

EXHIBIT I

to

**AFFIDAVIT OF WILLIAM R. EDMONDS
IN SUPPORT OF MOTION FOR SUMMARY DETERMINATION**

THE POLICY OF CARBON

The 2008 elections portend
federal regulation of
greenhouse gases
by 2010.

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U.S.

power companies face increasing uncertainty because of possible government regulation of carbon dioxide and other greenhouse-gas (GHG) emissions. The most obvious sign of this uncertainty has been the postponement of investments in new power generation facilities as power companies and investors wait for regulators to act.

The federal government's recent denial of California's and other states' petitions to regulate GHG emissions from automobiles, and several bills regulating GHGs pending before Congress, suggest any such regulation will come from Washington, D.C. The type of regulation enacted will affect the profitability of new power generation investments, shareholder returns, and how the economic costs of compliance are distributed between industry and consumers.

Comprehensive GHG regulation likely will emerge before 2010 because of growing public support for emissions reductions and probable Democratic and independent gains in the U.S. Senate in 2008. If GHG regulation occurs, it likely will originate in the U.S. Congress—and not the executive branch—and almost surely will take the form of a cap-and-trade system. However, the costs to carbon producers probably will be modest initially because compromise legislation will result in small and partially-binding targeted emissions reductions and the grandfathering of permits.

Carbon Penalties

Economists argue the best way to encourage investments in cleaner energy is to establish a price for emissions. There are two market-based means of controlling GHG emissions under discussion at the federal level. The first is a tax per metric ton of CO₂ or CO₂ equivalent (CO_{2e}) emitted.¹ An appropriate tax would bring the private cost of GHG emissions closer to the social costs and would create incentives for producers to reduce their emissions by adopting pollution controls.

An optimal tax would cover as many GHG producing activities as possible and be harmonized across industries (and ideally between countries). Using a dynamic integrated economic and climatic model, Yale University Economist William Nordhaus estimated the optimal carbon tax, the one maximizing world social welfare, at \$7.4 per ton of CO₂ in 2005 (in 2005 prices) and increasing by 2 to 3 percent per year in real terms over the next fifty years.² The U.N.-sponsored Intergovernmental Panel on Climate Change estimated that a tax of \$20 to \$50 per ton of CO₂ between 2020 and 2030 would be sufficient to stabilize global carbon dioxide concentrations at safe levels by the end of the century.³ In the United States, a tax of \$50 would result in modest increases in gas prices (about 15 percent) but significant increases in the price of electricity (about 35 percent).⁴

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The second type of control is a tradable permits or cap-and-trade system. Under this system, the federal government would establish an annual maximum allowance of GHG emissions for covered industries and then distribute permits to pollute in an amount up to the allowance. The permits could then be traded in a marketplace. In theory, the cap-and-trade system achieves the desired level of pollution at minimum cost, as firms with low abatement costs adopt pollution controls and firms with high abatement costs purchase permits and pollute.

In general, most economists favor a carbon tax. Taxation generally is superior to cap-and-trade systems from a social welfare standpoint when there is uncertainty about the optimal level of pollution and the costs of pollution controls are increasing. Most economists believe the costs and benefits of controlling GHG emissions exhibit these characteristics. When pollution-control technologies are expensive, a cap may impose unreasonable costs on GHG producers.

Economists also favor a carbon tax because it provides cost certainty, which facilitates investment planning. In contrast, a cap-and-trade system involves considerable cost uncertainty and variability. For instance, in the European Trading System, the European Union's carbon emissions trading market, the price per ton of CO₂ in 2006 ranged between \$12.12 and \$38.98.

Many economists and other policymakers find the potential for this kind of variability unacceptable. Thus, many proposals for cap-and-trade systems call for safeguards against high and variable emissions prices, popularly referred to as a safety valve. One form of safety valve is a price ceiling maintained by the government through the sale of additional permits. With a low (*i.e.*, binding) price ceiling, the cap-and-trade system functions much like a tax, as firms would be able to pollute as much as they like at the ceiling price. The market price is lower and emissions higher with a safety valve (*see Figure 1*).

