A Better Climate Bill

Union of Concerned Scientists

ANALYSIS

RAISING EFFICIENCY AND RENEWABLE ELECTRICITY STANDARDS INCREASES CONSUMER BENEFITS

A 2009 U.S. government study shows that the American Clean Energy and Security Act (ACES), which includes a national cap on carbon emissions and complementary energy policies, such as standards for renewable energy and energy efficiency, is an effective and affordable way to reduce global warming emissions. Analysis by the Union of Concerned Scientists finds that compared with ACES, a more robust set of complementary policies would:

- Reduce consumer electricity and natural gas expenditures by $113 billion through 2030
- Lower average U.S. household annual energy costs by nearly $100 in 2030
- Diversify the electric power mix and avoid the need for nearly 50 new nuclear power reactors
- Hasten the shift to a clean energy economy by increasing emission reductions within the capped sectors.

Energy-efficient technologies and renewable electricity resources such as wind, solar, geothermal, and bioenergy offer a swift, practical, and affordable path away from our continued dependence on the fossil fuels that drive global warming. As Congress considers legislation to significantly reduce heat-trapping emissions in every sector of the economy, it is important to recognize the role that strong complementary policies supporting renewable energy and energy efficiency can play in achieving the necessary reductions. A national economy-wide carbon cap that puts a price on carbon is vital to reducing emissions. But well-designed complementary policies can help overcome key market barriers to clean and efficient energy resources, and facilitate their deployment at a lower cost than a carbon price alone could do.

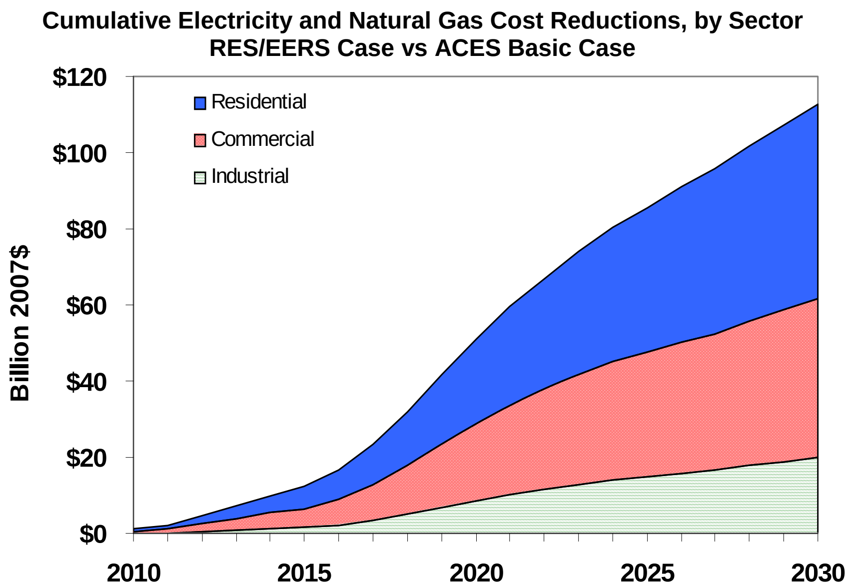
New analysis by the Union of Concerned Scientists (UCS) builds on an August 2009 U.S. Energy Information Administration (EIA) study[1] of the American Clean Energy and Security Act (ACES), a comprehensive climate and energy bill passed in June 2009 by the U.S. House of Representatives. In addition to a national cap on carbon emissions, ACES includes a combined energy efficiency and renewable electricity standard (RES) requiring large electric utilities to increase their use of efficiency and renewable energy to a nominal target of 20 percent by 2025. While the EIA study showed that ACES is both achievable and affordable, it also found that the RES embedded in the bill does not contribute to any substantial growth of renewable energy because of loopholes that erode the required electricity generation to levels below the EIA's "Business as Usual" projections.

Photo: Community Energy, Inc.

