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**Responses to Questions on the Design Elements of a
Mandatory Market-Based Greenhouse Gas Regulatory System**

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EXECUTIVE SUMMARY

The World Resources Institute (WRI) is submitting responses to Questions 1, 2, 3(a)(b)(c), and 4(a)(b)(c).

To mitigate the risk of dangerous climate change and avoid the worst physical and economic impacts, scientific evidence suggests that policies are needed to drive significant near-term reductions in emissions and achieve long-term stabilization of atmospheric greenhouse gas (GHG) concentrations. 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. 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 a vital option that could serve to reign in emissions quickly and at least cost. While there are additional policy options that are complementary and deserve consideration, market-based systems have proven to be powerful tools and are a key means to making cost-effective emission reductions.

Experience with mandatory market-based systems for GHG emissions implies that political considerations have as much to do with program design as technical or efficiency-based considerations. In all existing or proposed GHG emission trading systems, upstream regulation has been eschewed in favor of downstream regulation. One important reason for this is that an upstream system is effectively a carbon tax for which the value will be variable and unknown in advance. Another is to establish a relatively simple system first rather than cover every economic sector, with all that entails in terms of complexity and interest groups. Downstream systems tend to start with narrow coverage and an explicit aim to become more inclusive over time.

Distribution of allowances too is predominantly political. Auctioning as opposed to free allocation presents considerable practical and theoretical strengths, but in general these have not been sufficient to overcome industry opposition to auctioning. As greater experience is gained with market-based systems, however, the appeal of an auction is increasing. If a free allocation is pursued, several inter-related design variables must be considered simultaneously.

Linking emission trading systems is desirable where possible but can be done successfully only where a number of conditions are satisfied, especially mutual confidence. This makes linking plausible with the European Union and Canada but not with countries such as China and India for the foreseeable future. No overseeing structure is needed to link trading systems.

There is no single metric for evaluating relative efforts of different countries, though there is a range of metrics that can throw light on the subject. The appropriate consideration is whether international partners are taking *appropriate* levels of action rather than *equal* levels. Making U.S. policy formally contingent on specific actions in other nations would be counter-productive, but formal or informal review of relative efforts is a normal part of international negotiations.

Question 1: Who is regulated and where?

This section presents a rationale for the following points:

1. Existing experience with mandatory market-based systems for greenhouse gas (GHG) emissions implies that political considerations have as much to do with program design as technical- or efficiency-based considerations.
2. While upstream coverage offers potential advantages in terms of efficiency, 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.
3. 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 thus for narrow coverage of sectors and gases. Sectoral coverage is notably similar between systems around the world and centers on the power sector and (in most cases) heavy industry.
4. Existing downstream systems have an explicit aim to become more inclusive over time. This is likely based on two factors: (1) recognition that narrow coverage 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. 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 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 greenhouse gas (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.¹ For the U.S., this challenge implies that economy-wide emissions will need to

¹ 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.

peak and begin declining on an absolute basis within the next 10 years.² 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 a vital option that could serve to reign in emissions quickly and at least cost. In this regard, the white paper issued in February 2006 by Senators Domenici and Bingaman identifies the issues of fairness and administrative simplicity in relation to the pros and cons of economy-wide versus sector-specific approaches to regulating GHG emissions, including the debate over “upstream” versus “downstream” regulation. Taking into consideration the formidable challenge of making deep reductions in U.S. emissions, an economy-wide approach is not only 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)³.

As shown in Figure 1,⁴ the variety and complexity of GHG emissions across the U.S. economy suggests that an approach based on multiple policy tools may be attractive or even 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,

² 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°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).

³ 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.

⁴ 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.

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.

Given the prevalence of CO₂ from energy consumption, a number of economists and firms, including Duke Energy Corporation, argue that the centerpiece of a U.S. response to climate change should be a revenue-neutral “carbon tax shift” by which existing distortionary taxes are reduced and the revenue to the Treasury is replaced by a consumption tax on all carbon-based fossil fuels – coal, oil and natural gas.⁵ Importantly, however, tax policies are not mutually exclusive to a market-based system; the two could be complementary.⁶

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.