A second type of guarantee against price volatility shifts the costs of CO₂ reductions forward in time by allowing firms to borrow against their future allowances. Under such a system, firms are able to pollute more today in return for greater reductions in their emissions tomorrow. In theory, such a system would lower the costs of complying with new GHG regulations (as there would be time to develop new, low-cost pollution-control technologies) while maintaining the integrity of the cap. However, allowing firms to borrow against future allowances may create a time inconsistency problem, as producers of GHGs

might pressure lawmakers later to relax limits on emissions. This would undermine the integrity of the cap.

Political Virtues and Vices

Although a carbon tax has many economic virtues, a tax-based system of controlling GHG emissions is unlikely to be instituted in the United States. Two characteristics of a cap-and-trade system give it an advantage over a tax in national politics. First, a cap-and-trade system avoids direct taxation while still relying on market principles. This makes it attractive to politicians wanting to avoid the stigma of raising taxes. Second, the cap-and-trade system gives supporters of GHG legislation a valuable bargaining chip during legislative negotiations with powerful special interest groups opposed to limits on emissions. The support of these interests and that of reluctant lawmakers may be won with agreements to distribute permits to certain industries for free on the basis of past production—*i.e.*, grandfathering—at least on a temporary basis. This will shift more of the burden of the costs of reducing GHGs to consumers (as the government will lose tax revenues from the sale of permits that could be used to offset the higher costs of carbon-intensive goods or reduce other taxes) but it will not undermine the integrity of the caps or the price of carbon.

In principle, either Congress or the executive branch acting through the Environmental Protection Agency could establish a cap-and-trade system for greenhouse gases. However, the obstacles to a cap-and-trade system are much higher for EPA than for Congress, and for that reason any action is much more likely to come from Capitol Hill. Congress has clear precedent for such a system with the passage of the Clean Air Act Amendment of 1990, which established a successful cap-and-trade system for sulfur dioxide emissions. The path to a carbon cap-and-trade system for the EPA is much murkier because the agency's powers to regulate are not well suited to pollutants like carbon dioxide. By law, the agency must rely on the states or consortia of states to implement national pollution standards. Sections 108-110 of the Clean Air Act give the EPA power to establish national ambient air quality standards (NAAQS), which the states must then comply with through state implementation plans (SIPs). However, because concentrations of GHGs are determined by global outputs, state efforts to meet a standard inevitably would fail. If the states failed to implement the standards, then EPA would have the authority to establish a federal implementation plan that included a cap-and-trade system.⁵ In such a situation, however, the EPA or the president might be reluctant to impose such a system.

Growing Pressure

Recent developments favor the passage of federal legislation regulating GHG emissions soon. Global warming and its eco-

nomic and environmental costs are becoming increasingly self-evident. There is growing public awareness of global warming and rising concern about its effects on the environment and the economy. Concern is much greater among Democratic than Republican voters. According to a recent Economist/YouGov poll, 53 percent of Democrats cite global warming as the greatest environmental problem, whereas just eight percent of Republicans do the same. Many more Democrats are willing to impose taxes to curb GHG emissions as well.⁶

Nevertheless, both parties' presumptive nominees for president support a cap-and-trade system. Many businesses now see profit opportunities in controlling GHGs, whereas before they saw only burdensome regulation.⁷ Also, initiatives by the states to limit GHG emissions and recent federal court rulings that GHG emissions from automobiles can be regulated under the Clean Air Act have increased regulatory uncertainty, putting pressure on the federal government to harmonize state and federal policies. The other major industrialized nations of the world, all of which have limits on GHG emissions, are lobbying the United States to bring its emissions under control as well. Finally, the American Climate Security Act (S 2191)—generally known as Lieberman-Warner—which would limit GHG emissions through a cap-and-trade system, recently passed the U.S. Senate Environment and Public Works Committee. Majority Leader Harry Reid (D-Nev.) recently promised the bill would be considered in the full Senate this summer.

