

COMPARISON OF LEGISLATIVE CLIMATE CHANGE TARGETS

WORLD RESOURCES INSTITUTE

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Attached is an update to the World Resources Institute's analysis of the greenhouse gas (GHG) reduction targets and timetables in the 110th Congress. Two sets of charts are attached:

- 1) a comparative chart of all legislative proposals that have been considered on the U.S. Senate floor or voted upon in committee (as of June 4, 2008)
- 2) Two comparative charts (annual and cumulative) of all current legislative climate change targets and timetables under consideration in the 110th Congress (as of May 23, 2008)

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HISTORICAL COMPARISON OF LEGISLATIVE CLIMATE CHANGE TARGETS CONSIDERED BY THE U.S. SENATE

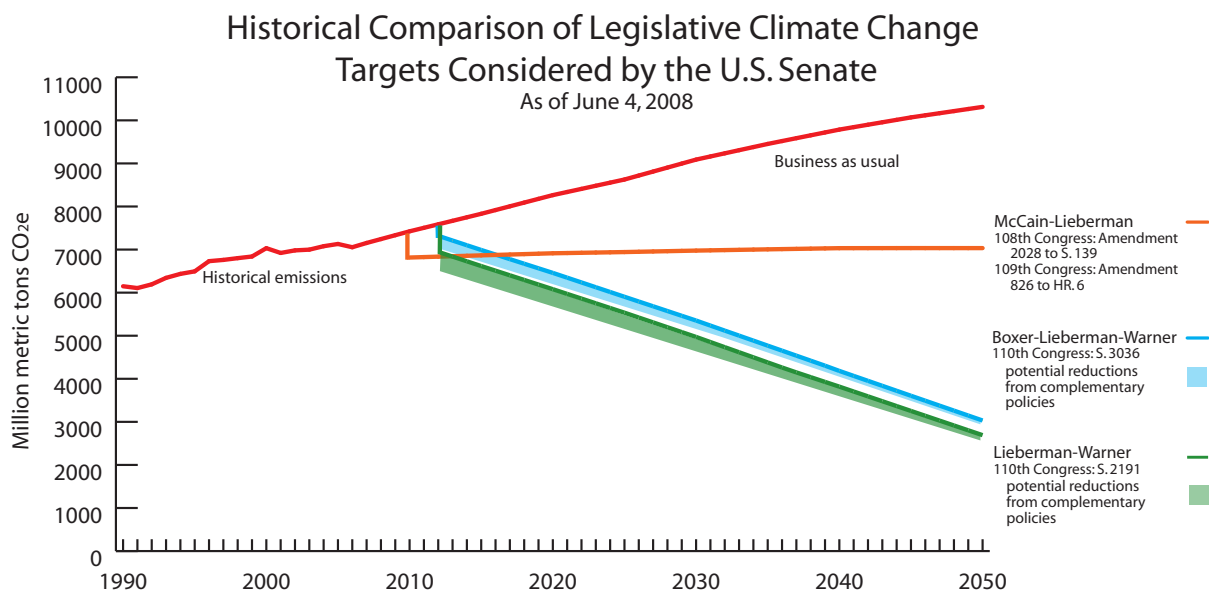
This brief analysis attempts to fairly and accurately compare emission targets of all climate proposals considered by the full Senate and the Environment and Public Works Committee. The chart below provides readers:

- a reference line of historical emissions
- a business as usual scenario that projects GHG emissions without climate policy
- a discrete snapshot of the legislative proposals voted upon by the U.S. Senate over the past three Congresses

The chart depicts emissions trajectories that reflect the mandated caps contained in the legislation plus estimates of growth in uncovered emissions. Potential additional emission reductions that could occur from complementary policies are also included for each proposal. While cost containment mechanisms will influence the actual pathway of U.S. emissions over time, this analysis does not take these mechanisms into account.

