Chapter 5. Renewable Portfolio Standards

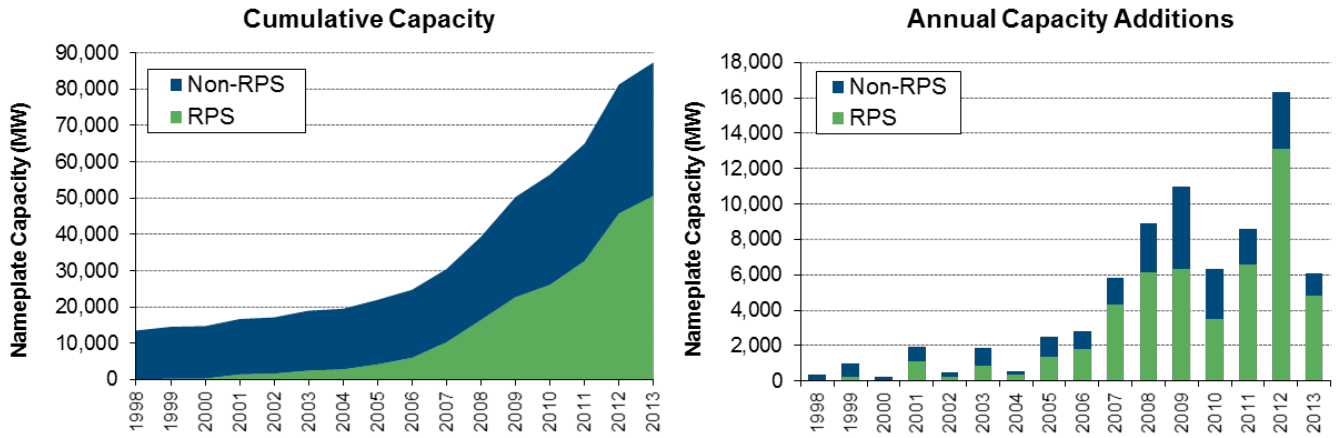
Policy Description and Objective

Summary

A renewable portfolio standard (RPS) requires electric utilities and other retail electric providers to supply a specified minimum percentage (or absolute amount) of customer demand with eligible sources of renewable electricity. As of March 2015, 29 states and Washington, D.C. have established mandatory RPS requirements. An additional eight states have adopted non-binding renewable portfolio goals (DSIRE 2015d).

In 2013, state RPS policies applied to 56 percent of all U.S. retail electricity sales (LBNL 2014). Between 1998 and 2013, 61 percent, or 46 gigawatts, of new, non-hydro[42] renewable energy capacity developed was added in states with existing or pending RPS requirements. While this information is an imperfect metric, it indicates that RPS policies are a key driver for new renewable electric generation facility development in the United States (LBNL 2013).

Figure 5.1: Cumulative and Annual Non-hydro Renewable Energy Capacity in RPS and Non-RPS States, Nationally



Source: LBNL 2014

RPS policies have supported the installation of new wind capacity, which accounted for approximately 78 percent of RPS-motivated renewable energy capacity additions between 1998 and 2012. In recent years, RPSs have also increasingly supported the development of new solar capacity, particularly distributed generation (DG) such as customer-sited solar systems.[43] Seventeen states and Washington, D.C., now include solar or DG-specific targets (also referred to as "set-asides" or "carve-outs") in their RPS requirements. Outside of California, solar and DG RPS policies drove approximately 60 to 80 percent of all new U.S. solar photovoltaic

[42] Hydropower has historically been the dominant source of renewable energy and there are many hydropower projects across the country. Therefore, when discussing growth in the renewables sector, emphasis is typically given to non-hydro renewables.

[43] DG, also called onsite generation, refers to small-scale, electric-generating technologies installed at, or in close proximity to, the end-user's location.

(PV) additions since 2005 (LBNL 2014). In some states, RPSs have also supported the development of other renewable sources such as solar thermal electric power, geothermal, and hydropower.

Many states have adopted RPS requirements because they are an administratively efficient, cost-effective, market-based approach to achieving renewable electricity policy objectives. RPS requirements can be used in both regulated and restructured electricity markets. States have tailored their RPS requirements to satisfy particular state policy objectives, electricity market characteristics, and renewable resource potential. Consequently, there is wide variation in RPS rules from state to state regarding the minimum requirement of renewable energy, implementation timing, eligible technologies and resources, and other policy design details.

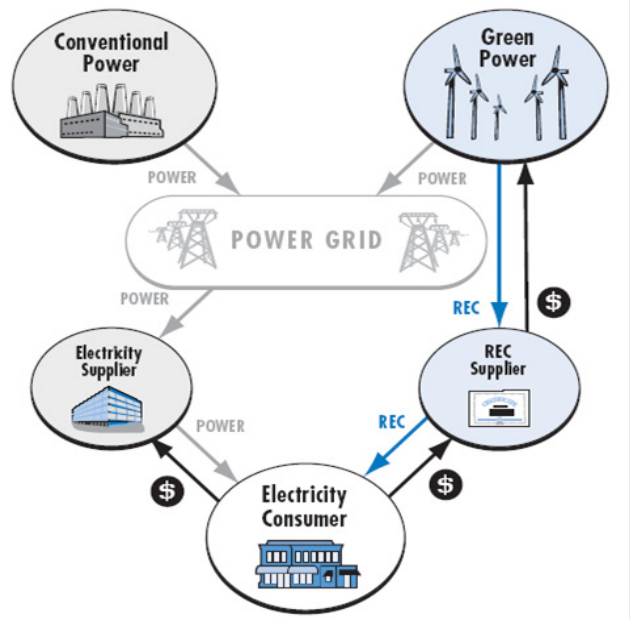
An electricity supplier demonstrates compliance with RPS requirements by one of these three mechanisms:

- Own a renewable energy facility and retain its renewable electricity, including the renewable energy certificates (RECs).
- Purchase electricity and RECs from a renewable facility (sometimes called renewable electricity or bundled renewable electricity).
- Purchase RECs only (sometimes called unbundled RECs).

A REC is a tradable right (separate from the electrical energy itself) to the environmental, social, and other generator attributes associated with 1 megawatt-hour (MWh) of renewable electricity generated by a specific facility. These attributes convey information about the generator, such as: type of resource (e.g., wind), plant-level air emissions (if any), geographic location, nameplate capacity (megawatt [MW]), commercial operation date, ownership, and eligibility for RPS compliance or voluntary market certification. A REC is the basis for demonstrating renewable electricity ownership, procurement, use, and compliance (CRS 2014).

Unlike procuring renewable electricity (bundled electricity and RECs), REC-only transactions are not constrained by the physical delivery of electricity over the power grid. They can therefore be traded between two parties regardless of the location of the generator relative to the utility seeking compliance under an RPS. State RPSs typically limit the eligibility of RECs based on either the location of the generating facility or whether it sells power to the state or to the regional grid. As of January 2014, 35 states and territories allow RECs to satisfy either mandatory RPS requirements or voluntary renewable portfolio goals (CRS 2014).

Figure 5.2: Renewable Energy Certificates Illustrated



Source: DOE and EPA 2010

Objective

States create RPS programs because of the energy, environmental, and economic benefits of renewable energy. Many states have also adopted RPS programs to stimulate market and technology development and to ultimately help make renewable energy competitive with conventional forms of electric power.

Benefits

RPS benefits are the same as those from renewable energy in general:

- Environmental improvement (e.g., less air and carbon pollution, climate change mitigation, waste reduction, habitat preservation, conservation of water and other valuable natural resources).
- Increased diversity and security of energy supply, with greater reliance on domestic, regional, and in-state resources.
- Reduced volatility of power prices given the stable (or nonexistent) fuel costs of renewables.
- Local economic development resulting from new jobs, taxes, and revenue associated with new renewable capacity (NREL and LBNL 2014).

