U.S. POLICY

RECOMMENDATIONS FOR MARYLAND'S GREENHOUSE GAS REDUCTION PLAN

CENTER FOR CLIMATE AND ENERGY SOLUTIONS

Todd McGarvey
Timothy Markle
Doug Vine

Center for Climate and Energy Solutions

November 2015

Amid the more well-known national-level activity, U.S. states are demonstrating serious climate action. In the past 15 years, 18 states have set greenhouse gas emission reduction targets through legislation or executive orders. Efforts in some of these states have faded as proactive governments have been replaced with less climate-friendly administrations. However, eight states (California, Maine, Maryland, Massachusetts, New York, Oregon, Vermont and Washington) remain committed to their greenhouse gas reduction targets and stand out as leaders. These sub-national efforts (including programs and plans announced by U.S. businesses) are critical to the United States meeting its international climate commitments, as analysis has shown that current and announced federal policies fall around 6 to 9 percent short of its 2025 target.

INTRODUCTION

In 2009, the Maryland legislature approved the Greenhouse Gas Reduction Act (GGRA), which established a requirement to reduce its greenhouse gas emissions 25 percent below 2006 levels by the year 2020 in a manner that creates jobs and improves the economy. Maryland has already begun implementing more than 150 initiatives to reduce its emissions 55.26 million metric tons below business-as-usual (BAU) by 2020.[1] Note that the GGRA did not establish a post-2020 goal for Maryland.

Over the past 15 years, 18 other states have set greenhouse gas reduction targets. Seven of these states, exclusive of Maryland, stand out as leaders because they have established their targets by legislative action or executive order; they have reporting requirements and obligations to update their original climate plans, which institutionalize the goals and create accountability; and they have demonstrated ongoing action to reduce emissions through participation in a cap-and-trade program such as the Regional Greenhouse Gas Initiative (RGGI), and/or have aggressively pursued other actions. These leading states have introduced hundreds of initiatives to achieve their respective targets.

The GGRA requires a report in 2015 that assesses Maryland's efforts to date and requires the Maryland Department of the Environment (MDE) to provide a recommendation on what the State's post-2020 reduction target should be. Additionally, the Maryland Climate Change Commission (MCCC) is charged with developing a Plan

of Action in 2015 with benchmarks and timetables for its implementation.[2] In order to assist Maryland, this brief compares emissions, targets, actions and initiatives of the eight leading states. Additionally, it highlights major initiatives and provides key insights for Maryland. Finally, the report provides a high-level overview of key aspects of the Clean Power Plan and possible implications for the state of Maryland. Summaries of leading state actions and plans are also provided.

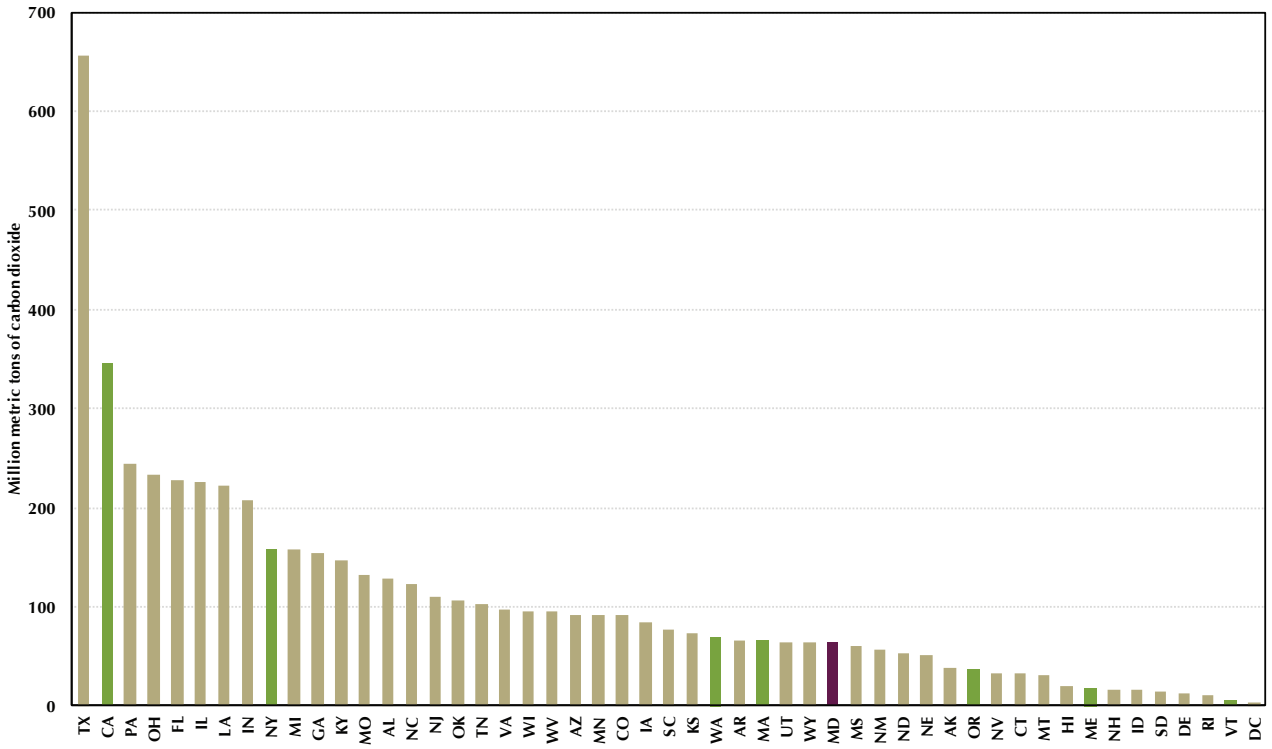
EMISSIONS

In 2011, Maryland emitted 63.8 million metric tons of carbon dioxide from energy-related sources – by burning fossil fuels across all economic sectors for electric power, heating, and transportation, among other things.[3] Among all U.S. states and the District of Columbia, Maryland was the 33rd largest emitter on an absolute basis (Figure 1) and 41st largest emitter on a per capita basis (Figure 2).

Just 10 U.S. states were responsible for 50 percent of energy-related carbon dioxide emissions in 2011.[4] Only 2 of these top 10 emitting states, California and New York, have greenhouse gas reduction targets.

On a per capita-basis, the leading states (shown in green in Figure 2) have among the lowest emission rates per person in the nation. Maryland (shown in purple in Figure 2) at 10.9 million metric tons per person in 2011 is the second highest among the eight leading states.

FIGURE 1: State Energy-Related Carbon Dioxide Emissions, 2011



Source: Energy Information Administration, "State-Level Energy-Related Carbon Dioxide Emissions, 2000-2011." August 2014. Available at: http://www.eia.gov/environment/emissions/state/analysis/.

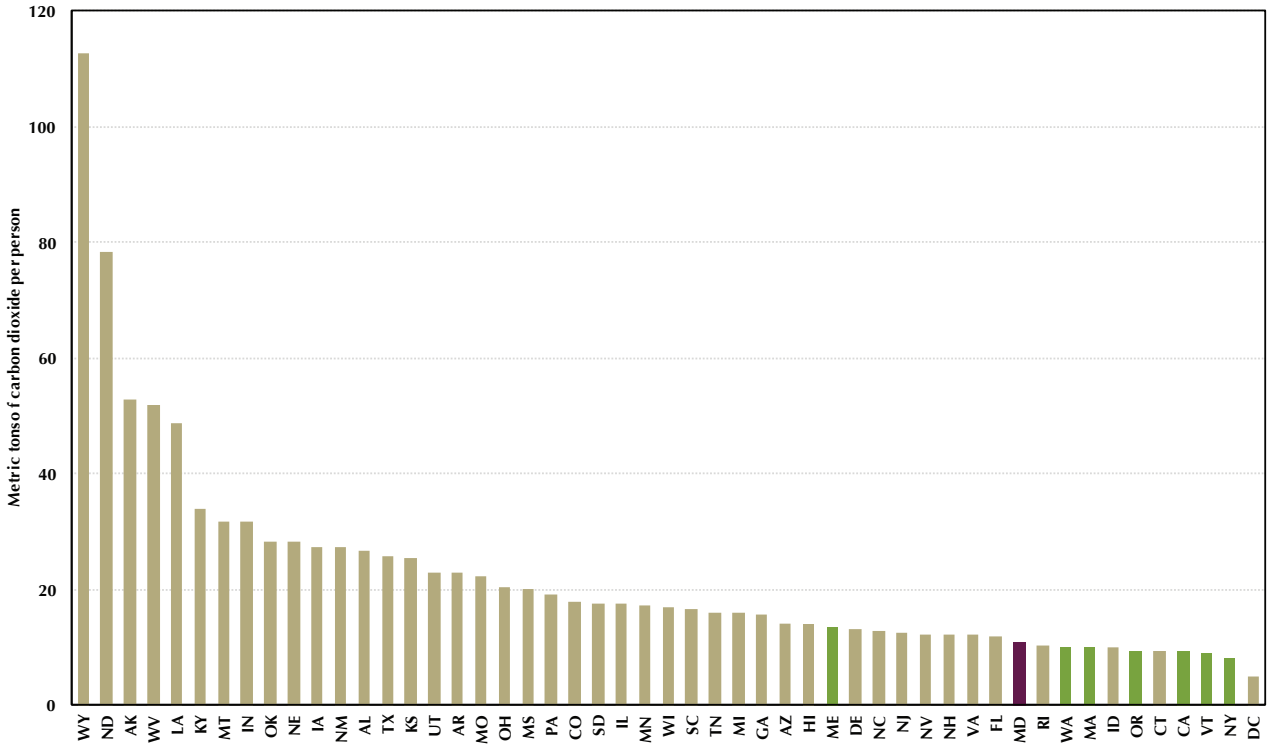
REDUCTION TARGETS

The eight leading states have set emission targets relative to their respective 1990 greenhouse gas emission levels (Table 1). Assuming Maryland's 2006 greenhouse gas emissions are similar to 1990 levels (as some state officials have indicated), then its 2020 target is somewhat stronger than targets put forth by other leading states. On the less ambitious end, California and Washington have set targets to reduce emissions to 1990 levels by 2020, and Oregon and Maine intend to reduce emissions 10 percent below 1990 levels by 2020. On the more ambitious end, Vermont has set a target to reduce its emissions 25 percent below 1990 levels by 2012 and 50 percent below by 2028.

