

# COMPARISON OF LEGISLATIVE CLIMATE CHANGE TARGETS

WORLD RESOURCES INSTITUTE

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This document is an update to the World Resources Institute's analysis of the greenhouse gas (GHG) reduction targets and timetables of climate legislation proposed in the 110<sup>th</sup> Congress. It includes a set of charts (annual and cumulative) as well as a reference table comparing all current legislative climate change targets and timetables under consideration in the 110<sup>th</sup> Congress (as of September 9, 2008)

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## COMPARISON OF LEGISLATIVE CLIMATE CHANGE TARGETS IN THE 110<sup>TH</sup> CONGRESS

The World Resources Institute's analysis of emissions targets and cumulative emissions budgets attempts to objectively, fairly and accurately compare GHG reductions from explicit carbon caps and complementary policies contained in climate proposals submitted in the 110<sup>th</sup> Congress. Emissions from capped 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 uncontrolled in line with projections published by EPA. This analysis uses a single set of carefully selected data and methods to provide a consistent comparison across all climate proposals in the 110<sup>th</sup> 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.

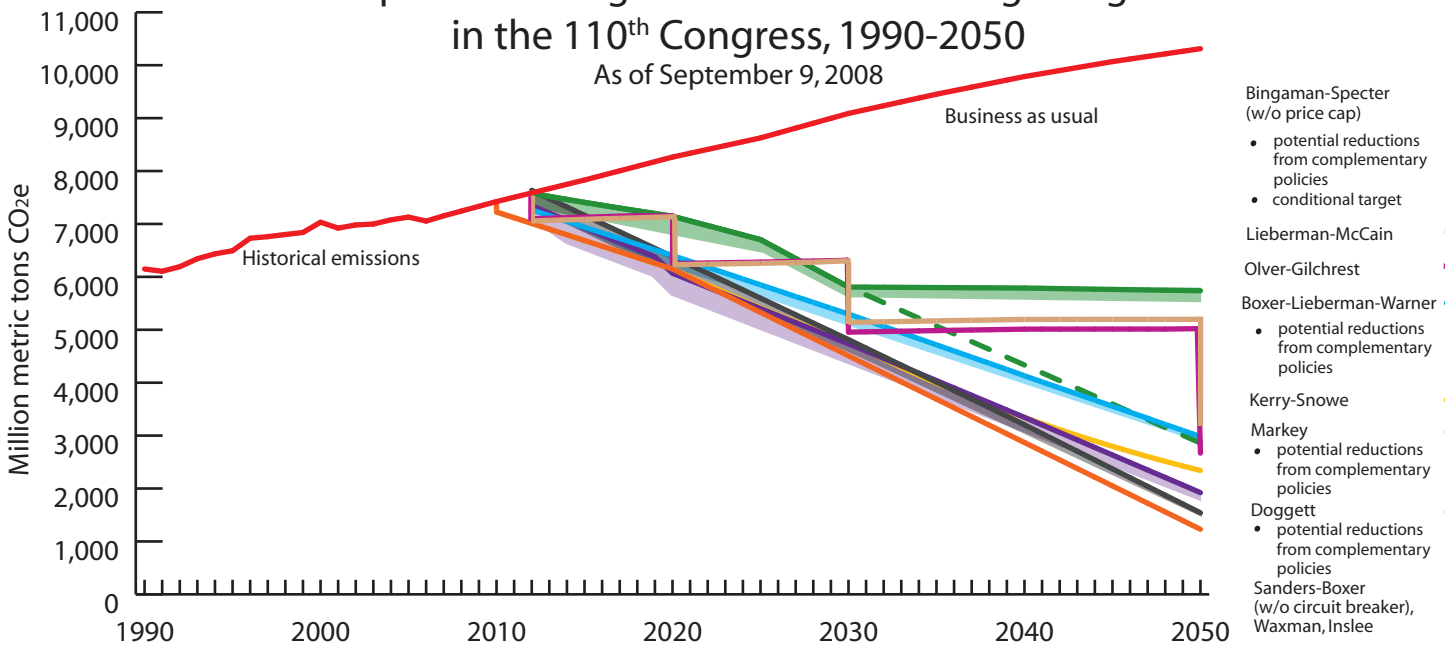
"Comparison of Legislative Climate Change Targets in the 110<sup>th</sup> Congress" (Figure 1) compares targets for legislative proposals of mandatory cap and trade programs for greenhouse gas emissions. Specifically, each line reflects the mandatory caps plus the growth in uncovered emissions as well as a range of additional possible reductions that could occur through complementary policies. Appendix 1 contains a table that includes the underlying data and estimates of emission reductions for selected years. This chart is a revision of a similar analysis by World Resources Institute released during the 109<sup>th</sup> Congress and subsequently updated through June 18, 2008.

