COMPARISON OF LEGISLATIVE CLIMATE CHANGE TARGETS IN THE 110TH CONGRESS

DECEMBER 7, 2007

The World Resources Institute's analysis of emissions targets and cumulative emissions budgets attempts to fairly and accurately compare explicit carbon caps in Congressional climate proposals. Emissions from regulated sectors are calculated based on the text of the respective draft legislation. For sectors that are not covered by the legislation, emissions are estimated to continue to grow. This analysis uses a single set of data and methods carefully selected to provide a consistent comparison across all current climate proposals in the 110th Congress. As a result, information contained in this analysis may differ from other WRI analyses due to the use of different underlying data and methodology. This analysis is not a projection of actual emissions under the various proposals nor is it an analysis of economic impacts resulting from the enactment of these policies.

"Comparison of Legislative Climate Change Targets in the 110th Congress" (Figure 1) compares targets for legislative proposals of mandatory cap and trade programs for greenhouse gas emissions. This chart is a revision of a similar analysis originally released during the 109th Congress and updated through September of this year. Two significant changes have been made since the last iteration, released in September. Most importantly, the analysis of the proposal by Senators Warner and Lieberman has been updated to reflect the legislative language as passed by the Senate Committee on Environment and Public Works Subcommittee on Private Sector and Consumer Solutions to Global Warming and Wildlife Protection. Furthermore, emissions growth rates from uncovered sectors have been recalculated using data from the Energy Information Administration (EIA).

Figure 1

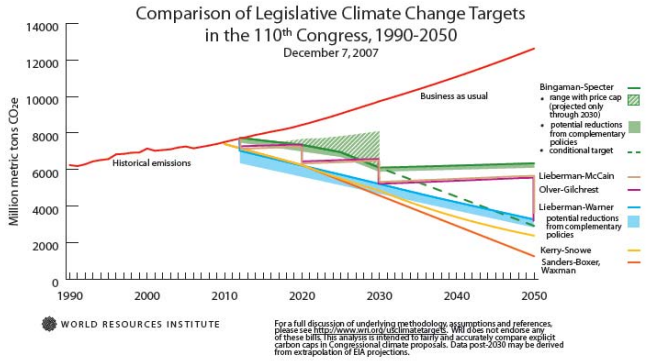
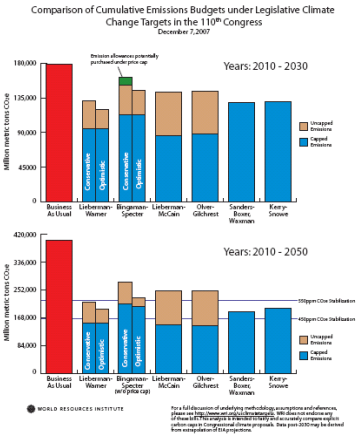


