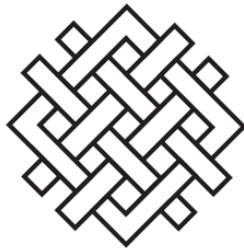


**Testimony of Dr. Jonathan Pershing before the  
U.S. Senate Environment and Public Works Committee**



**WORLD  
RESOURCES  
INSTITUTE**

**Legislative Hearing  
on  
America's Climate Security Act of 2007, S. 2191**

**November 8, 2007**

My name is Jonathan Pershing, and I am the Director of the Climate, Energy and Pollution Program at the World Resources Institute. The World Resources Institute is a non-profit, non-partisan environmental think tank that goes beyond research to provide practical solutions to the world's most urgent environment and development challenges. We work in partnership with scientists, businesses, governments, and non-governmental organizations in more than seventy countries to provide information, tools and analysis to address problems like climate change, the degradation of ecosystems and their capacity to provide for human well-being.

I am very pleased to be here to speak to what I consider the most pressing environmental issues faced by the world – and to what I consider a very strong legislative proposal to place the United States firmly on the path to addressing the problem.

### **Urgency and Scale**

The Earth is warming, primarily due to human activities. The fossil fuels that have led to huge increases in human productivity and great improvements in human well-being, together with significant deforestation, have been the most important causes of global warming. The buildup of carbon dioxide and other greenhouse gases (GHGs) is accelerating, and unless we act very soon to control emissions warming, will rise to very dangerous levels during our children's lifetimes.

In February 2007, the Intergovernmental Panel on Climate Change (IPCC – the official science process endorsed and supported by the world's governments and in which the United States was an active participant) released its most recent report. The report states that it is “unequivocal”

that Earth's climate is warming, and confirms that the current atmospheric concentration of carbon dioxide and methane, two important GHGs, "exceeds by far the natural range over the last 650,000 years." Further, the IPCC concludes that it is now "very likely" (greater than 90% probability) that GHG emissions from human activities have caused "most of the observed increase in globally averaged temperatures since the mid-20th century."

Indeed, the impacts of warming have become increasingly evident. Sea ice in the Arctic is shrinking, and Greenland's massive ice sheet is receding – far faster even than predicted in the IPCC report released prior to this summer's unprecedented melting. Glaciers are rapidly shrinking from the Rockies to the Alps. There have been fatal heat waves in Northern Europe and a three year drought in the Amazon. Farmers and hunters across the United States report changing growing seasons and changing bird migration. If we already see these kinds of damages with only about 0.6 °C (1 °F) of warming, the nature of future damages, with temperatures ranging to 2°C and higher, are likely to be catastrophic.

The IPCC also gave us a clear sense of the emissions reductions required to limit the damages – and a timeframe in which to achieve them. The IPCC suggests that we must reduce emissions globally by as much as 50-85% below 2000 levels by 2050 if we wish to see global average temperatures remain below two degrees of warming. We must stabilize global emissions by 2035.

The warming occurring today is the result of greenhouse gases emitted over the past half century. The United States, with 4.6 percent of the world's population, has contributed 28 percent of the

emissions currently in the atmosphere.<sup>i</sup> Our strong economic growth in the 20<sup>th</sup> century was fueled by fossil fuel technologies we invented. And it is clear that today the U.S., with the most advanced economic and technological resources and capacity, must take the lead in transforming the global economy to a low-carbon future. We cannot expect the rest of the world to act if we do not – or expect that countries with per capita incomes 1/10 of our own to act until we do.

The emissions limits we set for the U.S. matter. Action by the U.S. will be seen as the benchmark against which other countries will measure their commitments. The U.S., with its historical responsibility for the current build up of greenhouse gases in the atmosphere, will continue to be a key contributor to temperature rise – even as other countries may pass us in annual emissions levels. With our European allies committing to a 20-30 percent reduction in greenhouse gas emissions by 2020 to align with the science, U.S. and European action and leadership could help advance the efforts of other countries to take action.

U.S. action alone will not be enough to reduce global emissions to the extent required. It is widely understood that without timely and aggressive U.S. action, a successful international agreement on climate change will be impossible to achieve. The policies you are developing here will have the potential to demonstrate the American commitment to global action on climate change, and consequently, to move the world.

