WORLD RESOURCES INSTITUTE

Submission to the U.S. House of Representatives Committee on Energy and Commerce Climate Conference

Responses to Questions on Options for U.S. Climate Policy Design and Implementation

March 19, 2007

1. **Please outline which issues should be addressed in the Committee's legislation, how you think they should be resolved, and your recommended timetable for Congressional consideration and enactment. For any policy recommendations, please address the impacts you believe the relevant policy would have on:**
    a. **emissions of greenhouse gases and the rate and consequences of climate change; and**
    b. **the effects on the U.S. economy, consumer prices, and jobs.**

Addressing global climate change is a paramount challenge of the 21st century. The United States is facing a defining moment: we must rapidly enact national legislation to slow, stop and reverse the growth of greenhouse gas (GHG) emissions over the shortest period of time reasonably achievable.

We believe U.S. climate legislation must:

- Account for the global dimensions of climate change and bring the US back into a position of constructive leadership in the international community's efforts to tackle climate change;
- Recognize the importance of technology and catalyze innovation to accelerate the development and deployment of new technologies for a low-carbon economy, and the capture and storage of GHG emissions;
- Be environmentally effective by ensuring that mandatory requirements and incentives must be stringent enough to achieve necessary emissions reductions within timeframes that prevent an unacceptable level of GHG concentrations and climate change. We must start a program in the near-term that captures short-range reduction opportunities, puts us on the path to stabilizing concentrations, and preserves our options to avoid an unacceptable level of climate change in the future.
- Create economic opportunity and advantage; addressing climate change must be achieved in a highly cost-effective manner that allows for economic growth in both the developed world and emerging economies. Climate and energy policy can drive improved efficiency to make the U.S. more competitive, provide support for new, clean technology solutions, and create new jobs.
- Fairly reach the whole economy so that no single sector, region, or group of consumers bear an unfair burden and all participate in the shift to a clean, low carbon energy future.
- Encourage early action and reward investments that lower emissions today. There is no time to lose.

A U.S. policy framework must include:

- Mandatory programs to reduce greenhouse gas emissions from the major emitting sectors including emissions from large stationary sources, transportation, and energy use in commercial and residential buildings that could be phased in over time, with attention to near-, mid-and long-term time horizons (5,10, 15 and 40 year goals see WRI response to question 2f);

- Flexible approaches to establish a price signal for carbon that may vary by economic sector and could include: market-based incentives; performance standards; cap-and-trade; tax reform; incentives for technology research, development, and deployment; and

- Incentives to encourage actions by other countries, including large emitting economies in the developing world, to implement GHG emission reduction strategies.

Cap and Trade is Essential. Our environmental goal and economic objectives can best be accomplished through an economy-wide, market-driven approach that includes a cap and trade program that places specified limits on GHG emissions. This approach will ensure emission reduction targets will be met while simultaneously generating a price signal resulting in market incentives that stimulate investment and innovation in the technologies that will be necessary to achieve our environmental goal. The U.S. climate protection program should create a domestic market that will establish a uniform price for GHG emissions for all sectors and should promote the creation of a global market.

There needs to be a comprehensive policy approach. Within that comprehensive program, there are specific actions Congress can enact today that will underpin the comprehensive cap and trade program. Legislation should require the following programs to be implemented on a fast track while a cap and trade program is put in place: the establishment of a GHG inventory and registry; credit for early action; aggressive technology research and development; and policies that discourage new investments in high-emitting facilities and accelerate deployment of zero and low-emitting technologies and energy efficiency. We recommend these fast track actions begin within one year of enactment.

For any policy recommendations, please address the impacts you believe the relevant policy would have on:

a. emissions of greenhouse gases and the rate and consequences of climate change; and

Climate stabilization requires immediate action and sustained effort over several decades. Mandatory requirements and incentives must be stringent enough to achieve necessary emissions reductions within timeframes that prevent an unacceptable level of GHG concentrations and climate change. We must start a program in the near-term that captures short-range reduction opportunities, puts us on the path to stabilizing concentrations, and preserves our options to avoid an unacceptable level of climate change in the future.

U.S. legislation should be designed to achieve the goal of limiting global atmospheric GHG concentrations to a level that minimizes large-scale adverse climate change impacts to human populations and the natural environment, which will require global GHG concentrations to be stabilized over the long-term at a carbon dioxide equivalent level between 450–550 parts per million.

The US share of such an effort should be commensurate with both our capacity and historic responsibility for global emissions. A goal of a safe and secure climate can be met if the US is on a path, by 2050, to reduce emissions by 60-80 percent below current levels. In the near term, this means emissions would need to be capped at no more than 5 percent above today's levels within five years; returned to today's levels (or below) within ten years, and reduced 10 to 30 percent below today's levels within fifteen years.

b. the effects on the U.S. economy, consumer prices, and jobs.

While achieving our environmental goal will require a fundamental transformation of the energy system over the long-term, we cannot predict with accuracy all technological developments between now and 2100. For these reasons, legislation should focus on what we know can be achieved cost-effectively over the next twenty to thirty years while putting us on a trajectory for deeper emission reductions by mid-century.

The cost of meeting our environmental goals need not be too high. Historically, we have demonstrated that a clear price signal, harnessing the power of the market, can lead to compliance at modest costs. This is borne in our successful implementation of the SO_2 and NOx programs in the United State: in spite of initial expectations that these programs would create enormous financial burdens for the electric industry, full environmental compliance has been found to have little if any impact on industry profitability.

It is likely that similar expressions of concern about GHG management are also overstated. The numbers suggest a relatively modest impact. Currently, the share of energy in the U.S. economy is roughly 7% of GDP – making it unlikely that we will see double-digit losses and much more likely that while some actors and sectors will be affected, others are likely to prosper, offsetting any costs. The legitimate concerns of individual sectors of our economy should not foreclose policy leadership.

Conversely, the costs of inaction are significant. The recently published Stern Report[1] estimates that the cost of ***not acting*** would be a reduction in GDP of 5% annually (compared to what it would have been) and that alone, extreme weather events due to climate change could reduce global gross domestic product by 1%.

[1] Stern Review: Economics of Climate Change, 2006

According to both the Intergovernmental Panel on Climate Change (IPCC) [2] and Stern, limiting world average temperature increases to 2 degrees Celsius, requires stabilizing global emissions within the next 20-25 years – and decreasing emissions 1-3% annually thereafter. The cost associated with this goal is estimated by the Stern Report to be a reduction of 1% of global GDP.[3]

The costs associated with a $10/tonne price for CO_2 would correspond to approximately a 4% increase in consumer prices for heating and transport fuels (see Box 1). Consumers would only pay an additional $0.09 per gallon of gasoline. The biggest price impact would be on electricity – which could be offset to some degree by energy efficiency and increased renewable energy use.[4]

Box 1: Stabilizing CO2 concentrations alters the relative cost of fossil fuels: impact of $10/tonne C on fuel prices

	Base Cost Fuel ($2004)	Added Cost ($)	Added Cost (%)
Utility Coal ($/short ton)	$27.30	$19.05	70%
Pipeline Natural Gas ($/mgf)	$10.74	$0.55	5%
Crude Oil ($/barrel)	$36.77	$4.33	12%
Heating Oil ($/gal)	$1.52	$0.10	7%
Regular Gasoline ($/gal)	$2.39 *	$0.09	4%

Source: WRI adapted and updated from Bradley, et al 1991.

* US average prices for the 4th quarter of 2005 as reported by US DOE, EIA, Short-Term Energy and Winter Fuels Outlook October 10th, 2006 Release

[2] IPCC (2001). *Climate Change 2001: Synthesis Report*, UK: Cambridge University Press.
[3] The Stern report has come under criticism for using a near-zero discount rate (more specifically, a component of the discount rate reflecting society's "pure rate of time preference") to evaluate the potential damages from unmitigated climate change. See, for example, Nordhaus, W., 2006. 'The Stern Review on the Economics of Climate Change' - comment, Yale University. Low discount rates are not, however, a concern related to the report's cited estimates of the cost of reducing emissions, which are estimated at one percent of GDP, plus or minus three percent.
[4] WRI adapted and updated from Bradley, et al 1991

While the debate has centered on the potential costs, models have shown that with international trading and an energy efficient economy, the U.S. and global economy could benefit – even as a carbon price is implemented. The IEA's World Energy Outlook 2006 reinforces this view: in their "Alternative Policy Scenario" in which global emissions are reduced by more than 15% below the reference case, energy savings are more than $3 trillion. [5]

The potential for profit has been well understood by some companies – which are betting that they can improve their product offerings to capture the business value of providing low-carbon products and services. Climate policy can be an investment in American competitiveness. Venture capitalist John Doerr recently stated that green technology is "the largest economic opportunity of the 21st century." [6]

Each year we delay action to control emissions increases the risk of unavoidable consequences that could necessitate even steeper reductions in the future, at potentially greater economic cost and social disruption. Action sooner rather than later preserves valuable response options, narrows the uncertainties associated with changes to the climate, and should lower the costs of mitigation and adaptation.

[5] IEA, *World Energy Outlook*, 2006
[6] Associated Press April 12, 2006

2. **One particular policy option that has received a substantial amount of attention and analysis is "cap-and-trade." Please answer the following questions regarding the potential enactment of a cap-and-trade policy:**

    a. **Which sectors should it cover? Should some sectors be phased in over time?**

    NOTE: Sectoral coverage and the upstream or downstream application of a cap-and-trade program (question 2(c)) are closely related, so the discussion presented here addresses both issues.

Our environmental goal and economic objectives can best be accomplished through an economy-wide, market-driven approach that includes a cap and trade program that places specified limits on GHG emissions. This approach will ensure emission reduction targets will be met while simultaneously generating a price signal resulting in market incentives that stimulates investment and innovation in the technologies that will be necessary to achieve our environmental goal. The U.S. climate protection program should create a domestic market that will establish a uniform price for GHG emissions for all sectors and should promote the creation of a global market.

A cap and trade program should cover as much of the economy's GHG emissions as is politically and administratively possible. We believe there are two potentially effective approaches to achieving these objectives:

- An "upstream" program that requires fossil fuel producers (or shippers in the case of natural gas) to be covered by allowances that equal the emissions released when the fuel is combusted, thereby adding the cost of the emission reduction allowance to the price of the fuel; OR
- A "hybrid" program that includes a downstream cap applied to GHG emissions from large stationary sources (e.g., covering 80% of the emissions from the fewest possible number of sources) combined with an upstream cap or another policy tool applied to the carbon content of fossil fuels used by remaining sources.

The development of other cap-and-trade programs suggests the following:

- Political considerations have as much to do with program design (including sectoral coverage) as technical- or efficiency-based considerations.