This update includes the following:

- An analysis of HR.6316, the Climate Market, Auction, Trust & Trade Emissions Reduction System Act of 2008 sponsored by Representative Doggett. In addition to estimates of GHG reductions under the proposed cap and trade program and auction revenue funding for GHG reductions in uncapped sectors, this analysis incorporates GHG reduction estimates from additional regulations on uncapped sectors and funding for domestic and international carbon sequestration programs.
- Very small adjustments have been made to estimates of emissions coverage for the Boxer-Lieberman-Warner proposal to properly account for the treatment of PFCs emissions from aluminum smelters. This adjustment results in less than a 0.1 percent change in resulting emissions estimates.

"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 figure 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 also an essential indicator of the overall 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, Bingaman-Specter, Doggett and Markey proposals, maximum and minimum reduction scenarios are presented to account for changes in U.S. emissions that may result from conditional targets and complementary policies included in these bills. These estimates do not include changes to the targets or annual emissions levels that may result from the use of cost-containment provisions included in some proposals.

## Comparison of Legislative Climate Change Targets in the 110<sup>th</sup> Congress, 1990-2050 As of September 9, 2008

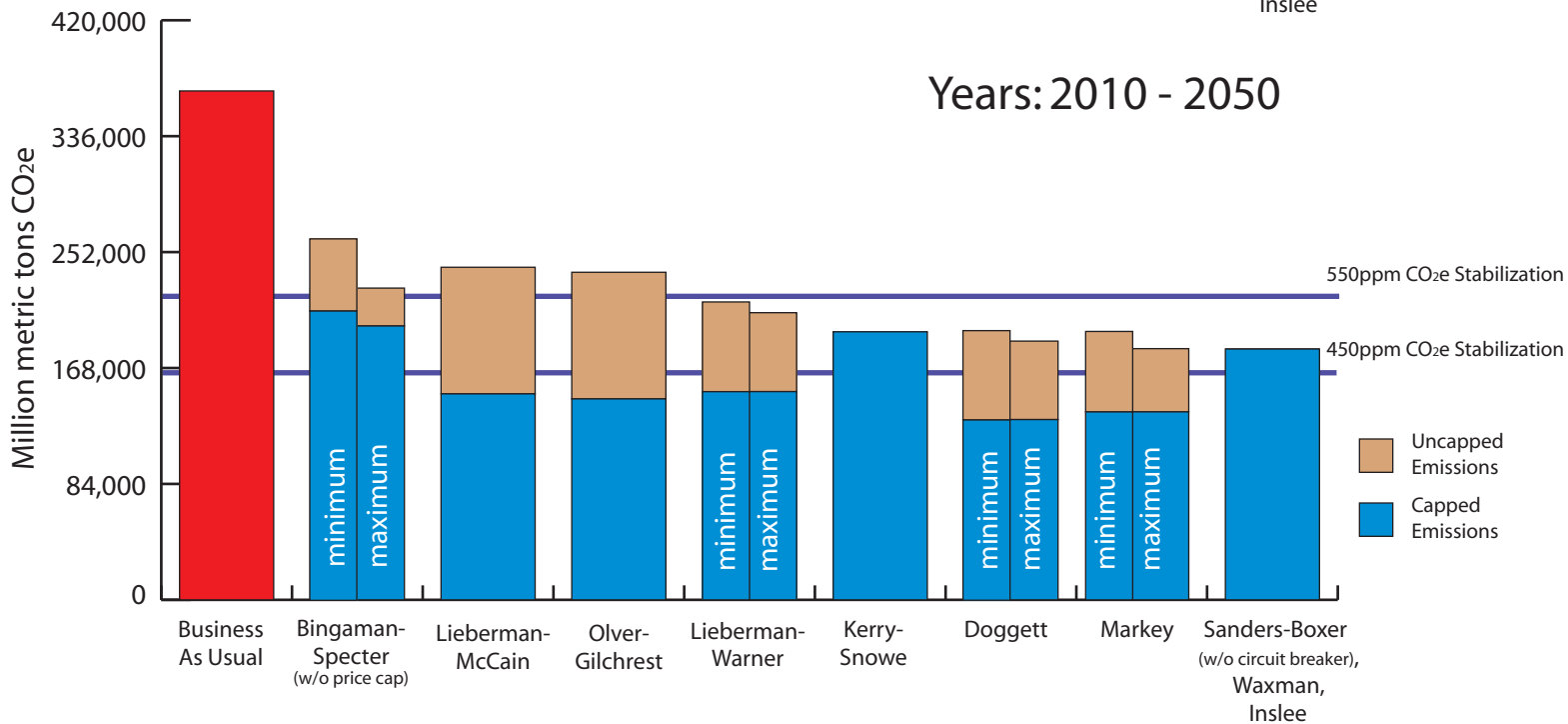
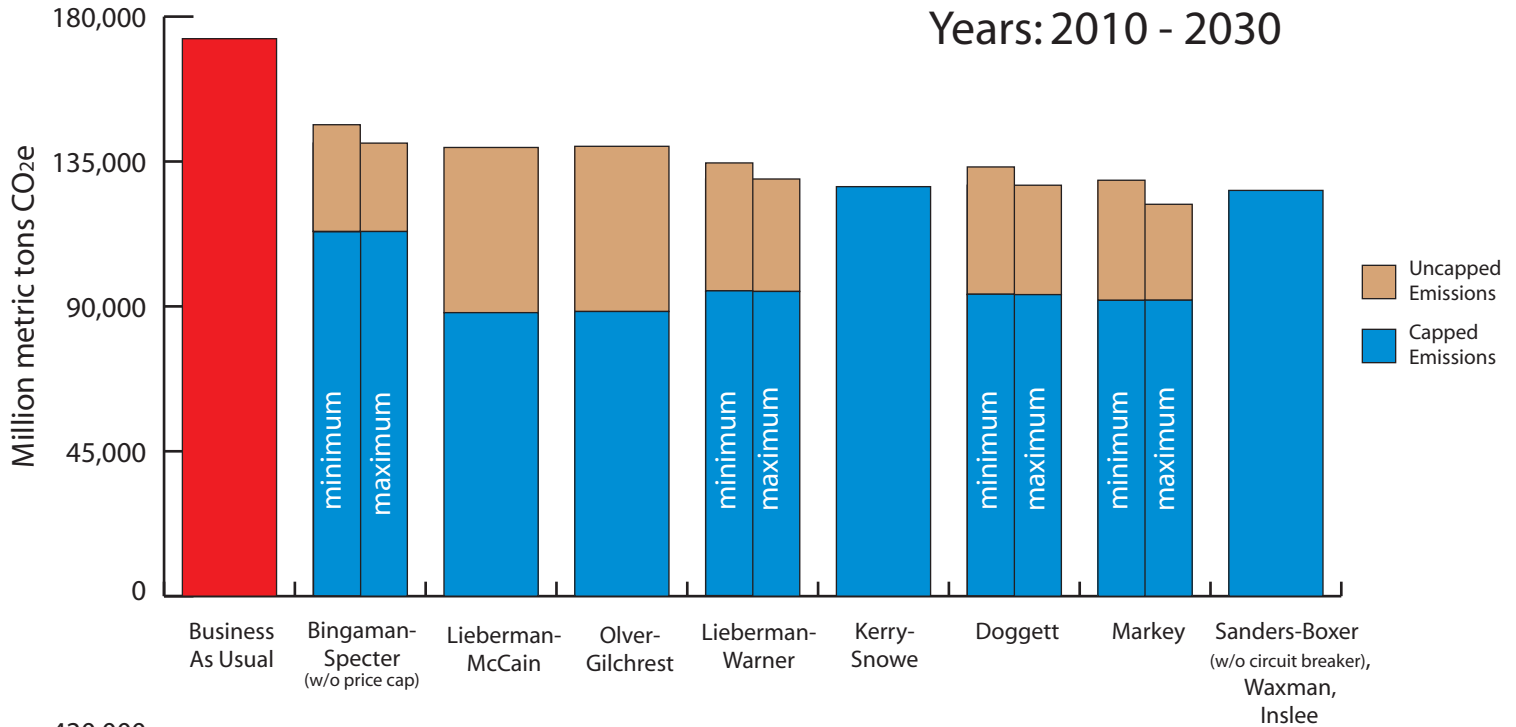