## The Cost of Climate Damages

The U.S. emitted 7,260 billion tons in 2006,<sup>ii</sup> and because greenhouse gas pollution is not regulated, these harmful emissions had no financial consequence to those who produced them – but significant consequences to future generations. A price signal is required in order to ensure that polluters recognize their impact, begin to control what has been unfettered access to our atmosphere, and pay for their pollution. Economists consistently point out that there is no free lunch; climate change is no exception. A report authored last year by Sir Nicolas Stern, former lead economist at the World Bank and advisor to then UK Chancellor of the Exchequer (and now Prime Minister, Gordon Brown), found that the costs of climate change could range from 5 to 20 percent of global GDP.<sup>iii</sup> In dollar terms, this is equal to about \$6.98 trillion – a staggering cost against which our current mitigation price expectations pale.<sup>iv</sup>

A few recent examples demonstrate the point: The California wildfires (a phenomenon expected to increase considerably in a warmer world), are estimated by Risk Management Solutions, a leading provider of products and services for catastrophe risk management, to already run between \$900 million and \$1.6 billion<sup>v</sup>. The drought in the Southeast, a potential harbinger of future events, has led the governors of Florida, Georgia and Alabama to request aid from the President, and has been reported by the *Atlanta Journal-Constitution* to have already cost the Georgia landscape industry \$1.2 billion in losses and the agricultural industry \$782 million in losses<sup>vi</sup>. Among the most devastating impacts likely to arise from climate change is increased frequency of high intensity storms and hurricanes. According to the Congressional Budget

Office, damages estimated from Hurricane Katrina alone are expected to run between \$70 and \$130 billion.

### **Cap and Trade: A signal for innovation**

It is in the context of the clear understanding of the science and impacts of climate change that strong and prompt action is required. The Climate Security Act provides this.

As with all cap-and-trade regulatory systems, the approach in S.2191 has two main attractions: it puts a clear and specific limit on aggregate emissions and it achieves the emissions-reduction target at lower cost than would otherwise be possible. The cap establishes certainty as to the total amount of emissions that will occur under the program. Meanwhile, the ability to trade emissions allowances yields cost-savings by promoting emissions reductions at those sources that are able to achieve the reductions most cheaply. Trading emissions allowances lowers costs to the facilities covered under the program. In doing so it reduces economic impacts on workers, consumers, and taxpayers.

### **The Environmental Benefits**

While several organizations are preparing full economic models of S.2191, WRI has conducted a preliminary analysis to quantify the emission reductions that might be expected under this bill.

Our analysis has included three elements of the legislation:

1. Coverage of the cap

2. Emission targets
3. Complementary policies

### *Coverage*

It is highly unlikely that all U.S. emissions would ever be directly covered in any cap and trade regime. The coverage of the EU-ETS during phase one was approximately 46 percent of total EU emissions. The Northeast states' Regional Greenhouse Gas Initiative applied its initial caps to the power sector alone, accounting for approximately 22 percent of total regional emissions. The limited coverage of these programs reflects the fact that some sources of emissions are easier to monitor and track, while others are more onerous to regulate. Nevertheless, maximizing the ability of a carbon market to find low-cost abatement options generally depends upon the inclusion of diverse sources of emissions. More comprehensive coverage will be necessary to achieve economy-wide targets while keeping compliance costs to a minimum.

S.2191 (as amended in subcommittee to include emissions from the use of natural gas in the residential and commercial sectors) subjects 82 percent of all U.S. emissions to mandatory reduction obligations. The bill covers emissions from significant facilities in the power, industrial and transportation sectors as well as a majority of emissions in the residential and commercial sectors. The bill includes both reduction obligations, and complementary measures designed to achieve reductions in emissions from sectors outside the cap, from sectors where a price signal alone is unlikely to spur a technological transformation, and includes recognition of state circumstances and cost mitigation requirements.

### *Emission targets*

S.2191 sets straightforward annual budgets for covered facilities, and does so with absolute rather than relative numbers. WRI estimates that the bill would reduce covered emissions from 2005 levels by 17 percent in 2020 and by 71 percent in 2050. Over the life of the program covered emissions are reduced at an average annual rate of just over 3 percent. However, as noted above, nearly twenty percent of U.S. emissions are not covered by mandatory reduction targets under the cap. If we assume a rate of growth of emissions of approximately 0.8 percent for these uncovered sectors, total U.S. emissions are estimated to be 16 percent below 2005 levels by 2020 and 27 percent below 2005 levels by 2030. Interactions between covered and uncovered sectors of the economy, particularly in the out years of 2030 to 2050, are difficult to assess.<sup>1</sup> Complementary policies in the current bill will only partly offset the growth in the uncovered sectors, and Congress will need to further review and adopt additional policies (see chart 1).

