Incorporating Energy Efficiency and Renewable Energy Policies into Section 111(d) Greenhouse Gas Compliance Plans

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Foreword

States have long been leaders in designing and implementing innovative energy programs and policies, including market-oriented financing programs, voluntary industrial efficiency initiatives, building energy codes, public facilities retrofits, and renewable and energy efficiency standards. As the U.S. Environmental Protection Agency (EPA) finalizes its greenhouse gas performance standards next summer, states will need all of these tools and more to achieve their greenhouse gas reduction goals at the lowest cost possible for consumers and businesses.

This report provides a survey of several innovative energy efficiency and renewable energy programs and policies states have developed, as well as an analysis of their impact in several states in the context of compliance with EPA's pending rule under section 111(d) of the Clean Air Act. The purpose of the report is simply to aid states as they consider their options for 111(d) compliance.

The National Association of State Energy Officials (NASEO) has not taken a position on the merits of EPA's rulemaking. However, should the proposed rule move forward, NASEO believes it is essential to preserve states' options to include a range of existing and future energy efficiency and renewable energy programs. NASEO's determination to preserve states' options in complying with the potential rule is echoed by two other state organizations engaged on EPA's Clean Power Plan – the National Association of Regulatory Utility Commissioners (NARUC) and National Association of Clean Air Agencies (NACAA). Our three organizations (collectively known as the "3N" group) came together to ensure states would have the option of robust inclusion of existing and future energy efficiency and renewable energy programs and policies as one means of potential compliance. The result was a jointly prepared set of principles issued in May 2014 and transmitted to EPA as they considered the draft and final rule.[1]

Among these principles is that EPA should provide a clear path for existing energy efficiency and renewable energy policies, state-overseen investor-owned utility energy efficiency programs, and state coordinated (non-ratepayer) programs which are achieved through private sector investment and actions. These private-sector or "non-ratepayer" programs include energy savings performance contracting, low-income weatherization programs, industrial energy efficiency and combined heat and power, financing, and building energy codes, among other strategies. The total private-sector investment in energy efficiency is substantially larger than either ratepayer or taxpayer-funded programs and offers a potential least cost approach to compliance when combined with existing state policies such as those analyzed in this report. NASEO is working with a number of private sector companies, trade associations, non-profit organizations, public agencies, and other partners on identifying how states might use both state and private sector delivered energy efficiency programs for potential 111(d) compliance. These programs have been the focus of recent NASEO meetings and 3N meetings, and NASEO and its partners will publish subsequent resources to help states use these energy efficiency strategies for 111(d) compliance.

While this report references private sector energy efficiency programs, it does not include specific analysis of their potential contribution to state 111(d) compliance plans. That type of analysis has been the subject of other reports, meetings, and presentations developed by NASEO and our public

[1] The principles can be accessed at http://111d.naseo.org/

and private sector partners. Rather, the focus of this report is to help states identify a process by which they can estimate the potential contribution that existing policies, specifically renewable electricity standards and energy efficiency resource standards, can make in terms of potential 111(d) compliance. The report authors, M.J. Bradley & Associates, focused their analysis on three states: Minnesota, Arizona, and Pennsylvania. The varying energy resources and polices in these three states may offer helpful insight to other states as they consider their 111(d) compliance options. The analysis finds that, together, these policies can bring states a long way toward meeting their future carbon reduction goals as stated in the pending rule.

Minnesota, for example, has a strong renewable electricity standard and discussions are underway to potentially increase the level of renewable electricity required. Combined with its energy efficiency standard, the state is in a good position to comply with a future carbon reduction goal. Similarly, Pennsylvania has laws in place requiring additional investments in renewable energy and energy efficiency. Depending on the implementation of these policies, the state also appears well positioned to comply with EPA's proposed rule. According to the analysis in this report, Arizona's energy efficiency and renewable policies are projected to reduce the state's average CO_2 emission rate by at least 25 percent. This is based on an analysis that makes several conservative assumptions. This would not be enough to meet EPA's proposed interim or final CO_2 standards. As a result, in the context of the proposed rule, the state would need to consider additional policies and programs to reduce its CO_2 emissions.

These three examples illustrate the types of analyses that states may want to consider as they evaluate their options for potentially complying with EPA's rate-based performance standards under the proposed section 111(d) rule.[2] As important, it may help guide states as they consider a greater than anticipated reliance on non-ratepayer or private sector delivered energy efficiency and renewable energy programs which, when coupled with existing policies, can lower the cost of compliance for consumers, businesses, and taxpayers. Also, this analysis suggests that adopting a mass-based target would simplify some of the compliance issues associated with energy efficiency and renewable energy under a rate-based goal.

Overall, this report finds that state energy efficiency and renewable energy policies can likely play a critical role in meeting the nation's energy security, economic development, and greenhouse gas reduction goals. States are encouraged to examine the role these existing policies can play in complying with the proposed 111(d) rule and also assess how other existing, non-ratepayer programs can be leveraged for 111(d) compliance.

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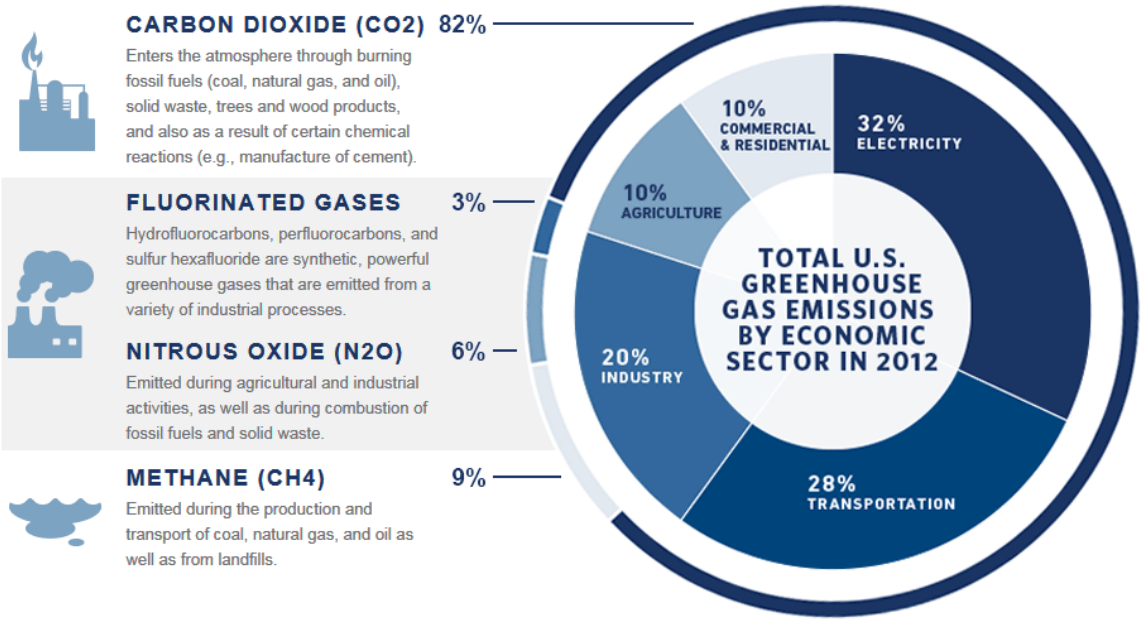
[2] As discussed in the draft rule and the supplemental proposal released on October 28, 2014, states have the option of using a mass-based target instead of a rate-based target. In general, under a mass-based target, states will illustrate compliance through measuring carbon emissions from affected electric generating units and will not need to report to EPA the impact of energy efficiency and renewable energy programs. While the analyses in the report are most relevant for states that pursue a rate-based target, states will likely need to conduct similar projections of how energy efficiency and renewable energy programs can help meet a mass-based goal.

Background: EPA's Clean Power Plan

On June 2, 2014, the U.S. Environmental Protection Agency (EPA) proposed a regulatory plan to reduce carbon emissions from existing fossil fuel-fired power plants—facilities burning coal, natural gas, and oil to produce and deliver electricity to the grid.[3] The proposed rule is based on EPA's authority under section 111(d) of the Clean Air Act, and is sometimes referred to as the 111(d) rule. There are currently no national limits on carbon emissions from power plants. These facilities account for roughly one-third of all greenhouse gas emissions in the United States (see figure 1). EPA's Clean Power Plan would change this by requiring states to reduce the sector's CO_2 emissions beginning in 2020. EPA is planning to issue a final rule by next summer after taking comment from stakeholders, including states, power companies, electricity consumers, and environmental groups. There are a wide range of legal and economic factors that EPA needs to weigh in crafting its plan.

Figure 1. U.S. Greenhouse Gas Emissions by Economic Sector in 2012



Source: U.S. EPA

In short, the Clean Power Plan proposes state-specific CO_2 emissions standards or goals, expressed in pounds of CO_2 per megawatt hour (MWh) of electricity production. The emission rate targets vary significantly across individual states, reflecting the application of a series of common

[3] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units 79 FR 34829. June 18, 2014; https://federalregister.gov/a/2014-13726.

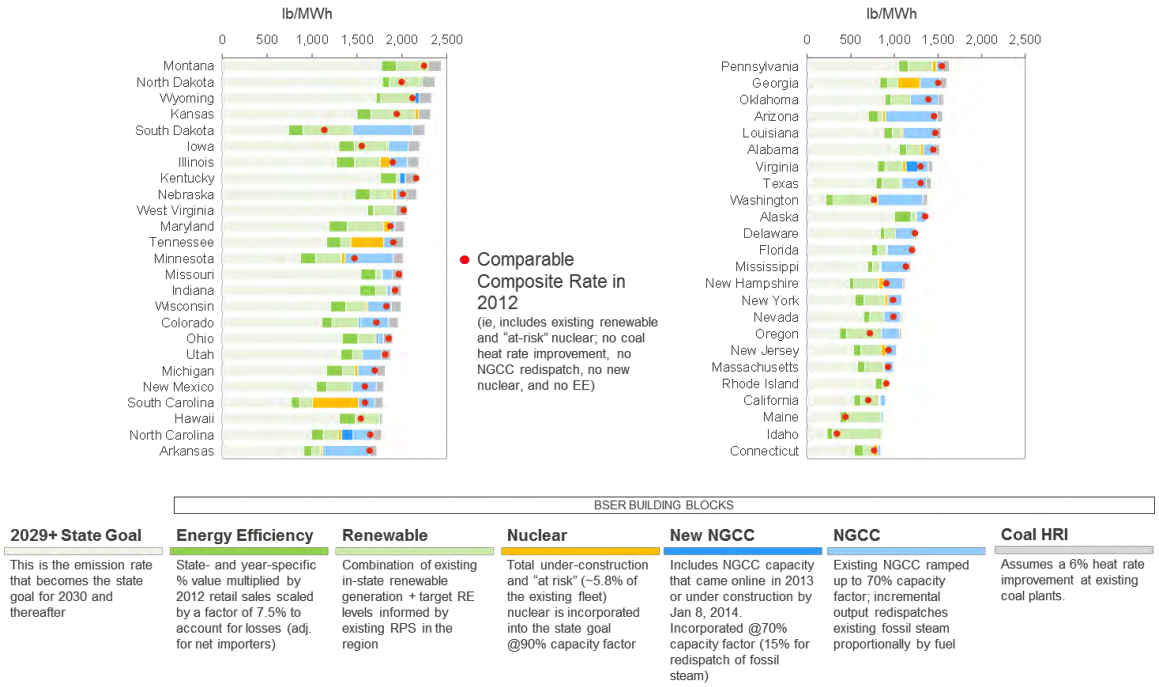
"building blocks" or control strategies to states with widely differing starting points in terms of their energy resource mix and carbon emissions intensity. These strategies include (1) improvements in the efficiency of coal-fired power plants, (2) increased utilization of natural gas combined cycle facilities, (3) investment in renewable power sources and nuclear facilities, and (4) greater reliance on demand-side energy efficiency. Figure 2 shows the final state goals proposed by EPA (light gray bars).[4] For example, North Dakota would have the highest (least stringent) 2030 emissions goal at 1,783 pounds per MWh (lb/MWh), and Washington would have the lowest (most stringent) 2030 emissions goal at 215 lb/MWh. To help put these numbers in context, a coal-fired power plant will produce CO_2 emissions at a rate of about 2,000 pounds per MWh; while a modern, natural gas combined cycle facility will produce CO_2 emissions at a rate of less than 1,000 pounds per MWh.

Figure 2 also shows the extent to which each of the building block elements contribute to the stringency of each state goal; the full length of the bar represents the states' current fossil emission rates; the colored segments show the extent to which each element reduces the states' current fossil rates to the final goals under the proposed rule. This chart highlights the fact that natural gas combined cycle facilities (building block 2) and renewable energy (building block 3) are both large contributors in terms of the goal setting, reflecting EPA's determination that these two approaches have significant potential for reducing the carbon intensity of the electric power sector. Coal heat rate improvements (building block 1) is a relatively small contributor to the goal computation; in some states, it does not register at all. Energy efficiency (building block 4) is the one building block that contributes a fairly consistent degree of stringency across all states. EPA assumes that states will reach a 1.5% annual savings goal from energy efficiency.[5]

EPA's approach to the standard setting process takes into account cost and feasibility of the available control measures and reflects the fact that there is no one solution to reducing CO_2 emissions from the power sector. A wide range of measures are required to achieve meaningful reductions in emissions at least cost. Also, EPA gives states the option to convert its final rate based goal into a "mass-based" limit or emissions budget.

