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Learning from Others' Mistakes:

What Europe's Experience with Renewable Mandates and Subsidies can Teach Texas

by Josiah Neeley
Energy & Environment Policy Analyst

Key Points

- Subsidies for renewable energy have proven a poor method of creating green jobs both in Texas and abroad.
- State Renewable Energy Credits alone constitute a subsidy of between $26,373 and $43,956 for every permanent wind job.
- Texas should repeal its Renewable Portfolio Standard.

Introduction

Texas is currently one of the world's largest producers of wind energy, with more than 10,000 megawatts (MW) of installed capacity[1] and the largest single wind farm (the Roscoe Wind Farm, 781 MW) in the world.[2]

Some of the credit for Texas' wind industry growth has gone to the state's adoption of a Renewable Portfolio Standard (RPS), which mandates that Texas electrical providers collectively generate 10,000 megawatts (MW) of renewable electricity by 2025. At the same time, the federal government has enacted depreciation allowances for wind installation as well as generous tax credits for installation and generation. This, combined with favorable wind conditions in the vast open plains of west Texas, has led the state to be the country's top producer of electricity from wind turbines, though the rate of installation has dropped in recent years due to a lagging economy and a reduction in Texas electricity prices.[3]

The RPS was justified as a method of reducing carbon emissions and as a means of investing in a fashionable industry. In addition, the RPS was supposed to help create jobs. In their "baseline" scenario, a consultancy reported that "[a]ssuming that Texas would invest enough to maintain its share of U.S. clean energy capacity through 2020, Texas employment in the clean energy sector would increase by 6,000 jobs per year from 2010 to 2020, for a total of more than 51,000 construction jobs and nearly 15,000 operations jobs for the decade."[4]

By contrast, a December 2010 report from the Texas Comptroller's office found that wind farms were only responsible for approximately 500 jobs in Texas.[5]

Is the rapid growth of Texas wind turbines more the result of the RPS, or federal subsidies? And how many jobs did it actually create? To answer these questions, it can be helpful to look at the experience other countries have had with renewable subsidies and mandates. In particular, five European countries (Spain, Italy, the United Kingdom, Germany, and Denmark), exhibit a remarkably similar pattern both with respect to the effect of renewable supports on job creation, and on the relative effectiveness of renewable subsidies as opposed to mandates.[6]

Spain

Both critics and supporters of renewable energy have cited Spain as a model. In 2007 the Spanish government agreed to binding targets to increase its share of final energy consumption derived from renewable energy from 8.5 percent in 2005 to 20 percent by 2020. To achieve this ambitious target, Spain initiated substantial subsidies for the generation of wind and solar power. Under a pair of royal decrees* issued in 2007 and 2008, solar electricity received between €310 and €340 per MWh, while wind electricity received up to €73.20 per MWh for the first 20 years of a plant's life.[7]

* In Spain, new legislation is often promulgated via royal decrees. The decrees are technically issued by Spanish King Juan Carlos, though the substance is determined by the elected parliament.

900 Congress Avenue
Suite 400
Austin, TX 78701
(512) 472-2700 Phone
(512) 472-2728 Fax
www.TexasPolicy.com

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These subsidies led to a massive increase in Spanish installed capacity for renewable energy. By 2008, Spain accounted for half of the world's new solar-power installations in terms of wattage. Yet the effect of these subsidies on the job market was less stellar. A 2009 study by researchers at the Universidad Rey Juan Carlos found that creating "green jobs" was incredibly expensive. Between 2000 and 2009, Spain spent €571,138 to create each "green job," including subsidies of more than €1 million per wind industry job. Subsidies payable to renewables were equivalent to 3.45 percent of all of Spain's household income tax revenues, or 5.6 percent of the nation's corporate income tax revenues in 2007.[8]

In addition, the study found that creating "green jobs" resulted in destruction of other jobs in the wider economy because it involved siphoning off resources to pay for the subsidies in the form of taxes and higher energy prices. The study calculated that the programs creating those jobs also resulted in the destruction of nearly 110,500 jobs elsewhere in the economy, or 2.2 jobs destroyed for every "green job" created. Each "green" megawatt installed destroyed 5.28 jobs on average elsewhere in the economy: 8.99 for photovoltaics, 4.27 for wind energy, 5.05 for mini-hydro. This is because "the high cost of electricity affects costs of production and employment levels in metallurgy, non-metallic mining and food processing, beverage, and tobacco industries." Further, "these costs do not appear to be unique to Spain's approach, but instead are largely inherent in schemes to promote renewable energy sources."[9]

