Louisiana TAP Request – Part II-B

A Review of REC Tracking Systems and RPS Design and Implementation

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Through the U.S. Department of Energy's Technical Assistance Program (TAP), the Louisiana Department of Natural Resources (DNR) asked NREL to provide an overview of four main topics, including: (1) green school programs, including financing options and opportunities; (2) utility support for energy efficiency and renewable energy, and greenhouse gas reductions; (3) renewable energy certificate trading programs and state-level renewable portfolio standards; and (4) applications of energy efficiency and renewable energy for Louisiana.

The following report summarizes NREL's research and findings on Renewable Energy Certificates (RECs) and REC trading systems, as well as on Renewable Portfolio standards.

1.0 Renewable Energy Certificate Tracking – an Overview

1.1 Renewable Energy Certificates Introduction

(A modified excerpt from an upcoming paper by NREL)

RECs are a relatively new market instrument created by separating the "attributes" of renewable electricity generation from the physical electricity produced, thus making RECs a tradable commodity separate from the actual electrons (Figure 1). One REC typically represents the attributes of 1 megawatt-hour (MWh) of renewable electricity generation. Once the REC is removed from the underlying electricity and sold to another party, claims to the attributes can only be made by the REC owner, and not by the electricity owner or the owner of the project.

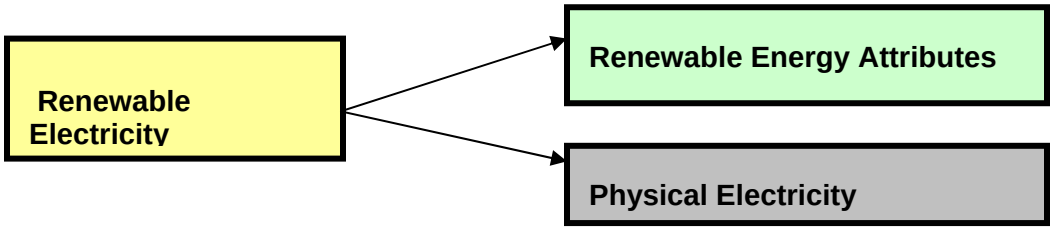


Figure 1. Renewable Energy Certificates and Attributes Creation

RECs have many advantages. The use of RECs frees renewable energy sellers from the need to deliver the renewable electricity in real time to the ultimate users. Rather, the electricity, devoid of any attributes, is injected into the grid while the RECs (and all of their attributes) are retained for other uses. The RECs provide an accurate, durable record of what was produced and a fungible commodity that can be traded. Revenue from REC sales is an additional revenue stream (in addition to energy sales and any state or federal incentives), that is helping more and more renewable projects become economically viable so that they can secure financing and be built. A REC is spent or "retired" from circulation once it is matched uniquely with an identical quantity of electricity consumed by an end-user.

The use of RECs can reduce the cost of RPS compliance by lowering transmission and distribution costs, while also providing access to a larger quantity of resource options. When properly structured, a REC tracking system simplifies monitoring and administration of RPS programs by creating a central database where RECs can only be claimed by one party and where compliance with RPS mandates can be quickly checked. Finally, RECs provide compliance flexibility by facilitating market trading and increasing market liquidity. As a result,

RECs have become the dominant mechanism of RPS compliance. However, the manner in which RECs are defined and treated in RPS policies varies by state and region.

The New Jersey REC tracking system is unique in two critical aspects that should be considered by other existing and developing REC systems. First, behind-the-meter, or on-site solar generation is encouraged to participate. Second, the system posts the average price of REC transactions across the market and keeps a historical record that is publicly accessible. More details are provided below. This is lacking in most REC markets and has been pointed out as a definite need going forward, particularly by debt and equity investors.

1.2 REC Trading Systems

(A modified excerpt from an upcoming paper by NREL)

REC tracking systems provide a mechanism for regulators to easily verify and trace RECs ownership. REC tracking systems are now operating in the states of Texas, Wisconsin, and New Jersey (solar-only); and in the grid regions of New England, PJM and the western interconnection. Additional REC trading systems are under development in New York, and the Midwest. These REC tracking platforms have been designed for the specific state or regional circumstances. As more states employ REC tracking systems to monitor RPS compliance, the trading of RECs between systems with divergent definitions and tracking structures will have to be addressed.

Key challenges relate to whether and how to allow for interregional trading, and how to protect against double counting between states and regions. The Center for Resource Solutions has been facilitating a discussion of seams issues between REC tracking platforms through the North American Association of Issuing Bodies (NAAIB). NAAIB is a voluntary organization working to promote compatibility among tracking systems to prevent double counting.[1] Whether REC trading between systems occurs or not, the possibility (or lack thereof) should be clearly defined so that market players can understand the rules under which REC trading and transfer can occur.

Brief descriptions of each tracking system are included in the appendix, along with relevant websites.

1.3 Key REC Reports

A lot of information has been compiled about REC markets and the treatment of RECs in RPS requirements. Below are three key reports recommended for reading.

Emerging Markets for Renewable Energy Certificates: Opportunities and Challenges
http://www.nrel.gov/docs/fy05osti/37388.pdf

RECs are currently used by utilities and marketers to supply renewable energy products to end-use customers who voluntarily purchase RECs, as well as to demonstrate compliance with regulatory requirements, such as renewable energy mandates. The purpose of this report is to describe and analyze the emerging market for renewable energy certificates. It describes how RECs are marketed, examines RECs markets including scope and prices, and identifies and describes the key challenges facing the growth and success of RECs markets.

[1] More information can be found at: http://www.resource-solutions.org/policy/naaib/index.htm

The Treatment of Renewable Energy Certificates, Emissions Allowances, and Green Power Programs in State Renewables Portfolio Standards
http://eetd.lbl.gov/ea/EMS/reports/62574.pdf

This report summarizes the treatment of renewable energy attributes in state RPS rules. Its purpose is to provide a source of information for states considering RPS policies, and also to draw attention to certain policy issues that arise when renewable attributes and RECs are used for RPS compliance. Three specific issues are addressed: (1) the degree to which unbundled RECs are allowed under existing state RPS programs and the status of systems to track RECs and renewable energy attributes; (2) definitions of the renewable energy attributes that must be included in order to meet state RPS obligations, including the treatment of available emissions allowances; and (3) state policies on whether renewable energy or RECs sold through voluntary green power transactions may count towards RPS obligations.

