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Renewable Energy Certificates: Background & Resources
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Renewable energy certificates (RECs) are transferable commodities that represent the environmental and other non-power attributes of renewable energy. RECs are used to demonstrate compliance with state renewable portfolio standards (RPS) which are designed to increase development and production of energy from renewable resources by imposing mandated targets for retail sales of renewable generation. RECS are also used in the voluntary green power market which allows individual purchasers to voluntarily purchase a REC and then claim an environmental benefit associated with that purchase. This background paper describes the importance of RECs and how state RPS policies and tracking systems influence REC availability, cost of compliance and price differences in REC markets from state to state. Resources for additional information about these topics are also provided.

I. What is a REC?

Renewable Energy Certificates (RECs) represent the environmental and other non-power attributes of renewable electricity. RECs are measured in megawatt-hours (MWh) and are created at the point of generation, as the electricity is introduced into the electricity grid. RECs are numbered, paper certificates that represent each MWh of renewable energy sold and provide information about the generation resource (e.g. wind, solar, geothermal), when the MWh was generated (e.g. what year), and the location of the generator. RECs can be used to demonstrate compliance with mandated RPS in many states. In addition, RECs have become increasingly important for organizations and individuals who would like to voluntarily purchase renewable generation but do not have access to retail electricity suppliers that sell it, or simply want to increase their share of renewable generation beyond what their utility supplies. A number of marketers and utilities purchase and sell RECs to meet this voluntary demand.

Most states allow generators to unbundle or separate the non-power attributes from the electricity and sell two commodities, electricity and RECs, separately. Once a buyer makes an environmental claim based on a REC, the REC is considered used. The buyer can no longer sell the REC and it is considered permanently “retired.” As of the end of 2007, 21 states and Washington D.C. allow RECs to count towards RPS compliance. Only four states do not accept RECs for compliance with their RPS (California, Arizona, Minnesota and Iowa). These states trace the “chain of custody” of the bundled renewable electricity to ensure it is delivered to the buyer along with the renewable attributes. RECs are also widely accepted in the voluntary green power markets. As discussed later, many states place restrictions on the type of RECs eligible for compliance based on the location of the generation or the deliverability of the electricity.

II. Why are RECs Important?

RECs are increasingly seen as the “currency” of renewable electricity and green power markets. They provide an accurate, durable record of what was produced and a fungible commodity that can be traded among suppliers who need to meet renewable energy generation targets. RECs are also important currency in voluntary green power markets for consumers who want to avoid carbon and other air emissions from fossil fuel energy, hedge against future electricity price

increases, create a positive public image, generate customer loyalty, or offset emissions from other personal or business activities.

The use of unbundled RECs enhances the market place for renewable energy by freeing renewable energy sellers from the need to directly deliver the renewable electricity in real time to the end users. While RECs are created at the time the renewable energy is delivered to the grid, when unbundled they can be retained for other uses and in some cases can be banked for days or months. Further, unbundled RECs can be sold throughout the country. The use of these RECs can reduce the cost of RPS compliance by allowing renewable energy to be generated where it makes the most economic sense, allowing greater geographic reach than the electricity delivery system provides (NREL, 2007), and avoiding the costs of new transmission and distribution. RECs can also provide access to a larger quantity of resource options than those available in a particular region.

III. Verification & Tracking Systems

All REC transactions are tracked so there is no confusion or misrepresentation concerning the ownership of the attributes that the certificates represent. **Tracking systems perform the following functions:** a) verify that the renewable power has been generated; b) follow the purchase and sale of all attributes of the REC to assure ownership is correctly assigned and there is no double counting; and c) track financial transactions to create a record of the volume and price of RECs sales and purchases. It is important to ensure against double counting, that is, inadvertently allowing more than one entity to claim ownership of the same REC, to maintain the integrity of the REC market.

There are two methods for tracking RECs: web-based and manual. About half of the states that have an RPS use **a web-based tracking system**. Five regional web-based tracking systems cover most of the U.S. The New England Generation Information System (GIS) and the PJM EIS Generation Attributes Tracking System (GATS) track certificates for all forms of electricity generation and also support environmental disclosure policies for retail electricity sales. Other web-based tracking systems, such as the Texas Renewable Energy Credits Program, and Western Renewable Energy Generation Information System (WREGIS) account for renewable energy only. Generally web-based tracking systems are considered more reliable in protecting buyers from the risk of double counting RECs.

Manual tracking systems of both unbundled and bundled renewable electricity transactions require the buyer of RECs (or obligated retail entity) to submit verifying information to a system administrator. Manual tracking systems are more manageable when there are limited market participants and transactions involved.

