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**Greenhouse Gas Emission Reductions under the Lieberman-Warner Bill (S. 2191)
Full Committee Chairman's Mark with Boxer 1st Degree Amendment**

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The Lieberman-Warner bill will cover all sources that emit more than 10,000 tons of carbon dioxide equivalent per year from the use of coal, all carbon dioxide emissions from the use of petroleum fuels (covered at the refinery), and all emissions from the use of natural gas in the United States. Emissions of hydrofluorocarbons (HFC) are covered by a separate cap. Several revisions have been made since the bill was reported out of Subcommittee to the full EPW committee, including:

- The Chairman's Mark redefines covered entities and expands annual allowance budgets to cover all emissions associated with the use of natural gas; the bill as reported by the Subcommittee directed the EPA to cover natural gas emissions, but the mechanism for doing so was not explicitly defined.
- The Chairman's Mark expands coverage of emissions from the use of petroleum fuels, but removes coverage of emissions from certain industrial processes, such as cement manufacture.
- The Chairman's Mark now requires that the allocation set-aside program administered by the U.S.D.A. achieve the maximum amount of real, verifiable, permanent and additional reductions and increased sequestration.
- A new set aside provides incentives for capture and destruction of methane from landfills and coal mines.

We estimate that the Chairman's Mark, as amended by the Boxer 1st Degree amendment, covers 86% of U.S. emissions in 2005, which is a modest increase in coverage compared to the bill reported by the Subcommittee. Based on EPA's inventory of greenhouse gas emissions covered sources emitted 6347 MMTCO₂e in 2005.¹ The bill caps HFC production starting in 2010 at 300 MMTCO₂e and this declines to 90 MMTCO₂e (70 percent reduction) in 2037 through 2050. The cap on the remaining emissions starts at 5775 MMTCO₂e in 2012 and declines linearly to 1732

¹ This amount assumes that the cap covers all CO₂ emissions from fossil fuel combustion, emissions from ammonia production, emissions from iron and steel production plus all emissions from natural gas systems, and CO₂ emissions from non-energy use of fuels, plus certain emissions of PFCs, SF₆, and HFCs. All emissions data comes from: U.S. EPA, 2007. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005. EPA-430-R-07-002. The inventory reports estimated HFC emissions, however HFCs are covered in the bill based on production (plus imports minus exports). This adjustment is applied to all calculations, increasing total "emissions" for 2005 by 87 MMTCO₂e.

MMTCO₂e in 2050 (a 70 percent reduction). In 2012 the sum of the caps on covered sources is 6064 MMTCO₂e.

The impact of the bill on total greenhouse gas emissions depends on assumptions made about state action, emissions from non-covered sources, and changes in biological carbon sequestration. The bill includes incentives for states to adopt climate policies that are more stringent than the federal program and to adopt and enforce model building codes; decouple electric and gas utility revenue from sales; and make energy efficiency investments as profitable as increasing energy supplies. The bill also includes energy efficiency standards for residential boilers and provisions requiring regular updates to residential and commercial building codes. The majority of these measures will largely affect emissions in covered sectors, lowering the overall cost of the program, but not achieving additional reductions in uncovered emissions. Finally, the bill sets aside 5% of the total allowance pool to promote increased biological sequestration and emission reductions on domestic farms and forests, an additional 2.5% for similar international efforts, and 1% for reductions in methane from coal mines and non-regulated landfills.

These provisions will reduce emissions from non-covered sources below business as usual levels but the magnitude of these benefits is difficult to quantify. NRDC and WRI have constructed the following Conservative and Optimistic cases to bound the likely range of total greenhouse gas emission reductions achieved under the bill.