Given all of this, it is not surprising that Spain has begun to back away from its prior enthusiasm for solar and wind power. In December of last year, a new royal decree placed caps on the number of hours a solar plant could operate yearly, and announced a retroactive 30 percent cut in the amount of subsidies given to the country's solar-photovoltaic energy producers.[10] The cuts in subsidies led to a significant drop-off in demand for solar-panels. The resulting glut in supply has driven down prices, forcing bankruptcies, and leading some solar manufacturers to sue the Spanish government.[11] Late last year, the government announced a similar 40 percent cut in subsidies for wind power.[12] And just last month, the new center-right government of Mariano Rajoy halted all subsidies for new wind and solar generators in an effort to deal with its growing budget crisis.[13]

Italy

Italy has also been aggressive in promoting wind and solar power. Under the Italian framework, power plants are issued one Certificati Verdi (Green Certificate) for every MWh of electricity produced from onshore wind, and 1.8 Certificati Verdi for every MWh produced from offshore wind produced during the first 15 years of the plant's operation. Certificates can be redeemed for €180, minus the average annual price of electricity, and can also be sold on the open market. Effectively, then, the Certificati Verdi system sets up a price floor for wind generated electricity at nearly three times the market rate.[14]

Italy's wind and solar power industries have been subject to the same problems that beset Spanish renewables. A study performed by Luciano Lavecchia and Carlo Stagnaro of Itay's Instituto Bruno Leoni found that "the same amount of capital that creates one job in the green sector, would create 6.9 or 4.8 if invested in the industry or the economy in general, respectively."[15]

The authors conclude that only a small percentage of the green jobs created by the subsidies were permanent: "Using what we see as inflated estimates, from various sources, of already-existing green jobs, we take between 9,000 and 26,000 jobs in wind power, and between 5,500 and 14,500 in photovoltaic energy, as our starting point. From there, we have calculated that thanks to the subsidies Rome has promised, the number of people working in the green economy will rise to an aggregate total of between 50,000 to 112,000 by 2020. However, most of those jobs—at least 60 percent—will be for installers or other temporary work that will disappear once a photovoltaic panel, or a winder tower, is operative."[16]

As in Spain, a combination of poor performance and tight budgets has led the Italian government to reduce subsidies for renewables.[17] Along with the cutbacks in Spain and other countries, this has contributed to a substantial fall in prices for solar power equipment, as failing companies sell off their stock.[18]

United Kingdom

In 2002, the United Kingdom set a target of 10 percent of electricity to be produced by renewable power by 2010. The United Kingdom failed to reach this target, generating only

6.5 percent of its electricity in 2010 from renewable sources.[19] Nevertheless, the government set a more ambitious target of 15 percent renewable electricity production by 2015 and 20 percent by 2020. The Scottish government has also established independent renewable targets in excess of those for the United Kingdom as a whole. The Scottish Executive has set a far bolder target of generating 80 percent of electricity from renewables by 2020.[20] Renewables located in Scotland count towards both the Scottish target and to the overall target for the United Kingdom.

The main policy tool used to promote renewable energy generation is the Renewables Obligation, which effectively raises the market price paid for electricity from renewable sources. Under this scheme, renewable generators received cumulative subsidies of £5 billion between 2002 and 2010, with subsidies drawn from electrical consumer bills amounting to £1.1 billion in the United Kingdom and around £100 million in Scotland in 2010 alone.[21]

These renewable supports have proven no more successful in creating jobs than those of Spain and Italy. Last year, Verso Economics published a study by Richard Marsh and Tom Miers that looked at the employment effects of renewable supports by the governments of the United Kingdom and Scotland.[22] The study uses a more sophisticated methodology than that used in the Spanish and Italian studies. Instead of calculating the cost of each "green" job and then using the average cost of a job in the broader economy to determine the ratio of jobs created to jobs destroyed, Verso uses what economists refer to as "input/output" tables to estimate the number of jobs that were foregone in the UK general economy in favor of the green jobs that were created through governmental subsidization.