From this analysis the following observations are apparent:

- Both McCain-Lieberman bills would have held emissions at approximately 2 percent below 2005 levels from 2010 onward.
- S.3036, the Boxer-Lieberman-Warner bill will reduce total U.S. emissions by approximately:
 - 13 percent below 2005 levels by 2020 and
 - 59 percent below 2005 levels by 2050
- The reduction estimates for S.3036 represent fewer potential emissions reductions than S.2191, the earlier version of the bill. These differences are primarily due to the following technical factors:
 - a decrease in coverage of emissions from the combustion of natural gas
 - a slight reduction in allowances allocated to activities that increase domestic and international carbon sequestration



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.

COMPARISON OF LEGISLATIVE CLIMATE CHANGE TARGETS IN THE 110TH CONGRESS

The World Resources Institute's analysis of emissions targets and cumulative emissions budgets attempts to fairly and accurately compare explicit carbon caps in climate proposals submitted in the 110th Congress. Emissions from regulated sectors are calculated based on the text of the respective legislation. For sectors that are not covered by the legislation, emissions are estimated to continue growing. This analysis uses a single set of carefully selected data and methods to provide a consistent comparison across all climate proposals in the 110th Congress. This analysis is not a projection of actual future 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. Specifically, each line reflects the sum of mandatory caps plus the growth in uncovered emissions as well as a range of additional possible reductions that could occur through complementary policies. This chart is a revision of a similar analysis originally released during the 109th Congress and updated through December of 2007. Several changes have been made since the December release. Updates include:

- An analysis of S.3036, the Boxer-Lieberman-Warner substitute amendment to S.2191 the Lieberman-Warner Climate Security Act.
- Depiction of S.2809, Representative Inslee's New Apollo Energy Act of 2007.
- Revision of historical emissions to reflect the most recent inventory of U.S. emissions published by the Environmental Protection Agency (EPA).
- An update of projected emissions under business as usual and projections of uncovered emissions, using data from the ADAGE reference scenario of EPA's analyses of federal climate change proposals. These data do not reflect enactment of the Energy Independence and Security Act of 2007.
- This analysis does not include the recently introduced Investing in Climate Action and Protection Act (iCAP) sponsored by Representative Markey. WRI intends to include this proposal in a subsequent update.

Figure 1

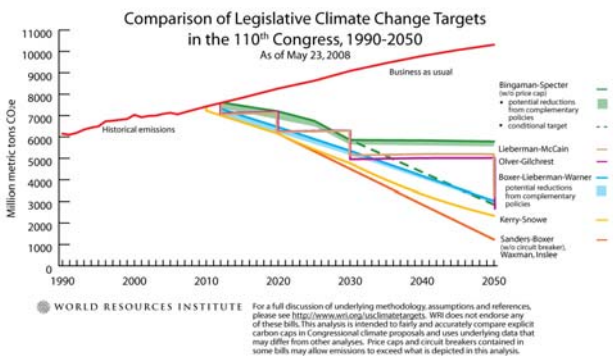
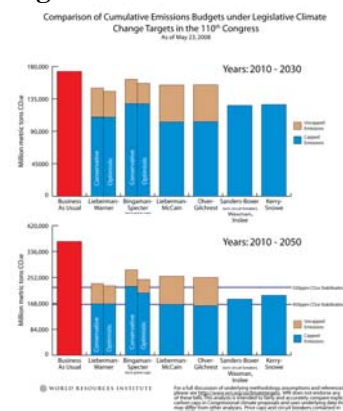


