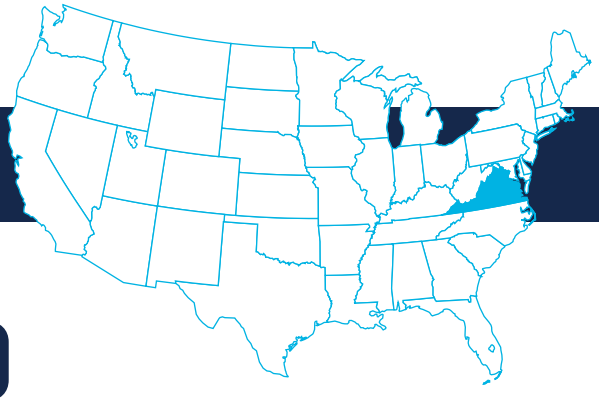

ISSUE BRIEF

VIRGINIA'S PATHWAY TO CUTTING CARBON POLLUTION

The Clean Power Plan, finalized by the U.S. Environmental Protection Agency, is a game changer. It sets the first-ever limits on carbon pollution from power plants, the nation's largest source of the pollution that is driving dangerous climate change. We need to act now because we already are seeing its effects in extreme weather, deeper drought, and more wildfires. This carbon pollution limit for power plants in Virginia is achievable, largely through increasing the state's clean and renewable energy sources, along with improving the energy efficiency of its homes and businesses.

The EPA standards set a limit on power plant pollution in each state. The carbon pollution limit is expressed in two ways: as a mass-based limit designating a maximum number of tons of carbon dioxide (CO_2) that may be emitted by covered plants and allowing for some load growth over the years; or as a rate-based limit expressed as a number of pounds of CO_2 per megawatt-hour (MWh) of electricity generated from covered plants for each time period. The standards allow each state the flexibility to design its own cost-effective pathway toward a cleaner electricity system. Under a mass-based standard, Virginia would need to limit its carbon pollution from all power plants to 27.8 million short tons in 2030. In limiting its pollution, Virginia will benefit from the expansion of its clean energy sources, adding jobs to its clean energy economy. The actions that Virginia takes now will move it toward a healthier, economically productive, clean energy future

THE EPA'S CLEAN POWER PLAN PROMISES GREAT BENEFITS FOR VIRGINIA AND THE NATION

The Clean Power Plan will reduce the nation's carbon pollution from fossil-fueled power plants 32 percent below 2005 levels by 2030.[1] As we curb carbon pollution, the nation will reap major health and environmental benefits, and by 2030 the average household will save about $85 a year on its energy bills.[2] These reductions are an economic imperative for the nation, and particularly for coastal states such as Virginia, where climate change will be especially costly unless we act now. Sea level rise will continue to damage the state's coastal cities, with the homes of more than 35,000 families expected to be in harm's way by the end of the century.[3] By decreasing the impacts of climate change and reducing the burden of health costs associated with power plant pollution, altogether the EPA standards will provide benefits of up to $54 billion in 2030.[4] That includes preventing up to 3,600 premature deaths, 1,700 heart attacks, 90,000 asthma attacks, and 300,000 missed work and school days.[5] These benefits far outweigh the estimated national compliance costs of $8.4 billion in 2030.

POLLUTION LIMITS ARE READILY ACHIEVABLE

The EPA set carbon pollution limits for each state's power plants based on three pollution-reduction approaches, or "building blocks." However, these blocks are not prescriptive; they are simply the EPA's method for estimating achievable pollution cuts from power plants. The Clean Power Plan gives states ample flexibility to meet these standards in any way they choose. NRDC encourages Virginia to be creative and think "outside the blocks," drawing on resources like demand-side energy efficiency. Virginia can now decide on its own path to reduce carbon pollution from power plants in the state—a path that will determine the level of economic, environmental, and public health benefits to Virginia residents.

The adoption of a flexible, market-based framework in combination with complementary state clean energy policies will allow Virginia to cost-effectively meet its carbon pollution limit, largely by expanding renewable wind and solar energy and improving the energy efficiency of its buildings and industry.