### *Complementary policies*

Although specific mandates are not set for all sectors, S.2191 does establish a wide variety of complementary policies to address emissions in these uncovered sectors. While many of the policies act also as cost-containment mechanisms (reducing overall compliance costs from “covered sectors”), there are several that explicitly reduce emissions outside the cap. In particular, S.2191 incentivizes reductions through allowance allocations. The most significant of these allocates allowances to the USDA to promote biological sequestration through domestic agriculture and forestry programs. While estimating these additional emissions reductions is

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<sup>1</sup> Uncovered emissions growth in WRI’s analysis is based on EIA projections of these sectors under business as usual reference case, and does not capture the potential interactions across sectors. Our assessment of emissions trends uncovered sectors may thus be conservative.

subject to considerable uncertainty, figure 2 below shows a potential range that may result from the combined policies.

While the intent of the bill is excellent, there may still need to be some strengthening of the rules for biological sequestration, in particular to ensure that reductions incentivized through this program would be additional and permanent, and that appropriate rules be developed to guarantee environmental benefits from this aspect of the program.

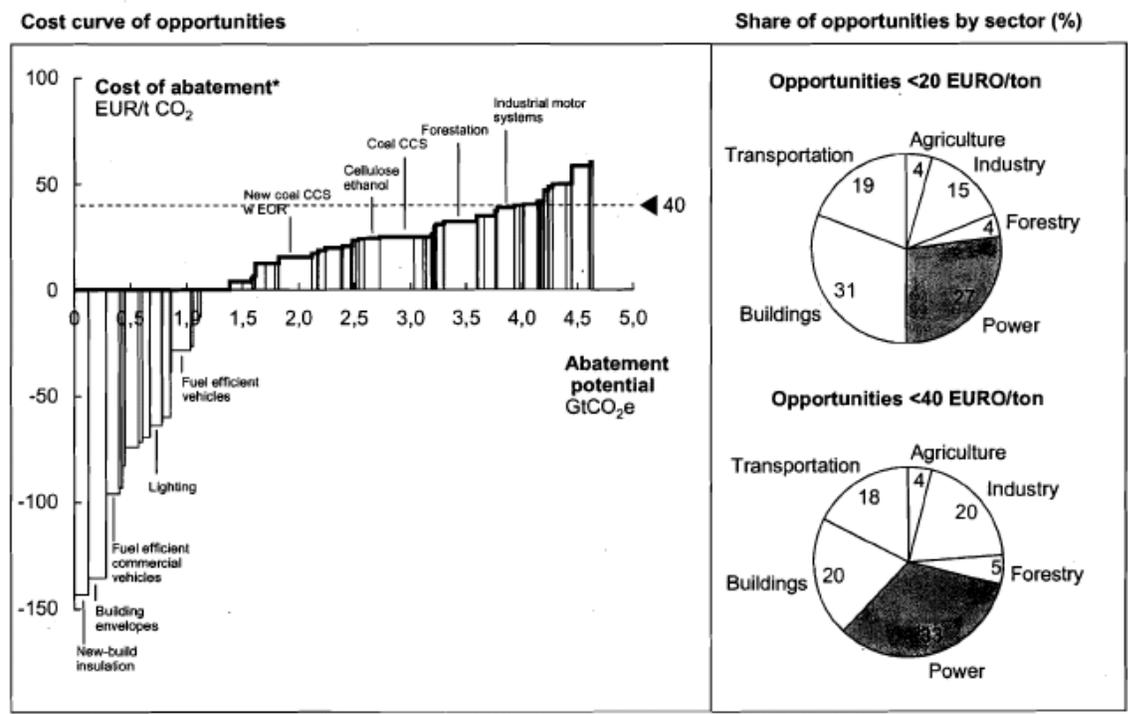
### **Understanding costs**

S.2191 sends a price signal to the market. By capping GHG emissions, it implicitly establishes a value on such emissions, and pushes investors to design and implement policies to reduce them. Economic and technology analysis suggests that the range of options to reduce emissions at modest costs is large.

A study being undertaken by McKinsey<sup>vii</sup> suggests that a wide variety of technologies, with more than 4 billion tons of abatement potential, would penetrate the market at costs below \$50/ton of carbon (see figure 1 below). However, even such a figure is misleading: a carbon price of \$50/ton does not imply a loss to the economy of this amount. Rather, it implies a shift – from systems and operations that are GHG intensive to those that are not. In turn, this suggests we are likely to see major investment in new energy and transport technologies that could continue to power the U.S. economy.