- While upstream application of a trading system offers potential advantages in terms of efficiency and broad coverage of sectors, in practice its similarity to a carbon tax has prevented its use among existing market-based systems. An upstream system raises prices for every fossil fuel user indiscriminately. In effect, the upstream approach is a carbon tax for which the value will be variable and unknown in advance. While there are sound reasons for implementing an upstream point of regulation (or a carbon tax, for that matter), the political sensitivities are critical to implementation.

- To date, all existing or planned systems have rejected the upstream point of regulation in favor of a system that is downstream, modest in its initial coverage, and with plans to expand over time. Also, a downstream approach places direct responsibility for monitoring, reporting and trading emissions in the hands of those best-placed to reduce emissions. The downstream approach is favored among existing systems for several reasons, including the desire for simplicity at the outset, and for narrow coverage of sectors and gases. Sectoral coverage is notably similar among systems around the world and centers on the power sector and (in most cases) heavy industry.

- Existing downstream systems have an explicit aim to expand beyond the electricity sector and become more inclusive over time. This is likely based on two factors: (1) recognition that narrow coverage is inadequate to address the magnitude of the problem, and (2) additional sectors and gases in a market-based system increase the opportunities to reduce emissions and therefore are likely to decrease the overall costs. Greenhouse gas emission trading systems have also tended to be implemented as one component of a broader set of policies and measures to reduce emissions in other sectors.

To evaluate the options for sectoral coverage and point of regulation in a mandatory market-based system, it is important to consider the magnitude and timing of the reductions that are required in GHG emissions. To mitigate the risk of dangerous climate change and avoid the worst physical and economic impacts, policies are needed to drive significant near-term reductions in emissions on an absolute basis and achieve long-term stabilization of atmospheric GHG concentrations.[7] For the U.S., this challenge implies that economy-wide emissions will need to peak and begin declining on an absolute basis within the next 10 years.[8] In addition, the U.S. will need to use its economic strength and technological capabilities to develop and export clean energy technologies globally.

In light of the urgency and stringency required in a U.S. program to address climate change, a mandatory market-based system for GHG regulation is one of the best policies to reign in emissions quickly and at least cost. Taking into consideration the challenge of making deep reductions in U.S. emissions, an economy-wide approach is not only

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[7] See, e.g., O'Neill, B. C., and M. Oppenheimer. 2002. Climate Change—Dangerous Climate Impacts and the Kyoto Protocol. *Science* 296(5575): 1971–72. Hasselmann, K. et al. 2003. The Challenge of Long-term Climate Change. *Science* 302: 1923-1925.

[8] This figure is derived from a WRI estimate built on modeling analyses and assumptions in: den Elzen, M.G.J. and M. Meinshausen. 2005. Meeting the EU 2^{o}C climate target: global and regional emissions implications. Bilthoven, The Netherlands: Netherlands Environmental Assessment Agency. Key assumptions include: (1) 550 PPM global stabilization (for all gases); (2) developing country emissions continue to rise beyond 2050; (3) continued globalization with dependence on fossil fuels, but optimistic assumptions on technology for GHG abatement potential and costs (more optimistic than a medium-level emissions scenario by IPCC SRES); and (4) "multi-stage" policy adoption involving gradual increase in binding targets for industrialized countries and 3 stages of policy adoption by developing countries (no commitment, then intensity targets, then absolute).

preferred but ultimately almost certainly required. This is not to say, however, that a single market-based emissions trading system must achieve economy-wide coverage by itself. To the contrary, given that all policy options must be "on the table" to deal with climate change, the salient question is not about market-based systems *per se* but rather the role that market-based systems should play in a suite of federal policies designed to reduce emissions. The full suite of policies may include fiscal measures, regulatory instruments, voluntary agreements, and research, development and deployment (RD&D)[9].

As shown in Figure 1,[10] the variety and complexity of GHG emissions across the U.S. economy suggests that an approach based on multiple policy tools may be attractive – and likely necessary. The overwhelming share (87 percent) of U.S. emissions comes from the combustion and processing of fossil fuels. Over 60 percent of U.S. emissions come from two sectors, transportation and electricity and heat. The middle portion of Figure 1 divides emissions according to use or activity, tracking the "downstream" points in the emissions life-cycle. The right side of Figure 1 divides emissions by gas. Carbon dioxide (CO2) accounts for 85 percent of U.S. GHG emissions.

If Congress seeks to make a mandatory market-based system as far-reaching as possible and construct an economy-wide approach, then the upstream point of regulation (dealing with coal, oil and natural gas producers and suppliers) is the clear choice. A pure upstream system has never been implemented, but the theoretical advantages include:

- A price signal that would be recognized in every economic sector, which in turn could drive the most emissions reductions at the least cost.
- Avoidance of sector-specific rules and associated administrative requirements.
- Coverage of sectors that are difficult to address in a downstream system, especially transportation.

[9] For example, in an effort to achieve the necessary economy-wide emissions reductions, a U.S. response could include: a cap-and-trade program for large downstream emitters; an aggressive RD&D "Manhattan project" for clean energy technologies; negotiated voluntary agreements with key commercial sectors; improved automobile efficiency standards, improved urban planning and a gasoline tax to reduce emissions in the transportation sector; changes in trade agreements to improve the import and export of clean energy fuels and technologies; and strengthening of international agreements on climate change.

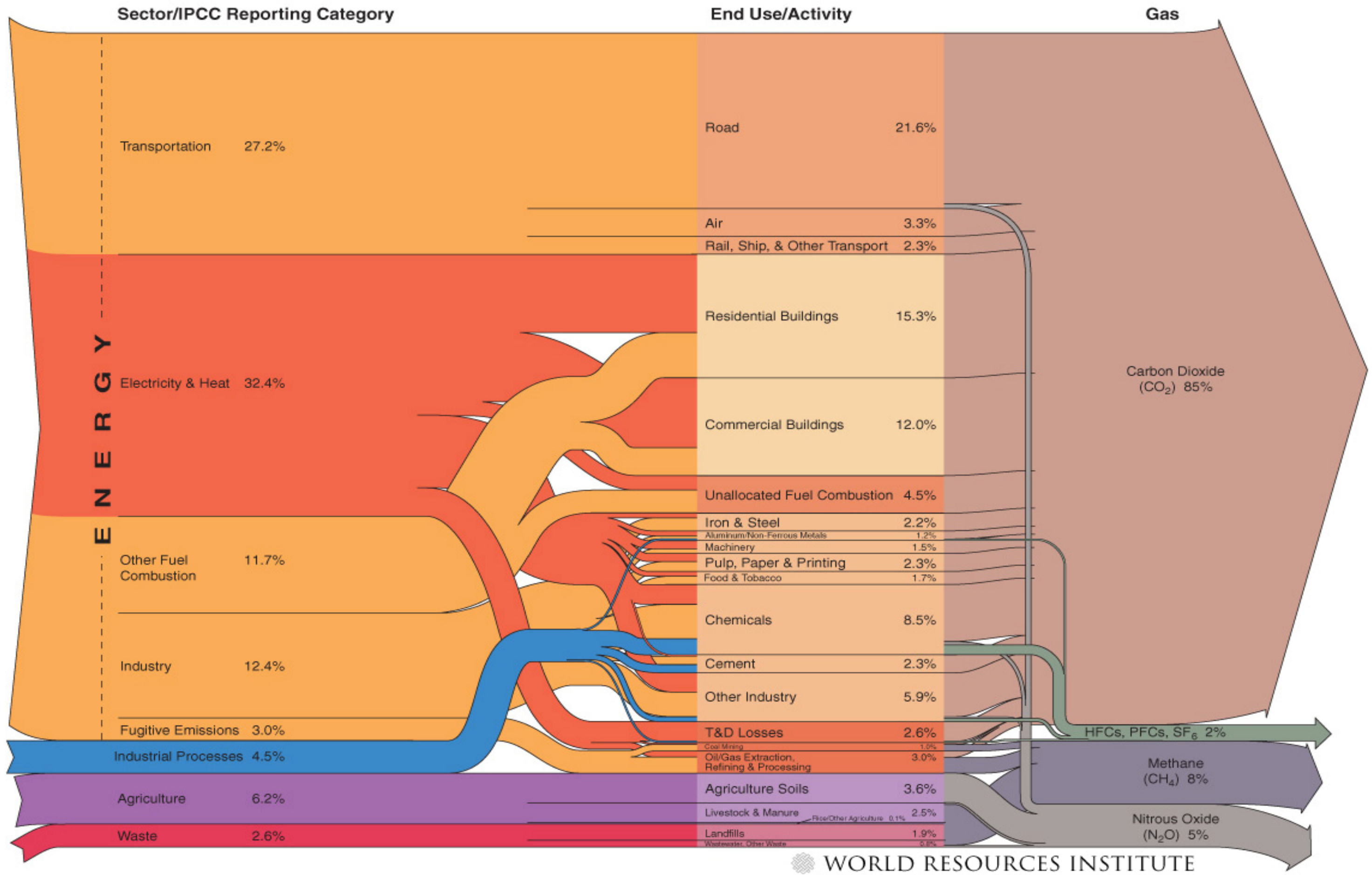
[10] Figure 1 provides a comprehensive overview of U.S. GHG emissions, their composition, and the sectors and activities from which they derive. The left side of the figure shows emissions by *sector*, using definitions from the IPCC. IPCC sectors are analogous to those commonly used by the U.S. Energy Information Administration and Environmental Protection Agency (residential, commercial, industrial and transportation), but there are important differences. Heat under the "Electricity and Heat" sector refers to heat plants that generate heat distributed for use by other sectors as opposed to heat generated on-site to heat buildings or for manufacturing. In the U.S., the heat generation component accounts for less than 5 percent of the sector total. Industrial emissions are separated into combustion-related emissions (under Energy) and process emissions. The latter refer to emissions from the manufacturing processes of various materials, as opposed to the energy used to produce those materials. For example, in the cement industry, carbon dioxide emissions result both from chemical reactions arising from clinker production and energy use at several stages in the production process.

An upstream system means that most operators in the economy, whether companies or individuals, do not directly participate in trading. Rather, most "downstream" entities are affected by the system through increases in energy prices, as the cost of allowances is passed through to them by energy producers and suppliers. Since fuel suppliers themselves do not have direct control over most emission abatement options (a coal supplier cannot switch fuels, improve end use efficiency, etc.), the real actors in emission abatement are given a price signal. In this respect, an upstream system closely resembles a carbon tax for much of the economy.

In comparison, a downstream market-based system places emission monitoring, reporting and trading squarely in the hands of the people who are closest to the decisions on cutting emissions (e.g., plant operators). This approach is widely familiar in the U.S. and elsewhere and has been used for both sulfur dioxide (SO2) and nitrogen oxide (NOx) emissions trading, with considerable success. However, a downstream system would not capture some sectors, most notably transport, which accounted for 27 percent of U.S. GHG emissions in 2003, and would therefore have to be part of a broader set of climate policies to address the problem adequately. Downstream application may allow for better coordination of a market-based system with other existing or planned regulations and policies affecting GHGs.

