Union of Concerned Scientists

FACT SHEET

Tapping Renewables and Efficiency to Meet Carbon Standards for Power Plants

The electricity sector is the largest single source of U.S. carbon dioxide (CO_2) emissions—responsible for nearly 40 percent of the total. In 2014 and 2015, the U.S. Environmental Protection Agency (EPA) is developing the first-ever rules to limit these emissions from both new and existing power plants. States are responsible for devising and implementing their own plans to achieve the EPA's standards for existing power plants.

Strong federal standards that include renewable energy and energy efficiency as options for cutting carbon emissions—and state plans that capitalize on these solutions—provide a tremendous opportunity to clean up and modernize our electricity system while curbing the harmful effects of climate change. These affordable options for reducing heat-trapping emissions are already delivering reliable electricity to millions of Americans. Renewable energy and energy efficiency can also play a significant role in enabling states to meet the new carbon standards for power plants. And these options provide extra benefits: by relying on renewable energy and energy efficiency to meet federal carbon standards, states can diversify their electricity mix, save consumers money, improve public health, and strengthen state and local economies.

This fact sheet outlines how policy makers can employ renewables and efficiency to reduce global warming emissions from the electricity sector and help curb the harmful and costly effects of climate change.

Reducing Carbon Emissions from Power Plants

Deep, economy-wide cuts in emissions are needed to reduce the impacts of climate change (Melillo, Richmond, and Yohe 2014). For the power sector, an approach that focuses on reducing carbon emissions across the entire electricity grid—and incorporating more low-carbon energy sources—can achieve greater cuts at a lower cost than efforts that focus solely on making technological improvements at individual power plants. A sectorwide approach also gives states more flexibility in determining how best to cost-effectively reduce carbon emissions, and is consistent with the statutory language of the Clean Air Act (Farnsworth 2014; Lashof and Yeh 2014; Burtraw and Woerman 2013; Lashof et al. 2013).

The EPA and the states should consider opportunities in the electricity sector broadly by encouraging power producers to rely on low-carbon options such as renewable energy, energy efficiency, natural gas plants, and nuclear power. New nuclear power facilities are more costly and more risky than most other low-carbon alternatives; the federal government would need to upgrade and enforce nuclear safety and security standards for this to become a viable low-carbon option (Lochbaum 2014; Lazard 2013). While encouraging the power sector to switch from coal to natural gas plants would provide some near-term cuts in carbon emissions and costs, a wholesale shift to natural gas would not reduce emissions enough to curb the climate crisis. Evidence is also growing that an overreliance on natural

Generating electricity from wind power and other renewable energy sources emits no carbon. Increasing their use is a cost-effective solution for achieving federal carbon standards for power plants while also improving public health and strengthening local economies. Photo Source: Flickr/Brian Jeffery Beggerly

gas poses risks to consumers, public health and safety, the economy, and land and water resources (Fleischman, Sattler, and Clemmer 2013). These risks include the price volatility of natural gas, continued harmful effects of climate change, and the environmental impacts of hydraulic fracturing.