We set out to examine the long-term economic and environmental costs and benefits of increasing the renewable electricity and energy efficiency standards in the carbon cap and other provisions included in ACES. To do so, we used the version of the National Energy Modeling System that the EIA employed for its analysis, and the same cost and performance assumptions as its "Basic Case" policy scenario.[2] Our analysis differs from the EIA's Basic Case in that we evaluated (1) a higher national renewable electricity standard of 25 percent by 2025 that closes the loopholes in ACES[3] and (2) a separate energy efficiency resource standard (EERS) that requires utilities to achieve a 10 percent electricity savings from efficiency measures by 2020. Below, we compare the results from our "RES/EERS Case" with the EIA's "ACES Basic Case" and, where appropriate, its "Business as Usual Reference Case" (which does not include the policies in ACES).

Lower Energy Costs for Consumers

Numerous studies have shown that increasing use of renewable energy and energy efficiency encourages competition within the fossil-fuel-dependent U.S. electric power sector, diversifies the energy resource mix, and leads to more stable and often lower electricity and natural gas prices.[4] Our analysis found the RES and EERS deliver such benefits when deployed with a national cap on carbon emissions.



Raising the RES and EERS targets in ACES to 25 percent and 10 percent, respectively, reduces average annual consumer electricity prices 2.2 percent in 2020 and 1.5 percent in 2030 compared with the ACES Basic Case (Table 1). Similarly, annual consumer natural gas prices in the RES/EERS Case are 3.4 percent lower than the Basic Case in 2020 and 1.4 percent lower in 2030.

Lower prices, combined with reductions in energy use resulting from energy efficiency measures, translate into real benefits for homes and businesses. Under the RES/EERS Case, consumer electric and gas expenditures would collectively be $23 billion lower in 2020 compared with the ACES Basic Case, and the annual cost reductions would grow to $29 billion in 2030.[5] The cumulative net present value (at a 7 percent discount rate) of the cost savings through 2030 would be $113 billion ($51 billion for households, $42 billion for commercial businesses, and $20 billion for industrial customers). The average U.S. household would see its annual energy expenditures (excluding transportation) lowered by $77 in 2020 and $94 in 2030.[6]

Compared with the Business as Usual Reference Case, average consumer electricity and natural gas prices under the RES/EERS Case remain largely the same through 2024, but increase from 2025 to 2030 due to the increasing cost of carbon allowances and the phase-out of free allowances to distributors, which are instead passed on to consumers in the form of direct rebates. However, the gains in efficiency and decline in energy use resulting from the EERS offset these higher prices and even lead to a small cumulative savings of $24 billion in consumer electricity and natural gas bills through 2030.

On an annual basis, the average U.S. household would see its non-transportation energy expenditures rise in later years compared with the Business as Usual Reference Case. For example, annual household energy expenditures (including dollars spent on heating, cooling, and electricity bills as well as investments in equipment and efficiency technologies) would be cut by $13 in 2020, but would rise by $170 in 2030 as energy prices increase. These higher energy costs, however, would be more than offset by the direct consumer rebates (in the form of a tax rebate) that take effect under ACES as the free allowances to distributors expire. The EIA's model does not factor these consumer rebates into its energy expenditure total.[7] UCS found that the average U.S. household would receive a tax rebate of $764 in 2030 (based on the allowance price results from our RES/EERS Case), leaving households with an annual net benefit of nearly $600 after accounting for their increased energy expenditures.

Lower Carbon Allowance Prices

A more aggressive renewable energy and energy efficiency policy puts downward pressure not only on conventional energy use and prices but also on the price of carbon allowances under an emissions cap. The ACES Basic Case found that allowance prices would reach $31.60 per ton in 2020 and $64.50 per ton in 2030. Under the UCS RES/EERS Case, allowances prices are $30.20 per ton in 2020, and gradually increase to $61.70 per ton in 2030, a reduction of 4.4 percent.