To better understand the implications of using upstream versus downstream regulation, the experience of other GHG emissions trading systems is instructive. In the following section we present four general observations of existing systems.

Figure 1: U.S. Greenhouse Gas Emissions Flow Chart



Sources & Notes: Created by World Resources Institute using data from the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2003,* U.S. EPA (using the CRF document). Allocations from "Electricity & Heat" and "Industry" to end uses are WRI estimates based on energy use data from the International Energy Agency (IEA, 2005). All data is for 2003. All calculations are based on CO2 equivalents, using 100-year global warming potentials from the IPCC (1996), based on total U.S. emissions of 6,978 MtCO2 equivalent. Emissions from fuels in international bunkers are included under Transportation. Emissions from solvents are included under Industrial Processes. Emissions and sinks from land use change and forestry (LUCF), which account for a sink of 821.6 MtCO2 equivalent, and flows less than 0.1 percent of total emissions are not shown. For detailed descriptions of sector and end use/activity definitions, see *Navigating the Numbers: Greenhouse Gas Data and International Climate Policy* (WRI, 2005).

<u>General observations from other GHG systems</u>:

1. All downstream

It is striking that all examples of existing or past emissions trading systems for GHGs apply downstream; the same is also true for the Regional Greenhouse Gas Initiative (RGGI) now in its final design stages in the northeast U.S. The primary reasons for this seem to be those outlined above: alignment of incentives with actors and a belief that sectors such as transport are best addressed by other measures.

In the case of the European Union Emissions Trading System (EU ETS), a downstream application was selected for three reasons – one economic, and two political:

- On the economic front, it was felt that downstream application would give greater incentives to plant managers to deal with emissions creatively than a simple energy price increase through an upstream system.
- As noted above, an upstream system is fiscally equivalent to a carbon tax, and could have been presented as a fiscal measure. In the EU, fiscal legislation needs to be approved unanimously by the member states, while environmental legislation can be passed with a majority vote. Placing the application downstream to industrial installations kept the proposal in the realm of environmental policy.
- In the EU, transport fuels are already heavily taxed, and in 2000 surging fuel prices had caused concern in European countries. Since an upstream emission trading system applies an effective fuel tax at a level not known in advance, this was regarded as too politically risky.

The RGGI program is following a similar approach. Simplicity and the desire to move forward incrementally informed this choice. RGGI state negotiators focused the point of regulation downstream, specifically on electricity generators. Downstream regulation was familiar to RGGI states since they had experience with market-based systems to control conventional pollutants, including the U.S. Acid Rain Program, the Ozone Transport Commission (OTC) NOx Budget Trading Program and the NOx State Implementation Plan (SIP) Call program.

2. Sectoral coverage and the value of simplicity

In terms of sectoral coverage, there is considerable similarity between existing systems – each focuses on large point sources of emissions. In each case the aim was to keep the system as simple and manageable as possible in the early stages.

For example, the European Commission’s primary concern was to limit the complexity of the EU ETS in its early stages. The Commission therefore focused on heavy industry sectors that covered the largest amount of emissions from a limited number of installations. Sector coverage includes power generation, cement, lime, iron and steel, ceramics, paper and pulp, and glass manufacture. Together, these sectors account for roughly 50 percent of EU CO_2 emissions, from around 12,000 installations. At present, it covers only CO_2 emissions, but it aspires to cover other sectors and gases through expansions over time. The inclusion of power generation means that, in effect, many other sectors are affected by the system. For instance, the majority of emissions associated with aluminum and many chemical processes derive from their use of electricity. The most controversial omission was the chemical sector. The Commission argued that the sector accounted for only 1 percent of EU direct CO2 emissions but some 30,000 installations, and excluded it from initial trading phases on the grounds of simplicity. In practice, large chemical installations tend to be covered as they have large on-site boilers or generators that are regulated.

RGGI is designed to cap and reduce CO2 emissions from the electricity generation sector. In designing the program, a primary goal was to keep the initial program simple and attainable. To this end RGGI only regulates CO2 emissions from electricity generators with a nameplate capacity of at least 25 MW. There were two reasons for this. First, approximately 85% of electric power generating units in the region are equipped with continuous emissions monitors (CEMs) that report CO2 emission data to the EPA through the Acid Rain Program. Thus, the monitoring infrastructure was already in place, whereas most industrial sources are not equipped with CEMs. Second, the number of electric generation units (700 region-wide) is manageable and accounts for nearly 20% of the region's total emissions. Adding industrial sources would have added monitoring complication while covering at most an additional 8.8% of regional emissions.[11]

The inclusion of electricity generating units with a nameplate capacity as low as 15 MW was considered but was rejected as most smaller units are not equipped with CEMs and would have covered a small amount of additional CO2 sources. The transportation sector, the largest source (35.4%) of regional emissions, was left out of RGGI and is instead being addressed through adoption of GHG vehicle emissions standards being developed by California.

3. Expansion to other sectors

While all the systems examined here have initially tried to limit sectoral coverage, all have been explicit in stating the intention to gradually expand this scope.

The EU ETS allows individual countries to "opt-in" other sectors, subject to certain criteria. It also explicitly promises in subsequent commitment periods to expand the system. Proposals currently being examined include CO2 emissions from aviation and non-CO_2 gases in industry applications. In addition it allows access to the Kyoto project mechanisms: Joint Implementation and the Clean Development Mechanism. These allow projects in developing countries that can cover six GHGs and all emitting sectors, as well as afforestation and reforestation projects.

RGGI plans to start its trading program with one sector and one gas, but clearly spells out its interest in expanding the system to other sectors and gases over time. RGGI does affect other gases and sectors at the outset through an offsets program, including agriculture, natural gas distribution, and energy end-use in commercial/residential sectors. Furthermore, RGGI may add additional offset categories over time.

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[11] Climate Analysis Indicators Tool-US (CAIT US). 2006. Washington, DC: World Resources Institute. http://cait.wri.org

In both cases of the EU ETS and RGGI, the desire to expand appears to be rooted in two factors: (1) recognition that the limited scope of coverage at the outset is inadequate to addressing the magnitude of the problem, and (2) additional sectors and gases in a market-based system increase the opportunities to reduce emissions and therefore are likely to decrease overall costs.

4. Treatment of electricity

There is a notable similarity in approach between existing cap-and-trade programs in terms of the preference for downstream application, the sectoral coverage, and the tendency to start simple rather than all-inclusive. However, one crucial way in which programs have differed is in their treatment of electricity. As the power sector is invariably the largest sector in these systems, this is important.

In the EU ETS and RGGI, electricity generators are formally covered by the system (i.e. the generators have targets and surrender allowances). This could be characterized as a "midstream" approach. in contrast, the United Kingdom emissions trading system took a radically different approach that excluded power companies themselves from the trading system by covering electricity-related emissions further downstream.

The UK pioneered a downstream carbon trading system at a national level, but did so in an environment of specific political constraints that particularly shaped the treatment of electricity. The UK's power sector was not formally covered, i.e. power generators were not responsible for limiting their emissions or for holding or trading allowances. Rather, industrial (but not residential or commercial) consumers of electricity were responsible for the emissions associated with their electricity supply. This was calculated on the basis of a standard national emission factor per kilowatt-hour of electricity.

The effect of this was that electricity users had an increased incentive to reduce their consumption but the incentive for power companies to switch fuels was removed. The reasons for this were twofold:

- "Fuel poverty" – concerns over the impact of energy prices on the poor – was a major political issue at the time, and this approach prevented price impacts on residential consumers.
- The UK had seen dramatic switch from coal to gas for two decades, and the dramatic shrinking of its coal industry. The government did not want to exacerbate that effect.

When the EU developed its trading system, the UK model was not incorporated into the design. Incentives placed upstream (to power producers) are leading to changes in behavior from both power companies and end-use consumers. Separate programs have been introduced to limit the impact on the poor associated with rising electricity prices.

Implications for a U.S. federal system

In brief, existing experience with mandatory market-based systems implies that political considerations have as much to do with program design as technical- or efficiency-based considerations. All existing or planned systems have rejected the upstream point of regulation in favor of a system that is downstream and modest in its initial sectoral coverage, but with plans to expand over time.

b. To what degree should the details be set in statute by Congress or delegated to another entity?

Different emissions trading programs have coped with this issue differently. Congress has a choice of developing the full details of the program (as in the case of the SO2 trading regime), setting general guidelines and providing for an administrative entity to develop detailed rules (as in the case of the EU trading System), or creating a "model rule" and allowing states to develop their own programs (as in the case of the Northeast Regional GHG Initiative, RGGI). In all cases, the program is implemented and overseen by an executive agency rather than by the legislature. Given the complexity of a trading system (likely to affect multiple sectors of the economy and have thousands of entities engaged), it may be more feasible for Congress to set broad goals and program criteria, and allow an Administrative entity to develop detailed design elements.

US SO2 Program. Determined to address the problem of acid deposition, Congress adopted a new Title IV in its1990 Amendments to the Clean Air Act[12]. This amendment provided details on the operation of the US SO2 emissions trading program. While it left the operation of the program to EPA, it listed in detail the allocation of allowances, and provided rules on the trading of permits. I also developed detailed guidance to EPA on monitoring, inventorying and reporting of emissions. In particular, Title IV:

- Set a total cap on emissions
- Specified the size of the plants that would be listed (including details on how to treat upgrades of plants as well as plant retirements)
- Provided specific rules for allocating allowances (allocating to sources for free, based on historic emissions, and in some cases creating special exemptions for specific units),
- Called on the EPA to establish a registry, as well as to set rules for monitoring, reporting, and verifying emissions
- Established penalties for non-compliance.
- Designated the EPA as the administrator of the program

If Congress chooses this model, it must be prepared to consider allocating to more than 10,000 different entities (assuming that it seeks to address all sources larger than 25 MW electricity or 25MMTC/year CO2 emissions). It may do this through the setting of general rules or standards, or by assigning the allocation process to an Executive Agency.