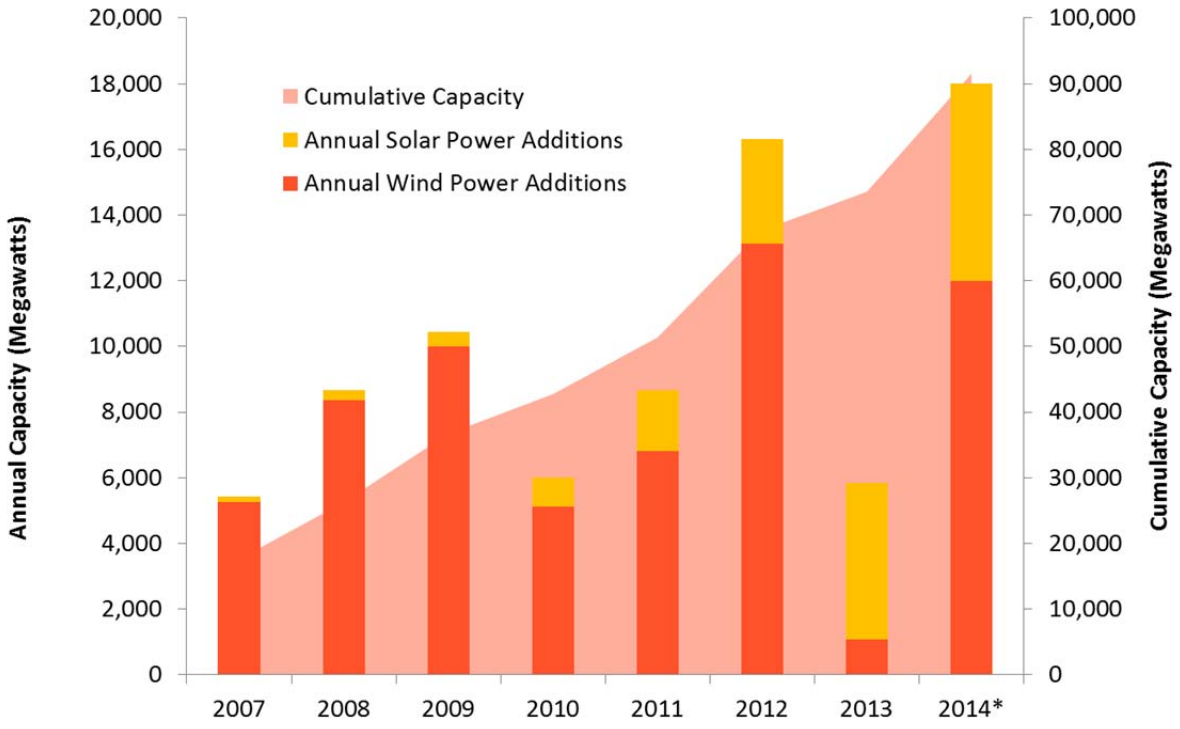
Renewable resources, in contrast, emit no carbon, and they are becoming cost-competitive and growing rapidly (Figure 1).

Technological improvements at most existing fossil fuel plants could reduce carbon emissions by 1 to 5 percent (Burtraw and Woerman 2013; McCarthy 2013; NETL 2010). Options for doing so include making boilers more efficient; switching a plant to lower-carbon fossil fuel, such as from coal to natural gas; and co-firing coal with biomass, such as energy crops and forest and agricultural waste. Other options at individual plants include implementing combined heat and power systems (that is, recovering waste heat produced during combustion), adding carbon capture and storage (CCS), and simply running a plant less often. Of these, only using CCS or running a plant much less often can provide meaningful cuts in carbon emissions from individual plants. Although CCS has yet to be deployed on a wide scale at commercial power plants, a number of projects are now under way, and its role could expand over time (NETL 2013).

State Implementation of the New Carbon Standards

The 1990 amendments to the Clean Air Act established a state-federal partnership to limit pollution from existing sources. Under that approach, the EPA sets federally enforceable standards, and requires states to devise plans for meeting them. President Obama has instructed the EPA to develop carbon standards for the electricity sector that give states a menu of compliance options, including performance standards and

FIGURE 1. U.S. Wind and Solar Photovoltaic Capacity



Falling costs, advances in technology, and strong state and federal policies are driving a rapid increase in renewable energy capacity. U.S. solar capacity grew more than 25-fold from the end of 2007 through 2013—to 4,750 megawatts (MW), and the industry expects to install another 6,000 MW in 2014. Meanwhile U.S. wind capacity nearly quadrupled to 61,110 MW during that period.

Note: For wind power, 2014 data reflect industry projections and projects under construction, some of which may not come online that year. For solar PV, 2014 data reflect industry projections.

SOURCES: AWEA 2013a; SEIA 2014; Barbose et al. 2013.

market-based tools. A diverse group of states—including the nine Northeast states that participate in the Regional Greenhouse Gas Initiative (RGGI), as well as California, Pennsylvania, and Kentucky, for example—are similarly advocating a flexible approach (IRC 2014; PA DEP 2014; Peters 2013; RGGI 2013).