An RPS can function in both traditionally regulated and competitive state electricity markets. Furthermore, states often find that RPS requirements provide a cost-effective approach to achieving energy and environmental goals. Because RPS compliance is market-based, an RPS typically leads to development of the most cost-competitive forms of renewable energy (currently wind power in most cases), unless the RPS includes features that also encourage higher cost renewable technologies. Finally, because it is market-based, an RPS can achieve its policy objectives efficiently and with relatively modest impacts on customer bills.

States with RPS Requirements

Tremendous diversity exists among state RPSs with respect to the minimum requirements of renewable energy and implementation timing (see Tables 5.1 and 5.2), as well as eligible technologies and resources. Although no new states have enacted RPS requirements since 2009, states with existing RPS policies have continued to refine their rules to reflect new technology, resource, and policy considerations that have changed over time. Between 2007 and 2013, 24 states passed major revisions to existing RPS policies. For example, 11 states have added solar and/or DG set-aside requirements since 2007 (LBNL 2013).

Many of the early RPS laws emerged as part of state deregulation of the electricity sector. However, states that are not deregulated have adopted RPS requirements while addressing other policy concerns, such as rising natural gas and coal prices or climate change. To date, 13 states and Washington, D.C., have enacted RPS requirements as part of restructuring legislation,[44] and 16 states have enacted RPS requirements under traditional utility regulation (NREL and LBNL 2014).

[44] A restructured market is defined here as one in which "the traditional electric utility monopoly, where the utility provides generation, transmission, and distribution, has been split. Customers in restructured states can choose which electric service company will supply their generation." The following states are thus counted as operating in restructured markets: Connecticut, Delaware, Illinois, Massachusetts, Maryland, Maine, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Texas, and Washington, D.C. (NREL and LBNL 2014).

Table 5.1: Mandatory State RPS Requirements

State	Main Target	Solar or DG* Target
AZ	15% by 2025	4.5% customer-sited DG by 2025 (half from residential)
CA	33% by 2020	
CO	30% by 2020 (IOUs) 10% by 2020 (co-ops and large munis)	IOUs: 3% of the 2020 requirement DG by 2020 (half customer-sited) Co-ops: 0.75 to 1% DG by 2020 (depending on size) Various credit multipliers available
CT	27% by 2020	IOUs must solicit 15-year contracts for ZRECs and LRECs from customer-sited facilities of up to 1 MW (ZRECs) and 2 MW (LRECs), within certain annual budgets.
DC	20% by 2020	2.5% solar by 2023
DE	25% by 2026	3.5% solar by 2025, 3x multiplier for solar installed before Jan. 2015
HI	40% by 2030	
IA	105 MW	
IL	25% by 2025	1.5% solar PV by 2025 1% DG by 2015 (50% <25kW)
KS	20% by 2020	
MA	22.1% by 2020 New renewable energy: 15% by 2020 (+1%/year after)	1,600 MW by 2020
MD	20% by 2022	2% solar by 2020
ME	30% by 2000 New renewable energy: 10% by 2017	
MI	10% and 1,100MW by 2015	3x multiplier for solar
MN	25% by 2025 (Xcel: 31.5% by 2020)	1.5% solar by 2020 (IOUs)
MO	15% by 2021	0.3% solar electric by 2021
MT	15% by 2015	
NC	12.5% by 2021 (IOUs) 10% by 2018 (co-ops & munis)	0.2% solar by 2018
NH	24.8 % by 2025	0.3% solar electric by 2014
NJ	20.38% by 2021	4.1% solar electric by 2027
NM	20% by 2020 (IOUs), 10% by 2020 (co-ops)	4% solar electric by 2020, 0.6% customer-sited DG by 2020
NV	25% by 2025	1.5% solar by 2025, 2.4x multiplier for PV until 2015

Table 5.1: Mandatory State RPS Requirements

State	Main Target	Solar or DG* Target
NY	29% by 2015	0.58% customer-sited by 2015
OH	12.5% by 2026	0.5% solar electric by 2026
OR	25% by 2025 (large utilities) 5-10% by 2025 (smaller utilities)	20 MW solar PV by 2020 2x multiplier for PV installed before 2016
PA	18% alternative energy by 2021	0.5% solar PV by 2020
RI	16% by 2020	
TX	5,880 MW by 2015	2x multiplier for all non-wind
WA	15% by 2020	2x multiplier for DG
WI	~10% by 2015 (varies by utility)	

Co-op= cooperatively owned utility; GWh= gigawatt-hour; IOU= investor-owned utility; kW= kilowatt; LREC= low emission renewable energy certificate; munis= municipally owned utility; MW= megawatt; Xcel=Xcel Energy; ZREC= zero emission renewable energy certificate

*The solar or DG targets may be part of the renewable energy targets or in addition to the renewable energy targets in the Target column. It varies by state.

Sources: LBNL 2013; DSIRE 2015d, 2015e

Table 5.2: Voluntary State Renewable Portfolio Goals

State	Target	Comments
AK	50% by 2025	RPS to be developed
IN	10% by 2025 (includes non-renewable alternative resources)	
ND	10% by 2015	
OK	15% by 2015	
SD	10% by 2015	
UT	20% by 2025	Extra credit for solar or customer-sited renewable energy
VA	15% by 2025	Extra credit for solar or customer-sited renewable energy
VT	Renewable energy meets any increase in retail sales by 2012 20% renewable energy and CHP by 2017	Even though utilities are required to contract with renewable generators, purchase of RECs is not required.

CHP= combined heat and power

Source: DSIRE 2015d

Designing an Effective RPS

There are several key elements states consider in designing effective RPS requirements. These elements include stakeholders, goals and objectives, program applicability, resource assessments, resource and technology eligibility, program structure, and administration. The discussion that follows reflects lessons learned from states' experiences in developing and implementing RPS requirements. In addition, this section provides insights on interactions of the RPS requirements with other state and federal policies.

Stakeholders

A number of organizations can actively participate in designing RPS requirements. While state legislatures and utility commissions play a central role in designing policy and regulations, it is important to include other stakeholders who are impacted by RPSs in the RPS design process. The role of each of these stakeholders is detailed below:

- *State legislatures/governors.* Typically the state legislature enacts legislation to mandate RPS requirements. However, in some states, legislation is not always necessary to introduce RPS requirements. For example, Colorado, Missouri, and Washington adopted RPS requirements by state ballot initiatives. In New York and Arizona, the utility commissions established RPS requirements under their existing regulatory authority by adopting administrative rules. Governors sometimes also play an active role in shaping RPS-related policies.
- *State public utility commissions (PUCs).* A state's PUC or other state agency is generally tasked with establishing the detailed rules governing RPS requirements. In crafting detailed RPS rules, state agencies follow the enabling legislation's intent and requirements but must sometimes resolve technical and policy issues that can influence the program's effectiveness.
- *Renewable electricity generators.* The efforts and ability of renewable energy developers to build new generating facilities are critical to the success of RPS requirements. Therefore, the legitimate commercial needs of these generators are an important component of the design phase. These needs can be addressed by facilitating long-term contracts, streamlining permitting processes, etc., so that generators have more certainty in the financial success of renewable projects.
- *Utilities.* Whether operating in restructured electricity markets or in traditionally regulated states, utilities are usually the entities on which RPS obligations fall. Ensuring that utility needs are addressed (e.g., recovery of compliance costs associated with RPS requirements) is vital in making RPS requirements effective.
- *Competitive electric service providers (ESPs).* In states that support retail electric choice, competitive ESPs that provide generation service to customers are usually subject to RPS requirements. Administrative feasibility, flexibility, and compliance provisions are key concerns of many ESPs.
- *Other agencies*. In some cases, states have carved out specific roles for other agencies, while the state PUCs retain overall RPS responsibilities. For example, the New York State Energy Research and Development Authority (NYSERDA) administers New York's RPS. Similarly, in 2007, the Illinois state legislature created the Illinois Power Agency to oversee procurement of RPS requirements for investor-owned utilities supplying electric service to 100,000 customers or more (DSIRE 2015b).
- *Other stakeholders.* Developing RPS rules has involved numerous other stakeholders, including state and local government officials, environmental organizations, ratepayer advocates, labor unions, trade associations, project developers, and others.

