Union of Concerned Scientists

POLICY BRIEF

Strengthening the EPA's Clean Power Plan

Increasing renewable energy use will achieve greater emissions reductions

THE CARBON-CUTTING POWER OF RENEWABLE ENERGY

Investing in renewable energy is a smart and cost-effective solution for delivering the sharp reductions in power plant carbon dioxide (CO_2) emissions needed to help slow the pace of climate change. The U.S. Environmental Protection Agency's (EPA's) new Clean Power Plan is an important step toward limiting these emissions from existing power plants. Yet, while the plan allows states to use renewable energy to meet their emissions reduction targets, it significantly underestimates the role of renewable energy in setting these targets.

The Union of Concerned Scientists has identified a better way to make the most of renewable energy in the Clean Power Plan. Using our recommended modifications, the EPA could nearly double the amount of cost-effective renewable energy in their state targets—from 12 percent of total 2030 U.S. electric sales to 23 percent. If states met these stronger targets, total CO_2 emissions reductions achieved by the Clean Power Plan would increase from 30 percent below 2005 levels by 2030 to approximately 40 percent.

In June 2014, the U.S. Environmental Protection Agency (EPA) proposed in its Clean Power Plan the first-ever limits on carbon dioxide (CO_2) produced by existing power plants. These plants are responsible for nearly 40 percent of total U.S. CO_2 emissions, constituting the nation's largest source of this heat-trapping gas. Given that Americans face worsening risks of climate impacts, as clearly reported in the National Climate Assessment, the Clean Power Plan is an important step forward in the effort to limit those risks (Melillo, Richmond, and Yohe 2014). The plan sets emissions rate reduction targets for the power sector state by state, and it would reduce national electricity sector emissions by an estimated 30 percent below 2005 levels by 2030 (EPA 2014a). However, analysis of the rule by the Union of Concerned Scientists (UCS) shows that the Clean Power Plan could deliver much deeper reductions in emissions, especially by taking greater advantage of cost-effective renewable energy options.

This brief outlines a better way to make the most of renewable energy in the Clean Power Plan, and to strengthen its state renewable energy targets as the cost of sources such as wind and solar power decline. The UCS proposal builds on the EPA's approach while utilizing the latest available market data, demonstrated rates of growth in renewable energy, and existing state commitments to deploy renewables. Using our recommended modifications, the EPA could *nearly double* the amount of cost-effective renewable energy in their state targets—from 12 percent of total 2030 U.S. electric sales to 23 percent (Figure 1, p. 3).

The EPA should adopt a similar approach, and thereby increase the total emissions reductions achieved by the Clean Power Plan from 30 percent below 2005 levels by 2030 to approximately 40 percent. Strengthening other parts of the plan could help achieve even deeper reductions.

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Investing in solar power and other renewable energy technologies is a smart and cost-effective solution for cutting CO_2 emissions.

The Basics of the Clean Power Plan

The EPA draft Clean Power Plan establishes state-by-state emissions rate reduction targets, and it offers a flexible framework under which states may meet those targets. The rule provides for a number of options to cut carbon—called "building blocks"—and determines state emissions rate targets by estimating the extent to which states can take advantage of each of them. Renewable energy resources account for one of the building blocks, alongside efficiency improvements at individual fossil fuel plants, nuclear power, shifting generation from coal to natural gas, and greater energy efficiency in buildings and industries. The EPA determined these building blocks to be the best system of emission reduction (BSER) for existing power plants—a technological and economic regulatory determination required by the Clean Air Act (CAA).

Each state's target derives from the aggregate level of emissions rate reductions coming from the suite of building blocks. Thus assumptions made by the EPA about the emissions reduction potential of each building block in a state directly affect its overall target. If the EPA's assessment for any of the individual building blocks is too modest, so too will be the state's final target.

Targets differ across states because of each state's unique mix of electricity-generation resources—and also because of technological feasibilities, costs, and emissions reduction potentials of each building block, all of which vary across the country. Because states are free to combine any of these building blocks in a flexible manner, they could therefore opt to meet a much larger share of their overall target through expanding their use of renewable energy resources.