Figure 1

### Abatement opportunities in North America in a 2030 perspective



Source: McKinsey, 2007

The subject of overall economic cost of emissions limits has been much studied. Modeling of S.2191 as introduced into subcommittee (with only modest differences to the current draft proposal) and other similar scenarios have estimated that the cost of allowances would rise to \$26.27 (2005 dollars) by 2020 (see table 1) and to \$56.71 by 2030.<sup>viii</sup> Since the economy must now internalize the cost of carbon where it was otherwise free, there is the potential for these costs to influence economic growth.

However, the economic impact of those prices is extremely small. Duke University's Nicholas Institute conducted an analysis of the earlier bill draft submitted by Senators Lieberman and Warner to the subcommittee. This analysis showed that in a business as usual scenario, GDP would increase 112% from 2005 levels by 2030. Under S.2191 GDP is projected to rise by about 111% from 2005 levels by 2030. The decline in economic activity is less than 1% of GDP over the course of the next two decades.

In the Nicholas Institute analysis, by 2050, the projected increase in GDP from 2005 levels is 238% – and under the bill, this would still increase by 236.4%. This means that in 2050, the same overall economic growth would be observed in the economy, but it would occur about 8 months later in the calendar year. The scale of the U.S. economy is huge, and even small percentages in growth are thus large absolute numbers. The context must be taken into account, however, and here it is clear: action on climate can be achieved at quite modest costs.

Table 1 provides the results of several economic modeling studies that reviewed cap and trade programs similar to S.2191. The comparison looks both at the price per ton of carbon, and the impact of that price level on GDP.

<b>Table 1.</b>						
<b>Results from modeling exercises of cap and trade scenarios similar to S. 2191<sup>ix</sup></b>						
	<b>Allowance price, \$ 2005/metric Ton</b>			<b>Impact on GDP percentage growth relative to 2005, (<i>change from reference case</i>)</b>		
	<b>2020</b>	<b>2030</b>	<b>2050</b>	<b>2020</b>	<b>2030</b>	<b>2050</b>
<b>Nicholas Institute</b>	25.50	41.80	111.10	58% (-0.82%)	110% (-0.98%)	237% (-1.64%)
<b>Massachusetts Institute of Technology</b>	37.25	55.13	120.80	64% (-0.56%)	119% (-0.70%)	268% (-0.28)
<b>Clean Air Task Force</b>	26.27	56.71	NA	NA	NA	NA

None of the economic analysis developed to date has included a complete accounting of the complementary policies or the explicit uses of the emissions trading revenues accruing to the government from an auction of allowances in minimizing economic impacts. These can be substantial. For example, WRI recently facilitated a multi-stakeholder process in Illinois to develop recommendations for a state climate mitigation program. The diverse stakeholder group was charged with submitting policy recommendations to reduce total state-wide emissions to 1990 levels by 2020 – comparable to near term targets under consideration in S.2191. Illinois is representative of many U.S. states as it relies on coal for about half of its electricity generation, is home to both large metropolitan areas and rural agriculture, and is currently witnessing significant growth in its GHG emissions. The policies under consideration included a cap and trade program for large emitters in the industrial and electric generation sectors as well as several complementary policies addressing energy efficiency, renewable energy, CCS equipped coal generation and reducing GHG emissions from passenger vehicles. In short, the process reviewed many of the approaches proposed in America’s Climate Security Act.

ICF Consulting was contracted by the Illinois to analyze the economic costs of the policy package. Economic modeling of the entire package of recommendations found that the price of allowances in the cap and trade program rose to over \$18/tonne in 2020, but that even at this price, state GDP *increased* by nearly 1 percent as compared to business as usual. Personal disposable income and net employment saw similar gains.<sup>x</sup> These results are in line with those of a similar study led by David Roland-Holst at the University of California – Berkley which looked at the economic effects of California’s GHG reduction policies<sup>xi</sup>. The policy package in that study, which also sought to reduce GHG emissions to 1990 levels by 2020, found that a cap on emissions in combination with complementary policies achieved up to a 3.4 percent increase in state GDP as well as an increase in net employment. These state examples show that robust and comprehensive climate policy can meet environmental goals while enhancing the nation’s economy.

The positive economic impacts of the implementation of a climate change regime are obvious. The U.S. economy has grown while becoming more efficient and reducing pollution for decades. A price on carbon in conjunction with appropriate complementary energy policies can accelerate this positive trend. Indeed, as existing and new American technologies are likely to thrive in a carbon constrained world, new business opportunities will plausibly lead to a more robust economy that can generate new jobs while increasing national energy security.

