, neither is easy to count. For direct employment, it is often difficult to distinguish whether jobs such as in construction, grid operations, office support, etc. should be attributed to renewable energy development or some other cause. For

indirect employment, the situation is even more complicated, as it is difficult to estimate the creation of jobs throughout the economic spectrum, from financial services, to auto repair, the hospitality industries (restaurants, hotels, etc.) and beyond. Even more difficult is the issue of determining whether, and how to count impacts to the self-employed such as farmers and ranchers. As an example, in New Mexico, a significant proportion of especially wind capacity is placed on private land. Farmers and ranchers on whose land wind turbines are built, along with ancillary facilities such as roads, transformer stations and power lines, receive significant lease payments. Ranchers on whose land the wind turbines of the New Mexico Wind Energy Center were built, told the author that without the lease payments they derive, it would have been difficult or impossible for them to hold on to their land and continue operating their ranches. Are jobs saved by renewable energy development to be counted as jobs created by it?

Finally, the argument is often made that renewable energy development is dependent on the will of politicians in power, and that political swings impact consistent development. [2] The case of the state of New Mexico offers an example of how this problem may be minimized or overcome. At least in the political context of the USA, where political power is divided between the executive and legislative branches, casting policy in a legal rather than regulatory framework renders it more persistent and resistant to swings in the political climate. It is much more difficult to repeal or amend laws than regulations and executive orders.

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