The EPA's decision to include renewable energy as an eligible compliance option for states is sensible, as technologies such as wind and solar—which already deliver safe, reliable, and affordable power to millions of U.S. consumers—emit no carbon in their operation and are a viable alternative to fossil fuels. All states have significant and diverse renewable energy resource potential that can be developed. And as a result of falling costs, advances in technology, and strong state policies, renewable energy technologies are in a strong position to compete with the other emissions reduction strategies allowed under the Clean Power Plan.

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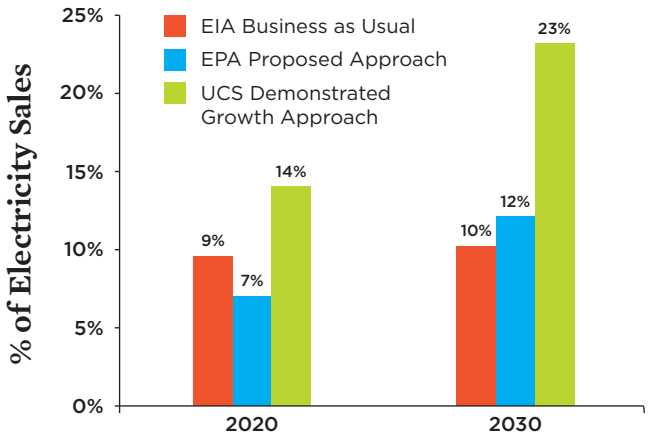
Coal-fired power plants are the electric sector's largest source of heat-trapping CO_2 emissions. By strengthening state renewable energy targets under its Clean Power Plan, the EPA could increase the total power sector emissions reductions achieved from 30 percent below 2005 levels by 2030 to approximately 40 percent.

The EPA Underestimates the Power of Renewable Energy

While the EPA draft rule specifically allows states to use renewable energy as an affordable way to meet their emissions reduction targets, it significantly *underestimates*, in several ways, the potential role of renewable energy in setting state targets. The Clean Power Plan does not adequately capture renewable energy deployment rates that states are already achieving. The plan also fails to reflect the continued growth and falling costs of renewable energy projected by market experts. Indeed, the EPA's proposal falls short of the national renewable energy generation levels that the U.S. Energy Information Administration (EIA) projects would occur in 2020 under a business-as-usual approach; the proposal's 2030 results are only marginally higher than the EIA's projections (EPA 2014a; EIA 2013) (Figure 1).

In the draft Clean Power Plan, the EPA presents both a proposed approach and an alternative option for determining the emissions reduction potential of the renewable energy building block. The proposed approach splits the nation into six regions and establishes conservative regional targets for renewable energy by averaging the 2020 targets of existing state-level renewable electricity standards (RESs) within each region. RESs, which have been adopted by 29 states and the District of Columbia, set a proportion of renewable electricity that utilities are required to supply over time. The EPA then calculates the annual growth rate needed to achieve the regional target in 2029, using state renewable energy generation levels in 2012 as the baseline. However, under the plan, the ramp-up in renewable energy does not begin until

FIGURE 1. The EPA's Renewable Energy Targets under Its Proposed Clean Power Plan Are Modest



The EPA's proposed Clean Power Plan requires states to limit CO_2 emissions from power plants through power plant efficiency improvements, fuel switching, renewable energy, and energy efficiency. But the agency's proposed renewable energy targets significantly underestimate the potential of these resources, and result in barely any additional renewable energy beyond what would have occurred under business as usual (i.e., without the proposed rule). By contrast, if the EPA adopted a modified proposal for setting state targets—the UCS Demonstrated Growth Approach—grounded in states' actual experience in deploying renewable energy, the renewable energy targets within the plan would nearly double at the national level.

SOURCES: EIA 2013; EPA 2014A.