## **Easing the Transition: Strategies to Contain Costs**

Although new opportunities will be significant, the cap-and-trade program will create uneven costs across the economy. In designing an effective cost containment strategy, five economic burdens must be balanced:

- cost to any particular company
- cost to an industry
- cost to a region
- cost to a class of consumers
- cost to the economy

Designing cost mitigation programs will therefore require different approaches depending on whose costs one mitigates. There are four ways in which the bill seeks to provide economic mitigation assistance: (i) free allocation of pollution allowances to regulated entities, (ii) a public auction to generate revenue for investment in new technologies and provide low income assistance, (iii) inclusion of energy efficiency and consumer and state programs as recipients of free allowances for public purposes, and (iv) specific cost mitigation programs such as offsets and borrowing.

In addition to rewards for early action and carbon capture and sequestration, the bill provides regulated entities a free allocation of 40 percent of the total allowance pool, phased out over time, disappearing entirely after 24 years. If we assume a price of \$20/ton of CO<sub>2</sub> equivalent, this implies a value of \$45 billion in transition assistance to regulated entities in the first year of

the program. For comparison, a recent Congressional Budget Office report estimated that as few as 15 percent of freely allocated allowances could allow for regulated entities to remain “whole” as they transition into the new low-carbon economy.<sup>xii</sup>

Auctioning allowances and using the revenues to cut distortionary taxes may be the most efficient and least expensive approach to implementing a market-based system according to economic models.<sup>xiii</sup> Auctions may also allow the government to raise revenue for any number of other purposes, including technology investments or deficit reduction. Furthermore, evidence exists that auctions tend to stimulate greater innovation than free allocations and may lead to more efficient investments in technology.<sup>xiv</sup> Real-world complexities, however, such as multiple distortionary policies, monopoly power, and differences among regulated firms, complicate the issue, making the optimal choice between full auctioning and full free allocations of allowances less clear.<sup>xv</sup> However, S.2191 makes a clear statement regarding the importance of auctioning, starting at a level that is far higher than proposed in other legislation, and currently surpassed only by individual state proposals in the Regional Greenhouse Gas Initiative program in Northeast (where most states plan to auction 100 percent of their allowances).

While an auction tempers the politics of allowance distribution, there are still important political decisions that must be made regarding the distribution of auction revenues. Such revenue will be key to mitigating the costs of the program on low-income households, for worker transition programs, as well as for funding new low carbon technology programs that will ultimately lower overall compliance costs. By making specific provisions for such allocations, S.2191 seeks to address the potential regressivity of the policy while providing dedicated funding to develop the

technologies required to reduce emissions and ensure the U.S. remains economically competitive.

Since markets do the best job of controlling costs over time, the most effective cost mitigation policy will be based upon the robustness of the cap and trade program. There have been concerns raised that large price fluctuations may arise in a new GHG market. Such large price changes create risks both to firms in terms of technology investment, and potential cost to consumers. S. 2191 attempts to limit price distortions and fluctuations through two mechanisms: (1) allowance borrowing and banking and (2) the establishment of a Carbon Market Efficiency Board which can adjust the amount and terms of borrowing to limit negative economic impacts. Additional consideration will be needed to assure that the Board has a clear, transparent and effective governance structure.

Offsets are another design element that can contain costs. Offsets provide regulated entities with additional options to reduce GHG emissions that occur outside of the cap. This is desirable as many offset opportunities are estimated to be of lower cost than abatement options at regulated facilities. A well designed offset program that contains a framework to insure that reductions are real, additional, permanent and verifiable can lower overall compliance costs while maintaining the environmental integrity of the program. S.2191, contains a design framework that should achieve these dual outcomes, including offsets from both within the US and internationally.

## **Interaction with States**

To date, states have been leading the policy response to climate change; California's AB32 and the Regional Greenhouse Gas Initiative serve as two notable examples. Recent WRI work on the influence of states in federal policy finds that a common development is for the federal government to (at least partially) preempt state authority, and set a regulatory floor to which all states must adhere (but which states may choose to exceed<sup>xvi</sup>).

S.2191 follows this tradition by applying a uniform national policy floor, but by allowing states to exceed this floor based on their particular circumstances. This approach achieves a more robust environmental outcome than one that stifles the innovation that will almost certainly emerge from continued state experimentation. However, it also serves to set a national standard that will reduce compliance costs for industry, which legitimately fears a patchwork of state regulation.

S.2191 follows state precedent in another, equally important fashion: it explicitly instructs the EPA to cooperate and harmonize federal emissions reporting and tracking requirements with the Climate Registry, a common emissions reporting and tracking platform in which 40 states currently take part. The Climate Registry uses generally accepted accounting protocols that are common in the private sector and in other GHG programs around the world. By adopting this standard, the bill provides for a common infrastructure for both state and federal programs, and one that already has national buy-in.