APX, Inc. is also developing a **default web-based tracking system** that can be used by states that do not currently have one. (<http://www.apx.com/environmental/renewable-energy-market-infrastructure.asp>)

IV. RPS Policies and Impacts on REC Markets

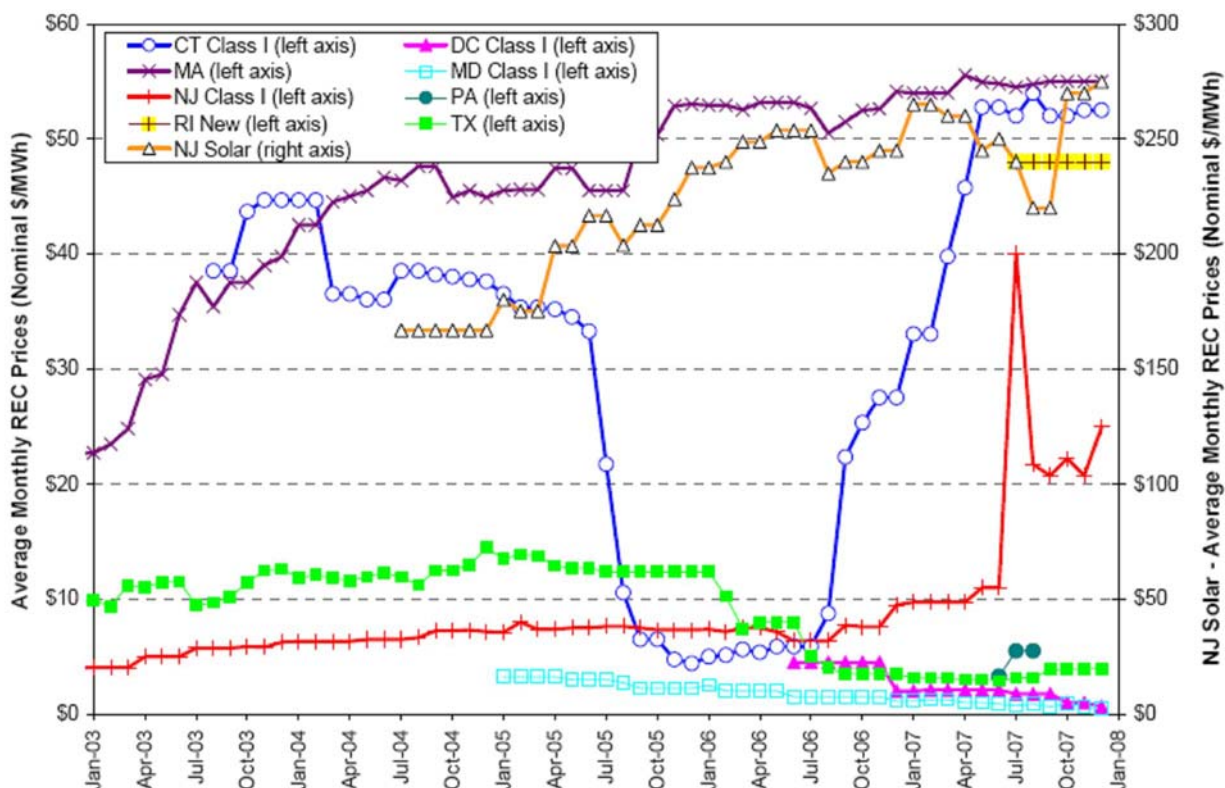
States have a number of goals in mind when they craft RPS policies and regulations. In addition to promoting the construction and generation of more renewable energy, states are interested in the air quality, economic development and fuel diversity benefits of increased renewable energy production. They may also want to mitigate the price risks of fossil fuel-powered generation. For all of these reasons, states try to balance the benefits of encouraging in-state renewable energy development with the flexibility and cost advantages of accepting RECs that are not subject to geographic or deliverability restrictions.

Difference in RPS policies from one state to the next **and differences in the regional tracking systems** have important implications for the availability of RECs, the cost of RECs and even the location and type of renewable generation projects developed to serve the RPS markets (Holt, 2007). The following policies, in particular, can strongly influence the availability and price of RECs:

- Limits on RECs related to electricity deliverability;
- The definition of renewable energy and REC eligibility;
- The extent to which voluntary green power RECs are counted toward the RPS; and
- Cost caps imposed on the RPS.

Large variations in REC prices have been observed across a number of states and over time, as shown below (Wiser, 2008).

REC Prices in RPS Compliance Markets (Main Tier & Class I) - pg. 27, Wiser, 2008.



RECs and Electricity Deliverability Requirements

REC markets can be impacted by state requirements that the renewable energy associated with the REC be delivered or generated within the state. The quality and availability of renewable energy resources vary across states and regions. Some states allow entities covered by an RPS to purchase RECs from outside the state or region where renewable generation is more abundant and less expensive, as long as the electricity can be delivered to the state. Other states, hoping to maximize the in-state benefits, require that all qualified RECs and renewable generation be located within the state. Only one state, Colorado, places no restrictions on the geographic location of the generation or the deliverability of the electricity in establishing eligibility of RECs.