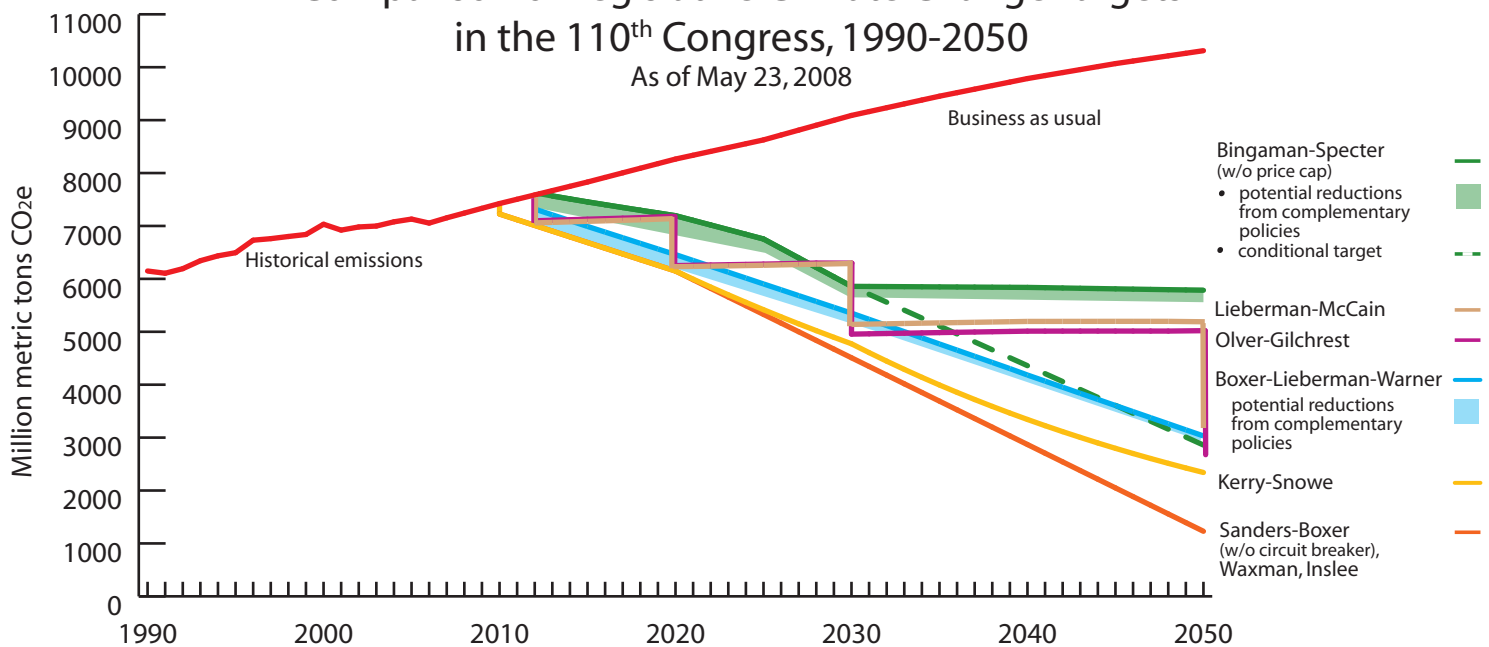
Figure 2



"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 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 Boxer-Lieberman-Warner and Bingaman-Specter proposals, optimistic and conservative scenarios are presented to account for changes in U.S. emissions that may result from conditional targets and complementary policies included in these bills.