All leading states have reported a reduction in emissions from a 2005 peak. The most significant decreases have occurred between 2008 and 2010 and have coincided with the economic recession. From 2010 onward, emissions in Maryland, Massachusetts, and Oregon have trended steadily downward. In California, Washington, and New York, this trend has either leveled off or decreased only slightly. The latest estimates from Maine and Vermont show an increase in emissions over the previous one to two years. Both states have attributed the increase to a combination of an increase in vehicle miles traveled (VMT) and added winter oil and natural gas heating.

Maryland must reduce emissions by an additional 16.9 percent by 2020 to meet its target (Table 2). This is the second highest percentage among the six leading states with 2020 targets. In contrast, Maine, Washington, and California are closest in percentage terms to reaching their respective targets. Maine, for example, must reduce its emissions an additional 2.7 percent. Additionally, Maryland has one of the largest percent differences between target emissions and projected business-as-usual emissions, indicating that current and proposed emissions reduction policies are expected to have a significant impact on the state's emissions trajectory.

FIGURE 2: Per Capita Energy-Related Carbon Dioxide Emissions by State, 2011



Source: Energy Information Administration, "State-Level Energy-Related Carbon Dioxide Emissions, 2000-2011." August 2014. Available at: http://www.eia.gov/environment/emissions/state/analysis/.

TABLE 1: Greenhouse Gas Reduction Targets of Leading States

STATE	TARGET	POST-2020 GOAL
California	1990 levels by 2020, 80% below 1990 levels by 2050	Yes
Maine	Reduce to 1990 levels by 2010, 10% below 1990 levels by 2020, long term "sufficient reduction to eliminate any dangerous threat to the climate"	Yes - not specific
Maryland	25% below 2006 levels by 2020	No
Massachusetts	25% below 1990 levels by 2020, 80% below 1990 levels by 2050	Yes
New York	40% below 1990 levels by 2030, 80% below 1990 levels by 2050	Yes
Oregon	10% below 1990 levels by 2020, 75% below 1990 levels by 2050	Yes
Vermont	25% below 1990 levels by 2012, 50% below 1990 levels by 2028, 75% below 1990 levels by 2050 (if practicable using reasonable efforts)	Yes
Washington	Reduce to 1990 levels by 2020, 25% below 1990 levels by 2035, 50% below 1990 levels by 2050	Yes

MID- AND LONG- TERM TARGET SETTING

The majority of leading states have set post-2020 targets. Four of the seven have established a mid-term target between 2028 and 2035, and six of the seven have set 2050 goals. The 2050 goals are remarkably similar. Goals set by California, Massachusetts, and New York fall within the Intergovernmental Panel on Climate Change's (IPCC) 450 ppm scenario to achieve 80 - 95 percent reductions by 2050 (though they are on the low end), and Oregon and Vermont come very close.

California, Massachusetts, New York, Oregon and Vermont have cited the IPCC guidance in setting their targets. Maine, Oregon, and Vermont cited the 2001 New England Governors/Eastern Canadian Premiers Climate Action Plan as a resource. Additionally, some states, such as Washington, turned to regional scientific information about projected impacts under different emissions scenarios as a basis for their goals.[5]

Generally, we have observed that states (and others) set or publicly announce targets first and later reveal the strategies, policies and programs to meet them. Additionally, states approach the question of administration of the goals in different ways. Notably, the California and Massachusetts statutes establish enforcement capacities and penalty options for non-compliance. The five other leading states use the targets in a more aspirational manner, with no penalties for falling short of the goals.

PROGRAM SIMILARITIES

Leading states have pursued hundreds of policy initiatives to achieve their greenhouse gas reduction goals. Table 4 shows that Maryland is using many of the same programs as other leading states. These programs range from state-wide and regional caps on emissions; to providing grants and state funding for energy efficiency programs; to community-based programs focusing on alternative transportation development, zoning regulation changes, and solid waste reductions. All leading states, Maryland included, have established renewable and alternative energy portfolio standards with mandated targets and regulations for buying and selling renewable energy credits (RECs). Moreover, these states have updated building codes to include energy efficiency upgrades and retrofits, and adopted fuel-efficiency standards at or exceeding the federal level. Furthermore, all leading states have implemented incentive programs to develop and support markets for electric vehicles, zero emission vehicles, and residential solar installation.

TABLE 2: Greenhouse Gas Inventories of Base Year and Latest Reporting Year

STATE	INVENTORIES: GROSS GHG EMISSIONS (MMTCO2E)			
	BASE YEAR	EMISSIONS	LATEST REPORTING YEAR	EMISSIONS
California	1990	431.00	2013	459.28
Maine	1990	21.53	2011	19.92*
Maryland	2006	107.23	2013	96.80
Massachusetts	1990	94.40	2011	80.00
New York	1990	230.80	2011	211.70
Oregon	1990	56.20	2010	62.80
Vermont	1990	8.11	2012	8.27
Washington	1990	88.40	2012	92.00

Greenhouse Gas Reduction Needed to Reach Emissions Target

STATE	NEAREST TARGET YEAR	EMISSIONS TARGET	REDUCTION NEEDED TO REACH TARGET (MMTCO2E)	REDUCTION NEEDED TO REACH TARGET (%)	PROJECTED BAU EMISSIONS BY TARGET YEAR (MMTCO2E)	DIFFERENCE IN TARGET AND BAU PROJECTED EMISSIONS (%)
California	2020	431.00	28.28	6.2	509.00	15.3
Maine	2020	19.38	0.54	2.7	22.50b	13.9
Maryland	2020	80.42	16.38	16.9	135.68	40.7
Massachusetts	2020	70.80	9.20	11.5	94.00	24.7
New York	2030	138.48	73.22	34.6	209.39**	33.9
Oregon	2020	50.58	12.22	19.5	89.20	43.3
Vermont	2028***	4.06	4.21	50.9	12.65	67.9
Washington	2020	88.40	3.60	3.9	104.00	15.0

** The 2012 greenhouse gas emissions preliminary estimate is 21.18 MMtCO2e.*

*** BAU estimates include policy projections out to target year.*

**** Vermont failed to meet its 2012 target.*

TABLE 3: Leading States Mid- and Long-Term Targets

STATE	BASE YEAR	EMISSIONS REDUCTION TARGETS FROM BASE YEAR			
		MID-TERM			LONG-TERM
		2028	2030	2035	2050
California	1990		40%		80%*
Maine	1990				
Maryland	2006				
Massachusetts	1990				80%
New York	1990		40%		80%
Oregon	1990				75%
Vermont	1990	50%			50%
Washington	1990			25%	75%

Most states have set long- and short-term targets; fewer states have set mid-term targets.

** Target set in executive order; proposed bill would codify target*

PROGRAM DIFFERENCES

Although leading states are using similar over-arching emissions reduction programs, there are differences in the application and financing of these programs. California is expanding its state-wide cap-and-trade system to include the transportation sector as a way to further cut emissions, while Vermont is relying more heavily on alternative transportation incentives and expanding grassroots public transportation education programs. Additionally, state renewable portfolio standards (RPS) are structured differently to account for differences in a state's renewable energy mix. For example, there is added focus on hydropower in Washington, solar in New York, and biomass in Vermont. Moreover, funding levels impact the speed at which policy is implemented. Federal and state funding for community tree planting and solid waste removal from landfills in Massachusetts has already yielded financial benefits and emission reductions.[6] However, in Vermont, where these programs are mostly voluntary, movement has been slow with little realized benefit.[7] Finally, New York and California have established green banks to spur private investment in innovative green energy projects that would have otherwise struggled to get off the ground due to their high market risk.

Emission reductions can be the result of policies or market forces, which can present unique challenges. State greenhouse gas inventory reports have concluded that the largest percentage of greenhouse gas emission reductions from peak levels are largely attributable to the recent recession and cheaper natural gas prices.[8, 9] Additional reductions have come through implementation of robust energy efficiency and RPS programs. Although leading states indicate a high level of confidence in reaching 2020 targets through current policy measures, states such as Massachusetts recognize that certain policies have reduced more emissions than anticipated while others have been less successful or are still not fully implemented.[10] Moreover, meeting post-2020 targets often rely on vague "roadmaps" that include advances in energy and transportation technologies, continued shifts in fuel-use mix, and changes in people's behavior. In order to increase the likelihood of reaching 2020 and post-2020 targets, these same states have begun tailoring programs to include innovative financing, stronger RPS programs, public-private partnerships, and community involvement.

TABLE 4: A Comparison of Emission Reduction Programs Utilized by Leading States

	CA	ME	MD	MA	NY	OR	VT	WA
CLIMATE ACTION								
GHG Emissions Targets and Reporting	✓	✓	✓	✓	✓	✓	✓	✓
State or Regional Cap and Trade	✓	✓	✓	✓	✓		✓	
ENERGY SECTOR								
Renewable and Alternative Portfolio Standards	✓	✓	✓	✓	✓	✓	✓	✓
Energy Efficiency Standards and Targets	✓	✓	✓	✓	✓	✓	✓	✓
TRANSPORTATION SECTOR								
Low Carbon Fuel Standards	✓	✓	✓	✓	✓	✓	✓	✓
Adopt CA Low- and Medium-Duty Fuel Efficiency Standards	✓	✓	✓	✓	✓	✓	✓	✓
Incentives for Plug-in Electrics Vehicles	✓	✓	✓	✓	✓	✓	✓	✓
VMT Incentives and Policies	✓	✓		✓	✓	✓	✓	✓
Zero Emission Vehicle (ZEV) Program	✓	✓	✓	✓	✓	✓	✓	
BUILDING SECTOR								
Updating Residential and Commercial Building Codes	✓		✓	✓	✓	✓	✓	✓
Green Growth and Green Community Programs	✓	✓	✓	✓	✓	✓	✓	✓
ENERGY EFFICIENCY PROGRAM FINANCING								
PACE	✓	✓	✓	✓	✓	✓	✓	
Green Pricing Programs						✓	✓	✓
On-Bill Financing		✓	✓	✓	✓	✓		
Green Banks	✓				✓			

POLICY RECOMMENDATIONS FOR MARYLAND

We reviewed policies from leading state agencies with an eye toward identifying emerging trends and novel initiatives as well as successful initiatives that have effectively reduced greenhouse gas emissions. We also considered factors like funding deficiencies and competing regulations that might negatively impinge on policies. Here are ten recommendations for Maryland to consider.

