
Less Carbon, More Jobs, Lower Bills

Protecting future generations from climate change, starting with power plants

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“Today, for the sake of our children, and the health and safety of all Americans, I’m directing the Environmental Protection Agency to put an end to the limitless dumping of carbon pollution from our power plants, and complete new pollution standards for both new and existing power plants.”

—remarks by President Obama announcing his climate plan June 25, 2013

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About NRDC

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The president's commitment to set the first-ever federal limits on carbon pollution from power plants is an important step forward in using the Clean Air Act to protect Americans and future generations from the dangerous pollution fueling climate change. Climate change is already affecting communities, families and businesses around the nation. It is time for action.

For more than 40 years, the Clean Air Act has proved itself an effective, efficient, and flexible tool that has safeguarded public health while fostering economic growth and innovation. A new analysis released by the Natural Resources Defense Council finds that curbing carbon pollution from power plants using the Clean Air Act would have similarly positive results.

NRDC asked Synapse Energy Economics, Inc., to examine the impacts that carbon standards would have on jobs, electric bills, and gross domestic product (GDP), using widely accepted economic modeling techniques. Synapse based this new analysis on an existing NRDC proposal that outlines innovative ways the U.S. Environmental Protection Agency could develop carbon standards for power plants.

The new analysis presented here finds that NRDC's proposal to cut carbon pollution would create new jobs nationally and lower the average American's monthly electric bill. Specifically, under our proposal, carbon standards would, in 2020:

- increase national employment by a net total of 210,000 jobs,
- lower average residential electricity bills by \$0.90 per month, and
- have essentially no overall impact on GDP.

Just as we used the Clean Air Act to set limits for arsenic, mercury, lead, and other dangerous pollution coming from power plants, we can set limits to efficiently cut the carbon pollution they emit. Power plants are America's largest carbon polluters, yet in most states today, power plants may release unlimited amounts of this heat-trapping gas into the air for free. As President Obama said, "That's not right, that's not safe, and it needs to stop."

The NRDC proposal is not the only way for the Environmental Protection Agency to design carbon standards. But it does demonstrate that we can cut carbon pollution from the power sector 26 percent by 2020, avoid 25 billion to \$60 billion in health impacts and other climate-related costs, and drive investments in energy efficiency upgrades. This new analysis shows that we can achieve these vital health protections for Americans while creating new jobs and lowering electric bills.

A FLEXIBLE AND COMMON-SENSE APPROACH TO LIMITING CARBON POLLUTION FROM POWER PLANTS

Power plants are our nation's biggest source of carbon pollution, emitting about 2.4 billion tons of carbon dioxide each year, nearly 40 percent of the nation's total carbon dioxide emissions, without any restrictions at all.¹

In NRDC's December 2012 report *Closing the Power Plant Carbon Pollution Loophole: Smart Ways the Clean Air Act Can Clean Up America's Biggest Climate Polluters*,² we proposed a flexible policy that could reduce carbon emissions by 26 percent by 2020 (relative to peak levels in 2005) while at the same time lowering electricity prices. The price tag? About \$4 billion in 2020. But the benefits—in saved lives, reduced illnesses, and avoided environmental damage—would be worth \$25 billion to \$60 billion, 6 to 15 times greater than those costs.³