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For a full discussion of underlying methodology, assumptions and references, please see <http://www.wri.org/usclimatetargets>. WRI does not endorse any of these bills. This analysis is intended to fairly and accurately compare explicit carbon caps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

# Comparison of Cumulative Emissions Ranges under Legislative Climate Change Targets in the 110<sup>th</sup> Congress

As of September 9, 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 accompanying charts and tables. 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 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. Estimates of emissions coverage are derived from each bill's legislative language and the EPA inventory. Emissions from the rest of the economy are assumed to increase at annual rates derived from the EPA's modeling of the McCain-Lieberman, Bingaman-Specter and Lieberman-Warner proposals as appropriate.
  - This analysis does not take into account potential leakage of emissions from capped sources to uncapped sources either within sectors or between sectors.
- Some complementary policies may achieve additional emission reductions in non-covered sectors.
  - Allocations of auction revenues or allowances to support domestic and/or international biological sequestration are assumed to achieve one tonne of net emission reductions per allowance allocated.
  - Complementary policies aimed at reducing 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.
  - Complementary policies aimed at reducing emissions from uncapped sectors and entities, such as technology standards for landfills or feedlots, are included where reasonable, robust estimates can be calculated. These estimates inform the range of potential emissions for each relevant bill.
  - Explicit emission limits on sources not covered by the cap and trade program are included in minimum abatement projections.
- 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 reduce the certainty of emissions reductions that could be achieved by the proposed cap and trade program.
  - This analysis does not show the effects of the price cap under the Bingaman-Specter proposal due to a lack of comparable data (earlier versions using EIA data did include the price cap, however in April 2008, the analysis migrated from EIA to EPA 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

- **Business as Usual**
  - Projections of total U.S. emissions under no federal action (referred to here as business as usual) are sourced from EPA's ADAGE Scenario 1, as published in its economic analyses of proposals put forward in the 110<sup>th</sup> Congress.

- **Lieberman-Warner, S.2191 (not included in this analysis)**
  - Since this bill was substituted by S.3036 in May, 2008 it has been removed from this analysis.
  - Data derived from other organization’s analyses of S.2191, particularly those conducted by the EPA have been incorporated into estimates of some legislative proposals in this analysis. For a full description of how S.2191 was analyzed by WRI please see previous updates (such as June 4, 2008) of this analysis available at: <http://www.wri.org/publication/usclimatetargets>.
  
- **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.
  - S.309 includes a “circuit breaker” which could exceed the limits of the cap. It is uncertain how much emission abatement would occur if the circuit breaker were triggered. Due to a lack of appropriate data, this scenario is not depicted in our analysis.
  