[4] Figure 2 is based on what EPA calls regulatory "Option 1". The Agency also requests comment on an alternative option (Option 2) with a shorter compliance period in combination with a less stringent set of CO_2 emissions goals.
[5] The savings rate is expressed as a percent of retail sales. States are assigned a ramp-up rate based on historic energy efficiency performance.

Figure 2. Proposed State Emissions Goals and Building Block Components



Source: M.J. Bradley & Associates based on EPA's Clean Power Plan Proposed Rule (Option 1).

Once the state performance goals have been finalized, states will take the lead in developing their plans to meet the standards. In the draft rule, EPA proposed approvability criteria and required plan components for states to follow in developing their compliance plans. The requirements provide broad discretion to the states in terms of how the goals are ultimately met. State compliance plans can include and rely on measures and policies to encourage demand-side energy efficiency, renewable energy investment, as well as direct regulation of fossil-fired generating facilities.[6] States are not obligated to follow the building block formula; they can over perform in some areas and under perform in others relative to EPA's formula. States can also pursue strategies to reduce CO_2 emissions that are outside of the building blocks (e.g., improvements in transmission and distribution systems) provided that the measures deliver CO_2 emissions reductions from existing fossil-fired electric generating units (EGUs). EPA will evaluate and approve state plans based on whether a plan will ensure compliance with the interim and final state targets and a general set of criteria, detailed in the pending final rule. According to EPA:

> "a state plan could include a combination of measures that reduce CO_2 emissions at affected [electric generating units] through the application of emission limits as well as measures that involve actions within the interconnected electricity system that reduce utilization at affected [electric generating units] and thereby avoid [electric generating unit] CO_2 emissions. Examples of these latter measures include, among others, end-use energy efficiency resource standards and renewable energy portfolio standards, as well as certain components of utility integrated resource plans. A state could either rely solely on CO_2 emission limits that are enforceable against affected [electric generating units] or, alternatively,

[6] The Regional Greenhouse Gas Initiative (RGGI) would be an example of a mass-based, direct regulatory approach (with enforceable limits on emissions from affected electric generating units).

rely on a portfolio approach, which would include those limits as well as other enforceable measures."[7]

Regardless of the approach selected, states may want to include demand-side energy efficiency and renewable energy policies as part of their CO_2 reduction strategy. Again, EPA gives states broad discretion to formulate compliance plans. Table 1 below provides some examples of how a state could structure its state plan and how to include new or existing energy efficiency and renewable energy policies based on EPA's guidance.

Table 1. Examples of Options for Structuring 111(d) State Compliance Plans

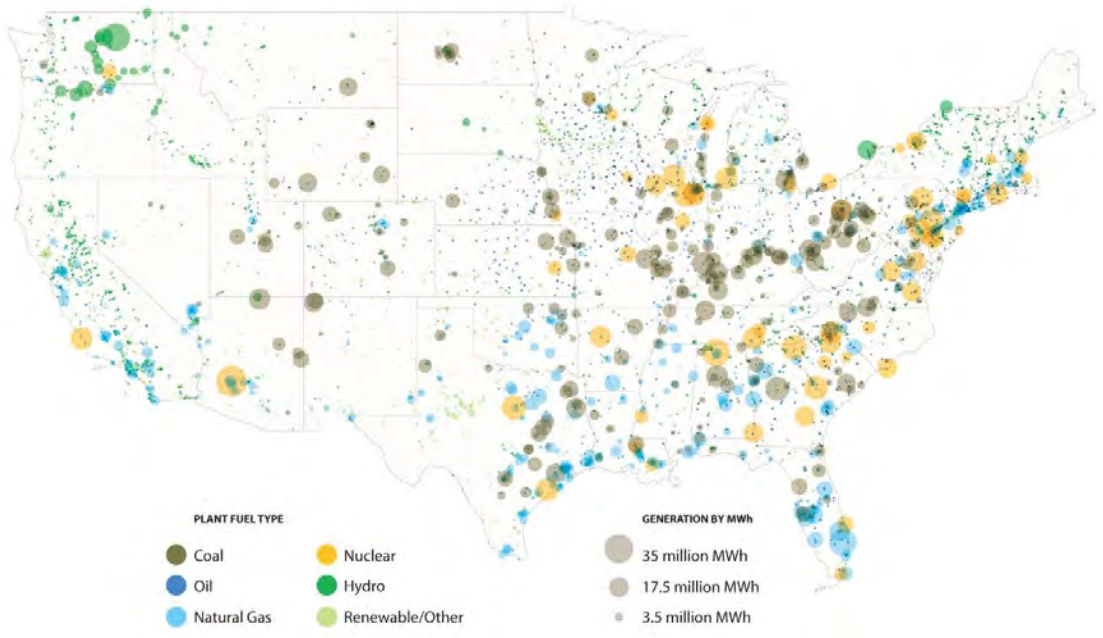
Option	Approach to Meeting EGU Emissions Target	Options for Integrating Energy Efficiency and Renewable Energy Policies and Programs
Option 1	Rate-based CO_2 trading program	States could establish a credit system for energy efficiency and renewable energy to factor into rate-based compliance calculations, including both policies overseen by public utility commissions and "non-ratepayer" programs conducted by other state agencies or private organizations.
Option 2	Mass-based CO_2 trading program	Energy efficiency and renewable energy programs, although not a direct compliance measure, could complement a mass-based trading program by reducing emissions
Option 3	Portfolio of measures, including a renewable electricity standard and/or energy efficiency resource standard	Renewable portfolio standard and/or energy efficiency resource standard could be included in the state plan as part of a package of enforceable policy measures

The Clean Power Plan will continue the progress that is already underway to reduce CO_2 emissions from the electric power sector in the United States. After decades of steadily rising emissions, the electric power sector has turned a corner, reversing this trend in recent years. The year 2007 marked the peak in electric power sector CO_2 emissions—topping more than 2,600 million tons of CO_2. The sector reduced its CO_2 emissions by 15 percent between 2007 and 2013 (inclusive). The Clean Power Plan is projected to achieve a further 18 percent reduction in emissions by 2030 through increased use of energy efficiency, renewable energy, and natural gas.[8]

[7] U.S. Environmental Protection Agency, Office of Air and Radiation. Technical Support Document (TSD) for Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units: State Plan Considerations. Docket ID No. EPA-HQ-OAR-2013-0602. June 2014.

[8] Based on Option 1 (Regional) Integrated Planning Model (IPM®) modeling results for 2030.

There are more than 6,400 power plants in the United States that produce electricity for sale to homes and businesses. About 68 percent of this power is produced by combusting fossil fuels (coal, natural gas, and oil). In 2012, coal accounted for 37 percent of total power production, natural gas accounted for 30 percent, and oil's contribution was negligible, less than a third of a percentage point. These fossil-fired power plants are located throughout the country, as illustrated by the map below.



Survey of State Energy Efficiency and Renewable Energy Policies

States—motivated by economic, environmental, and energy security concerns—have long been leaders in developing and implementing programs and policies to promote investment in energy efficiency and renewable energy resources. In general, these policies can be grouped into: (1) policies that establish specific mandates (e.g., minimum levels of renewable generation) and (2) programs and policies that help to catalyze or stimulate the markets for these resources. Furthermore, some of the policies target supply, and others target demand. This framework is illustrated in Table 2. Not included here are the direct CO_2 regulatory approaches that some states have adopted to reduce greenhouse gas emissions from the electric power sector (e.g., California's AB 32 or the Regional Greenhouse Gas Initiative in the Northeast). For the purposes of this

discussion, we focus on the policies that are more directly aimed at renewables and energy efficiency.

Table 2. State Renewable Energy and Energy Efficiency Policies

Policy Type	Supply Side	Demand Side
Mandate	Renewable electricity standard Alternative energy portfolio standard Renewable energy procurement requirements	Energy efficiency resource standard State appliance standards Building energy codes
Catalyst/Financial Incentives	State tax credits Net metering Combined heat and power (CHP) incentives	State tax credits Alternative rate mechanisms for regulated utility companies (decoupling) Energy savings performance contracting (ESPC)

The following sections provide a survey of existing state renewable and energy efficiency programs and policies, which could potentially be used in state section 111(d) compliance plans. States might rely on existing programs, amend existing programs, or adopt entirely new policies to meet the federal CO_2 emissions standards. This section includes information both on policies and programs typically overseen by public utility commissions and funded through ratepayer charges, as well as programs that are not typically funded by ratepayers but instead are managed by other state agencies or the private sector. As discussed in the forward, while the subsequent analysis in the report only focuses on ratepayer-funded policies and programs, NASEO and other organizations have highlighted the substantial role that non-ratepayer programs can play in helping states meet their goals. This section begins with a discussion of renewable energy.

Renewable Energy Programs and Policies

Renewable energy facilities (excluding large hydroelectric projects) produced more than 250 million MWhs of electricity in 2013, or more than six percent of U.S. electricity production, according to the latest statistics from the U.S. Energy Information Administration.[9] That is nearly a 200 percent increase since 2005; a period when overall electricity production in the United States was basically flat. Hydroelectric output, which has remained fairly constant over the past decade, contributed almost seven percent of total electricity production in 2013.[10] State programs and policies that advance the deployment of renewable energy technologies are one of several factors that have contributed to this rapid growth.

Renewable Energy Standards

The renewable energy standard or "RES" is the principal mechanism that states have used to promote the adoption of renewable energy technologies. An RES (also called an "RPS" or renewable portfolio standard) is a mandatory obligation, typically imposed on retail electricity suppliers, to supply a minimum share of their retail electricity load—or a certain amount of generating capacity—from qualifying renewable energy technologies. Compliance is often demonstrated with renewable energy credits (RECs), with one REC usually equal to one MWh of

[9] U.S. Energy Information Administration. Electric Power Monthly. March 21, 2014.
[10] Ibid.

renewable energy. Different states value RECs in different ways, assigning RECS more or less credit (e.g., 2 RECs/MWh or 0.5 REC/MWh) depending on the resource generating them. Electricity suppliers demonstrate compliance by accumulating RECs equal to their annual compliance obligation. RECs can be bought and sold, allowing entities that generate more renewable electricity than required to meet their own RES obligation to sell credits. Likewise, suppliers that cannot meet RES requirements with their own resources can purchase RECs. If a utility company fails to procure sufficient renewable energy or RECs, many states require an "alternative compliance payment", which may decrease the demand for renewable energy but also effectively caps the cost of compliance.

The first state RES was adopted in 1983, when Iowa passed the Alternative Energy Production law (revised in 1991), requiring Mid-American and Interstate Power and Light to contract for a combined total of 105 megawatts (MW) of renewable energy. Iowa has long since passed this goal. Iowa is now the top state in the nation for the percentage of electricity generated by wind energy at 27.4 percent.[11] Most states adopted or significantly revised their RES policies after 2000.[12,13] California has one of the most ambitious RES programs, requiring affected utilities to procure at least 33 percent of their electricity from qualifying renewables by 2020 and Governor Brown has proposed increasing this target to 50 percent by 2030.[14] California's three investor-owned utilities collectively served 22.7 percent of their 2013 retail electricity sales with renewable power.[15] As of 2013, 29 states and the District of Columbia have adopted mandatory RES policies. Most of these programs are based on retail electricity sales (i.e., percent of electricity sales); Texas, Kansas, and Iowa have capacity-based requirements.

Companies rely on a variety of strategies to demonstrate RES compliance: (1) utility companies own and operate qualifying renewable energy projects; (2) utility companies will contract for renewable energy under long-term supply contracts, including the attributes associated with the electricity; or (3) utility companies will purchase RECs—unbundled from the energy—to demonstrate RES compliance.[16,17] For example:

- **Utility Owned Renewable Generation** - Ameren Missouri is the owner and operator of the Keokuk Hydroelectric Generation Station in Keokuk, Iowa. The station consists of 15 generators, ranging from 7.2 to 8.8 MWs. The station is certified as a qualified renewable energy resource under the Missouri Renewable Energy Standard. Ameren Missouri relies on this out-of-state resource for a portion of the company's RES compliance.[18]

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[11] American Wind Energy Association. Iowa Wind Energy. http://www.awea.org/Resources/state.aspx?ItemNumber=5224. Accessed August 29, 2014.
[12] Lyon, Thomas P. and Haitao Yin. Why Do States Adopt Renewable Portfolio Standards?: An Empirical Investigation. The Energy Journal, Vol. 31, No. 3. 2010.
[13] Barbose, Galen. Renewable Portfolio Standards in the United States: A Status Update. 2012 National Summit on RPS. December 3, 2012.
[14] http://www.cpuc.ca.gov/PUC/energy/Renewables/ Los Angeles Times. Jerry Brown seeks new green regulations in historic fourth term. January 5, 2015.
[15] Ibid.
[16] A REC is an electronic certificate, which provides proof that electricity was generated from a renewable energy resource. Retail suppliers purchase REC certificates—either bundled or unbundled with the energy—to satisfy their RPS obligation.
[17] Also, some states use credit multipliers for certain generation resources, allowing certain resources to earn double or triple the amount of credits per MWh of generation.
[18] https://www.ameren.com/sites/aue/Environment/Renewables/Documents/renewable-energy-standard-compliance-report.pdf

- **Contracting for Renewable Energy and RECs** - In 2008, Pacific Gas and Electric Company (PG&E) announced that it had entered into a contract to purchase the output of a yet-to-be-constructed 250 MW solar photovoltaic project in San Luis Obispo County, California. The power from the facility is being sold to PG&E through 25-year power purchase agreements approved by the California Public Utilities Commission.[19] In 2010, the Massachusetts Department of Public Utilities (DPU) approved a 15-year power purchase agreement between National Grid and the Cape Wind off-shore wind farm. National Grid agreed to purchase a portion of the wind farm's electricity output, RECs, and capacity.
- **Purchasing Unbundled RECs** – PJM Environmental Information Services offers a web-based Bulletin Board for REC owners to post credits available for sale. Agreements brokered through the Bulletin Board are made on a bilateral basis between buyers and sellers. Once an agreement is reached, the seller initiates an electronic transfer of the RECs to the buyer.[20] The renewable certificate is sold independent of the power generated.