2017, despite significant U.S. renewable energy capacity that has already been installed or is under development. States with renewable energy generation below the regional target make annual progress at the predetermined growth rate. Once a state reaches the regional target, the plan assumes renewable energy generation remains flat through 2030.

The EPA's proposed approach for setting state renewable energy targets does not represent the CAA-required "best" system but more of an "average" system, and the approach results in the following anomalies:

- In seven states, actual renewable energy generation levels in 2013 exceed the EPA's renewable energy targets in 2030.
- Seventeen of the 29 states with RES policies have lower targets under the EPA approach than what is already required under their respective state laws.
- The average annual national renewable energy growth rate under the EPA proposal is 0.65 percent of total sales between 2017 and 2030. By contrast, many states have already been achieving an average annual growth rate of more than 1 percent over the last five years.
- Although the EPA's methodology aims to have states ramp up their renewable energy level toward reaching their respective regional targets, as many as 25 states do not actually reach this goal by 2030 because of the low annual growth rates assumed under the agency's proposed approach.

In its alternative approach to determine the BSER for the renewables building block, the EPA sets state targets based on the lesser of two methods: an assessment of market potential as projected by its own modeling, or a national benchmark rate for renewables deployment informed by data on existing renewable energy generation and resource technical potential (EPA 2014b). However, this alternative approach also underestimates the potential for renewable energy to cut carbon emissions. Nationally, it results in virtually the same renewable energy target as the EPA's proposed approach, though the distribution of renewable energy differs at the state and regional level.

States have the technological and economic potential to raise their renewable energy use to much higher levels than what the EPA is proposing in the Clean Power Plan. By specifying a larger role for renewable energy in setting state targets, the EPA could ensure that the Clean Power Plan achieves greater overall carbon emissions reductions.

Proposing a Stronger Role for Renewable Energy

UCS has developed a modified proposal for determining the BSER for the EPA's renewable energy building block. The Demonstrated Growth Approach for setting state renewable energy targets would improve on the EPA's approach by incorporating the following core components:

- Setting a national renewable energy growth rate benchmark based on demonstrated growth in the states from 2009 to 2013
- Assuming full compliance with current state RES policies, as set by law, that require certain percentages of electricity to come from renewable sources
- Accounting for actual and expected renewable energy growth between 2013 and 2017

Like the EPA, our state-level renewable energy targets begin in 2017—though compliance isn't required until 2020—and ramp up through 2030. To determine each state's 2017 baseline generation levels, we use actual generation data from 2013 (the EPA's approach uses 2012 data) and add projected generation from wind and utility-scale solar projects known to be under construction through 2016.

To calculate state renewable energy targets through 2030, we employ a four-step approach:

1. First, we use EIA data to calculate each state's average renewable energy growth rate over the five-year period from 2009 to 2013. We find that, on average, states increased their renewable share of electricity sales by 1 percent annually (EIA 2014). This growth rate serves as our national benchmark. The 2009–2013 benchmark period accounts for the recent rapid growth in wind and solar technologies; it eases fluctuations in development due to uncertainty around federal tax credit expirations and extensions and captures much of the historic development spurred by state RES policies—a key driver of renewables growth. Eleven of the 15 leading states that have achieved growth rates at or above the national benchmark from 2009 to 2013 have also achieved a 1 percent or higher average annual growth rate over a 10-year period from 2004 to 2013.
2. For states below the 1 percent national benchmark, we assume that they gradually ramp up to that rate from 2017 to 2020. This period therefore serves as an opportunity for states that have not been as active in deploying new renewable energy sources to catch up to the national benchmark. Renewable energy is assumed to grow after 2020 in these states at an annual rate of 1 percent of total sales through 2030.
3. For the 15 leading states among those that have been deploying renewable energy at or above the national benchmark, we increase their respective renewable energy targets from 2017 to 2030 at each state's average annual growth rate during the five-year benchmark period, up to a maximum of 1.5 percent per year. We view this as a reasonable upper limit that can be sustained over time in states with strong renewable energy potential. Moreover, a 1.5 percent growth rate is consistent with renewable energy targets set by leading RES states.
4. Finally, to account for full compliance with mandatory state RES laws, we assume that states achieve the greater of two measures: the generation projected by our growth rate approach; or the level needed to meet states' respective RES targets for each year from 2017 to 2030, as projected by the Department of Energy's Lawrence Berkeley National Laboratory (LBNL 2013). To ensure reasonably achievable renewable energy penetration rates during the compliance period, we also cap the total share of renewable generation for any state at 40 percent of total state electricity sales, a level that several studies by grid operators, utilities, and government agencies have shown can be achieved at the state and regional level in this timeframe while maintaining reliability (GE Energy Consulting 2014; NREL 2012a; NREL 2012b; Synapse Energy Economics 2011; Cleetus, Clemmer, and Friedman 2009). Only seven states hit this cap prior to 2030.