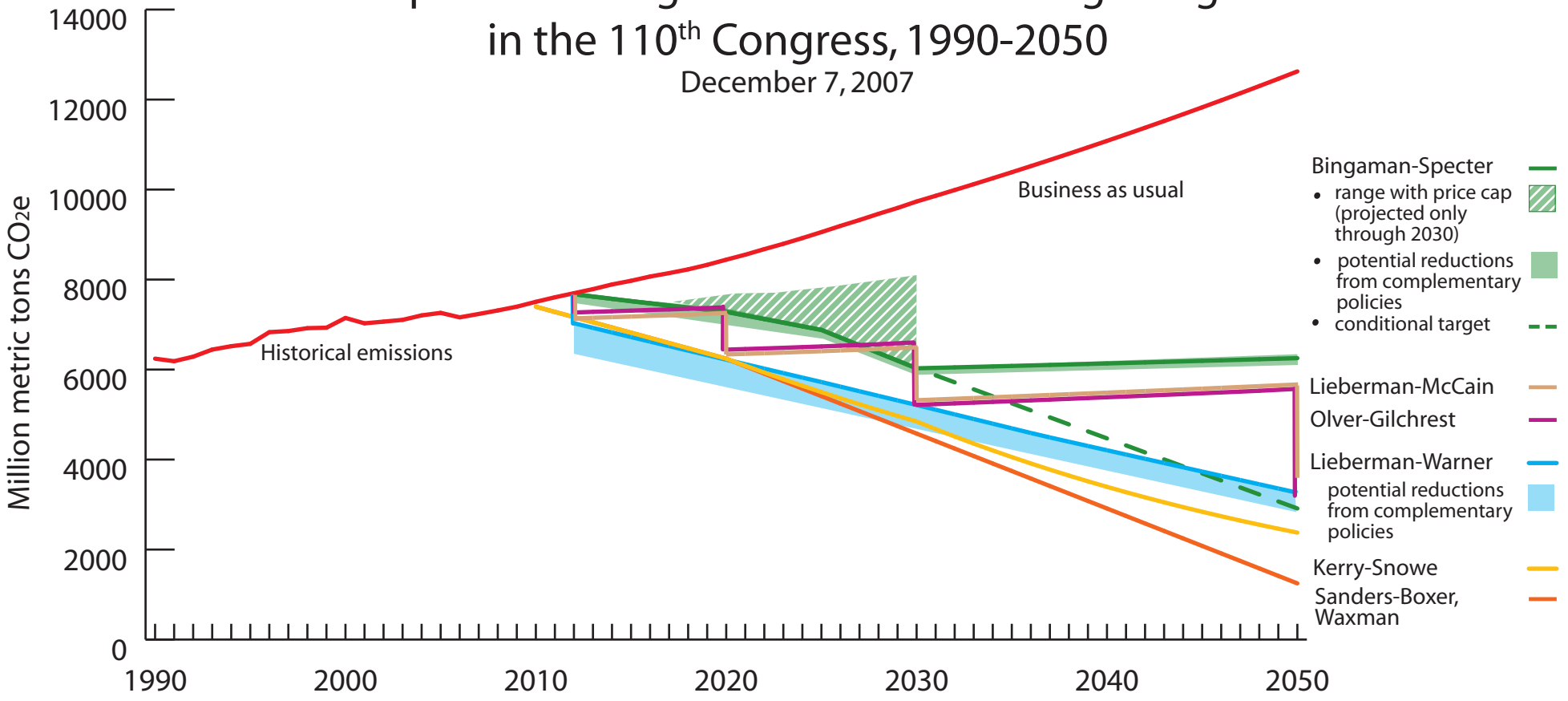
Figure 2



"Comparison of Cumulative Emissions Budgets under Legislative Climate Change Targets in the 110th Congress" (Figure 2) offers a different perspective on the same data. This chart depicts the cumulative greenhouse gas emissions budgets for the proposals over two different time periods. While the speed with which emissions reductions are implemented is an important determinant of the efficacy of climate change legislation, cumulative emissions reductions are an essential indicator of the environmental stringency of a policy proposal. Time periods of 2010-2030 and 2010-2050 were chosen to evaluate how ambitious the proposals are in both the short and long term. In addition, for the Lieberman-Warner and Bingaman-Specter proposals, optimistic and conservative scenario are presented to account for changes in U.S. emissions that may result from cost containment mechanisms, conditional targets and complementary policies included in these bills.

Comparison of Legislative Climate Change Targets in the 110th Congress, 1990-2050

