EMISSION REDUCTIONS UNDER CAP-AND-TRADE PROPOSALS IN THE 111TH CONGRESS

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This analysis provides an assessment of reductions in greenhouse gas (GHG) emissions relative to total U.S. emissions that could be achieved by pollution reduction proposals currently under consideration in the 111th Congress. This assessment is an update to a previous analysis WRI released on June 25, 2009 and includes an assessment comparing the Manager's Amendment to S.1733 the Clean Energy Jobs and American Power Act (CEJAPA) sponsored by Senators Kerry and Boxer and H.R. 2454 the American Clean Energy and Security Act of 2009 (ACESA) passed by the House of Representatives on June 26, 2009. To account for the effects of different components of these proposals, reduction estimates are divided into three scenarios that are then applied to both proposals considered in this analysis:

- Total emission reductions achieved solely by the proposed emissions caps.
- Total emission reductions achieved by proposed caps and all other complementary requirements, including emission performance standards for uncapped sources, allowances set aside for cost-containment and required components of supplemental reduction programs for reduced deforestation through 2025.
- A range of potential additional reductions that could be achieved through domestic supplemental reductions in all years, international supplemental reductions beyond 2025 and the 1.25 offset requirement for international offsets.

Key findings:

- The emissions caps in the CEJAPA and ACESA achieve reductions of 17 and 14 percent respectively relative to 2005 levels in 2020. By 2050, both the CEJAPA and ACESA achieve reductions of 72 percent relative to 2005 levels.
- Estimates of total US emissions in 2012 under the emissions caps in both the CEJAPA and ACESA are approximately 300 million tonnes higher than recent short-term projections of U.S. emissions for 2010 published by the Energy Information Administration.
- While the CEJAPA and ACESA contain similar complementary measures in addition to emissions caps, they are sometimes applied in different ways and in turn result in somewhat different relative emission reductions. Specifically:
    - When all complementary requirements are considered in addition to the caps, GHG emissions would be reduced 29 and 28 percent relative to 2005 levels by 2020 and 73 and 75 percent relative to 2005 levels by 2050 for the CEJAPA and ACESA respectively.
    - When additional potential emission reductions are considered, the CEJAPA and ACESA could achieve up to 34 and 33 percent relative to 2005 levels by 2020 and up to 78 and 81 percent relative to 2005 levels by 2050 respectively. The actual amount of reductions will depend on the quantity and quality of international offsets used for compliance and the effectiveness of supplemental reduction programs that do not explicitly contain GHG reduction requirements.

"Emission Reductions Under Cap-and-Trade Proposals in the 111th Congress, 2005-2050" (see page 2) graphically presents total GHG reductions achieved by S.1733 and H.R.2454 relative to U.S. historic and projected emissions under the three reduction scenarios. "Estimates of Total GHG Emissions and Emission Reductions Achieved by Cap-and-Trade Proposals in the 111th Congress, 2005-2050" (see page 3) presents a table of total GHG reductions that could be achieved by these proposals for selected years. A full description of the methods and assumptions behind this analysis can be found beginning on page 4.

Emission Reductions Under Cap-and-Trade Proposals in the 111th Congress, 2005-2050

