ISSUE BRIEF

PENNSYLVANIA'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 Pennsylvania 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's standards set a limit for power plant pollution in each state. The state carbon pollution limit is expressed in two ways: as a mass-based standard 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; and as a rate-based standard 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 its mass-based standard, Pennsylvania would reduce its carbon pollution from all power plants (existing and new) from 116.7 million tons in 2012 to 90.9 million tons in 2030.[1] In limiting its pollution, Pennsylvania will benefit from the expansion of its clean energy sources, adding jobs to its clean energy economy, which already employs more than 57,000 workers.[2] The actions that Pennsylvania takes now will move it toward a healthier, economically productive, clean energy future.

THE EPA'S CLEAN POWER PLAN PROMISES GREAT BENEFITS FOR PENNSYLVANIA 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.[3] 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.[4] Pennsylvania is already experiencing climate change impacts, and experts predict that extreme heat days will be two to three times more common in the state by the 2020s. By 2084, Philadelphia could experience temperatures exceeding 90˚F more than 80 days a year—four times more often than in 2011.[5] 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. 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.[6] These benefits far outweigh the estimated national compliance costs of $8.4 billion in 2030.

POLLUTION LIMITS ARE 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 in each state. The Clean Power Plan gives states ample flexibility to meet these standards in any way they choose. NRDC encourages Pennsylvania to be creative and think "outside the blocks." Pennsylvania can now decide on its own path, a path that will determine the level of economic, environmental, and public health benefits realized by Pennsylvania residents.

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

Under Pennsylvania's Alternative Energy Portfolio Standards Act of 2004 (AEPS), "alternative" energy sources will account of 18 percent of the state utilities' electricity sales by 2020, but truly renewable sources

For more information, please contact:
Mark Szybist
mszybist@nrdc.org
http://switchboard.nrdc.org/blogs/mszybist/

AUGUST 2015
IB:15-07-K

FIGURE 1: PATHWAY TO MEETING PENNSYLVANIA'S CARBON POLLUTION LIMITS[13]

Figures 1A and 1C demonstrate the electricity-generation mix and pollution levels as a result of Pennsylvania's existing clean energy policies and planned retirements ("business as usual," or BAU).