Environmental Marketing Guidelines for Electricity
http://www.oregon.gov/ENERGY/RENEW/docs/GreenMarketing.pdf

The National Association of Attorney's General developed guidelines on the claims that can be made with regards to the environmental attributes of electricity. It is the purpose of these Guidelines to: (1) diminish the potential for deceptive environmental marketing by providing guidance to the electric power industry as it undertakes to craft its advertising and information campaigns; (2) facilitate compliance with the law by providing industry with an interpretation by the Attorneys General of what state prohibitions on deceptive and misleading advertising mean in the context of environmental advertising for electricity; and (3) offer a model for state legislation and/or rulemaking.

2.0 Renewable Portfolio Standards

2.1 Renewable Portfolio Standard Overview

(A modified excerpt from an upcoming paper by NREL)

A renewable portfolio standard (RPS) is a policy that requires electricity retailers to provide a minimum percentage or quantity of their electricity supplies from renewable energy sources. An RPS establishes a base level of demand but allows the market to determine which renewable energy resources will meet that demand. Historically, state legislatures and regulatory agencies have been the driving force behind RPS policy formulation, although some RPS polices have been adopted through citizen ballot initiatives. Initially proposed as a mechanism to support renewable energy development in competitively restructured electricity markets, the RPS model today serves additional policy aims such as fuel diversity and in-state economic development.

By June 2007, 22 states and the District of Columbia had enacted RPS policies, ranging from 2% of the electricity supply in Iowa to 30% in Maine (Figure 1). Four other states, Illinois, Missouri, Vermont, and Virginia, have established nonbinding renewable energy goals. The time horizon for achieving the RPS varies among states. And there are significant differences in state RPS design—such as technology and geographic eligibility, methods that can be used to achieve compliance, and implementation specifics—that make it difficult to generalize about RPS policies nationally.