Key constraints included in our proposal, such as the 1.5 percent annual growth rate cap and the 40 percent cap on the overall target, are reflective of current conditions and thus should be flexible over time. As the EPA undertakes regular reviews of the Clean Power Plan, which should occur at least every eight years as allowed by the Clean Air Act, these constraints could be adjusted upward or eliminated to reflect improvements in renewable energy technologies, grid integration techniques, and falling costs.

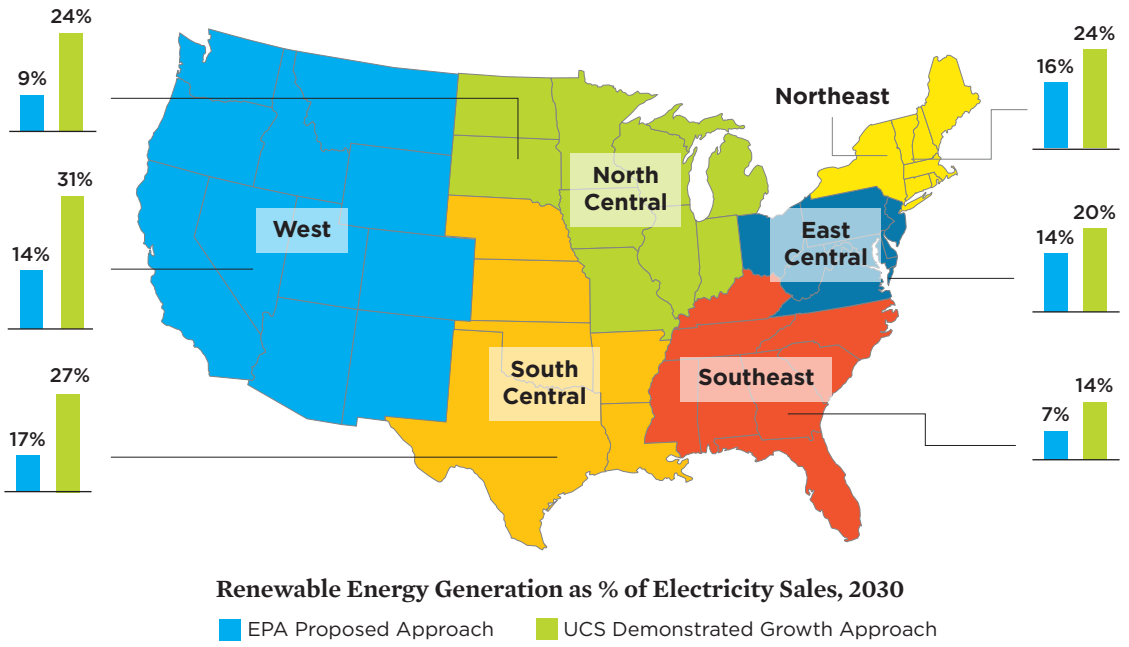
Deploying More Low-cost Renewables through the Clean Power Plan

The UCS proposal leads to stronger renewable energy targets for states than those proposed in the EPA's draft Clean Power Plan. If all states met these targets, the nation's electricity coming from renewable energy in 2020 would double compared with the EPA's proposal—from 7 percent of total U.S. electricity sales to 14 percent. By 2030, it would result in a 23 percent share of renewable energy, as compared with 12 percent under the current EPA proposal. All regions of the country would see higher renewable energy targets under our improved methodology (Figure 2), with higher targets in all but four states (Figure 3, p. 6).