FIGURE 1A: ELECTRICITY MIX, BUSINESS-AS-USUAL

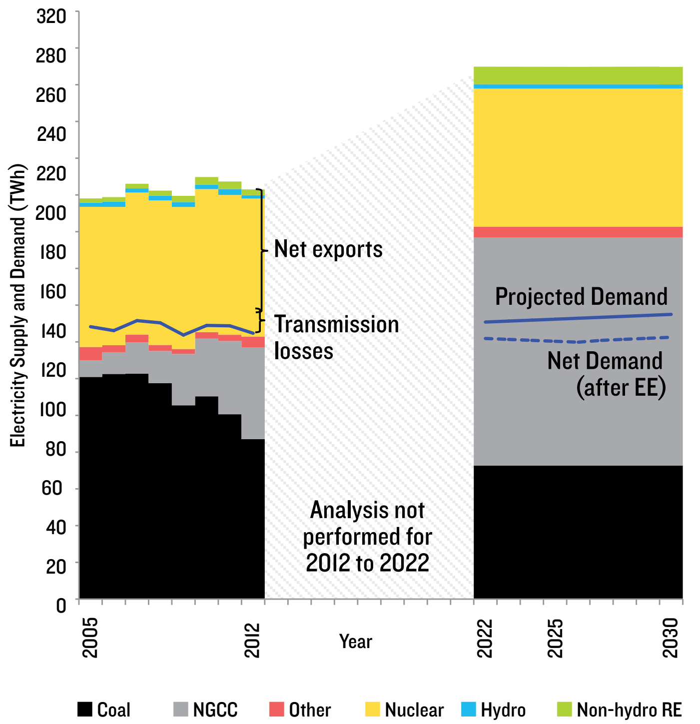


FIGURE 1B: ELECTRICITY MIX, CLEAN POWER PLAN SCENARIO

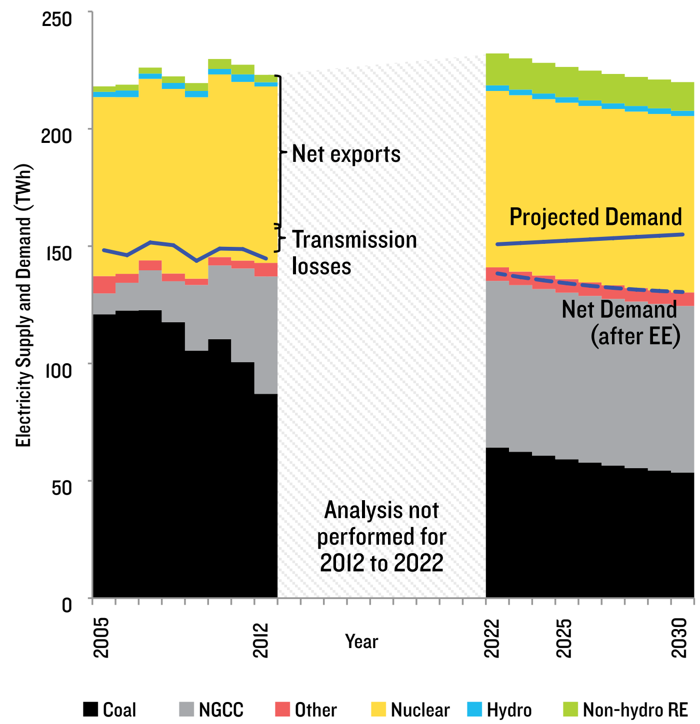
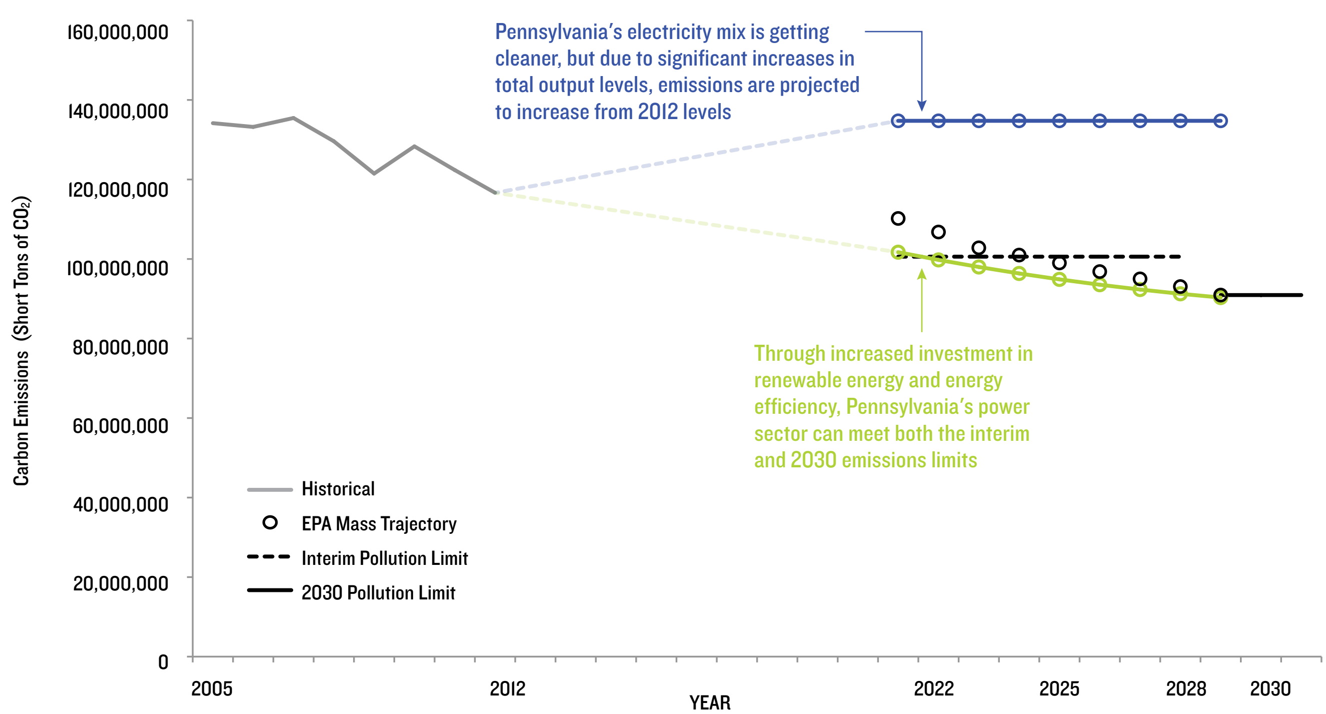