Goals

States often have multiple RPS goals, such as benefitting the environment, developing local economies, hedging fossil fuel price risks, and advancing specific technologies (NREL 2007). Depending on their goals, states may have broader "clean energy standards," requirements that encompass more than just renewable energy. Some requirements, such as those in Pennsylvania and Ohio, are called alternative energy portfolio standards. They may have a separate tier or target for non-renewable technologies that the state wants to support, but sometimes renewable and non-renewables (e.g., fuels cells and combined heat and power [CHP]) qualify within the same tier.

Similarly in some states, energy efficiency may be eligible to satisfy an RPS, again sometimes as a separate tier (as in Connecticut) or in direct competition with renewables (as in North Carolina, though it is currently limited to a maximum of 25 percent of the target). CHP is often eligible as an efficiency resource.

Regardless of the scope, these goals can serve as a guide to design choices for RPS requirements. It is important, therefore, to clearly articulate these goals and objectives during rule implementation and to ultimately produce the best RPS design for the state.

Applicability

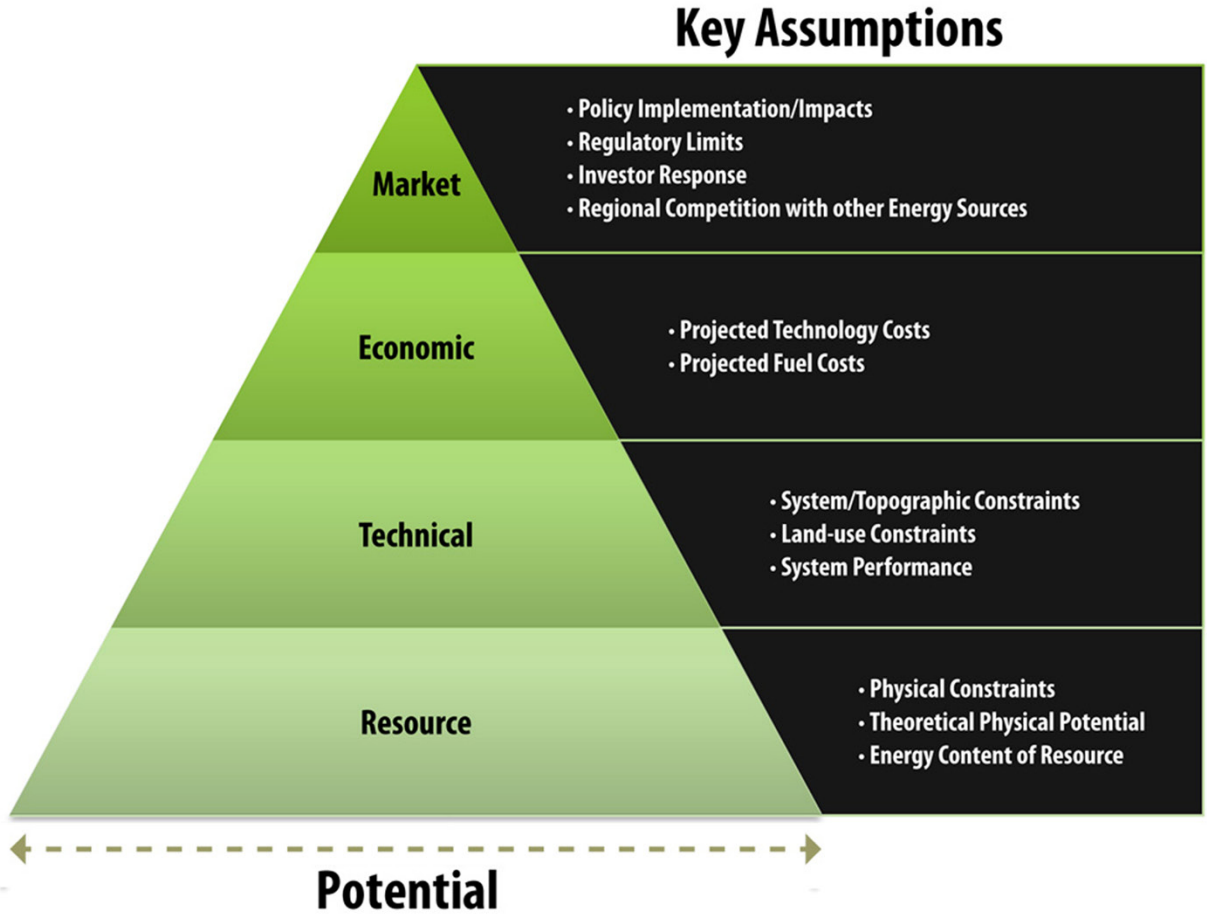
A common RPS policy element is determining the applicability of the requirements to utilities and ESPs. Some states have exempted municipally and cooperatively owned utilities from RPS requirements if they are not regulated by the PUC. Other states have adopted separate RPS requirements for municipally and cooperatively owned utilities, despite them being predominately self-regulated. For example, the Colorado, Washington, Oregon, and North Carolina RPS rules include specific requirements for municipally and cooperatively owned utilities (DSIRE 2015d).

States may also determine applicability by utility size, for example, exempting smaller utilities regardless of how they are governed or regulated. Some states allow certain customer loads to opt out of the RPS, thereby avoiding cost recovery and reducing the utility load to which the RPS targets apply. For example, Texas allows customers that receive electric service at transmission-level voltage to opt out, and Maryland allows industrial process load to opt out. Some states, such as Colorado, allow municipally or cooperatively owned utilities to opt in to the common RPS requirements.

Assessing Renewable Energy Resource Potential

States can use existing information to assess renewable energy resource potential for development in their state or region. For instance, the National Renewable Energy Laboratory (NREL) has developed maps and tools to conduct renewable energy resource assessments at the state, national, and international level (NREL 2013b). Assessments are available by renewable energy resource (e.g., solar energy) and technology type (e.g., solar PV and concentrating solar power) as well as potential under a range of assumptions (e.g., technical, economic). Using recent assessments will inform many of the necessary decisions in designing an effective RPS.

Figure 5.3: Defining Potential



Source: NREL 2012

Resource and Generator Eligibility

States with successful RPSs have ensured that a resource or technology's eligibility aligns with the objectives of the RPS. States need to address different topics during the process of defining resource and technology eligibility:

- *Technologies and fuel.* Which fuel sources and energy production technologies will be eligible? Some fuel sources are universally accepted (such as wind and solar PV), with almost no technology or project limitations. Other fuels have sometimes been excluded (e.g., municipal solid waste), or conditioned upon qualifying project technologies (e.g., run-of-river hydroelectric), project scale (e.g., small hydro), or project performance characteristics (e.g., low emission biomass combustion).

Eligible technologies may also include concentrating solar thermal, geothermal, ocean thermal, tidal and wave energy, and landfill gas. There are many states that consider CHP systems as a qualifying technology; however, they differ in their eligibility criteria.[45]

- *Existing versus new.* How are renewable resources built prior to the establishment of RPS requirements to be treated? Do they count toward RPS compliance or not? States have typically set a date to establish which renewable resources are eligible based on project commissioning. Some state rules are designed to prevent existing renewables from capturing additional revenues related to the RPS, which could increase ratepayer costs. However, other states may have an interest in ensuring there is some support for renewables already operating, and may therefore develop separate technology carve-outs within the RPS requirement for existing and new renewables.
- *Geographic eligibility and deliverability.* In which geographic area must the resources be located to be eligible under RPS requirements (e.g., energy generation just within the state or energy generation within a regional power market)? Does it suffice for a renewable project to deliver into the broader regional transmission organization (RTO)/independent system operator (ISO) that serves the state? RPS requirements and other policies in neighboring states may also affect this decision. For instance, many Mid-Atlantic state RPSs allow out-of-state resources to contribute, so long as they deliver into the broader PJM network. This allows developers to consider projects in the Midwest, where resources may be more cost-effective. Strict in-state eligibility requirements may raise legal concerns under the Interstate Commerce Clause (ICC), which prohibits states from favoring local industry to the disadvantage of out-of-state competitors (CESA 2011).[46]

Structure

While RPS requirements vary and program designs continue to evolve, experience with some program elements to date have identified best practices for structuring RPS requirements. These structural elements include:

- *Amount of renewable energy.* A key element of an RPS is the size of the renewable energy target. As shown in Tables 5.1 and 5.2, program targets vary from 10 to 40 percent and are influenced by many factors, including a state's goals, renewable energy potential, and definition of eligible technologies and resources. Sometimes siting, public acceptance, and balance of system capabilities (e.g., transmission capacity) also influence the amount of renewable energy that can ultimately be accessed. A number of states have increased their targets after the initial adoption of an RPS. The ramp rate for achieving the ultimate RPS target is also important. Every state will have unique economic, environmental, and policy factors that lead to the creation of a best-fit approach. States have found that since there are no absolutes, the keys to success are careful analysis and modeling of the expected impacts before establishing the targets.