Any federal legislation regulating GHG emissions likely will resemble the 2007 version of Lieberman-Warner or one of the close variants under consideration in the U.S. Senate (*see Table 1*). Sponsored by Senators Joseph Lieberman (I-CT) and John Warner (R-VA), the bill would cover electric power, transportation, and manufacturing carbon sources, which account for about 75 percent of GHG emissions in the United States. The cap would decline over time and require emissions to be four percent below their 2005 levels in 2012, 20 percent below 2005 levels in 2020, and 71 percent below 2005 levels in 2050. Permits sold at auction would rise gradually from 26 percent in 2012 to 70 percent after 2030. The remaining permits would be allocated between states and sectors of the economy according to a formula in the bill. To avoid price uncertainty and variability, the Lieberman-Warner bill would allow firms to increase their emissions in the short run by borrowing against future allocations of permits. The bill also would allow firms to purchase a limited number of carbon offsets in lieu of purchasing permits or reducing their emissions.

The other Senate bills have similar provisions, with modest differences in cap levels, the percentage of permits to be sold at auction, use of offsets, and cost controls. For instance, the Low Carbon Economy Act of 2007 (LCEA), sponsored by Senators Jeff Bingaman (D-NM) and Arlen Specter (R-PA), would insti-

TABLE 1 CAP-AND-TRADE BILLS, 2008

Bill	Coverage	Cap	Allocation	Offsets and other cost controls	Other
Lieberman-Warner "American Climate Security Act"	All six GHGs; mix of upstream (transport fuels and natural gas) and downstream (coal) uses.	% below 2005 levels in year: 4% in 2012; 19% in 2020; 71% in 2050	Auction and sector allocations. % sold at auction rising from 26.5% in 2012 to 69.5% in 2030.	Domestic offsets and borrowing against future allocations.	
Bingaman-Specter Low Carbon Economy Act	All six GHGs; mix of upstream (transport fuels and natural gas) and downstream (coal) uses.	2006 level in 2020; 1990 level in 2030	Auction and sector allocations. % sold at auction rising from 24% in 2012 to 53% in 2030.	\$12/ton price ceiling in 2012 rising 5% annually in real terms.	
Sanders-Boxer Global Warming Pollution Reduction Act	All six GHGs; economy wide; point of regulation not specified.	% below 1990 levels in year: 0% in 2020; 27% in 2030; 80% in 2050	Method of allocation must account for transition assistance and consumer impacts.	Provides for technology indexed stop price.	Cap-and-trade system allowed but not required.
McCain-Lieberman Climate Stewardship and Innovation Act	All six GHGs; mix of upstream (transportation sector) and downstream (electric utilities and other large sources) uses.	% below 1990 levels in year: 0% in 2020; 20% in 2030; 60% in 2050	Allocation determined by administrator accounting, for consumer impacts competition, etc.	Borrow against future allocations with interest; limited use of international credits and domestic offsets.	
Kerry-Snowe Global Warming Reduction Act	All six GHGs; economy wide; point of regulation not specified.	% below 1990 levels in year: 0% in 2020; 62% in 2050	Determined by the President; some allowances must be auctioned.		

ture a cap-and-trade system but require smaller reductions in GHGs than Lieberman-Warner. It also would establish a price ceiling for emissions. The price ceiling would be set at \$12 per metric ton of CO₂e in 2012 and rise steadily thereafter at 5 percent per year in real terms.