FIGURE 1B: CARBON EMISSIONS PROJECTIONS, BUSINESS-AS-USUAL VS. CLEAN POWER PLAN SCENARIO



such as solar and wind will account for only a fraction of that total.[7] Meanwhile, the Commonwealth's demand-side energy efficiency program (Act 129 of 2008) requires Pennsylvania's seven largest investor-owned utilities to reduce energy consumption by 1.6 to 2.9 percent between now and 2016, and by 2.6 to 5.0 percent between 2016 and 2021 (cumulative savings below 2010 sales).[8,9] Furthermore, many of the state's oldest and dirtiest coal plants (more than 5,000 MW) have already been retired or are slated for retirement by the end of 2016.[10] On the other hand, there is also roughly 16 GW of new natural gas power plant capacity planned for Pennsylvania, which would result in electric sector emissions significantly above its mass-based limit for new and existing plants, as shown in Figures 1A and 1C.

One compliance pathway would be to ramp up to 2 percent annual efficiency savings (a goal that could be readily achieved with changes to Act 129[11]), and ensure much greater use of low-carbon resources to meet the state's AEPS goals, as shown in Figures 1B and 1C. (Currently, Pennsylvania allows large portions of its AEPS goals to be met through "alternative" fuels that are not low-carbon resources, such as landfill gas and wood processing wastes.[12]) Additionally, Pennsylvania could limit its new NGCC capacity to about 5 GW, while still remaining a significant net exporter of electricity.

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.[14]

- Significant pollution reductions can be achieved at very low cost with energy efficiency and renewable energy. Energy efficiency is the most cost-effective option, and these clean energy investments have been found to reduce customers' energy bills.
- Because regional approaches that create larger trading markets for carbon allowances 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 carbon 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 Pennsylvania 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.[15] 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.[16]

