

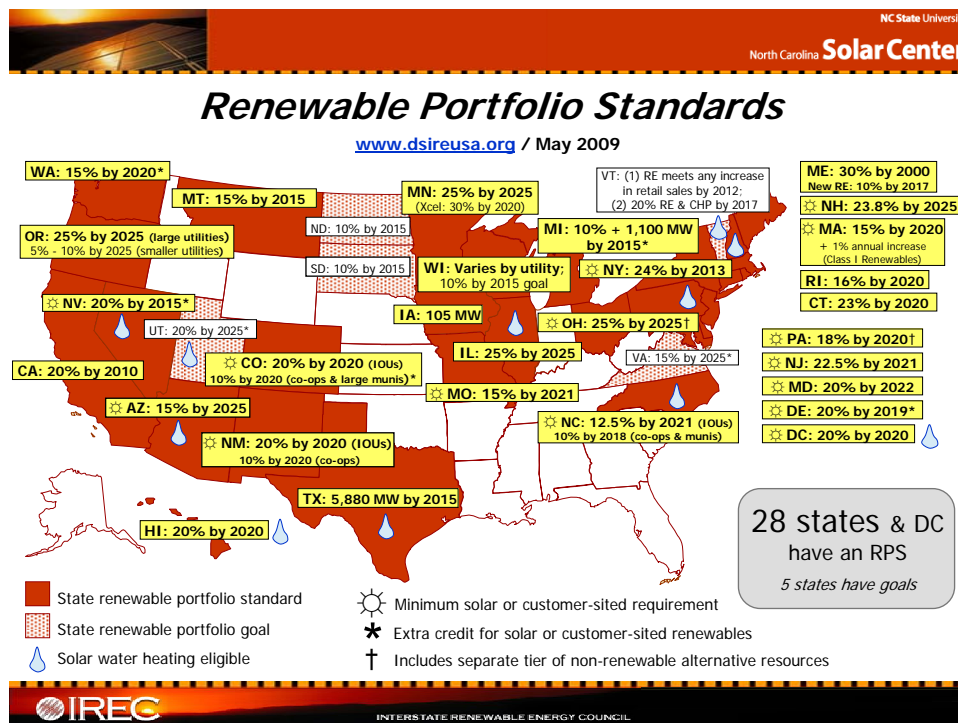
Research Note, Original date: June 2009

REC Trading in Texas - Lessons Learned & Way Forward¹

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More than half of the states in the U.S. (as of May 2009) have been supporting the expansion of renewable energy via mandates or requirements, known as Renewables Portfolio Standard (RPS). Currently, the U.S. Congress is working on a federal version with several bills under discussion.

Existing state-level mandatory RPS programs are estimated to cover 46% of total electricity sales in the U.S. (programs announced by the end of 2007). About 60 gigawatts (GW) of new renewable capacity is needed by 2025 to comply with the mandates. This requirement translates into an estimated 4.7% of total U.S. sales in 2025, and 15% of demand growth between 2007 and 2025.²



Most states with an RPS program have created markets where generators or retailers trade Renewable Energy Certificates, or Credits, known in short as RECs, or green tags. The federal version too will have REC trading. As a market-based mechanism, REC trading is expected to allow meeting renewables goals most efficiently. A REC represents one MWh of metered power produced by a renewable generator, which has to be certified as such by

¹ This article is based on research supported by the State Energy Conservation Office.

² Estimates from *Renewables Portfolio Standards in the United States: A Status Report with Data Through 2007*, LBNL, April 2008.

organizations such as Environmental Resources Trust and the Center for Resource Solutions (Green-e) among others. Each REC has a unique serial number and usually is valid in a specific jurisdiction. With the federal RPS, nationwide REC trading should be available.

Some RECs are exclusive for generation by a renewable resource; others acknowledge environmental attributes associated with renewable generation such as reduced emissions from displaced fossil fuel generation. The latter is the definition by Green-e, which is the largest certifier in the nation.

A particular concern with the latter definition (or some interpretations of this definition), and associated trading practices, has been double counting of benefits such as emissions reductions. New renewable generation may displace fossil fuel generation, which will then lead to emissions reduction. Ownership rights of this reduction need to be clearly defined and RECs associated with those rights should be traded in the market accordingly.³ Otherwise, both the renewable generator and fossil fuel generator can claim rights and try to trade associated RECs. The regulators with input from market participants and industry have been developing procedures to address this concern.