In some cases the tracking system imposes restrictions on out-of-state or out-of region renewable generation. For instance, New England's GIS and New York's tracking system require that each REC be accompanied with firm transmission rights to deliver the electricity to the region in the hour the generation occurred. A less stringent approach has been adopted by PJM GATS, which specifies that the electricity associated with the RECs must be delivered to the state, but allows the flexibility of monthly rather than hourly matching.

Beyond the impact these restrictions have on the availability and price of RECs, questions have been raised about the vulnerability of these policies to legal challenges under the “**dormant commerce clause**,” which specifies that no state can favor an in-state commodity over an out-of-state equivalent. Although no state RPS policies have been challenged, this consideration may influence some state policies (Cory, 2007).

Renewable Energy Definitions and REC eligibility

State definitions of eligible renewable resources can also impact REC markets. The definition of renewable energy for the purpose of RPS compliance may be negotiated through the legislative or regulatory process and typically reflects the type of resources available in the state or region or the technologies the state would like to see developed. While every state with an RPS recognizes solar, wind, biomass, and landfill gas within its definition of eligible renewable resources, there is less consistency in recognizing other resources (hydro, biogas, municipal solid waste, fuel cells, wave or tidal power). Several states, like Connecticut, Maryland and Pennsylvania, have created special categories of renewable resources with specific MW targets. These categories serve to further segment the REC market. A recent summary of the renewable energy resources eligible for state RPS's across the country is provided in the table below.

State RPS Resource Eligibility (Cory & Swezey, 2007)

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 ^a	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		X	x
D.C.	x	x	x	x	x	x	x	x				X	x
Hawaii	x	x	x	x	x	x	x	x				X	x
Illinois	x	x	x	x					x				
Iowa	x	x	x	x	x	x				x			
Maine	x	x	x	x		x	x	x			x		x
Md.	x	x	x	x	x	x	x	x				X	x
Mass.	x	x	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	x			x			
N.H.	x	x	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		x
N.C.	x	x	x	x	x		x			x			x
Ore.	x	x	x	x	x		x	x				X	x
Pa.	x	x	x	x	x	x	x	x		x	x		
R.I.	x	x	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	x

^a Can include thermal energy.

^b Can also be included in biomass definition.

^c Can include co-firing and come with emission limits or sustainable growth conditions.

^d Various size, technology, and vintage definitions.

^e MSW combustion is eligible if in Stanislaus County and operational before September 26, 1996. MSW conversion is eligible if it gasifies the MSW into a clean burning fuel, which is then used to generate electricity.

Sources: Union of Concerned Scientists 2007; Database of State Incentives for Renewables & Efficiency (www.dsireusa.org); and individual state RPS legislation.

States also have different limits on the length of time a REC can be used to meet RPS compliance. The “shelf life” of a REC can be as short as three months (New England) or as long as four years (Nevada and Wisconsin).

If states or regions define eligible resources and RECs differently, trading RECs across regions, even if bundled with the electricity, may make the information more difficult to verify, and will make some RECs more marketable than others. Renewable generation developers prefer greater flexibility and consistency in the resource definition, in the shelf life, and in the geographic eligibility of RECs because it provides greater certainty about the number of markets available to sell RECs. States, on the other hand, like to promote as much in-state renewable generation development as possible. In some cases, states provide incentives to encourage in-state development, such as multipliers on in-state RECs, rather than restrictions on the location or deliverability.

Voluntary Green Power RECs & Double Counting

A major policy concern is the possibility of double counting, that is, of inadvertently allowing more than one entity to claim ownership of the same REC. In states with and without RPS mandates, third party marketers and utilities may offer the opportunity to individuals and organizations to purchase RECs over and above the renewable energy sold as part of the retail utility's portfolio. The question of how to treat these voluntary sales is critical in states that have a mandatory RPS. Most states have decided that voluntary REC sales should not be counted toward meeting the RPS, in part because the purchaser may also be making claims against the environmental attributes of the green power, when that environmental benefit was mandated by the RPS policy. Minnesota for instance, has both an RPS and a requirement that utilities offer additional voluntary green power options to customers. Minnesota Public Utility Commission does not allow voluntary green power sales to count toward RPS compliance. The Texas legislature, in 2005, allowed all renewable energy generated in the state to count toward the RPS, including voluntary market sales, but repealed this provision in 2007 (Cory, 2007).

Green-e certification¹ of voluntary green power and membership in the U.S. EPA's Green Power Partnership require that the renewable power meet a standard of "additionality" to qualify for their programs, and thus prohibit voluntary market RECs that are also counted to meet RPS requirements. Additionality is the concept that the renewable generation is in addition to what would have been generated beyond what is required by policy mandates.