In many cases, states allow retail electricity suppliers to meet their RES obligation based on generating facilities located outside of their state borders, and in some cases, from generating facilities outside of the U.S. Table 3 summarizes the geographic requirements and limitations associated with a sampling of existing states RES programs (Class I only). New Jersey, for example, allows qualifying facilities to be located anywhere within the PJM service territory or adjacent control areas, if they deliver into PJM. According to the state's RES compliance report, most of the Class I RECs submitted for compliance were generated by wind projects in Illinois, Indiana, Pennsylvania, and West Virginia; landfill gas projects in Pennsylvania, New Jersey, and Illinois were also big contributors.[21] This dynamic complicates the process of complying with a rate-based CO_2 standard: do states base their compliance calculation on the renewable energy produced within their borders or can a state claim credit for the renewable energy produced outside the state for RES compliance? This is an issue that EPA has asked for comment on in its draft Clean Power Plan.[22]

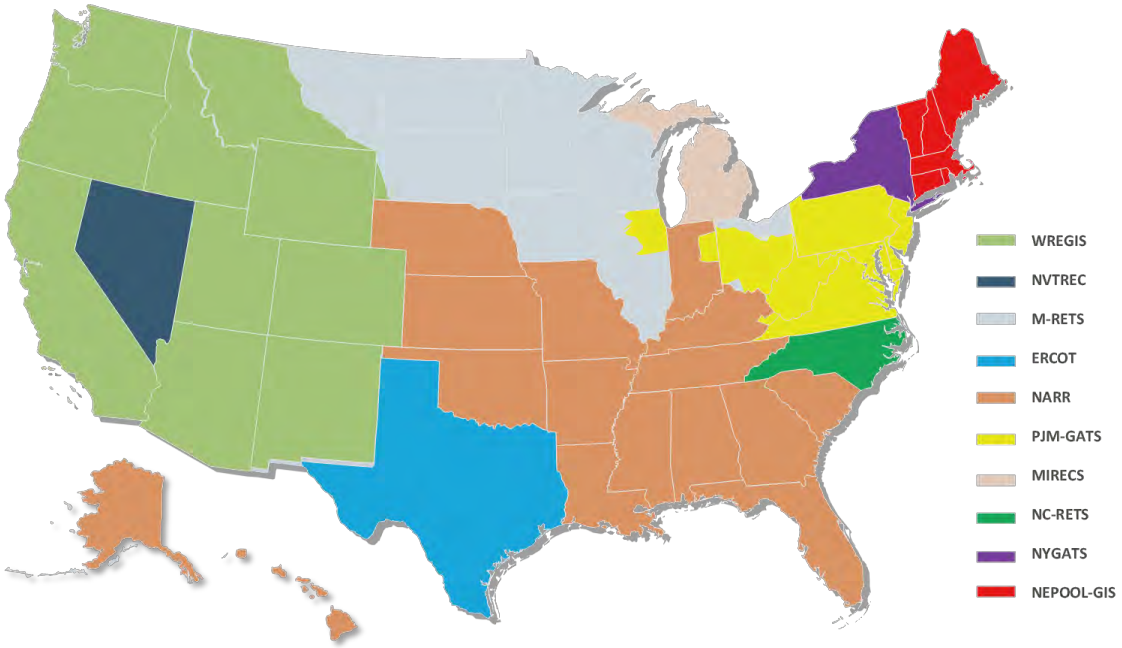
[19] http://www.californiavalleysolarranch.com
[20] http://www.pjm-eis.com/getting-started/how-do-I-sell-recs.aspx
[21] New Jersey Board of Public Utilities, Office of Clean Energy. New Jersey's Renewable Portfolio Standard Rules 2010 Annual Report. May 31, 2011.
[22] "The EPA is proposing that, for renewable energy measures, consistent with existing state RPS policies, a state could take into account all of the CO_2 emission reductions from renewable energy measures implemented by the state, whether they occur in the state or in other states. This proposed approach for RE acknowledges the existence of renewable energy certificates (REC) that allow for interstate trading of RE attributes and the fact that a given state's RPS requirements often allow for the use of qualifying RE located in another state to be used to comply with that state's RPS. The EPA is also seeking comment on how to avoid double counting emission reductions using this proposed approach." Federal Register Vol. 79, No. 117 Page 34922, June 18, 2014.

Table 3. Geographic Requirements and Limitations Associated with Class I RES Standards

State	Geographic Requirements and Limitations	RECs System?
Massachusetts	RES Class I Qualified Generation Units must be located anywhere in the ISO New England control area, as well as in the adjacent control areas (northern Maine, New York, Quebec, or the Canadian Maritime Provinces), provided that they transmit their power into New England and meet other criteria.	Yes
Ohio	At least half of the obligation must be satisfied by renewable energy resources located in Ohio; the remainder can be met with resources that can be shown to be deliverable into the state.	Yes
New Jersey	Class I RECs can be created by facilities generating electricity within or delivered into the PJM region.	Yes
Minnesota	Only RECs recorded and tracked through the Midwest Renewable Energy Tracking System (M-RETS®) can be used for compliance. M-RETS® tracks renewable generation located within the state and provincial boundaries of Illinois, Iowa, Manitoba, Minnesota, Montana, North Dakota, Ohio, South Dakota, and Wisconsin.	Yes
Pennsylvania	Qualified generators must be within the PJM footprint.	Yes
California	Facilities that are interconnected to a transmission network within the Western Electricity Coordinating Council (WECC) service area.	Yes

Because RECs can be uncoupled and sold independent of the power that created them, careful accounting is required to ensure that RECs are not double counted. To ensure the authenticity of RECs and prevent fraud, a number of regional renewable energy tracking systems have been or are in the processing of being developed. These systems aid in the creation, tracking and management of RECs. Figure 3 shows the nine active and one pending (New York) renewable energy tracking systems in the United States.

Figure 3. U.S. Renewable Energy Tracking Systems



Source: MJB&A

Several RES programs include non-renewable sources among their list of qualifying technologies. For example, Michigan allows for the use of "advanced cleaner energy" credits from industrial cogeneration facilities and coal-fired power plants with carbon capture and sequestration. These sources would be outside of the scope of EPA's 111(d) rule, which focuses on existing fossil fuel-fired electric generating facilities. However, these resources account for a small share of Michigan's RES compliance (i.e., roughly 2.5% in 2011).[23] Pennsylvania's Alternative Energy Portfolio Standard (AEPS) also includes non-renewable resources. Waste coal and coal gasification are qualifying technologies under the state's Tier II standard. However, the state's Tier I standard is more limited: renewable energy resources, biologically-derived methane, black liquor, coal-mine methane, and fuel cells. In 2012, black liquor accounted for 10.6% and coal-mine methane accounted for 3.1% of Tier I resources (based on MWhs); wind, landfill gas, and wood waste accounted for 84% of Tier I resources.[24] The inclusion of non-renewable resources is an issue that states will need to consider as they develop their compliance plans.

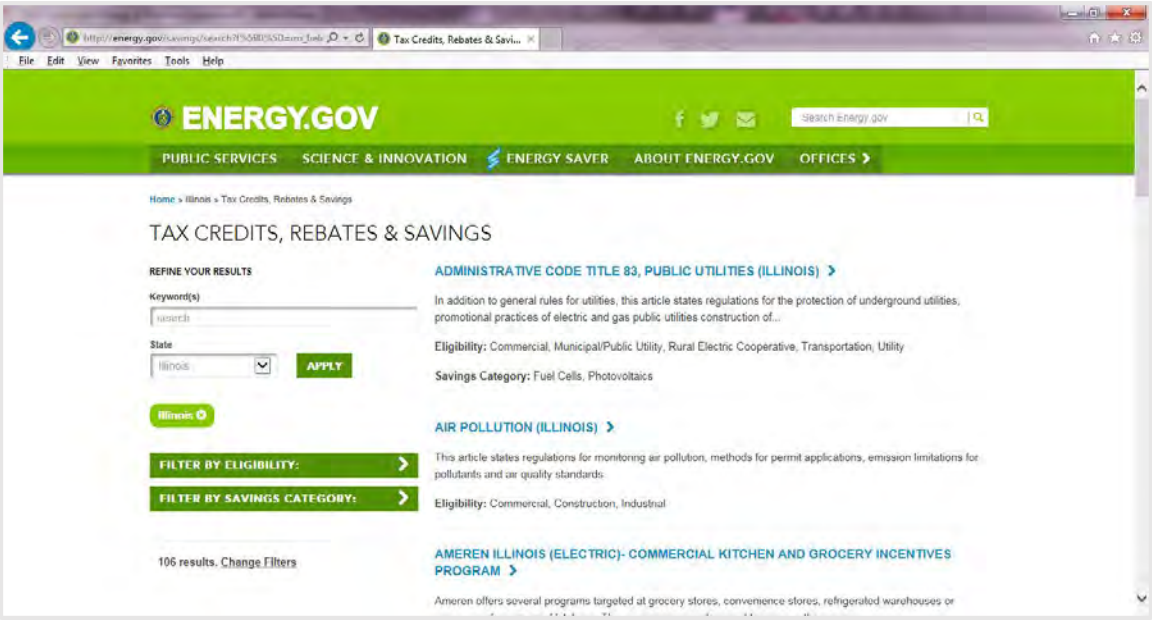
State RES programs have provided an important driver for renewable energy deployment and most states are on pace to meet their mandated goals.[25] Looking to the future, RES-driven demand has begun to plateau and RES programs are expected to make a limited contribution to deployment of new renewable generating capacity in the U.S. In order to motivate significant additional investment, states would need to modify their RES goals.

[23] Michigan Public Service Commission. Report on the Implementation of the P.A. 295 Renewable Energy Standard and the Cost-Effectiveness of the Energy Standards. February 15, 2013.
[24] PA Public Utility Commission. 2012 Annual Report: Alternative Energy Portfolio Standards Act of 2004. October 2013.
[25] Bloomberg New Energy Finance and The Business Council for Sustainable Energy. 2014 Sustainable Energy in America Factbook. February 2014.

Other Renewable Policies

Beyond RES policies, states and utilities offer numerous incentives for renewable energy development. These incentives include net metering, tax incentives, grant programs, utility shareholder earnings and consumer rebates. The Illinois Department of Commerce and Economic Opportunity, for example, recently finished accepting applications for its Large-Distributed Solar and Wind Grant Program.[26] Eligible businesses could apply for up to 30% of project costs for wind projects and 25% for solar PV; government and nonprofit entities could apply for up to 40% of project costs. Funding is supported by a surcharge on utility customer bills. Other states also offer a variety of incentives for renewable energy projects. The U.S. Department of Energy's "Energy Saver" website (Figure 4) provides an extensive listing of state renewable and energy efficiency tax credits, rebates, and other incentives.

Figure 4. Screenshot of DOE's Energy Saver Website



Also, many states require utility companies to prepare "integrated resource plans" to demonstrate how they will satisfy their future energy demands. In many cases, resource planning includes consideration of alternative energy resources, including energy efficiency and renewables. Georgia Power, for example, has developed a "Renewable Resource Action Plan", including a plan to develop 525 MWs of solar energy capacity.[27] Projects will be selected through a competitive RFP process.