By increasing state renewable energy targets to these levels, UCS analysis shows that total CO_2 reductions achieved by the Clean Power Plan could increase from 30 percent below 2005 levels to nearly 40 percent, assuming that the additional renewable energy generation displaced mostly natural gas. If more coal were displaced, total emissions reductions could increase above these levels. And of course, improvements in other building blocks within the Clean Power Plan, as well as states' decisions to deploy renewable energy beyond their targets, could further increase the total level of emissions reductions.

Some of the largest increases in renewable energy targets occur in the leading renewable energy states of the Upper Midwest and the West. Under the EPA's approach, many of the renewable energy targets in these states reflect little, if any, more renewable energy than what they have already achieved. By contrast, our approach encompasses the reasonable expectation that these states will continue to grow at rates similar to what they are currently demonstrating up to a maximum of 1.5 percent. Further, we assume that full compliance with current state RES policies—a legal requirement, where they exist—should be incorporated into state renewable energy targets. This assumption has the greatest effect among Northeast and Mid-Atlantic states, as well as in California.

FIGURE 2. Regional Comparison of Renewable Energy Targets, 2030



The UCS Demonstrated Growth Approach for setting state targets under the Clean Power Plan's renewable energy building block leads to higher targets for 2030 than does the EPA's proposed approach, and in every region of the country. In the upper Midwest, West, and Southeast regions, the amount of cost-effective renewable energy generation included in the targets at least double.

SOURCE: EPA 2014A.

Higher Renewable Energy Levels in the UCS Proposal Are Affordable

Achieving higher renewable energy targets under the Clean Power Plan—as proposed by the UCS approach—is also affordable. Diversifying the electricity mix with renewable energy would help reduce the economic risks associated with an overreliance on natural gas (Bolinger 2013; Fagan et al. 2013; Mercurio 2013). Reducing the demand for natural gas would also lead to lower and more stable natural gas and electricity prices.