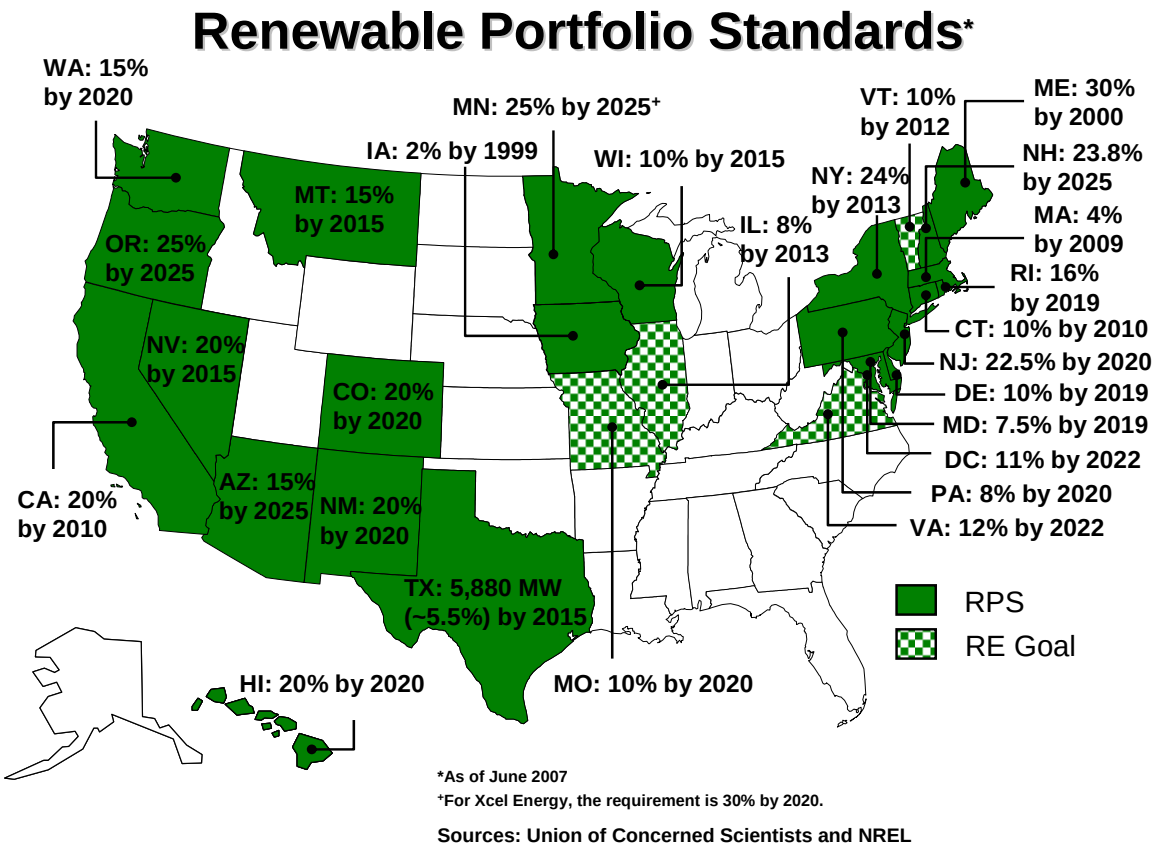


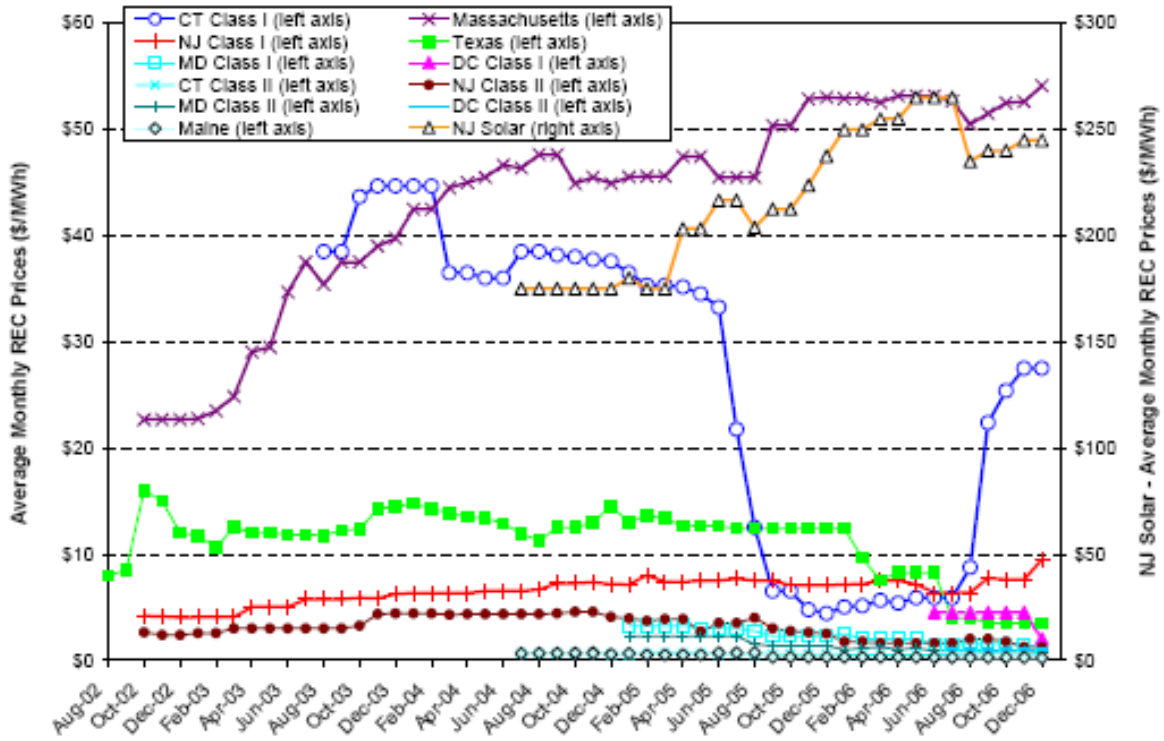
Figure X. States with Renewable Portfolio Standards

2.2 RPS Cost Projections

(A modified excerpt from LBNL paper on RPS, cited in section 2.6)

One of the first questions asked about an RPS policy – is how much will it cost and what is the impact on rates? While this has not been evaluated specifically, there are two main indicators that indicate approximate costs: REC prices in compliance markets and RPS cost projections.

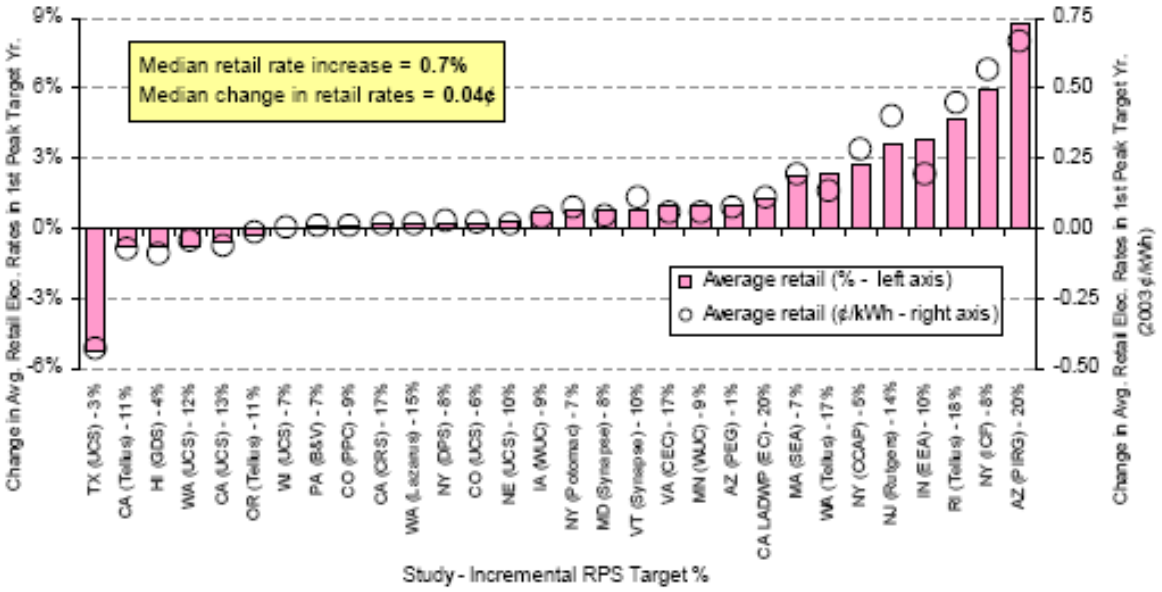
Figure Y below shows historical REC prices in a number of states with mandatory renewable requirements. Note that this does not cover all states with mandatory requirements. From the chart it is clear that REC prices vary by technology (NJ solar vs. other), region (influenced by economics and quality of wind in particular), and even over time (e.g. CT keeps adjusting their RPS eligibility). Lawrence Berkeley National Laboratory (LBNL) did a rough estimate to translate REC prices (assumed to be the incremental above-market cost of renewable energy), into electric rate impacts in 2006 and found the following rate increases: Maine (0.1%), Maryland (0.1%), New Jersey (0.1%), New York (0.1%), Connecticut (0.2%), Arizona (0.4%), and Massachusetts (1.1%). They also note that "these retail rate impacts will grow as RPS percentage obligations increase, unless REC prices simultaneously decline."



Source: Berkeley Lab compilation of data from Evolution Markets[18]

Figure Y. Compliance REC Prices in States with Mandatory Renewable Requirements

Another way to estimate costs is to look at RPS cost projection studies. Berkeley Lab reviewed 28 studies, covering 18 states (not all have an RPS), and found that 70% of the sample forecast retail electricity rate increases of no greater than 1% when the RPS reached its peak percentage target. See Figure Z to see the percentage and c/kWh rate increase projections.