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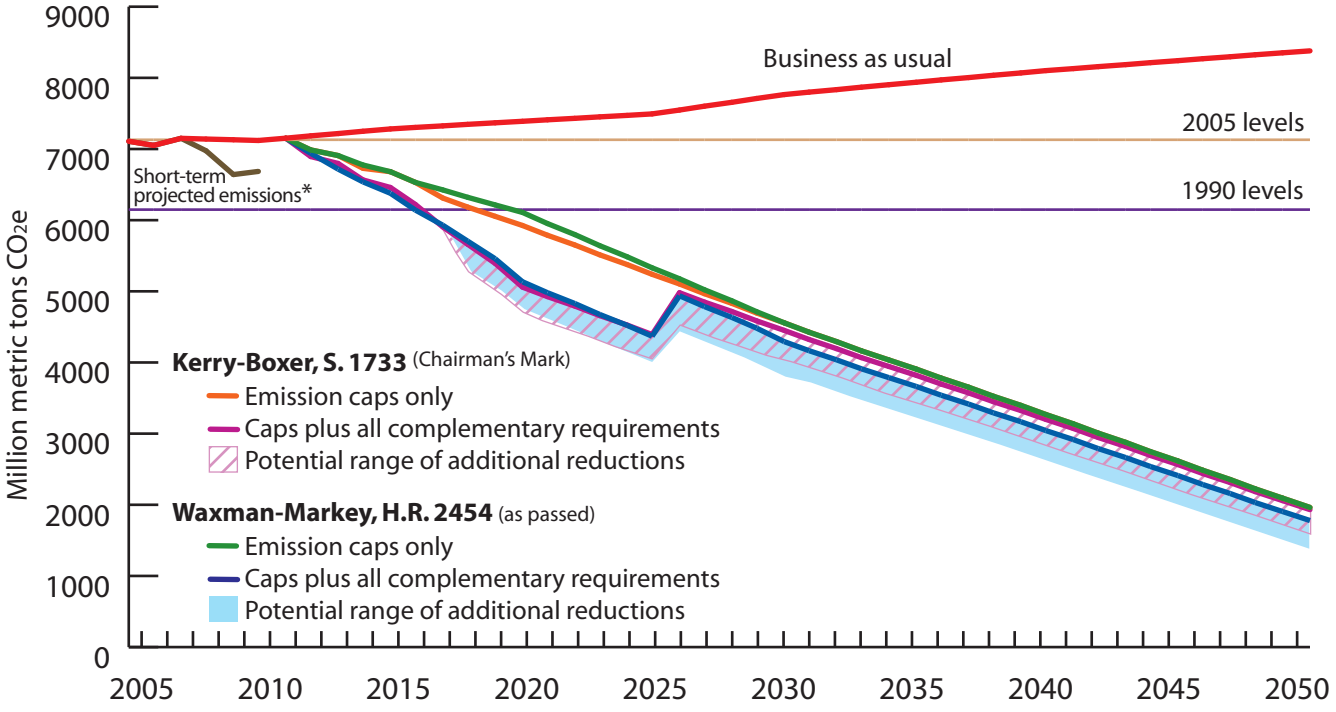

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For a full discussion of underlying methodology, assumptions and references, please see http://www.wri.org/usclimatetargets.

* "Business as usual" emission projections are from EPA's reference case for its analysis of the Waxman Markey Discussion Draft. "Short-term projected emissions" represent EIA's most recent estimates of emissions for 2008-2010.

Table 1. Estimates of Total GHG Emissions and Emission Reductions Achieved by Cap-and-Trade Proposals in the 111th Congress (MMtCO2e)

Absolute Emissions (Million Metric Tons CO_2eq)						
	2010	**2012**	**2020**	**2030**	**2040**	**2050**
Business as usual emissions		7,185	7,390	7,765	8,102	8,379
Short-term projected emissions	6,685					
H.R. 2454 Emissions caps only		6,987	6,109	4,558	3,269	1,963
H.R. 2454 Caps plus all complementary requirements		6,940	5,134	4,294	3,043	1,779
H.R. 2454 Potential range of additional reductions		6,940	4,759	3,816	2,624	1,383
S.1733 Emissions caps only		6,987	5,925	4,558	3,269	1,963
S.1733 Caps plus all complementary requirements		6,894	5,059	4,451	3,200	1,932
S.1733 Potential range of additional reductions		6,809	4,697	4,027	2,833	1,595
Percent change from 2005 emissions						
	2010	**2012**	**2020**	**2030**	**2040**	**2050**
Business as usual emissions		1	4	9	14	18
Short-term projected emissions	-6					
H.R. 2454 Emissions caps only		-2	-14	-36	-54	-72
H.R. 2454 Caps plus all complementary requirements		-2	-28	-40	-57	-75
H.R. 2454 Potential range of additional reductions		-2	-33	-46	-63	-81
S.1733 Emissions caps only		-2	-17	-36	-54	-72
S.1733 Caps plus all complementary requirements		-3	-29	-37	-55	-73
S.1733 Potential range of additional reductions		-4	-34	-43	-60	-78
Percent change from 1990 emissions						
	2010	**2012**	**2020**	**2030**	**2040**	**2050**
Business as usual emissions		18	21	27	33	37
Short-term projected emissions	10					
H.R. 2454 Emissions caps only		15	0	-25	-46	-68
H.R. 2454 Caps plus all complementary requirements		14	-16	-30	-50	-71
H.R. 2454 Potential range of additional reductions		14	-22	-37	-57	-77
S.1733 Emissions caps only		15	-3	-25	-46	-68
S.1733 Caps plus all complementary requirements		13	-17	-27	-48	-68
S.1733 Potential range of additional reductions		12	-23	-34	-54	-74