Double counting is also an issue when states allow certain attributes of the REC, such as claims about its avoided GHG or NOX emissions, to be sold separately. Many states do not accept RECs if individual attributes have been used for compliance in other markets, and the regional tracking systems currently do not track the disaggregation of different benefits associated with the RECs. However, some states' RPS policies are silent on the issue of how disaggregated RECs should be treated, and allow the market to determine their value and how to verify claims about their remaining attributes.

Cost Caps

A number of states have implemented **cost caps in conjunction with their RPS policies that allow alternative compliance options** when the cost of meeting the RPS exceeds the cap. A comprehensive analysis of the cost impact of RPS policies has not been conducted, although the data that has been collected indicates that the annual rate impact in 2007 was 1.1% or less (Wiser, 2008). As RPS requirements grow and costs of new renewable projects escalate, the rate impacts are likely to increase over time.

Some states have implemented alternative compliance payments (ACP) if REC prices exceed a certain threshold to cap the cost of their RPS policy. Other states simply exempt retail suppliers from compliance if the cost reaches a certain threshold, such as a renewable energy funding cap, per customer rate increase, or contract price cap. Another method that some states have adopted is a force majeure mechanism in the RPS which allows electricity suppliers to limit their RPS and REC purchases if they can make the case that it would unduly increase electricity rates. Regardless of the approach, these price controls have the effect of establishing a limit on

¹ Green-e is the certification brand of the Center for Resource Solutions, which sets standards for environmental and product content of retail and wholesale green power.

the value of RECs and the project developer's return. A summary of various state approaches is provided in the table below.

Approaches to Cap Costs of State RPS Policies (Wiser, 2008, p.31)

State	ACP		Retail Rate/ Revenue Req. Cap	Renewable Energy Contract Price Cap	Per- Customer Cost Cap	Renewable Energy Fund Cap	Financial Penalty May Serve as Cost Cap	Maximum Effective Retail Rate Increase
	Auto. Cost Rec.	Possible Cost Rec.						
AZ					•	•		to be determined
CA						•		cap for portion of cost
CO			•					1.7%
CT							•	6.5%
DE		•						16.3%
HI				•				0.0%
IA								no explicit cap
IL			•					1.4%
MA	•							1.4%
MD		•	•					2.1%
ME	•							4.8%
MN								no explicit cap
MT				•				0.1%
NC					•			1.9%
NH	•							8.3%
NJ	•							10.6%
NM			•	•	•			1.8%
NV								no explicit cap
NY						•		0.9%
OR		•	•					4.0%
PA							•	no explicit cap
RI	•							6.4%
TX							•	2.1%
WA			•					4.0%
D.C.		•						2.5%
WI								no explicit cap

NOTE: ACP refers to Alternative Compliance Payments

V. Solar RPS and Behind-the-Meter REC Ownership:

Of the 26 RPS programs, 12 have set separate targets within their RPS for solar or distributed generation. The vast majority of solar energy generation is customer-owned, distributed generation that is used on-site. While the net generation may be credited to the customer's account through net-metering provisions, ownership of the RECs generated is not always clearly addressed in state policy.

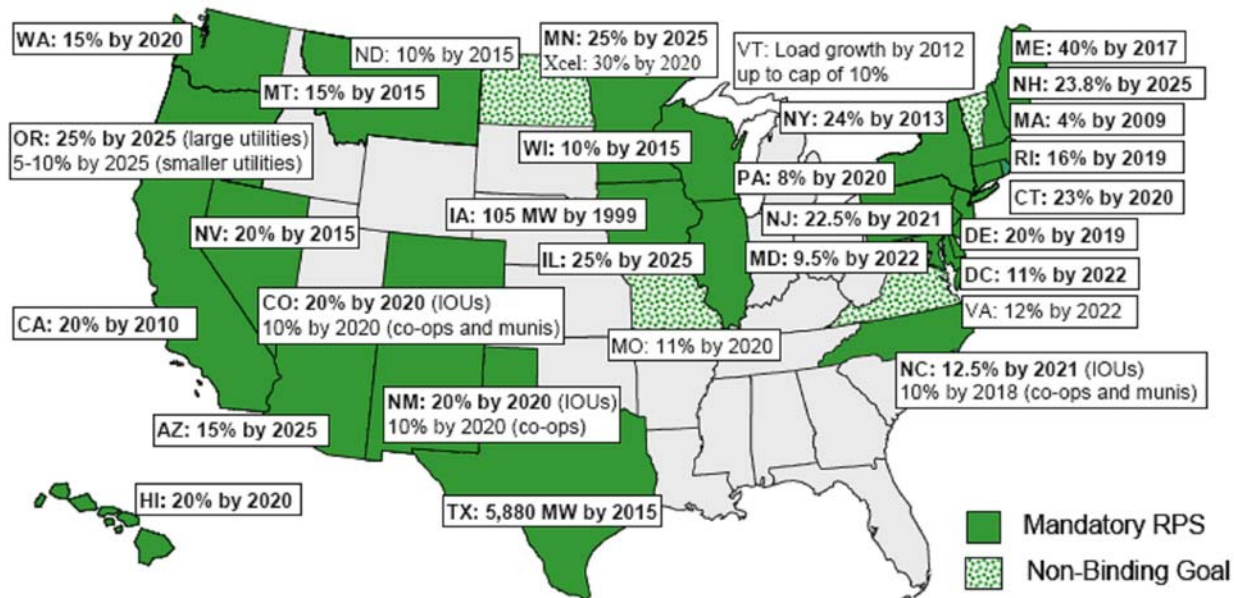
In Colorado, the utility gets credit for the "behind-the-meter" generation, but the customer-generator receives a system rebate to compensate for the solar RECs. In New Jersey, like most states, the customer-generator retains ownership of the solar RECs, and can sell them to the