[45] In a number of states, CHP of all fuel types qualify while in others (e.g., Arizona) only renewably fueled CHP qualifies. Some portfolio standards, however, only recognize certain fuel-type CHP systems. Some standards define CHP system characteristics, such as power-to-heat ratios, cost-effectiveness thresholds, and eligibility requirements for systems to be installed before or after specific dates (EPA 2013).

[46] While court interpretation may vary depending on the specific situation, these cases demonstrate the importance of carefully considering geographic eligibility requirements when drafting RPS policies. In 2010, TransCanada Power Marketing sued the state of Massachusetts in federal district court, claiming that implementation of the state's RPS violated the ICC. Although the parties reached agreement out of court, the lawsuit raised concerns about the constitutionality of certain geographic eligibility provisions in state RPS requirements. Other legal cases have continued to raise ICC concerns; some have been resolved and others are still pending (CESA 2014). See CESA (2011) for policy recommendations on how to avoid RPS conflicts with the ICC.

- *Targeted support among eligible resources.* States may have policy interests in promoting particular renewable energy technologies and deployment locations to advance market competitiveness or other social, economic, or environmental objectives (NREL 2007). Technology tiers (also known as "carve-outs" or "set-asides") and credit multipliers are the primary approaches used to meet these objectives. A technology tier establishes a specific target for the subset of technologies or resources within that tier, sometimes "carved out" of the overall RPS obligation and sometimes in addition to the main tier targets. These eligible technologies may be viewed as crucial for renewable policy objectives but may be less competitive due to higher cost, greater technical difficulty, or other market barriers. For example, New Jersey has a solar tier that requires that 4.1 percent of retail sales be supported by solar electric generation by 2028.

  The most common resource tier approaches taken to date include: 1) separate tiers for new and existing resources; 2) separate tiers differentiated by broad groups of eligible technologies or fuel types; and 3) a separate carve-out or tier for a specific technology, fuel type, or location (such as solar, customer-sited DG, offshore wind, or renewables sited on eligible landfills or brownfields). With respect to customer-sited projects, states should address whether RECs will be procured in exchange for a rebate, by a separate payment for REC value, or via a solar renewable energy certificate (SREC) market. In any case, states should be very clear and unambiguous about whether the utility or the customer has rights to the RECs and under what circumstances.

- *Time horizon.* Adequate time is required to establish, implement, and create new renewable electricity facilities and markets. Therefore, RPS requirements with sufficiently long timelines will enable markets to develop. They will also provide project developers and investors time to plan and recover capital investments. RPS requirements typically start at modest levels and ramp up over a period of 10 to 20 years from the first year of compliance to the year the ultimate target is reached. Most states also require that once reached, the target percentage or capacity be maintained indefinitely. RPS requirements that persist will inspire confidence among developers and financiers.

- *Energy versus capacity.* Most states have chosen to base RPS targets on percentage of retail energy sales (MWh) rather than installed capacity (MW). While targets based on retail sales are straightforward to calculate because energy is measured by a common denominator (MWh), there is less certainty on the actual target itself as future retail sales are uncertain. Moreover, calculating percent of retail sales can involve several questions about what basis to use for retail sales (e.g., use retail sales from the current year, the previous year, or some other historical baseline year). Conversely, while there is more certainty on a capacity-based target, the actual output for each MW can vary widely depending on the technology type; therefore, the share of renewables in the generation mix can vary from year to year. Currently, Iowa and Texas have capacity-based targets in their RPSs. Kansas also has a capacity-based target, although the capacity is based on peak demand and can therefore fluctuate from year to year. Massachusetts has an energy-based RPS target, but also has a capacity-based carve-out for solar.

- *Mandatory or voluntary.*[47] While the longevity of RPS requirements is crucial for project financing, developing new renewable energy projects also depends on instilling investor confidence in the REC market and other trading mechanisms related to RPS requirements. To create investor confidence that demand will be more predictable and certain, most states use an RPS or mandatory structure with financial consequences for noncompliance. A renewable portfolio goal that is not enforced may do little to provide investors with sufficient assurance that financial returns will be adequate to invest in new renewable

[47] Strictly speaking, an RPS is a mandatory target with potential financial penalties for noncompliance. However, there are states that have well-defined voluntary renewable portfolio goals (see Table 5.2).

facilities, especially when renewable energy options are more expensive than conventional power supplies. In addition, compliance obligations that apply to the broadest possible group of retail sellers, including both default service providers (distribution utilities) and competitive energy service providers, will increase demand for renewable resources.