Bills analyzed include H.R.2454 as passed by the House of Representatives on June 26, 2009 and the Chairman's Mark of S.1733 as released on October 23, 2009. "Business as usual emission" projections are from EPA's reference case for its analysis of the Waxman Markey Discussion Draft. "Short-term projected emissions" represent EIA's most recent estimates of emissions for 2008-2010.

ASSUMPTIONS AND METHODOLOGY

WRI has made a number of assumptions to simplify this analysis; these 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. WRI will update this analysis to reflect new legislation as well as new analyses of emissions or economic and technical considerations published by the Environmental Protection Agency, the Department of Energy or other relevant organizations.

For this analysis of GHG emission reductions, the following general assumptions and methods apply; methods and assumptions that apply to the entire analysis are included below followed by descriptions of specific information relevant to each proposal.

- All proposals are enacted in 2009. Where annual data are unavailable, years between targets or projections are interpolated using a simple linear formula.
- Caps will impact only capped emissions.
    - Caps are calculated and applied according to the legislative language in each proposal.
    - Bills that define which sectors or entities will be capped are assumed to impact only covered sectors. Estimates of emissions coverage for each proposal are generated based on 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 ADAGE reference case projections of the Waxman-Markey proposal as reported.
    - 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 emission reductions in non-covered sectors beyond what would result from the cap. First, a scenario that considers just the emission caps without complementary policies is provided and labeled as “emission caps only.” Policies that have clear mandates for additional reductions are depicted in the “caps plus all complementary requirements” scenario, while policies with less clear requirements or less certain outcomes are depicted in the “potential range of additional reductions.”
    - 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 performance standards for landfills, are included where reasonable, robust estimates can be calculated.
    - Supplemental reduction programs funded through allowance allocations that require a specific amount of emission reduction be achieved are assumed to meet their requirements. Where no reduction requirements exist, we assume a tonne of GHG reductions is achieved for every tonne allocated.
    - Additional offset rules such as a requirement to turn in 5 offsets for every 4 tonnes of GHGs emitted are assumed to generate potential additional reductions.
- Offsets will be real, permanent and additional.
    - This analysis 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. If the environmental integrity of offsets is not completely real, permanent and additional then the emission reduction estimates included in this analysis would be diminished proportionately.

- 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.

Methodologies for Legislative Proposals

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 reference case projections from the ADAGE model as published in its economic analyses of H.R.2454.

Historic Emissions
Historic emissions from 1990 through 2007 are sourced from the most recent version of EPA's GHG Inventory of sources and sinks. WRI analysis released on June 25, 2009 was based on EPAs previous inventory published in 2008. Due to this update, some near-term emission reduction estimates in this analysis are slightly different from those reported previously.

Short-term Emissions Projection
Short-term projections of GHG emissions are derived from EIA's Short-term Energy and Winter Fuels Outlook. Projections from 2008 through 2010 of CO2 emissions from fossil fuels are coupled with EPA's estimates of non-fossil GHG emissions for 2007.