December 7, 2007



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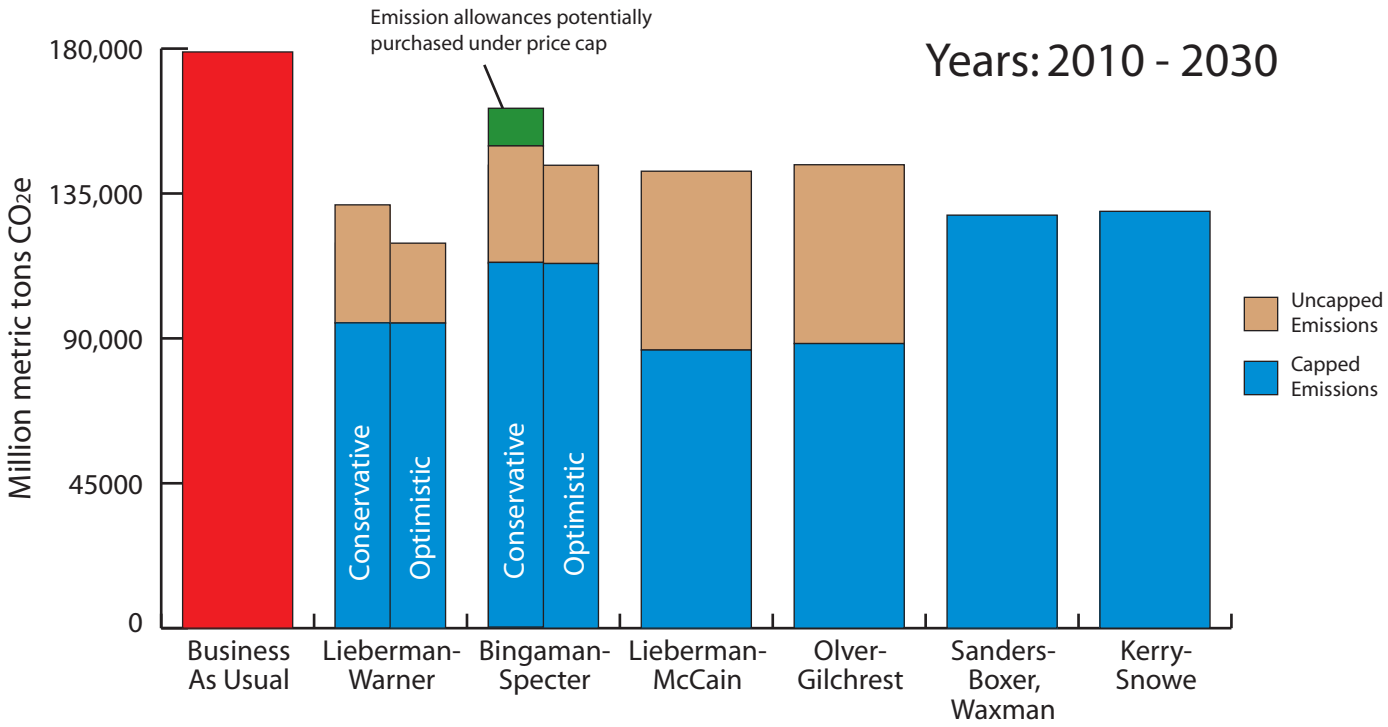
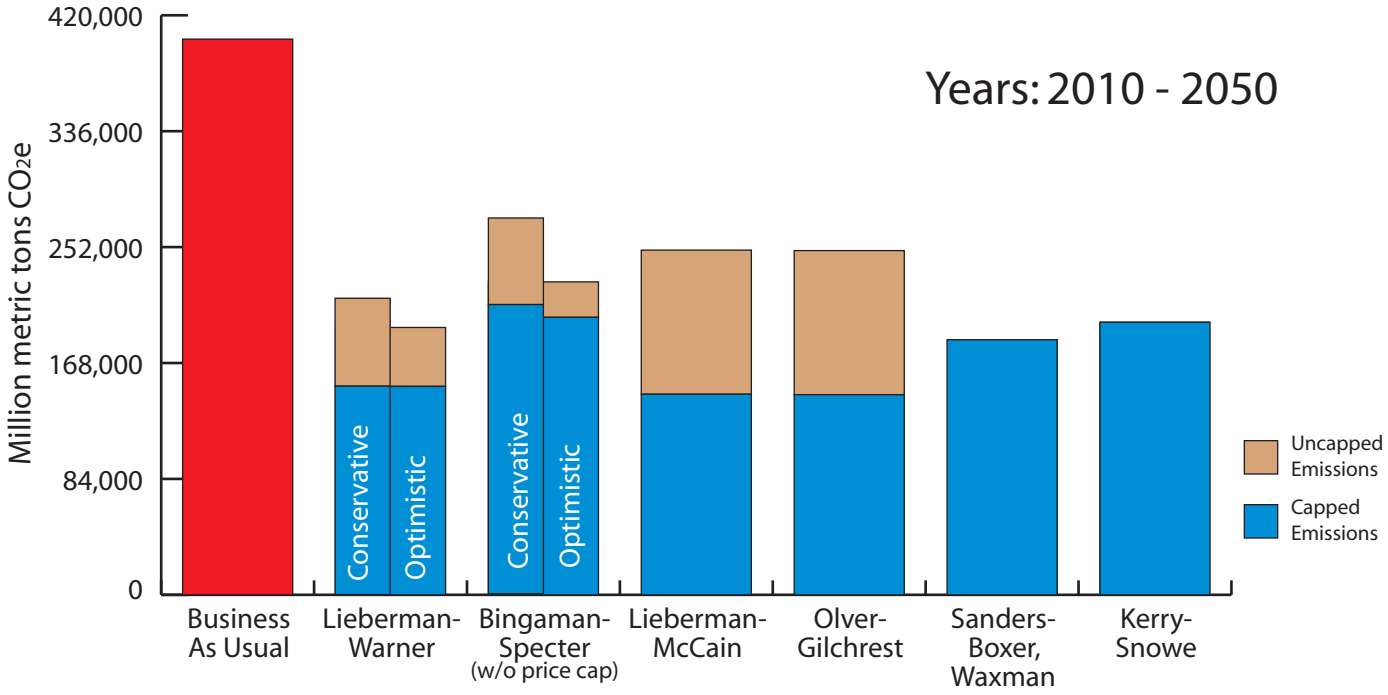
For a full discussion of underlying methodology, assumptions and references, please see http://www.wri.org/usclimatetargets. WRI does not endorse any of these bills. This analysis is intended to fairly and accurately compare explicit carbon caps in Congressional climate proposals and uses underlying data that may differ from other analyses. Data post-2030 may be derived from extrapolation of EIA projections.