## **International Interactions**

The global community is assembling in a month in Indonesia to continue discussions about the global action required to protect the climate. There are three major issues on the table: mitigation efforts by major industrial emissions sources and emitting countries, reducing emissions from deforestation and encouraging sustainable forest carbon management, and programs and approaches to help countries, ecosystems and vulnerable populations adapt to climate impacts.

America's Climate Security Act focuses on U.S. mitigation efforts, but also clearly acknowledges forestry through both the inclusion of an offsets program, and through an innovative set aside for forestry both in the U.S. and globally. In the U.S. and around the world, impacts and costs of climate change are already mounting and hurting the world's poor populations and harming fragile ecosystems and water resources. S.2191 provides only one lens for this issue – the national security implications for the United States of a fragile natural resource base and vulnerable populations. The broader adaptation agenda is both a responsibility and an opportunity for the U.S. to rebuild its international leadership in the climate arena and support robust private and public engagement to help protect people and the planet.

Just as S.2191 provides a clear roadmap for industry in the U.S. on the emissions reductions required through its targets and timetables, the bill also signals to the international community that the U.S. will take the steps required to reign in its emissions and its impact on people and ecosystems around the world. With the U.S. and Australia currently reviewing climate policies,

and Europe's cap and trade program underway, China releasing its National Climate Change Plan, and the Meeting of the Parties next month, we can chart a course for a new international agreement by 2012.

Thank you Madame Chair. I appreciate the opportunity to present this testimony. I welcome any questions you or the committee might have.