utility for RPS compliance. Other states (such as Oregon) split the ownership between the utility and the customer. In states where this ownership issue has not been clarified, the marketability of the RECs is impaired.

VI. Recent State/ Regional Experience

Eleven states have made substantial changes to their RPS since 2006 and four states (IL, NC, NH and OR) have created new RPS policies, bringing the total number of states with a mandatory RPS or broader Energy Portfolio standard to 25 plus the District of Columbia. An overview of these policies is provided in the map below.

State RPS Policies and Non-Binding Renewable Energy Goals



Source: Wiser, 2008, p. 3.

Below is a description of the more recent changes.

Major Revisions to Existing State RPS Policies since 2006 (Wiser, 2008)

State	Key Elements of Renewables Portfolio Standard Design
California	California's RPS first took effect in 2003, and was designed such that certain above-market renewable energy contract costs would be paid through a separate fund administered by the California Energy Commission (the payments were called supplemental energy payments, or SEPs). This structure created administrative complexity and imposed financing difficulties on renewable energy projects. As a result, legislation was passed in October 2007 that repeals the SEP process and returns the funds to the state's Load Serving Entities (LSEs). To continue to ensure that the cost of the RPS is capped, above-market contract costs for the state's Investor Owned Utilities (IOUs) and Energy Service Providers (ESPs) will be limited to the funds transferred to them by the California Energy Commission. Separate legislation, also enacted in October 2007, expanded the resource eligibility rules to include certain hydropower facilities.
Colorado	Colorado was the first state to enact an RPS via the ballot box. In March 2007, follow-up legislation doubled the ultimate RPS target for IOUs (now 20% in 2020, up from 10% in 2015), thereby also doubling the effective size of the solar set-aside. The 2007 legislation also