Although there are voluntary markets for RECs, markets created by policy are significantly larger. States generate incentives for REC markets by either requiring utilities to produce a certain amount of their power from renewable sources or retail electric service providers to supply a certain percentage of their markets with electricity produced from renewable sources. In competitive electricity markets like that of Texas, where even the residential users can choose their electricity supplier, creating demand for renewable energy through the retail providers appears desirable and useful. By relieving buyers of renewable electricity from the obligation of arranging for physical delivery of such power (which would be geographically and technologically impossible for many customers connected to large grids), RECs promote a greater demand for electricity generated from renewable sources.

But REC prices have not been universally helpful across jurisdictions. REC prices around or below \$10 as seen in Texas, Maryland, New Jersey (Class 1) and DC are not strong signals to developers of renewables capacity. On the other hand, prices in Rhode Island, Massachusetts and Connecticut have been quite high, albeit highly volatile in the case of Connecticut. These differences reflect the design of RPS programs (e.g., aggressiveness of goals and definition of resource eligibility) and availability of resources. For example, Texas benefited greatly from the large potential of highly prospective wind resources, especially given the fact that wind technology is the most advanced and competitive with conventional generation. With prices above \$200, New Jersey's solar program underscores the relative high cost of the solar technology.

Jurisdictions are learning from each other as they establish and expand their trading schemes; NEPOOL established their system after observing the Texas REC market for few years; and PJM basically adopted the NEPOOL system with minor modifications. Accordingly, industry standards are developing across regions; certificate creation, retirement, tracking and transfers, and compliance reporting started to follow similar paths across regions. Although these standards develop around the trading platforms and everyday trading operations of market participants, policy and regulatory differences across states create complexities for market participants. Renewables eligible under the RPS program and RECs are defined differently in terms of environmental and other attributes in

³ For example, Qualifying Facilities that are built under 1978 Public Utility Regulatory Policies Act (PURPA) sell their power to utilities at avoided cost. Ownership of unbundled RECs has become an issue in states where QFs generate large amounts of electric power from renewable or low emission resources. An April 2006 study from Lawrence Berkeley National Laboratory by Ed Holt, Ryan Wiser and Mark Bolinger (*Who Owns Renewable Energy Certificates? An Exploration of Policy Options and Practice*) address ownership rights issues associated with QFs as well as those associated with net metering and facilities receiving financial incentives from states or utilities.

each state; and sometimes states do not allow interstate trading. Often, local economic development goals shape these design elements. As more and more states implement greenhouse gas policies, definitional differences will likely become more critical.⁴ The current discussion in the Congress around various RPS bills is a symptom of these differences and states' desire to protect their own goals and their own regulatory authority.

Recently, some jurisdictions have been experimenting with new instruments, such as energy efficiency and demand management (or conservation) certificates, which are also known as white tags. There is also growing interest in trading other environmental attributes, such as avoided carbon and other greenhouse gas (GHG), through REC (or rather, environmental) markets. Information systems that are in place to facilitate REC trading are already keeping track of these attributes; it would be relatively straightforward to start trading in them. The trading may start on a voluntary basis but eventually may become mandatory if states legislate, say GHG emissions. Brokers and trading companies are closely following these developments and adapting their technologies to be flexible so that they can handle trading white tags.