Chart 1

### Emissions cap and total economy-wide emissions under S. 2191

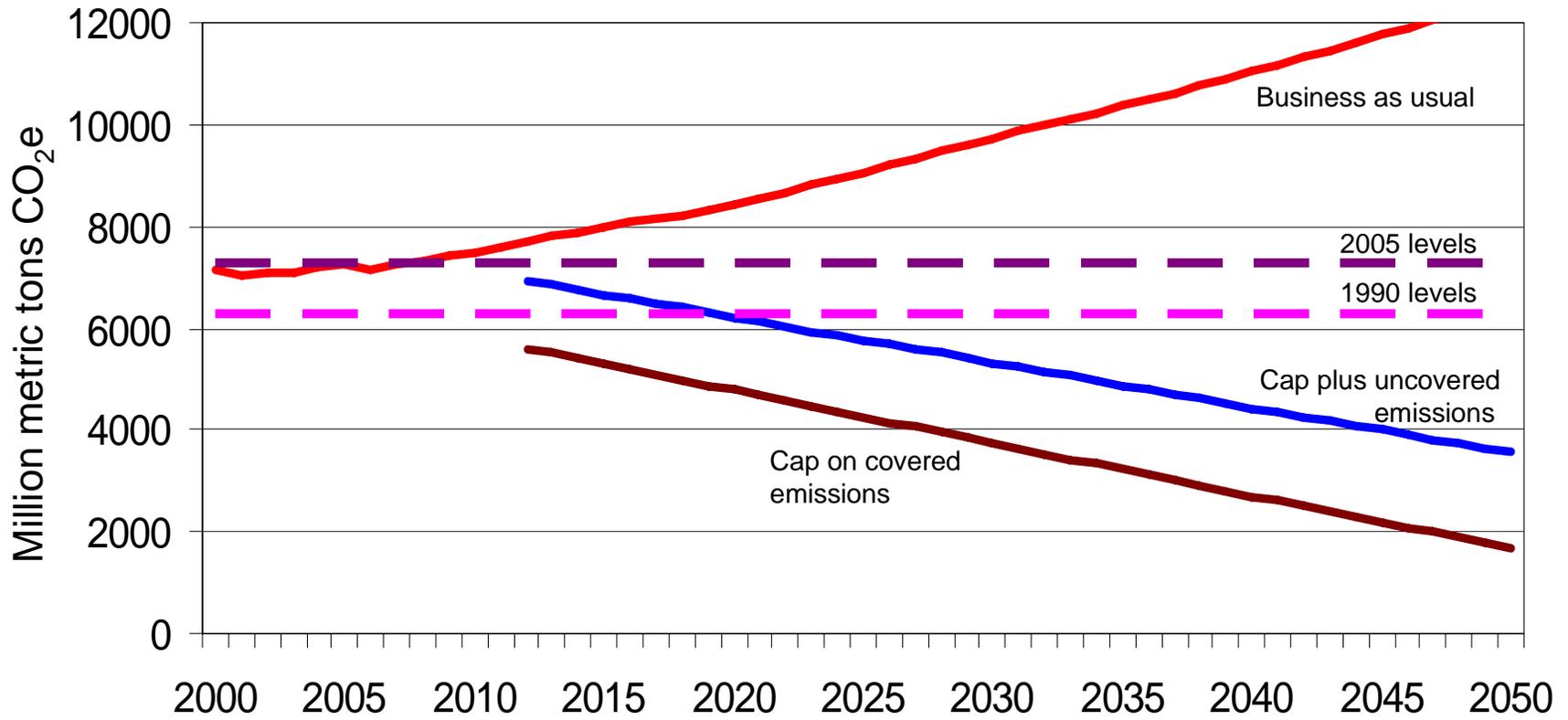
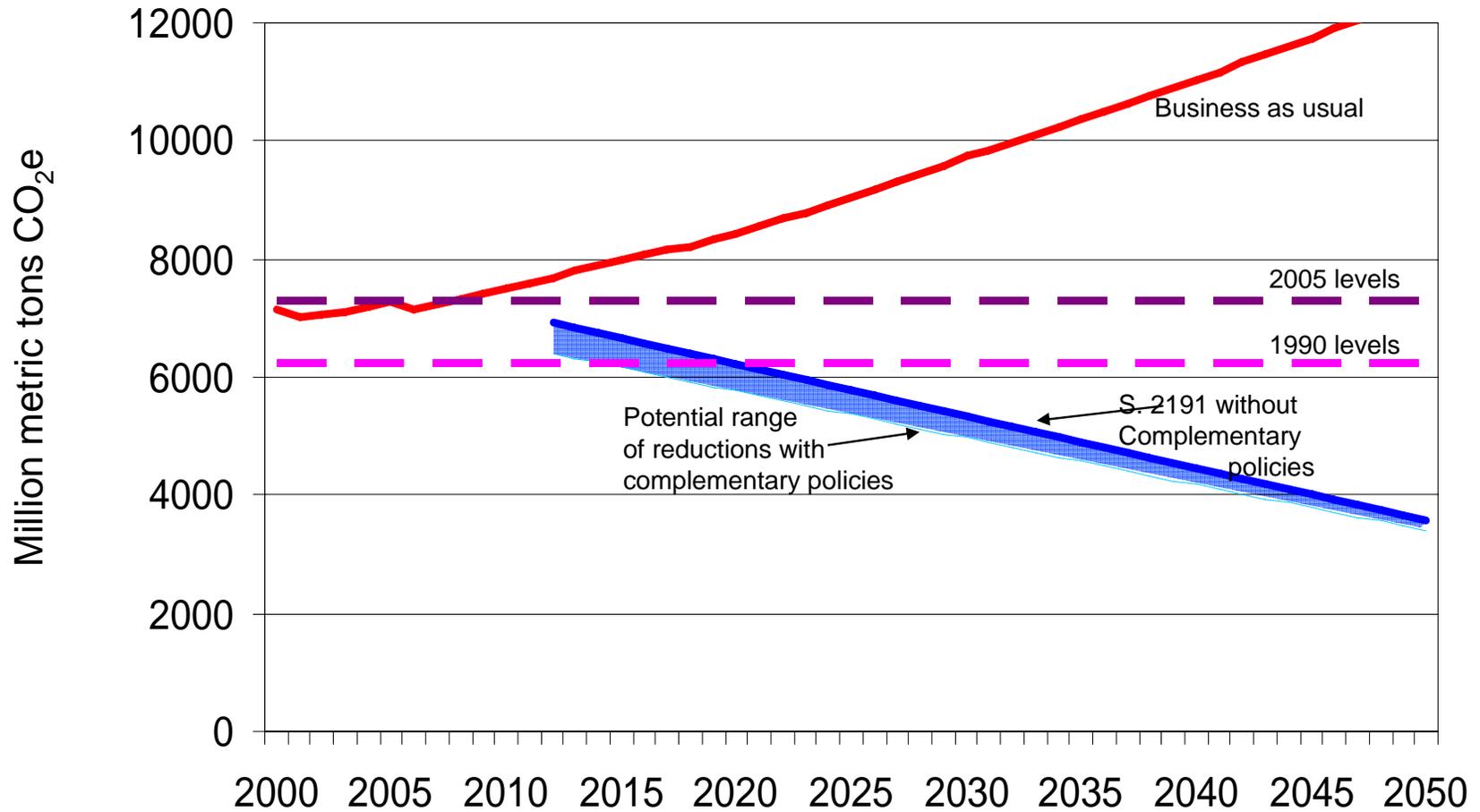