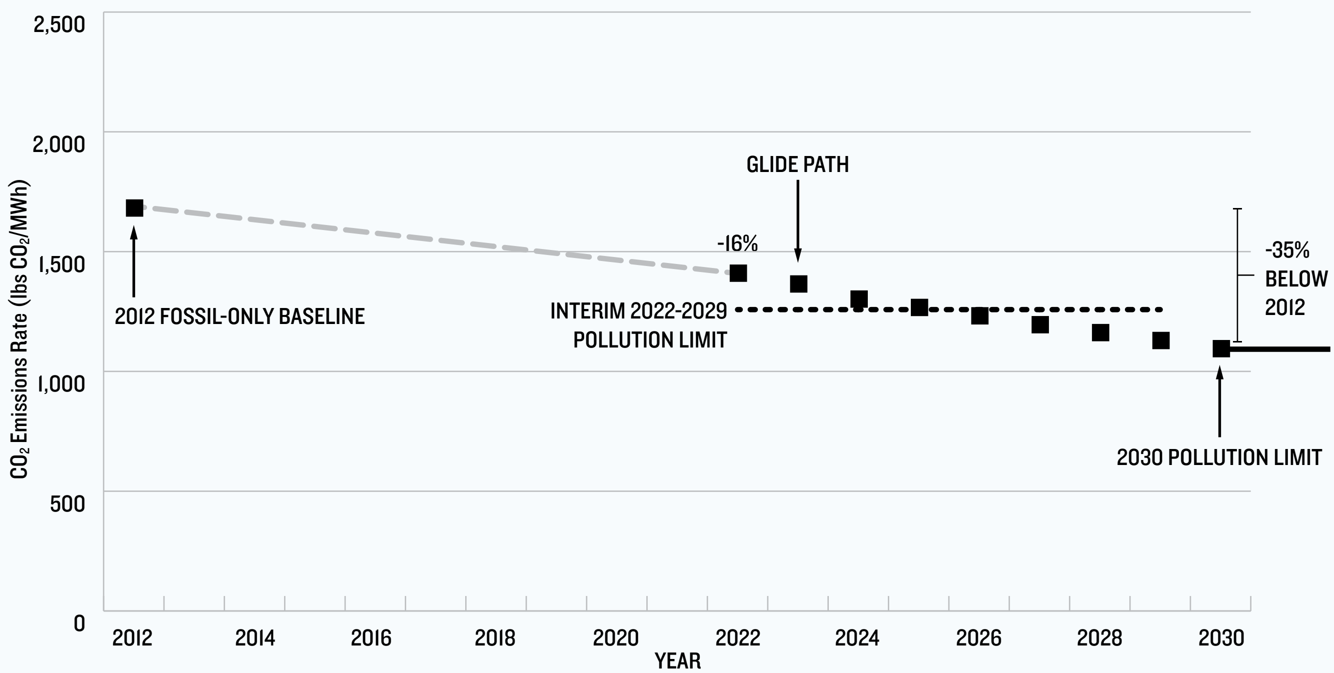
WHAT IS THE CARBON POLLUTION LIMIT FOR POWER PLANTS IN PENNSYLVANIA?

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. Pennsylvania'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 Pennsylvania is 1,095 pounds of CO_2 per MWh generated. The EPA provides additional guidance on how to convert rate-based emissions limits into mass-based emissions limits, and NRDC has analyzed compliance with Pennsylvania's mass-based limit (covering existing and new sources) in Figure 1 on page 2.

Table 1: Carbon Pollution Limits for Pennsylvania Power Plants

Period	Rate-based limit (lbs CO_2/MWh)	Mass-Based Limit, All Sources (short tons)
Baseline (2012)	1,681	116,657,632
Interim Period 2022-2029	1,258	100,588,162
2030 & Beyond Target	1,095	90,931,637

FIGURE 2: CARBON POLLUTION LIMITS FOR PENNSYLVANIA'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 will 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 PENNSYLVANIA

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 Pennsylvania 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.[17] Prioritizing investment in energy efficiency and renewable energy will keep costs down and avoid overutilizing natural gas.

As Pennsylvania 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 Pennsylvania's goals. Robust engagement with the full range of interested stakeholders will ensure that Pennsylvania chooses the best path forward, reducing its reliance on fossil fuels and moving toward a clean energy future.

<table>
<tr><th colspan="3">Table 2: Three key decision steps for developing a state plan</th></tr>
<tr><th>Decision Steps</th><th colspan="2">Description</th></tr>
<tr><td rowspan="2">Choose a rate-based or mass-based approach</td><td>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.</td><td>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.</td></tr>
<tr><td>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).</td><td>Option 4: Mass-based, Existing and New Sources
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.</td></tr>
<tr><td>Opt for an individual state plan or a plan linked with other states</td><td colspan="2">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.</td></tr>
<tr><td>Formulate state plan details and complementary policies</td><td colspan="2">• 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.</td></tr>
</table>

ENDNOTES

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

2 Environmental Entrepreneurs and Keystone Energy Efficiency Alliance, "Clean Jobs Pennsylvania", November 2014, http://cleanenergyworksforus.org/wp-content/uploads/2014/11/CleanJobsPennsylvania.pdf.