⁵ Parry, I. 2003. Fiscal Interactions and the Case for Carbon Taxes over Grandfathered Carbon Permits, Resources for the Future Discussion Paper 03-46. Washington, DC: Resources for the Future; Dinan, T.D., and R. Shackleton. 2005. Limiting Carbon Dioxide Emissions: Prices vs Caps. Washington, DC: Congressional Budget Office; Repetto, R. et al. 1992. *Green Fees: How a Tax Shift Can Work for the Environment and the Economy*. Washington, DC: World Resources Institute; Poterba, James M. 1991. Tax Policy to Combat Global Warming: on Designing a Carbon Tax, in Dornbusch, R., and J.M. Poterba, eds. 1991. *Global Warming: Economic Policy Responses*. Cambridge, MA: Massachusetts Institute of Technology; Duke Energy Corporation, “Carbon Tax as an Element of Tax Reform Agenda,” available at <http://comments.taxreformpanel.gov>. A carbon tax is different from a Btu tax which was proposed by the Clinton Administration in 1993. The 1993 Btu tax would have applied to nearly all forms of energy (including nuclear and hydropower) based on the heat content of the fuel, without regard to their different levels of carbon and therefore without regard to their contribution, if any, to global climate change. In addition, the Btu tax was not designed to be revenue neutral; rather, it was intended to generate new revenues for deficit reduction.

⁶ A number of European countries, including Finland, Sweden, the Netherlands and the UK, have both carbon or energy taxes and a cap-and-trade system.

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 (NO_x) emissions trading, with notable 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.

General observations from other GHG systems:

1. All downstream

It is striking that all examples of existing or past emissions trading systems for GHGs apply downstream, and the same is true for the advanced proposals for the Regional Greenhouse Gas Initiative (RGGI) in the northeast U.S. as well as the Canadian Large Final Emitter System (LFE). 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) for instance, consultants to the EU tended to advocate an upstream system based on economic efficiency considerations. The EU chose a downstream application for three reasons – one economic, and two political:

- On the economic front, it was felt that downstream application would give greater incentive 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 Canadian LFE program and the RGGI among seven northeastern U.S. states both plan to adopt similar approaches. In each case, simplicity and the desire to move forward incrementally informed this choice. The Canadian LFE program seeks to regulate downstream emission sources within the Canadian economy. It was not designed to regulate GHGs upstream due to the political perception that emissions should be cut by end users and not by energy and feedstock producers. This perception was reinforced by the strong objection of oil and gas companies (a large part of Canada's economy) to any upstream GHG regulation.

RGGI state negotiators also 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 the systems – all focus 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 CO₂ emissions, from around 12,000 installations. At present, it covers only CO₂ 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.

There was considerable enthusiasm among industry participants for the inclusion of non-CO₂ gases such as sulfur hexafluoride and nitrous oxide. 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.

Canada's LFE proposes to cover more or less the same sectors as those in the EU system, with some additions (chemicals, aluminum) and exceptions (cogeneration). The LFE System includes the largest emitting sectors in Canada's economy totaling nearly 50% of total GHG emissions. Covered industries included in each sector were selected through a threshold approach where an industry must meet both of the following criteria: (1) annual average emissions of 8 kilotonnes CO₂ equivalent per establishment or more; and (2) annual average emissions of 20 kilograms CO₂ equivalent per \$1000 gross production or more.

Because this threshold approach applies to each industry, not each specific source, smaller sources within GHG-intensive industries will be included in the LFE program. For instance, because the cement industry is included in the LFE program, all cement sources (including smaller cement sources) will also be covered. This approach was designed for equity reasons to minimize competitive disadvantages due to the LFE program. Similarly, even if a specific industry has several large emitting sources, if that sector as a whole falls below the threshold, these large sources will not be covered in the LFE program. This is the case for the automaking industry, which does not qualify as a large emitting sector.