Despite the different methodology, the Veros study confirmed the results of prior studies finding that renewable supports did not boost job creation. Based on a macroeconomic model previously used by the Scottish government to measure the opportunity cost of the cut in a value-added tax, the study concluded that "the policy to promote renewable energy in the United Kingdom has an opportunity cost of 10,000 direct jobs in 2009-10 and 1,200 jobs in Scotland." Thus, "for every job created in the UK in renewable energy, 3.7 jobs are lost," and "[i]n Scotland there is no net benefit from government support for the sector, and probably a small net loss of jobs."[23]

Meeting the United Kingdom's renewable targets would also hit consumers in their pocketbook. According to one estimate, achieving even the more modest goal of 15 percent of energy from "green" power by 2020 would cost each U.K. household an additional £4,000.[24]

As with Italy and Spain, budget constraints are now leading the United Kingdom to scale back its renewable supports program. The government has announced a 50 percent cut in subsidies for all new installations effective December 12, 2011,[25] which could force many renewable companies into bankruptcy.[26]

Germany

The Renewable Energy Sources Act (EEG), passed in 2000, provides the framework for Germany's renewable energy subsidies. As of July, 2010, Germany had set a 100 percent target for renewable electricity by 2050.[27] Germany attempted to achieve this by instituting a feed-in tariff, which required utilities to purchase different kinds of renewable energy at different rates. In 2009, feed-in tariffs were €92 per MWh for onshore wind, €150 per MWh for offshore wind, and €430 per MWh for solar photovoltaic. Given that the price of conventional electricity in Germany was €51.60 per MWh in 2009, this means that German subsidies for renewables were between 1.78 and 8.33 times the cost of conventional electricity generation.[28]

A number of studies have found the net employment benefits of these subsidies to be nonexistent, if not negative. For example, a 2009 paper by German economists Manuel Frondel, Nolan Ritter, Christopher M. Schmidt, and Colin Vance has argued that indirect "job losses that result from the crowding out of cheaper forms of conventional energy generation," as well as from "the drain on economic activity precipitated by higher electricity prices," serve to offset direct job gains from the subsidies. Notably, the paper also suggested that many of the jobs which were created by subsidies might go to foreign workers. Due to "a substantial share of all PV modules installed in Germany originated from imports, most notably from Japan and China … we would expect massive employment effects in export countries such

as China, since these countries do not suffer from the EEG's crowding-out effects, nor from negative income effects."[29]

And, rather than bringing lower cost energy, Frondel et al found that the implementation of wind and solar power raised household energy rates by 7.5 percent. The paper concludes that, "Germany's PV promotion has become a subsidization regime that by far exceeds average wages," with per-worker subsidies as high as €175,000.[30] This, of course, does not include the additional cost of building transmission lines, which has become a source of controversy. Germany's energy agency says building these lines will cost €1.1 billion ($1.4 billion) or an extra €17 per year for each household, and some estimates have put the cost even higher.[31]

Germany is not an exception to the trend towards renewable subsidy cutbacks. In May of 2011, the German parliament cut back the subsidy for solar photovoltaic systems by 15-16 percent.[32] Additional cuts are currently under discussion.[33]

Denmark

Denmark was among the earliest countries to adopt subsidies for wind power, and has been more ambitious than most in setting targets for renewable energy. In 1979, the government began subsidizing 30 percent of wind investment costs, and later mandated that Danish utilities buy electricity generated from wind power at a consistent, above market price.[34]

While Denmark has shown greater commitment to renewable energy, it hasn't necessarily resulted in a better record of green job creation. A 2009 report by the Danish think tank the Center for Politiske Studier (CEPOS) found that in Denmark "a very optimistic ballpark estimate of net real job creation is 10 percent of total employment in [the renewable energy] sector. In this case, the subsidy per job created is 600,000-900,000 DKK per year ($90,000-140,000). This subsidy constitutes around 175-250 percent of the average pay per worker in the Danish manufacturing industry."[35]