Track greenhouse gas emissions and results from individual policy actions; compare to projected targets annually. Use the data to adjust programs, targets, and funding streams as needed.

Yearly tracking with updated projections from the responsible state agencies affords opportunities to thoughtfully manage the portfolio of emission reduction projects. With better data across the portfolio of state efforts, policy makers can accelerate high-performing projects, and also address obstacles hindering low-performing projects. The yearly time frame makes it possible to observe and measure project progress. However, it is also critical that tracking efforts recognize certain programs may have longer payoff times. Therefore, tracking criteria may have to be adjusted or trends reported in multi-year timeframes. Furthermore, tracking external data, such as economic indicators, may prove beneficial in formulating emissions reduction policies due to their effect on business-as-usual emissions projections, among other things.

Massachusetts, Vermont, and California have implemented program tracking efforts to varying degrees. Some useful examples are provided here.

The Massachusetts Energy Efficiency Advisory Council (MA EEAC) has developed a comprehensive three-year plan, complete with a cost-benefit and a cost-avoidance analysis, outlining all energy efficiency projects and goals. The plan contains provisions for periodic monitoring of programs and includes a yearly report, evaluation update and a mid-term modification report. This gives MA EEAC and project advisors the ability to restructure projects to improve results. The three-year plan concludes with an evaluation, verification, and modification (EV&M) report. Findings of this report are then incorporated into the subsequent three-year plan, already rolled-out, through the modification process. The EV&M report from the first three-year plan, implemented in 2010, identified a 90 percent success rate in meeting energy efficiency program and emissions reduction targets. Following adjustments made to the second three-year plan, the 2013 mid-term report identified emission reductions of over 100 percent of proposed targets.[11] A draft of the 2016-2018 plan is currently in the public comment stage.

The Vermont Agency of Natural Resources (VT ANR) has recognized the need to track emission reductions and policy targets within the transportation sector.[12] The 2013 roll-out of a zero emissions vehicle (ZEV) action plan includes one- to three-year timeframes for tracking consumer purchase and emission reduction targets. Furthermore, the 2011 Comprehensive Energy Plan (CEP) identified challenges in reducing VMT and electrifying the transportation sector. CEP recommendations included annual tracking of data from the Vermont Department of Motor Vehicles, AMTRAK, U.S. Census Bureau, and the Vermont Department of Transportation (VTrans) to analyze trends in VMT, EVs purchased, and mass transit use. Conclusions from the analysis are reported to the Vermont Climate Cabinet Staff, which has the authority to recommend and implement policy changes.

California has the most robust tracking system in place. The state Environmental Protection Agency is required to prepare an annual 'report card',nnual 008.h in AB sion 3 of Tital 2 of the Government Code s the Western U.S. and the Alaska interior have burned. [13] describing state agency actions to reduce greenhouse gas emissions.[14] Report cards detail the measures adopted and implemented by agencies and the actual emission reductions achieved. They also include a timetable of additional measures necessary to meet targets, the expected emission reductions from these measures, and a comparison of the emission reductions from actions taken or proposed by the agency to its set targets. Measures included in the report cards directly align with the strategies contained within the state's climate action plan, allowing a continuity of evaluation from formation through to implementation.

Identify and adjust policy actions that conflict with desired outcomes.

The potential for conflict between policy actions exists given the breadth of actions proposed or undertaken to reduce emissions. This effect can be seen in the interaction between initiatives and the source of their funding. For example, in the transportation sector, project funding is often generated from consumption-based fuel fees.

This establishes a tension between the need to reduce emissions, which is in part correlated to consuming less of particular fuel types, and maintaining transportation funding, reliant on sustaining, if not growing, the fuel consumption on which the fee is charged. As such, it is necessary to consider the interactions between policies before moving forward.

Examples from Vermont and Oregon highlight this issue.

In Vermont, VTrans recognized that electrification of the transportation sector will have the biggest impact on reducing the state's greenhouse gas emissions.[15] Although there are currently incentives in place for the purchase of EVs, funding to upgrade EV infrastructure comes from the transportation budget. This is funded mostly through a gasoline tax. VTrans has stated that current budget projections only cover current infrastructure needs, and any additional improvement projects would create a budget shortfall. To compound this issue, VTrans has also indicated that a move to electrification would reduce income generated from the gasoline tax resulting in negative cash flow.[16] The agency has recommended that the Vermont legislation adopt a demand-side tax, for example a tax on VMT, to eliminate the risk of funding gaps.

Oregon also identified the incompatibility of its gasoline tax as a source of funding for transportation investments that seek to reduce emissions. Inflation, a decrease in VMT in the state, and more fuel efficient vehicles have eroded the purchasing power of this funding source. These factors, combined with a constitutional requirement to use gasoline tax revenue solely on highway-related projects, have led state officials to recommend a shift toward a utility funding model for transportation. This would remove the restriction on permitted funding areas and allow investments in transportation that contribute to emission reductions, while moving towards demand-side revenue sources based on usage and peak charges.[17]

Identify and fill gaps between state regulations and necessary resources for effective energy efficiency policy implementation.

Efforts to ensure a state fully achieves its efficiency and demand reduction targets make a valuable contribution towards overall emission reductions. In its evaluation of EmPOWER's progress to date, the Maryland Energy Administration concluded that energy reduction programs consistently fell short of intended targets. In comparing Maryland's energy efficiency program funding to other leading states, a sizeable difference was noted. Maryland utilities spent approximately $17 per capita on state energy efficiency programs. This is far less than the $67 per capita spent in Vermont or the $79 per capita spent in Massachusetts.[18] Because Maryland has positioned itself as a leading state in emission reduction targets, the state may have to increase funding of energy efficiency programs to a level similar to that of other leading states in order to meet future targets. Currently, inadequate financial resources have limited efforts and have created an inability to reach energy efficiency targets.

Both the Massachusetts Department of Environmental Resources (DoER) and the New York Department of Environmental Conservation (NYDEC) have identified resource gaps between energy efficiency (EE) policy regulation and implementation at a city level. Much of this occurs within the commercial and industrial building sectors and focuses on robust EE programs (e.g. deep retrofits, stretch codes, and new green construction). Reports from both states identify that while funding for projects is present, these projects are not fully realized within given timeframes due to insufficient government resources.[19,20] These inefficiencies include a lack of government oversight through proper licensing and inspection, a lack of education and training for inspectors concerning new codes, and a limited number of inspectors. State reports suggest that grants funding EE programs include provisions to ensure an adequate number of municipal building inspectors and proper training.

Improved participant education will further realize the goals of key energy efficiency programs.

Providing a funding stream for energy efficiency programs is a necessary but not sufficient step towards realizing efficiency goals. There are many barriers beyond financing that prevent households and businesses from participating in energy efficiency programs, including issues of awareness and attention regarding current energy consumption, potential savings, and measures to capture those savings.[21] Efforts to engage households and businesses and demonstrate the value of energy efficiency programs will be required to fully realize both the efficiency goals established by states and the emission reductions delivered through achieving these goals.

The latest Massachusetts EEAC three-year plan (2013-2015) identified four barriers limiting full implementation of key EE programs. These include: (1) lack

of customer knowledge and funds, (2) language barriers in urban locations, (3) insufficient workforce to deliver goods, and (4) an aversion to implementing "unproven" technology. To remedy these issues, MA EEAC has diverted funds to increase job training and has recommended increasing the marketing budget by 25 percent to expand education programs.

The Vermont Comprehensive Energy Plan (CEP) acknowledged that shifting consumer behavior patterns should also drive policy actions to help overcome difficulties in decreasing emissions in the transportation sector. CEP recommended the inclusion of educational components in funding consumer and alternative transportation initiatives. The plan suggests that there is insufficient awareness of tax incentives for EV sellers and consumers as well as the availability of alternate transportation options throughout the state.[22]

Finding that customers are emerging as active participants in the power grid, and with the potential to form partnerships with their energy providers on demand-side programs, California looked to increase its marketing, education and outreach efforts to increase customer participation.[23] An assessment of Energy Upgrade California, the umbrella brand encompassing all demand-side activities, found low awareness of the brand amongst residential consumers and small businesses. Further, awareness and knowledge of the energy management opportunities offered by the programs encompassed within the brand was limited. Addressing this low awareness is seen as a significant opportunity to increase customer participation in energy efficiency programs.[24]

Scaling back on current low- or zero-emission electricity generation prior to tapping into new sources may cause gaps between supply and demand that must be filled by increasing fossil-fuel based electricity imports, negatively impacting emissions reduction progress.

Efforts to reduce the emissions profile of the electricity consumed within a state need to take into account the capacity of new, low- or zero-emission generation to meet demand. Further, it is prudent to be mindful of the impact that the cessation of generation from low- or zero-emission sources can have on the emissions of a state. Nuclear output from the Calvert Cliffs Nuclear Power Plant in southern Maryland consistently accounts for a large proportion of the state's net electrical generation, representing approximately 37 percent of all generation in 2014.[25] Having gained renewals of its licenses for Unit 1 and Unit 2 out to 2034 and 2036 respectively, there is no foreseeable short-term interruption to this significant source of zero emission electricity for the state. However, Maryland should not take Calvert Cliffs for granted. Should the state lose this generating source, steps to replace the output would need to consider the carbon intensity of the replacement source to maintain progress towards emissions reduction targets.