Comparison of Cumulative Emissions Budgets under Legislative Climate Change Targets in the 110th Congress

December 7, 2007





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General assumptions

Many assumptions were made to complete this analysis. Assumptions have been made to simplify the analysis and should not be taken as statements of fact. In many situations, these assumptions highlight contentious issues which must be resolved to ensure the environmental integrity of a market-based approach to addressing the threat of climate change.

For this analysis, WRI assumes that:

- All proposals are enacted in 2007. Where annual data are unavailable, years between targets or projections are interpolated using a simple linear formula.
- Caps will impact only capped sectors.
    - Bills with caps or reduction targets that explicitly apply to 100 percent of U.S. emissions are taken at face value.
    - Bills that define which sectors or entities will be capped are assumed to impact only covered sectors. Emissions from the rest of the economy are assumed to increase at annual growth rates derived from the EIA's modeling of the McCain-Lieberman and Bingaman-Specter proposals.
- Some complementary policies may achieve emission reductions in non-covered sectors beyond what is explicitly mandated in the cap.
    - Allocations to support biological sequestration are assumed to achieve up to one ton of net emission reductions per allowance allocated.
    - Allowances allocated to states as a reward for more stringent policies may be retired. Since emission reductions resulting from state policies would be offset by increases in emissions in other states, such allowance retirements are the only way for states to reduce cumulative U.S. emissions below Federal caps.
    - Complementary policies aimed at reducing the emissions from capped sectors and entities, such as increased fuel economy standards or renewable electricity standards, may affect the price of emissions allowances but would not lower economy-wide GHG emissions below the mandated cap.
- Offsets will be real, permanent and additional.
    - This representation assumes offsets represent a real reduction in total global GHG emissions. As a result, emissions under each bill are portrayed as total emissions minus offsets.
- Borrowing and banking will not allow increases in cumulative GHG emissions.
    - Annual emissions may stray above or below the cap, but cumulative GHG emissions over the life of the program would be the same with or without borrowing or banking.
    - Although borrowing and banking may allow actual emissions in a given year to differ from a bill's stated cap, this analysis assumes no changes to the cap.
- Price caps, while providing price certainty, potentially compromise a bill's environmental integrity and create uncertain emissions reductions.
    - This analysis shows the effects of the price cap under the proposal by Senators Bingaman and Specter.
    - The upper bound of the range is informed by potential emissions reduction cost curves for the price cap as derived from the EIA's National Energy Modeling System (NEMS) model outputs.
    - The lower bound of the range is determined by the caps identified in the text of the bill.
    - If, independent of other complementary policies and assumptions, the upper-bound were to dip below the lower bound, it is assumed that the price cap would not take effect and the lower bound would continue to effectively represent the emissions cap. It is likely that such a situation would lead to overcompliance and banking of emissions allowances to be used in later years. However, as stated above, this analysis assumes no banking.