Source: Lawrence Berkeley National Laboratory

Figure Z. Projected RPS Electricity Rate Impacts, by Study

2.3 RPS Design Issues

(A modified excerpt from EPA's Guide to Action, cited in section 2.6)

RPS policies are complex and there are many different components that must be taken into account when the policy is designed. The U.S. Environmental Protection Agency's (EPA's) Clean Energy-Environment Guide to Action describes the salient design features of an RPS, such as applicability to market participants, resource eligibility, policy administration, cost caps, and cost recovery. Below are the best practices; the appendix describes more detail about all the design issues that should be addressed when developing an RPS policy. Specific information regarding how to support solar renewable generation as a part of an RPS is also included below.

EPA RECOMMENDED BEST DESIGN PRACTICES

The best practices summarized below will help states design an RPS. These best practices are based on the experiences of states that have RPS requirements.

- Develop broad support for an RPS, including top-level support of the governor and/or the legislature.
- Clearly articulate all RPS goals and objectives (drivers of RPS rules and structure).
- Specify which renewable energy technologies and resources will be eligible, driven by the stated goals and objectives. Also consider state and regional resource availability if a goal/objective is to encourage resource diversity through a technology tier. Then, determine the mix and amount of renewable energy desired.
- Finally, consider using energy generation (not installed capacity) as a target, establish a long timeline to encourage private investment, make compliance mandatory for all retail sellers, make enforcement credible, allow utility cost recovery, establish cost caps, and consider flexible compliance mechanisms.

SOLAR COMPONENT TO RPS
(A modified excerpt from an upcoming paper by NREL)

Some states have established RPS carve-outs or set-asides for particular renewable energy technologies. This is usually done to support promising technologies with valuable characteristics that might otherwise be shut out of the market because of their higher costs. Solar energy has been the primary recipient of most RPS set-aside rules. The correlation between solar electricity generation and peak summer loads is excellent, and solar generation lends itself well to distributed or on-site applications. Solar can also be valuable in load-congested areas, where siting and emissions considerations can limit power generation options.

Solar energy installations may be encouraged in several ways. For example, states can specify a certain quantity or percentage of the RPS that must be met with solar resources. Some states have created separate tiers of resources so that some are preferred over others; the highest tier of resources invariably includes solar. Also, five states have established specific solar set-asides in their RPS policies, and two other states have set-asides for customer-sited or distributed systems, which tend to favor solar. Collectively, these set-asides could result in up to 3,500 MW of installed solar electric capacity by 2020.[2]

Some RPS policies offer extra credit to solar; i.e., solar RECs are assigned greater weight toward compliance than other RECs. The intent of this mechanism is to provide a greater incentive to use solar for RPS compliance. In some states, extra credits have also been used to promote other technologies (e.g., wind or fuel cells) or other actions (e.g., early compliance).

Because solar energy remains relatively expensive when compared with other renewable energy technologies, states with solar set-asides may also offer financial incentives to assist with solar compliance. For example, New Jersey offers a rebate for customer-owned solar electric systems of from $3.80/watt (W) to $4.40/W. Similarly, Colorado offers a $2.00/W system rebate, but also offers another $2.50/W to compensate customers for the solar RECs that the utility then applies toward RPS compliance (Table 3). However, if the penalty for non-compliance is high enough, then these incentives may not be needed.

Table 3. Financial Incentives Offered in States with RPS Solar Set-Asides

State	Incentive
Arizona	$2.00 to $3.00/W system rebate[a]
Colorado	$2.00/W system rebate + $2.50/W RECs payment[b]
District of Columbia	No incentives available
Nevada	$2.50/W system rebate for residential and small business $5.00/W system rebate for schools and public buildings
New Jersey	$3.80/W to $4.40/W system rebate
New York	$4.00/W to $4.50/W system rebate
Pennsylvania	No incentives available

[a]Arizona Public Service *Solar Partners* incentive program. The state also provides a 10% corporate tax credit and a personal tax credit.
[b]RECs payment amount is for Xcel Energy's *Solar*Rewards* incentive program for systems 10 kW or less in size; the RECS payment for larger systems is 11.5¢/kWh.
Source: Database of State Incentives for Renewables & Efficency (www.dsireusa.org)

[2] Navigant Consulting, Inc., Arizona Solar Electric Roadmap Study, Arizona Department of Commerce, January 2007, at http://www.azcommerce.com/doclib/energy/az_solar_electric_roadmap_study_full_report.pdf.

2.4 RPS Implementation Issues

(Two sources for this section – both the EPA's Guide to Action, cited in section 2.6, and an upcoming paper by NREL)

BEST IMPLEMENTATION PRACTICES

The best practices identified below will help states implement an RPS. These best practices are based on experiences of states that have implemented an RPS:

- **Lead agency.** Identify the most appropriate "lead" agency or organization for implementation authority of the RPS.
- **Compliance accounting.** Establish a transparent and easy-to-use accounting system for compliance. RECs are currently the standard and more and more are being tracked at regional levels.
- **Flexibility.** Provide retail suppliers with some flexibility in their compliance.
- **Penalties.** Make sure a credible noncompliance mechanism is in place in the form of penalties. Set the price high enough to include new renewable development (if that is the goal).
- **Support financing.** RPS rules and conditions must allow new projects to be financed and built. Market structure can be important in this regard, particularly whether the market is regulated, with a single electricity provider, or restructured for market competition. In either case, the existence of a creditworthy purchasing entity is key. In addition, long-term power and REC/attribute contracts are often required in order to obtain private equity investment and debt finance and cost recovery for these contracts should be allowed by regulators.
- **Regulatory consistency**. Both political and regulatory consistency are important. Market confidence can be negatively affected if RPS compliance rules change over time or enforcement is lax. Such factors can include compliance waivers, vague eligibility definitions, low cost impact thresholds, and weak enforcement penalties. Any of these factors can create uncertainty about the stability and longevity of a given RPS policy and undermine investor confidence. If a mid-course performance review is conducted, modifications might be warranted, but the state should fully evaluate the impact of potential changes so as not to undermine the burgeoning market.
    - Figure CC (next page) shows major revisions of RPS requirements – according to LBNL, "where changes have been made, with few exceptions, these legislative changes have been to strengthen RPS requirements; no state RPS policy has yet been repealed by later legislative action."