EU Emissions trading System (EU-ETS). Given the need to enact policies in light of the Kyoto targets (itself the product of a political negotiation through an international treaty process), the development of the EU-ETS was politically agreed in principle by the EU Council of

[12] See: http://www.epa.gov/airmarkets/progsregs/arp/docs/title4.pdf

Environment Ministers in December 2002. The caps for each country were not agreed as part of the negotiation of the EU ETS; these were the subject of a separate negotiation among ministers. The trading system was developed through an iterative process between the European Commission (which developed a set of recommendations - Directive 2003/87/EC), the European Parliament, and the Council of Ministers. The system was formally adopted by the Council of Ministers on 13 October 2003[13]. The directive framed elements of the trading program, but left considerable latitude to the EU member states for implementation and specific decisions. The Directive:

- Listed which greenhouse gases, and which sectors of the economy were eligible for inclusion;
- Provided general guidelines for allocation (although it left the specific allocation plans to the national governments, it required that at least 95% of the allowances be distributed free of charge in the first period);
- Called on the EC to set guidelines for establishing registries, as well as for monitoring, reporting, and verifying emissions;
- Required EU countries to establish penalties for non-compliance and set general criteria for effectiveness for these;
- Designated the EC as the general administrator for the EU program;
- Allowed for links to other countries that had adopted the Kyoto Protocol, but left the EC to draw up any necessary agreement to implement this agreement; and
- Subsequently adopted a second directive allowing "offsets" to be used to comply with a share of the commitments under the ETS.

The EC has since served as the technical arm to develop the detailed rules required to implement the agreement. It has also reviewed national allocations plans (although objections to reviews have been lodged with the Council, which, so far, has largely backed EC decisions.

If Congress chooses to adopt this model, it may assign responsibility to EPA to develop detailed rules. Alternatively, it may provide considerable latitude to the states to allocate permits, perhaps setting EPA as an adjudicator with authority to assess state performance based on congressionally mandated standards.

Regional GHG Initiative (RGGI). In this program, a general design framework was agreed by the States (in the form of a Memorandum of Understanding[14]), followed by agreement on a "Draft Model Rule[15]" that serves as a template for each state as it develops and adopts its own state rules. States retain sovereignty to address and control emissions, but the agreed template creates common standards and harmonizes interstate trading. In combination, the MOU and Model Rule:

- Set specific emissions caps for each state;
- List which greenhouse gases may be traded (initially CO2 from power plants; other gases only through the offset program);

[13] See http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32003L0087:EN:HTML for the full text of Title IV
[14] See http://www.rggi.org/docs/mou_12_20_05.pdf for the full text of the MOU
[15] See http://www.rggi.org/docs/model_rule_corrected_1_5_07.pdf for the full text of the Model Rule.

- Which sectors of the economy to include (initially power plants in the trading component, other sectors through the offset program);
- Provided general guidelines for allocation (although it leaves the specific allocation plans to the state governments, it required that at least 25% of the allowances be set aside for consumer benefits);
- Called for the establishment of registries and for monitoring, reporting, and verification of emissions;
- Set a common penalty for non-compliance;
- Agreed to establish a Regional Organization (RO) to manage the development of new rules; and
- Allowed lining to other States that established emissions trading programs, and links to the global market though acceptance of “Clean Development Mechanism” credits.

If Congress chooses this structure, it may build on the model rule created by the RGGI states; perhaps providing amendments or changes to allow for its broader application throughout the country. It could assign to EPA the role the RGGI states assigned to the Regional Organization. This structure would require Congress to set caps for each state, as well as rules or allocation within states to prevent competitiveness concerns.

c. Should the program’s requirements be imposed upstream or downstream or some combination thereof?

This question is answered in relation to sectoral coverage, under question 2a.

d. How should allowances be allocated? By whom? What percentage of the allowances, if any, should be auctioned? Should non-emitting sources, such as nuclear plants, be given allowances?

The ascendance of emissions trading in the 1990s as the preferred method of regulating air emissions was propelled in large part by the greater flexibility the system provides to industry. It explicitly recognizes the inherent limitations of government agencies to fully know and understand all of the factors affecting the decisions to reduce emissions.

While the total cost of an emissions trading regime is a function of the stringency of the cap and the mitigation options available to market actors, allowance allocation allows policymakers to shape the local costs of a cap and trade program. To that end, emissions allocations are inherently a controversial and difficult subject. As greater experience is gained with market-based systems, the appeal of an auction is increasing, due to both the difficulties with setting free allocations, experiences with over-allocations (as in the EU ETS) and a new precedent being set by the Regional Greenhouse Gas Initiative where most states are now opting for a 100% auction allocation scheme. The political and economic appeal of an auctioning approach will also depend on how the revenues are allocated.

In crafting an allocation scheme, Congress should not look only to a single model. Just as a trading program may ratchet its targets over time, or expand to include additional sectors, also it may adjust its allocation formulas[16]. In the near term, the program will seek to balance important goals:

- an emission allowance allocation system should seek to mitigate economic transition costs to entities and regions of the country that will be relatively more adversely affected by GHG emission limits,;
- recognize that there are companies or regions that have already made investments in higher cost, low-GHG technologies; and
- encourage the transition from older, higher-emitting technologies to newer, lower-emitting technologies.

To do this, a portion of allowances should be initially distributed free to capped entities and to economic sectors particularly disadvantaged by the secondary price effects of a cap including the possibility of funding transition assistance to adversely affected workers and communities.

In establishing methods for the free allocation of allowances, government policy makers may put themselves into the position of determining sector or technology specific policies – an outcome the cap-and-trade system was theoretically meant to avoid. For GHG trading programs, the problem of limited and imperfect knowledge on the part of policy makers is particularly acute (as compared to SO2 and NOx) given that GHG emissions arise from so many sectors and sources. A sense of scale is useful here: The EU ETS "downstream" allocation covers 11,000 installations, and this figure could have tripled if the EU had included the chemicals and aluminum sectors in its system.

If free allocations to the private sector are part of the program design, they should be phased out over a reasonable period of time.

Economic models offer some evidence that auctioning allowances and using the revenues to cut distortionary taxes is the most efficient and least expensive approach to implementing a market-based system.[17] Auctions may also allow the government to raise revenue for any number of 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.[18] Real-world complexities, however, such as

[16] It should be noted, however, that "updating" (as adjustments to allocation schemes are called) may also lead to unintended consequences. For example, price spikes or allowance hoarding could occur during periods when updating is being considered. Conversely, if the subsequent system is less stringent, holders of allowances could see a rapid loss in the value of their permits.

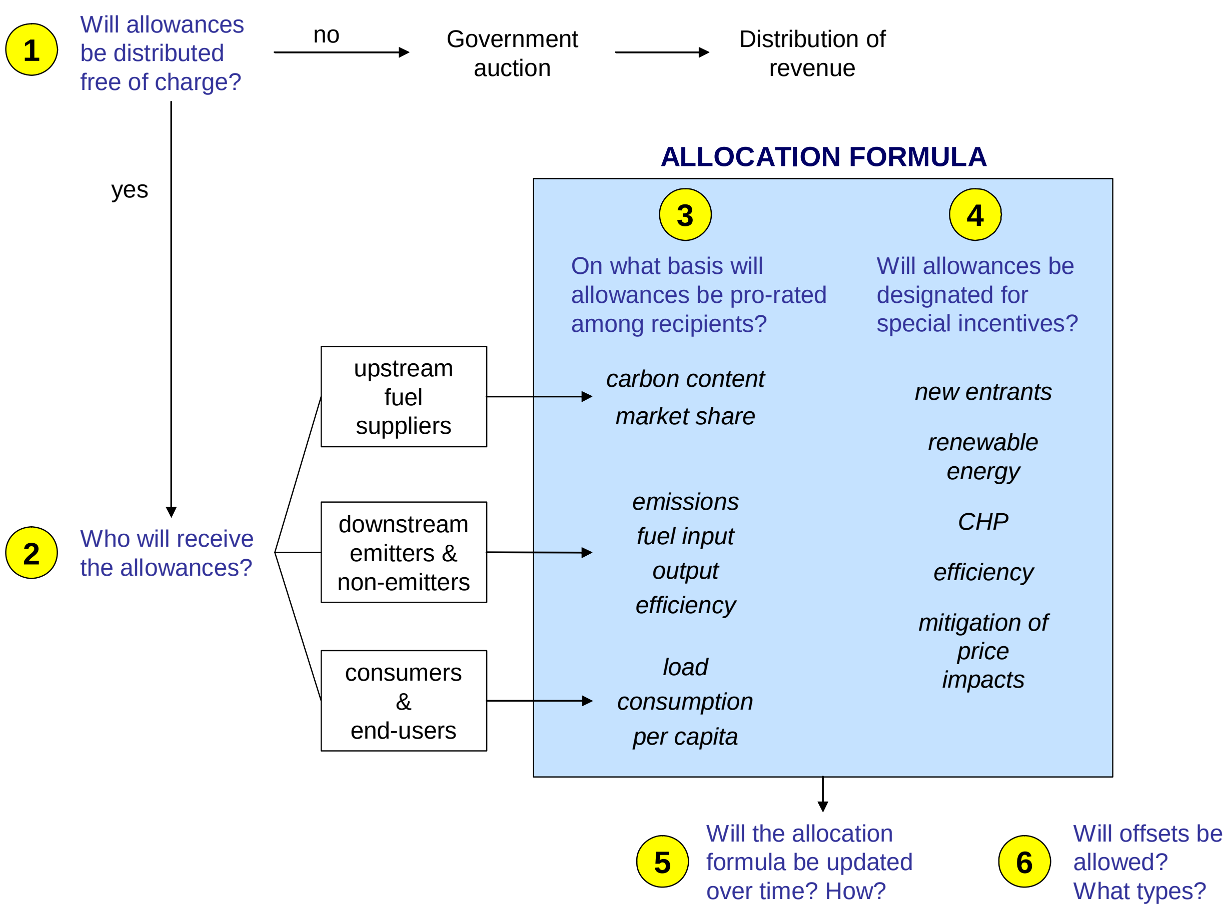
[17] Fullerton, D., and G. E. Metcalf. 2001. Environmental Controls, Scarcity Rents, and Pre-existing Distortions. *Journal of Public Economics* 80(2): 249–67. Goulder, L. H., et al. 1999. The Cost-Effectiveness of Alternative Instruments for Environmental Protection in a Second-Best Setting. *Journal of Public Economics* 72(3): 329–60.

[18] 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.

multiple distortionary policies, monopoly power, and differences among regulated firms, complicate the issue, making the optimal choice less clear.[19]

A simple decision tree for evaluating allocation decisions is provided below (figure 2).