Chart 2

### Potential emission reductions under S. 2191



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- <sup>i</sup> Environmental Protection Agency, October 1, 2007. “EPA Analysis of Bingaman-Specter Request on Global CO<sub>2</sub> Concentrations”.
- <sup>ii</sup> See EPA GHG Inventory; <http://www.epa.gov/climatechange/emissions/downloads06/07ES.pdf>
- <sup>iii</sup> Stern, Nicholas. 2006. *Stern Review on the Economics of Climate Change*. (Cambridge University Press: Cambridge, United Kingdom).
- <sup>iv</sup> In the Stern report, the upper bound of projected costs of climate change were estimated at £3.68 trillion. At the time of the report’s release, this was equal to \$6.98 trillion.
- <sup>v</sup> See <http://www.rms.com/>
- <sup>vi</sup> See <http://www.ajc.com/news/content/news/stories/2007/10/20/waterecon1020.html?cxntlid=inform>
- <sup>vii</sup> This figure, from new analysis underway by McKinsey, is posted by the Wisconsin DNR as part of their work to design a state climate change program: <http://dnr.wi.gov/environmentprotect/gtfgw/documents/Ma3TF20071019.pdf>
- <sup>viii</sup> Showalter, Sharon. October 23, 2007 memo to Joe Chaisson, Clean Air Task Force. Re: Warner-Lieberman Bill NEMS Modeling Analysis.
- <sup>ix</sup> **Nicholas**: Murray, Brian; Ross, Martin. 2007. “The Lieberman-Warner America’s Climate Security Act: A Preliminary Assessment of Potential Economic Impacts.” (Duke University: Durham, North Carolina). Data from “Warner-Lieberman Tighter Cap Scenario” is used to represent the tighter cap of S. 2191 in comparison to the caps of the annotated table of contents modeled in the core scenario.
- MIT** – Paltsev, et al. 2007. Assessment of U.S. Cap-and-trade Proposals. MIT Joint Program on the Science and Policy of Global Change Report 146. Data from “203 bmt limited sectoral coverage” scenario is used to represent less than full-economy coverage of S. 2191.
- CATF**: Showalter, Sharon. October 23, 2007 memo to Joe Chaisson, Clean Air Task Force. Re: Warner-Lieberman Bill NEMS Modeling Analysis.
- <sup>x</sup> Illinois Climate Change Advisory Group, forthcoming. Report of the Illinois Climate Change Advisory Group to Governor Rod R. Blagojevich. For an overview presentation of modeling results please see <http://www.epa.state.il.us/air/climatechange/documents/07-09-06/modeling-of-policy-proposals.ppt>
- <sup>xi</sup> Roland-Holst, Robert, 2006. Economic Growth and Greenhouse Gas Mitigation in California. University of California – Berkley.
- <sup>xii</sup> Congressional Budget Office, 2007. Trade-offs in Allocating Allowances for CO<sub>2</sub> Emissions. Economic and Budget Issue Brief.
- <sup>xiii</sup> Fullerton, D., and G. E. Metcalf. 2001. Environmental Controls, Scarcity Rents, and Pre-existing Distortions. *Journal of Public Economics* 80(2): 249–67. Goulder, L. H., et al. 1999. The Cost-Effectiveness of Alternative Instruments for Environmental Protection in a Second-Best Setting. *Journal of Public Economics* 72(3): 329–60.
- <sup>xiv</sup> Kerr, S., and R. G. Newell. 2003. Policy-Induced Technology Adoption: Evidence from the US Lead Phasedown. *Journal of Industrial Economics* 51(3): 317–43. Milliman, S. R., and R. Prince. 1989. Firm Incentives to Promote Technological-Change in Pollution-Control. *Journal of Environmental Economics and Management* 17(3): 247–65. Popp, D. 2003. Pollution Control Innovations and the Clean Air Act of 1990. *Journal of Policy Analysis and Management* 22(4): 641–60.
- <sup>xv</sup> Babiker, M. H., et al. 2003. Tax Distortions and Global Climate Policy. *Journal of Environmental Economics and Management* 46(2): 269–87. Fischer, C., I. W. H. Parry, and W. Pizer. 2003. Instrument Choice for Environmental Protection When Technological Innovation Is Endogenous. *Journal of Environmental Economics and Management* 45(3): 523–45.
- <sup>xvi</sup> Aulisi, et al. 2007. Climate Policy in the State Laboratory: How States Influence Federal Regulation and the Implications for Climate Change Policy in the United States. World Resources Institute.