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FIGURE I: PATHWAY TO MEETING VIRGINIA'S CARBON POLLUTION LIMITS[10]

Figures IA and IC demonstrate the electricity-generation mix and pollution levels resulting from Virginia's planned retirements ("business as usual," or BAU). By meeting its energy efficiency and renewable energy goals, Virginia can achieve its Clean Power Plan emission limits, as shown in Figures IB and IC.

FIGURE IA: ELECTRICITY MIX, BUSINESS-AS-USUAL

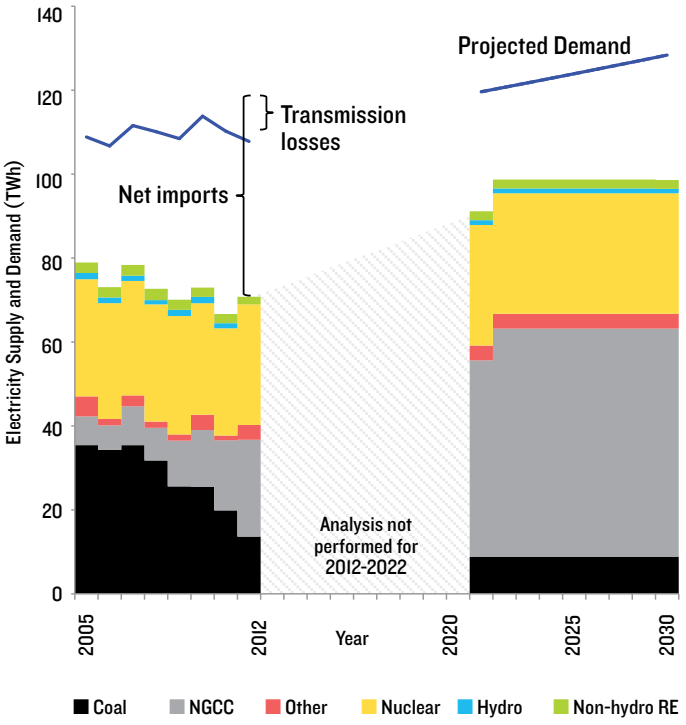


FIGURE IB: ELECTRICITY MIX, CLEAN POWER PLAN SCENARIO

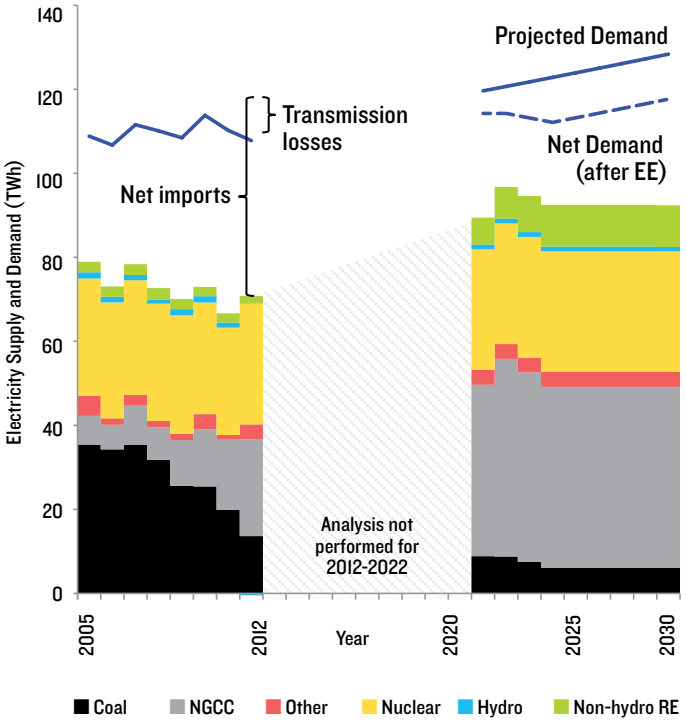
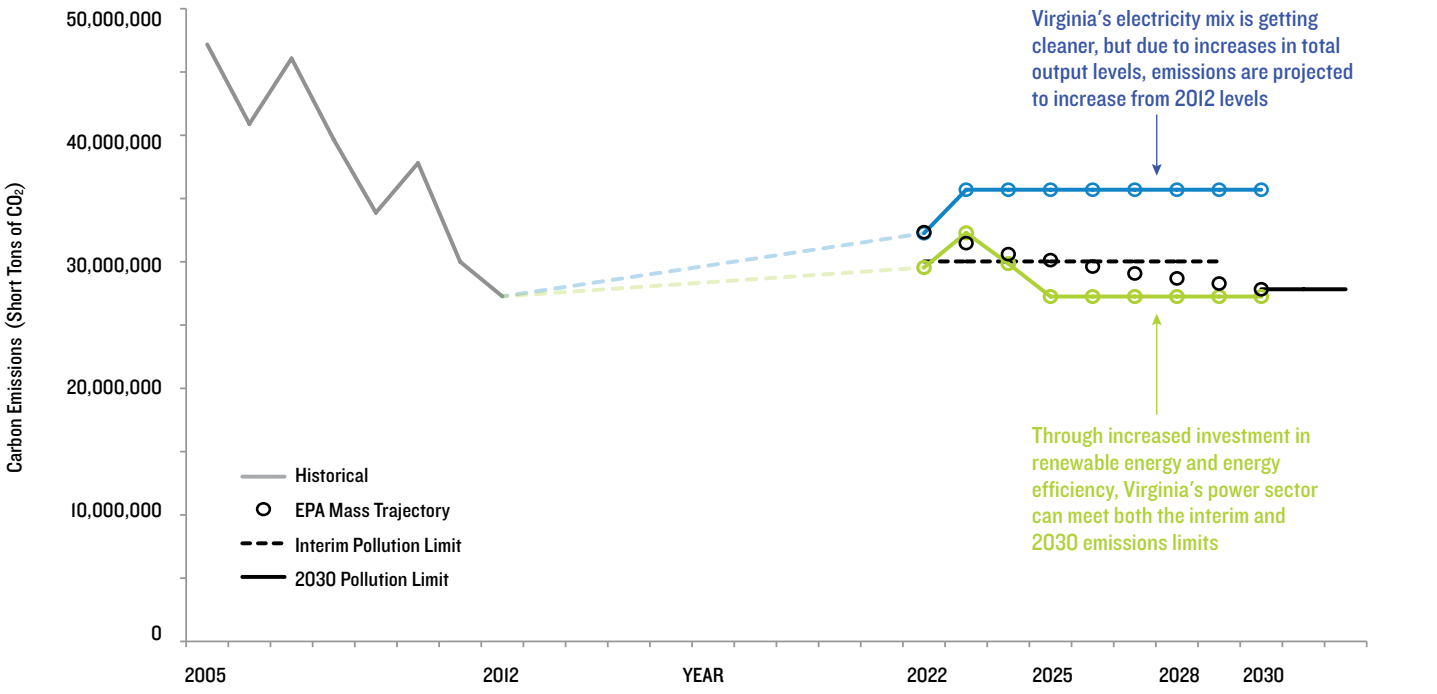


FIGURE IC: CARBON EMISSIONS PROJECTIONS: BUSINESS-AS-USUAL VS. CLEAN POWER PLAN SCENARIO



Virginia is already making progress toward its Clean Power Plan emissions limits, thanks to a scheduled cleanup of its existing power plants. Even though the construction of new power plants (and corresponding increases in statewide output) will result in emissions increases from 2012 levels, the emissions limits are still readily achievable with renewable energy and energy efficiency. Several of Virginia's oldest and dirtiest coal plants (more than 3,000 MW) have recently retired, are slated to be retired, or will switch to lower-carbon fuels by the end of 2016.[6] As shown in Figures 1A and 1C, these expected changes to the state's power sector will put the state's power plants above the 2030 mass-based limit of 27.8 million short tons.[7] However, Virginia has established voluntary efficiency and renewable energy goals for its utilities. If these goals are met, utilities will generate 15 percent of their 2007 annual sales from renewable sources by 2025[8] and reduce energy waste by 10 percent relative to 2006 sales by 2022.[9] Reaching the state's efficiency goal and even just half of its renewables goal with eligible resources would put Virginia's power plants *in full compliance with their emissions limits*, as shown in Figures 1B and 1C on page 2.