Energy Efficiency Programs and Policies

States have developed a wide variety of programs and policies to promote investment and deployment of energy efficiency measures. The non-profit American Council for an Energy-Efficient Economy (ACEEE) ranks Massachusetts, California, Vermont, Oregon, and Rhode Island

[26] Illinois Department of Commerce & Economic Opportunity. Large Distributed Solar and Wind Grant Program: Application Guidelines. Application Deadline October 17, 2014.
[27] Georgia Power Company's Renewable Resource Action Plan and Time Table Update. May 2014. Docket No. 24505.

among the leading states in terms of their energy efficiency policies.[28] Some of the policies and programs that states have adopted include:

- Energy efficiency resource standards (EERS) and similar policies establish energy savings targets that utilities (primarily investor owned utilities) or independent program administrators must meet through customer energy efficiency programs. Twenty-five states have EERS policies as of 2014.[29]
- Mandatory building energy codes and code enforcement ensure a minimum level of energy efficiency for new residential and commercial buildings and substantial renovations.
- Appliance and equipment efficiency standards have been used to reduce appliance energy use.
- States are also leading by example by reducing energy use in public buildings and turning to energy service companies to finance and deliver energy-saving projects.
- Utilities and states have opted for energy efficiency investments in utility integrated resource planning and procurement.

In general, there are three categories or pathways of energy efficiency investments. First, there are state overseen utility programs that invest ratepayer funds in energy efficiency, primarily through rebates to customers who purchase and install high efficiency lighting, HVAC, or other appliances. These investments are usually made to comply with EERS requirements or related state utility commission energy efficiency targets. Second, energy consumers invest in energy efficiency through energy service companies (ESCOs) and public facility retrofits. ESCOs work with clients, such as schools and hospitals, to identify and implement energy saving measures, including financing options. Finally, households and businesses invest in energy saving measures every day outside of formal utility programs or ESCO contracts. This last category is highly fragmented, and therefore, difficult to track or quantify.

Together, state overseen utility programs and public facility retrofit programs invested more than $12 billion in energy efficiency in 2012.[30] Utility program spending has increased dramatically over the past decade as states have adopted EERS policies. Utility companies employ programs such as efficiency audits, discounts on energy efficient equipment, rebates to consumers, and financial assistance to companies engaged in energy saving projects in order to encourage energy savings. California, New York, Massachusetts, New Jersey, and Washington had the largest rate-payer funded electric efficiency budgets in 2013, together accounting for about half of the nationwide budget.[31] ESCOs generally rely on performance contracting in delivering their energy-efficiency services; an ESCO will assess the efficiency opportunity, purchase equipment necessary to improve performance, and install the equipment. Most ESCOs will provide a financing option for these services as well, but depending on the ESCO, the building owner may be required to seek outside financing. ESCOs typically guarantee that energy savings will pay for the cost of financing over the life of the project. Importantly, many states have agencies, typically the state energy office

[28] ACEEE. *The 2014 State Energy Efficiency Scorecard*. October 2014. http://www.aceee.org/sites/default/files/publications/researchreports/u1408.pdf.
[29] ACEEE. *State EERS Policy Brief*. April 2014. Available at: http://aceee.org/files/pdf/policy-brief/eers-04-2014.pdf. Accessed August 25, 2014.
[30] Bloomberg New Energy Finance and The Business Council for Sustainable Energy. 2014 Sustainable Energy in America Factbook. February 2014.
[31] ACEEE. *The 2014 State Energy Efficiency Scorecard*. October 2014

or general services agencies that are involved in overseeing performance contracting in state-owned buildings or other types of public buildings. This oversight role can include evaluating project proposals and ensuring measurement and evaluation (M&V) requirements are met. For example, in Georgia the Georgia Environmental Finance Authority approves all performance contracting projects in state buildings and reviews the ESCO M&V reports. Overall, the ESCO industry has grown at a steady pace with estimated revenues of $6.4 billion in 2013, most of which comes from energy efficiency services.[32]

Analysts predict the performance contracting energy efficiency market will continue to expand in the next decade with increased growth in the Midwest and Southeast regions.[33]

Energy Efficiency Resource Standards

Energy Efficiency Resource Standards (EERS) are one of the primary drivers of energy efficiency savings. EERS set mandatory multi-year targets for energy savings that are usually achieved through the implementation of demand-side energy efficiency programs. These programs are paid for by rate-payers and implemented by electric utilities subject to the standard, although some states have set up third party administrators to run their programs. Energy saving efforts aim to improve the energy efficiency of residential, commercial and industrial buildings and typically include free or incentivized lighting replacement programs, energy audits, and insulation installation. Other energy saving activities, such as transmission and distribution system upgrades, also qualify towards EERS goals in some states. A handful of states allow efficiency improvements from combined heat and power (CHP) facilities to contribute towards savings targets.

The form of EERS savings targets varies from state-to-state: (1) percent of annual retail sales, (2) percent reduction in demand growth, or (3) specific amounts of electricity (MWhs). Savings targets may be established for individual years or require cumulative savings over a set period of time. For example, Massachusetts requires suppliers to save an increasing percentage of annual sales, while Vermont requires a cumulative reduction in sales percentage over a three year period. While most EERS are established by state legislatures, a number of states have developed policies under PUC authority.

As of April 2014, 25 states were implementing EERS (see Table 4). Together, these states represent approximately 60 percent of U.S. electricity sales. If current policy targets are achieved out to 2020, it will result in cumulative savings of 232,000 gigawatt hours (GWhs), equal to six percent of projected sales in 2020.[34] Additionally, Delaware is in the process of establishing EERS, but the regulations have not been finalized. Nevada and North Carolina have combined EERS/RES policies (some states also allow efficiency savings to contribute towards RES targets). Florida enacted an EERS, but the PUC eliminated the funding required to implement the policy. Indiana's EERS was eliminated by the state legislature in April 2014.

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[32] U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Weatherization and Intergovernmental Program. Current Size and Remaining Market Potential of the U.S. Energy Service Company Industry. September 2013.
[33] Ibid.
[34] ACEEE. *State EERS Policy Brief*. April 2014. Available at: http://aceee.org/files/pdf/policy-brief/eers-04-2014.pdf. Accessed August 25, 2014.

Table 4. State EERS Policies

State	Year Enacted	Applicability	% Sales Affected	Standard	Notes
AZ	2010	IOUs, Co-ops	59%	1.25% savings/year from 2011-2015, 2.5% from 2016-2020, total savings of 22% retail sales	2% of cumulative savings can come from peak demand reductions
AR	2010	IOUs	53%	Annual reduction of 0.75% total sales in 2014 and 0.9% in 2016.	
CA	2004	IOUs	78%	0.9% annual savings through 2020. Demand reduction of 4,541 MW through 2020	Utilities must pursue all cost effective efficiency resources
CO	2007	IOUs	57%	Black Hills: 0.8% sales savings target 2011-2014, 1.35% 2015-2018, increase to 1.66% in 2019	
CT	2007	IOUs	94%	Approx. annual sales savings of 1.4% through 2015.	Utilities must pursue all cost effective efficiency resources
HI	2004	Statewide	100%	Consumption reduction of 4,300 MW by 2030 (1.4% annual savings)	
IL	2007	Utilities with >100,000 customers, DCEO	88%	0.2% annual savings 2008-2011, 1% savings 2012-2014, 2% from 2015 forward. Annual peak demand reduction of 0.1% through 2018	EE measures may not exceed pre-determined cost cap
IA	2009	IOUs	75%	Annual savings goals vary by utility 1-1.5% through 2014.	
ME	2009	Efficiency Maine	100%	Savings of 20% by 2020 (1.6% annually)	Utilities must pursue all cost effective efficiency resources
MD	2008	Statewide	100%	15% per capita use reduction by 2015 (10% by utilities, 5% achieved independently). 15% reduction in per capita peak demand by 2015 (2007 baseline)	
MA	2009	IOUs, Co-ops, Muni's, Cape Light Compact	86%	Annual sale savings of 1.4% in 2010, 2% in 2011, 2.4% in 2012, 2.5% 2013-2014, 2.6% in 2015	Utilities must pursue all cost effective efficiency resources
MI	2008	Statewide	100%	0.3% savings 2009-2011, 1% savings 2012-2015	
MN	2007	Statewide	100%	Annual savings of 1.5% from 2010 forward	

State	Year Enacted	Applicability	% Sales Affected	Standard	Notes
NV	2009	IOUs	62%	20% of sales to be met by renewables and EE by 2015, 25% by 2025	EE may be used to meet 25% of standard through 2012, but phased out in 2025
NM	2013	IOUs	68%	5% reduction in retail sales by 2014, 8% by 2020 (2005 baseline)	
NY	2008	Statewide	100%	Cumulative savings of 15% by 2015	
NC	2007	Statewide	100%	Combined RES and EERS requires RE generation and or EE savings of 6% by 2015, 10% by 2018, and 12.5% after 2021. EE capped at 25% of target, increasing to 40% in 2021	
OH	2008	IOUs	89%	22% cumulative savings by 2027 (0.3% savings in 2009 ramping to 1% in 2017 and 2% in 2021). Peak demand reductions for some utilities.	SB 310 (2014) froze savings targets for 2 years, expanded the types of eligible savings, relaxed EM&V requirements, allowed carryover of excess savings from year to year, and allows large customers to opt out of EE programs.
OR	2010	Energy Trust of Oregon	70%	0.8% of 2009 sales in 2010, increasing to 1.4% in 2013 and 2014	
PA	2008	Utilities with >100,000 customers	93%	3% cumulative savings 2009-2013, 2.3% cumulative savings 2014-2016. Includes peak demand targets	EE measures may not exceed pre-determined cost cap
RI	2006	IOUs, Muni's	99%	Savings of 1.7% in 2012, 2.1% in 2013, 2.5% in 2014. EERS includes demand response targets	Utilities must acquire all cost effective EE
TX	2007	IOUs	73%	20% of incremental load growth in 2011 (0.1% annual savings), 25% in 2012, 30% 2013 forward. Peak demand reduction targets of 0.4% compared to previous year	EE measures may not exceed pre-determined cost cap
VT	2000	Efficiency Vermont, Burlington Electric	100%	Cumulative savings of 6% from 2012-2014. Includes DR targets	EE utilities must set budgets at levels that attain all cost effective EE
WA	2006	IOUs, Co-ops, Muni's	81%	Biennial and ten year goals vary by utility. All goals based on law that estimates 1.5% annual savings through 2030 for all utilities	Includes all cost effective conservation requirement

State	Year Enacted	Applicability	% Sales Affected	Standard	Notes
WI	2011	Focus on Energy	100%	0.66% annual savings 2011-2014	EE measures may not exceed pre-determined cost cap

Source: ACEEE. *State EERS Policy Brief*. April 2014. Available at: http://aceee.org/files/pdf/policy-brief/eers-04-2014.pdf. Accessed August 25, 2014.

In order to ensure that electricity suppliers are achieving EERS savings goals, PUCs often rely on the oversight of independent auditors. These auditors carry out evaluation, measurement, and verification (EM&V) activities to estimate the annual and cumulative energy savings attributable to utility efficiency programs. These estimates are incorporated into compliance reports that electricity suppliers must submit to PUCs in order to prove attainment of EERS savings targets. Fines can be assessed on electricity suppliers that fail to submit plans to achieve energy efficiency savings plans. For example, obligated utilities in Pennsylvania that fail to submit a plan to the PUC are subject to a fine of $100,000 per day, and utilities that fail to achieve energy savings goals may be fined between $1 million to $20 million.[35] In some states, noncompliance may result in PUCs restricting the amount of rate recovery utilities receive to fund demand-side efficiency programs.

Energy Savings Performance Contracting and Lead By Example Initiatives

Throughout the country, state and local governments have been leading by example by reducing energy use within their own buildings and operations. These goals are typically set as an energy savings percentage for a statewide building portfolio. For example, as of November 2013, North Carolina had completed more than 10 projects through performance contracting facilitated by the Utility Savings Initiative, their lead by example program. The program has a goal to reduce their energy consumption per gross square foot by 30 percent by 2015 based on the 2002-03 fiscal year. These 10 projects at state agencies and universities represent a facility upgrade investment of $134.5 million.[36] North Carolina law allows state agencies and universities to use a performance contracting process to implement and finance major facility upgrades that save energy and reduce utility expenditures.