GHG-Regulation Scenarios

The probability of passage of federal legislation regulating GHG emissions before the end of 2008 is virtually zero. The Democrats and independents supporting such legislation have a bare majority in the Senate, not enough to overcome a certain Republican filibuster. Also, any legislation passing Congress surely would almost be vetoed by President Bush, and supporters would not have enough votes in the Senate or House to override such a veto. The only possibility of Republican and White House support would be if GHG legislation was viewed as inevitable, and Republicans sought to preempt ambitious reductions in GHGs by supporting a weak and watered-down bill—which Democrats likely would reject.

The probability of a carbon penalty will increase significantly after 2008, however. The enactment of a cap-and-trade system will depend principally on the outcomes of the upcoming presidential and Congressional elections. The most critical variable will be the size of the Democratic and independent majority in the U.S. Senate. If the Democrats and independent can get close to 60 votes (with some support from Republican

moderates), legislation imposing a carbon penalty through a cap-and-trade system is very likely.

Six possible scenarios in Washington, D.C., in January 2009 will determine the path of climate-change legislation. These scenarios correspond to whether the Democrats or Republicans win the White House and whether the Democrats and independents in the Senate obtain a bare majority (less than or equal to 52 votes), a strong majority (53-54 votes), or an effective filibuster-proof majority (55+ votes, assuming moderate Republicans will join Democrats and independents to support GHG legislation) in the November elections. The current political analysis assumes the Democrats will at least maintain their majority in the Senate and will continue to have a majority in the House. It also assumes Democratic senators will support a carbon penalty while Republicans (with a handful of exceptions) will oppose one. This assumption is justified by the strong support of Democratic voters for a carbon penalty and the near party-line vote in the Senate Environment and Public Works Committee on the Lieberman-Warner bill. Reluctant Democrats and moderate Republicans may be persuaded to support GHG legislation with agreements to grandfather permits for certain industries or with promises of additional federal spending using revenues from the sale of pollution permits.

In addition, the remaining Democratic presidential candidates presumably will continue supporting comprehensive GHG legislation. There are few differences between the pro-

TABLE 2 GHG LEGISLATION AFTER 2008

		Size of the Democratic and independent majority in the U.S. Senate in 2009*		
		Bare majority	Strong majority	Filibuster-proof majority
President in 2009	Democrat	No or weak legislation	Weak or moderate	Moderate or strong
	Republican	No legislation	Weak or Moderate	Moderate

*Assumes moderate Republicans will join Democrats and independents to support GHG legislation.

posed GHG policies of Sen. Hillary Clinton and Sen. Barack Obama, according to public statements and platforms. Both propose emissions should be 80 percent below their 1990 levels by 2050, and would auction 100 percent of the permits. On the Republican side, Sen. John McCain also supports federal GHG legislation, but his support is more cautious. He argues the U.S. must act to limit GHGs through a cap-and-trade system, but he favors an allocation method that considers end-use cost consequences.

The prospects for GHG legislation, as well as the specific characteristics of the legislation, will depend on which scenario becomes reality (see Table 2). A cap-and-trade system seems far more likely than a carbon tax, but there are three important dimensions along which GHG legislation could vary. The first is the size of the targeted reductions. The second is whether the legislation contains a safety valve, and how low the price ceiling will be set.⁸ The third is the extent of grandfathering of pollution permits.

The strongest form of GHG legislation would involve high targeted reductions, with a high price ceiling or no ceiling at all, and no grandfathering. The weakest form of GHG legislation would involve low targeted reductions, a low price ceiling, and extensive grandfathering. A moderate form of legislation would involve some grandfathering and either high targeted reductions and a low price ceiling or a high price ceiling and low targeted reductions.

Obviously, for power companies and other carbon producers, strong legislation would be the most costly and weak legislation the least costly. From the standpoint of controlling GHG emissions, strong legislation would have the most effect and weak legislation the least effect, although the grandfathering of permits affects only the distribution of the costs of pollution control.