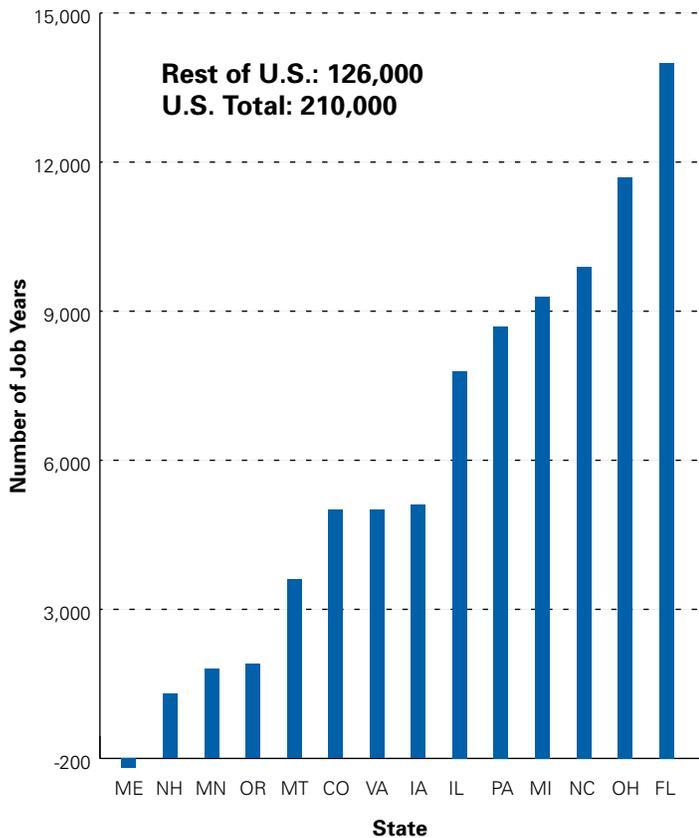
The NRDC plan tailors pollution limits to the specific energy mix of each individual state; gives utilities the flexibility to determine the most cost-effective way to hit the target; and can save our families money by reducing waste through energy efficiency.

IMPACT ON JOBS AND ELECTRIC BILLS

NRDC asked Synapse Energy Economics, Inc., to analyze our proposal to examine the impacts it would have on jobs, GDP, and electric bills for the nation as a whole and for 14 individual states. The analysis found that a carbon standard for power plants, if implemented according to NRDC's proposal, could create 210,000 jobs nationwide in 2020 (specifically, "job-years," or a year's worth of employment) and reduce the average household's monthly electric bill by \$0.90. As a result of the job increases and electric bill savings, the impact on the nation's GDP in 2020 would be negligible.⁴

We found similar results in individual states. Figure 1 shows net job creation for the 14 states studied. Every state but one would experience job growth as a result of cutting carbon pollution from power plants, with the increases ranging from 1,300 to 14,000 jobs. Maine would experience an estimated loss of 200 jobs compared with the number it would have in 2020 without our proposal.

Figure 1: Total Net Jobs Added by State in 2020 from Carbon Standard



Households' utility bills were also not noticeably impacted across states.

As Table 1 below indicates, residents in all but 3 of the 14 states we examined would experience lower electricity bills in 2020 under the proposal compared to business-as-usual.⁵ These savings would occur because the energy efficiency program costs included in electricity bills would be lower than the cost of electricity that would otherwise be required. While electricity *rates* (cents per kilowatt-hour) could go up modestly in some cases, electricity *bills* (rate times usage) go down, on average, because energy efficiency improvements reduce overall electricity consumption.

Table 1: Changes in Net Job Years and Utility Bills in the U.S. and by State from Carbon Standard in 2020* (Policy Case Relative to Business-as-Usual)

	Total net change in job-years	Change in average monthly utility bill
U.S.	210,000	-\$0.90
Colorado	5,000	\$1.82
Florida	14,000	-\$0.31
Illinois	7,800	-\$2.47
Iowa	5,100	\$1.06
Maine	-200	-\$3.19
Michigan	9,300	-\$0.84
Minnesota	1,800	\$6.02
Montana	3,600	-\$1.25
New Hampshire	1,300	-\$3.61
North Carolina	9,900	-\$2.73
Ohio	12,000	-\$1.03
Oregon	1,900	-\$0.65
Pennsylvania	8,700	-\$0.29
Virginia	5,000	-\$4.35

* Estimates do not include savings beyond 2020 from efficiency measures or positive productivity impacts from reduced climate change.

Table 2 shows that energy efficiency upgrades are the primary driver of job gains, creating 236,000 additional direct jobs in 2020. Shifts in other sectors (including not just power plants but also industries that supply inputs to their production) reduce the net increase to 210,000.