- The Optimistic case assumes that states that enact climate programs more stringent than the federal program retire the bonus allowances allocated to them (2% of the total allowance pool). While the bill makes clear that states have the authority to enforce global warming pollution standards more stringent than federal requirements currently there is no clear mechanism by which these state programs would result in reductions in national emissions other than by retiring their bonus allowances. Further elaboration of the state authority provisions could allow for greater national benefits from state programs. The Conservative case assumes that these state programs help achieve the emission caps specified in the bill but do not achieve additional environmental benefits.
- In the Optimistic case non-covered methane emissions (other than landfill and coal mine emissions, which are addressed through an allowance set aside program) are assumed to decline at the same annual rate as they did from 2000 to 2005 (0.3% per year). Emissions of nitrous oxide are assumed to remain constant at 2005 levels, and emissions of other non-covered sources are assumed to grow at the rate projected for uncovered emissions by the ADAGE model in the EPA's analysis of S.280. In the Conservative case emissions from all non-covered sources are assumed to increase at the rate projected by EPA in its analysis of S.280 using the ADAGE model (0.3% per year).²
- In the Optimistic case the 5% set aside for domestic agriculture and forestry activities and the 2.5% allowance set aside for international biological sequestration are assumed to generate one ton of benefits for each ton of allowances devoted to these purposes. In both cases, the 1% set aside for coal mine and small landfill methane reductions is assumed to reduce emissions in accordance with EPA's assessment of the technically feasible reductions from these sources that could be incentivized by the resources generated through this set aside

² Environmental Protection Agency, "EPA Analysis of The Climate Stewardship and Innovation Act of 2007", (Washington, DC: July 2007).

program.³ This results in an 83% reduction in emissions from these sources by 2020 and a 90% reduction by 2050 from their level in 2005.

The Chairman's Mark directs the U.S.D.A. to allocate 5 percent of allowances to achieve the maximum amount of permanent and additional emission reductions and sequestration possible. If biological sequestration and emission reductions from programs supported by the U.S.D.A. are less expensive than the market price of allowances, the U.S.D.A. could be expected to require more than one ton of emission benefits for every allowance allocated. Modeling by the Nicholas Institute of Duke University and the U.S. EPA indicates that such a situation could arise after 2025.⁴ While this scenario would be contingent on several other factors including the demand for biofuels, the value of agricultural land for other purposes and in what way states include terrestrial sequestration in their own climate change programs, additional reductions beyond those reported here could be achieved. For example, if set aside recipients were able to sell allowances in 2050 for \$100/ton and obtained reductions for \$35/ton then 160 MMTCO₂e of additional net emission reductions would be achieved, bringing the 2050 reduction to as much as 69% from 2005 levels.

The assumed breakdown of emissions between covered and non-covered sources is shown in Table 1. Table 2 presents the results of the analysis.

Table 1. 2005 Emissions from Covered and Non-Covered Sources (MMTCO₂e)

Covered Sources other than HFCs	HFC production	Non-covered Methane	Non-covered Nitrous Oxide	Other non-covered sources	Total
6134	213	428	469	106	7350

Table 2. Emission Reductions under the Lieberman-Warner Bill

Year	Emissions of Covered Sources	Estimated Total Emissions Optimistic Case (MMTCO ₂ e)	Estimated Total Emissions Conservative Case (MMTCO ₂ e)	Reductions in Emissions from Covered Sources (2005 Baseline)	Estimated Range of Reductions in Total Greenhouse Gas Emissions (2005 Baseline)
2012	6,064	6,391	6,960	4%	5-13%
2020	5169	5,539	6,051	19%	18-25%
2030	4,022	4,484	4,924	37%	33-39%
2040	2,886	3,441	3,811	55%	48-53%
2050	1,822	2,471	2,771	71%	62-66%

³ Derived from coal methane and landfill gas methane mitigation curves from the EPA Analysis of the Climate Stewardship and Innovation Act of 2007.

⁴ Based on EPA's supply curve for emission reductions outside the cap as presented in the EPA Analysis of the Climate Stewardship and Innovation Act of 2007 and Nicholas Institute projections of allowance prices under an earlier version of the bill as presented in: Murray, Brian and Ross, Martin. "The Lieberman-Warner America's Climate Security Act: A Preliminary Assessment of Potential Economic Impacts", Duke University: (Durham, North Carolina, October 2007).