The Vermont Yankee nuclear power plant supplied Vermont with up 70 percent of the state's energy needs prior to its shut down in 2014.[26] Entergy, the company operating the plant, stepped down energy production beginning in 2012, citing increased operating costs and a lower cost for natural gas. VT ANR, along with the Governor's office, responded by increasing the number of long-term contracts for out-of-state hydropower. However, the import of this energy was delayed due to legal battles concerning a needed increase of transmission lines within the state. At the same time, VT SPEED, a voluntary RPS-like program, reported renewable energy growth lower than projected targets. These factors combined to increase Vermont's need for imported natural gas. In 2012, the state reported a 2 percent increase in emissions, the first increase since its 2005 peak.[27] This increase pushed emissions above the 1990 baseline and significantly above the 2012 emissions reduction target. The report from VT ANR specifically attributes the increase to these factors.

Encourage the development of public-private financial partnerships to improve resource capacity, grow viable markets, and spur innovation in the renewable energy sector.

Emerging and innovative green technologies face financial hurdles. Public funds are often limited and private investment will not move toward a technology that is not yet proven or has high market risk.[28] Green banks help facilitate public-private partnerships, allowing government funds to be leveraged through low-interest loans. The funds are matched by private investors who utilize these loans in order to receive a higher rate of return on riskier ventures. These actions increase investment and broaden markets for new energy projects. The low interest rate of the loan helps drive down project costs, lowers consumer costs and increases utilization rates. A loan loss reserve further minimizes the risk of failed projects by covering losses incurred by investors. The Coalition for Green Capital has worked with New York, California,

and Washington to establish green banks, and is working with over a dozen other states to establish additional banks.

In 2014, Governor Cuomo established the New York Green Bank (NYGB). NYGB is a specialized financial program designed to encourage private investment in the clean energy market by filling gaps in current markets and leveraging private funds to develop new or secondary markets for innovative energy programs at initial stages of development or solely within a wholesale market. The program will compliment other funding programs for energy efficiency programs, and therefore has limits to the types of EE projects and investments permitted. NYGB was established through an initial investment of $1 billion by the state. The program is expected to attract a minimum of $8 billion dollars of additional investment from private companies and banks.[29] This added investment relies on a loan-loss guarantee program designed into framework. This risk-aversion program encourages investment for "unproven" technologies and secondary markets by allowing investors to recoup losses from failed investments.[30]

Public-private partnerships are not limited to the inclusion of financial institutions. Partnerships between state agencies, universities, and private tech companies can also spur innovation by expanding resource capital while taking advantage of the low-risk environment afforded by research and development programs at colleges and universities.

The New York State Community Partnership (NYSCP) and New York State Energy and research Development Authority (NYSERDA) are also leading joint initiatives in recognizing and encouraging colleges and universities in taking clean energy ideas from the classroom to businesses and communities. The Campus Challenge provides tools, resources, technical assistance, and in-house expertise to turn green ideas into action. One such program, NYSUNY 2020, spent $117 million to hire additional faculty and graduate researchers to develop new R&D programs and bolster existing ones.[31] This includes the establishment of the Emerging Technology and Entrepreneurship Complex (E-TEC), a state-of-the-art research and development (R&D) hub for emerging technologies and entrepreneurial leadership. NYSUNY 2020 is expected to generate $43 million annually in research expenditures.[32]

Additionally, Governor Cuomo established Start-up NY, a program designed to reduce the tax burden on new and expanding businesses on or near colleges and universities. The plan allows businesses to operate tax-free for 10 years, partner with universities, and locate near transportation hubs. Like Campus Challenge, the goal is to bring businesses with green energy ideas and technical expertise to NY to spur innovation and help continue the state's push toward developing and implementing clean and renewable energy technologies. These partnership programs emphasize the state's philosophy that reaching emissions reduction targets, especially those beyond 2020, will require more than policy actions.[33] They will also require new technology at increased speeds of development, well-established markets, and lower production costs.

Encourage cities and local communities to identify opportunities and develop approaches to reduce local emissions through their own climate action plans.

Local communities and cities are active participants in efforts to reduce emissions, demonstrated in networks such as C40 which brings together more than 75 of the world's cities, representing in excess of 500 million people and one quarter of the global economy, to advance actions that reduce emissions and climate risks.[34] As densely populated centers under local government jurisdiction, cities are uniquely positioned to advance innovative actions, particularly in the building and transportation sectors. Actions taken by local communities and cities can be evaluated by state agencies to determine whether effective local policies should receive additional state funding to expand initiatives or whether these policies can be scaled up to a state level or incorporated into existing state programs.

Although emissions from New York City are included within the state inventory, NYC conducts yearly greenhouse gas inventories independent of the state. The yearly inventories help identify variations in the magnitude of sector-based emissions between the city and the state. For example, the largest amount of emissions in the state come from the transportation sector (34 percent).[35] In NYC, however, approximately 70 percent of emissions are from building energy use.[36] Because of the disproportionately high amount of emissions from building energy use, NYC has focused emissions reduction efforts on building retrofits and new green construction through its PlanNYC initiative.[37] The city has also led this effort by first implementing many of these EE and retrofit programs throughout city offices and buildings,

a policy action mirrored by state officials. Following Hurricane Sandy in 2012, the city introduced OneNYC and One City Built to Last as updates to the original plan. These city initiatives incorporate resilience planning into emission reduction activities, including upgrading infrastructure and using community-based competitive grants to encourage the further use of small-scale renewables, including the development of community microgrids. The city is also working with NYSERDA to increase funding for renewable energy projects for lower income families and multi-family housing units.

PlanBTV is an initiative established by the city of Burlington, VT to implement changes to zoning and planning laws to reduce emissions and increase resilience. The city is altering residential planning to encourage development of more affordable housing in the city's downtown and waterfront districts. The city is also increasing the number of bicycle lanes and alternative transportation options. Additionally, the city has eased zoning requirements to increase the installation capacity of solar energy and local food production. The overall goal is to reduce the city's emissions by reducing the need for imported natural gas and fossil-fuel based transportation methods.[38] The city has also developed a comprehensive assessment structure, including annual policy progress reports and greenhouse gas inventories, as well as a periodic review of policy relevance. This is coordinated through the city sustainability office.

Cap-and-trade policies are most effective at reducing emissions and meeting targets.

Identifying and pursuing emission reductions on a programmatic level provides a targeted and considered approach to achieving a state's goal, but does present the risk that progress towards the goal can be impacted by programs that are abandoned, delayed, or fail to realize the expected reductions. Cap-and-trade policies address this risk, by placing an absolute cap on the emissions that can be produced by covered entities. In doing so, a level of certainty is provided that a state will make progress towards its goal.

Maryland has already experienced a myriad of successes as a participant in the Regional Greenhouse Gas Initiative (RGGI), a multi-state cap-and-trade program.[39] Since 2009, RGGI allowance proceeds, as administered by MEA, have supported energy efficiency projects for approximately 12,000 low- to –moderate-income households; helped over 5,000 homes and 200 businesses install solar, wind, and geothermal systems; funded a variety of technical assistance and energy efficiency rebate programs, and provided green-energy job training to almost 1,000 workers. Most importantly, the programs funded proceeds from RGGI have saved residents close to $120 million in lifetime energy savings and avoided the consumption of almost 175,000 MWh of electricity and 3 million mmBTU of fossil fuels. Maryland is not unique in its emission reduction and cost savings success.[40] Similar results from other states' internal and regional cap-and-trade programs indicate that reducing emissions through cap-and-trade policies is highly effective and a program that Maryland should continue to employ.

With its adoption in 2013, The California Cap-and-Trade Program became the central pillar of the state's efforts to meet its emissions reduction targets. Covering approximately 450 entities that represent about 85 percent of the state's emissions, the program regulates emissions from electricity generators and industrial facilities emitting 25,000 metric tons CO2e or more annually (covered from 2013), and distributors of transportation, natural gas, and other fuels (covered from 2015). A key design aspect of the program is the relationship between the established cap level and the 2020 reduction target. The cap represents the maximum permissible emission levels from covered sources; these levels, in addition to the expected emissions from uncapped sectors, will be equal to the 2020 target. Notwithstanding deviations from the expected emissions projection of the uncapped sectors, the cap provides a degree of certainty that California will meet its 2020 target.[41]

Other states have recognized that placing a strict emissions cap provides a benefit of certainty with respect to proposed reduction targets. A recent assessment requested by the Washington Legislature and undertaken by the State of Washington Climate Legislative and Executive Workgroup (CLEW) concluded that Washington State would not meet its targets for 2020, 2035, and 2050 with current state and federal policies. However, the state was more likely to meet the 2020 target if a cap-and-trade policy was implemented.[42] CLEW, in fact, reported two sets of recommendations based on their assessment. The first recommendation supported placing a cap on emissions. The second supported reduction efforts through using advanced technologies to drive mitigation efforts.[43] Following stalled efforts to establish a cap-and-trade program through the Legislature,[44,45] Governor Inslee, on July 28th, 2015, directed the Department of Ecology to de-

velop a regulatory cap on emissions.[46] The rule-making process is expected to take about a year, and underscores the notion that policy can be promulgated via legislative action or through executive authority, if necessary.

Greenhouse gas emissions in Massachusetts' electricity generation sector have fallen by 11 MMtCO2e between 1990 and 2011, a decrease of over 37 percent. The decline of emissions is a result of the shut-down of two large coal-based power plants and a move away from coal to natural gas. These events are tied to stricter federal regulations and the state's participation in the Regional Greenhouse Gas Initiative (RGGI). Moreover, the state anticipates the closure of a third plant by 2017. If this happens, emissions will decrease by a further 2.5 MMtCO2e.[47] Massachusetts has also received over $250 million in revenue from RGGI since 2008. Over 80 percent of these proceeds have been allocated to fund various EE programs. These programs have reduced emissions by additional 1MMtCO2e between 2010 and 2012. MA EEAC projects over $300 million dollars of additional revenue for EE programs from RGGI following the 2014 agreement to lower the emission cap from 165 million short tons to 91 million short tons.[48]

Low Carbon Fuel Standards are a means of addressing emissions in a significant and challenging sector.