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

As of May 23, 2008

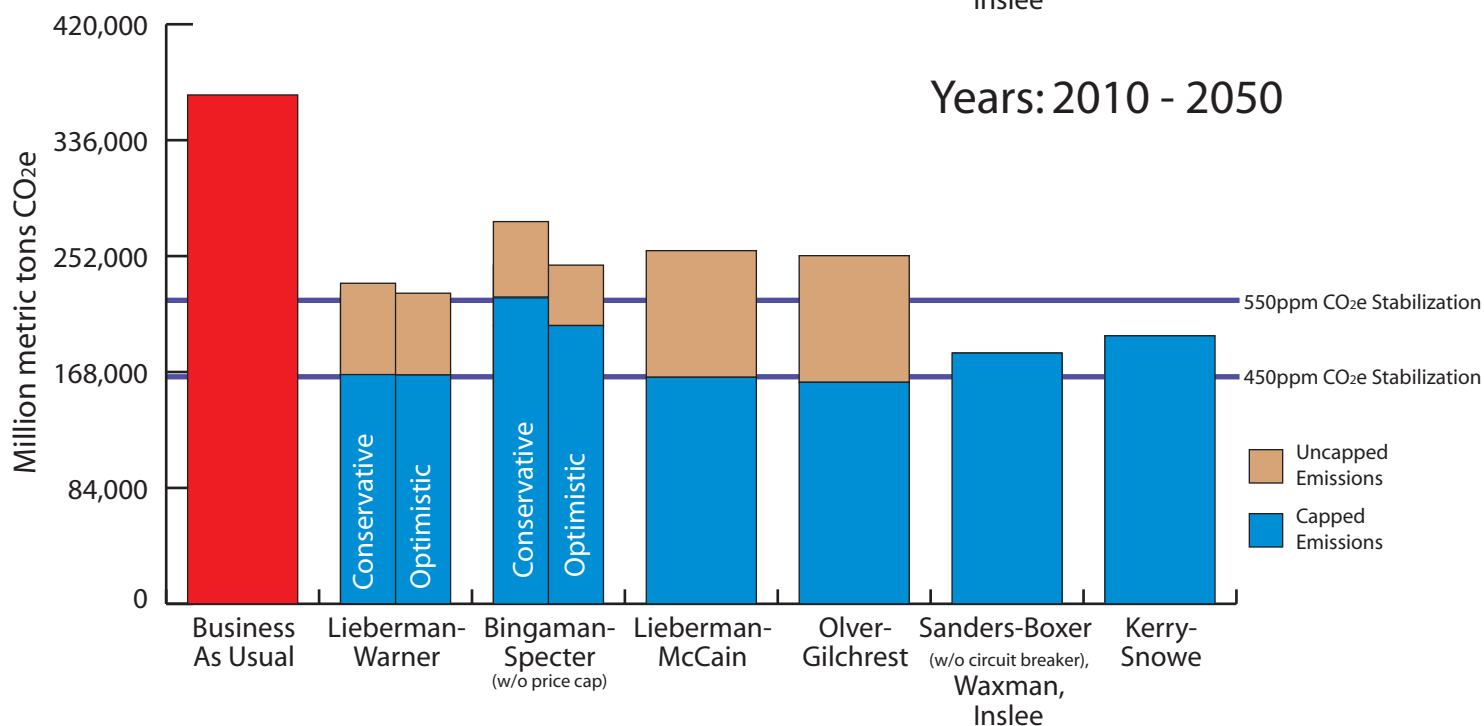
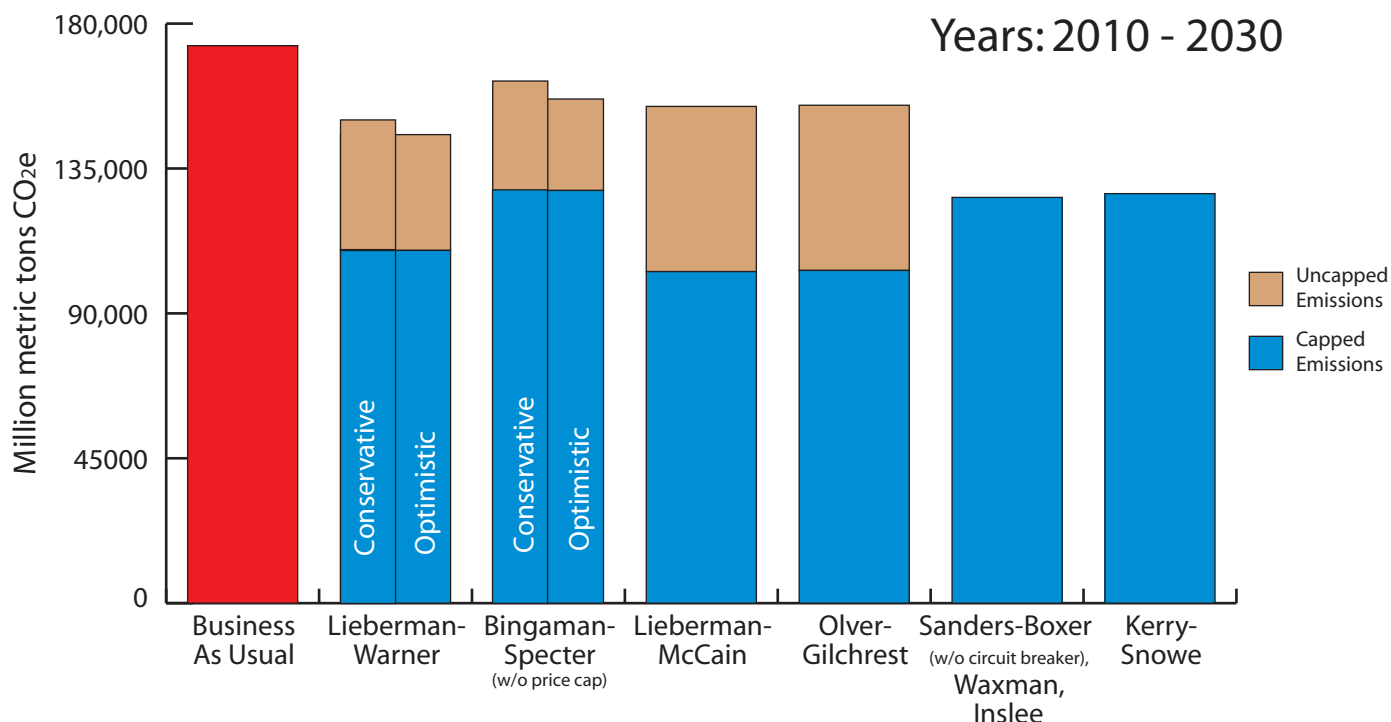