Figure 2: Simplified Decision Tree for Interdependent Allocation Variables



Free historical allocations for downstream emitters became the norm for U.S. market-based programs, including the SO2 program, the Ozone Transport Commission (OTC) NOx Budget Trading Program and the subsequent state-federal NOx SIP Call trading program. On the surface, the much-heralded SO2 program had a simple allocation formula: allowances were given to downstream emitters (mainly power plants) based on their heat input rates. In the details, however, it provides an illustration of how allocation is an inherently political issue, and suggest that allocation may come at the expense of economic efficiency. The SO2 allocations were subject to considerable political influence that resulted in myriad provisions and

[19] 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.

adjustments to the formulas, creating winners and losers among the states and the regulated firms, for example:[20]

- During the legislative process for the Title IV of the Clean Air Act Amendments of 1990, which gave rise to the SO2 trading program, congressmen from Illinois and Indiana were ranking member and chairman, respectively, of subcommittees with jurisdiction over Title IV. Also, the state with the highest SO2 emissions, Ohio, had two representatives on the House Energy and Power Subcommittee. These three states became recipients of "bonus allowances" totaling 200,000 tons annually, which at the time were estimated to be worth $50 million (on the low end); at current SO2 prices, these allowances are worth over $200 million.

- In response to requests from high-sulfur coal states, extension allowances were set aside in "Phase 1" to provide incentives for electric generating units (EGUs) to install qualifying pollution abatement technology (SO2 "scrubbers"). Coal producers argued that this incentive would help ensure a market for their product and keep coal miners employed. In the end, these allowances were allocated almost exclusively to high-sulfur coal-producing states in Appalachia and the Midwest, directly benefiting their power companies.

- When "Phase 2" of the trading program began in 2000, over 30 provisions for deviations from the baseline formula were included in the allocation scheme. For example, some of these provisions addressed equity arguments for special treatment of units that had unusually low emissions during the baseline year or were small units with few abatement options.

- There are at least ten provisions pertaining to Phase 2 allocation that single out specific states or specific utilities for bonus allowances. These provisions do not name specific beneficiaries but outline requirements that are so narrowly focused that they could only apply to a small group of regulated firms.

It should be noted that the allocation system for the SO2 program also included a "set aside" of allowances to reward investments in energy efficiency and renewable energy, known as the Conservation and Renewable Energy Reserve, or CRER. The set aside amounted to 300,000 allowances, or roughly 3% of the cap, but the program was significantly undersubscribed (in fact, it was virtually unused). The barriers to using CRER included low SO2 allowance prices, a low conversion factor for calculating the award, and restrictions on participation (utilities only).[21] Undersubscription was also exhibited in the state set asides set up under the OTC NOx program.[22] Despite these early problems with set asides, though, they appear to be gaining favor with policy makers, as evidenced by various set asides in the EU ETS, the 25 percent allowance

[20] For a complete description of the SO2 allocation system, see: Ellerman, D. et al. 200. Markets for Clean Air: The US Acid Rain Program. Cambridge, UK: Cambridge University Press.

[21] Wooley, D., E.M. Morss and J.M. Fang. 2000. The Clean Air Act and Renewable Energy: Opportunities, Barriers, and Options. Paper presented at the Association of Energy Service Professionals Conference. Golden, CO: National Renewable Energy Laboratory.

[22] Aulisi, A., Farrell, A.F., Pershing, J., and VanDeveer, S. 2005. Greenhouse Gas Emissions Trading in U.S. States: Observations and lessons from the OTC NOx Budget Program. Washington, DC: World Resources Institute.

withholding in RGGI, and the increasing number and size of NOx set asides in the NOx SIP Call Trading Program.[23]

Turning to NOx allocation formulas more broadly, the details of how the OTC NOx allocation was determined varied from state to state, reflecting the political reality that a "one size fits all" approach was untenable and that allocation formulas had to be tailored by each state to its unique political and economic circumstances. For instance, some states based their allocation on heat input while others used output (megawatt-hours of generation). Some states had set asides for renewable energy or combined heat and power, while others did not. Delaware, New Hampshire, New York, Pennsylvania, and the District of Columbia had fixed allocations from 1999 to 2002. In contrast, Connecticut, Maryland, and New Jersey periodically adjusted their allocations according to various factors.

When the OTC program was eventually overtaken by the state-federal NOx SIP Call trading program, the practice of state-by-state allocation was continued. States that choose to participate in the NOx program are allowed to design their own allocation plan as part of their State Implementation Plan to help the state meet the federal air quality standards set by the Environmental Protection Agency.

e. How should the cap be set (e.g., tons of greenhouse gases emitted, CO2 intensity)?

Caps should be set in terms of total tons of GHG emissions. Only limits specified in absolute tons and well in advance will provide the market certainty that firms need to make long-term investment choices. Trading systems based on intensity are inherently uncertain because the size of the market is based on future GDP, which cannot be known in advance.

There is a fundamental but often misunderstood difference between an emissions "cap" and an emissions "target." A target can be absolute—often called "environmental" targets—or intensity—often called "rate-based" or "economic" targets. Absolute targets are specified as tons of GHG emissions, while intensity targets are GHG emissions per unit of GDP.

In contrast, a "cap" by definition is denominated in absolute tons. Like all market mechanisms, cap-and-trade programs need a known quantity of the tradable commodity to establish a price. Without an absolute cap on greenhouse gases, a price cannot be established and trading cannot occur. Cap-and-trade programs may have *targets* that are expressed in terms of intensity, but in any given trading period the target must be converted into a specified cap. When policymakers talk about intensity-based cap-and-trade systems, they usually mean trading systems that set annual emissions *caps* based on long-term *targets* that are expressed in terms of intensity.

f. Where should the cap be set for different years?

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[23] U.S. Environmental Protection Agency. 2005. Draft Report. State Set-Aside Programs for Energy Efficiency and Renewable Energy Projects Under the NOx Budget Trading Program: A Review of Programs in Indiana, Maryland, Massachusetts, Missouri, New Jersey, New York, and Ohio. EPA 430-R-03-005. Washington, DC: U.S. Environmental Protection Agency.

U.S. legislation should be designed to achieve the goal of limiting global atmospheric GHG concentrations to a level that minimizes large-scale adverse climate change impacts to human populations and the natural environment, which will require global GHG concentrations to be stabilized over the long-term at a carbon dioxide equivalent level between 450-550 parts per million.

To begin the process of reducing U.S. emissions we recommend Congress establish a mandatory emission reduction pathway with the specific targets that are:

- between 100-105% of today's levels within five years of rapid enactment
- between 90-100% of today's levels within ten years of rapid enactment
- between 70-90% of today's levels within fifteen years of rapid enactment (a 10-30% reduction by 2023).

The short- and mid-term targets selected by Congress should be aimed at making it clear to the millions of actors in our economy and to other nations that we are committed to a pathway that will slow, stop and reverse the growth of U.S. emissions. Furthermore, Congress should specify an emission target zone aimed at reducing emissions by 60% to 80% from current levels by 2050.

g. Which greenhouse gases should be covered?

Ultimately, a cap-and-trade program should cover all six major anthropogenic greenhouse gases: CO_2, CH_4, N_2O , SF_6, HFCs, and PFCs. Broad coverage will maximize the cost-effectiveness of the program, because including more gases will increase opportunities to reduce emissions. Some of the lowest-cost reduction opportunities can be found among non-CO_2 gases, which by weight have a much higher warming effect than CO_2.

Notwithstanding the advantages, there may be practical reasons to limit the number of gases included under the cap, at least in the early stages of the program. The main practical concern is data quality. In many cases, it is more difficult to accurately monitor and quantify emissions involving non-CO_2 gases. For example, as the EU Emissions Trading System (ETS) was being developed, there was considerable enthusiasm among industry participants for the inclusion of non-CO2 gases such as SF_6 and N_2O. The EU's legislation emphasizes that their inclusion is desirable but excludes them from the early phases because of concerns about the accuracy of monitoring in many applications. Because of the high global warming potentials of non-CO2 gases, inaccuracy in monitoring can be as much as 20,000 times more consequential, pound for pound, than in the case of CO2.

Similarly, the Regional Greenhouse Gas Initiative (RGGI) in the northeastern United States plans to start with one gas (CO_2), but makes clear its interest in expanding the system to other sectors and gases over time. In designing the program, a primary goal was to keep the initial program simple. At the same time, RGGI does include other gases at the outset through an offsets program, which covers SF_6 emissions from the utility sector, and CH_4 emissions from agriculture, landfills, and energy end-uses in the commercial/residential sectors.

Both the EU ETS and RGGI clearly indicate the desire to expand to cover other gases over time. In both cases, their rationale for expansion is recognition that: (1) the limited scope of coverage at the outset is inadequate to addressing the magnitude of the problem, and (2) additional sectors and gases in a market-based system increase the opportunities to reduce emissions and therefore are likely to decrease the overall costs.

h. Should early reductions be credited? If so, what criteria should be used to determine what is an early reduction?

Prior to the effective date of mandatory emission limits, every reasonable effort should be made to reduce emissions. Legislation should require regulations to be promulgated by no later than the end of 2008 establishing an early action program that grants credit for reductions made starting from a specified date, such as 1995, until such time as the mandatory program becomes effective. The program should establish clear guidelines for how companies will be credited or rewarded for taking early action to reduce their emissions.

The most straightforward way to reward early reductions is through baseline-setting and allocation of allowances once the cap and trade system commences. All else equal, a company that reduces its emissions early will be automatically rewarded, because it will require fewer allowances once the program begins. The only caveat is that if allowances are not auctioned, care must be taken not to unjustly penalize companies that take early action by giving them a correspondingly lower allocation of allowances. If allowances are allocated based on historical emissions, for example, a baseline year should be chosen that is far enough in the past to capture any meaningful reductions that were undertaken prior to the onset of the cap and trade program.

If early reductions are explicitly “credited,” two questions arise: (1) what form of credit is granted for early reductions; and (2) what qualifies as a creditable early reduction? For an early reduction crediting program to be effective, it should be as explicit as possible about the answers to these questions.

If early reductions are recognized by granting emission credits or “extra” allowances that may be retired to meet emissions obligations under the cap-and-trade program, then they will function in the same way as emissions offsets. In this case, early reductions should be recognized and credited using the same rules that are applied to offset projects (see discussion under section j, below). In other words, early reductions could simply be recognized by allowing offsets from projects that were initiated prior to the commencement of the program, assuming the projects meet all applicable criteria.

i. Should the program employ a safety valve? If so, at what level?

Cost control measures are policies designed to provide capped entities with greater confidence that their cost will be limited and flexibility to manage emission reduction compliance costs. Along with many others, we believe the most powerful cost control measure is a robust cap and trade program since markets do the best job of controlling costs over time. If additional measures are used, they must be designed to enable a long-term price signal that is stable and high enough to drive investment in low- and zero emitting technologies, including carbon capture and storage. Any additional cost-control option considered by Congress must ensure the integrity of the emissions cap over a multi-year period and preserve the market's effectiveness in driving reductions, investment, and innovation. As policy makers weigh additional cost control options, it is important for them to consider who and what portions of the economy are impacted, the time duration of the impact and remedy, international competitiveness, the implications for international emissions trading, and how the measure impacts the price signal necessary to stimulate investment and technological innovation. Some possible additional cost control options include but are not limited to a safety valve, borrowing, strategic allowance reserve, preferential allocations, dedicated funding, technology incentives and transition assistance.