Minnesota's lead by example initiatives include 2011's Executive Order 11-12 that called for a 20 percent reduction in energy use in state facilities and required the use of the B3 Energy Benchmarking website to track the success of the efforts. Executive Order 11-12 also established the Office of Guaranteed Energy Savings Program (GESP) to provide technical, contractual, and financial assistance with state agencies, local government units, school districts, and institutions of higher learning that elect to implement energy efficiency and renewable energy improvements through performance contracts on their list of pre-qualified contractors and model contracts.[37]

Building Energy Codes

Commercial and residential buildings account for approximately 72 percent of electricity usage in the United States.[38] Building energy codes and standards set minimum requirements for energy-

[35] DSIRE. "Energy Efficiency and Conservation Requirements for Utilities: Pennsylvania". Available at: http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=PA14R&re=0&ee=0. Accessed August 25, 2014.
[36] North Carolina Department of Environment and Natural Resources. 2013 Performance Contracting Annual Report. November 1, 2013.
[37] Minn. Exec. Order No. 11-12 April 8, 2011.
[38] Pacific Northwest National Laboratory. Building Energy Codes Program: National Benefits Assessment, 1992–2040. March 2014.

efficient design and construction for new and renovated buildings, delivering long-term reductions in energy use and greenhouse gas emissions over the life of buildings. While some government entities have developed their own building energy codes, many use existing model codes (sometimes with state-specific amendments), such as the International Energy Conservation Code (IECC), developed and published by the International Code Council (ICC), or ASHRAE Standard 90.1.[39]

Some states have also encouraged their local municipalities or buildings funded through public dollars to go beyond the base energy codes with the adoption of so-called stretch codes (or reach codes). For example, the Massachusetts Stretch Energy Code, adopted in 2009, is about 20 percent more stringent than the base energy code. Adoption of the more energy efficient alternative code is voluntary; however, more than 140 Massachusetts communities have adopted the stretch code.[40] In Minnesota, the Sustainable Building 2030 (SB2030) program sets above-code energy standards for buildings that receive general obligation bond funding from the State of Minnesota.[41] Oregon and California have also adopted stretch codes.[42,43] Enforcement of energy codes is important in order to attain the intended energy savings. Compliance and enforcement strategies vary across states and local governments and may include review of building plans and specifications, evaluation of products, materials and equipment specifications, inspection of the building and its systems during construction or inspection immediately prior to occupancy.[44]

Several states partner with utility funded programs to increase training and compliance with state and local building codes. The Illinois State Energy Office, for example, offers training on state energy conservation codes for the construction industry. The trainings are offered at no cost to customers of investor owned utilities (IOU).[45] California's Statewide Codes and Standards Program, funded by utility customers, offers a wide variety of training, resources, and services to improve compliance with the state's building energy codes.[46] In Arizona, building codes are adopted and enforced at the local level, and approximately 70 percent of the population is covered by 2009 IECC or better.[47] In an effort to promote code enforcement and implementation, local utilities are able to earn credits equivalent to one-third of the energy-savings from building energy code programs if they demonstrate and evaluate the savings. These credits can count toward their annual energy efficiency savings goals.[48]

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[39] The U.S. Department of Energy maintains a database of the state energy code adoption: http://www.energycodes.gov/adoption/states.

[40] Massachusetts Department of Energy Resources (DOER). Community Adoption of the Stretch Energy Code; "Appendix 115 AA" of the MA State Building Code (780 CrMR). http://www.mass.gov/eea/docs/doer/green-communities/grant-program/stretch-code-towns-adoption-by-community-map-and-list.pdf.

[41] For more information, see http://www.b3mn.org/2030energystandard/. The SB2030 standard can also be used on a voluntary basis on any project.

[42] U.S. Department of Energy. Building Energy Codes Resource Guide for Policy Makers. June 2011.

[43] New Buildings Institute. "Stretch Codes". Available at: http://newbuildings.org/stretch-codes. Accessed September 9, 2014.

[44] Building Energy Codes Program. Department of Energy. Compliance and Enforcement Basics. Available at www.energycodes.gov/compliance/basics.

[45] Illinois Department of Commerce and Economic Opportunity. Available at "http://www.illinois.gov/dceo/whyillinois/KeyIndustries/Energy/Pages/IECC.aspx. Accessed September 18, 2014.

[46] California Statewide Codes & Standards Program. Energy Code Ace. Available at http://www.energycodeace.com/content/about/. Accessed September 18, 2014.

[47] American Council for an Energy-Efficient Economy. Arizona Building Codes. Available at http://www.aceee.org/energy-efficiency-sector/state-policy/Arizona/177/all/193. Accessed September 18, 2014.

[48] Arizona Corporation Commission. Docket No. RE-00000C-09-0427.

Appliance Standards

Appliance standards establish minimum energy efficiency levels for a wide range of products from dryers to air conditioners to illuminated exit signs. Unlike building codes, where state and local governments have substantial authority, federal law almost completely preempts state and local governments from establishing appliance efficiency standards.[49] In 1978, Congress enacted legislation that preempts state efficiency standards where Congress or the Department of Energy (DOE) has set a federal efficiency standard for the appliance in question. Some stakeholders have encouraged EPA to allow states to claim credit for the energy savings resulting from adopting state efficiency standards that go beyond federal requirements or programs to encourage the adoption of more efficient appliances.[50]

[49] Klass, Alexandra B. State Standards for Nationwide Products Revisited: Federalism, Green Building Codes, and Appliance Efficiency Standards. Harvard Environmental Law Review. Vol. 34. 2010.

[50] For example, in comments to EPA on the proposed 111(d) rule, the Oregon Department of Environmental Quality recommends states be allowed to include energy savings from appliance standards in their compliance plans.

Clean Power Plan Compliance Analysis

As mentioned in the Forward, the compliance analysis in this report is specifically focused on examining the role energy efficiency resource standards and renewable portfolio standards can play in helping states achieve compliance with the 111(d) targets. Other equally important policies and programs mentioned briefly in this report—such as building energy codes, energy savings performance contracting, CHP and industrial energy efficiency programs, and state tax incentives for renewable energy—are not addressed in this analysis, as it was outside the scope of the study. Additional research and resources are being developed by a number of organizations that will help states utilize a wide portfolio of energy efficiency and renewable energy policies and programs for 111(d) compliance.

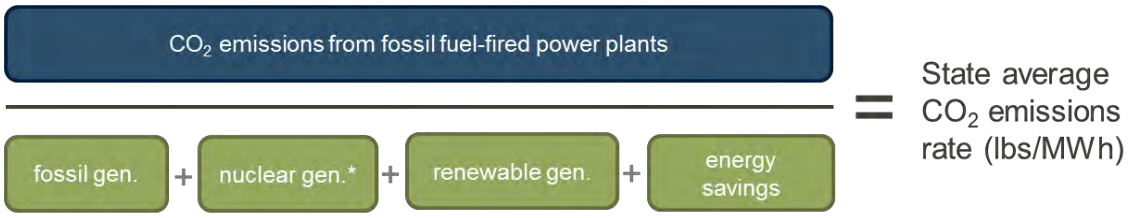
As discussed in the preceding sections, states have adopted a wide variety of strategies to promote alternative energy resources, tailoring them to their own circumstances and priorities. As EPA works to finalize its CO_2 standards for fossil fuel-fired power plants, states can begin to assess what policies can be used to comply with the rule. To help inform this process, the following analysis evaluates the extent to which state energy efficiency resource standards and renewable energy policies might contribute toward compliance with EPA's performance goals, while recognizing that the proposed standards are still subject to change.

As discussed in more detail above, EPA has proposed interim and final CO_2 emissions goals for all affected states expressed in lb/MWh. EPA has also proposed annual mass-based goals (expressed in tons per year) if states prefer to comply with a mass-based rather than a rate-based target.[51] In order to comply with a rate-based standard, states would need to (1) decrease their fossil CO_2 emissions, (2) increase their non-emitting generation (including energy savings), or (3) some combination of the two. Figure 5 illustrates the general formula that states would use in demonstrating compliance with a rate-based performance goal. As currently proposed, only a portion of nuclear generation would count toward compliance (i.e., 5.8% of existing and 100% of new nuclear generation); existing and new renewable energy MWhs would be included (excluding existing large hydroelectric output). Energy savings from energy efficiency projects installed in 2016 or later would count toward compliance.

For each of the states evaluated, the analysis estimates the potential effect of its energy efficiency and renewable energy policies on the state's average CO_2 emissions rates, following EPA's rate-based compliance formula (Figure 5). The states evaluated include Minnesota, Arizona, and Pennsylvania.

[51] U.S. EPA. Notice; Additional Information Regarding The Translation Of Emission Rate Based CO_2 Goals To Mass Based Equivalents. November 13, 2014.

Figure 5. Rate-Based Compliance Formula



*EPA's proposed rule would allow states to include 5.8% of existing nuclear capacity and 100% of under construction nuclear capacity (both at an assumed 90% capacity factor).

Minnesota EERS and RES

In 2007, Minnesota adopted a mandatory renewable portfolio standard (called the Renewable Energy Standard or RES) with separate standards for nuclear utilities (i.e., Xcel Energy) and other utilities.[52] Eligible technologies include solar, wind, hydroelectric power (less than 100 MWs), landfill gas, anaerobic digester systems, and several other energy resources. The standards apply to total retail electric sales, excluding power provided by the Western Area Power Administration. Only RECs recorded and tracked through M-RETS can be used for compliance. The Minnesota statute has a provision allowing utilities to petition for a delay in the RES standard; however, no utility has requested a modification or delay to date. According to the latest progress report from the Minnesota Department of Commerce to the legislature, all utilities subject to the RES standard met it in 2011 and were on track to meet their 2012 goals.[53] Minnesota also has a separate solar energy carve out, which applies to public utilities and is based on a subset of customer types.

The current Minnesota RES goals are presented in Table 5. The state is also currently considering whether to strengthen the RES mandate. The Minnesota Department of Commerce recently issued a study, *Minnesota Renewable Energy Integration and Transmission Study*, which notes that the "capacity for adding additional wind and solar up to 40 percent by 2030 can be reliably accommodated by the electric power system". The study shows that with relatively modest upgrades to existing transmission, the power system can be reliably operated with large amounts of additional wind and solar. Minnesota utility and transmission companies conducted the study in coordination with MISO and directed by the Minnesota Department of Commerce.

[52] Minn. Stat. §216B.1691

[53] Report to the Minnesota Legislature: Progress on Compliance By Electric Utilities With The Minnesota Renewable Energy Objective and the Renewable Energy Standard, Prepared by: The Minnesota Department of Commerce, Division of Energy Resources January 14, 2013; http://mn.gov/commerce/energy/images/2013RESLegReport.pdf.

Table 5. Renewable Energy Standard by Utility Type (% of sales)

Utility	2010	2012	2016	2020	2025
Xcel Energy (Northern States Power Company)	15%	18%	25%	30%	30%
Other electric utilities, including cooperative electric associations, municipal power agencies, or power districts.	N/A	12%	17%	20%	25%

Note: In a March 19, 2010 order from the Minnesota Department of Commerce, the Commission clarified that the percentages of total retail sales that utilities must generate or procure from renewable energy apply for every year forward until the next year percentage identified by the statute.

In 2007, the Minnesota legislature passed the Next Generation Energy Act, which requires electric utilities to reduce energy sales by 1.5 percent of average sales (three year average) beginning in 2010. The law reads: "[e]ach individual utility and association shall have an annual energy-savings goal equivalent to 1.5 percent of gross annual retail energy sales unless modified by the commissioner under paragraph (d)."[54,55] This requirement is consistent with the target used by EPA in setting its state emissions goals under the proposed Clean Power Plan rule. According to a recent progress report, Minnesota electric utilities collectively exceeded the 1.5% savings standard in 2011, avoiding an estimated 880,000 tons of CO_2.[56]

Potential Compliance with EPA's Clean Power Plan: Minnesota

EPA has proposed interim and final CO_2 emissions goals for Minnesota of 911 lb/MWh and 873 lb/MWh, respectively.[57] Table 6 calculates a projected CO_2 emission rate for Minnesota based on the renewable MWhs required to meet the state's RES as well as the energy savings required by the state's EERS. Although the state's RES and EERS went into effect in 2010, this analysis focuses on the period from 2020 to 2030 when EPA's Clean Power Plan would go into effect.[58] Several assumptions were required to prepare this forecast.

In terms of the renewable energy forecast, between 2020 and 2030, the Minnesota RES is assumed to require between 17.6 million and 20.7 million MWhs of renewable energy. To put this in context, this is roughly equivalent to the total coal-fired electricity generation in Minnesota in 2012.[59] This forecast is based on EPA's forecast of future energy sales in Minnesota and the

[54] Minn. Stat. §216B.241

[55] Utilities may petition the Director of the Division of Energy Resources to adjust their savings goals to a minimum of 1 percent based on a conservation potential study, a utility's historic conservation improvement program experience, or other factors.

[56] The Minnesota Department of Commerce's *Minnesota Conservation Improvement Program Energy and Carbon Dioxide Savings Report for 2010-2011* reports an average savings rate for 2011 of 1.6%.

[57] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units 79 FR 34829, June 18, 2014; https://federalregister.gov/a/2014-13726. Page 34895, Table 8-Proposed State Goals.

[58] EPA requests comment on whether emission reductions that occur prior to 2020 should count toward a state's interim goal.

[59] U.S. EIA. Net Generation by State: 1990-2012. Coal-fired power plants in Minnesota are reported to have produced 22,722,774 megawatt hours of electricity in 2012.

requirements of the Minnesota RES.[60] Also, this assumes that EPA would allow states to credit 100% of the renewable generation associated with their RES standards, regardless of where the electricity is produced.[61]

In terms of the projected energy efficiency savings, for the purpose of this analysis, we adopted EPA's projection of net cumulative energy efficiency savings, since EPA assumed the same savings rate in its goal computation (1.5 percent annual savings rate and importer discount). This was assumed to be a reasonable proxy for the requirements of the Next Generation Energy Act.

In terms of the remaining elements, we assume that (1) half of the expanded renewable generation from the state's RES will displace existing fossil MWhs within Minnesota (the rest is assumed to satisfy future electricity demand growth or may come from out-of-state without displacing Minnesota fossil generation)[62], (2) fossil MWhs are based on EPA's 2012 eGrid data with an adjustment for Sherburne County Unit 3, which was out of service in 2012, and (3) Minnesota's existing nuclear facilities remain in operation through 2030. The analysis does not assume that energy efficiency savings would displace existing fossil generation and associated CO_2 emissions within the state (effectively we are assuming that energy efficiency savings will only displace future electricity demand growth or fossil generation outside of Minnesota). This is a conservative assumption; in practice, energy efficiency savings would displace a mix of generating resources, including fossil generating units.