H.R.2454, Waxman-Markey American Clean Energy and Security Act 2009 (ACESA) (passed by the House of Representatives June 26, 2009)
Cap and coverage: The ACESA proposes the creation of two caps – one to phase down U.S. HFC consumption and another to reduce all other GHG emissions. These two caps combined represent the "emissions caps only" scenario.

- Coverage of non-HFC GHG emissions is phased in over the first 5 years of the program.
    - The initial 2012 cap, set at 4,627 million tonnes of emissions, is estimated to cover approximately 67 percent of total 2005 U.S. emissions.
    - In 2014, the cap is expanded to include most industrial emissions, increasing coverage to an estimated 78 percent of 2005 U.S. emissions.
    - In 2016, the cap is again expanded to include emissions from natural gas sold by local distribution companies, increasing coverage to an estimated 85 percent of 2005 US emissions.
    - The ACESA requires a one-time small adjustment to the size of the cap in the event that the bill's assumed estimates of coverage do not match EPA's final coverage estimates during implementation. WRI's estimates of coverage differ slightly compared to the assumptions contained in the bill and so this analysis incorporates the bill's prescribed cap adjustments.
- The HFC cap would go into effect in 2012, covering the production of specifically identified HFCs. These HFCs were responsible for approximately 2 percent of 2005 emissions.
- When combined with the HFC cap, the draft bill would cover up to 87 percent of 2005 U.S. emissions.

Growth of uncovered emissions: The remaining 13 percent of U.S. emissions not covered by the caps from 2016 onward are increased in line with EPA projections of business as usual for uncovered emissions under the proposal. These annual growth rates, while varying from year to year, average 0 percent annually through 2050. Adjustments are made to these rates between

2012 and 2016 to account for varying degrees of emissions coverage as the cap is phased in.**Complementary requirements**: In addition to the two caps outlined above, the draft includes a variety of policies that require additional reductions from uncapped sources both inside and outside of the United States. The combination of these provisions and the caps represent the "caps plus all complementary requirements" scenario and include:

- Supplemental greenhouse gas reduction program for international forestry: The ACESA requires the program administrator to use allowances from the cap to fund international forestry projects to achieve 720 million tonnes of additional emission reductions in 2020 and a total of 6,000 million tonnes of reductions by 2025. To distribute these reductions among individual years, we assume an acceleration of the program between 2012 and 2020 to reach the required 720 million tonnes in 2020. After 2020, we assume a leveling off of reductions to achieve the required cumulative reduction between 2012 and 2025 of 6,000 million.
- New Source Performance Standards: The proposal phases in industrial performance standards between 2012 and 2019. EPA is instructed to cover 95 percent of total industrial emissions (including industrial process and F-gas emissions) with a combination of the cap and performance standards. WRI estimates that 84 percent of these emissions are covered under the cap leaving 11 percent subject to standards. Since the structure of these standards is to be designed by the Administrator, it is unknown precisely how much mitigation the standards would achieve. This analysis assumes emissions subject to performance standards are reduced by 50 percent and then held constant from the effective year onward. Performance standards for other uncapped sources are assumed to achieve additional reductions of approximately 115 million tonnes CO_2e derived from estimates conducted by the EPA. These regulations are assumed to take effect in 2013. This estimate may be conservative as it does not take into account improvements in technology over time.
- The strategic reserve represents a fixed amount of reductions that will take place in addition to reductions made to meet the cap. If the strategic reserve trigger price is not reached, allowances in this reserve (2,692 million) will not be released – in effect tightening the cap. If the trigger price is reached, forest tonne offsets are used to refill the reserve. We assume that these purchases are designed to maintain a constant level of credits that are fungible with normal allowances (either allowances or forest tonnes discounted at the rate outlined in the legislation) effectively yielding emission reductions whether or not the reserve is tapped. We distribute these reductions depending on the years in which the allowances are withdrawn from the cap to fill the reserve (we do not credit the reductions until the allowance withdrawals force abatement among covered sectors). Additional reductions could occur through the forest tonne purchasing component of the reserve; these are not taken into account in this analysis.
- The vast majority of mandatory energy efficiency programs would further regulate capped emissions and thus not achieve additional reductions beyond the cap. However, some programs such as residential home efficiency standards would achieve reductions in natural gas consumption and resulting GHG emissions prior to the inclusion of residential natural gas usage in the cap in 2016. Due to a lack of data, these reductions were not quantified. Based on our analysis of the natural gas savings due to the EERS included in the Waxman-Markey Discussion Draft we are fairly certain that emission reductions achieved by HR 2454 prior to 2016 would be negligible – roughly 10 million tonnes on average annually from 2012 through 2015.