If a "safety valve" is used, it should be set at a level that is high enough to drive the kinds of technologies required to significantly reduce GHG emissions. According to a recent report by McKinsey ("A Cost Curve For GHG Reduction", by Enqvist, Naucler and Rosander, 2007)[24] if we are to stabilize global concentrations at 450 to 500 pm in the atmosphere, we need a cost of at least \$40/ton by 2030. At this price, it is expected that various backstop technologies, including capture and storage of CO2 from coal fired power generation, would be economic.

However, a number of concerns have been raised with regard to the barriers and consequences of government seeking to set and maintain market prices. Essentially, picking a price is (albeit in a less constrained way) a variant of picking a specific technology – and governments have been historically poor at picking specific technologies to solve problems. Technologies that may today have a price higher than the cap are less likely to be developed. If instead the desirable emissions level is picked and price not specified, companies have a considerably greater incentive to seek least cost near- and long-term compliance opportunities rather than working only on options that are below the price cap level.

Another rationale for supporting price caps is that political objections to high prices could lead to efforts to dismantle the entire system. To date, we have a rather mixed record. For example, in the early history of the US NOx trading program, prices spiked at nearly \$7,000, about five times the longer term average costs. Yet, the program was not halted – and in fact, investments continued and the overall environmental effectiveness of the program was very high: emissions were well below allocated amounts in all years of the program.

A similar example in emissions trading under European Emissions Trading System (EU-ETS) suggests that a price cap may not be necessary. Prices in the EU market rose steadily over the first year of operation (from under €20 euro to nearly €30) before falling sharply to their present levels of about €15/ton. A number or rationales for the price collapse have been offered, including efforts at market manipulation, inadequacy of reporting, and expectations that the market would be short. However, had a price cap been set and had the government issued additional permits once the cap had been breached, it seems likely that an even greater price collapse would have been observed as oversupply would have left little if any reduction

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[24] See http://www.usehalf.com/pick/files/page3_blog_entry15_1.pdf

requirement for firms with allocations. With demand near zero, prices would have been extremely low, and generated little if any incentive for changes in performance.

Perhaps the most problematic aspect of establishing price caps is that they constrain the cost of compliance by voiding the environmental outcome desired. Given that a significant share of climate change will be locked in over the next few decades, it is difficult to judge how high (or low) an initial cap price should be. Technology optimists suggest that very low prices (and hence low cap levels) might drive adequate change over long time periods, although most acknowledge they will provide little change in the near term. Conversely, higher prices or caps would yield greater near-term reductions, but may be politically unpalatable. With the difficulty of establishing precise cost information, the debate is likely to be politically charged. In this context, it seems likely that the relative greater level of political power of those objecting to any price, much less a high price, will win the debate. Thus, we are likely to emerge with low prices, and concomitantly relatively limited action being undertaken. Conversely, if environmental benefits rather than costs were the basis for debate, a different constituency may be brought to the table, likely leading to more aggressive near-term efforts.

j. Should offsets be allowed? If so, what types of offsets? What criteria should govern the types of offsets that would be allowed?

Offsets can reduce program compliance costs by allowing in cost-effective GHG emissions reductions that can be made by entities outside the cap. Entities subject to the cap should be allowed to meet part of their obligations through the purchase of offsets. Designing an effective offset program involves numerous considerations. Some of these can be decided by regulators, and others should be addressed in legislation.

The first and most important consideration should be defining the overall goals and objectives of an offset program. These goals should be expressed in legislation. Some common goals for offsets include:

- Reducing overall compliance costs by providing access to cost-effective emission reduction opportunities from uncapped sources;
- Promoting innovation in uncapped sectors of the economy;
- Allowing participation of sectors whose inclusion under the cap might be difficult for administrative reasons; and
- Promoting secondary social, environmental, and economic goals through the promotion of specific types of emission-reducing practices or technologies.

Deciding which goals to emphasize may influence many details of an offset program. For example, some activities that generate cost-effective reductions (e.g., destruction of hydrofluorocarbons, or HFCs) may contribute marginally, if at all, to secondary environmental and economic goals. Emphasizing secondary objectives could be grounds for excluding certain types of projects, or for including others (e.g., forestry projects).

The second major consideration involves establishing the basic criteria governing what qualifies as an offset. At a minimum, legislation should specify that offsets must represent emission reductions that are:

1. *Real* – Offset emission reductions should represent actual emission reductions and not artifacts of (incomplete) accounting
2. *Surplus* – Offset emission reductions should be a response to the incentives provided by the offset program, not reductions that would have happened anyway under a "business as usual" scenario.
3. *Verifiable* – Offset emission reductions should result from projects or programs whose performance can be readily monitored and verified.
4. *Permanent* – Offset emission reductions (or removals, in the case of sequestration) should be permanent, or backed by guarantees if they are could be reversed, i.e., re-emitted to the atmosphere.
5. *Enforceable* – Offset emission reductions should be backed by contracts or legal instruments that define their creation, provide for transparency, and ensure exclusive ownership.

Detailed rules specifying how these basic criteria will be met can be left up to regulators. However, many of the details will depend on additional considerations that legislators may wish to address. These include:

1. *Geographic scope*. From which non-capped sources will offsets be allowed? An exclusively domestic system will be easier to oversee and enforce, but a system that allows offsets from other countries could provide access to more cost-effective reduction opportunities.

2. *Emissions scope*. Which greenhouse gases will be recognized for the purpose offsets? There are many low-cost reduction options involving non-CO_2 gases, but some of these options may contribute little to secondary program objectives.

3. *Sectoral scope*. Based on program objectives, there may be certain types of technologies or practices that the program should prioritize. There may also be sectors that should be excluded.

4. *Limitations on use*. In principle, it is not necessary to limit the number of offsets that a capped entity is allowed to purchase and retire for compliance purposes. In practice, limitations may be desired in order to spur greater reductions among capped sources, or because of inherent uncertainties in how offset reductions are quantified.

5. *"Bottom up" or "top down" accounting rules*. Ensuring that offsets are real, surplus, and permanent requires detailed rules for quantifying emission reductions. These rules must be elaborated for each type of project or activity that qualifies for offset crediting. Rules can either be developed upfront by regulators (the "top-down" approach), or proposed by individual offset providers as the program evolves (the "bottom-up" approach). The Clean Development Mechanism (CDM) under the Kyoto Protocol, for example, follows a bottom-up approach. The advantage of this approach is that it requires little upfront investment of time and resources by regulators, and allows maximal opportunities for offset providers (projects of any type can be proposed). The drawback is that it imposes high uncertainty and transaction costs on offset providers, at least in the early stages of the program.

Under a top-down approach, regulators must devote significant time and resources upfront, and offsets may initially be allowed only in a few sectors. The advantage of this approach is that it provides offset providers with certainty about the rules and can dramatically reduce transaction costs. In light of some of the difficulties experienced under the CDM, some recently proposed offset programs have opted for this approach (e.g., the Regional Greenhouse Gas Initiative).

A hybrid system is also possible. Rules may be elaborated upfront by regulators for important sectors, but the program could allow project developers to propose new rules for other sectors.

6. *Project-specific assessments vs. performance standards*. Quantifying emission reductions for offsets and determining whether they are "surplus" can be done through individual project assessments, or by using standardized benchmark criteria and performance standards. Project-specific assessments may be more rigorous, but can also be less transparent, more subjective, and ultimately less certain for offset providers. The CDM relies for the most part on project-specific assessments. Performance standards may leave more room for error, and may not be suitable for all project types, but they provide greater certainty for offset providers and lower transaction costs. In the United States, both the Regional Greenhouse Gas Initiative and Chicago Climate Exchange rely on standardized accounting rules.

7. *Institutional Roles and Responsibilities*. An effective offset program must designate the entities responsible for validating project applications, verifying the performance of projects, certifying emission reductions, and registering their associated offset credits. Many programs assign validation and verification responsibilities to accredited third parties (verifiers), although regulators can also perform these duties. Assigning responsibility to third parties can provide an independent check on program performance and reduce administrative costs.

8. *Linkages to other programs*. Although considerations about whether and how to link to other emissions trading programs go beyond offsets, one option for quickly and easily expanding the scope of an offset program is to recognize offset credits from other established programs. Rather than develop separate rules and oversight for projects in other countries, for example, a U.S. program could simply recognize credits from Kyoto Protocol offset mechanisms (this could be done without disposing the United States to full participation in the Kyoto system). A national U.S. program could also recognize offset credits from separate domestic programs. The key issue for recognition would be deciding whether other program criteria and accounting rules are sufficiently compatible.

k. If an auction or a safety valve is used, what should be done with the revenue from those features?

When regulators create a cap and trade program and issue allowances, they are creating a new currency with value. According to recent studies (see, for example, Burtraw, 2006 "Simple Rules for Targeting CO2 Allowance Allocations to Compensate Firms"[25]), only a share of the revenues would be needed to compensate the emitter for the revenue lost in complying with the GHG limits.

Thus, as an initial distribution matter, the allowance allocation system should seek to mitigate economic transition costs to entities and regions of the country that will be relatively more adversely affected by GHG emission limits or have already made investments in higher cost, low-GHG technologies, while simultaneously encouraging the transition from older, higher-emitting technologies to newer, lower-emitting technologies. A portion of allowances should be initially distributed free to capped entities and to economic sectors particularly disadvantaged by the secondary price effects of a cap including the possibility of funding transition assistance to adversely affected workers and communities. Free allocations to the private sector should be phased out over a reasonable period of time.

Economic models offer some evidence that auctioning allowances and using the revenues to cut distortionary taxes is the most efficient and least expensive approach to implementing a market-based system.[26] Auctions may also allow the government to raise revenue for any number of purposes, including technology investments or deficit reduction.

It is useful to consider the scale of the revenues that may be derived from an emissions trading program. A comparable regime, that of the EU-ETS, allocated about 6 billion tons of CO2 for 2005-2007; at market prices, these represented a total asset value of around 130 billion Euro (US$153 billion).[27] If the U.S. were to launch a similar emissions trading system to cover only downstream emissions from large point sources (power plants and industry, as is the case with SO2 and NOx), and this system had sufficient stringency to result in a $20 per tonne trading price, then the asset value of each year's worth of U.S. allowances could be on the order of $70 billion, or $700 billion over ten years.[28]

l. Are there special features that should be added to encourage technological development?

A federal technology research, development and demonstration (RD&D) and deployment program is a necessary complement to the GHG reduction policies that will drive demand for low-carbon technology. The program should be designed with the following key characteristics.