This has made Denmark a poorer nation: "In terms of value added per employee, the energy technology sector over the period 1999-2006 underperformed by as much as 13 percent compared with the industrial average. This implies that the effect of the government subsidy has been to shift employment from more productive employment in other sectors to less productive employment in the wind industry. As a consequence, Danish GDP is approximately 1.8 billion DKK ($270 million) lower than it would have been if the wind sector work force was employed elsewhere."[36]

Installed Capacity vs. Actual Net Generation

A critical distinction that is often obscured by renewable energy mandates is the difference between a power source's installed capacity, i.e. the amount of electricity that could be generated by a plant operating at full power 24/7, and its actual net generation, i.e., its capacity factor. For wind and solar power, the difference between installed capacity and actual net generation is often substantial, because of the intermittent nature of those energy sources (the sun doesn't shine at night or when it is cloudy, and the wind rarely blows hard enough to utilize a turbine's full capacity). Renewable mandates are often framed in terms of installed capacity, rather than actual net generation, even though the latter is what matters for meeting electrical demand.

Periods of high wind can also be problematic, if they do not occur during periods of peak demand for electricity. While Denmark generates almost 20 percent of its electricity via wind power, much of this electricity cannot be used in Denmark because periods of peak generation do not match periods of peak electrical demand. One analysis concluded that "wind power has recently (2006) met as little as 5 percent of Denmark's annual electricity consumption with an average over the last five years of 9.7 percent."[37]

The difference between Texas' installed wind power capacity and actual net generation is even more striking. Texas' wind farms are concentrated in the panhandle region. While this makes sense insofar as this is where there is the most wind to capture, this area is far from the focus of Texas' electrical demand, which lies along the I-35 corridor. In addition, wind tends to blow hardest at night and during off peak months, when there is less overall demand, and not as much during the high demand summer months. For these reasons, ERCOT estimates that actual net generation for wind power in Texas is only around 8.7 percent of installed capacity.

Further, Denmark's unique situation may give an inflated picture of the potential for wind power in other areas. To keep its electricity system in balance, Denmark must export surplus capacity to neighboring countries and then import energy

Texas

Texas began experimenting with renewable subsidies with the passage of Senate Bill 7 in 1999.[40] Senate Bill 7 included Texas' first Renewable Portfolio Standard (RPS), which mandated that the state's competitive electric providers install 2,000 MW of new renewable energy capacity by 2009. Later legislatures increased the RPS to 10,000-MW by 2025. Despite these increases, Texas met the target for installed wind capacity in 2010, a full 15 years ahead of schedule.[41]

Under the RPS, each competitive provider's share of the mandate was its share of total competitive energy sales. Texas' RPS also includes a Renewable Energy Credit (REC) trading program, which will continue through 2019. As described by the Texas State Energy Conservation Office (SECO):

> The renewable energy capacity required by the electricity sellers can be provided directly or through the REC market. If a utility earns extra credits, it can sell the credits to utilities who need credits to meet the RPS requirements. This enables electricity providers that do not own or purchase enough renewable energy capacity to purchase credits instead of capacity.[42]

Not content with state and federal renewable supports, the city of Austin has started its own program to promote renewable energy use. Under the city's GreenChoice program, Austin residents have the option of choosing a utility plan under which all of their electricity is provided from renewable sources.[43] Initially prices for the GreenChoice program were only slightly higher than traditional electricity, and for several years were actually lower due to the fact that GreenChoice members had long term contracts preventing rate increases.[44] Today, however, the GreenChoice program is substantially more expensive than the alternatives, with participants paying 5.7 cents per kWh, compared to 3.1 cents for traditional electricity.[45]

While there has been no study of the effect of Texas' Renewable Portfolio Standard on job creation comparable to the European studies, several factors suggest that the overall impact is likely negative. Renewable Energy Credits for wind energy are estimated to cost around $54 million during 2011, with a cumulative cost of nearly $700 million over the coming decade, all of which will be passed on to consumers through the price of electricity.[46] The National Renewable Energy Laboratory estimates that 6 to 10 permanent operations-and maintenance jobs and 100 to 200 short-term construction jobs are

from those countries during periods of high demand. As the CEPOS study states: "Norway and Sweden provide Denmark, Germany and Netherlands access to significant amounts of fast, short term balancing reserve, via interconnectors. They effectively act as Denmark's 'electricity storage batteries.' Norwegian and Swedish hydropower can be rapidly turned up and down, and Norway's lakes effectively 'store' some portion of Danish wind power. Over the last eight years West Denmark has exported (couldn't use), on average, 57 percent of the wind power it generated and East Denmark had an average of 45 percent."[38]