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For a full discussion of underlying methodology, assumptions and references, please see <http://www.wri.org/usclimatetargets>. WRI does not endorse any of these bills. This analysis is intended to fairly and accurately compare explicit carbon caps in Congressional climate proposals and uses underlying data that may differ from other analyses. Price caps and circuit breakers contained in some bills may allow emissions to exceed what is depicted in this analysis.

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

As of May 23, 2008



GENERAL ASSUMPTIONS AND METHODOLOGIES

Many assumptions have been made to simplify the analysis and should not be taken as statements of fact. These assumptions apply to all charts and data included in both the Senate and Congressional comparison. 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 2008. 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 EPA's modeling of the McCain-Lieberman, Bingaman-Specter and Lieberman-Warner proposals as appropriate.
- Some complementary policies may achieve emission reductions in non-covered sectors beyond what is explicitly mandated in the cap.
 - Allocations to support domestic and/or international biological sequestration are assumed to achieve up to one ton of net emission reductions per allowance allocated.
 - 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 does not predict when and how much this would occur; therefore it is assumed that there would be 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 does not show the effects of the price cap under the proposal by Senators Bingaman and Specter due to a lack of comparable data.
 - The price cap provision could result in emissions above the line presented in Figure 1 and in greater cumulative emissions than those presented in Figure 2.