- Joint public/private sector cost-sharing and oversight;

[25] http://www.rff.org/documents/RFF-DP-06-28.pdf
[26] 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.
[27] Presentation by Lars Olof Hoolner (European Commission), 2006.
[28] Based on EPA emissions data for U.S. GHG emissions in the year 2000, the total emissions for "Electric Power" and "Industry" were 3.731 billion metric tonnes. If the market price were $20 per tonne, this would amount to an asset value of $74.62 billion dollars annually. However, a hypothetical downstream system would not cover every source within the sector; small emitters are likely to be exempt.

- Establishment of performance criteria and a technology roadmap to guide RD&D and deployment program investment decisions;
- Stable, long-term financing (e.g., a dedicated federal revenue stream or other means not reliant upon annual Congressional appropriations);
- Establishment of a public/private institution to govern the administration of the RD&D and deployment program fund; and
- A mix of deployment policies to create incentives to use of low-GHG technologies and address regulatory or financial barriers. Such policies could include loan guarantees, investment tax credits, and procurement standards.

Policies and measures are needed to complement an economically sound cap and trade system to create additional incentives to invest in low-GHG approaches in key sectors. These should include:

- ***New Coal-Based Energy Facilities and Other Stationary Sources.*** Policies are needed to speed transition to low- and zero emission stationary sources and strongly discourage further construction of stationary sources that cannot easily capture CO_2 emissions for geologic sequestration.
- ***Carbon Capture and Storage.*** Congress should require EPA to promulgate regulations promptly to permit long-term geologic sequestration of carbon dioxide from stationary sources. Congress should fund at least three sequestration demonstration projects in depleted and abandoned oil and gas fields and saline aquifers with CO_2 injection, each at levels equivalent to emissions produced by a large coal-based power plant.
- ***Transportation Sources.*** Climate protection legislation must achieve substantial GHG emission reductions from all major emitting sectors of the economy, including the transportation sector. Congress should enact policies to reduce GHG emissions in the transportation sector, including consideration of policies to:
    - promote lower-carbon transportation fuels;
    - cost-effectively decrease allowable GHG emissions of automobile manufacturers' fleets and promote new low-emissions vehicles, for example with GHG or fuel economy performance standards;
    - efficiently decrease vehicle miles traveled and enhance mass transit and other less carbon-intensive transportation alternatives;
    - promote better growth planning;
    - educate consumers; and
    - address emissions from air, rail, and marine transport.
- ***Buildings and Energy Efficiency.*** Policies are needed to realize the full potential of energy efficiency as a high priority energy resource and a cost-effective means of reducing GHG emissions. To achieve this objective, climate legislation should establish federal and state policies that align financial and regulatory incentives with utilities' business interests to aggressively pursue energy efficiency programs and promote policies that "decouple" utility sales and revenues in conjunction with requirements for utilities to pursue all cost-effective energy efficiency savings. Stronger energy efficiency codes and standards are needed for whole buildings and for equipment and appliances, as are incentives and tax reform measures to advance the infrastructure necessary to support new "smart" and highly-efficient technologies and distributed generation. Finally, the

legislation should create separate incentives for regulated entities, building owners, and other parties not subject to the cap to go even further in producing energy efficiency savings.

m. Are there design features that would encourage high-emitting developing countries to agree to limits on their greenhouse gas emissions?

There are a number of measures that the United States can take to incent developing country emission reductions, including the following:

1. Crediting Mechanism

A U.S. emissions trading program could recognize emission reductions achieved in developing countries. For example, if a U.S. company invests in an industrial facility in Mexico that results in GHG emission reductions, and those reductions are verified by a third party, U.S. legislation could allow those emission reductions to be credited against the obligations of a domestic source. Such a program would have the dual advantage of promoting emission reductions in developing countries while also reducing compliance costs to U.S. companies. Presently, the European Union has such a provision in its Emissions Trading System.[29] WRI together with the World Business Council on Sustainable Development have developed guidance on how such project mechanisms can be made to work effectively[30].

2. Export Credits

The U.S. government routinely supports private domestic companies with preferential trade financing (e.g., loans of short-term maturity) for the export of equipment or services. (These and other financial services are provided through the Export-Import Bank of the United States and the Overseas Private Investment Corporation.) "Greening" the U.S. export credit portfolio and supporting international environmental standards—including GHG standards—governing all export credit agencies could significantly further emission reduction efforts in developing countries.[31]

3. Removal of Trade Barriers

The United States can work with other countries—particularly developing countries to reduce trade barriers to clean energy technologies and services. This involves removal of barriers imposed by other countries, as well as the United States' own barriers to the clean

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[29] This link was established through Directive 2004/101/EC of the European Parliament and of the Council of 27 October 2004 amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms.
[30] Greenhouse Gas Protocol: The GHG Protocol for Project Accounting. Available at http://climate.wri.org/ghgprojectaccounting-pub-4039.html
[31] *See* Harmon, J., C. Maurer, J. Sohn and T. Carbonell. 2005. *Diverging Paths: What future for export credit agencies in development finance?* Washington, DC: World Resources Institute, *available at*: http://climate.wri.org/divergingpaths-pub-3930.html; and C. Maurer with R. Bhandari. 2000. *The Climate of Export Credit Agencies*. Washington, DC: World Resources Institute, *available at*: http://climate.wri.org/climateexportcreditagencies-pub-3005.html.

energy exports of other countries. For instance, the United States prevents Brazilian ethanol from entering the domestic market by levying a 54-cent per gallon tax on imports.

4. Clean Technology Development and Diffusion

Certain clean technologies, if developed in the United States, are likely to diffuse to developing countries through market forces, resulting in emissions savings. This is particularly true for products that are widely tradable, such as motor vehicles.[32] Most motor vehicles are produced (and sold) in industrialized countries by a relatively small number of manufacturers. Developing countries, on the other hand, tend to rely on either imports or licensed production. Under these conditions, technology diffusion can be surprisingly quick, as exemplified by the spread of catalytic converter technologies. An essential prerequisite for such diffusion, however, is that the United States (and preferably Europe and Japan as well) needs to adopt clean technology standards for various products, such as automobiles.

Other technology options, such as carbon capture and storage (CCS), also hold promise. To achieve market penetration, however, this technology will likely need to be developed in the United States (and perhaps other industrialized countries) with financial support to promote developing-country uptake. The reason is that there are virtually no development benefits to adopting CCS technology. For the foreseeable future, developing countries will be focused on providing electricity *access* to their populations, rather than devoting scarce resources to CO_2 capture and storage.[33]

5. Aid and other Financial Assistance

The U.S. foreign assistance already includes programs to reduce GHG emissions in developing countries. These come in the form of bilateral assistance and multilateral assistance (e.g., the Global Environment Facility). These efforts can be maintained and strengthened.

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By reinvigorating existing initiatives above and launching several new ones, the United States could contribute substantially to greening financial flows to developing countries and promoting clean technology transfer.

To be most effective, as discussed above, initiatives should be targeted at the major developing countries, in particular China and India. These two countries comprise 38 percent of the world's population—almost as much as all other developing countries combined. These two countries, which already have fast-growing middle classes, will soon demand energy and transport services resembling those of the developed world. Ensuring that those services can be

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[32] *See* Baumert, K., C. Dasgupta, and B. Müller. 2003. "How Can the Transatlantic Partners Help in Addressing Developing Country Emissions?" *in* A. Ochs and A. Venturelli (eds.), *Towards Transatlantic Consensus on Climate Change.*

[33] *See* Mwakasonda, S. and H. Winkler. 2005. "Carbon Capture and Storage in South Africa" *in* R. Bradley and K. Baumert (eds.), *Growing in the Greenhouse: Protecting the Climate by Putting Development First.*

delivered in a low-carbon context is perhaps the biggest challenge to restraining global emissions over the coming decades.

3. **How well do you believe existing authorities permitting or compelling voluntary or mandatory actions are functioning? What lessons do you think can be learned from existing voluntary or mandatory programs?**

U.S. experience to date with voluntary programs to address climate change has been quite valuable. Initiatives such as the U.S. Environmental Protection Agency's "Climate Leaders" program have given participating companies essential knowledge about measuring and tracking their GHG emissions, and identifying innovative and cost-effective ways to reduce those emissions. The California Climate Action Registry likewise affords leading companies the opportunity to develop comprehensive GHG inventories and report progress towards lowering their emissions. The Climate Registry, a nascent GHG registry initiative, will allow companies to measure and report progress on reducing emissions in states across the country. The Chicago Climate Exchange, a voluntary emissions trading system in which participants agree to take on legally binding GHG reduction targets, is providing companies with invaluable knowledge not only with tracking their emissions, but also hands-on experience with the functioning of a market-based cap-and-trade system. All of these initiatives rely on the "Greenhouse Gas Protocol," a corporate GHG accounting and reporting standard developed by the World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD). The WRI/WBCSD GHG Protocol is currently used by hundreds of companies around the world to voluntarily measure and report their emissions and develop cost-effective GHG management strategies.[34]

All of these efforts notwithstanding, voluntary actions alone are not sufficient to achieve the emissions reductions necessary to avoid dangerous climate change. For every company engaged in proactive efforts to reduce GHG emissions, many more are not engaged. Many companies that voluntarily take action on climate change find opportunities for cost-reductions and competitive advantage. But there are fundamental limits to the level of achievable emission reductions when there are no direct, economy-wide commercial incentives attached to reducing them. Providing such incentives requires mandatory regulations, the most effective of which involve putting a price on GHG emissions.

Although price signals for encouraging emission reductions can be created through taxation (e.g., a carbon tax), the most widely adopted market-based mechanism for controlling emissions to date has been emissions trading. Emissions trading as a regulatory mechanism was invented in the United States. In the 1970s the United States sought to reduce air pollution through a series of legislative and regulatory actions collectively referred to as "command-and-control" regulations. Command and control policies relied on setting specific technology standards on a source-by-source basis. Concerns about the high cost of this approach, however, led to the enactment of the Clean Air Act Amendments of 1990, which included a first-of-its-kind, market based cap-and-trade provision for sulfur dioxide (SO_2) emissions.

The SO_2 cap-and-trade system has been remarkably successful on both environmental and economic grounds. In spite of economic growth, U.S. SO_2 emissions from power plants have been reduced by more than half since 1980, at a cost hundreds of millions of dollars below what

[34] For more information, see http://www.ghgprotocol.org.

would have been expected from “command and control” options.[35] The success of the SO_2 program opened the door for additional emissions-trading programs to address other air pollutants, including oxides of nitrogen (NO_x). [36] Emissions trading has become the preferred environmental policy tool in large part because it offers flexibility and lower compliance costs as opposed to command-and-control policies.