Table 6. Revised CO_2 Emission Rates with Minnesota RES and EERS

Year	CO_2 Emissions (tons)	Fossil and Other MWhs	Nuclear (at risk) MWhs	Renewable MWhs	Energy Savings (MWhs)	Revised CO_2 Rate (lb/MWh)
2020	29,609,979	28,757,974	840,190	17,636,869	3,446,449	1,168
2021	29,560,593	28,710,104	840,190	17,732,610	4,276,070	1,147
2022	29,510,938	28,661,974	840,190	17,828,870	5,045,134	1,127
2023	29,461,014	28,613,583	840,190	17,925,652	5,754,929	1,109
2024	29,410,819	28,564,929	840,190	18,022,959	6,406,672	1,093
2025	28,331,306	27,518,566	840,190	20,115,686	7,001,517	1,021
2026	28,274,979	27,463,968	840,190	20,224,881	7,540,551	1,009
2027	28,218,347	27,409,075	840,190	20,334,667	8,024,800	997
2028	28,161,407	27,353,884	840,190	20,445,049	8,455,227	986
2029	28,104,159	27,298,393	840,190	20,556,030	8,832,737	977
2030	28,046,600	27,242,602	840,190	20,667,613	9,158,177	969

Note: In 2011, Sherburne County Unit 3 (938 MW coal unit) was out of service due to an explosion at the plant. For the purpose of this analysis, given that the unit has returned to service, the unit's average annual generation in 2010 and 2011 were added back into the state's assumed coal generation and CO_2 emissions. No adjustment was made to EPA's projected energy savings, which apply an importer discount, because it is not clear how this would be applied in a compliance context.

As illustrated by this analysis, the Minnesota RES and EERS both serve to bring down the state's average emission rate, from a current rate of about 1,450 lb/MWh to a rate between 1,168 lb/MWh

[60] Projected electricity sales in Minnesota were taken from EPA's Clean Power Plan analysis (minus WAPA sales in 2012 from EIA 861). Projected statewide sales were divided between Xcel Energy and other utilities based on their respective share of sales in 2012 (from EIA 861).

[61] EPA will need to clarify in the final rule how renewable energy generation will be treated, including whether "imported" renewable energy generation (mandated by a state RPS) can count towards compliance.

[62] This assumption may not be conservative enough given that Minnesota utilities have been developing renewable energy projects outside the state. Minnesota Power, for example, has constructed several large wind projects in North Dakota and continues to evaluate renewable options in and around Minnesota. See Minnesota Power 2013 Resource Plan, March 1, 2013.

and 969 lb/MWh.[63] Again, EPA has proposed interim and final CO_2 emissions goals for Minnesota of 911 lb/MWh and 873 lb/MWh, respectively. As a result, the state would need to consider additional measures to bring it into compliance with the proposed rule (e.g., by increasing its renewable energy goals). Key to this conclusion is the assumption that (1) EPA would credit Minnesota for 100% of its RECs purchases, (2) all of the state's nuclear units would remain on-line through 2030, and (3) the state could achieve and sustain a 1.5 percent savings rate across all electricity sales.

In order to comply with the proposed standards, Minnesota could direct utilities to improve the efficiency of existing fossil generating units, retire existing fossil generating units, or switch to lower carbon fuels. Minnesota utilities have already announced plans to retire at least seven coal-fired generating units between 2015 and 2020.[64] Together these units produced 7 million tons of CO_2 emissions in 2013.[65]

Arizona EERS and RES

Arizona enacted an EERS policy in 2010 that covers electricity sales from 2011 to 2020. The standard requires investor-owned utilities with annual revenues greater than $5 million to achieve cumulative savings of 22 percent of retail electricity sales by 2020, with annual savings goals set for each year (ranging from 2.0% to 2.5%). Electric distribution cooperatives must set annual savings goals that are at least 75 percent of the EERS annual goal. Together these obligations cover 59 percent of electricity sales in the state.[66]

The majority of energy efficiency savings in Arizona come from state mandated demand-side efficiency programs for utilities. These programs are funded by a surcharge on customer bills that is subject to approval by the Arizona Corporation Commission. Peak demand savings can contribute a portion of the state's cumulative savings goal. One-third of the energy saved from the implementation of new building codes can contribute to savings targets, while savings from old demand-side management programs (2005-2010) can count toward savings after 2016. Energy from CHP installations that do not qualify under the state's Renewable Energy Standard can also count toward meeting savings targets.

Arizona has also adopted an RES. In November 2006, the Arizona Corporation Commission (ACC) adopted final rules to expand the state's Renewable Energy Standard (RES) to 15% by 2025 (with 30% of the renewable energy to be derived from distributed energy technologies). The standard applies to investor-owned utilities and electric power cooperatives serving retail customers in Arizona.

Compliance with EPA's Clean Power Plan: Arizona

EPA has proposed interim and final CO_2 emissions goals for Arizona of 735 lb/MWh and 702 lb/MWh, respectively.[67] Table 7 calculates a revised CO_2 emission rate for Arizona assuming an

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[63] The state's current rate was calculated based on its 2012 CO_2 emissions, fossil and other MWhs, at risk nuclear MWhs, and 2012 RES mandate. No energy efficiency savings were assumed.

[64] Comments of the Minnesota Public Utilities Commission to U.S. EPA Administrator Gina McCarthy on November 25, 2014 RE: Docket ID No. EPA-HQ-OAR-2013-0602 – Clean Power Plan. In addition to the plants listed in the PUC comments, Rochester Public Utilities had previously announced plans to close the Silver Lake coal plant in 2015.

[65] U.S. EPA Clean Air Market Database.

[66] ACEEE. *State EERS Policy Brief*. April 2014. Available at: http://aceee.org/files/pdf/policy-brief/eers-04-2014.pdf. Accessed August 25, 2014.

[67] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units 79 FR 34829, June 18, 2014; https://federalregister.gov/a/2014-13726. Page 34895, Table 8-Proposed State Goals.

extension of the state's EERS through 2030 and based on the projected renewable MWhs required to meet the state's RES. Specifically, this analysis assumes a 2.5 percent savings rate applied to 59 percent of the state's projected electricity sales. Again, several assumptions were required to prepare this forecast.

In terms of the renewable energy forecast, between 2020 and 2030, the Arizona RES is assumed to require between 4.9 million and 8.3 million MWhs of renewable energy. This forecast is based on EPA's forecast of future energy sales in Arizona and the requirements of the Arizona RES.[68] This analysis also assumes that EPA would allow states to credit 100 percent of the renewable generation associated with their RES, regardless of where the electricity is produced.

In terms of the projected energy efficiency savings, Arizona's EERS policy currently ends in 2020 and no information is available on whether or not it will be extended. For the purposes of this analysis, Arizona's EERS is assumed to be extended through 2030, with electricity suppliers required to reduce sales by 2.5 percent each year from 2020 to 2030. Also, we assume that the policy only covers 59 percent of total electricity sales within the state.[69] Based on these assumptions, Arizona's EERS will reduce electricity sales by 86.3 million MWh's between 2020 and 2030 compared to a business as usual scenario.[70]

In terms of the remaining elements, we assume that (1) half of the expanded renewable generation from the state's RES will displace existing fossil MWhs within Arizona (the rest is assumed to satisfy future electricity demand growth or may come from out-of-state without displacing Arizona fossil generation), (2) Arizona's existing nuclear facilities remain in operation through 2030, and (3) the energy efficiency savings associated with the Arizona EERS are not assumed to displace Arizona fossil generation (effectively we are assuming that energy efficiency savings will only displace future electricity demand growth or fossil generation outside of Arizona). This is a conservative assumption; in practice, energy efficiency savings would displace a mix of generating resources, including fossil generating units.

Table 7. Revised CO_2 Emission Rates with Arizona RES and Extension of EERS

Year	CO_2 Emissions (tons)	Fossil and Other MWhs	Nuclear (at risk) MWhs	Renewable MWhs (RES mandate)	Energy Savings (MWhs)	Revised CO_2 Rate (lb/MWh)
2020	39,234,172	50,584,912	1,818,486	4,870,805	4,306,827	1,274
2021	39,018,184	50,306,482	1,818,486	5,427,665	5,200,530	1,244
2022	38,796,890	50,021,213	1,818,486	5,998,204	6,028,136	1,215
2023	38,570,189	49,728,973	1,818,486	6,582,683	6,791,831	1,188
2024	38,337,977	49,429,630	1,818,486	7,181,369	7,493,648	1,163
2025	38,100,150	49,123,048	1,818,486	7,794,532	8,135,480	1,140
2026	38,060,776	49,072,291	1,818,486	7,896,046	8,719,080	1,128
2027	38,020,890	49,020,873	1,818,486	7,998,882	9,246,071	1,117
2028	37,980,483	48,968,786	1,818,486	8,103,057	9,717,949	1,107
2029	37,939,551	48,916,020	1,818,486	8,208,589	10,136,089	1,098
2030	37,898,085	48,862,567	1,818,486	8,315,496	10,501,752	1,091

[68] Projected electricity sales in Arizona were taken from EPA's Clean Power Plan analysis with the EERS savings rate applied.

[69] ACEEE (April 2014) State Energy Efficiency Resource Standards (EERS) Policy Brief. Available at: http://www.aceee.org/files/pdf/policy-brief/eers-04-2014.pdf.

[70] Energy efficiency savings are calculated consistent with the methodology that EPA used for Building Block #4, except that we assumed a savings rate of 2.5% and savings were only applied to 59% of the state's total electricity sales.

Based on this analysis, we find that the Arizona RES and an extension of the Arizona EERS would reduce the state's CO_2 emissions rate between 12 percent and 25 percent (between 2020 and 2030) from its current average (1,453 lb/MWh).[71] Given the stringency of Arizona's proposed performance targets, the state would still need to reduce its CO_2 emissions by roughly 14 million tons to meet its interim goal. While the analysis indicates that the state's RES and EERS bring the state closer to potential compliance, Arizona would need to consider additional control measures to comply with the proposed Clean Power Plan. If the RES and EERS are maintained, they could significantly contribute to Arizona's compliance with the proposed rule.

Pennsylvania EERS and RES

The Pennsylvania EERS first required utilities to achieve electricity savings goals in 2008 with the adoption of Act 129.[72] The Act covers the utilities in Pennsylvania that have at least 100,000 customers, which translates to more than 90 percent of electricity sales in the state. The law required affected utilities to reach 3 percent cumulative savings by May 2013 and to develop plans for peak demand savings of 4.5 percent by May 2013. Once this initial phase was complete, the Pennsylvania Public Utility Commission (PA PUC) was charged with assessing the cost-effectiveness of the energy efficiency and conservation program and setting additional incremental reductions in electric consumption once it was determined that benefits exceeded costs. Phase II was then initiated and is currently in place. Phase II requires affected utilities to achieve between 1.6 percent and 2.9 percent cumulative savings goals between May 2013 and May 2016. The Pennsylvania Public Utility Commission is currently leading the development of Phase III, which could potentially run from 2016 to 2021. The stakeholder process to gather feedback on Phase III began in early 2014. As a result, the savings goals for Phase III have not yet been established.

The Pennsylvania Alternative Energy Portfolio Standard (AEPS), established by Act 213, was signed into law in November 2004. The law requires that an increasing share of the electricity sold to retail customers in Pennsylvania is produced from alternative energy sources. There are two tiers of energy sources under the law. The state's Tier I standard includes: renewable energy resources, biologically-derived methane, black liquor, coal-mine methane, and fuel cells. In 2012, black liquor accounted for 10.6% and coal-mine methane accounted for 3.1% of Tier I resources (based on MWhs); wind, landfill gas, and wood waste accounted for 84% of Tier I resources.[73] The Pennsylvania Public Utilities Commission (PUC) is responsible for carrying out and enforcing the AEPS. Compliance is based on alternative energy credits (AECs) tracked by the PJM GATS system.

Potential Compliance with EPA's Clean Power Plan: Pennsylvania

EPA has proposed interim and final CO_2 emissions goals for Pennsylvania of 1,179 lb/MWh and 1,052 lb/MWh, respectively. Table 8 calculates a revised CO_2 emission rate for Pennsylvania based on the implementation of Pennsylvania's AEPS. Several assumptions were required to prepare this forecast.

In terms of the renewable energy forecast, between 2020 and 2030, the Pennsylvania AEPS is assumed to require about 10 million MWh of renewable energy generation. This forecast is based

[71] The state's average CO_2 rate would be reduced between 14% and 33% if 100 percent of the expanded renewable generation and energy efficiency savings were assumed to displace fossil MWhs.
[72] PA Act 129 of 2008 (the Utility Energy Efficiency Act).
[73] PA Public Utility Commission. 2012 Annual Report: Alternative Energy Portfolio Standards Act of 2004. October 2013.

on EPA's forecast of future energy sales in Pennsylvania (with EERS savings) and the requirements of the Pennsylvania AEPS projected through 2030 (Tier I including solar). The analysis also assumes that 97 percent of electricity sales are covered by the AEPS and 85 percent of the projected MWhs would qualify for credit under the Clean Power Plan (based on the fact that renewable resources accounted for 84 percent of Tier I resources in 2012). This analysis effectively assumes that EPA would allow states to credit the renewable generation associated with their RES policies, regardless of where the electricity is produced.