Texas RPS and REC market

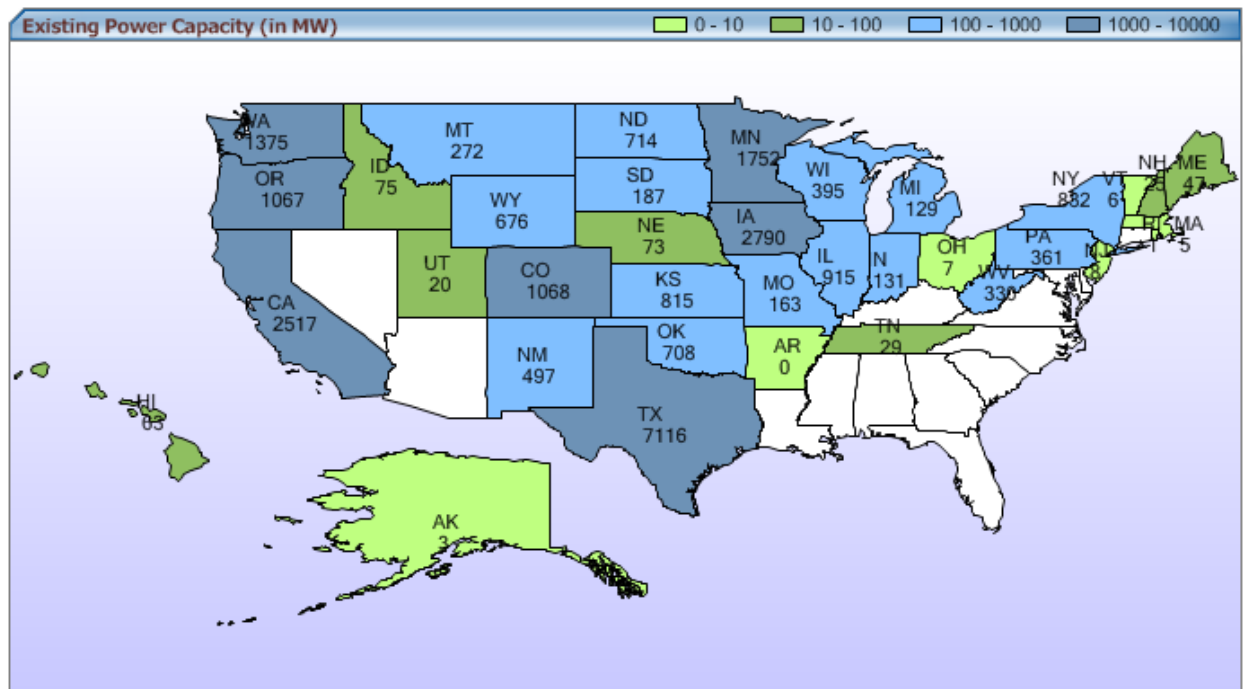
Texas was one of the first states to enact an RPS. The Senate Bill 7 (SB 7) that was passed by the Texas Legislature in May 1999 mandated 2,000 MW of additional renewable generation capacity to be built by 2009. This mandate was supported by creating a REC market. Retail electricity providers (known in short as REPs) were required to acquire and retire RECs based on their share of state-wide retail electricity sales. This requirement created demand for renewable electricity and helped Texas achieve SB 7 target of 2,000 MW of new renewable generation in 2005, four years earlier than the target date stipulated in the bill. Tradable RECs, issued quarterly, allowed electricity retailers from anywhere in the state to search for the lowest cost renewable resources in the state with no obligation to take physical delivery of electricity. The most prolific wind capacity in Texas happens to be in West Texas away from load centers in the north and east of the state. Thanks to unbundled REC trading, REPs were able to meet their RPS obligations while new wind generation capacity was built in the west. In 2006, Texas surpassed California as the largest generator of wind power in the U.S.

The REC market is administered by the Electric Reliability Council of Texas (ERCOT), the independent system operator (ISO). The Public Utility Commission of Texas (PUCT) has the authority to cap the price of RECs and, in consultation with ERCOT, may suspend the RPS requirements if necessary to protect the reliability and operation of the grid. The PUCT also enforces penalties for non-compliance with the RPS requirements.

Based on the success of the REC market leading to satisfaction of SB 7 RPS requirements in few years, the Texas Legislature expanded the RPS goals of the state significantly in 2005 with the passage of Senate Bill 20 (SB 20), which set a goal of 5,880 MW of renewable generation capacity by 2015. In order to diversify renewable sources, SB 20 set a non-binding target of 500 MW of non-wind renewable capacity. The bill's renewables generation capacity target for 2025 is 10,000 MW. Again, the developers were eager and the SB 20 target has already been surpassed: as of December 31, 2008 there is 7,116 MW of installed wind capacity in Texas.

⁴ An April 2007 study from Lawrence Berkeley National Laboratory by Ed Holt and Ryan Wiser (*The Treatment of Renewable Energy Certificates, Emissions Allowances, and Green Power Programs in State Renewables Portfolio Standards*) address three specific issues that may create differences across states: (1) degree to which unbundled RECs are allowed and ability of the systems to track attributes; (2) definitions of the renewable energy attributes such as emission reductions; and (3) ability to count RECs sold through voluntary markets towards RPS obligations.

Installed wind capacity in the U.S. (as of 12/31/2008)



Source: American Wind Energy Association (www.awea.org/projects/)

Despite this positive and encouraging record, the REC market in Texas went through cycles and revisions, offering valuable lessons. In fact, due to success of building so much new wind capacity, REC prices collapsed and did not provide much incentive; rather it was the federal production tax credit (PTC) and high quality of wind resources in West Texas that fueled investment.