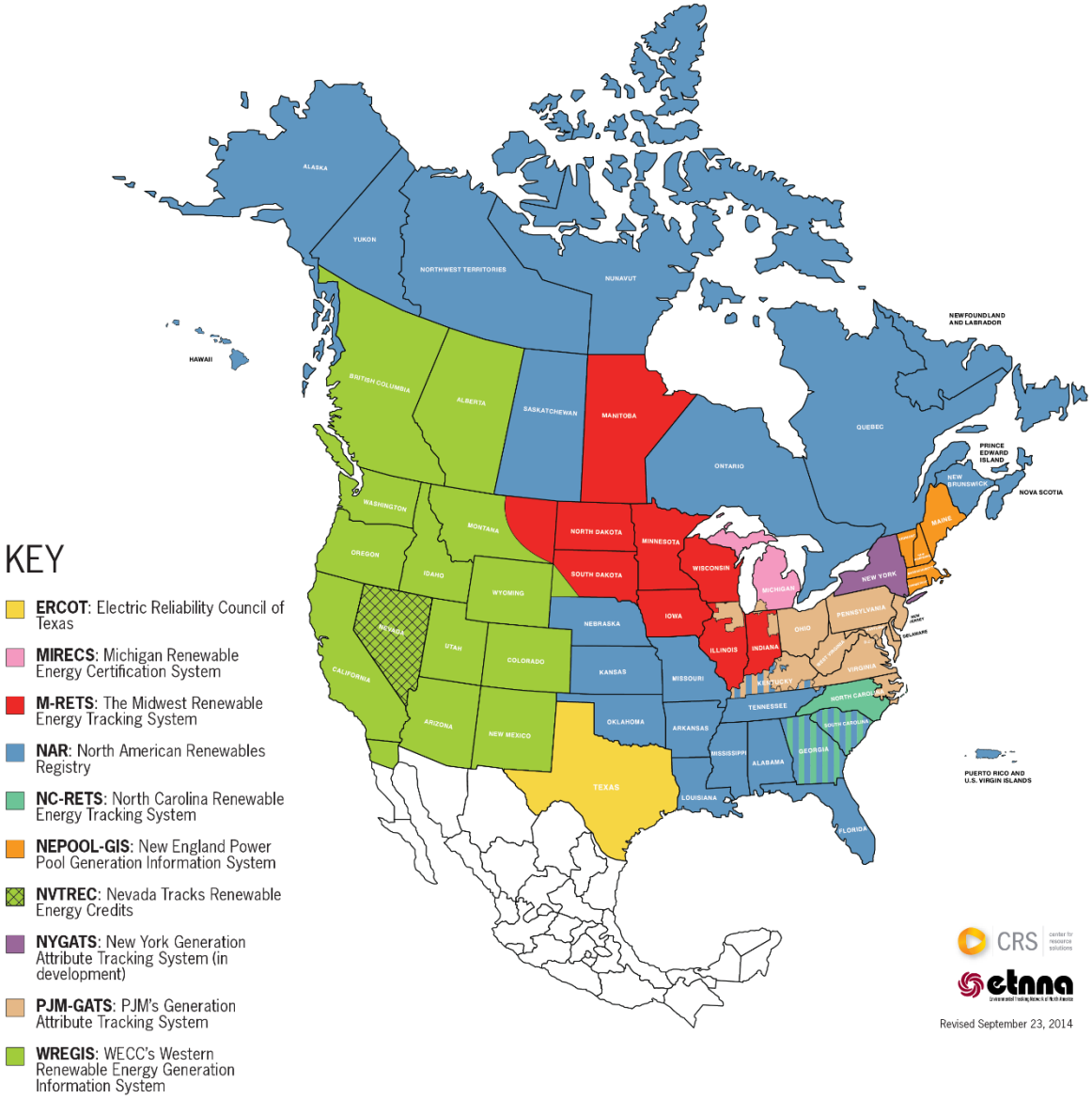
Administration

When considering how the RPS requirements will be administered, some key issues include:

- *Planning and reporting compliance strategy*. Under traditional regulation, PUCs can require utilities to submit RPS compliance plans in advance to demonstrate that they are on track to meet their renewable requirements. Moreover, making such plans public will allow stakeholders to provide their input on compliance strategies, so as to ensure that RPS goals are being met and that the least cost options are being pursued.
- *Accounting.* For RPS compliance, it is important to accurately and regularly account for the renewable energy generated and delivered to consumers. Most states require affected utilities to file an annual report demonstrating compliance, which is usually shown by ownership and retirement of RECs issued by state or regional tracking systems.[48] (See Figure 5.4 for a map of existing tracking systems.)
- *Enforcement*. Enforcement options are numerous, but a number of states use an alternative compliance payment, especially in restructured states. Under such a policy, if a retail supplier cannot meet its RPS obligation by acquiring the renewable electricity or RECs, the supplier must pay a per-kilowatt-hour (kWh) charge for the shortfall. Alternative compliance payment rates vary, generally ranging from 1 to 6 cents per kWh, with higher amounts for solar-specific RPS requirements (e.g., up to 52 cents per kWh in Massachusetts, but declining by 5 percent annually). These may or may not be recoverable in rates, depending on the state treatment. Some states "recycle" payments to support energy efficiency and renewable energy development. In Ohio, the cost of alternative compliance payments is not recoverable by the utilities (a true penalty), while costs may be recovered in other states. States without alternative compliance payment options can usually enforce compliance with financial penalties, which are explicit in some states and discretionary in others.
- *Flexibility mechanisms.* Because retailers may face difficulties in complying with a renewable energy purchase obligation, many states provide flexibility mechanisms for retailers. For instance, there may be uncertainty about when a project may come online due to lengthy permitting processes or doubt about how well the project will actually perform. These mechanisms can allow a retail supplier to receive credit for renewable energy generated before the compliance date (e.g., credit for early compliance, forward compliance banking, REC banking) and some flexibility when compliance is not met by the specified date (e.g., deficit banking, true-up period). Similarly, allowing for multi-year compliance periods also provides more flexibility to utilities without compromising RPS end goals. The alternative compliance payment, discussed above, is also a flexibility tool.

[48] Before issuing RECs, the tracking systems verify generator characteristics and the amount of electricity generated from each. Once issued, RECs may be traded from one party to another. REC ownership gives the owner the right to use it for RPS compliance or for other purposes. The tracking systems provide reports to utilities or others who can use them to substantiate RPS compliance claims. For more on tracking systems, see: http://www.epa.gov/greenpower/gpmarket/tracking.htm; http://www.cesa.org/assets/2014-Files/RECs-Attribute-Definitions-Hamrin-June-2014.pdf; and http://www.resource-solutions.org/pub_pdfs/Tracking%20Renewable%20Energy.pdf.

Figure 5.4: North American Certificate Tracking Systems



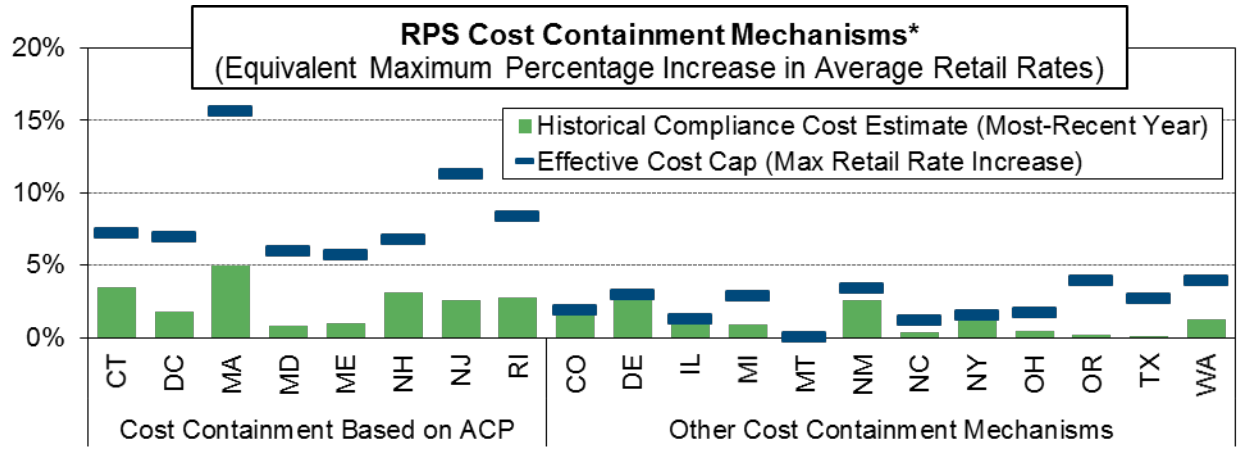
Source: ETNNA 2014

- *Cost recovery.* Retail suppliers will likely incur costs to comply with RPS requirements by buying RECs, developing renewable generation, or entering into power purchase agreements (potentially at above-market rates). Therefore, RPS requirements generally have a mechanism to enable the utility to pass eligible costs on to retail customers via existing rate structures or by a new surcharge to utility bills.
- PUCs do not regulate competitive retail supplier rates; therefore, suppliers will need to recover their costs through the prices they charge to their customers who are subject to competitive market conditions. In many RPS states, the cost of alternative compliance payments may be recovered in utility rates or in

competitive retail supplier electricity prices. However, in some states, cost recovery depends on whether these costs were prudently incurred. In Ohio, alternative compliance payments are not recoverable.

- *Cost caps.* In response to concerns over the impact of RPS policy costs on consumers, many states have adopted cost caps to place an upper bound on ratepayer impacts. These cost caps may be set as a percent increase in retail rates, a percent of utility revenue requirements, or as a cap on the increase in consumer monthly bills (NREL and LBNL 2014). Cost caps may also take the form of an alternative compliance payment. By setting a price that suppliers can pay in lieu of acquiring the renewable energy or RECs, the alternative compliance payment functions as a cap on retailers' exposure to potentially high renewable energy prices. When used, alternative compliance payments typically reflect an inadequate supply of eligible renewables with regard to RPS requirements and can generally be recovered from the customers by regulated utilities. Effective caps are usually low enough to limit ratepayer impacts, but high enough to encourage renewable energy development (see Figure 5.5).