Bill methodology

- Kerry-Snowe
  - The bill language stipulates a declining cap, to cover 100 percent of U.S. emissions starting in 2010. The chart reflects the text of the language - annual reductions from 2010 through 2020 that bring economy-wide emissions down to 1990 levels by 2020, then annual 2.5 percent reductions from 2021 through 2029 and 3.5 percent annual reductions from 2030 through 2050.
- Sanders-Boxer and Waxman
  - Emissions are reduced linearly to reach 1990 levels by 2020. From there, emissions are reduced linearly to reach 80% below 1990 levels by 2050. Although the text of Representative Waxman's proposal is somewhat different from the Sanders-Boxer proposal, staff confirms that the cap is intended to follow an identical trajectory. According to our analysis this straight line trajectory is equal to an average annual reduction of approximately 5.2 percent.
- McCain-Lieberman and Olver-Gilchrest
  - The texts of both bills stipulate annual caps for covered sectors to be adjusted by:
    - Subtracting 2000 levels of emissions from exempted sources (unquantifiable emissions within covered sectors – 8.3 percent of economy emissions);
    - Subtracting the 2012, 2020, 2030 and 2050 estimated emissions from non-covered entities (entities from covered sectors that emit less than 10,000 mmt CO_2e – 5.2 percent of economy emissions) for each cap period following a cap-tightening.
  - This adjusted cap is applied to emissions from non-exempt, covered entities within covered sectors (73.9 percent of 2004 total U.S. emissions).
  - The remaining 26.1 percent of emissions are increased in line with EIA estimates of uncovered emissions growth under the McCain-Lieberman proposal. These annual growth rates, while varying from year to year, average 0.72 percent through 2030.
  - A thorough discussion of emissions coverage under the McCain-Lieberman proposal can be found in a memo from the EPA to the EIA dated 3/6/07 titled "Emissions that Fall under the Cap under S.280."
- Bingaman-Specter
  - Cap on covered sectors is derived from legislative language. The bill is calculated to cap 86.4 percent of 2004 total U.S. emissions, based on model output data from a June 2007 run of NEMS conducted for the National Commission on Energy Policy.
  - The remaining 13.6 percent of economy emissions are increased in line with EIA's estimates of uncovered emissions growth under an earlier draft of this legislation. These annual growth rates, while varying from year to year, average 0.86 percent through 2030.
  - The text of the bill requires that, by 2030, if the five largest trading partners have enacted comparable policies, the President, based on findings from an interagency review, will recommend to Congress more stringent targets to reduce total (100 percent) U.S. emissions at least 60 percent below 2006 levels. This cap is shown on the chart as the conditional target.
  - Without significant additional complementary policies, it is highly likely that the bill's price cap will be triggered, thus breaching the environmental integrity of the cap. As a result, a shaded region is used to represent the emissions reductions possible at the price cap value for carbon. This analysis is based on potential mitigation curves derived from the Energy Information Agency's January 2007 analysis, "Energy Market and Economic Impacts of a Proposal to Reduce Greenhouse Gas Intensity with a Cap and Trade System." Due to the timeframe of this underlying data, the impacts of this price cap are only projected through 2030.
  - The cumulative emission budget comparison's conservative scenario assumes that the price cap is triggered to some degree (for periods in which , the conditional target is not