- **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 CO<sub>2</sub>e – 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.”
  
- **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, exceeding the limits of the cap. It is uncertain how much emission abatement would occur if the price cap were triggered. Due to a lack of appropriate data, this scenario is not depicted in our analysis.

- The cumulative emission budget comparison's minimum reduction 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 maximum reduction 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 CO<sub>2</sub>e emissions in 2012. WRI calculations, based on the EPA GHG Inventory, indicate that covered entities emitted approximately 5,769 million tonnes in 2006 or approximately 82 percent of total U.S. emissions in that year.
    - The remaining 18 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 MMTCO<sub>2</sub>e 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 MMTCO<sub>2</sub>e in 2012 decreasing to 1,789 MMTCO<sub>2</sub>e 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 maximum reduction 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.
    - Complementary policies to reduce end use HFC emissions are currently not included in this analysis. WRI intends to incorporate estimates in a future update. Inclusion of such policies would result in a slight decrease in GHG emission estimates.
  - **Markey, HR.6186: Preliminary estimates**
    - Estimates should be considered preliminary pending additional peer review and inclusion of analysis of complementary policies for HFCs.
    - Annual caps on covered sectors are derived from legislative language. The bill's cap is set at 6,098 million tonnes of CO<sub>2</sub>e emissions in 2012. It is important to note that emissions from HFCs are not covered under this proposal until 2020. WRI calculations, based on the EPA GHG Inventory, indicate that covered entities emitted approximately 5,984 million tonnes in 2006 or approximately 85 percent of total U.S. emissions in that year. Coverage is increased to 87 percent of total U.S. 2006 emissions after 2019 when HFCs are incorporated into the overall cap.
    - From 2006 through 2019, HFC emissions are assumed to increase in line with EPA's ADAGE reference case projections.
    - The remaining 13 percent of economy emissions are increased in line with EPA estimates of uncovered emissions growth rates under S.2191. 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 maximum reduction 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.
      - GHG emission reductions at uncapped sources due to best available control technology standards achieve additional reductions of approximately 100 million tonnes CO<sub>2</sub>e based on estimates conducted by the EPA. These regulations are assumed to take effect in 2014. This estimate may be conservative as it does not take into account reductions of methane from enteric fermentation or improvements in best available control technology over time.

- HFCs currently are assumed to be capped based on emissions rather than production data. WRI is currently exploring whether an adjustment similar to those made for S.2191 and S.3036 is necessary to accurately portray this portion of the proposal. If an adjustment is deemed to be necessary, total GHG reduction estimates could be slightly larger than those included in this preliminary analysis.
  - Complementary policies to reduce end use HFC emissions are currently not included in this analysis. WRI intends to incorporate estimates into a future update. Once included, total GHG reduction estimates could be slightly larger than those included in this preliminary analysis.
  - Additional reductions that could be achieved outside of the U.S. through international clean technology deployment funds contained in this proposal are not included in this analysis. Depending on the performance of such programs as well as the level of international engagement, additional overseas GHG reductions could be substantial. However, attribution and quantification of such reductions is difficult.
- **Doggett, HR.6316**
    - Annual caps on covered sectors are derived from legislative language. The bill's cap is set at 6,351 million tonnes of CO<sub>2</sub>e emissions in 2012. WRI calculations, based on the EPA GHG Inventory, indicate that covered entities emitted approximately 5,769 million tonnes in 2006 or approximately 82 percent of total U.S. emissions in that year.
    - Of the 18 percent of emissions that are not covered, half are from uncovered sectors and half are from uncovered emission sources within covered sectors. The nine percent of emissions from uncovered sources within covered sectors are increased in line with EPA estimates of uncovered emissions growth rates under S. 2191. Additional regulations in the bill require the EPA to prevent emissions growth in uncovered *sectors* after 2012. As a result, the nine percent of U.S. emissions coming from the agriculture and waste sectors are held at 2012 levels unless these emissions are projected to fall below 2012 levels at some point before 2050.
    - 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 maximum reduction 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.
  - **Stabilization**
    - Stabilization lines for atmospheric CO<sub>2</sub> 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](http://www.wri.org/usclimatetargets).