Figure 5.5: Most States Have Capped Rate Impacts Below 10 Percent and Many Below 5 Percent



** For states with multiple cost containment mechanisms, the cap shown here is based on the most-binding mechanism. MA does not have a single terminal year for its RPS; the calculated cost cap shown is based on RPS targets and ACP rates for 2020. "Other cost containment mechanisms" include: rate impact/revenue requirement caps (DE, KS, IL, NM, OH, OR, WA), surcharge caps (CO, MI, NC), renewable energy contract price cap (MT), renewable energy fund cap (NY), and financial penalty (TX). Excluded from the chart are those states currently without any mechanism to cap total incremental RPS costs (AZ, CA, IA, HI, KS, MN, MO, NV, PA, WI), though some of those states may have other kinds of mechanisms or regulatory processes to limit RPS costs.*

Source: LBNL 2014

A recent analysis of RPS ratepayer impacts found that estimated RPS compliance costs were roughly equal to less than 3 percent of average retail electricity rates (LBNL 2014). It is important for states to perform such analyses in conjunction with the design of an RPS to ensure that the renewable energy target is not set too high, which would result in higher costs.

Interaction with Federal and State Programs and Policies

RPS programs will be more effective if they are reinforced by complementary federal and state programs and policies. Being aware of these programs and policies, their goals, and how they might affect RPS requirements will help states design their RPS. They will avoid implementation pitfalls by assessing in advance how RPS requirements would interact with both state and federal policy.

Interaction with Federal Programs and Policies

- *Federal tax credits.* Federal corporate tax credits, such as the renewable energy production tax credit (PTC), the business energy investment tax credit (ITC), and the Modified Accelerated Cost Recovery System (MACRS), offer financial incentives to renewable energy developers for qualifying forms of renewable energy. The basis for these credits and incentives differ. The PTC provides an inflation-adjusted per-kWh tax credit for electricity generated by qualified energy resources. The ITC provides a tax credit based on a specific percentage of expenditures on eligible systems. The MACRS provides the basis for depreciation deductions for certain renewable energy properties (DSIRE 2015a). The PTC has been extended mostly in 1- to 2-year intervals since first enacted and has lapsed several times. These lapses resulted in significant decreases in project completions during those periods (AWEA 2014). Both the PTC and the ITC are important to the economic feasibility of many new projects that supply state RPSs, and are therefore critical to meeting RPS goals. It is up to Congress whether to renew these frequently debated policies.
- *Transmission facility extension costs*. Transmission line extensions can be costly for remotely sited projects. Without affordable transmission, renewable energy projects are unlikely to be built, and RPS supply may go unmet. Whether transmission line extensions (and the projects they serve) get built may depend on the allocation of transmission costs. In determining who pays for the build-out of transmission, policy-makers judge whether line extensions provide societal benefits, such as reliability, and therefore might justify socializing the costs, or whether the developer is the principal beneficiary, which suggests that the developer alone must shoulder the costs. Although siting transmission is a state issue, how to allocate transmission costs is within FERC's jurisdiction. States can communicate their position on the need for the projects both to the RTO (or control area operator) and to FERC. Regarding cost allocation, regulators should be prepared to question cost allocation recommendations, to consider whether new renewable projects provide system benefits or only project benefits, and to allocate costs accordingly.

Interaction with State Programs and Policies

- *State, local, and utility financial incentives.* Most states or utilities offer incentives for renewable energy development, particularly for customer-sited renewable projects, because they have a hard time competing with utility-scale projects on cost. For instance, since distributed solar is relatively more expensive than other forms of renewables, states often use financial incentives (such as tax exemptions, rebates, or production-based payments or credits) to support small to moderate-sized solar projects. This support can be in addition to DG or solar carve-outs that are included in the RPS. In adopting incentive programs, states should be clear about who owns the RECs (the customer that owns the project or the state/utility that provided the incentive) and should pay attention to whether the additional incentives go further than necessary to create a level playing field. Websites such as http://www.dsireusa.org and http://www.cleanenergystates.org track such individual state and utility renewable energy incentive policies for the entire country.
- *Long-term contracting.* In states with traditional utility regulation, utilities are typically responsible for long-term planning and they have a long-term outlook. However, the rules differ in states with a restructured electricity sector. In many cases, uncertainty about future loads means that default service providers and competitive retail suppliers might not be willing to enter into long-term contracts for renewable electricity or REC purchases. This limits the ability of renewable energy developers to secure project financing, which typically requires a sufficient long-term revenue stream to ensure adequate debt coverage ratios used by project financiers. Some restructured states have addressed this problem by directing distribution utilities to enter long-term purchase agreements through competitive solicitations; if approved by the PUC prior to contract execution, cost recovery will be assured. Getting new projects built

will increase the supply of renewable energy for RPS compliance, and increasing supply will help lower the price of RECs and the cost of RPS compliance. To learn how this might work, states can review other states' policies that encourage or require long-term contracting, such as Maine, Massachusetts, and Rhode Island.

- *Interconnection standards.* Smaller-scale DG projects are sometimes subject to the same, frequently lengthy and costly, interconnection procedures as larger projects even though their system impact is likely to be significantly less. If interconnection procedures are overly expensive in proportion to the size of the project, they can overwhelm project costs to the point of making clean DG uneconomical. In some states, each utility may have different interconnection requirements for similar projects, creating a challenge for developers of multiple small projects. Standard interconnection rules establish uniform processes and technical requirements that apply to utilities and proposed projects within the state. Removing these barriers to DG makes it easier to meet RPS DG or solar targets. States may wish to revisit or update their interconnection requirements to ensure that they are appropriate and consistent for projects of similar size. For more information, see Section 7.3, "Interconnection and Net Metering Standards."
- *Emissions regulations.* Some states have expressly prohibited eligible RPS resources from selling emission allowances or credits they obtain through state environmental incentive programs. Many other state RPS rules are silent about the interaction between emission rules and RPS requirements. Uncertainty and confusion, and potentially double claims, may result. Generally, RPS requirements are intended to produce environmental benefits. A clear statement of policy with respect to avoided emissions, emission reductions and allowances, would reduce the likelihood of double counting these benefits. Since most states require RECs for RPS compliance, it is important to know what environmental attributes must be included with a REC. States can remove uncertainty and make explicit their policy intention by carefully defining the environmental attributes of a REC. Distinguishing clearly between direct, plant-level emissions (zero for most renewable sources), on the one hand, and emission allowances or avoided emissions, on the other, would be helpful.
- *Voluntary green power programs and double claims.* Efforts to encourage renewable energy purchases by electricity consumers are intended to increase renewable energy sales beyond the levels mandated by RPS requirements. If this voluntary demand is also counted towards satisfying a mandatory RPS, consumers' voluntary demand will diminish because voluntary buyers want their purchase to have an effect that is above and beyond what is required by law or regulation. As a result, many states prohibit counting voluntary demand toward RPS compliance. Additionally, double counting voluntary demand will result in lower effective amounts of renewable energy being supported by RPS requirements. As a result, many states prohibit double counting: RECs used to satisfy an RPS may not be counted towards any voluntary program or product. States can review their RPS rules to make sure that voluntary demand is not counted for RPS compliance, and that double claims are prohibited. For example, the New Jersey RPS rules specifically prohibit the sale of RECs used for RPS compliance in voluntary green power programs, and vice versa (NJCEP 2014).

Examples of RPS Design Choices and Approaches

Many innovations and best practices can be found in state RPSs, some of which have already been described. The following are a sampling of additional noteworthy elements in these rules. State cases are shown in the *State Examples* section later in this chapter.

- *REC tracking.* Texas was the first state to adopt the use of RECs to verify compliance and develop an efficient renewables market. Texas regulators also saw RECs as complementary to their efforts at restructuring the broader electricity market. State RPS rules now commonly use RECs for RPS compliance,

as well as REC tracking systems for verification and avoiding double-counting. State REC use also supports environmental claim verification in voluntary markets.