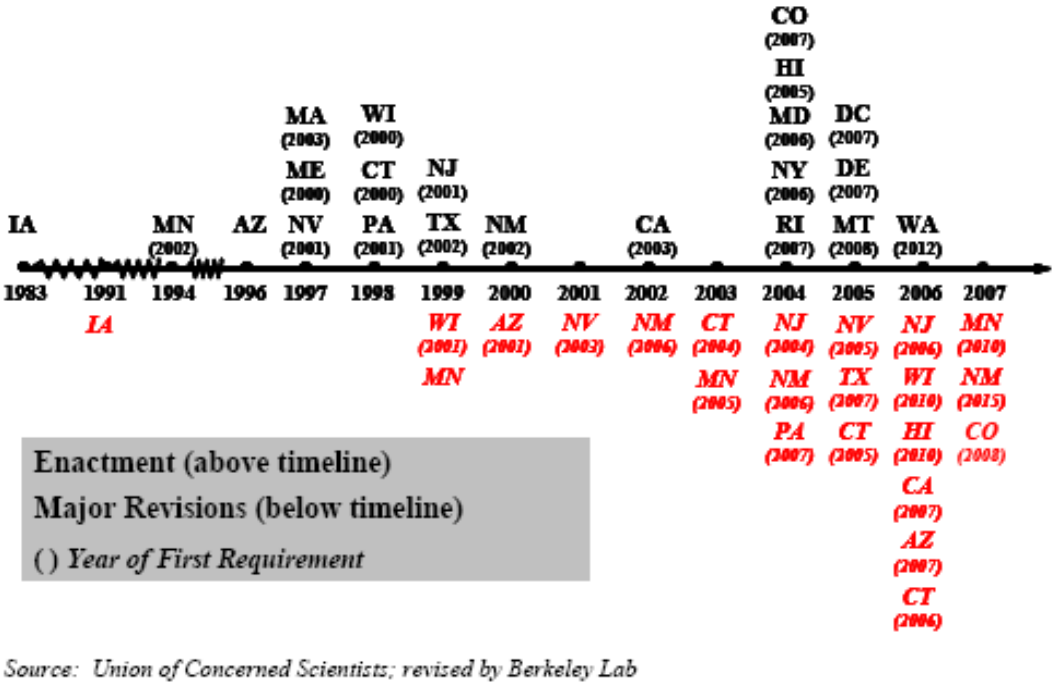
ADDRESSING TRANSMISSION – BEST PRACTICE

Many large wind farms developed in recent years have required significant and costly transmissions system extensions or upgrades to facilitate grid connection. The Federal Energy Regulatory Commission (FERC) has ratemaking jurisdiction over interstate transmission facilities. Transmission line extensions can be rather costly for remotely sighted wind turbines. Whether transmission interconnection facilities are "rolled in" and paid by all system users or are assigned specifically to the new generators could significantly influence RPS compliance.

Texas took a unique approach to addressing some of the challenges with transmission for new renewable facilities. Senate Bill 20 requires that competitive renewable energy zones (CREZ) be designated in the best areas in the state and that an electric transmission infrastructure be constructed to move renewable energy from those zones to markets where people use energy,

even if the generation has not yet been built. The Electric Reliability Council of Texas (ERCOT), the state's transmission operator, is charged with collecting wind data and nominating a number of CREZs based on transmission cost calculations for each CREZ.

Final CREZ order - http://www.puc.state.tx.us/rules/subrules/electric/25.174/25.174.pdf



Source: Union of Concerned Scientists; revised by Berkeley Lab

Figure CC. The Adoption and Revision of State RPS policies

2.5 Federal and State RPS interaction

(A modified excerpt from LBNL paper on RPS, cited in section 2.6)

Congress has considered a number of Federal RPS proposals (and amendments) in the U.S. House of Representatives and the U.S. Senate. To date, no proposal has been passed by both houses. All of the Federal RPS proposals have certain common design features that largely mirror policy devices found in one or more of the state RPS programs. Significantly, the Federal programs would all allow tradability of RECs within the entire U.S., whereas most state policies contain significant state-wide or regional limitations on REC sources. The Federal proposals have also tended to assume a replacement of the Federal Production Tax Credit (PTC) with a National RPS, whereas state programs will operate with or without the Federal PTC.

As policymakers discuss the merits and design of Federal RPS proposals, one design element that will need to be addressed is how such a Federal standard might interact with the pre-existing state RPS policies. The Bingaman proposal in the 109th Congress contained provisions indicating that the Federal RPS would not pre-empt state RPS programs, and should coordinate to the extent practicable with such programs.[3] These provisions, however, did not explicitly

[3] For example, see "Analysis of a 10 Percent Renewable Portfolio Standard" at http://www.eia.doe.gov/oiaf/servicerpt/rps2/index.html, also bill H.R. 6, engrossed amendments as agreed to by the

address issues such as whether generation applied to a state target may also be applied to the Federal requirement, or if financial compliance mechanisms (alternative compliance payments, penalty payments, and so forth) at the state level are acceptable for Federal compliance.[4] Presumably, such issues could be addressed by regulation at the Federal level, based on the coordination direction in the proposal, but there is no specific guidance on such issues. The more recent Coleman proposal, on the other hand, explicitly allows qualified state credits to count towards the Federal requirement. It also has provisions allowing limited trade of excess state credits[5] and allowing state financial compliance mechanisms to count towards the Federal requirement.

These issues have not been addressed clearly in most state-level RPS policies. Most states specifically address "double-counting" of credits, generally to disallow the same credits or generation from being used to satisfy more than one RPS requirement. In many states, double-counting restrictions are specified against another state's program, but several states prohibit the practice with respect to any other jurisdiction. Whether these restrictions are intended to disallow an electricity provider from using its state RPS purchases towards a possible future Federal RPS is unclear. In fact, it appears as if only Colorado has specifically addressed Federal RPS interactions, by allowing credits to count against both the Colorado target and any prospective Federal requirement. Clearly, interactions between state RPS policies and a possible Federal RPS are one of the complicating features that must be addressed as Federal RPS policies are proposed, and as state policies develop.[6]

2.6 Key RPS Reports and Resources

A lot of information has been compiled about RPS policies. The two reports listed below are recommended for reading and the DSIRE website is an excellent resource for learning about state-specific RPS details.