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# APPENDIX 1

**Table 1. GHG emissions estimates under legislative proposals of the 110th Congress**

Absolute emissions (million metric tons)					
	2012	2020	2030	2040	2050
Business as usual emissions	7,586	8,264	9,089	9,786	10,312
Bingaman-Specter, S.1766	7423 to 7244	7145 to 6835	5808 to 5567	5789 to 4334	5738 to 2860
McCain-Lieberman, S.280	7,057	6,229	5,139	5,196	3,181
Olver-Gilchrest, HR.620	7,098	6,251	4,956	5,012	2,668
Boxer-Lieberman-Warner, S.3036	7266 to 6963	6404 to 6146	5297 to 5094	4130 to 3976	2982 to 2887
Kerry-Snowe, S.485	7,010	6,148	4,773	3,343	2,341
Markey, HR.6186 (preliminary analysis)	7343 to 6999	6069 to 5621	4736 to 4381	3344 to 3088	1922 to 1767
Doggett, HR.6316	7634 to 7294	6380 to 6060	4811 to 4590	3202 to 3080	1538 to 1516
Sanders-Boxer, S.309; Inslee, HR.2809; Waxman, HR.1590	7,010	6,148	4,509	2,869	1,230
Percent change from 2005 emissions					
	2012	2020	2030	2040	2050
Business as usual emissions	6	16	27	37	45
Bingaman-Specter, S.1766	4 to 2	0 to -4	-19 to -22	-19 to -39	-20 to -60
McCain-Lieberman, S.280	-1	-13	-28	-27	-55
Olver-Gilchrest, HR.620	0	-12	-30	-30	-63
Boxer-Lieberman-Warner, S.3036	2 to -2	-10 to -14	-26 to -29	-42 to -44	-58 to -60
Kerry-Snowe, S.485	-2	-14	-33	-53	-67
Markey, HR.6186 (preliminary analysis)	3 to -2	-15 to -21	-34 to -39	-53 to -57	-73 to -75
Doggett, HR.6316	7 to 2	-11 to -15	-33 to -36	-55 to -57	-78 to -79
Sanders-Boxer, S.309; Inslee, HR.2809; Waxman, HR.1590	-2	-14	-37	-60	-83
Percent change from 1990 emissions					
	2012	2020	2030	2040	2050
Business as usual emissions	23	34	48	59	68
Bingaman-Specter, S.1766	21 to 18	16 to 11	-6 to -9	-6 to -30	-7 to -53
McCain-Lieberman, S.280	15	1	-16	-15	-48
Olver-Gilchrest, HR.620	15	2	-19	-18	-57
Boxer-Lieberman-Warner, S.3036	18 to 13	4 to 0	-14 to -17	-33 to -35	-51 to -53
Kerry-Snowe, S.485	14	0	-22	-46	-62
Markey, HR.6186 (preliminary analysis)	19 to 14	-1 to -9	-23 to -29	-46 to -50	-69 to -71
Doggett, HR.6316	24 to 19	4 to -1	-22 to -25	-48 to -50	-75 to -75
Sanders-Boxer, S.309; Inslee, HR.2809; Waxman, HR.1590	14	0	-27	-53	-80

(Note: These estimates portray the minimum and maximum emission reductions that could be achieved by each proposal. Minimum estimates include mandatory caps and projections of uncovered emissions as well as additional explicit emissions limits on uncapped sectors. Maximum estimates include minimum estimates plus additional reductions achieved through complementary policies and conditional targets but do not take into account changes in annual emissions due to cost containment provisions. Additional reductions from complementary policies for HFCs and international clean technology are not included.)