The transportation sector represents one of the greatest opportunities for reductions, with the sector often being the leading contributor to a state's emissions.[49] However, it is also a challenging sector in which to achieve reductions, due to the necessity of transportation, the prevalence of petroleum-based fuels throughout the sector, the non-point source nature of emissions, and the complexity of factors that determine transportation demand (such as land use planning, employment availability, and population demographics).

Recognizing both the need to address the sector's emissions and the challenge in doing so, California, as part of a suite of measures, adopted a Low Carbon Fuel Standard in 2010.[50] Targeting a 10 percent reduction in the carbon intensity of transportation fuels by 2020, the performance-based and fuel-neutral standard allows the market to determine how the carbon intensity of the state's transportation fuels will be reduced. To date, regulated parties as a whole have over-complied with the regulation, banking excess credits that can be used for future compliance.[51] In 2012, the regulation produced emission reductions of 1.6 MMtCO2e, which are projected to increase to annual reductions of 20.7 MMtCO2e upon full ramp-up of the regulation.[52]

Oregon, another state where transportation is the leading contributor to emissions, is currently in the process of implementing a Low Carbon Fuel Standard. Similar to California, Oregon's standard seeks a 10 percent reduction from 2010 levels in the carbon intensity of transportation fuels by 2025.[53]

In 2009, the governors of 11 Northeast and Mid-Atlantic states signed a Memorandum of Understanding (MOU) in response to rising emissions in the transportation sector. The original plan was to reduce the carbon intensity of transportation fuels by 15 percent over a 10 to 15 year period. Following the MOU, the states formed the Northeast States for Coordinated Air Use Management (NESCAUM) consortium, with the intention of developing a draft plan based on an analysis of each state's transportation sector emissions.[54] In August 2011, NESCAUM issued a draft report based on its economic analysis. The report recommended adopting a plan similar to that of the California LCFS program.[55] However, due to shifting political climates within states, there has been no progress since November 2011 beyond the draft plan.

In addition to creating low carbon fuel standards for fossil-fuel vehicles, developing policies to support zero-emission vehicles (ZEV) can address transportation sector (Table 4), signed an MOU to ensure the successful implementation of their state zero-emission vehicle (ZEV) programs.[56] A ZEV is any vehicle that releases zero emissions during operation, such as a battery electric or hydrogen fuel cell vehicle. Collectively, these programs aim to have 3.3 million ZEV vehicles on the road by 2025. The regional agreement created a ZEV Program Implementation Task Force, comprised of various state officials tasked with developing and overseeing policy initiatives. Although states act to promote ZEV markets based on their own need, the aim of this regional task force is to assist in the continuity and consistency in policy actions across state boundaries.[57] For example, while Vermont may establish its own tax-based incentive policies to increase ZEV demand, the ZEV task force can ensure that electric vehicle (EV) charging stations within the state are consistent with neighboring states or that developed high-occupancy vehicle (HOV) lanes continue across state borders. Continuity ensures regional infrastructure consistency and easier transit for ZEV users. Both actions provide the platform for further ZEV demand and eventual transportation-sector emission reduction.

A thoughtful RPS design can significantly reduce greenhouse gas emissions, which can lead to job creation, increased energy security, resilience and cleaner air.

Thirty states and the District of Columbia have alternative energy (AEPS) or renewable portfolio standards (RPS), which are generally designed to accelerate the deployment of renewable energy resources like wind and solar.[58] Typically, an RPS requires a certain percentage of a utility's power plant capacity or generation to come from renewable or alternative energy sources by a given date. The standards range from modest to ambitious, and qualifying energy sources vary. Some states also include "carve-outs" (requirements that a certain percentage of the portfolio be generated from a specific energy source, such as solar power) or other incentives to encourage the development of particular resources. Although climate change may not be the prime motivation behind these standards, the use of renewable or alternative energy can deliver significant greenhouse gas emission reductions. Increasing a state's use of renewable energy brings other benefits as well, including job creation, energy security, resilience and cleaner air. While the first RPS was established in 1983, the majority of states passed or strengthened their standards after 2000. Consequently, while many of these efforts have increased the penetration of renewables; others have not been in effect long enough to do so. Many states allow utilities to comply with the RPS or AEPS through tradeable credits. While the success of state efforts to increase renewable or alternative energy production will depend in part on federal policies such as production tax credits, states have been effective in encouraging clean energy generation.

By comparison, Maryland's RPS is not the strongest (e.g., New York, California, Vermont) and others extend farther into the future (e.g. Oregon, Minnesota).[59] This latter point is an important distinction because market certainty is a key driver for projects that require long-term planning and financing - common characteristics of renewable energy projects.[60] By setting a post-2022 target that steadily ramps up over time (e.g., Oregon), Maryland will bolster certainty for investors and create the appropriate conditions to accelerate clean energy projects.[61]

Several states have already met or are on target to meet their RPS goals, and a few, including California, New York, and Vermont are considering increasing their RPS.

California has one of the most ambitious RPS programs in the country, requiring 33 percent of customers' electricity needs to be served by eligible renewable energy sources by 2020.[62] Since it was originally established, nearly 200 new renewable energy generation projects have been built in the state, and nearly three-quarters of these projects were built in counties with unemployment rates at 10 percent or higher.[63]

Governor Brown recently announced his intention to raise the RPS target to 50 percent by 2030, while acknowledging the many challenges in achieving such a goal.[64]

New York, like California, also has an ambitious RPS program, requiring 30 percent of electricity needs be met through renewable energy sources by the end of 2015.[65] This is an increase from the initial 2004 State Energy plan, which placed a renewable energy target of 25 percent by 2013.[66] While most RPS programs require utilities and suppliers to meet specified percentages of customer demands with renewable generation or pay a fine, the New York RPS program uses a central procurement model. Within this model, all investor-owned utilities are required to collect an RPS charge from customers. The collected charges are placed in a fund and administered by the New York State Energy Research and Development Authority (NYSERDA) for use in renewable energy incentive programs. The incentive programs are split between two tiers: main and customer-sited. These tiers support large-scale projects and small-scale, "behind-the-meter" projects, respectively. As of December 31, 2014, 56 Main Tier projects and approximately 14,500 Customer-Sited Tier projects have been installed.[67] In 2015, the Governor's Office announced that RPS programs net $3 to the New York economy for every $1 invested.[68]

In June 2015, NYSERDA released the latest New York State Energy Plan (SEP), providing a roadmap to advance the Reforming the Energy Vision (REV) initiative. The 2015 SEP increased the RPS target to 50 percent by 2030.[69] NYSERDA has identified greater levels of distributed energy resources (DER) integration into the NYISO grid as one method to reach this target. NYSERDA and the Governor's Office have authorized a series of investments through the Green Bank and the Clean Energy Fund to modernize and transform the current aging distribution grid. Under the REV initiatives, a new electric distribution platform incorporating DER will improve efficiency across the grid.[70] The establishment of NY SUN, as well as competitive grants for community microgrids,

have exploded the market for small-scale residential solar across the state.[71] By bringing this energy source into the distribution mix, the state hopes to spur development and deployment of additional cleaner and more resilient renewable energy and storage technologies.

In 2005, Vermont established the Sustainably Priced Energy Development (SPEED) program. This is a voluntary, feed-in-tariff based renewable energy development system unique to Vermont.[72] The goals were to allow utilities to enter into sufficient long-term contracts to generate 5 percent of Vermont's 2005 load with SPEED resources by 2012 and that they supply 20 percent of Vermont's energy load by 2017. This program was advantageous because the pricing mechanism allowed utilities to know finance costs up front and keep rate costs lower than that of comparable RPS programs. This structure allowed for rapid development of renewable energy within Vermont. However, by 2009 development slowed and rate goals had to be adjusted. This has been attributed in part to the fixed prices established by long-term contracts. Moreover, the renewable energy contracts purchased by utilities were sold to neighboring states as RECs. It is argued that this action double-counts the credit and artificially inflates the amount of renewable energy generated.[73]

Following the 2012 renewable energy generation results that were lower than projected, the Vermont state legislature began deliberations as to whether it should transition to a mandatory RPS structure. Citing uncertainties in the voluntary SPEED to meet current targets and a need to increase the original targets to meet renewable energy and emissions reduction goals, legislators opted for the transition to an RPS scheme.[74] This would also remove the potential for double-counting RECs and allow for more regional cooperation, as Connecticut had ceased all REC transactions with Vermont over the double-counting issue. RPS legislation was passed on June 11, 2015 and is the most stringent in the contiguous United States.[75]

Projecting renewable energy development job growth is challenging due to multiple underlying economic variables, although state data does support the idea that RPS programs stimulate job growth. In August 2015, the University of California, Berkeley Donald Vial Center on Employment in the green Economy released Job Impacts of California's Existing and Proposed Renewables Portfolio Standard. Contained within this report was an analysis of jobs created in 2013-2014 by the construction of renewable energy capacity along with a projection of future job growth. The study, using a Jobs and Economic Development Impact (JEDI) model, concluded the addition of approximately 52,000 direct jobs in California between 2013 and 2014.[76] The study also projected that California would create an additional 879,000 to 1,067,000 direct, indirect, and induced jobs in the renewable energy development sector.[77] A similar study by Next 10 shows California's Clean Sector economy grew by 20 percent between 2002 and 2012, with clean energy manufacturing jobs up 53 percent within the same decade. This increase occurred as economy-wide manufacturing decreased 21 percent.[78]

New York has also projected long-term job growth development, albeit without concrete job numbers. In the Renewable Portfolio Standard Main Tier 2013 Program Review, NYSERDA estimated that there was $2.7 billion in in-state investments in renewable energy development.[79] Of the $2.7 billion, approximately 11 percent will go to the creation of long-term renewable energy generation jobs.[80] Additional renewable energy generation job data from New York state offices, as well as other leading emission recuing states, are combined with energy efficiency program job data and cannot be analyzed effectively, although the data indicates an overall increase in job growth within the green energy sector.[81,82,83]

THE CLEAN POWER PLAN AND MARYLAND

The recently finalized Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, commonly referred to as the Clean Power Plan, established (1) carbon dioxide emission guidelines for affected electric power generating units (EGUs) and (2) unique state emissions targets based on each states' 2012 mix of these affected EGUs. Recognizing the complexity of the rule and the need for substantive analysis to determine viable compliance pathways, this section provides a high-level overview of some key aspects of the Clean Power Plan and possible implications for the state of Maryland.