- *Stakeholder review.* After Massachusetts adopted legislation mandating RPS requirements, the Massachusetts Department of Energy Resources (DOER) conducted an extensive stakeholder consultation process and commissioned a wide-ranging analytical review of design issues related to RPS requirements. This review process led to the creation of 12 white papers on key RPS requirement topics with important insights and analytical support for eventual design choices. DOER engaged stakeholders in a similar process during the development of the state's SREC I Solar Carve-Out in 2009–2010, and the SREC II Carve-Out in 2013–2014.
- *Technology tiers.* In 2001, Arizona was one of the first states to adopt a technology tier approach in its RPS. At the time, Arizona mandated that at least 50 percent of renewable energy requirements come from solar electric sources as of 2001. The state increased that number to 60 percent by the 2004–2012 timeframe. Although Arizona has since made significant revisions to this policy, a number of states have followed their example and have used technology tiers in subsequent development of RPS requirements. For example, 17 states and Washington, D.C., currently have technology tiers for solar generation or DG as a component of their RPS requirements (LBNL 2013).
- *RPS policy goals*. California's RPS goals include improved public health and environmental quality, as well as reduced burning of fossil fuels and the associated environmental impacts. These goals are linked to California's definition of a REC and its environmental attributes, including all credits, benefits, emissions reductions, offsets, and allowances directly attributable to the eligible generation.
- *Long-term perspective*. New Mexico has provided a long-term, stable investment environment by extending the final year's target of 20 percent by 2020 "and thereafter," so that investors will not face a demand cliff as the RPS target approaches its zenith.
- *Cost caps*. In Colorado, RPS costs may not exceed 2 percent of the total electric bill annually for each customer. Michigan has expressed its cost caps as a fixed dollar amount per month, differentiated by customer class. Both are calculated as the incremental cost of compliance.

Best Practices: Designing an RPS

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

- Assess renewable energy potential that is available for development under a range of assumptions.
- Develop broad support for an RPS, including top-level support from the governor and/or legislature.
- Clearly articulate all RPS goals and objectives, since these will drive 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.

Implementation and Evaluation

This section provides an overview of the implementation and evaluation of RPS requirements.

Roles and Responsibilities of Implementing Organizations

States enacting RPS requirements (e.g., the state legislature) designate one agency as the primary implementation authority. A number of agencies and organizations will likely be involved in the implementation regardless of which agency is named as lead. These include:

- *State PUCs.* PUCs will be involved in enforcing RPS requirements and overseeing cost and ratepayer issues.
- *State energy offices.* These offices, or similar State Public Benefit Corporations (e.g., NYSERDA) and quasi-public agencies (e.g., Massachusetts Clean Energy Center or Connecticut Green Bank), may provide financial support for new facilities and may also be responsible for siting new projects. They can also be actively involved in developing administrative rules based on legislation and are often required to conduct evaluations and provide reports to the legislature, sometimes with recommendations on possible revisions. These agencies may also be involved in "making the market" by supporting emerging REC markets and administering renewable energy funds that are targeted toward enhancing compliance with RPS requirements.
- *ISOs.* ISOs (e.g., Energy Reliability Council of Texas or RTOs) may support REC tracking systems by providing data on generation and loads; they may also support markets for renewable energy generation.

Evaluation

Periodic evaluation of RPS requirements is key to their success (CESA 2012, 2013). The enabling legislation for RPS requirements sometimes includes provisions for annual or periodic evaluation and reporting of progress. Massachusetts, for example, requires an annual report.

While scheduled policy evaluations are important, experience has shown that altering RPS policy midstream without sufficient justification or consistency with the original legislative intent can hinder the program. The danger is that if long-term certainty and stability in the policy are lacking, project developers and regulated retail providers may delay plans and projects and fail to deliver the RPS's intended results.

Best Practices: Implementing an RPS

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

- Identify the most appropriate lead agency or organization for RPS implementation authority.
- Establish a transparent and easy-to-use accounting system for compliance.
- Provide retail suppliers with some flexibility in their compliance.
- Make sure a credible noncompliance enforcement mechanism is in place.
- Conduct a mid-course performance review and make modifications if warranted and consistent with the RPS's original intent.

State Examples

The following state examples illustrate the diverse types of RPS design approaches, policy objectives, and implementation strategies that states have deployed. Each example highlights a particular design issue or policy objective.

California

Increasing Targets by Building on Earlier Successes

In 2002, California set its initial RPS target at 20 percent by 2017. However, the state later accelerated that target to 20 percent by 2010. In 2009, the state instituted a 33 percent standard by 2020 through executive order, later codified in law (CPUC 2015). In 2015, the governor proposed a revised target to 50 percent by 2030.

Massachusetts

Differentiating New from Existing Renewable Resources

Massachusetts has two separate renewable targets: Class I for new resources and Class II for existing resources. The Class I target is set at 15 percent by 2020 and will increase by 1 percent each year thereafter. Eligible resources for Class I must have an online date after December 31, 1997, whereas resources operating prior to that date fall under Class II. By assigning separate tiers for new and existing resources, the state encourages the development of new renewables while also acknowledging and providing some support to existing renewables (DSIRE 2015c).

New Jersey

Requiring a Separate Target for Solar

Even though the state RPS target for New Jersey is 20.38 percent by 2021, it also has a separate target requiring solar resources to meet an additional 4.1 percent by 2028. The separate technology requirement has created a market specifically for RECs from eligible New Jersey solar resources. Given that the price of solar is higher than most forms of renewables, New Jersey SREC prices are also considerably higher than other New Jersey RECs. Therefore, the solar tier allows the state to target its support for solar without distorting the broader REC market (LBNL 2010).

Rhode Island

Determining Eligibility by Delivery of Electricity to the Greater Region

The Rhode Island RPS requires eligible generation units to be located in the New England Power Pool (NEPOOL) control area. However, generation units in an adjacent control area can also qualify if the energy they produce is delivered into NEPOOL for consumption by New England consumers. Therefore, a renewable generator in New York could qualify as an eligible unit under the Rhode Island RPS if it can deliver into the NEPOOL control area to which Rhode Island belongs (RI PUC 2015).

Wisconsin

Supporting Non-Electrical Technologies in its RPS

Wisconsin's RPS lists a few non-electrical technologies as eligible resources, specifically solar water heaters; solar light pipes; ground source heat pumps; and installations that generate output from biomass, biogas, synthetic gas, densified fuel pellets, or fuel produced by pyrolysis. The state also has regulations that direct how eligible RECs can be issued from these resources that do not produce electricity (WI PSC 2012).

What States Can Do

Action Steps for States

RPSs accelerate the development of renewable and clean energy supplies. Benefits include a clear and long-term target for renewable energy generation that can increase investors' and developers' confidence in the prospects for renewable energy. States have chosen from a wide variety of approaches and goals in developing their RPS requirements. The best practices common among these states have been explored above. Action steps are outlined below.

States with existing RPS requirements have made it a priority to identify and mitigate issues that might adversely impact the program's success. The longevity and credibility of the RPS requirements is crucial for investment in new renewable projects. More specifically, states with existing RPS requirements can:

- Monitor the pace of installing new renewable projects to ensure that the renewable resources needed to meet RPS goals will be in place. If adequate resource development is lagging, identify the reasons for any delay and explore possible mitigation options. For example, lengthy siting and permitting policies for renewable projects often present obstacles to successful RPS implementation.
- Monitor utility and retail supplier compliance and the impact on ratepayers. Any significant, unanticipated adverse impacts on ratepayers can be addressed by implementing or adjusting cost caps or other appropriate means.
- Evaluate the scope of eligible technologies and, as needed, consider adding eligible technologies or altering the percentage requirements. At the same time, it is important to recognize that long-term stability and policy certainty are important; frequent changes may undermine the success of RPS requirements.

Broad political and public support for establishing renewable energy goals have been an important part of establishing RPS requirements. Many states have found that after establishing general support for goals, it is helpful to hold facilitated discussions among key stakeholders regarding appropriate RPS design. More specifically, states that do not have existing RPS requirements can:

- Establish a working group of interested stakeholders to consider design issues and develop recommendations for RPS requirements.
- Analyze costs and benefits as they did in New York and Texas.
- Publicize RPS goals as they are reached to ensure that state officials, public office holders, and the public know that the RPS requirements are working and achieving the desired results.

Related actions that states can take include:

- Consider the need for additional policies or regulations that will help make RPS requirements successful. Transmission-related policies have been critical to the success of large wind farms that are some distance from load centers and require transmission line extensions or upgrades. Determining the preferred way to allocate the cost of transmission upgrades or interconnections can impact a state's ability to meet its RPS goals.
- Consider adopting (or improving) policies that facilitate customer-sited clean DG projects, especially if specific DG targets have been adopted.