U.S. Environmental Protection Agency's Clean Energy-Environment Guide to Action
http://www.epa.gov/cleanenergy/pdf/gta/guide_action_full.pdf

The Guide to Action provides in-depth information about 16 clean energy policies and programs that states are using to meet their energy, environmental, and economic objectives. Each policy description is based on states' experiences in designing and implementing policies that enhance energy efficiency and/or increase the use of renewable energy and clean distributed generation (including combined heat and power). The Guide to Action is intended for use by state energy, environment, and economic policymakers and public utility commissions.

Renewables Portfolio Standards: A Factual Introduction to Experience from the United States – Lawrence Berkeley National Laboratory
http://eetd.lbl.gov/ea/EMS/reports/62569.pdf

Senate (109th Congress) at http://thomas.loc.gov

[4] Payments for not meeting state targets in excess of the Federal requirement would be allowed to count against any Federal compliance payments.

[5] That is, in a state where the renewable share requirement exceeds the Federal share requirement, a company may assign "excess" credits to an affiliate in another state.

[6] In the event that the Federal government passed an RPS with explicit language addressing the double-counting issue, there is always the possibility that state RPS statutes, as they affect Federal jurisdictions, would be rendered moot on constitutional grounds.

Renewables portfolio standards (RPS) have – since the late 1990s – proliferated at the state level in the United States and has emerged as an important driver for renewable energy capacity additions in the United States. The present article provides an introduction to the history, concept, and design of the RPS, reviews early experience with the policy as applied at the state level, and provides a brief overview of Federal RPS proposals to date and the possible relationship between Federal and state RPS policies. Our purpose is to offer a factual introduction to the RPS, as applied and considered in the U.S.

Database of State Incentives for Renewables and Efficiency
http://www.dsireusa.org/

The DSIRE website provides a fast and convenient method for accessing information about renewable energy and energy efficiency incentives and regulatory policies administered by federal and state agencies, utilities, and local organizations. Summary Maps provide a geographical perspective of the availability of each renewable energy incentive type across the United States. Summary Tables provide an overview of renewable energy and energy efficiency incentives offered in each state.

The following link from DSIRE presents an overview for all renewable energy requirements and goals currently enacted at the state level. The brief descriptions summarize the eligible technologies, applicable sectors, standard and by when it must be reached, and technology-specific minimums, whether credit trading is allowable and links to the appropriate legislation.
http://www.dsireusa.org/library/includes/seeallincentivetype.cfm?type=RPS&currentpageid=7&back=regtab&EE=1&RE=1

3.0 Appendix

3.1 State REC Tracking Systems

Texas Renewable Energy Credit Program
http://www.texasrenewables.com/

On May 9, 2000, the Public Utility Commission of Texas (PUCT) appointed ERCOT as Program Administrator of the Renewable Energy Credits Trading Program. This program is described in Subsection (g) of Substantive Rule 25.173, Goal for Renewable Energy. This section states:

> The purpose of the Renewable energy credits trading program is to ensure that an additional 2,000 megawatts (MW) of generating capacity from renewable energy technologies is installed in Texas by 2009 pursuant to the Public Utility Regulatory Act (PURA) s39.904, to established a renewable energy credits trading program that would ensure that the new renewable energy capacity is built in the most efficient and economical manner, to encourage the development, construction, and operation of new renewable energy resources at those sites in this state that have the greatest economic potential for capture and development of this state's environmentally beneficial resources, to protect and enhance the quality of the environment in Texas through increased use of renewable resources, to respond to customers expressed preferences for renewable resources by ensuring that all customers have access to providers of energy generated by renewable energy resources pursuant to PURA s39.101(b)(3), and to ensure that the cumulative installed renewable capacity in Texas will be at least 2,880 MW by January 1, 2009.

Wisconsin Renewable Resource Credit Tracking System
https://www.wirrc.com/rrc/index.html

The Wisconsin Renewable Resource Credit Tracking System (WIRRC) was established as a result of Wisconsin's 1999 RPS law. If a utility secures more renewables than they need to meet their obligation under the state's RPS, then RRCs are created and can be sold from that utility to another obligated utility. This is explained in the enabling legislation. However, ownership is likely to be expanded as part of the development of a new regional Midwest tracking system, which is described below.

New Jersey Solar Renewable Energy Certificate Tracking
http://www.njcep.com/srec/index-primary.html

New Jersey created a separate solar tier in their RPS, to encourage a minimum amount of solar generation that would not have to compete with more cost-effective renewable generation. New Jersey's Board of Public Utilities contracted with Clean Power Markets to administer the state's solar REC tracking system for solar RECs, or SRECs. SRECs are issued in 1 MWh denominations and are sold or traded separately from the underlying power.

There are a few unique aspects of this tracking system. First, behind-the-meter, or on-site solar generation is encouraged to participate. The administrator maintains a database of all solar systems in New Jersey, no matter their size. Therefore, the SREC trading platform specifically allows behind-the-meter generation to set up an account and participate in trading. Second, the system provides the market with price transparency. Anyone who transfers an SREC has to report the price of the transaction to the administrator, who publicly posts the average price of all transactions that took place that month (see table below). Information on the website describes monthly SREC weighted-average prices from August 2004, forward. While the prices of specific transactions are kept confidential, the availability of monthly market SREC prices creates a price history that is publicly accessible and ultimate increases investor confidence in the validity of the SREC as a commodity. This is lacking in most REC markets and has been pointed out as a definite need going forward, particularly by debt and equity investors. Finally, Clean Power Market's maintains an actively-used bulletin board where people post RECs to sell, or the desire to purchase RECs and their desired bid/offer price. This allows buyers and sellers to easily find each other in the market, particularly if they do not know who to approach. These unique characteristics mean that the New Jersey SREC tracking system is providing the market with additional value not found in most other REC tracking systems. See the table below for the SREC prices from June 2006 – May 2007 (http://www.njcep.com/srec/trading-statistics.html).

Current SREC Trading Statistics, Through May 2007

Reporting Year 2007 (for production between June 1, 2006 and May 31, 2007.