Potential range of additional reductions: The lower bound of the range represents the "range of potential additional reductions" scenario and incorporates additional emission reductions that may

be achieved through the implementation of the proposal, but are not mandated. Such policies include:

- 1.25 offset requirement for international offsets: The ACESA requires 1.25 international offsets to be submitted for compliance for every tonne of regulated emissions beginning in 2018. This requirement would yield additional reductions contingent on the number offsets used. In addition, under certain circumstances the international offset limit may be increased from 1 billion tonnes to up to 1.5 billion tonnes. This extends the maximum potential emission reductions of the 1.25 offset requirement if this limit is expanded. A range of additional emission reductions in uncovered international emissions are included in this analysis to represent this provision. The range starts at zero and increases to 375 million tonnes per year.
- Supplemental greenhouse gas reduction program for international forestry: After 2025, the explicit reduction requirements as well as the authority to increase the amount of allocations dedicated to the program are dropped from the supplemental GHG reduction program. After this date, we assume that each tonne allocated has the potential to generate up to one tonne of forest reductions.
- Supplemental greenhouse gas reduction program for domestic agriculture and forestry: A small amount of allowances are dedicated to reductions in uncapped emissions and increases in carbon sequestration in domestic farms and forests as well as other activities. We assume that each tonne allocated to this program has the potential to generate up to one tonne of additional reductions.

S.1733, Kerry-Boxer Clean Energy Jobs and American Power Act of 2009 (CEJAPA) (Chairman's Mark released October 23, 2009)

Cap and coverage: The ACESA proposes the creation of two caps – one to phase down U.S. HFC consumption and another to reduce all other GHG emissions. These two caps combined represent the "emissions caps only" scenario.

- Coverage of non-HFC GHG emissions is phased in over the first 5 years of the program.
    - The initial 2012 cap, set at 4,627 million tonnes of emissions, is estimated to cover approximately 67 percent of total 2005 U.S. emissions.
    - In 2014, the cap is expanded to include most industrial emissions except direct emissions from small business refiners – increasing coverage to an estimated 78 percent of 2005 U.S. emissions.
    - In 2015, direct emissions from small business refiners are included under the cap. WRI estimates that this delay of coverage will not result in any significant difference in emission reductions given that small business refiners account for approximately 10 percent of total U.S. refining capacity and in turn we assume similar caps and coverage to ACESA.
    - In 2016, the cap is again expanded to include emissions from natural gas sold by local distribution companies – increasing coverage to an estimated 85 percent of 2005 US emissions.
    - The CEJAPA requires a one-time small adjustment to the size of the cap in the event that the bill's assumed estimates of coverage do not match EPA's final coverage estimates during implementation. WRI's estimates of coverage differ slightly compared to the assumptions contained in the bill and so this analysis incorporates the bill's prescribed cap adjustments.
- The HFC cap would go into effect in 2012, covering the production of specifically identified HFCs. These HFCs were responsible for approximately 2 percent of 2005 emissions.