Table 1. Summary of Key Energy Price and Consumer Bill Results, Case Comparisons[1]	**2007**	**2020**			**2030**		
		AEO 2009	**EIA ACES Basic**	**UCS RES/EERS**	**AEO 2009**	**EIA ACES Basic**	**UCS RES/EERS**
Delivered energy prices[2]							
Natural gas (dollars per thousand cubic feet)							
Residential	13.1	12.9	13.3	12.9	14.4	16.7	16.5
Electric power	7.2	7.2	8.5	8.0	8.6	10.4	10.2
Coal, electric power sector (dollars per million Btu)	1.8	2.0	4.8	4.7	2.0	7.8	7.5
Electricity (cents per kWh)	9.1	9.3	9.5	9.3	10.0	12.0	11.8
Electricity and Natural Gas Bills (billion dollars)							
Residential	210	226	228	218	265	290	277
Commercial	162	190	194	185	233	264	253
Industrial	107	107	105	101	116	128	123
Total	480	522	527	503	614	683	653
Cumulative Electricity and Natural Gas Bills (billion dollars)							
Residential	n/a	1,808	1,826	1,804	2,469	2,501	2,450
Commercial	n/a	1,438	1,463	1,443	2,005	2,054	2,012
Industrial	n/a	847	855	846	1,149	1,157	1,137
Total	n/a	4,092	4,144	4,093	5,623	5,712	5,599
Non-Transportation Household Energy Expenditures (dollars)							
Annualized Incremental Capital Expenditures	n/a	488	531	543	477	552	569
Household energy expenditures	n/a	1,995	2,017	1,927	2,102	2,291	2,180
Total	n/a	2,483	2,547	2,470	2,579	2,843	2,749

[1]All results are in 2007 dollars unless otherwise noted. Cumulative results are net present value using a 7 percent discount rate.
[2]Includes allowance costs after adjustment for free allocations.

Allowance pricing helps overcome a single market barrier to renewable energy and energy efficiency: the failure of conventional energy pricing to account for the costs resulting from global warming emissions. The additional complementary policies are meant to overcome other market barriers to energy efficiency and clean energy technologies so they can play a larger role in reducing emissions than would be possible with carbon allowances alone. For example, even though energy-efficient technologies provide long-term financial savings to consumers, risk-averse or financially constrained consumers may be reluctant to purchase them because of their higher up-front costs. Similarly, renewable energy faces structural barriers in the electricity sector (e.g., access to the grid, price distortions from unequal subsidies) but provides valuable fuel price stability once deployed.[8] The larger role played by efficiency and renewable energy under a comprehensive policy approach can thus help lower carbon prices.

A Robust and Growing Economy

As with many other studies of climate policies, the EIA's analysis of ACES found that a national climate and energy policy would have a minimal effect on the overall U.S. economy. The ACES Basic Case projects continued economic growth, though at a slightly slower pace than the Business as Usual Reference Case. Under the latter, U.S. gross domestic product (GDP) grows from $11 trillion in 2005 to $19.9 trillion in 2030—an average annual growth rate of 2.40 percent. Under the Basic Case, GDP increases at a rate of 2.37 percent, reaching more than $19.7 trillion in 2030. The Basic Case also shows that ACES will have a small effect on total household consumption: an average yearly loss of just $83 (0.1 percent) between 2012 and 2030 compared with the Business as Usual Reference Case.


Photo: University of Colorado.

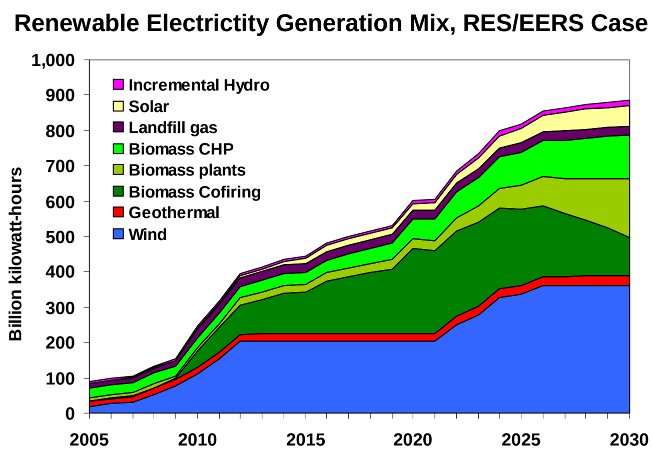
Strengthening the EERS and RES in ACES—as in the RES/EERS Case—would have no discernable effect on GDP and per-household consumption compared with the Basic Case: GDP grows at an average annual rate of

2.37 percent, reaching nearly $19.7 trillion in 2030. Cumulatively through 2030, the RES/EERS Case reduces GDP by less than 0.1 percent compared with the ACES Basic Case, and by just 0.3 percent compared with the Business as Usual Reference Case. On a per-household basis, average yearly consumption from 2012 to 2030 drops by $136 (0.1 percent) compared with the Business as Usual Reference Case. The decline may actually be overstated because the EIA's model does not consider individual households' capital expenditures for efficiency technologies as part of consumption.[9]