Month	Year	Active kw DC	# SRECs Issued in Month	# SRECs Traded in Month	Monthly High ($/MWh)	Monthly Low ($/MWh)	Cumulative # SRECs Traded	Cumulative Weighted Average Price ($/MWh)
May	2007	35,738.462	5493	3375	$265	$150	17705	$217.96
April	2007		2479	2527	$265	$150	14330	$214.75
Mar	2007		2127	1828	$265	$150	11803	$208.65
Feb	2007		1744	3067	$265	$110	9975	$205.65
Jan	2007		1194	1557	$265	$115	6908	$204.03
Dec	2006		1681	2750	$260	$110	5351	$195.44
Nov	2006		1820	1022	$260	$110	2601	$197.89
Oct	2006		2622	464	$250	$160	1579	$205.99
Sept	2006		1426	747	$255	$174	1115	$206.08
Aug	2006		1597	131	$235	$150	368	$213.77
July	2006		1226	237	$240	$150	237	$218.60
	Total		**23,409**	**17,705**				

3.2 Regional REC Tracking Systems

New England Generation Information System (NE-GIS)

http://www.nepoolgis.com/

The New England Generation Information System (NE-GIS) began operations in April 2002 and creates one certificate for each MWh of energy generated or imported into New England (both energy and RECs must be imported). Regulators from New England states were brought together to discuss creating a regional tracking system. It soon became clear that RPS mandates were being considered in other New England states and that other requirements

might require coordinated tracking, such as emission/generation portfolio standards for criteria pollutants or potentially, carbon. Rather than develop a separate tracking system for each requirement, New England decided to create a single tracking system that tracks all NEPOOL generation. Not only does the NE-GIS track RPS-eligible RECs (by state, since requirements differ), but it also tracks when, where and who produced the power; the type of fuel source used; and the amount and type of pollutants – including NOX, SO2, CO2, CO, Mercury, particulates, fine particulates and organic compounds. Most other states and regions focused exclusively on REC tracking, without the foresight to allow expansion to track emissions as well.

PJM Generation Attribute Tracking System (GATS)
http://www.pjm-eis.com/gats/about-gats.html

The Generation Attribute Tracking System (GATS) is used to meet the information disclosure requirements of states with fuel mix and emissions disclosure requirements or that have renewable portfolio standard requirements. Participation in GATS is by paid subscription.

The GATS database contains information for each individual generation unit, on a MWh basis. It creates generator-specific electronic certificates that identify the generation attributes necessary for electricity suppliers to satisfy state policies and to document claims made about "green" power. Data in the GATS include: megawatt-hours produced, emissions data (primarily from the U.S. Environmental Protection Agency and supplemented from other sources), fuel source, location, state program qualification and ownership of attributes for each megawatt-hour tracked.

Western Renewable Energy Generation Information System (WREGIS)
http://www.wregis.org/index.php

WREGIS is an accounting system designed to issue, register and track renewable energy certificates (RECs) for use in verification of compliance with state and provincial regulatory and voluntary market programs. WREGIS is governed by a Western Electricity Coordinating Council (WECC) board committee, entitled the WREGIS Committee, that is comprised of appointed and elected representatives. The appointed representatives are taken from the three WREGIS program sponsors: the WECC, the Western Governors' Association (WGA) and the California Energy Commission. The elected representatives are chosen by members of the Stakeholder Advisory Committee (SAC) to represent 4 distinct stakeholder groups: Load-Serving Entities, Generators, State/Provincial, and Industry-Other.

The system can be accessed by both registered account holders and public users, but the functionality available to registered users is much higher than that available to the public. WREGIS is meant for use in the region covered by the Western Interconnection. This region consists of all or part of 14 states, 2 Canadian Provinces, and Baja California. The 14 states in the region are: Arizona, California, Colorado, Idaho, Montana, Nebraska, Nevada, New Mexico, Oregon, South Dakota, Texas, Utah, Washington, and Wyoming. The 2 Canadian provinces in the region are Alberta and British Columbia. The figure below shows the states and provinces that encompasses the WREGIS region.

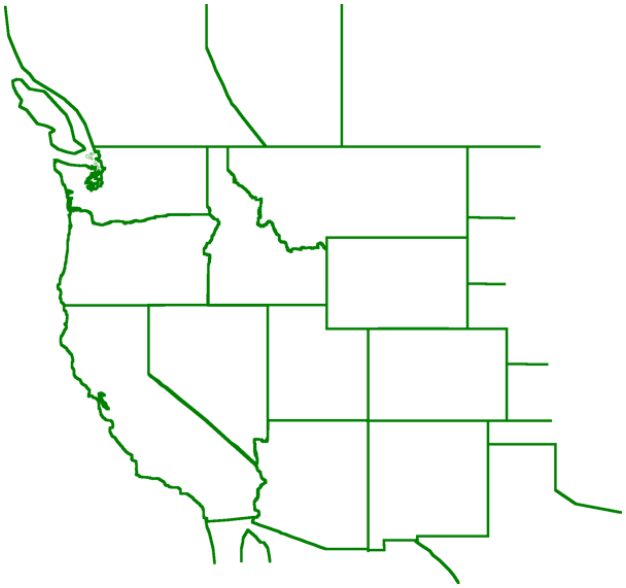


Figure A-1. WREGIS Region – U.S. States and Canadian Provinces

3.3 RPS Design Issues

(A modified excerpt from EPA's Guide to Action)
http://www.epa.gov/cleanenergy/pdf/gta/guide_action_full.pdf

GOALS AND OBJECTIVES

In order to design an appropriate RPS requirement, the goals and objectives must be clearly stated – sample goals cited by states that have enacted RPS policies include:

- Local, regional, or global environmental benefits
- Local economic development goals
- Hedging fossil fuel price risks
- Advancement of specific technologies

APPLICABILITY AND ELIGIBILITY

- **Which technologies and fuel are eligible?** Some fuel sources are universally accepted (such as wind and photovoltaics [PV]) with almost no technology or project limitations. Other fuels have been excluded (e.g., municipal solid waste [MSW] or nuclear power) or conditioned on qualifying project technologies (e.g., run-of-river hydro), project scale (e.g., "small" hydro), or project performance characteristics (e.g., "low emission" biomass combustion). See Table AA
- **Do existing and new resources compete?** Do existing renewable resources compete with new generation to meet the RPS, or do they have their own tier (to support their continuation after PURPA qualifying facility contracts expire)? How to define "new?"
- **Which geographic zone?** Does the generator have to reside within a specific regional market? Strict in-state eligibility requirements may raise legal concerns under the U.S. constitution's Interstate Commerce Clause.
- **Include Customer-sited?** Are grid-tied and off-grid customer-sited renewable systems eligible?
- **Include munis and coops?** Doing so creates more demand for renewables.