STATE PLAN APPROACHES

In their plans, states will be able to choose from two approaches to demonstrate compliance;

Emission standards approach

Under this approach, a state would apply all requirements for meeting the emission guidelines solely to the affected EGUs in the form of federally enforceable emission standards. The emission guidelines used can either be rate- or mass-based, and these can be applied to individual affected EGUs or can be achieved through market-based trading mechanisms. The key aspect of the emissions standards approach is that affected EGUs fully bear the requirement for meeting the emissions guidelines.

States measures approach

Under this approach, only the mass-based goal can be used. It does however provide additional flexibility relative to the emission standards approach. The mass-based goal to be achieved by affected EGUs can be done in such a manner that the measures used to achieve the goal can be applied directly to affected EGUs, to other entities, or to some combination. This allows states to pursue measures that result in avoided generation and CO_2 emissions at affected EGUs, but do not actually occur at the affected EGUs.

In its explanation for providing the state measures approach as a plan option, the EPA highlights that it provides states the latitude to accommodate existing or planned programs that involve measures implemented by the state or by entities other than affected EGUs, specifically calling out the RGGI, RPS, and demand-side energy efficiency programs. As such, the approach would allow states to implement a portfolio of measures that are adopted, implemented, and enforceable only under state law, but to use such measures in demonstrating compliance with the emission guidelines for affected EGUs. These characteristics suggest that the state measures approach would be most compatible for Maryland, given its current portfolio of measures to address emissions in the state.

STATE COORDINATION

The EPA is finalizing two approaches that allow states to coordinate implementation of their measures with other states to demonstrate compliance with the emission guidelines;

1. Submitting a multi-state plan that addresses the affected EGUs in a group of states, demonstrating compliance with a joint emission goal
2. Retain individual state goals for affected EGUs and submit individual plans, but coordinate plan implementation through a trading mechanism with other states

For the first option, the EPA is finalizing the proposed approach by which multiple states can aggregate their rate- or mass-based goals, with either a weighted average rate-based aggregation or a cumulative mass-based goal of the participating states. The joint emission goal approach is acceptable for both emission standards and state measures plan, however a joint goal can only apply to states implementing the same type of plan.

The second option allows states to submit individual plans that will demonstrate compliance with the emission guidelines, but include coordination with other state plans by providing for the interstate transfer of CO_2 allowances. Under this approach, a state plan could indicate that allowances issued by others states with an EPA approved plan could be used by affected EGUs for compliance in their state. Given the existence of this functionality within the RGGI currently, retaining individual state goals and submitting an individual plan may best align with the current compliance structure in Maryland.

EARLY ACTION

In August 2014, EPA proposed a voluntary Clean Energy Incentive Program (CEIP) as part of the Clean Power

Plan to spur early investment in certain renewable energy and energy efficiency measures, with the intent to bring about the generation and operation of measures prior to commencement of the compliance periods. The proposal will be finalized within one year. It will be available regardless of the type of plan a state chooses to implement, but requires that a state include in its initial submittal of a plan a non-binding statement of intent to participate in the program.

If adopting a mass-based plan approach, a state may set aside allowances from the CO_2 budget it determines for the interim performance period (2022-2029) and allocate these allowances to eligible projects for the megawatt-hours those projects generate (for renewable energy projects) or save (for energy efficiency projects) in 2020 and/or 2021. The EPA will then provide additional early-action allowances up to 300 million short tons of CO_2 emissions, apportioned among states based on the amount of reductions from 2012 levels affected EGUs in the state are required to achieve relative to those in other participating states. Awarding of allowances is as follows:

- For renewable energy projects from any type of wind or solar, for every 2 MWh generated, the project will receive one early action allowance[84] from the state, and the EPA will award one matching allowance to the state to award to the project
- For energy efficiency in low income communities, for every 2 MWh saved, the project will receive two early action allowances from the state, and the EPA will provide two matching allowances

The program, as proposed, provides allowances only for eligible wind and solar projects, and for low-income energy efficiency projects. EPA is taking comment on the size of each reserve. In addition, the EPA will address design and implementation details of the CEIP, including the definition of low-income, in a subsequent action.

Despite the lack of firm details regarding the CEIP, it suggests an opportunity for Maryland to benefit from new renewable energy and energy efficiency projects in low-income communities. The allowances provided under this program can be banked and used for compliance during the performance periods, and are fully transferable prior to such use, presenting a revenue source for projects through an allowance trading mechanism. Additionally, this program with its low-income energy efficiency component, aligns well with environmental justice issues Maryland continues to pursue.

TIMELINE

The EPA has established three types of performance periods, and compliance must be demonstrated in each:

1. The final deadline by which, and after which, affected EGUs must be in compliance with emission guidelines – 2030
2. The interim period – 2022-2029
3. Three, multi-year interim step periods within the interim period – 2022-2024, 2025-2027, and 2028-2029

States can submit a plan with alternative rates or goals in the step period than those proposed by the EPA, but on average (for rate-based) or cumulatively (for mass-based), the alternative rates or goals must achieve the equivalent of the interim emission guidelines. Essentially, a state can define its own trajectory, as long as it achieves the equivalent of the emission guidelines established for the interim period. This will allow states pursuing measures outside of federally enforceable emission standards on affected EGUs, for which these measures may have differing timelines regarding implementation and the achievement of results, to still be able to demonstrate compliance with the interim performance period.

MARYLAND'S PROGRESS TOWARDS THE EMISSION GUIDELINES

Maryland already has caps on the emissions from affected units[85] through legislation enacting the RGGI. The 2020 target, the last cap decrease in the program and after which the cap remains at this level, consists of allowances to cover CO_2 emissions for 17,749,162 tons. Comparing this emission cap to the statewide mass-based CO_2 emission performance goal (Table 5) put forward by the EPA offers a simple yardstick by which to consider Maryland's position, noting care should be taken in drawing absolute conclusions from this comparison given the complexities involved in demonstrating compliance. The final mass-based goal set for Maryland is 14,347,628 tons of CO_2 emissions, indicating a gap between the emissions the RGGI will deliver and those required under the Clean Power Plan. However, in a scenario where the RGGI states cooperate on their plans, either through a joint emissions goal or through individual plans with an interstate trading mechanism, the member states as a whole achieve emissions that are within the cumulative total of their individual mass-based goals (Figure 3). Vermont is excluded in this scenario, as it does not have affected EGUs under the Clean Power Plan.

A recent analysis[86] of the positions states are in to meet their goals under the Clean Power Plan, consisting of a more in-depth analysis, indicates that Maryland would more than exceed the necessary reductions to demonstrate compliance. The analysis looked at four specific actions that states are taking, or have already taken, that will help them meet their reduction requirements under the Clean Power Plan:

- Announced retirements of coal-fired power plants since 2012
- Incremental renewable energy demand from mandatory state renewable electricity standards that comes online after 2012
- Avoided generation from mandatory energy efficiency resource standards that occurs after 2012
- Completion of nuclear power plants under construction as of 2012

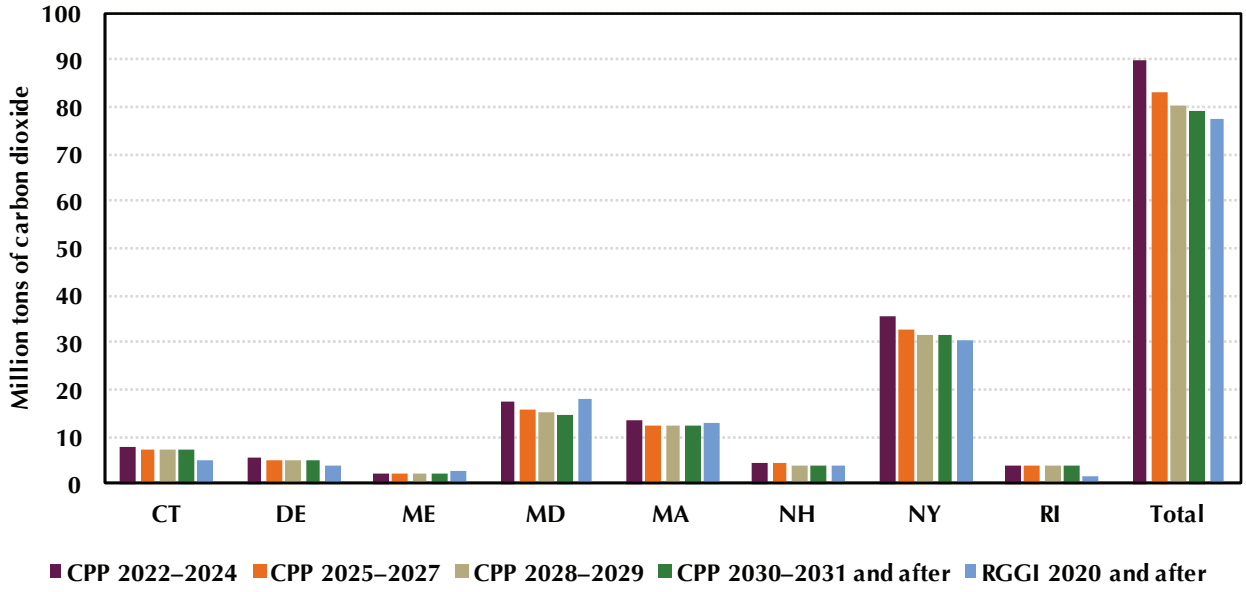
With these actions (except for nuclear power plants), Maryland demonstrates a greater than 200 percent progress towards emission reductions necessary to demonstrate compliance with the final 2030 mass-based target.