States will be developing compliance plans for meeting carbon standards that resemble the State Implementation Plans required under the Clean Air Act to limit conventional power plant pollutants such as sulfur dioxide, nitrogen oxides, and ozone. States have used such plans successfully for decades to cost-effectively improve air quality. Once a state issues its plan, the EPA—with public input—will approve or reject all or parts of the plan. Ultimately, if it deems a state plan inadequate, the EPA will enforce a federal plan for complying with the standards (EPA 2013).

Guidance from the EPA that allows states to use existing, expanded, and new programs for renewable energy and energy efficiency would give states flexibility in achieving low-cost reductions in carbon emissions across the power sector while maintaining a reliable electricity supply.

States have had years of advance notice that the EPA would be promulgating this rule, and will have two years after the release of the draft standard to finalize their plans to meet it. States may have already begun—or if not should immediately start—to explore ways to cut carbon emissions, especially by maximizing the benefits of renewable energy and energy efficiency.

Regional approaches can amplify the benefits of renewables and energy efficiency while lowering the cost of reducing carbon emissions.

How States Are Already Driving Investments in Renewables and Energy Efficiency

State policies are leading drivers of the use of renewable energy sources to produce electricity as well as to reduce demand for power from both homes and businesses. For example, state renewable electricity standards (RESs) require utilities to increase their reliance on renewable sources over time. Twenty-nine states and the District of Columbia have adopted RESs—with 17 states setting targets of 20 percent or more (UCS 2013). And state energy efficiency resource standards (EERSs) require utilities to meet a growing share of customers' power needs by investing in technologies that reduce electricity use. Twenty-four states have adopted such a standard, with most requiring utilities to reduce electricity use by at least 1 percent each year (Downs et al. 2013).

Other state policies that drive renewables and efficiency include cap-and-trade programs for heat-trapping emissions; net metering, which allows residential and commercial customers that generate their own electricity from renewable sources to feed electricity they do not use back into the grid; public-benefit funds, which are small surcharges on utility bills used to fund renewables and efficiency; and tax incentives to support these technologies. Along with RESs and EERSs, these approaches give many states a head start in reducing carbon emissions from the power sector. States that strengthen and expand these policies will be in an even better position to meet federal standards for carbon emissions cost-effectively while accelerating the transition to a clean energy economy.

Using Regional Cooperation to Spur Cuts in Carbon Emissions

States have shown that regional approaches can amplify the benefits of renewables and energy efficiency while lowering the cost of reducing carbon emissions. For example, the Regional Greenhouse Gas Initiative (RGGI)—a market-based carbon-trading program—has cost-effectively cut heat-trapping emissions and spurred economic development in the nine participating Northeast states.

Under RGGI, these states have set a regional declining cap on carbon emissions. Power plant owners must buy an allowance for each ton of carbon their facilities emit. States have used two-thirds of the revenues from the auctions of these allowances through 2011 to support energy efficiency programs. Those programs are projected to deliver $1.3 billion in savings on consumer energy bills, cut power demand by more than 27 million megawatt-hours, and curb CO_2 emissions by 12 million tons (RGGI 2012).

Meanwhile California has established its own cap-and-trade program, and efforts are under way to expand that program to other western states and the Canadian province of British Columbia. And states with RESs and EERSs—including many in the Midwest—could use them as part of regional mechanisms for complying with federal carbon standards.

Regional grid operators—which run electricity markets, ensure the reliability of the power supply, and perform regional planning—could foster cooperation among states in complying with federal carbon standards (IRC 2014). A recent study by

PJM Interconnection—which manages the power grid for utilities in 13 eastern states—found that renewables could supply up to 30 percent of the region's electricity by 2026 while maintaining system reliability. That approach would cut carbon emissions by 27 percent to 41 percent (GE Energy Consulting 2014). To encourage reliance on renewables, grid operators could consider carbon emissions when choosing which power plants are dispatched to meet electricity needs (Chang et al. 2014).

No matter which approach to complying with federal standards they use, state air-quality regulators will need resources and tools to accurately monitor, verify, and track cuts in carbon emissions from the power sector. Most states now track such emissions, but they may need support to measure avoided emissions stemming from policies such as RESs and EERSs. Fortunately, states and regions can build on the experiences of early movers such as the RGGI states.