PRIMARY POLICY OPTIONS

States can pick from a number of policy approaches to reduce carbon pollution. The following are key conclusions from extensive analyses of state plan options under the Clean Power Plan.[11]

- Significant pollution reductions can be achieved at very low cost with energy efficiency and renewable energy. Energy efficiency is a smart and cost-effective option, and these clean energy investments have been found to reduce customers' energy bills.
- Because regional approaches that create larger trading markets significantly reduce costs, states across the country are exploring regional policy approaches and trading, from developing a regional plan to writing individual plans with common elements and trading across borders. Regional consistency also reduces market distortions and pollution "leakage" across state borders.
- The lowest-cost policy choice is a mass-based approach, as long as the allowance value or permit revenue is paid for by polluters and reinvested for customer benefit.

The best compliance approaches are simple, tested, and low-cost. They have high environmental integrity and are easily interconnected across states and regions. A mass-based approach—paired with essential, complementary clean energy policies—would fulfill all these criteria.

WHY ARE COMPLEMENTARY POLICIES IMPORTANT IN A MARKET-BASED FRAMEWORK?

As Virginia has demonstrated, clean energy policies can drive economic gain and reduce emissions. While these policies need not be included in a state plan to demonstrate enforceable limits on carbon emissions, they can complement a market-based compliance strategy to ensure the lowest-cost and most effective carbon pollution reductions.

Investment in energy efficiency and renewable energy can provide numerous benefits to customers, including lower wholesale prices, reduced energy bills, and less reliance on volatile fuel markets.[12] These investments can also lower the overall costs and maximize the benefits of a market-based emissions reduction program. A recent analysis of states participating in the Regional Greenhouse Gas Initiative (RGGI) found that net economic benefits and job creation were highest in states with the greatest levels of reinvestment in energy efficiency.[13]

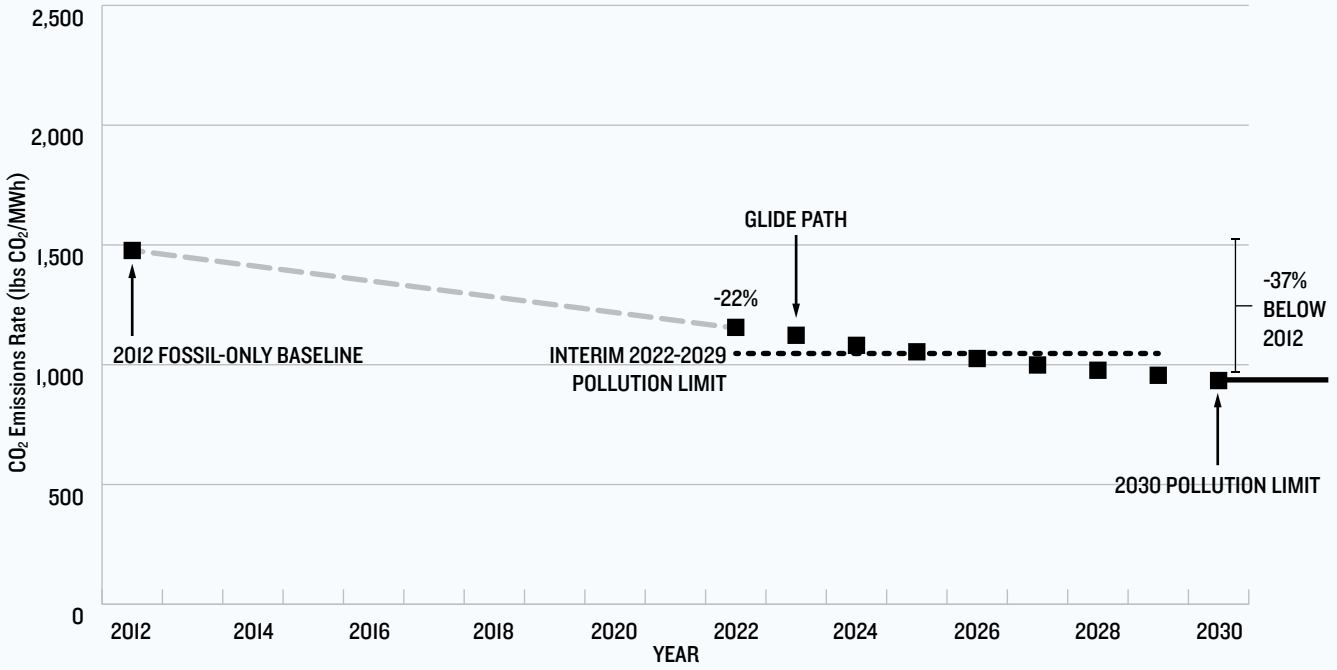
WHAT IS THE CARBON POLLUTION LIMIT FOR POWER PLANTS IN VIRGINIA?