TABLE 5: Maryland's Interim (2022 – 2030) and Final (2030) Mass-Based Goals

INTERIM GOAL				FINAL GOAL
2022-2024	2025-2027	2028-2029	2022-2029	2030 and beyond
17,447,354	15,842,485	14,902,826	16,209,396	14,347,628

Source: U.S. Environmental Protection Agency 2015

FIGURE 3: Individual State and Cumulative RGGI Cap



Source: U.S. Environmental Protection Agency (2015) and Regional Greenhouse Gas Initiative (2015)

ENDNOTES

1 Maryland Department of the Environment, "Maryland's Greenhouse Gas Reduction Act Plan." October 2013. p 63. Available at: http://climatechange.maryland.gov/publications/greenhouse-gas-emissions-reduction-act-plan/.

2 Maryland Manual On-Line, "Climate Change Commission." July 2015. Available at: http://msa.maryland.gov/msa/mdmanual/26excom/html/09climate.html.

3 U.S. Energy Information Administration, "State-Level Energy-Related Carbon Dioxide Emissions, 2000-2011." August 2014. Available at: http://www.eia.gov/environment/emissions/state/analysis/.

4 U.S. Energy Information Administration, "State-Level Energy-Related Carbon Dioxide Emissions, 2000-2011." August 2014. Available at: http://www.eia.gov/environment/emissions/state/analysis/.

5 State of Washington Department of Ecology, "Path to a Low-Carbon Economy: An Interim Plan to Address Washington's Greenhouse Gas Emissions." December 2010. Available at: https://fortress.wa.gov/ecy/publications/documents/1001011.pdf.

6 Massachusetts Executive Office of Energy and Environmental Affairs (EEA), "Global Warming and Solutions Act: 5-Year Progress Report." January 6, 2014. Available at: www.mass.gov/eea/docs/eea/gwsa/ma-gwsa-5yr-progress-report-1-6-14.pdf.

7 Vermont Public Service Department, "Total Energy Study: Final Report on a Total Energy Approach to Meeting the State's Greenhouse Gas and Renewable Energy Goals." December 8th, 2014. Available at: http://publicservice.vermont.gov/sites/psd/files/Pubs_Plans_Reports/TES/TES%20FINAL%20Report%2020141208.pdf.

8 Massachusetts Executive Office of Energy and Environmental Affairs (EEA), "Global Warming and Solutions Act: 5-Year Progress Report." January 6, 2014. Available at: www.mass.gov/eea/docs/eea/gwsa/ma-gwsa-5yr-progress-report-1-6-14.pdf.

9 Vermont Agency of Natural Resources, "Vermont Greenhouse Gas Emissions Inventory: 1990 – 2012." June 2015. Available at: http://www.anr.state.vt.us/anr/climatechange/Pubs/Vermont%20GHG%20Emissions%20Inventory%20Update%201990-2012_June%20-2015.pdf#zoom=100

10 Massachusetts Executive Office of Energy and Environmental Affairs (EEA), "Global Warming and Solutions Act: 5-Year Progress Report." January 6, 2014. Available at: www.mass.gov/eea/docs/eea/gwsa/ma-gwsa-5yr-progress-report-1-6-14.pdf.

11 EEA, "The Report of the Massachusetts Energy Efficiency Advisory Council: 2012." November 2013. Available at: www.mass.gov/eea/docs/doer/energy-efficiency/ma-advisory-council-2012-report.pdf.

12 Vermont Department of Public Service, "Comprehensive Energy Plan 2011: Facts, Analysis, and Recommendations Volume 2." December 2011. Available at: http://publicservice.vermont.gov/sites/psd/files/Pubs_Plans_Reports/State_Plans/Comp_Energy_Plan/2011/2011%20CEP_Volume%202%5B1%5D.pdf.

13 The California EPA Annual Report Card is a compendium of multiple agency greenhouse gas emissions reports and is required under section 12892 of Part 2.5 of Division 3 of Title 2 of the Government Code as set forth in AB 1338, 2008.

14 California Air Resources Board, "Climate Change Scoping Plan – a framework for change." December 2008. Available at: http://www.arb.ca.gov/cc/scopingplan/document/adopted_scoping_plan.pdf.

15 Vermont Department of Public Service, "Comprehensive Energy Plan 2011: Facts, Analysis, and Recommendations Volume 2." December 2011. Available at: http://publicservice.vermont.gov/sites/psd/files/Pubs_Plans_Reports/State_Plans/Comp_Energy_Plan/2011/2011%20CEP_Volume%202%5B1%5D.pdf.

16 Vermont Department of Public Service, "Comprehensive Energy Plan 2011: Facts, Analysis, and Recom-

mendations Volume 2." December 2011. Available at: http://publicservice.vermont.gov/sites/psd/files/Pubs_Plans_Reports/State_Plans/Comp_Energy_Plan/2011/2011%20CEP_Volume%202%5B1%5D.pdf.

17 Oregon Global Warming Commission, "Interim Roadmap to 2020." October 29, 2010. Available at: http://www.keeporegoncool.org/sites/default/files/Integrated_OGWC_Interim_Roadmap_to_2020_Oct29_11-19Additions.pdf.

18 Maryland Energy Administration, "Report to the Senate Finance Committee and House Economic Matters Committee to discuss whether to modify EmPOWER Maryland Targets beyond 2015." January 16, 2013. Available at: http://energy.maryland.gov/empower3/documents/EmPOWERPlanningFinalReport2013-01-16.pdf.

19 EEA, "The Report of the Massachusetts Energy Efficiency Advisory Council: 2012." November 2013. Available at: www.mass.gov/eea/docs/doer/energy-efficiency/ma-advisory-council-2012-report.pdf.

20 NYSERDA, "The Energy to Lead: 2015 New York State Energy Plan", 2015, available at http://energyplan.ny.gov/Plans/2014.aspx.

21 McKinsey & Company. McKinsey Global Energy and Materials: Unlooking Energy Efficiency in the U.S. Economy." July 2009. Available at: http://www.mckinsey.com/~/media/mckinsey/dotcom/client_service/epng/pdfs/unlocking%20energy%20efficiency/us_energy_efficiency_full_report.ashx.

22 Vermont Department of Public Service, "Comprehensive Energy Plan 2011: Facts, Analysis, and Recommendations Volume 2." December 2011. Available at: http://publicservice.vermont.gov/sites/psd/files/Pubs_Plans_Reports/State_Plans/Comp_Energy_Plan/2011/2011%20CEP_Volume%202%5B1%5D.pdf.

23 California Public Utilities Commissions, "2010-2012 Energy Efficiency Annual Progress Evaluation Report." March 2015. Available at: http://www.cpuc.ca.gov/NR/rdonlyres/052ED0ED-D314-4050-9FAA-198E45480C85/0/EEReport_Main_Book_v008.pdf.

24 Opinion Dynamics Corporation, "Energy Upgrade California Brand Assessment Study." February 2013. Available at: http://www.cpuc.ca.gov/NR/rdonlyres/049F2182-225C-4A33-9553-B7C83A2B9689/0/EnergyUpgradeCaliforniaBrandAssessment_FINALReport.pdf.

25 U.S. Energy Information Administration, "Profile Analysis – Maryland." July 16, 2015. Available at: http://www.eia.gov/state/?sid=MD

26 Vermont Department of Public Service, "Comprehensive Energy Plan 2011: Facts, Analysis, and Recommendations Volume 2." December 2011. Available at: http://publicservice.vermont.gov/sites/psd/files/Pubs_Plans_Reports/State_Plans/Comp_Energy_Plan/2011/2011%20CEP_Volume%202%5B1%5D.pdf.

27 Vermont Agency of Natural Resources, "Vermont Greenhouse Gas Emissions Inventory: 1990 – 2012." June 2015. Available at: http://www.anr.state.vt.us/anr/climatechange/Pubs/Vermont%20GHG%20Emissions%20Inventory%20Update%201990-2012_June%20-2015.pdf#zoom=100.

28 NYSERDA – New York Green Bank, "New York Green Bank Overview." 2015. Available at: http://greenbank.ny.gov/About/Overview.

29 NYSERDA – New York Green Bank, "New York Green Bank Overview." 2015. Available at: http://greenbank.ny.gov/About/Overview.

30 NYSERDA – New York Green Bank, "New York Green Bank Overview." 2015. Available at: http://greenbank.ny.gov/About/Overview.

31 State University at Albany, "NYSUNY 2020 Impact." 2015. Available at: http://www.albany.edu/nysuny2020/.

32 State University at Albany, "NYSUNY 2020 Impact." 2015. Available at: http://www.albany.edu/nysuny2020/.

33 New York State Governor's Office, "What is Start-Up NY?" 2014. Available at: http://startup.ny.gov/.

34 C40 Cities – Sustainable Action on Climate Change. Available at: http://www.c40.org/about.

35 NYSERDA, "New York State Greenhouse Gas Inventory and Forecast: Inventory 1990-2011 and Forecast 2012-2030." June 2015. Available at: http://energyplan.ny.gov/Plans/2014.aspx.

36 Mayor's Office of Long-Term Planning and Sustainability, "One City Built to Last." 2015. Available at: http://www.nyc.gov/html/builttolast/assets/downloads/pdf/OneCity.pdf.

37 Mayor's Office of Long-Term Planning and Sustainability, "One City Built to Last." 2015. Available at: http://www.nyc.gov/html/builttolast/assets/downloads/pdf/OneCity.pdf.

38 City of Burlington, VT, "Plan BTV." 2015. Available at: https://www.burlingtonvt.gov/planBTV.

39 Regional Greenhouse Gas Initiative – Maryland. Available at: http://www.rggi.org/rggi_benefits/program_investments/maryland.

40 Regional Greenhouse Gas Initiatve – Benefits. Available at: http://www.rggi.org/rggi_benefits.

41 California Air Resources Board, "Cap and Trade 2010 – Appendix E: Setting the Program Emissions Cap." 2011. Available at: http://www.arb.ca.gov/regact/2010/capandtrade10/capv3appe.pdf.