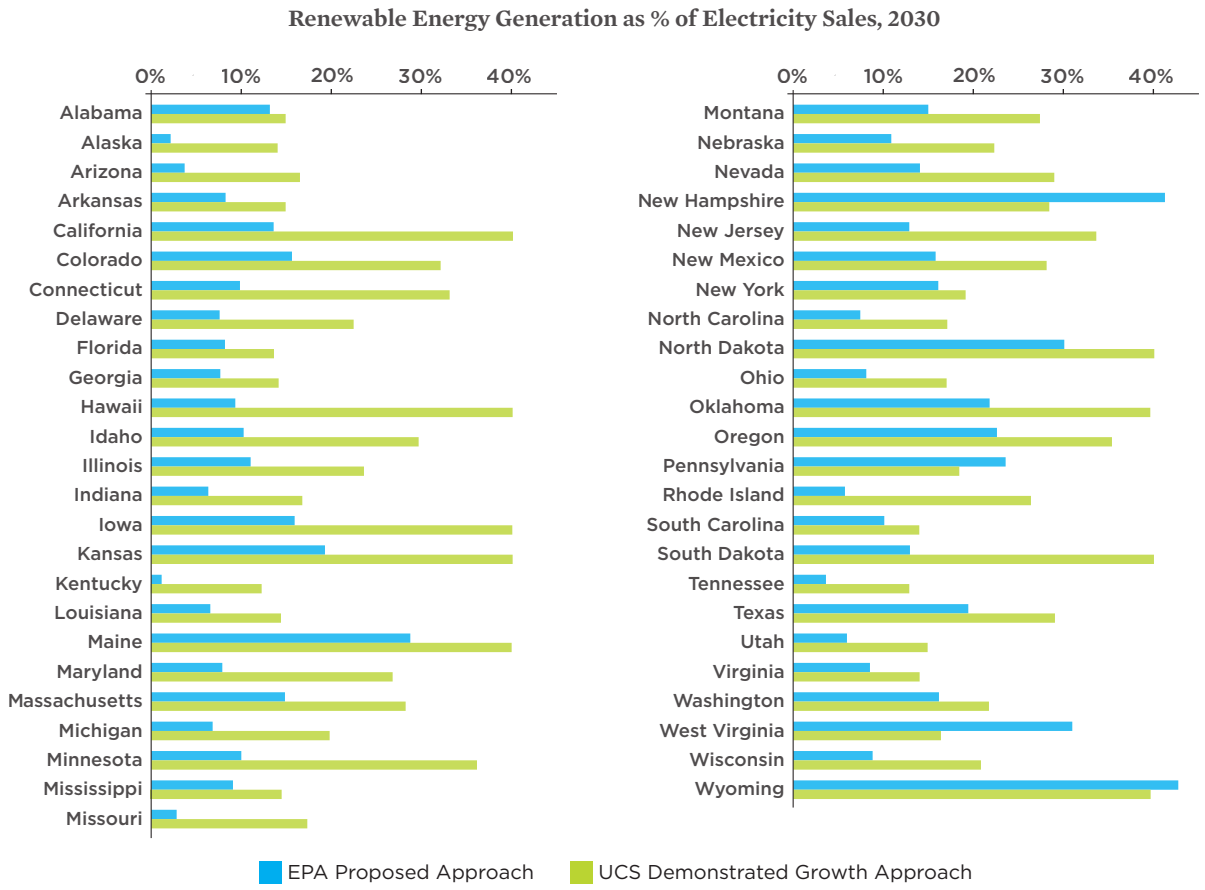
Using the National Renewable Energy Laboratory's Regional Energy Deployment System (ReEDS) model, we analyzed the impacts on electricity and natural gas prices of achieving the state renewable energy targets under the UCS approach compared with business as usual. Our analysis also included updates to technology cost and performance assumptions that reflected data from recent project installations and mid-range projections for future costs (Cleetus et al. 2014).

Under the UCS proposed approach, which leads to 23 percent of electricity sales coming from renewable energy nationally in 2030, national average consumer electricity prices were a maximum of 0.3 percent higher per year than business as usual through 2030, with some regional variation. As a result, a typical household (using 600 kilowatt-hours per month) would see a maximum increase of 18 cents on their monthly electricity bill. Under the UCS proposal, the national average price of natural gas in the electricity sector would be 9 percent lower than business as usual by 2030. Previous studies have shown that reducing natural gas in the electricity sector also can help reduce consumer natural gas prices for heating and manufacturing (Cleetus, Clemmer, and Friedman 2009; EIA 2009; UCS 2009). However, these benefits are not captured in our analysis, which uses an economic model that focuses only on the power sector.

We also found that the incremental cost of increasing renewables under the UCS proposal was within the range that the EPA identifies as meeting BSER cost criteria under the Clean Power Plan (EPA 2014b; EPA 2014c).

Our analysis is a reasonable approximation of the incremental cost impacts of increasing renewables under the Clean Power Plan. We did not analyze the full impacts of implementing the entire draft rule, but focused exclusively on the renewable energy building block. In addition, these results assume unrestricted national trading of renewable

FIGURE 3. Comparison of State Renewable Energy Targets, 2030



This chart compares the EPA's proposed 2030 renewable energy targets for each state with those of the modified approach recommended by UCS. As the chart illustrates, the EPA has underestimated the level of renewable energy that can cost-effectively contribute to state emissions reduction targets. Nationally, the UCS approach nearly doubles the proportion of renewable energy included in the state targets.