States	Solar[a]	Wind	Biomass[b]	LFG[c]	Biogas[c]	MSW	Geoth.	All Hydro	Increm. Hydro	Small Hydro[d]	Fuel Cells	RE-only Fuel Cells	Ocean/ Wave/ Tidal
Ariz.	x	x	x	x	x		X		x	x		x	
Calif.	x	x	x	x	x		X						x
Colo.	x	x	x	x	x		X			x		x	
Conn.	x	x	x	x		X				x	x		x
Del.	x	x	x	x			X			x		x	x
D.C.	x	x	x	x		X	X	x				x	x
Hawaii	x	x	x	x		X	X	x			x		x
Iowa	x	x	x	x	x	X							
Maine	x	x	x			X	X	x			x		x
Md.	x	x	x	x		X	X	x				x	x
Mass.	x	x	x	x		X		x					x
Minn.	x	x	x	x	x	X				x		x	
Mont.	x	x	x	x	x		x			x		x	
Nev.	x	x	x			X	x			x			
N.J.	x	x	x	x		X	x			x	x		x
N.M.	x	x	x	x	x		x		x			x	
N.Y.	x	x	x		x			x	x	x	x		x
Pa.	x	x	x	x			x			x	x		
R.I.	x	x	x				x			x		x	x
Tex.	x	x	x	x			x	x					x
Wash.	x	x	x	x			x		x			x	x
Wis.	x	x	x				x			x		x	x

From upcoming paper by NREL – doesn't include Oregon requirement

Table AA. RPS Rules on Resource Eligibility

STRUCTURE

- **Base requirement on energy (MWh) or capacity (MW)?**
- **Time horizon?** When will the requirement begin? How will it ramp up over time? Does it have to be sustained for a number of years once the peak is reached? Note that the longer the requirement, the more confidence is instilled in developers and financiers.
- **Create a mandate or a goal?** Mandatory RPS requirements are clearly working, if they have structured enforcement mechanisms. A number of states use an Alternative Compliance Payment, where a retail supplier may pay a per-kWh charge to avoid being out of compliance. The rate generally ranges from 1 to 5 cents per kWh for non-solar and up to 30 cents per kWh for solar. Money is sometimes used by programs that encourage additional renewable development to help increase supply.
- **What renewable energy mix is desired?** States may choose to have a single tier for new resources, a single tier for both existing and new renewables or multiple tiers based on vintage (new/existing), fuel or technology (e.g. solar is popular). Some states have credit multipliers, where 1 MWh of generation results in more than 1 REC.
- See Table BB for a snapshot of variations in RPS design (as of April 2007 – does not include Oregon, or any state "goals").

State	Original Start Date	Current Ultimate Target	Existing Plants Eligible*	Technology Bands or Tiers
Arizona	2001	15% (2025)	No	Yes (Distributed Generation)
California	2003	20% (2010)	Yes	No
Colorado	2007	20% (2020)	Yes	Yes (Solar)
Connecticut	2000	10% (2010)	Yes	Yes (Class I/II Technologies)
Delaware	2007	10% (2019)	Yes	Yes (Vintage)
Hawaii	2005	20% (2020)	Yes	No
Iowa	1999	~2% (1999)	Yes	No
Maine	2000	30% (2000)	Yes	No
Maryland	2006	7.5% (2019)	Yes	Yes (Class I/II Technologies)
Massachusetts	2003	4% (2009)	No	No
Minnesota	2002	25-30% (2020-25)	Yes	Yes (Wind/Other for Xcel)
Montana	2008	15% (2015)	No	Yes (Community Wind)
Nevada	2001	20% (2015)	Yes	Yes (Solar)
New Jersey	2001	22.5% (2021)	Yes	Yes (Solar, Class I/II Technologies)
New Mexico	2006	20% (2020)	Yes	No
New York	2006	24% (2013)	Yes	Yes (Distributed Generation)
Pennsylvania	2001	8% (2020)	Yes	Yes (Solar)
Rhode Island	2007	16% (2020)	Yes	Yes (Vintage)
Texas	2002	~4.2% (2015)	Yes	Yes (Goal, Non-Wind)
Washington	2012	15% (2020)	No	No
Washington DC	2007	11% (2022)	Yes	Yes (Solar, Class I/II Technologies)
Wisconsin	2000	10% (2015)	Yes	No

* In some cases, RPS policies allow existing facilities built after a certain date, e.g., 1999. We list these states as not allowing existing resources in this table because they do not allow older existing facilities.

Source: Lawrence Berkeley National Laboratory

Table BB. State RPS Design Variations

ADMINISTRATION

- **Accounting.** Most states use RECs to determine compliance, although some states require RECs to be bundled with power.
- **Flexibility Mechanisms.** To provide flexibility in compliance, some states allow credit for early compliance, forward compliance banking, REC banking, deficit banking and true-up periods in order to deal with the annual and seasonal variability of some renewable resources.
- **Cost recovery.** Utilities generally pass eligible costs on to retail customers through existing rate structures or new surcharges on utility bills.
- **Cost caps.** Cost caps are sometimes put in place to impose an upper bound on ratepayer impacts, to limit potential market abuses and to provide an alternative compliance mechanism if the market is undersupplied. Effective caps are low enough to limit ratepayer impacts, but high enough to encourage renewable energy development.
- **Voluntary market.** Most, but not all, RPS prohibit the sale of voluntary, premium-priced green power by the retail supplier as a means of compliance with RPS requirements. In fact, Texas just revised their RPS to prevent utilities from counting voluntary REC sales to count towards the state RPS (See http://www.eere.energy.gov/greenpower/news/news_template.shtml?id=1264).