The EPA has provided robust criteria and methods for using state programs that expand renewable energy and energy efficiency to comply with standards for conventional pollutants. States could apply these tools to their efforts to curb carbon emissions (EPA 2012). And the EPA has already released a tool that helps states quantify avoided carbon emissions (EPA 2014).

Renewables and Energy Efficiency Can Provide Cost-Effective Cuts in Carbon

Renewable energy sources such as wind and solar not only emit no carbon when producing electricity; they can also readily and reliably replace electricity produced from fossil fuels. By curbing demand for electricity, energy efficiency measures similarly displace power from existing fossil fuel plants, while also reducing the need to build new plants.

Non-hydro renewable energy sources supplied 6.2 percent of our nation's power in 2013, and their use continues to grow at a fast pace. Technological advances have ushered in impressive growth of wind and solar power by dramatically lowering costs. For example, the cost of wind power dropped 43 percent in the last four years—and is now competitive with power from new fossil fuel plants in many regions of the country (Wiser and Bolinger 2013). The average installed price of solar photovoltaic (PV) systems fell by about 40 percent from 2008 to 2012, and by another 15 percent in 2013 (Kann et al. 2014; Barbose et al. 2013).

The potential for renewables and energy efficiency to curb carbon emissions from the power sector is great. Ratepayer-funded energy efficiency programs reduced those emissions by nearly 83 million metric tons (MMT) in 2011 (Foster, Wallace, and Dahlberg 2013). Wind power cut carbon emissions from the electricity sector by 96 MMT, or 4.4 percent, in 2013 (AWEA 2014b). Replacing coal plants that are either already scheduled for retirement or economically vulnerable with such zero-emission sources could cut CO2 emissions by another 440 MMT annually (Fleischman et al. 2013).

The electricity sector is the largest single source of U.S. carbon dioxide emissions—responsible for nearly 40 percent of the total. Emissions from coal power plants account for nearly three-quarters of the sector's share. Photo Source: Flickr/WalterPro4755

Renewable energy and energy efficiency also provide a host of benefits beyond cost-effective cuts in carbon emissions (Machol and Rizk 2013; Cleetus, Clemmer, and Friedman 2009). For example, the use of clean power reduces other types of air and water pollution, improving public health—especially among people living near dirty power plants. Expanding the use of renewables also helps diversify the electricity mix. And that, in turn, stabilizes the cost of electricity by reducing reliance on fuels subject to price spikes and long-term price increases, protecting consumers from economic risks (UCS 2013). Finally, strong state policies that encourage the use of renewables and energy efficiency can help diversify local economies and create jobs—particularly important for fossil-dependent communities (Richardson et al. 2014; Brown et al. 2009).

Recommendations and Conclusion

- A sectorwide approach to enforcing strong carbon standards for existing power plants gives states and power producers incentives to expand reliance on renewable energy and energy efficiency. The EPA should not only require ambitious reductions in heat-trapping emissions, but also give states the flexibility to use renewable energy and energy efficiency programs to comply with the standards. The EPA should also allow states to use various approaches—including regional ones—in their implementation plans.
- States should take advantage of significant opportunities to reduce carbon emissions by expanding renewable energy and energy efficiency programs. Doing so would also reduce air and water pollution, diversify the electricity mix, save consumers money, and strengthen state and local economies. States should consider regional approaches to amplify the impact of such efforts.
- The EPA should continue to provide states with robust criteria and methods for accurately quantifying reductions in carbon emissions from state and regional programs that support renewables and efficiency. To make that approach work, states must ensure that air-quality regulators, energy offices, and public utility commissions coordinate their efforts.

Shifting to clean, low-carbon power sources such as renewable energy and energy efficiency is a swift and cost-effective way to achieve the deep cuts in carbon emissions needed to tackle the climate crisis, diversify the electricity mix, and create healthier, more productive communities. By tapping existing and expanded programs to spur renewables and efficiency, states and communities can meet federal carbon standards while enjoying the environmental and economic benefits of the transition to a low-carbon electricity system.

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