	obligates all of the state's electric cooperatives (previously limited to coops, serving over 40,000 customers) and municipal utilities serving more than 40,000 customers to meet a target of 10% by 2020, and eliminates any ability to opt-out of these requirements. POU's are now excluded from the solar set-aside; instead, solar projects that come online prior to July 2015 will receive a 3x multiplier. "Recycled" energy was added to the list of eligible technologies, while community-owned renewable projects of under 30 MW and located in Colorado will receive a 1.5x multiplier. The revisions also increase the retail-rate-cap for the RPS to 2% (up from 1%, except that electric cooperatives are still subject to the 1% cap), and provide some encouragement for utility-owned renewable energy projects.
Connecticut	In June 2007, new legislation increased Connecticut's RPS to 23% by 2020, with at least 20% from Class I resources. The new legislation also requires the Connecticut Municipal Electric Energy Cooperative to develop renewable energy standards for the state's municipal electric utilities and report progress on those standards annually.
Delaware	In July 2007, Delaware increased its RPS, previously at 10% by 2019, to 20% by the same year, and created a solar PV set-aside that reaches 2% by 2019. The legislation also increases the level of ACP payments that may be made in lieu of purchasing RECs, and establishes an ACP schedule for the solar set-aside.
Illinois	In 2001, Illinois established a non-binding renewable energy goal by legislation, and in 2005 a non-binding goal was established through regulatory action. In August 2007, the RPS was made mandatory and targets were both increased and extended, starting at 2% in 2008 and increasing to 25% in 2025. The targets only apply to electric utilities serving over 100,000 Illinois customers, and further only to customers taking fixed-price service (i.e., the fixed-price offerings of the Investor Owned Utility (IOU) default service providers), making Publicly Owned Utilities (POUs) and competitive energy service providers exempt from mandatory renewable purchases. Seventy-five percent of each year's target is to come from wind power, and in-state resources are strongly encouraged through 2011 (with out-of-state resource eligible during that period only if cost-effective in-state resources are not available). Cost caps change over time. In 2011, the cap will equal the greater of an additional 0.5% of the amount paid per kWh during the year ending May 2010, or 2% of the amount paid per kWh during the year ending May 2007. The newly created Illinois Power Agency is responsible for developing the procurement plans and conducting solicitations to ensure compliance by the state's IOU default service providers, making Illinois the second state (after New York) to use a variant of a central procurement model to pursue its RPS.
Maine	Maine's original RPS did little to support new renewable projects. In June 2007, the legislature made mandatory a new and additional target (stated as a non-binding goal in 2006 legislation) of 10% of supply from new renewable capacity by 2017, starting at 1% in 2008. ACP levels for the new requirement are determined by the PUC, and the PUC subsequently established an ACP for the 10% requirement starting at \$57.12/MWh in 2007 dollars, matching the ACP levels in MA, NH, and RI. The PUC is also given the discretion to suspend annual increases in the new standard under certain conditions.
Maryland	Legislation enacted in April 2007 raises Maryland's existing RPS targets by adding a requirement that 2% of the states' electricity come from solar sources by 2022, thereby increasing the overall renewable energy target from 7.5% to 9.5%. In exchange for the new solar set-aside, the revised legislation deletes the earlier 2x multiplier for solar. The legislation establishes solar contracting requirements, revises solar REC ownership rules, and creates a higher ACP for the solar set-aside. Delays in achieving the solar set-aside may be allowed if certain cost limits are reached.
Massachusetts	On July 2, 2008, Massachusetts Governor Patrick signed into law the Green Communities Act. Massachusetts must implement the regulations governing its revised RPS for Class I and Class II by January 2009. The MA Office of Energy Resources is currently reviewing what amendments will be necessary to modify the current RPS regulation, and plans on conducting an informal fact-gathering process that will allow stakeholders to provide comment on the RPS issues raised by the Act. Once sufficient facts and comments from stakeholders are gathered, DOER will commence a formal regulatory promulgation process.
Minnesota	February 2007 legislation alters the RPS in Minnesota in several respects. Most importantly, it raises Xcel's RPS obligations to 30% by 2020 (of which at least 25% must come from wind; the remaining 5% may come from other sources), and creates somewhat lower but mandatory

	targets for the state's other electric utilities (including POUs) increasing to 25% by 2025 (previous targets were 10% by 2015). A separate "good faith" objective of 7% by 2010 exists for all electric utilities in the state. Unbundled RECs may now be used for compliance.
New Hampshire	New Hampshire's RPS, enacted in May 2007, establishes a renewables target for all of the state's electricity suppliers of 4% in 2008, increasing to 23.8% by 2025. The target is segmented into four classes of eligible resources: Class I is for new renewable facilities beginning operation in 2006 or later (16% by 2025); Class II is for solar electricity from facilities beginning operation in 2006 or later (0.3% by 2014); Class III is for pre-2006 biomass and methane projects (6/5% by 2011); and Class IV is for certain pre-2006 hydroelectric facilities with a nameplate capacity of 5 MW or less (1% by 2009). Alternative compliance payments (ACPs) vary according to the four classes, with starting values that range from \$28/MWh for Class III and IV to \$57.12/MWh for Class I and \$150/MWh for Class II. The PUC is provided limited authority to accelerate or slow scheduled changes to the renewable energy targets, and to alter Class III and IV requirements.
New Jersey	In 2007, New Jersey's BPU began to significantly change the implementation of that state's solar set-aside. In particular, the importance of up-front rebates for PV will decline, with the goal of transitioning towards a system that relies more-heavily on the purchase and sale of solar RECs. As part of that process, among other proposed changes, solar ACP levels are to increase and become more predictable, with a rolling 8-year price schedule set in advance. The trading life of solar RECs will be extended to two years, and PV systems will only be allowed to create solar RECs for 15 years. The BPU staff was also directed to develop an overall cost cap for solar incentive payments, at a level of roughly 2% of retail rates. Additionally, the BPU staff was directed to cap solar capacity requirements at a level that accounts for the state's aggressive energy efficiency goals. New Jersey also extended the timeframe for 2007 RPS compliance, given the run-up Class I REC prices.
New Mexico	In March 2007, New Mexico's RPS for IOUs was increased to 20% by 2020 (up from 10% by 2011 previously), and for rural cooperatives an RPS of 10% by 2020 was established. Rules adopted by the New Mexico Public Regulation Commission (PRC) encourage resource diversity for IOUs through set-asides for solar and wind (each required to meet at least 20% of 2011 targets, and thereafter) and biomass or geothermal (a combined minimum of 10% of 2011 targets, and thereafter); distributed generation is required to serve 3% of the RPS by 2015. These set-asides replace earlier-developed credit multipliers. The PRC has also established caps on energy costs by resource type, and has developed an overall cost cap of 2% for IOUs, and 1% for coops.
North Carolina	North Carolina's RPS, signed into law in August 2007 and the first mandatory RPS in the Southeast, requires IOUs to meet eligible energy targets of 3% in 2012 (solar targets begin in 2010), increasing to 12.5% in 2021 and thereafter. Electric cooperatives and municipal utilities are obligated to the same early-year targets but are not required to achieve more than 10% in 2018 and thereafter. Utility-implemented energy efficiency (including waste heat from fossil CHP) qualifies as an eligible resource for IOUs, up to a limit of 25% of each yearly target through 2020 and 40% in years thereafter; renewable CHP, both electricity and heat, qualifies for the renewables portion of the RPS. Publically-owned utilities may include load management as a substitute for energy efficiency, have no limits on the use of these sources, may use hydropower to qualify for up to 30% of their standard, and are provided additional leniency on the vintage of projects with which they contract. Unbundled RECs may be used for compliance, but unbundled RECs from out-of-state facilities may not meet more than 25% of annual requirements (except that one supplier—Dominion—is allowed unlimited use of such RECs). The RPS included set-asides for swine waste, poultry waste, and new solar electric or solar thermal facilities (the solar set-aside begins in 2010). Cost caps vary by customer type.
Oregon	Oregon's RPS was signed into law in June 2007, requiring utilities serving greater than 3% of statewide load (and any utility making a new investment in a coal plant) to meet a renewable energy purchase target of 5% in 2011, increasing to 25% by 2025. Smaller utilities have 2025 targets of 10% or 5%, depending on utility size, and no targets in intervening years. Competitive Energy Service Providers (ESPs) must meet targets that are dependent on the RPS obligations of the utility that would otherwise have served their customers. Unbundled RECs may be used for RPS compliance, but IOUs are capped at 20% unbundled RECs; large POUs may use up to 50% for RPS compliance, but IOUs are capped at 20% unbundled RECs; large