SOURCE: EPA 2014A.

energy credits (RECs). RECs represent the energy and environmental attributes of renewable electricity and serve as the basis for documenting ownership rights and trading transactions across the United States in both RES and voluntary markets. RECs and existing REC tracking systems would also be effective in accounting for the contribution of renewable energy within the Clean Power Plan framework (Quarrier and Farnsworth 2014). If there are any policy constraints placed on trading between regions, experience with renewable energy markets suggests that REC prices would likely be higher in some regions and lower in other regions of the country (Heeter et al. 2014). Furthermore, increasing renewable energy, in combination with other technologies and measures to cut carbon emissions—such as greater investments in energy efficiency—would lead to different impacts on energy prices and consumer bills.

The UCS proposal also aims to capture the tremendous growth in renewable energy, driven largely by advances in technology and decreases in costs. Wind capacity increased by 75 percent and solar capacity by 473 percent from 2009 to 2013 (AWEA 2014; SEIA 2014). The national average cost of wind power has dropped more than 60 percent since 2009, making it competitive with new fossil fuel plants in many regions (Wiser and Bolinger 2014). Solar photovoltaic system costs fell by about 40 percent from 2008 to 2012, and by another 15 percent in 2013 (Kann et al. 2014; Barbose et al. 2013). Looking ahead, the two trends of improved technologies and reduced costs are expected to continue (BNEF 2014; IRENA 2014; NREL 2012a).

This growth in renewable energy has helped most utilities comply with their state RES requirements at little or no cost to consumers, and in some cases even providing them with net savings (UCS 2013). A recent federal government

study, relying primarily on data from utilities and state regulators, found that between 2010 and 2012 the cost of complying with RESs in 25 states ranged from a net savings of 0.2 percent of retail rates to a net cost of 3.8 percent, with a weighted average cost of 0.9 percent (Heeter et al. 2014).

Recommendations

Achieving higher levels of renewable energy deployment, and greater emissions reductions, will require strong actions over the next decade. Smart policies, such as a strengthened Clean Power Plan, could accelerate the advances in renewable energy use already under way. State renewable electricity standards and carbon caps have already been shown to work, and they could also be effective and affordable ways for states to meet their requirements under the EPA's Clean Power Plan; carbon-pricing policies have also proven successful at the multi-state or regional level in delivering more cost-effective outcomes.

To accelerate the transition to a low-carbon power sector, the UCS recommends that:

- **The EPA should expand the role of renewable energy in establishing state emissions rate reduction targets**. Specifically, the EPA should revise its methodology regarding the renewable energy building block's contribution to state targets, and the agency should set renewables growth rates that better reflect deployment rates already being achieved by many states. The EPA also should use actual generation data from 2013 and include recent and planned renewable energy development between 2013 and 2017. Finally, it should incorporate full compliance with current state RES laws.
- **The EPA should commit to reviewing and strengthening state emissions reduction targets, as well as state renewable energy targets**, by 2025 to ensure that the Clean Power Plan is updated to reflect the latest cost-effective opportunities for cutting CO_2 emissions.
- **States and the EPA should implement measures to prevent double counting of renewable energy generation** in complying with the Clean Power Plan. This can be accomplished by (a) using—and, where necessary, expanding on—existing regional renewable energy credit tracking systems; and (b) ensuring that compliance credit goes to the states where the purchasers of renewable energy generation or credits reside, regardless of where the renewable generation is physically located.
- **States should prepare to develop and implement strong compliance plans** that include policies to increase their reliance on renewable energy resources to meet as much of their emissions reduction targets as possible. Toward that end, states should work with other states to find the lowest-cost carbon reduction options, if advantageous. States should also work with regional grid operators to identify and implement policies and measures to ensure that higher levels of renewable energy can reliably and affordably be added to the grid (UCS 2014).

Sharp reductions in power plant CO_2 emissions are critical to help slow the pace of climate change. The UCS proposal for modifying the renewable energy building block under the EPA's Clean Power Plan provides a powerful framework for expanding the use of such energy and putting us on a path toward a clean, affordable, and low-carbon electricity system.

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