pursued and allocations for biological sequestration do not achieve any net emission reductions.
    - The cumulative emission budget comparison's optimistic scenario assumes that the price cap is not triggered, the conditional target is pursued and allocations for biological sequestration achieve one tonne of net reductions beyond business as usual for each tonne allocated.
- Lieberman-Warner bill as passed by the Environment and Public Works committee
    - Annual caps on covered sectors are derived from legislative language. The bill's two caps combine to equal 6,064 million tonnes of CO_2e emissions in 2012. WRI calculations, based on the EPA GHG Inventory, indicate that covered entities emitted approximately 6,252 million tonnes in 2005 or approximately 86.1 percent of total U.S. emissions in that year.
    - The remaining 13.9 percent of economy emissions are increased in line with EIA estimates of uncovered emissions growth rates under the Bingaman-Specter proposal. These annual growth rates, while varying from year to year, average 0.86 percent annually through 2030.
    - The Lieberman-Warner bill differs from other bills evaluated in that it creates a separate cap for HFC consumption. Since HFC consumption is not equivalent to HFC emissions, an adjustment was made to convert this consumption cap to an emissions cap. Based on EPA estimates of the historical difference between these numbers found in an EPA memo to the EIA titled "Emissions that Fall under the Cap under S.280" from their analysis of the McCain-Lieberman and the EPA GHG Inventory, we have assumed an adjustment of 83 $MMTCO_2e$ in 2012. After making this adjustment, the cap is tightened at the same rate as outlined in the legislative language. As a result, we assume the combined caps allow covered sources to emit only 5,984 $MMTCO_2e$ in 2012 decreasing to 1,797 $MMTCO_2e$ in 2050.
    - A range of potential emissions is presented to reflect the possible impacts of complementary policies included in the bill. The lower bound of this range informs the optimistic case depicted in the cumulative emission budget comparison and assumes:
        - The 2 percent allowance allocation for states with more stringent GHG regulations is assumed to be entirely retired in all years of the program. It is assumed that no additional allowances are retired by states as the financial incentive of selling them is assumed to be more attractive.
        - Allocations for domestic and international agriculture and forestry activities generate one tonne of net emission reductions per allowance allocated.
        - Allocations for reductions in methane emissions from coal mine and landfill methane reduce emissions in accordance with supply curves of mitigation options from these sectors as presented in EPA's analysis of the McCain-Lieberman proposal.. This results in a 75 percent reduction in emissions from these sources by 2020.
- Stabilization
    - Stabilization lines for atmospheric CO_2 equivalent concentrations of 450 and 550 parts per million are derived from van Vuuren and den Elzen *et al.* 2006. These curves represent reductions the U.S. would need to achieve in tandem with immediate and significant commitments from all industrialized countries and the eventual cooperation of all major developing country emitters to prevent atmospheric greenhouse gas concentrations from exceeding 450ppm or 550 ppm based on the multi-stage scenario used in this study.

Acknowledgements:
This analysis was completed by John Larsen and Robert Heilmayr at the World Resources Institute. The authors would like to thank the offices of Representatives Gilchrest and Waxman and Senators Bingaman, Boxer, Kerry, Lieberman, Sanders and Warner as well as analysts at the World Resources Institute, the United States Environmental Protection Agency, the American Council for an Energy Efficient Economy, the Natural Resources Defense Council, the National Commission on Energy Policy, the Pew Center on Global Climate Change, Resources for the Future and the Union of Concerned Scientists for their help in reviewing earlier versions of this analysis.

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