The EIA further underestimates the benefits of stronger renewable energy and efficiency policies because it does not fully consider the positive effects on GDP resulting from investments that lower consumers' and businesses' energy costs and allows them to spend it in other ways. The EIA's Business as Usual Reference Case also does not include the likely severe reduction in GDP that would result from unchecked global warming.[10]

A Safer, More Diverse Electric Power Mix

Due to the United States' heavy reliance on coal, natural gas, and nuclear for our power needs, consumers and the economy are left vulnerable to potential supply shortages, interruptions, and price volatility. Stronger complementary policies that support renewable energy and energy efficiency help diversify and strengthen the electric power mix. Under the RES/EERS Case, non-hydro renewable electricity generation expands to 22.4 percent of total U.S. electricity sales by 2030–a 23 percent jump over the ACES Basic Case. Wind power makes the largest contribution to the increase, with small-scale solar photovoltaics, biomass co-firing, and incremental hydropower also playing important roles. Energy efficiency measures reduce total electricity sales 6 percent by 2030 compared with the Basic Case and 12 percent compared with the Business as Usual Reference Case.



Furthermore, the increase in energy efficiency and renewable energy under the RES/EERS Case significantly reduces the projected growth of new nuclear power reactors envisioned by the EIA: nearly 50 typical (1,100 MW) reactors would be avoided through 2030 under the RES/EERS Case compared with the ACES Basic Case. This would reduce ratepayers', taxpayers', and utilities' exposure to the high risk of cost escalation and overruns associated with nuclear plants.[11] The 2009 EIA assumptions we used in this study, for example, project that a typical new 1,100 MW reactor would cost $3.9 billion (including "overnight" capital costs, but not project financing, which could add 20 percent to 40 percent to total costs).[12] EIA's 2010 analysis will assume a cost of $4.6 billion.[13] Recent actual project announcements as well as Wall Street and other independent analysts, however, estimate that the costs for such a nuclear reactor could be between $5.5 billion and $11 billion.[14] Nuclear power generation would still increase 47 percent over today's levels by 2030, if nuclear plants can be built at the EIA's projected costs.

Natural gas power generation also declines as efficiency improves and renewable energy expands. Under the RES/EERS Case, electricity generation from natural gas in 2020 will be 18 percent lower than the Business as Usual Reference Case and 15 percent lower than the ACES Basic Case. By 2030, the cuts are 32 percent and 4 percent, respectively. The gap in natural gas generation between the RES/EERS Case and the ACES Basic Case narrows in the forecast's final years as additional generation is needed to offset losses from the avoided nuclear power reactors. To a lesser extent, coal power generation is also lower under the RES/EERS Case than the Basic Case during most years through 2030, as more than seven gigawatts of new coal power capacity would be avoided. Compared with the Business as Usual Reference Case, coal generation declines 40 percent under the RES/EERS Case by 2030.

Greater Reductions in Power Sector Carbon Emissions

The EIA's analysis demonstrates that ACES can effectively reduce global warming emissions through a combination of direct cuts in the capped sectors and the use of offsets to reduce emissions from sources not included under the cap. The Basic Case achieves the 21 percent (or 24.6 billion metric tons of CO_2 equivalent) cut in cumulative emissions required by the legislation

Photo: National Renewable Energy Laboratory.

through 2030. The RES/EERS Case also achieves the required reductions, but increases the proportion of cuts in the capped sectors—especially from electricity generators. Cumulative power plant CO_2 emissions are 805 million metric tons (or 2 percent) lower under the RES/EERS Case than the ACES Basic Case through 2030. As a result, fewer offsets are needed to meet the cap, which will help move the electric power sector more rapidly onto a low-carbon pathway and prevent a long-term commitment to its currently aging, dirty infrastructure.

A Sensible Climate Solution Approach

A strong national carbon cap that significantly reduces heat-trapping emissions in every sector of the economy is essential if we are to avoid the most dangerous effects of global warming. Renewable energy and energy efficiency are also smart climate solutions, with proven track records of delivering emissions reductions in a cost-effective manner. But fully unlocking the potential of these solutions will require strong complementary policies including a renewable electricity standard and an energy efficiency resource standard, in combination with an economy-wide carbon cap. This integrated approach to reducing carbon emissions would provide the framework for a national transition to a clean, safer energy economy and, according to our analysis, would also increase the benefits for consumers, the economy, and the environment.