With a filibuster-proof Democratic majority, supporters of strict limits on GHG emissions will be in a position to pass either a moderate or strong form of legislation. Supporters may not have to compromise along either dimension affecting the level of the cap (allowable emissions and the safety-valve price), but the political influence of carbon producers and their ability to weaken any targets and shift the costs of compliance to others should not be underestimated. With just a strong majority in the Senate, supporters probably will have to compromise along at least one dimension to win sufficient Republican sup-

FIG. 1

CAP-AND-TRADE SYSTEMS

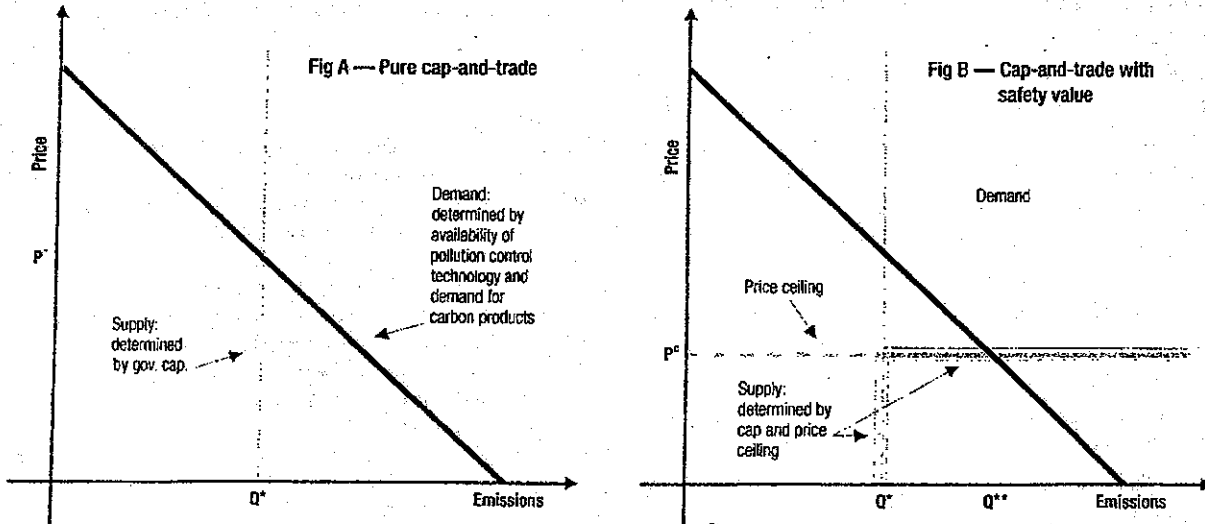


Figure A shows the quantity and market price of emissions when the government establishes a pure cap-and-trade system. The market price P^* is determined by the intersection of demand and supply. Emissions equal Q^* the emissions set under the cap. Figure B shows the quantity and market price of emissions when the government establishes a cap-and-trade system with a price ceiling. The price ceiling PC is binding and the supply curve becomes the heavily shaded rotated "L." The market price is PC and emissions are $Q^{**} > Q^*$. The price ceiling has the effect of lowering the price of, and raising the amount of, emissions. For a given cap, the effect of a binding price ceiling on emissions will depend upon the price elasticity of demand for emissions.

port. They may have to compromise further if a Republican is president. With a bare majority, supporters can probably hope for no more than weak legislation even if a Democrat is in the White House. In that scenario, Republicans will be able to filibuster any bill. With a Republican president and only a bare majority, the chance of passing comprehensive GHG legislation falls further.

Climate Predictions

Will the Democrats increase their control in the Senate, and who will occupy the White House? As this election cycle demonstrates, predicting election outcomes is no easy task. The task is complicated by interdependence between the U.S. Senate and presidential races. One political analysis suggests the Democratic Party stands a better chance of winning a strong or filibuster-proof majority if

Obama is the party's nominee for president. The reason is a Clinton nomination would mobilize many Republican voters who would otherwise be apathetic and unlikely to come to the polls—which would have a negative effect on Democratic candidates in close Senate races, reducing the party's chances of winning a strong or filibuster-proof majority.