After unprecedented stakeholder outreach and a review of millions of public comments, the EPA carefully reconsidered and revised its emissions limits to be more consistent nationally and to incorporate the interconnected nature of the electric grid. The EPA set separate, nationally uniform rates for coal and natural gas power plants, treating all plants equally. Virginia's rate-based limit is based on the share of each of those resources within the state. The final (2030) rate-based emissions limit for power plants in Virginia is 934 pounds of CO_2 per MWh generated. The EPA provides additional guidance on how to convert rate-base emission limits into mass-based emissions limits, and NRDC has analyzed compliance with Virginia's mass-based limit (covering existing and new sources) in Figure I on page 2.

Table I: Carbon Pollution Limits for Virginia Power Plants

Period	Rate-based limit (lbs CO_2/MWh)	Mass-Based Limit, All Sources (short tons)
Baseline (2012)	1,477	27,365,439
Interim Period 2022-2029	1047	30,030,100
2030 & Beyond Target	934	27,830,174

FIGURE 2: CARBON POLLUTION LIMITS FOR VIRGINIA'S POWER PLANTS



INCENTIVES FOR EARLY INVESTMENTS IN RENEWABLES AND ENERGY EFFICIENCY

Early investments in renewables and energy efficiency can help states comply in two ways. First, in a rate-based policy approach, a power plant can purchase credits from energy efficiency, wind, solar, and other renewable energy projects developed after 2012 and still generating electricity in 2022 and beyond. In a mass-based approach, non-emitting energy efficiency and renewable energy will also contribute to meeting the emissions goal and reduce costs.

In addition, the final Clean Power Plan creates the voluntary Clean Energy Incentive Program (CEIP). The CEIP is designed to recognize emissions reductions that occur before the compliance period begins in 2022. It would allow states to give bonus allowances or credits—which have monetary value—to qualifying renewable electricity generation and energy efficiency investments in low-income communities in 2020 and 2021. Renewable energy and energy efficiency projects are eligible if they are initiated after the state submits its complete state plan—creating an incentive for states to complete their plans early.

NEXT STEPS FOR VIRGINIA

While states have flexibility to decide on any pollution reduction pathway, some approaches will result in more benefits for the environment, the economy, and electricity customers. Table 2 outlines key decision steps for Virginia to consider as the state designs a plan to meet the carbon pollution limits for its power plants.

These policy options work with many available cost-effective programs that deliver clean energy benefits and keep electricity affordable for everyone, including low-income communities.[14] Prioritizing investment in energy efficiency and renewable energy will keep costs down and avoid overutilizing natural gas.