	POUs may use up to 50% unbundled RECs until 2020, other suppliers have no restrictions. The PUC and consumer-owned utility governing boards are required to determine ACP rates for each utility. Suppliers are not required to comply if governing boards are required to determine ACP rates for each utility. Suppliers are not required to comply if incremental compliance costs exceed 4% of annual revenue requirements. Suppliers are also not required to comply with the RPS in individual years if doing so would require them to acquire renewable energy in excess of load growth, displace non-fossil energy with eligible renewable power, or displace low-cost power from the Bonneville Power Administration. The legislation also contains a non-binding goal that community-based and small-scale renewable energy projects of 20 MW or less provide at least 8% of 2025 retail load.
Pennsylvania	In July 2007, legislation was passed that clarifies the force majeure clause in Pennsylvania's RPS, creates a more-detailed schedule for the solar set-aside, adds solar thermal to the list of eligible Tier I technologies, confirms REC property rights for generators and customer-generators, and somewhat limits the geographic scope of projects that may be eligible.
Texas	Legislation in 2007 clarifies that RECs retired for other purposes (e.g., sold through a voluntary green power program) cannot be counted toward the RPS. The legislation also permits certain large customers to opt out of the RPS requirements, and empowers the PUC to establish alternative compliance payments for the RPS.

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State Renewable Portfolio Standards (RPS)	
Pew clickable map of U.S. states and their RPS programs	http://www.pewclimate.org/what_s_being_done/in_the_states/rps.cfm
Union of Concerned Scientists State-Level Renewable Energy Standards Toolkit	http://go.ucsusa.org/cgi-bin/RES/state_standards_search.pl?template=main
Arizona	2006 Proposed Renewable Energy Standard Rules (Arizona Corporation Commission): http://www.azcc.gov/divisions/utilities/electric/res.pdf Arizona incentives for renewable energy (DSIRE): http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=AZ06F&CurrentPageID=3
California	CA Renewable Portfolio Standards website (CPUC): http://www.cpuc.ca.gov/PUC/energy/electric/renewableenergy/index.htm REC compliance with RPS in CA (CPUC): http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/86954.htm Energy Certificates and the California Renewables Portfolio Standard Program Report (CPUC) http://docs.cpuc.ca.gov/published/Report/55606.htm Analysis of CA RPS policy (Union of Concerned Scientists): http://www.ucsusa.org/clean_energy/solutions/renewable_energy_solutions/california-res.html
Colorado	House Bill concerning Renewable Energy Standards (General Assembly of the State of Colorado): http://www.leg.state.co.us/CLICS/CLICS2007A/csl.nsf/fsbillcont3/C9B0B62160D242CA87257251007C4F7A?Open&file=1281_enr.pdf Colorado incentives for renewable energy (DSIRE): http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=CO24R