Table 2: Changes in Energy-Sector Employment from Carbon Standard in 2020 (Policy Case Relative to Business-as-Usual)*

Job changes by energy source/generation (direct jobs)	
Energy efficiency	236,000
Coal-fired power plants	20,000
Gas-fired power plants	-1,900**
Zero-emitting sources (nuclear, wind, solar photovoltaic)	-600***

* Estimates do not include positive productivity impacts from reduced climate change.

** Employment is higher relative to 2012 levels under both the policy and reference cases, with 4,500 more jobs versus 6,400 over 2012.

*** In the policy case relative to business-as-usual, nuclear jobs decrease by 700, wind increase by 100, and there is no difference in solar.

Changes in the coal-fired, natural gas-fired, and non-emitting generation sources at first appear counterintuitive.

Starting with coal-fired power plants, some operation and maintenance jobs are lost with coal retirements. However, installation of carbon capture and storage (CCS) technology (5 gigawatts [GW] of capacity) creates a significant number of new construction jobs at these plants.⁶ The net effect is a gain of 20,000 direct jobs. (Our energy sector modeling found that CCS was a cost-effective compliance option at some facilities, in part because the captured carbon dioxide can be sold to the oil industry for use in enhanced oil recovery.)

For natural gas generation, the NRDC carbon standard has two counteracting effects. On the one hand, energy providers replace coal generation with natural gas, through both new construction and fuel switching. On the other, energy efficiency reduces the need for new generation overall. The net effect of these two factors is 1,900 fewer jobs relative to the reference case at natural gas-fired plants in 2020. However, because this reduction measures incremental gains relative to a reference case, this doesn't mean a reduction in jobs from today. In both cases, employment at gas-fired plants would still be higher in 2020 than in 2012—just less so in the policy case (6,400 more jobs in the reference case versus 4,500 under the policy).

For non-emitting, clean energy sources (wind and solar photovoltaic) and nuclear power, the growth in generation is about the same in the policy scenario we modeled as it is in our reference case. This is because growth of renewable energy capacity in both cases is driven primarily by state renewable energy standards, and we did not assume these standards would be adjusted in response to carbon

standards. In practice, many states may choose to comply with carbon standards by relying more heavily on renewables (and less heavily on energy efficiency), which would increase the economic benefits from those clean technologies. Additionally, there is a strong push to extend and expand state renewable energy standards and federal energy incentives, which would further increase the amount of renewable energy generation relative to the base case.

In both the reference and policy case our modeling projects a 50 percent increase in wind generation and almost a fivefold increase in solar PV by 2020 relative to 2012 levels. A stricter standard, combined with expanded state and federal renewables policies, could increase wind and solar generation even more. And given recent reductions in the cost of renewable energy systems, this could be even more cost-effective than the compliance scenario we modeled.

As the results above indicate, energy efficiency is the primary means for reducing carbon under NRDC's proposal. Power companies can earn credit toward compliance for avoided pollution by helping their customers use less electricity. This means emissions can be cut without costly or lengthy power plant retrofits or new construction, which reduces compliance costs significantly and saves energy consumers money. It is one of the many reasons utilities have scaled up annual investments in electricity-use efficiency programs from \$2.7 billion in 2007 to nearly \$7 billion in 2011.

The model assumes energy efficiency is widely adopted under our plan because of its low cost. As a result, by 2020 overall electricity demand declines by 4 percent, rather than increasing by 7 percent without the standard. Because consumers are using less electricity, their bills are lower.

Energy efficiency has another benefit: The jobs it creates can't be outsourced and are in industries that have been especially hard hit by the recent recession. Because the bulk of investment is in making our buildings and homes more efficient, efficiency creates a lot of jobs that require a broad range of homegrown expertise, including electricians, heating/air conditioning installers, carpenters, construction equipment operators, roofers, insulation workers, industrial truck drivers, construction managers, and building inspectors.