As Virginia considers the full range of options to reduce carbon pollution from power plants operating in the state, an open and transparent process is essential to crafting a strong state plan that meets all of Virginia's goals. Robust engagement with the full range of interested stakeholders will ensure that Virginia chooses the best path forward, reducing its reliance on fossil fuels and moving toward a clean energy future.

Table 2: Three key decision steps for developing a state plan

Decision Steps	Description	
Choose a rate-based or mass-based approach	**Option 1: Rate-based, Blended Rate** Each generator must meet the state-wide emissions limit in pollution per unit of electricity generated (lbs CO_2/MWh). Fossil power plants that pollute above the intensity standard must buy credits from generators or efficiency providers that operate below the standard.	**Option 3: Mass-based, Existing Sources Only** The state has a total emissions limit (tons CO_2) that is a fixed amount. The state limit includes some amount of load growth above 2012 levels. Existing power plants have to hold an allowance, issued by a state agency, for every ton of CO_2 emitted. These allowances could be auctioned, with the value returned to customers or used to expand complementary programs.
	Option 2: Rate-based, Dual Rate Each generator must meet applicable emissions rate limit (steam or NGCC) in pollution per unit of electricity generated (lbs CO_2/MWh). Fossil steam units that pollute above the steam rate must buy credits from new non-emitting resources (including efficiency) or incremental NGCC generation (above 2012 levels). NGCC units can only purchase credits from new non-emitting resources (including efficiency).	**Option 4: Mass-based, All Sources (Existing and New)** A state may choose to include new power plants in the mass-based standard, which has the advantage of treating all power plants the same in electric power markets, regardless of when they were built. Under this approach, the limit is adjusted upwards to account for the emissions of new power plants meeting any load growth that was not already covered in the limit for existing sources, above.
Opt for an individual state plan or a plan linked with other states	The state can submit its own individual plan or coordinate with neighboring states on common policy approaches. Regional approaches include both formal multistate plans and agreements to link, such as adopting common elements to facilitate trading. Linkage and trading are likely to be much easier under a mass-based approach. Benefits of regional coordination include: • LOWER COST—A larger market is more efficient and reduces costs. • IMPROVED ENVIRONMENTAL OUTCOME—Regional approaches avoid different price signals across state boundaries, which also helps avoid emissions leakage and higher-than-anticipated national emissions. • STRONGER ELECTRIC GRID—A larger market and additional flexibility reduce concerns about electric grid reliability. • EQUAL TREATMENT—Generators, market participants, and customers face more consistent market signals, costs, and benefits.	
Formulate state plan details and complementary policies	• In a mass-based approach, the state has to decide how to distribute allowances and either return the value to customers or give away the value to emitters. If pollution allowances are auctioned to emitters, the state will generate revenue that can be reinvested to reduce customers' electricity bills through energy efficiency investments, rebates, or other state programs. • Complementary measures like clean energy standards and improved utility rate designs can also help address market barriers to investment. • Complementary policies can also address important equity issues for workers in transition, people of color, low-income communities, and others. Complementary policies may include worker retraining, investments in energy efficiency, and direct bill assistance.	

ENDNOTES

1 U.S. Environmental Protection Agency. *Fact Sheet: Overview of the Clean Power Plan*, August 2015. Available at: http://www.epa.gov/airquality/cpp/fs-cpp-overview.pdf.

2 Ibid.

3 B.H. Strauss et al., "Tidally Adjusted Estimates of Topographic Vulnerability to Sea Level Rise and Flooding for the Contiguous United States," *Environmental Research Letters* 7, no. 1 (2012): 014033, research.fit.edu/sealevelriselibrary/documents/doc_mgr/456/US_Tidal_Model_of_Topographic_Vulnerability_to_SLR_-_Strauss_et_al._2012.pdf.

4 U.S. Environmental Protection Agency. *Fact Sheet: Overview of the Clean Power Plan*, August 2015. Available at: http://www.epa.gov/airquality/cpp/fs-cpp-overview.pdf

5 Ibid.

6 The retirement list for Virginia compiled by the consulting group MJ Bradley & Associates includes the following coal units (3,056 MW total): Clinch River 1,2, and 3; Glen Lyn 5 and 6; Potomac River units 1–5; Bremo Bluff 3 and 4; Chesapeake 3, ST1, ST2, and ST4; Yorktown 1 and 2; Hopewell Power Station 1; Altavista Power Station 1; Southampton Power Station 1.