42 Leidos – prepared for WA CLEW, "Evaluation of Approaches to Reduce GHG Emissions in Washington State – Final Report." October 14, 2013. Available at: http://www.governor.wa.gov/sites/default/files/documents/Task_4_Final_Report_10-13-2013.pdf.

43 State of Washington Climate Legislative and Executive Workgroup, "A Report to the Legislature on the Work of the Climate Legislative and Executive Workgroup." January 2014. Available at: http://www.governor.wa.gov/sites/default/files/documents/CLEWfinalCombinedReport20140130.pdf.

44 State of Washington – 64th Legislature, "Substitute House Bill 1314." February 12, 2015. Available at: http://lawfilesext.leg.wa.gov/biennium/2015-16/Pdf/Bills/House%20Bills/1314-S.pdf.

45 State of Washington – 64th Legislature, "Senate Bill 5283." January 19, 2015. Available at: http://lawfilesext.leg.wa.gov/biennium/2015-16/Pdf/Bills/Senate%20Bills/5283.pdf.

46 Washington Office of the Governor, "Inslee Directing Ecology to Develop Regulatory Cap on Carbon Emissions." July 28, 2015. Available at: http://www.governor.wa.gov/news-media/inslee-directing-ecology-develop-regulatory-cap-carbon-emissions.

47 EEA, "Global Warming and Solutions Act: 5-Year Progress Report." January 6, 2014. Available at: www.mass.gov/eea/docs/eea/gwsa/ma-gwsa-5yr-progress-report-1-6-14.pdf

48 EEA, "Global Warming and Solutions Act: 5-Year Progress Report." January 6, 2014. Available at: www.mass.gov/eea/docs/eea/gwsa/ma-gwsa-5yr-progress-report-1-6-14.pdf

49 Transportation accounts for 45.7% of Washington's greenhouse gas emissions in 2011, 36.0% of Oregon's greenhouse gas emissions in 2010, and 37% of California's greenhouse gas emissions in 2013, representing the largest contributor of any sector

50 D. Potter – Senior Staff Council, "State of California Office of Administrative Law: Title 17." January 12, 2010. Available at: http://www.arb.ca.gov/fuels/lcfs/011210lcfs_oal_approval.pdf.

51 California Air Resources Board, "Proposed Re-adoption of the Low Carbon Fuel Standard." December 2014. Available at: http://www.arb.ca.gov/regact/2015/lcfs2015/lcfs15isor.pdf.

52 California Air Resources Board, "Proposed Re-adoption of the Low Carbon Fuel Standard." December 2014. Available at: http://www.arb.ca.gov/regact/2015/lcfs2015/lcfs15isor.pdf.

53 78th Oregon Legislative Assembly, "Senate Bill 324." February 17, 2015. Available at: http://www.deq.state.or.us/aq/cleanFuel/docs/SB324.pdf.

54 Northeast States for Coordinated Air Use Management, "Northeast and Mid-Atlantic Low Carbon Fuel Standard: Memorandum of Understanding." December 2009. Available at: http://www.nescaum.org/documents/lcfs-mou-govs-final.pdf/.

55 Northeast States for Coordinated Air Use Management, "Economic Analysis of a Program to Promote Clean Transportation Fuels in the Northeast/Mid-Atlantic Region." August 2011. Available at: http://www.nescaum.org/documents/nescaum-cfs-economic-analysis-final.pdf/.

56 ZEV Program Implementation Task Force, "Multi-State ZEV Action Plan." May 2014. Available at: http://www.dem.ri.gov/zevplanmou.pdf.

57 ZEV Program Implementation Task Force, "Multi-State ZEV Action Plan." May 2014. Available at: http://www.dem.ri.gov/zevplanmou.pdf.

58 Center for Climate and Energy Solutions, "Renewable and Alternative Energy Portfolio Standards." Accessed July 31, 2015. Available at: http://www.c2es.org/us-states-regions/policy-maps/renewable-energy-standards.

59 U.S. Department of Energy, "DSIRE: Database of State Incentives for Renewable Energy & Efficiency." Accessed August 7, 2015. Available at: http://www.dsireusa.org/.

60 National Renewable Energy Laboratory, "Technology Deployment: State & Local Governments: Renewable Portfolio Standards." Accessed August 7, 2015. Available at: http://www.nrel.gov/tech_deployment/state_local_governments/basics_portfolio_standards.html.

61 U.S. Department of Energy, "DSIRE: Oregon: Renewable Portfolio Standard." Accessed August, 7 2015. Available at: http://programs.dsireusa.org/system/program/detail/2594. Oregon's RPS ramps up over time: 5% by 2011; 15% by 2015; 20% by 2020; and 25% by 2025.

62 California Public Utilities Commission, "California Renewable Portfolio Standard." August 2015. Available at: http://www.cpuc.ca.gov/PUC/energy/Renewables/.

63 Union of Concerned Scientists, "California's Commitment to Renewable Energy." 2014. Available at: http://www.ucsusa.org/clean_energy/smart-energy-solutions/increase-renewables/renewable-energy-in-california.html#.Vds8SZfUVB8.

64 Overton, Thomas. Power Mag, "California Governor Wants to Raise State's RPS Target to 50%." January 7, 2015. Available at: http://www.powermag.com/california-governor-wants-to-raise-states-2030-rps-target-to-50/.

65 NYSERDA. "History of the NYS Renewable Portfolio Standard." 2015. Available at: http://www.nyserda.ny.gov/All-Programs/Programs/Main-Tier/History.

66 NYSERDA. "History of the NYS Renewable Portfolio Standard." 2015. Available at: http://www.nyserda.ny.gov/All-Programs/Programs/Main-Tier/History.

67 NYSERDA, "New York State Renewable Portfolio Standard: Annual Performance Report through December 31, 2014." 2015. Available at: http://www.nyserda.ny.gov/All-Programs/Programs/Main-Tier/Documents.

68 New York State Governor's Office, "Governor Cuomo Announces $160 Million Investment in Clean Energy." April 7, 2015. Available at: https://www.governor.ny.gov/news/governor-cuomo-announces-160-million-investment-clean-energy.

69 NYSERDA, "The Energy to Lead: 2015 New York State Energy plan." 2015. Available at: http://energyplan.ny.gov/Plans/2015.

70 NYSERDA, "The Energy to Lead: 2015 New York State Energy plan." 2015. Available at: http://energy-

plan.ny.gov/Plans/2015.

71 Pace Energy and Climate Center Law School, "New York's Renewable Portfolio Standard: Where To From Here?" 2013. Available at: http://energy.pace.edu/sites/default/files/publications/RPS%20Report.pdf.

72 Vermont Public Service Board, "Analysis of Renewable Energy Policy Options for Vermont." 2011. Available at: http://psb.vermont.gov/sites/psb/files/publications/Reports%20to%20legislature/RPSreport2011/CESA%20SEA%20Draft%20Vermont%20Report%208%2026.pdf.

73 Vermont Public Service Board, "Analysis of Renewable Energy Policy Options for Vermont." 2011. Available at: http://psb.vermont.gov/sites/psb/files/publications/Reports%20to%20legislature/RPSreport2011/CESA%20SEA%20Draft%20Vermont%20Report%208%2026.pdf.

74 Vermont Public Service Board, "Section 13a. Renewable Portfolio Standard, SPEED, and Board Report." 2015. Available at: http://psb.vermont.gov/sites/psb/files/Act_159_RPS_study_section.pdf.

75 U.S. Energy Information Agency, "Hawaii and Vermont set high Renewable Portfolio Standard Targets." June 29, 2015. Available at: http://www.eia.gov/todayinenergy/detail.cfm?id=21852.

76 University of California Berkeley – Donald Vial Center on Employment in the Green Economy, "Job Impacts of California's Existing and Proposed Renewables Portfolio Standard." August 28, 2015. Available at: http://www.irle.berkeley.edu/vial/publications/job-impacts-ca-rps.pdf.

77 University of California Berkeley – Donald Vial Center on Employment in the Green Economy, "Job Impacts of California's Existing and Proposed Renewables Portfolio Standard." August 28, 2015. Available at: http://www.irle.berkeley.edu/vial/publications/job-impacts-ca-rps.pdf.

78 Next 10, "California Green Innovation Index 6th Edition." 2014. Available at: http://www.next10.org/sites/next10.huang.radicaldesigns.org/files/2014%20Green%20Innovation%20Index.pdf.

79 NYSERDA. "Renewable Portfolio Standard Main Tier 2013 Program Review: Direct Investments in New York State." September 5, 2013. Available at: http://www.nyserda.ny.gov/All-Programs/Programs/Main-Tier/Documents.

80 NYSERDA. "Renewable Portfolio Standard Main Tier 2013 Program Review: Direct Investments in New York State." September 5, 2013. Available at: http://www.nyserda.ny.gov/All-Programs/Programs/Main-Tier/Documents.

81 New York State Department of Labor, "New York State Green Jobs Survey," 2011. Available at: https://labor.ny.gov/stats/green/statewide-findings.pdf.

82 Vermont Department of Labor; Economic & Labor market Information Division, "Analysis of Green Jobs Sector in Vermont." August, 2013. Available at: http://www.vermontgreencareers.org/wp-content/uploads/2014/01/Analysis-of-Green-Jobs-Sector-in-Vermont.pdf.

83 Massachusetts Clean Energy Center, "2013 Clean Energy Industry Report." 2014. Available at: http://images.masscec.com/uploads/attachments/2013/09/MassCEC_2013_IndustryRpt.pdf.

CENTER FOR CLIMATE
AND ENERGY SOLUTIONS

The Center for Climate and Energy Solutions (C2ES) is an independent nonprofit organization working to promote practical, effective policies and actions to address the twin challenges of energy and climate change.

2101 WILSON BLVD. SUITE 550 ARLINGTON, VA 22201 703-516-4146 **C2ES.ORG**