Nevertheless, the Democratic Party has a strong chance of increasing its Senate majority. Of the Senate seats up for election, 23 are held by Republicans and 12 by Democrats. All 12 Democratic candidates are incumbents, and only Mary Landrieu (LA) and Tim Johnson (SD) are considered vulnerable. In contrast, four incumbent Republicans are retiring from the Senate, and seats currently held by Republicans in Colorado, Minnesota, New Mexico and Virginia are considered vulnerable. The state of the economy and the course of the Iraq war will help to determine the extent of Democratic gains.

The best information about the likely party nominees for president and the outcomes of the primary and general elections comes from recent polls and primary outcomes as well as from political futures markets—including Intrade and the Iowa Electronic Markets (IEM). On the Democratic side, the data suggest Obama will be the nominee—although at this writing the race still was contested. On the Republican side, McCain will be the nominee.

Guessing the outcome of the general election is a hazardous endeavor, but the political futures markets expect a Democratic

candidate will win. At press time, an IEC contract that will pay one dollar in the event a Democrat is elected to the White House costs 53.3 cents, and a contract that pays one dollar in the event a Republican is nominated costs 41.9 cents.

HANDICAPPING GHG REGULATION

Although the full Senate will consider the Lieberman-Warner bill (the American Climate Security Act) in the summer of 2008, there is little probability of legislation limiting greenhouse gas (GHG) emissions being passed before President Bush leaves office. After that, the probability of comprehensive GHG legislation being passed in 2009 or 2010 will increase significantly if the Democratic Party and independents increase the size of their majority in the U.S. Senate. Moreover:

- Regulation of greenhouse gases will come from the U.S. Congress and not the executive branch acting through the EPA.
- If legislation is enacted, controls of GHG emissions will take the form of a cap-and-trade system.
- The costs of a cap-and-trade system for carbon producers will be small initially because of modest caps on emissions, price ceilings for permits, and the grandfathering of permits.—JIS and MSK

Given current trends in the U.S. political climate, comprehensive federal regulation of GHG emissions likely will be enacted after the 2008 elections. Odds favor the Democratic Party winning the White House and making modest gains in the U.S. Senate. A weak economy could postpone passage of GHG legislation for a year, but the political winds seem likely to drive Congress to enact a cap-and-trade system that will impose moderate costs on carbon producers. It likely will have a modest cap, a low safety-valve price, and significant initial grandfathering of permits.

Such a compromise will allow proponents of GHG regulation to

navigate the treacherous political waters of Washington, D.C., and also will give carbon producers time to develop new technologies to control their carbon emissions before regulation becomes more stringent and the price of carbon emissions rises. ■

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Endnotes

1. The statutory incidence of the tax, that is, who pays the tax (e.g., the producers of the carbon fuel, intermediate users, or consumers) usually depends on the costs of administering the tax. The economic incidence (who bears the costs) is more important and depends upon the price elasticity of demand and supply of carbon-based products.
2. Nordhaus, William, *The Challenge of Global Warming: Economic Models and Environmental Policy*. Yale University Economics Department working paper, 2007, available at http://nordhaus.econ.yale.edu/dice_nss_072407_all.pdf
3. *Fourth Assessment Report, Climate Change 2007: Synthesis Report*, p. 18, U.N. Intergovernmental Panel on Climate Change.
4. *The Economist*, May 31, 2007.
5. Wiener, Jonathan B., (forthcoming), "Think Globally, Act Globally: The Limits of Local Climate Policies," *University of Pennsylvania Law Review*.
6. *The Economist*, May 31, 2007.
7. *Ibid.*
8. For a given cap, the effect of a binding price ceiling on the amount of emissions will depend upon the price elasticity of demand. Highly elastic demand for emissions will result in a large increase in the quantity of emissions (see *Figure 1*).