7 While the EPA has established plant emission standards in terms of a *rate-based* carbon intensity, or "pound/MWh," it has also provided extensive guidance on how states can—if they so choose—convert that target into a *mass-based* target and demonstrate compliance. Many states and regions are discussing mass-based plans due to their administrative simplicity and the relative ease of trading with neighboring states under such a plan.

8 Database for State Incentives & Renewable Energy, "Virginia: Voluntary Renewable Energy Portfolio Goal," last updated February 8, 2015, http://programs.dsireusa.org/system/program/detail/2528.

9 Database for State Incentives & Renewable Energy, "Virginia: Energy Efficiency Resource Goal," last updated May 19, 2015, http://programs.dsireusa.org/system/program/detail/5056.

10 The Natural Resources Defense Council has analyzed Virginia's compliance options using the Clean Power Plan compliance tool developed by MJ Bradley & Associates. This tool, designed to perform a simple resource analysis for each state, is available at www.mjbradley.com/about-us/case-studies/clean-power-plan-evaluation-tools. Note: the BAU (blue) and CPP Compliance (green) emissions projections in Figure 1C correspond to the "Achieved" line in the tool for the different scenarios outlined. Other assumptions: clean energy displaces 50 percent coal and 50 percent natural gas; new NGCCs run at a capacity factor of 55 percent; new power plants are covered by the emissions limit. For simplicity, this analysis assumes all projects in the interconnection queue are built. However, not all of this capacity is necessarily going to be built, in which case Virginia could comply with less displacement of existing in-state fossil generation. This assumption can be adjusted in the Interconnection Queue feature.

11 PJM Interconnection, *PJM Interconnection Economic Analysis of EPA Clean Power Plan Proposal*, March 2015. Nicholas Institute, Duke University, *Assessing Impacts of the Clean Power Plan on Southeast States*, May 2015. Nicholas Institute, Duke University, *Enhancing Compliance Flexibility Under the Clean Power Plan: A Common Elements Approach to Capturing Low-Cost Emissions Reductions*, March 2015. Center for Climate and Energy Solutions, *Modeling EPA's Clean Power Plan: Insights for Cost-Effective Implementation*, May 2015. Bipartisan Policy Center, *Insights from Modeling the Proposed Clean Power Plan*, April 2015. Analysis Group, *EPA's Clean Power Plan: States' Tools for Reducing Costs and Increasing Benefits to Consumers*, July 2014. Analysis Group, The Economic Impacts of the Regional Greenhouse Gas Initiative on Nine Northeast and Mid-Atlantic States, July 2015.

12 Lawrence Berkeley National Laboratory, *A Survey of State-Level Cost and Benefit Estimates of Renewable Portfolio Standards*, 2014. Union of Concerned Scientists, *How Renewable Electricity Standards Deliver Economic Benefits*, May 2013, www.ucsusa.org/sites/default/files/legacy/assets/documents/clean_energy/Renewable-Electricity-Standards-Deliver-Economic-Benefits.pdf. Regulatory Assistance Project, "Recognizing the Full Value of Energy Efficiency," October 2013, http://www.raponline.org/event/recognizing-the-full-value-of-efficiency-theres-more-layers-in-the-layer-cake-than-many-account.

13 Analysis Group, *The Economic Impacts of the Regional Greenhouse Gas Initiative on Nine Northeast and Mid-Atlantic States,* July 2015, http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/analysis_group_rggi_report_july_2015.pdf.

14 Natural Resources Defense Council, *Bridging the Clean Energy Divide: Affordable Clean Energy Solutions for Today and Tomorrow*, April 2015, www.nrdc.org/energy/files/clean-energy-benefits-vulnerable-comms-report.pdf.