Information Resources

General Information

Title/Description	URL Address
Evaluating Experience with Renewables Portfolio Standards in the United States. This document provides an analysis of U.S. experience with RPSs, including lessons learned.	http://emp.lbl.gov/sites/all/files/lbnl%20-%2062569.pdf
State-Federal RPS Collaborative. The collaborative serves a forum for dialogue and cooperation among state and federal government officials and other stakeholders involved in the implementation of state RPS policies. The Collaborative publishes reports and papers related to RPS policy and design.	http://www.cesa.org/projects/state-federal-rps-collaborative/ http://www.cesa.org/projects/state-federal-rps-collaborative/rps-publications/
REC Definitions and Tracking Mechanisms used by State RPS Programs. This State-Federal RPS Collaborative report provides an overview of individual state REC definitions and compares state and regional REC tracking systems.	http://www.cesa.org/assets/2014-Files/RECs-Attribute-Definitions-Hamrin-June-2014.pdf
The State of State Renewable Portfolio Standards. This State-Federal RPS Collaborative report highlights achievements of RPS policies, the strengths and weaknesses of RPS policies, and potential challenges to RPS policy success in the future.	http://www.cesa.org/assets/2013-Files/RPS/State-of-State-RPSs-Report-Final-June-2013.pdf
Projecting the Impact of State Portfolio Standards on Renewable Energy and Solar Installations. This PowerPoint presentation estimates and summarizes the potential impacts of existing state RPSs on renewable energy capacity and supply, and of state RPS solar set-asides on solar PV capacity and supply.	http://www.ilsr.org/wp-content/uploads/files/images/solarestimates0105.ppt
Real Energy Solutions: The Renewable Electricity Standard. This fact sheet from the Union of Concerned Scientists provides an overview of a renewable energy standard (RES). An RES can diversify our energy supply with clean, domestic resources. It will help stabilize electricity prices, reduce natural gas prices, reduce emissions of carbon dioxide and other harmful air pollutants, and create jobs—especially in rural areas—and new income for farmers and ranchers.	http://www.ucsusa.org/clean_energy/smart-energy-solutions/increase-renewables/real-energy-solutions-the.html
Renewable Electricity Standards at Work in the States. This fact sheet from the Union of Concerned Scientists gives an overview of some state RESs. In a growing number of states, RESs—also called RPSs—have emerged as an effective and popular tool for promoting a cleaner, renewable power supply.	http://www.ucsusa.org/clean_energy/smart-energy-solutions/increase-renewables/renewable-electricity-1.html
Renewable Portfolio Standards. This NREL website provides a background on RPSs, implementation issues, design best practices, and additional resources.	http://www.nrel.gov/tech_deployment/state_local_governments/basics_portfolio_standards.html
A Survey of State-Level Cost and Benefit Estimates of Renewable Portfolio Standards. This NREL report surveys and summarizes existing state-level RPS cost and benefit estimates based on information provided by electric utilities and state regulators.	http://www.nrel.gov/docs/fy14osti/61042.pdf
State Clean Energy Practices: Renewable Portfolio Standards. This NREL report examines the key factors that impact state RPS outcomes and provides an overview of critical issues and solutions among early adopter states.	http://www.nrel.gov/tech_deployment/state_local_governments/pdfs/43512.pdf

Title/Description	URL Address
Renewable Portfolio Standards Resources. This website is a clearinghouse for RPS-related work published by the Lawrence Berkeley National Laboratory, including PowerPoint presentation updates on the current status of RPSs in the United States as well as data files and analysis.	http://emp.lbl.gov/rps

Information about Federal Resources

Title/Description	URL Address
EPA CHP Partnership. This is a voluntary program that seeks to reduce the environmental impact of energy generation by promoting the use of CHP. The Partnership helps states identify opportunities for policy developments (energy, environmental, economic) to encourage energy efficiency through CHP. The Partnership can provide information and assistance to states considering including CHP or waste heat recovery in their RPS requirements.	http://www.epa.gov/chp/
EPA Green Power Partnership. This program provides assistance to renewable generators in marketing RECs and helps educate potential REC buyers about resources. The Partnership may be of assistance to states that employ RECs as a compliance measure for their RPS requirements but also allow for purchase and retirement of RECs for organizational "green power" designation.	http://www.epa.gov/greenpower

Information about Selected State Programs

State	Title/Description	URL Address
Arizona	Arizona Corporation Commission (ACC) Environmental Portfolio Standard Developments. This website is the ACC archive on RPS rules, suggested amendments, workshops, and public comment.	http://www.azcc.gov/divisions/utilities/electric/environmentab4l.htm
California	California Energy Commission Renewables Portfolio Standard. This website provides a history of the California RPS and relevant renewable energy links.	http://www.energy.ca.gov/renewables/
Hawaii	Hawaii Clean Energy Initiative. This website discusses Hawaii's aggressive mandatory RPS goal of 40 percent by 2030, which is coupled with a 30 percent energy efficiency goal.	http://www.hawaiicleanenergyinitiative.org/

State	Title/Description	URL Address
Massachusetts	Massachusetts DOER: Renewable Portfolio Standard and Alternative Energy Portfolio Standard (AEPS). This website provides an archive on the state's RPS and AEPS requirements, rulings, compliance information, statutes and regulations, and compliance reports.	http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/rps-aps/
	Massachusetts DOER: Renewable Portfolio Standard, RPS Annual Reports. The RPS regulations (at 225 CMR 14.10(2)) require DOER to issue an Annual Energy Resource Report summarizing certain information from the Annual Compliance Filings.	http://www.mass.gov/eea/energy-utilities-clean-tech/renewable-energy/rps-aps/annual-compliance-reports.html
Minnesota	Minnesota Department of Commerce, Division of Energy Resources: Progress on Compliance with the Renewable Energy Standard. This 2013 progress report provides a history of the Minnesota RES and utility compliance information through 2011.	http://mn.gov/commerce/energy/images/2013RESLegReport.pdf
New York	New York State Public Service Commission: Retail Renewable Portfolio Standard. This website provides an archive of documents on New York RPS requirements.	http://www.dps.ny.gov/03e0188.htm
Oregon	Oregon Department of Energy: Renewable Portfolio Standard. This website provides a history of the Oregon RPS, statues, and rules.	http://www.oregon.gov/ENERGY/RENEW/Pages/RPS_home.aspx
Texas	PUC of Texas: Goal for Renewable Energy. This website provides the Texas PUC's archive of documents on RPS requirements.	https://www.puc.texas.gov/agency/rulesnlaws/subrules/electric/25.173/25.173ei.aspx
	Transmission Issues Associated with Renewable Energy in Texas: Informal White Paper for the Texas Legislature, 2005. This document provides data for consideration by legislators in evaluating bills to expand the Texas RPS.	http://www.ercot.com/news/presentations/2006/RenewablesTransmissi.pdf

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CRS. 2014. The Legal Basis for Renewable Energy Certificates. Center for Resource Solutions.	http://www.resource-solutions.org/pub_pdfs/The%20Legal%20Basis%20for%20RECs.pdf

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DSIRE. 2015a. Federal: Incentives/Policies for Renewables & Efficiency. Database of State Incentives for Renewables and Efficiency.	http://programs.dsireusa.org/system/program?state=US
DSIRE. 2015b. Illinois: Incentives/Policies for Renewables & Efficiency. Database of State Incentives for Renewables and Efficiency.	http://programs.dsireusa.org/system/program?state=IL
DSIRE. 2015c. Massachusetts: Incentives/Policies for Renewables & Efficiency. Database of State Incentives for Renewables and Efficiency.	http://programs.dsireusa.org/system/program?state=MA
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NREL. 2012. U.S. Renewable Energy Technical Potentials: A GIS-Based Analysis. National Renewable Energy Laboratory.	http://www.nrel.gov/docs/fy12osti/51946.pdf
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