The Regional Greenhouse Gas Initiative

The Regional Greenhouse Gas Initiative (RGGI) is a five-year-old, nine-state carbon trading program designed by a bipartisan group of governors to drive down carbon emissions while boosting energy savings and economic growth in the region. The market-based program, in which Maine, Vermont, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, Delaware and Maryland trade and bid on pollution permits, delivers cost-effective emissions reductions: Since 2008, RGGI has helped reduce power-plant carbon pollution by more than 30 percent while gross regional product has increased.⁷ It has also injected \$1.6 billion in economic benefits into the regional economy, helping generate 16,000 job-years of work as well as investments that will save \$1.3 billion on energy bills.⁸

The initiative has spurred projects like one in Hartford, at the Connecticut Children's Medical Center, where RGGI-funded upgrades are enabling the medical center to save \$23,000 a year on energy—a benefit that accrues not just to the medical center but to its young patients as well.⁹ Likewise, at Cayuga Community College, in upstate New York, RGGI-supported solar panels and lighting upgrades allow the college to save \$150,000 annually—money it can now put toward educating students.¹⁰

The program was strengthened in February 2013, and the first quarterly pollution allowance auction brought in a near-record \$124.4 million and twice as many offers as there were allowances to sell—a sign of a healthy market.¹¹ It proves that the states' recent plan to tighten pollution limits allowed under RGGI is working as designed and reinvigorating the program. RGGI shows that cutting carbon pollution in a smart way creates good jobs that can't be shipped overseas, saves consumers money on energy, and builds stronger local and regional economies.

CONSERVATIVE ESTIMATES

Our estimates are conservative.

Changes in utility bills capture savings from energy efficiency only for the year 2020, yet energy efficiency upgrades installed up to that point will continue to have benefits for consumers for many years beyond. The bill savings we estimated reflect up-front charges on electricity bills for energy efficiency programs and investments in cleaner generation, minus savings from avoided generation received only in the year of analysis.

We also did not include two positive impacts our proposal would have on GDP, due to modeling limitations.

First, we did not calculate productivity improvements to the economy that would result from the \$25 billion to \$60 billion in health and environmental benefits. These could be significant: a series of studies led by Dale Jorgenson at Harvard University¹² concluded that the healthier workforce resulting from the Clean Air Act increased GDP by as much as 1.5 percent by 2010. Similar to other environmental damages, climate change disrupts worker productivity because of work days lost to extreme weather (e.g. from damages to homes, businesses, and transportation and other infrastructure) and climate-related illnesses (e.g. exacerbated respiratory illnesses such as asthma and bronchitis, and emergency room visits during heat-waves for various health impacts). Extreme heat also lowers the productivity of outdoor workers.

Second, our proposed carbon standard reduces wholesale electricity prices in the regions we studied in the Eastern part of the country due to reduced electricity demand and the form of the output-based standard, but we did not estimate the positive effect this would have on businesses and economy-wide production.¹³

CONCLUSION

The President has laid out a robust plan for tackling climate change, noting that we have an obligation to protect future generations from climate change. The centerpiece of that plan is the task of cleaning up the dangerous carbon pollution from power plants. Power plants are our biggest source of carbon pollution, and while they must observe strict limits for arsenic, mercury, lead and other emissions, they face no limits for their carbon dioxide pollution. This analysis demonstrates that NRDC's proposal for reducing carbon pollution from power plants by 26 percent will add jobs to the US economy, and save Americans money on their electric bills. Considering that climate change is already upon us and already affecting communities all across the nation, a path forward to less carbon, more jobs, and lower bills is the right one to take.

Methodology

The analysis was performed using results disaggregated to the state level based on the power sector analysis conducted for NRDC by ICF, Inc., and published in our December 2012 report.

The widely used IMPLAN input-output model, which represents the flow of goods and services (and the associated employment) among states and economic sectors and industries, was used to estimate the economic effects of our estimated changes in spending between the carbon standard and a reference, or “business as usual,” scenario. Changes in expenditures included generation costs (i.e., construction, operation, and maintenance), energy efficiency expenditures, and customers’ electricity bills. Synapse developed technology-specific details for the inputs needed for each energy resource technology (i.e., labor and materials). A complete description of the methodology can be found in the Synapse report *Economic Impacts of the NRDC Carbon Standard*.¹⁴

Endnotes

1 US Environmental Protection Agency, Overview of Greenhouse Gases. <http://www.epa.gov/climatechange/ghgemissions/gases/co2.html>.