- When combined with the HFC cap, the draft bill would cover up to 87 percent of 2005 U.S. emissions.
- Sec. 714 of the CEJAPA does authorize the Administrator to remove Perfluorocarbons and certain other substances from regulation under the cap and instead set emissions standards. Given that these substances account for less than 0.2 percent of total U.S. emissions we assume that regardless of the method of regulation no significant change in total reductions would result.

Growth of uncovered emissions: The remaining 13 percent of U.S. emissions not covered by the caps from 2016 onward are increased in line with EPA projections of business as usual for uncovered emissions under the proposal. These annual growth rates, while varying from year to year, average 0 percent annually through 2050. Adjustments are made to these rates between 2012 and 2016 to account for varying degrees of emissions coverage as the cap is phased in.

Complementary requirements: In addition to the two caps outlined above, the draft includes a variety of policies that require additional reductions from uncapped sources both inside and outside of the United States. The combination of these provisions and the caps represent the "caps plus all complementary requirements" scenario and include:

- Supplemental greenhouse gas reduction program for international forestry: The CEJAPA requires the program administrator to use allowances from the cap to fund international forestry projects to achieve 720 million tonnes of additional emission reductions in 2020 and a total of 6,000 million tonnes of reductions by 2025. To distribute these reductions among individual years, we assume an acceleration of the program between 2012 and 2020 to reach the required 720 million tonnes in 2020. After 2020, we assume a leveling off of reductions to achieve the required cumulative reduction between 2012 and 2025 of 6,000 million.
- New Source Performance Standards: The CEJAPA prevents the Administrator from setting New Source Performance Standards for uncapped emissions that qualify as offset project types under the cap and trade program until 2020. However, there is no mandate or directive to set such standards other than existing statutory authority under the Clean Air Act. Given that there are no specific provisions in the CEJAPA mandating such standards, no additional emission reductions from these provisions are included anywhere in our estimates.
- The Market Stability Reserve represents a fixed amount of reductions that will take place in addition to reductions made to meet the cap. If the strategic reserve trigger price is not reached, allowances in this reserve (3,534 million) will not be released – in effect tightening the cap. If the trigger price is reached, offsets are used to refill the reserve. We assume that these purchases are designed to maintain a constant level of credits that are fungible with normal allowances (either allowances or offset discounted at the rate outlined in the legislation) effectively yielding emission reductions whether or not the reserve is tapped. We distribute these reductions depending on the years in which the allowances are withdrawn from the cap to fill the reserve (we do not credit the reductions until the allowance withdrawals force abatement among covered sectors). Additional reductions could occur through the offset purchasing component of the reserve; these are not taken into account in this analysis.

Potential range of additional reductions: The lower bound of the range represents the "range of potential additional reductions" scenario and incorporates additional emission reductions that may be achieved through the implementation of the proposal, but are not mandated. Such policies include:

- 1.25 offset requirement for international offsets: The CEJAPA requires 1.25 international offsets to be submitted for compliance for every tonne of regulated emissions beginning in 2018. This requirement would yield additional reductions contingent on the quantity

and quality of offsets used. In addition, under certain circumstances the international offset limit may be increased from 0.5 billion tonnes to up to 1.25 billion tonnes. This extends the maximum potential emission reductions of the 1.25 offset requirement if this limit is expanded. A range of additional emission reductions in uncovered international emissions are included in this analysis to represent this provision. The range starts at zero and increases to 313 million tonnes per year.

- Supplemental greenhouse gas reduction program for international forestry: After 2025, the explicit reduction requirements as well as the authority to increase the amount of allocations dedicated to the program are dropped from the supplemental GHG reduction program. After this date, we assume that each tonne allocated has the potential to generate up to one tonne of forest reductions.
- Supplemental greenhouse gas reduction program for domestic agriculture and forestry: A small amount of allowances are dedicated for reductions in uncapped emissions and increases in carbon sequestration in domestic farms and forests as well as other activities. We assume that each tonne allocated to this program has the potential to generate up to one tonne of additional reductions.

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