Since the Phase III EERS goals are not currently known, for illustrative purposes only, we assume a 1% annual savings rate from 2020 through 2030.[74] The 1% savings rate is applied to 93 percent of the state's projected electricity sales,[75] but otherwise relies on the same methodology that EPA used in the proposed Clean Power Plan for projecting future energy efficiency savings for Building Block #4. Based on these assumptions, the 1% hypothetical savings target will save between 5.2 million and 12.6 million MWhs between 2020 and 2030, relative to the adjusted business-as-usual forecast.

In terms of the remaining elements in EPA's rate-based compliance formula, we assume that (1) half of the expanded renewable generation from the state's AEPS will displace existing fossil MWhs within Pennsylvania (the rest is assumed to satisfy future electricity demand growth or may come from out-of-state without displacing Pennsylvania fossil generation), (2) Pennsylvania's existing nuclear facilities remain in operation through 2030, and (3) the energy efficiency savings associated with the hypothetical EERS are not assumed to displace Pennsylvania fossil generation (effectively we are assuming that energy efficiency savings will only displace future electricity demand growth or fossil generation outside of Pennsylvania). This is a conservative assumption; in practice, energy efficiency savings would displace a mix of generating resources, including fossil generating units. We also assume that projected CO_2 emissions are reduced by 14 million tons (14%) based on planned coal unit retirements that are scheduled to occur before 2020.

Table 8. Revised CO_2 Emission Rates with Pennsylvania AEPS and Hypothetical EERS

Year	CO_2 Emissions (tons)	Fossil and Other MWhs	Nuclear (at risk) MWhs	Renewable MWhs	Energy Savings (MWhs)	Revised CO_2 Rate (lb/MWh)
2020	85,481,728	126,329,399	4,425,296	10,075,628	5,196,015	1,171
2021	85,461,293	126,303,853	4,425,296	10,126,719	6,262,613	1,162
2022	85,440,753	126,278,178	4,425,296	10,178,070	7,253,923	1,154
2023	85,420,110	126,252,373	4,425,296	10,229,681	8,170,917	1,146
2024	85,399,362	126,226,436	4,425,296	10,281,553	9,014,518	1,139
2025	85,378,509	126,200,369	4,425,296	10,333,689	9,785,596	1,133
2026	85,357,550	126,174,169	4,425,296	10,386,089	10,484,974	1,127
2027	85,336,485	126,147,836	4,425,296	10,438,754	11,113,427	1,122
2028	85,315,313	126,121,370	4,425,296	10,491,687	11,671,681	1,117
2029	85,294,034	126,094,769	4,425,296	10,544,888	12,160,417	1,113
2030	85,272,646	126,068,034	4,425,296	10,598,359	12,580,271	1,110

[74] According to PennFuture, during the first two years of Phase I, utility companies were able to achieve a savings rate of 1.2 percent per year. http://my.pennfuture.org/site/MessageViewer?em_id=50401.0

[75] ACEEE (April 2014) State Energy Efficiency Resource Standards (EERS) Policy Brief. Available at: http://www.aceee.org/files/pdf/policy-brief/eers-04-2014.pdf.

Based on this analysis, we find that a combination of the Pennsylvania AEPS, a 1% annual savings goal, and scheduled coal retirements would bring the state into compliance with EPA's interim CO_2 performance standard, but not the final (2030) performance standard. The projected CO_2 rate, averaged from 2020 to 2029, is equal to 1,138 lb/MWh—below EPA's proposed standard. The state's projected 2030 rate, however, is not below EPA's proposed final standard. EPA has proposed interim and final CO_2 emissions goals for Pennsylvania of 1,179 lb/MWh and 1,052 lb/MWh, respectively. Key to this conclusion is the assumption that (1) EPA would credit Pennsylvania for out-of-state RECs purchases, (2) that all of the state's nuclear units would remain on-line through 2030, and (3) that the state could achieve 1.0 percent annual incremental energy efficiency savings.

Remaining Compliance Questions

These examples in this report illustrate that state energy efficiency and renewable energy policies will play a critical role in meeting the nation's energy security, economic development, and greenhouse gas reduction goals. However, a number of states and other stakeholders have raised several issues and questions in their comments to EPA about the proposed rule that could serve as barriers to utilizing energy efficiency and renewable energy policies and programs to achieve compliance with 111(d) targets, including:

- How will existing RECs be treated under the section 111(d) program? Should states be looking to modify existing tracking systems, such that a wind project, for example, could produce both a state REC as well as a section 111(d) credit? Effectively, the same renewable energy MWh could be used for compliance with both programs. One possible advantage of this approach would be that crediting rules could be applied consistently for all section 111(d) credits. For example, while a state RPS program might allow bonus credit for distributed solar, the tracking system could be designed to mint only a single section 111(d) credit per MWh of output.
- How will state programs interact? For example, a state that adopts a cap-and-trade program will automatically benefit from developing a new renewable energy project. As renewable energy is added to the grid, it will displace fossil generation to some extent, reducing CO_2 emissions and helping the state to meet its CO_2 cap. However, would that same wind project be eligible to generate section 111(d) credits for another state to use toward its rate-based compliance program? This issue stems from the fact that EPA allows states to adopt a mix of program approaches. One possible solution that could mitigate this concern would be to establish regional programs so that there is consistent treatment across states.
- In terms of energy efficiency programs, EPA is planning to develop evaluation, measurement, and verification (EM&V) guidance to assist states in developing programs to track and report energy efficiency savings. These savings could then be included in the state's compliance demonstration, assuming compliance with a rate-based standard. This guidance will need to recognize that many states already have existing EM&V programs and the federal guidelines should not create an added burden that hurts the cost-effectiveness of energy efficiency programs. Also, stakeholders have recommended establishing an energy efficiency registry that would provide a transparent platform for reporting energy efficiency savings to EPA as well as a trading platform for energy efficiency credits.
- EPA's EM&V guidelines can be designed to allow states to rely on a wide range of energy efficiency programs and approaches as outlined in this report. From a state's perspective, these issues are dramatically simplified by adopting a mass-based target and mass-based trading system because tracking and reporting renewable generation and energy efficiency savings is really only necessary in the context of rate-based compliance where emissions and MWhs are needed to derive the state's average emission rate

Summary of Findings

These three examples illustrate the types of analyses that states will be conducting as they consider their options for complying with the Clean Power Plan. Appendix B contains a forecast of RES-mandated renewable energy generation for 29 states, and Table 4 contains a listing of state EERS policies. Combined with state-specific forecasts of fossil-fired power generation and nuclear power generation, these data can be used to evaluate EPA's proposed Clean Power Plan, similar to the three examples provided here.

The analysis also highlights the important contributions that renewable energy and energy efficiency can make toward compliance. Minnesota has a strong renewable standard and discussions are underway to potentially strengthen the law. Combined with its energy efficiency standard, the state is in a good position to comply with a future carbon reduction goal.[76] Similarly, the Pennsylvania AEPS requires additional non-emitting generation and Pennsylvania is considering the next phase of its EERS. Assuming those policies are fully implemented and continued, the state appears very well positioned to comply with EPA's proposed rule.

The Arizona EERS and RES are projected to reduce the state's average CO_2 emission rate by at least 25 percent. This is based on an analysis that makes several conservative assumptions. This would not be enough to meet EPA's proposed interim or final CO_2 standards. As a result, the state would need to consider additional policy measures to reduce its CO_2 emissions, including potentially, additional policies to promote energy efficiency and renewable energy technologies.

As emphasized in the forward and throughout the report, the analysis in this paper only focused on EERS and RES policies. It did not consider non-ratepayer energy efficiency or renewable energy policies and programs, such as building energy codes, energy savings performance contracting, state tax incentives, or industrial energy efficiency or combined heat and power projects. NASEO and other organizations believe these non-ratepayer programs are a vital strategy that many states should consider in developing their compliance plans if and when the final rule is published. While NASEO does not take a position on the merits of the proposed rule, the organization does hope that this report and other resources focused on non-ratepayer programs will assist the states in identifying energy efficiency and renewable energy opportunities that can be used for compliance with the proposed rule.

[76] Recognizing that adjustments may be needed to Minnesota's 2012 baseline data given the outage at Sherburne County Unit 3.

Appendix A

Figure 2 Backup Data

		Step 1 - Unadjusted 2012 state fossil emission rate	Step 2 BSER Block One	Step 3a Block Two	Step 3b Block Two	Step 4a Block Three	Step 4b Block Three	Step 5 Block Four
State	**2012 Comparable Rate (lb/MWh)**	**2012 Starting Covered Fossil Rate (lb/MWh)**	**With Coal Heat Rate Improvement (HRI)**	**With Redispatch to Existing NGCC Capacity**	**With Redispatch to Under Construction NGCC Capacity**	**With Under Construction and At-Risk Nuclear Capacity**	**With Existing and New Renewable**	**With Demand Side Energy Efficiency**
Alabama	1,444	1,518	1,456	1,329	1,329	1,299	1,139	1,059
Alaska	1,351	1,368	1,357	1,252	1,252	1,252	1,191	1,003
Arizona	1,453	1,551	1,488	900	900	870	814	702
Arkansas	1,640	1,722	1,638	1,115	1,115	1,095	996	910
California	698	900	899	836	838	831	615	537
Colorado	1,714	1,959	1,853	1,541	1,521	1,521	1,222	1,108
Connecticut	765	844	843	809	809	762	643	540
Delaware	1,234	1,255	1,232	1,013	1,013	1,013	892	841
Florida	1,200	1,238	1,207	920	910	902	812	740
Georgia	1,500	1,598	1,527	1,296	1,296	1,041	926	834
Hawaii	1,540	1,783	1,751	1,751	1,751	1,751	1,485	1,306
Idaho	339	858	858	858	858	858	291	228
Illinois	1,895	2,189	2,062	1,865	1,865	1,759	1,476	1,271
Indiana	1,923	1,991	1,880	1,834	1,834	1,834	1,707	1,531
Iowa	1,552	2,197	2,068	1,846	1,846	1,831	1,472	1,301
Kansas	1,940	2,320	2,186	2,186	2,186	2,146	1,658	1,499
Kentucky	2,158	2,166	2,036	2,036	1,986	1,986	1,947	1,763
Louisiana	1,466	1,533	1,480	1,099	1,099	1,082	978	883
Maine	437	873	873	848	848	848	451	378
Maryland	1,870	2,029	1,923	1,868	1,868	1,797	1,394	1,187
Massachusetts	925	1,001	990	886	886	876	661	576
Michigan	1,696	1,814	1,720	1,511	1,511	1,476	1,339	1,161
Minnesota	1,470	2,013	1,903	1,369	1,369	1,329	1,042	873
Mississippi	1,130	1,140	1,159	848	843	833	752	692
Missouri	1,963	2,010	1,893	1,784	1,784	1,771	1,711	1,544
Montana	2,245	2,439	2,295	2,295	2,295	2,295	1,936	1,771
Nebraska	2,009	2,162	2,034	1,941	1,941	1,897	1,652	1,479
Nevada	988	1,091	1,071	882	882	882	720	647
New Hampshire	905	1,119	1,097	878	878	821	532	486
New Jersey	932	1,035	1,022	905	905	850	616	531
New Mexico	1,586	1,798	1,715	1,447	1,447	1,447	1,163	1,048
New York	983	1,096	1,087	927	927	893	652	549
North Carolina	1,646	1,772	1,678	1,455	1,329	1,290	1,125	992
North Dakota	1,994	2,368	2,226	2,226	2,226	2,226	1,865	1,783
Ohio	1,850	1,897	1,795	1,739	1,714	1,699	1,512	1,338
Oklahoma	1,387	1,562	1,502	1,186	1,186	1,186	964	895
Oregon	717	1,081	1,058	852	852	852	452	372

		Step 1 - Unadjusted 2012 state fossil emission rate	Step 2 BSER Block One	Step 3a Block Two	Step 3b Block Two	Step 4a Block Three	Step 4b Block Three	Step 5 Block Four
State	**2012 Comparable Rate (lb/MWh)**	**2012 Starting Covered Fossil Rate (lb/MWh)**	**With Coal Heat Rate Improvement (HRI)**	**With Redispatch to Existing NGCC Capacity**	**With Redispatch to Under Construction NGCC Capacity**	**With Under Construction and At-Risk Nuclear Capacity**	**With Existing and New Renewable**	**With Demand Side Energy Efficiency**
Pennsylvania	1,540	1,627	1,550	1,480	1,480	1,435	1,157	1,052
Rhode Island	907	918	918	918	918	918	867	782
South Carolina	1,587	1,791	1,699	1,514	1,514	1,005	866	772
South Dakota	1,135	2,256	2,121	1,456	1,456	1,456	900	741
Tennessee	1,903	2,015	1,902	1,798	1,798	1,433	1,322	1,163
Texas	1,298	1,420	1,366	1,083	1,083	1,075	861	791
Utah	1,813	1,874	1,770	1,559	1,559	1,559	1,454	1,322
Virginia	1,297	1,438	1,389	1,273	1,135	1,097	894	810
Washington	763	1,379	1,327	811	811	774	298	215
West Virginia	2,019	2,056	1,933	1,933	1,933	1,933	1,687	1,620
Wisconsin	1,827	1,988	1,881	1,619	1,619	1,598	1,379	1,203
Wyoming	2,115	2,331	2,191	2,191	2,151	2,151	1,771	1,714