2 <http://www.nrdc.org/air/pollution-standards/>.

3 As explained in our December 2012 report, the avoided costs estimate is based on the reduction of traditional pollutants like sulfur and nitrogen oxides and the lives saved and illnesses reduced from those reductions, plus the estimated value of reducing carbon dioxide itself. In December 2012, the value of reducing carbon pollution was estimated at \$25 to \$59 per ton. Our estimate of the overall value of implementing our carbon proposal reflects the reduction of the traditional pollutants as well as range of values estimated for reducing each ton of carbon.

4 Synapse Energy Economics, Inc., June 2013. Economic Impacts of the NRDC Carbon Standard. <http://www.synapse-energy.com/Downloads/SynapseReport.2013-06.NRDC.Economic-Impacts-of-NRDC-Carbon-Standard.13-014.pdf>.

5 Business-as-usual is synonymous with reference case.

6 The reference case (also referred to as business-as-usual) used in NRDC’s December 2012 report, Closing the Carbon Pollution Loophole, upon which this study was based, was benchmarked to the Energy Information Administration’s 2011 Annual Energy Outlook reference case (AEO2011). Energy markets have shifted significantly since then and the 2013 Annual Energy Outlook reference case (AEO2013) projects significantly less generation with coal-fired power plants and significantly more generation with natural gas-fired power plants than did the 2011 Outlook. (Projections of electricity generation by nuclear power plants and renewable energy sources are similar in these two reports). Specifically, coal’s share of electricity generation is projected to be 38 percent in 2020 in AEO2013 compared to 43 percent in AEO2011. Conversely, the share of electricity generated by natural gas in 2020 is projected to be 27 percent in AEO2013 compared to 22 percent in AEO2011. This suggests that a smaller shift from business-as-usual may be required to achieve a given level of carbon dioxide emissions than was assumed here. NRDC is planning future work to update its analysis to reflect the newer reference case.

7 The Regional Greenhouse Gas Initiative, “Regional Investment of CO₂ Allowance Proceeds, 2011,” November 2012, via <http://www.rggi.org/docs/Documents/2011-Investment-Report.pdf>.

8 Analysis Group, “The Regional Greenhouse Gas Initiative: Economic Impacts of the First Three Years,” November 2011, via http://www.analysisgroup.com/uploadedFiles/Publishing/Articles/Economic_Impact_RGGI_Fact_Sheet.pdf.

9 Connecticut Energy Efficiency Fund, “Efficiency at Work,” via http://www.rggi.org/docs/NU_EEF_CS_ChildrnMedical_f.pdf.

10 Kelly Voll, “Solar panels expected to help CCC lower energy costs,” *The Citizen*, November 23, 2010, via http://auburnpub.com/news/local/solar-panels-expected-to-help-ccc-lower-energy-costs/article_0645832a-f6bb-11df-94d2-001cc4c002e0.html.

11 RGGI Inc, “38.7 Million CO₂ Allowances Sold at 20th RGGI Auction,” June 7, 2013, via http://www.rggi.org/docs/Auctions/20/PRO60713_Auction20.pdf.

12 Empirical Evidence Regarding the Effects of the Clean Air Act on Jobs and Economic Growth, EPA White Paper (February 9, 2011), http://www.epa.gov/ocir/pdf/hottopics/2011_0208_white_paper.pdf.

13 Under NRDC’s proposal, each state would have an emission rate standard. In general, efficient gas-fired generators would emit at a lower rate than the standard, and the emission credits they earn would lower their marginal generating costs. In states with competitive wholesale markets, this would lower wholesale electricity rates during hours when these plants are the marginal generating source.

14 <http://www.synapse-energy.com/Downloads/SynapseReport.2013-06.NRDC.Economic-Impacts-of-NRDC-Carbon-Standard.13-014.pdf>.