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[1] Energy Information Administration (EIA). 2009. Energy market and economic impacts of H.R. 2454, the American Clean Energy and Security Act of 2009. Washington, DC: U.S. Department of Energy (DOE). August. Online at *http://www.eia.doe.gov/oiaf/servicerpt/hr2454/index.html*.
[2] Though we use them in this analysis for direct comparison purposes, UCS does not endorse the EIA's cost and performance assumptions. Our research shows these assumptions tend to be overly pessimistic for various energy technologies and do not account for more recent cost escalations. For more information, see: Cleetus, R., S. Clemmer, and D. Friedman. 2009. *Climate 2030: A national blueprint for a clean energy economy*. Cambridge, MA: Union of Concerned Scientists (UCS). May. Online at *http://www.ucsusa.org/global_warming/solutions/big_picture_solutions/climate-2030-blueprint.html*.
[3] In addition to exempting all electric utilities with annual retail power sales of less than 4 million megawatt-hours, the RES in the ACES Act excludes electricity generated by large-scale hydro and new nuclear facilities, as well as new coal facilities with carbon capture. The RES evaluated in our analysis includes a higher nominal target, required compliance for all electric utilities, and no baseline exclusions. As a result, the required generation under our RES is equal to 25 percent of total U.S. sales in 2030 compared with about 10 percent under the ACES RES.
[4] See, for example: UCS. 2009. *Clean power, green jobs*. Cambridge, MA. March. Online at *http://www.ucsusa.org/assets/documents/clean_energy/Clean-Power-Green-Jobs-25-RES.pdf*. And: EIA. 2009. *Impacts of a 25-percent renewable electricity standard as proposed in the American Clean Energy and Security Act discussion draft*. SR/OIAF/2009-04. April. Online at *http://www.eia.doe.gov/oiaf/servicerpt/acesa/index.html*. And: Nogee, A., J. Deyette, and S. Clemmer. 2007. The projected impacts of a national renewables portfolio standard. *Electricity Journal* 20(4). May. And: Wiser, R., M. Bolinger, and M. St. Clair. 2005. *Easing the natural gas crisis*. LBNL-56756. Lawrence Berkeley National Laboratory. January. Online at *http://eetd.lbl.gov/ea/EMS/reports/56756.pdf*.
[5] All results are in 2007 dollars unless otherwise noted.
[6] Our model results also showed modest savings in transportation costs as a result of lower allowance prices, but because of modeling issues we consider these savings less certain and do not account for them in our reporting.
[7] The EIA accounts for consumer tax rebates in the change in household income under its macro model, but does not list them in its report.
[8] For further discussion of the market barriers to renewable energy and efficiency, see: Energy Future Coalition. 2009. *Three pillars: A comprehensive approach to setting clean energy standards for the electric sector*. April. And: Cleetus, R., S. Clemmer, and D. Friedman. 2009. *Climate 2030: A national blueprint for a clean energy economy*. Cambridge, MA: Union of Concerned Scientists. May.
[9] Personal communication with Kay Smith, Energy Information Administration, November 24, 2009.
[10] Cleetus, R., S. Clemmer, and D. Friedman. 2009. *Climate 2030: A national blueprint for a clean energy economy*. Cambridge, MA: UCS. May.
[11] Ibid.
[12] EIA. 2009. *Assumptions to the Annual Energy Outlook 2009*. Washington, DC: U.S. DOE. March. Online at *http://www.eia.doe.gov/oiaf/aeo/assumption/pdf/0554(2009).pdf*.
[13] EIA. 2010. *Electric Generating Technology Cost Assumptions*. Washington, DC: U.S. DOE. January. Online at *http://www.eia.doe.gov/oiaf/aeo/excel/aeo2010%20tab8%202.xls*.
[14] Cooper, M. 2009. *The economics of nuclear reactors: Renaissance or relapse?* South Royalton, VT: Institute for Energy and the Environment, Vermont Law School. Online at *www.vermontlaw.edu/Documents/Cooper%20Report%20on%20Nuclear%20Economics%20FINAL%5b1%5d.pdf*.

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