Appendix B

Forecast of RPS-Mandated Generation

	2012	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Arizona Sales Forecast	76,275	84,593	85,695	86,811	87,942	89,087	90,247	91,423	92,613	93,820	95,041	96,279
Annual RPS	4%	10%	11%	12%	13%	14%	15%	15%	15%	15%	15%	15%
% of sales Covered	59%	59%	59%	59%	59%	59%	59%	59%	59%	59%	59%	59%
RPS GWh	1,564	4,957	5,524	6,105	6,699	7,309	7,933	8,036	8,141	8,247	8,354	8,463
California Sales Forecast	262,824	282,239	284,765	287,313	289,884	292,478	295,096	297,736	300,401	303,089	305,801	308,538
Annual RPS	20%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%
% of sales Covered	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%
RPS GWh	51,513	91,276	92,093	92,917	93,749	94,587	95,434	96,288	97,150	98,019	98,896	99,781
Colorado Sales Forecast	54,145	59,661	60,389	61,125	61,871	62,626	63,390	64,163	64,946	65,739	66,541	67,352
Annual RPS	12%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
% of sales Covered	59%	59%	59%	59%	59%	59%	59%	59%	59%	59%	59%	59%
RPS GWh	3,833	10,560	10,689	10,819	10,951	11,085	11,220	11,357	11,495	11,636	11,778	11,921
Connecticut Sales Forecast	29,844	30,372	30,438	30,505	30,572	30,639	30,706	30,773	30,841	30,909	30,976	31,044
Annual RPS	16%	27%	27%	27%	27%	27%	27%	27%	27%	27%	27%	27%
% of sales Covered	93%	93%	93%	93%	93%	93%	93%	93%	93%	93%	93%	93%
RPS GWh	4,460	7,659	7,676	7,693	7,710	7,727	7,743	7,760	7,777	7,795	7,812	7,829
Delaware Sales Forecast	11,530	12,006	12,067	12,128	12,190	12,252	12,314	12,376	12,439	12,502	12,565	12,629
Annual RPS	7%	19%	20%	21%	22%	23%	24%	25%	25%	25%	25%	25%
% of sales Covered	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%
RPS GWh	565	1,597	1,689	1,783	1,877	1,973	2,069	2,166	2,177	2,188	2,199	2,210
Hawaii Sales Forecast	9,643	10,258	10,338	10,418	10,499	10,580	10,662	10,745	10,828	10,912	10,996	11,082
Annual RPS	10%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	40%
% of sales Covered	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
RPS GWh	964	2,565	2,584	2,604	2,625	2,645	2,665	2,686	2,707	2,728	2,749	4,433
Illinois Sales Forecast	144,869	149,653	150,262	150,874	151,488	152,104	152,723	153,345	153,969	154,596	155,225	155,856
Annual RPS	6%	16%	18%	19%	21%	22%	24%	25%	25%	25%	25%	25%
% of sales Covered	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%
RPS GWh	3,468	9,554	10,492	11,438	12,391	13,352	14,320	15,296	15,358	15,421	15,484	15,547
Iowa Sales Forecast	46,190	48,233	48,495	48,758	49,022	49,288	49,556	49,824	50,095	50,366	50,640	50,914
Annual RPS (MW, not %)	105	105	105	105	105	105	105	105	105	105	105	105

	2012	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
% of sales Covered	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RPS GWh (assumes 30% capacity factor)	276	276	276	276	276	276	276	276	276	276	276	276
Kansas Sales Forecast	40,302	42,248	42,498	42,749	43,002	43,256	43,512	43,769	44,028	44,288	44,550	44,813
Annual RPS	10%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
% of sales Covered	82%	82%	82%	82%	82%	82%	82%	82%	82%	82%	82%	82%
RPS GWh	3,305	6,929	6,970	7,011	7,052	7,094	7,136	7,178	7,221	7,263	7,306	7,349
Maine Sales Forecast	11,788	11,996	12,022	12,049	12,075	12,102	12,128	12,155	12,181	12,208	12,235	12,262
Annual RPS	35%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%
% of sales Covered	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%
RPS GWh	4,055	4,717	4,727	4,738	4,748	4,758	4,769	4,779	4,790	4,800	4,811	4,821
Maryland Sales Forecast	62,384	64,960	65,290	65,621	65,954	66,288	66,624	66,962	67,302	67,643	67,986	68,331
Annual RPS	9%	18%	19%	20%	20%	20%	20%	20%	20%	20%	20%	20%
% of sales Covered	93%	93%	93%	93%	93%	93%	93%	93%	93%	93%	93%	93%
RPS GWh	5,244	10,921	11,403	12,258	12,320	12,383	12,445	12,509	12,572	12,636	12,700	12,764
Massachusetts Sales Forecast	55,834	56,821	56,946	57,071	57,196	57,321	57,447	57,573	57,699	57,826	57,953	58,080
Annual RPS	14%	22%	23%	24%	25%	26%	27%	28%	29%	31%	32%	33%
% of sales Covered	86%	86%	86%	86%	86%	86%	86%	86%	86%	86%	86%	86%
RPS GWh	6,770	10,799	11,313	11,828	12,346	12,866	13,389	13,913	14,440	15,419	15,951	16,486
Michigan Sales Forecast	105,880	108,692	109,049	109,407	109,766	110,126	110,488	110,850	111,214	111,579	111,945	112,313
Annual RPS	5%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
% of sales Covered	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
RPS GWh	5,082	10,869	10,905	10,941	10,977	11,013	11,049	11,085	11,121	11,158	11,195	11,231
Minnesota Sales Forecast	68,748	71,788	72,178	72,569	72,963	73,359	73,757	74,157	74,559	74,963	75,370	75,779
Annual RPS (Excel/Other)	18%/12%	30%/ 20%	30%/20%	30%/20%	30%/20%	30%/20%	30%/25%	30%/25%	30%/25%	30%/25%	30%/25%	30%/25%
% of sales Covered	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
RPS GWh	10,030	17,637	17,733	17,829	17,926	18,023	20,116	20,225	20,335	20,445	20,556	20,668
Missouri Sales Forecast	82,536	85,719	86,125	86,533	86,944	87,356	87,770	88,186	88,604	89,024	89,446	89,870
Annual RPS	2%	10%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
% of sales Covered	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%	70%
RPS GWh	1,156	6,000	9,043	9,086	9,129	9,172	9,216	9,260	9,303	9,348	9,392	9,436
Montana Sales Forecast	13,955	15,080	15,227	15,375	15,525	15,676	15,829	15,983	16,139	16,296	16,455	16,615
Annual RPS	10%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
% of sales Covered	64%	64%	64%	64%	64%	64%	64%	64%	64%	64%	64%	64%
RPS GWh	899	1,457	1,471	1,485	1,500	1,514	1,529	1,544	1,559	1,574	1,590	1,605
Nevada Sales Forecast	35,369	38,221	38,593	38,969	39,349	39,732	40,119	40,510	40,905	41,303	41,705	42,112

	2012	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Annual RPS	15%	22%	22%	22%	22%	22%	25%	25%	25%	25%	25%	25%
% of sales Covered	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%
RPS GWh	4,679	7,416	7,489	7,562	7,635	7,710	8,846	8,932	9,019	9,107	9,196	9,286
New Hampshire Sales Forecast	10,922	11,115	11,139	11,164	11,188	11,213	11,237	11,262	11,287	11,312	11,336	11,361
Annual RPS	11%	20%	21%	22%	23%	24%	25%	25%	25%	25%	25%	25%
% of sales Covered	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%
RPS GWh	1,142	2,216	2,319	2,423	2,527	2,632	2,737	2,743	2,749	2,755	2,761	2,767
New Jersey Sales Forecast	75,208	78,314	78,711	79,110	79,511	79,915	80,320	80,727	81,137	81,548	81,961	82,377
Annual RPS	9%	19%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
% of sales Covered	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%	98%
RPS GWh	6,521	14,264	15,769	15,849	15,929	16,010	16,091	16,173	16,255	16,337	16,420	16,503
New Mexico Sales Forecast	23,317	25,860	26,197	26,538	26,883	27,233	27,588	27,947	28,311	28,680	29,054	29,432
Annual RPS	10%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
% of sales Covered	68%	68%	68%	68%	68%	68%	68%	68%	68%	68%	68%	68%
RPS GWh	1,579	3,501	3,547	3,593	3,640	3,687	3,735	3,784	3,833	3,883	3,934	3,985
New York Sales Forecast	144,501	147,128	147,460	147,792	148,125	148,459	148,794	149,130	149,466	149,803	150,141	150,479
Annual RPS	25%	29%	29%	29%	29%	29%	29%	29%	29%	29%	29%	29%
% of sales Covered	82%	82%	82%	82%	82%	82%	82%	82%	82%	82%	82%	82%
RPS GWh	29,099	34,734	34,812	34,891	34,970	35,049	35,128	35,207	35,286	35,366	35,445	35,525
North Carolina Sales Forecast	128,555	140,334	141,880	143,443	145,024	146,622	148,237	149,870	151,522	153,191	154,879	156,586
Annual RPS	3%	10%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%
% of sales Covered	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%
RPS GWh	2,900	10,553	13,337	13,484	13,632	13,782	13,934	14,088	14,243	14,400	14,559	14,719
Ohio Sales Forecast	153,780	158,859	159,506	160,155	160,807	161,461	162,118	162,778	163,440	164,106	164,773	165,444
Annual RPS	2%	9%	10%	11%	12%	13%	13%	13%	13%	13%	13%	13%
% of sales Covered	89%	89%	89%	89%	89%	89%	89%	89%	89%	89%	89%	89%
RPS GWh	2,044	11,964	13,426	14,899	16,385	17,882	17,955	18,028	18,101	18,175	18,249	18,323
Oregon Sales Forecast	47,200	51,006	51,503	52,005	52,511	53,023	53,539	54,061	54,588	55,119	55,656	56,198
Annual RPS	5%	20%	20%	20%	20%	20%	25%	25%	25%	25%	25%	25%
% of sales Covered	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%
RPS GWh	1,761	7,610	7,684	7,759	7,835	7,911	9,985	10,082	10,181	10,280	10,380	10,481
Pennsylvania Sales Forecast	146,244	152,283	153,055	153,831	154,611	155,395	156,183	156,975	157,771	158,571	159,375	160,183
Annual RPS (Tier I with solar)	3.5%	7.5%	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
% of sales Covered	97%	97%	97%	97%	97%	97%	97%	97%	97%	97%	97%	97%
RPS GWh (with CO_2 sources)	4,980	11,113	11,914	11,974	12,035	12,096	12,157	12,219	12,281	12,343	12,406	12,469
Rhode Island Sales Forecast	7,768	7,906	7,923	7,940	7,958	7,975	7,993	8,010	8,028	8,045	8,063	8,081

	2012	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Annual RPS	7%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%
% of sales Covered	99%	82%	82%	82%	82%	82%	82%	82%	82%	82%	82%	82%
RPS GWh	501	1,037	1,039	1,042	1,044	1,046	1,049	1,051	1,053	1,056	1,058	1,060
Texas Sales Forecast	366,154	393,022	396,516	400,041	403,598	407,186	410,806	414,458	418,143	421,861	425,611	429,395
Annual RPS (MW not %)	5,256	5,880	5,880	5,880	5,880	5,880	5,880	5,880	5,880	5,880	5,880	5,880
% of sales Covered	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
RPS GWh (assumes 30% capacity factor)	13,813	15,453	15,453	15,453	15,453	15,453	15,453	15,453	15,453	15,453	15,453	15,453
Washington Sales Forecast	93,230	100,748	101,730	102,721	103,721	104,732	105,752	106,782	107,822	108,873	109,933	111,004
Annual RPS	3%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
% of sales Covered	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%	87%
RPS GWh	2,444	13,208	13,337	13,467	13,598	13,730	13,864	13,999	14,136	14,273	14,412	14,553
Wisconsin Sales Forecast	69,542	71,529	71,781	72,035	72,289	72,544	72,800	73,057	73,314	73,573	73,833	74,093
Annual RPS	6%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
% of sales Covered	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
RPS GWh	3,873	6,845	6,869	6,894	6,918	6,942	6,967	6,992	7,016	7,041	7,066	7,091

Note: RPS Standards in this table are "Primary" as defined by DSIRE website with the exception of Minnesota which includes both "Primary" and "Secondary" RPS standards.