Denmark's electricity system is dwarfed by the electricity systems of its wind trading partners. Norway and Sweden each generate more than four times as much electricity as Denmark (largely from hydro power), while Germany generates about 18 times as much electricity. Thus, it is only by piggybacking off of much larger non-wind countries that Denmark is able to generate such a high percentage of its electricity via wind.

A study produced for the Renewable Energy Foundation by Danish engineer Paul-Frederik Bach found that the electricity systems of Germany and Denmark were sufficiently integrated that they "now behave like one electricity market, and balance their grids as a single entity." As such, Bach concludes that "it is misleading to suggest that Denmark has integrated some 20 percent of MWhs from wind." Rather, "it is more accurate to say that a new entity, 'Germany-and-Denmark', has absorbed around 7 percent wind power, and this has in large part been possible only because of trading relations with Norway and its hydropower."[39]

One should therefore be wary of attempts to cite Denmark as an example of the potential for wind power over a much larger region. By way of comparison, Nolan County, Texas (home of several large wind farms) undoubtedly produces more electricity from wind than it consumed in electricity total.* The same is not true of Texas as a whole.

* Though because of the intermittency issues discussed above, it would not consume all of its electricity generated by wind.

created for every 100 MW of installed wind capacity.[47] Since installation of more than 10,000 MW of wind power is already complete, at most we can expect the RPS to maintain is between 600 and 1,000 wind industry jobs going forward, at a cost of between $26,373 and $43,956 per job per year attributable to RECS and the RPS alone.*

Even this calculation exaggerates the effect of the RPS on job creation. This is because the cost of RECS is dwarfed by the price tag for federal renewable subsidies, which are projected to total $4.61 billion for the period 2011-2020. Indeed, when federal tax credits for renewable energy briefly lapsed, new wind installation in Texas dried up, despite the fact that no change had been made in Texas' RPS.[48] Were the RPS, rather than subsidies, the driving force behind increased wind power generation, we would not expect Texas to have met its renewable targets 15 years ahead of schedule. It is quite possible, therefore, that the RPS has had no positive effect on job creation even within the wind industry.

Findings and Recommendations

Texas should repeal the Renewable Portfolio Standard. As the experience of both European nations and Texas itself has shown, supporting renewable energy is not a good mechanism for creating jobs. The number of jobs needed to maintain a wind turbine is low, and the fact that Texans are paying to subsidize wind energy does not mean that jobs manufacturing turbines will go to Texans. Money used to pay for these subsidies—either in the form of higher taxes or higher electricity bills—is money taken away from the wider economy which otherwise could be used to create more productive jobs.

Further, the evidence suggests that federal subsidies, rather than the RPS, are chiefly responsible for the growth in Texas' wind industry. RECS constitute approximately 15 percent of the federal credits provided to wind plants, and the fact that Texas surpassed the RPS 15 years early strongly suggests that other factors are at play.

Texas is not Europe. But looking at the European experience with renewable energy does give an indication of where pursuing renewable supports is likely to lead, and hopefully can help the state frame a response that avoids some of the errors made in other countries. ✯

* Based on recent market prices of $1.70 per REC. While federal subsidies may lead to installation of wind power beyond 10,000 MW, jobs related to such installation cannot be attributable to the RPS, as this standard has already been met.

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About the Author

Josiah Neeley joined the Texas Public Policy Foundation in October of 2011 as a Policy Analyst for the Center for Tenth Amendment Studies and the Armstrong Center on Energy & the Environment.

Prior to joining the Foundation, Neeley worked as an Associate for the firm of Bopp, Coleson & Bostrom in Terre Haute, Indiana, specializing in Constitutional Litigation, and clerked for the Honorable Roger Vinson, a federal district court judge in Pensacola, Florida.

He has a B.A. in Government and Philosophy from the University of Texas and a J.D. from the Notre Dame Law School.

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