SB 20 included some language that led Green-e, a certification company, to declare RECs originating from Texas ineligible for its certification: "Notwithstanding any other provision of law, the commission shall ensure that all renewable capacity installed in this state and all renewable energy credits awarded, produced, procured, or sold from renewable capacity in this state are counted toward the renewable energy goal." This language, which was deemed to undermine the goal of adding new renewables capacity, was fixed by the Texas Legislature in 2007 via the House Bill 1090 (HB 1090).

Most significantly, transmission limitations slowed down the development of wind capacity in West Texas and Panhandle areas. PUCT developed the Competitive Renewable Energy Zones (CREZ) process to address this challenge. Under CREZ, several phases of transmission capacity expansion plans are developed by ERCOT. Companies to construct the lines of the first phase have been chosen.

However, there are issues going forward. Curtailment of wind is an everyday reality due to transmission constraints, leading to significant negative bidding. Lowest bids are equal to the negative of the sum of the PTC and REC, or roughly $-\$35/\text{MWh}$. In 2009, by May 31, there were 91 days (out of 151 total) with negative prices from the West zone. On average,

during 15 intervals, prices were negative; on April 26, 91 out of 96 intervals saw negative prices with an average price of -\$25.7.⁵

Some wind developers are arguing for dispatch priority once the CREZ lines are built; these companies have made certain investments in identifying and securing their sites and they would like to avoid losing market share to latecomers, some of whom could also be traditional generation facilities. Allowing certain generators priority dispatch is fundamentally inconsistent with open access transmission grid established by SB 7. The open access rule is crucial to making the competitive market work. Also, it will likely disrupt the nodal market by causing out-of-merit order dispatch and therefore possibly creating congestion or other operational challenges. Some of the transmission companies selected to build the lines are merchant companies, not listed as utilities in Texas. According the Public Utilities Regulatory Act of Texas, there could be challenges to their participation. As a result of these uncertainties, wind generators that are stranded are looking for other options including building private lines.

Reliability considerations by ERCOT have been attracting more attention by more market stakeholders outside ERCOT as more wind capacity is built. Even when the transmission constraints are resolved, ERCOT will have to improve its ability to forecast wind generation to avoid reliability issues such as those experienced in early 2008. The wind in West Texas blows strongest at night when the electricity demand is low. Increasing amount of wind will complicate system operations and will probably require adjustments to the way ancillary services markets are run. Recently, FERC commissioned a new study focusing on frequency response to assess reliable integration of intermittent resources such as wind. This study will supplement ERCOT's own analysis on how much intermittent capacity can be reliably integrated into the grid.

Finally, some are concerned that wind dominated the renewables expansion and the state has not done enough to promote solar, biomass and other technologies. Under the Texas RPS program, wind prevailed because it is by far the cheapest renewable resource technology. Supporters of solar and other alternatives put forward many bills in the 2009 legislative session in Texas but they all failed, mainly due to concerns over their high cost.

Closing remarks

Texas leads the nation in installed wind capacity. Most of this capacity was built since the passage of SB 7 in 1999, which initiated the Texas RPS program. The program design has been simple and was implemented competently by PUCT and ERCOT. These agencies have been proactive in transmission planning as demonstrated by the CREZ process. The general pro-business environment of the state that helped the competitive electricity market to evolve also helped renewables investors. But ultimately, the high quality of wind in West Texas, federal tax credits, and to a smaller extent state tax abatement programs are primarily responsible for the rapid expansion of wind capacity in the state. Other technologies such as solar, small hydro and biomass have not contributed much. The RPS program or federal tax credits did not provide sufficient incentives for these technologies to prosper. New incentive structures are under consideration both at the state and federal levels but all proposed bills in Texas Legislature failed. Going forward, it is not likely for as much renewable investment as in the near past to take place due to transmission constraints (for wind) and lack of additional incentives (for solar and others) as well as general malaise in economic and financial markets. After the recovery, Texas will probably

⁵ In 2008, trends were similar. 192 days out of 366 had negative prices. In those days, there were, on average, 13 intervals with negative prices out of 96. In several days, more than 90 intervals were negative. Between June and October, there were only a handful days with negative prices.

continue building more wind farms as long as federal tax credits continue and CREZ transmission expansion happens as planned.