Bill methodologies

- **Kerry-Snowe, S.485**
 - 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, S.309; Inslee, HR.2809; and Waxman, HR.1590**
 - The bill language stipulates a declining cap, to cover 100 percent of U.S. emissions starting in 2010. Emissions are reduced linearly to reach 1990 levels by 2020. From there, emissions are reduced linearly to reach 80 percent 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. It is assumed that Representative Inslee’s proposal operates in the same fashion. According to this analysis this straight line trajectory is equal to an average annual reduction of approximately 5.2 percent.
- **McCain-Lieberman, S.240 and Olver-Gilchrest, HR.620**
 - 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 CO₂e – 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 (approximately 75 percent of 2006 total U.S. emissions).
 - The remaining 25 percent of emissions are increased in line with EPA projections of uncovered emissions growth under the McCain-Lieberman proposal. These annual growth rates, while varying from year to year, average 0.27 percent through 2050.
 - 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 and titled “Emissions that Fall under the Cap under S.280.”
- **Previous versions of McCain-Lieberman, SA 2028 (108th Congress), S1151 (109th Congress)**
 - The texts of both bills stipulate annual caps starting in 2010 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 2000 levels of emissions from non-covered entities (entities from covered sectors that emit less than 10,000 mmt CO₂e – 5.2 percent of economy emissions).
 - No additional cap levels or sunset provisions are included in the legislative language. It is assumed that the initial cap level would be maintained through 2050.
 - All other assumptions applied to the 110th Congress version of the bill, S.280 are applied to these proposals.
- **Bingaman-Specter, S.1766**
 - Cap on covered sectors is derived from legislative language. The bill is calculated to cap 86 percent of 2006 total U.S. emissions.
 - The remaining 14 percent of economy emissions are increased in line with EPA’s projections of uncovered emissions growth under the proposal. These annual growth rates, while varying from year to year, average -0.02 percent through 2050.
 - 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.
 - According to EPA analysis, 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. Due to a lack of appropriate data, a comparable price cap emissions

range is not presented here. It is uncertain exactly how much emission abatement would occur if the price cap were triggered; therefore no emissions range is included.

- The cumulative emission budget comparison's conservative scenario assumes the conditional target is not pursued and allocations for biological sequestration do not achieve any net emission reductions. No price cap emissions range is included.
- 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.

- **Boxer-Lieberman-Warner substitute, S.3036**

- Annual caps on covered sectors are derived from legislative language. The bill's two caps combine to equal a limit of 5,981 million tonnes of CO₂e emissions in 2012. WRI calculations, based on the EPA GHG Inventory, indicate that covered entities emitted approximately 5,713 million tonnes in 2006 or approximately 81 percent of total U.S. emissions in that year.
- The remaining 19 percent of economy emissions are increased in line with EPA estimates of uncovered emissions growth rates under the proposal. These annual growth rates, while varying from year to year, average -0.2 percent annually through 2050.
- The Boxer-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. We have assumed an adjustment of 83 MMTCO₂e in 2012, 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" and the EPA GHG Inventory. 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 5,981 MMTCO₂e in 2012 decreasing to 1,789 MMTCO₂e 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:
 - Allocations for domestic and international agriculture and forestry activities generate one tonne of net emission reductions per allowance allocated.
 - While states and other entities could retire additional allowances under S.3036 such amounts are difficult to quantify and therefore no estimates are included in this analysis

- **Lieberman-Warner as reported out of EPW, S.2191**

- Annual caps contained in S.3036 are identical to those contained in S.2191. WRI calculations, based on the EPA GHG Inventory and legislative language, indicate that covered entities emitted approximately 6,089 million tonnes in 2006, or approximately 86 percent of total U.S. emissions in that year.
- The remaining 14 percent of economy emissions are increased in line with EPA estimates of uncovered emissions growth rates under the proposal. These annual growth rates, while varying from year to year, average -0.2 percent annually through 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:
 - 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.

- While states and other entities could retire additional allowances under S.2191, such amounts are difficult to quantify and therefore no estimates are included in this analysis.
- Stabilization
 - Stabilization lines for atmospheric CO₂ 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:

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Please contact John Larsen (202-729-7661) or Robert Heilmayr (202-729-7844) with any questions. For more information, go to www.wri.org/usclimatetargets.

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