The success of U.S. emissions trading for SO_2 and NO_x led to international interest in the use of cap-and-trade programs as a means to reduce CO_2 and other GHG emissions. As a result, emissions trading has emerged as the preeminent approach to dealing with climate change globally. Two prominent existing cap-and-trade programs include the European Union’s mandatory Emission Trading System (EU ETS) and the voluntary Chicago Climate Exchange (CCX). Early indications are that both systems are achieving environmental and economic success. Both systems have exhibited “over-compliance,” i.e., emissions from capped sources have been consistently lower than the total allocation of allowances.[37] Some observers have blamed this on overly lenient caps. However, both the U.S. SO_2 and NO_x trading programs have exhibited similar over-compliance patterns, particularly in their early stages.[38]

The EU ETS has come in for particular criticism related to the apparent over-allocation of allowances in its first phase (2005-2007). The first phase, however, was intended to be transitional and preliminary studies suggest that actual abatement of emissions has occurred despite the lenient “cap.” [39] The EU ETS’s primary flaw in its first phase has been insufficient information and price discovery, combined with the inability of participants to bank allowances for use in its second phase (2008-2012). The result was higher than expected prices for allowances, followed by a precipitous drop in prices once market participants discovered that allocated allowances were more than sufficient cover total emissions.[40] Preliminary analysis suggests the volatility experienced by the EU ETS in its first phase might have been avoided if:

- Banking of allowances were allowed between the first and second phases.
- Accurate information about actual emissions had been disclosed to market participants on a regular and ongoing basis prior to the start of the system. Official emissions figures for 2005 were only released in April and May of 2006, and there was little verified historical emissions data for market participants to rely on prior to that point. Lack of emissions data - and the corresponding lack of experience with anticipating emissions trends - was a leading cause of the drop in EU ETS prices from over $30 per ton of CO2 to less than $15 per ton. Prices for 2006 declined more steadily over the past year, as better

[35] Burtraw, et al., 2005. *Economics of Pollution Trading for SO_2 and NO_x*. Resources for the Future, Washington, DC.
[36] Aulisi, Andrew et. al. (2005). *Greenhouse Gas Emissions Trading in the U.S. States: Observations and Lessons from the OTC NOx Budget Program.* World Resources Institute, Washington, DC.
[37] Ellerman, A Denny (2006). *Over-Allocation or Abatement? A Preliminary Analysis of the EU Emissions Trading Scheme Based on the 2005 Emissions Data*. MIT Joint Program on the Science and Policy of Global Change
[38] Burtraw, et al., 2005. *Economics of Pollution Trading for SO_2 and NO_x*. Resources for the Future, Washington, DC. and Aulisi, Andrew et. al. (2005). *Greenhouse Gas Emissions Trading in the U.S. States: Observations and Lessons from the OTC NOx Budget Program.* World Resources Institute, Washington, DC.
[39] Ellerman, A Denny (2006). *Over-Allocation or Abatement? A Preliminary Analysis of the EU Emissions Trading Scheme Based on the 2005 Emissions Data*. MIT Joint Program on the Science and Policy of Global Change.
[40] Ellerman, A Denny (2006). *Over-Allocation or Abatement? A Preliminary Analysis of the EU Emissions Trading Scheme Based on the 2005 Emissions Data*. MIT Joint Program on the Science and Policy of Global Change

information was available to market participants about total emissions relative to total allowances.
- Greater levels of auctioning were required as a means of price discovery.

Finally, some over-allocation was probably inevitable as EU Member States were allowed to set caps independently, and no government wanted to unduly burden its own regulated industries relative to others. This tendency could have been mitigated if the total number of allowances was determined for the entire system by a central authority, rather than by the separate governments for individual member states.

To date there have been no comprehensive, independent evaluations of the CCX in its first phase (2003-2006). One notable feature of the CCX has been its relatively low prices, which have ranged from around $2 to $5 per ton of CO_2-equivalent (compared to over $30 per ton at the peak of the EU ETS market, and around $10 per ton in the global market for GHG reductions established by the Kyoto Protocol). These prices suggest that significant reductions in GHG emissions (four percent below 1998-2001 baseline levels in the first phase) are achievable for many companies at low cost. As indicated above, the overly high prices in the EU ETS were an anomaly related to inadequate information. The low CCX prices probably also reflect, however, the relatively advanced emissions management capabilities of the companies which have voluntarily chosen to participate in this trading system.

4. **How should potential mandatory domestic requirements be integrated with future obligations the United States may assume under the 1992 United Nations Framework Convention on Climate Change? In particular, how should any U.S. domestic regime be timed relative to any international obligations? Should adoption of mandatory domestic requirements be conditioned upon assumption of specific responsibilities by developing nations?**

The effects of climate change are global, as are the sources of GHG emissions. However, not all countries have equal responsibility. A list of the top 12 emitting countries, responsible for 75% of global emissions, is provided in the table below. These countries also account for 77% of U.S. exports and an equal share of U.S. imports.[41] Focusing on the individual and collective efforts of these countries should be an important consideration of the U.S. government.

Table 1. Top Greenhouse Gas Emitting Countries (CO_2, CH_4, N_2O, HFCs, PFCs, SF_6)

Country	$MtCO_2$ equivalent	% of World GHGs
1. United States	6,928	20.6%
2. China	4,938	14.7%
3. EU-25	4,725	14.0%
4. Russia	1,915	5.7%
5. India	1,884	5.6%
6. Japan	1,317	3.9%
7. Brazil	851	2.5%
8. Canada	680	2.0%
9. South Korea	521	1.5%
10. Mexico	512	1.5%
11. Indonesia	503	1.5%
12. Australia	491	1.5%
Rest of World	**8,401**	**25%**
Sources & Notes: World Resources Institute, Climate Analysis Indicators Tool (CAIT, v. 3.0). Totals exclude emissions from international bunker fuels and land use change and forestry. 2000 data.		

Success will require commitments by all of the major emitting countries. Toward this end, the U.S. government should become more involved in developing the post-2012 international arrangements for addressing climate change that are now being discussed. While care should be taken that policies do not merely push emissions from U.S. facilities to overseas plants, ultimately there must be an international program for addressing climate change and its impacts.

The UN Framework Convention on Climate Change (UNFCC) offers the only international forum for global discussion of climate change. All of the top emitting countries are party to the

[41] World Trade Organization. 2005. *World Trade Statistics*. Geneva. *See* Table III.16. Other economies (not shown in Table 1) that comprise a significant share of U.S. exports are Taiwan (2.7%), Singapore (2.4%), and Hong Kong (1.9%).

UNFCCC. While numerous side-agreements, bilateral efforts and regional programs seek to address climate change, the global nature of the problem and the need for wide engagement are likely to require the use of this international forum. Working within it to assure that US interests are met will be key.

While the US need not be formally constrained by the targets set under the UNFCC's Kyoto Protocol, the expiration date of that agreement's first commitment period, in 2012, offers an opportunity for the adoption of a new regime that meets both US and global demand for a fair, equitable and environmentally effective successor. Furthermore, key elements of the UNFCCC, including obligations to inventory and report on national GHG emissions, and on the policies being taken to mitigate these emissions, offer an excellent means to share information on effective approaches, and to provide collective assurance that national programs and policies are being implemented.

Congress should call upon the Administration to engage in international negotiations with the aim of establishing commitments by all major emitting countries. The post-2012 global framework should establish international GHG markets, assist vulnerable populations in adapting to climate impacts, and boost support for climate-friendly technology in developing countries. If a US domestic climate program sets a national GHG market, promotes U.S. technology development, and supports US adaptation to climatic change, it should be easily integrated into the global effort.

However, U.S. action to implement mandatory measures and incentives for reducing emissions should not be contingent on simultaneous action by other countries. Rather, we believe that U.S. leadership is essential for establishing an equitable and effective international policy framework for robust action by all major emitting countries.

Recognizing that all countries should take action is not, however, equivalent to demanding that the action from al countries must include an equal level of effort or equal emission reductions. The U.S. has long supported the view that national responses should be "differentiated" according to national circumstances faced by different countries, and that some countries should be expected to contribute greater efforts than others. This principle is embodied in the 1992 Climate Convention,[42] which has been ratified by the U.S. with unanimous support from the Senate.

Furthermore, the *type* of emission reducing efforts undertaken by developing countries need not be the same as those taken in the US. A cap-and-trade system, for instance, is a highly efficient mechanism for reducing emissions in a country which has the necessary monitoring capacity and legal institutions. In most developing countries these do not exist, and it may be more appropriate for emission reduction efforts to be framed differently, for instance as a commitment to implement certain policies rather than meet numerical emission goals.

In negotiating the Kyoto Protocol the United States took a leadership role, framing the global agreement in largely American terms, including a cap-and-trade approach used in the USA and

[42] Article 3, United Nations Framework Convention on Climate Change (UNFCCC). 1992. *Available at*: http://unfccc.int/resource/docs/convkp/conveng.pdf.

virtually unknown elsewhere. Unfortunately, in this respect our international negotiators had moved ahead of the discussion back home, and there was no consensus to move forward with domestic policy; this in turn led the US withdrawal from the Protocol it designed. This dynamic has been very damaging to US credibility in the climate policy sphere, and avoiding a repetition of it should be a high priority.

Indeed, negotiating internationally in the absence of a reasonably well-defined domestic policy may well prove impossible. As noted above the United States has long accepted the principle that developed countries should be first movers, and most of our OECD counterparts have adopted serious policies of their own. In the absence of demonstrable progress domestically we have little hope of being taken seriously as a negotiating partner.

The timetables set in US policy may well differ from those agreed internationally. The experience of the European Union under Kyoto is salutary. The EU emission trading system has been a reasonably successful response to its Kyoto commitments. However, perhaps its biggest weakness is that it has chosen to set targets over 5-year periods that match those of the Kyoto Protocol, and these are subject to renegotiation through the National Allocation Plan process before the start of each period. Industry complains that 5 years is too short a period for them to have the certainty they need to form their investments. It is significant that US industry calls for climate policy have generally stressed longer time horizons[43].

[43] See for instance the Climate Action Partnership declaration, http://www.us-cap.org/

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March 19, 2007

Honorable John Dingell
Committee on Energy and Commerce
2125 Rayburn House Office
Building, Washington, DC 20515

Dear Chairman Dingell:

Thank you for this opportunity to provide input to the Energy and Commerce Committee on questions concerning U.S. climate change legislation. We appreciate the efforts of the Committee to address these important topics and look forward to further engagement with you and your staff as you continue to explore U.S. climate policy design.

Very Best Wishes,

Jonathan Pershing
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March 19, 2007

Honorable Rick Boucher
Committee on Energy and Commerce
2125 Rayburn House Office
Building, Washington, DC 20515

Dear Congressman Boucher:

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Very Best Wishes,

Jonathan Pershing
Director, Climate and Energy Program
World Resources Institute