Maryland	2008 Renewable Energy Portfolio Standard Report (Maryland Public Service Commission): http://www.psc.state.md.us/psc/Reports/MD%20RPS%202008%20Annual%20RPS%20Report%20ver(2%200).pdf MD House Bill 375 http://mlis.state.md.us/2008rs/chapters_noln/Ch_126_hb0375E.pdf
Massachusetts	Green Communities Act http://www.mass.gov/?pageID=eoeaterminal&L=5&L0=Home&L1=Energy%2c+Utilities+%26+Clean+Technologies&L2=Renewable+Energy&L3=Renewable+Portfolio+Standard&L4=Green+Communities+Act&sid=Eoea&b=terminalcont&f=doer_rps_gc_class1_2_regs&csid=Eoea
New Jersey	Solar Renewable Energy Credit (SREC) program (Board of Public Utilities): http://www.njcleanenergy.com/renewable-energy/programs/solar-renewable-energy-certificates-srec/new-jersey-solar-renewable-energy
North Carolina	2007 Renewable Energy Portfolio Standards Report (General Assembly of North Carolina): http://www.ncga.state.nc.us/Sessions/2007/Bills/Senate/PDF/S3v6.pdf Analysis of a Renewable Portfolio Standard for the State of North Carolina (La Capra Associates, Inc.): http://www.ncuc.commerce.state.nc.us/reps/NCRPSReport12-06.pdf
Pennsylvania	Alternative Energy Portfolio Standards website (Public Utility Commission): http://www.puc.state.pa.us/electric/electric_alt_energy.aspx 2007 Annual Report Alternative Energy Portfolio Standards Act of 2004 (Public Utility Commission): http://www.puc.state.pa.us/electric/pdf/AEPS/AEPS_Ann_Rpt_2007.pdf
Texas	2007 Annual Report on the REC Program (Electric Reliability Council of Texas, Inc.): https://www.texasrenewables.com/staticReports/Annual%20Report/2007_Report.pdf
REC Verification and Tracking Systems	
Overview of U.S. Mandatory REC markets (APX, Inc.)	http://www.apx.com/documents/Whitepaper--US-Mandatory-REC-Markets.v.Final.pdf
Treatment of Environmental Attributes across Tracking Systems (Environmental Tracking Network of America)	http://www.resource-solutions.org/policy/etna/docs/ETNNA%20Discussion%20Paper%20final%207-1-08.pdf

Best Practices for Transferring Certificates Across Tracking System Boundaries (Center for Resource Solutions)	http://www.resource-solutions.org/policy/etnna/docs/Best Practices Transferring Certs bt IBs v8.pdf
North American Renewables Registry	http://narenewables.apx.com/
ERCOT	https://www.texasrenewables.com/
NEPOOL GIS	http://www.nepoolgis.com/
PJM GATS	https://gats.pjm-eis.com/mymodule/mypage.asp
WREGIS	http://www.wregis.org/
M-RETS	http://www.m-rets.com/
Miscellaneous Information Resources	
EPA Guide to Purchasing Green Power: Renewable Electricity, Renewable Energy Certificates, and On-Site Renewable Generation	http://www.epa.gov/greenpower/documents/purchasing_guide_for_web.pdf
EPA Guide to Action, Chapter 5	http://www.epa.gov/cleanenergy/documents/gta/guide_action_chap5_s1.pdf
National Renewable Energy Laboratories- Renewable Portfolio Standards in the States: Balancing Goals and Implementation Strategies (NREL)	http://www.nrel.gov/docs/fy08osti/41409.pdf
Renewable Portfolio Standards: A Factual Introduction to Experience from the United States (LBNL)	http://eetd.lbl.gov/ea/ems/reports/62569.pdf
Who Owns Renewable Energy Certificates? An Exploration of Policy Options and Practice. (LBNL)	http://eetd.lbl.gov/ea/ems/reports/59965.pdf
The Treatment of Renewable Energy Certificates, Emissions Allowances, and Green Power Programs in State Renewables Portfolio Standards (LBNL)	http://eetd.lbl.gov/ea/emp/reports/62574.pdf
Renewable Portfolio Standards in the U.S., A Status Report with Data Through 2007 (LBNL)	http://eetd.lbl.gov/ea/ems/reports/lbnl-154e.pdf

Center for Resource Solutions: Tradable REC Handbook	http://www.resource-solutions.org/policy/trchandbook.htm
Recommended Practices for the Treatment of Behind-the-Meter Generators in Certificate Tracking Systems, 2006 (ETNNA)	http://www.resource-solutions.org/policy/etnna/docs/BTM_issues_summary_8-16-06.pdf
DOE Workshop on REC Markets & Challenges	http://apps3.eere.energy.gov/greenpower/resources/pdfs/0907_rec_summary.p df
Renewable Energy Certificate (REC) products available to retail customers nationally or regionally (DOE)	http://apps3.eere.energy.gov/greenpower/markets/certificates.shtml?page=1