3 Ibid.

4 Ibid.

5 Based on a comparison of historical and future projected days over 90^0 F (under a high-emissions A2 scenario) across all Pennsylvania counties, using data from the Centers for Disease Control and Prevention, "Tracking Climate Change," ephtracking.cdc.gov/showClimateChangeTracking.action.

6 U.S. Environmental Protection Agency (EPA), *Fact Sheet: Overview of the Clean Power Plan*, August 2015, www.epa.gov/airquality/cpp/fs-cpp-overview.pdf.

7 For the analysis in Figures 1A and 1B, it is assumed that 26 percent of the AEPS (4.6 percent of state sales) is met by eligible low-carbon resources, based on a review of past compliance, with the remaining percentage being met by non-eligible resources. See Reference [11] for more detail.

8 Database of State Incentives for Renewables & Efficiency (DSIRE), www.dsireusa.org/. Under Act 129, the Pennsylvania Public Utility Commission (PUC) sets individual energy savings targets for utilities based on several factors, with each target expressed as a percentage of 2010 retail sales. On June 11, 2015, the PUC adopted an order establishing new targets for a five-year period starting on June 1, 2016. These targets range from 2.6 percent to 5.0 percent.

9 The Alternative Energy Standard applies to Pennsylvania's investor-owned utilities, which provide nearly all of the state's electricity (97 percent). For this analysis, based on 2013 AEPS compliance, it was assumed that 60% of Tier 1 requirements are met with CPP-eligible resources (e.g. wind and solar).

10 The retirement list for Pennsylvania compiled by the consulting group MJ Bradley & Associates includes the following coal units (5,077 MW total): Elrama units 1-4; Portland 1 and 2; Titus 1, 2, and 3; Shawville units 1-4; New Castle plants 3, 4, and 5; Sunbury Generation LP units 1-4; First Energy Armstrong Power 1 and 2; Hatfields Ferry Power Station 1, 2, and 3; First Energy Mitchell Power Station 3; AES Beaver Valley Gen2 and Gen 3.

11 Under Act 129, Pennsylvania currently has a spending cap on energy efficiency that limits utility spending to 2 percent of 2006 revenues, even if further expenditures are cost-effective. Removing this cap would enable Pennsylvania's utilities to achieve higher levels of annual savings, to the benefit of Pennsylvania's electricity customers. Several states have achieved 2 percent annual energy efficiency savings; see, for example: Analysis Group, "Assessment of EPA's Clean Power Plan: Evaluation of Energy Efficiency Program Ramp Rates and Savings Levels," December 2014, www.analysisgroup.com/uploadedfiles/content/insights/publishing/assessment_of_epa_clean_power_plan.pdf.

12 Pennsylvania Public Utility Commission (PUC) and Pennsylvania Department of Environmental Protection (DEP), "2013 Annual Report: Alternative Energy Portfolio Standards Act of 2004," October 2014, www.puc.pa.gov/electric/pdf/AEPS/AEPS_Ann_Rpt_2013.pdf.

13 The Natural Resources Defense Council has analyzed Pennsylvania's compliance trajectory 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. Other assumptions: clean energy displaces pro-rata share of coal and gas (2012 levels); new NGCCs run at a capacity factor of 55%; the emissions limit covers new power plants. For simplicity, the BAU scenario assumes all projects in the interconnection queue (~16 GW of new NGCC capacity) is built. However, not all of that capacity is likely to be built, and in the CPP scenario only 5 GW is brought online, reaching the emissions limits while maintaining Pennsylvania's position as a significant net exporter. The CPP scenario also assumes clean energy displaces in-state coal.

14 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.

15 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.

16 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.

17 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.