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.⁷

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.

⁷ Climate Analysis Indicators Tool-US (CAIT US). 2006. Washington, DC: World Resources Institute. <http://cait.wri.org>.

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-CO₂ 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 with one sector and one gas, but lays clear its interest in expanding the system to other sectors and gases over time, if possible. 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.

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 the overall costs.

4. Treatment of electricity

There is a notable similarity in approach between existing ETS systems in terms of the preference for downstream application, the sectoral coverage, and the tendency to start simple rather than all-inclusive. However, one crucial and interesting way in which they differ 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, Canada’s LFE system 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. However, the United Kingdom ETS 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. These shaped in particular the way that electricity was treated. 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.

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 than technical- or efficiency-based considerations. In particular, 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 coverage, but with plans to expand over time.

Question 2: Should the costs of regulation be mitigated for any sector of the economy, through the allocation of allowances without cost? Or, should allowances be distributed by means of an auction? If allowances are allocated, what is the criteria for and method of such allocation?

In this response we present a rationale for the following points:

1. Distribution of allowances is predominantly a political issue with significant economic implications.
2. Allocation by auction has considerable practical and theoretical strengths as opposed to free allocation. However, in most instances these have not been sufficient to overcome industry opposition.
3. As greater experience is gained with market-based systems, the appeal of an auction is probably increasing, due to both the difficulties with setting free allocations and the recent precedent set by the Regional Greenhouse Gas Initiative. The political and economic appeal of an auctioning approach will also depend on how the revenues are allocated.
4. If a free allocation is pursued, the allocation formula is shaped by five inter-related design variables that must be considered simultaneously.

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.⁸ 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.⁹ Real-world complexities, however, such as multiple distortionary policies, monopoly power, and differences among regulated firms, complicate the issue, making the optimal choice less clear.¹⁰

⁸ 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.

⁹ 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.

¹⁰ 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.

The white paper issued in February 2006 by Senators Domenici and Bingaman notes that an allowance auction has the benefits of avoiding some administrative costs as well as unintended competitive advantages, including windfall profits, for certain market participants. In addition, an allowance auction has the benefit of alleviating policy makers from the difficult and potentially costly task of attempting to design and negotiate an allocation method with imperfect knowledge.

In the cases of the United Kingdom Emissions Trading System (UK ETS) for greenhouse gases (GHGs) launched in 2001 and the European Union Emissions Trading System (EU ETS) for GHGs launched in 2005, government policy makers engaged in long, complex and difficult negotiations with regulated firms over the method of allocation. However, on the critical issues being discussed, including emissions baselines, business-as-usual emissions growth and the technical feasibility of emissions reductions, the regulated firms were likely to have had better and more detailed information about their operations than their government counterparts. Likewise, for the costs of emissions abatement, government-funded modeling studies in the U.S. have tended to overstate the costs when compared to the actual prices of emissions allowances once trading begins,¹¹ probably due to overly pessimistic assumptions about the rate of technology innovation and deployment among regulated industry.

As a result, if a negotiation over free allocation of allowances is to occur, industry is likely to have the “upper hand.” In the case of the UK ETS, preliminary research indicates that the program may have awarded excessive credits to companies that were reducing emissions anyway.¹²

In the case of the EU ETS, the first draft national allocation plan (NAP) that was issued came from the UK and was widely perceived to be stringent, meaning industry would not receive an excessive amount of free allowances. Subsequent to the UK proposal, however, other countries issued NAPs that were widely derided as being excessively generous to industry, even providing more allowances than would be needed under business-as-usual growth projections, thus setting a competitive disadvantage for companies in the UK. In response the UK altered its NAP by changing the assumptions for business-as-usual emissions growth, resulting in more free allowances for industry, particularly the prominent oil refining business. The EU experience thus illustrates the pressure that industry can apply in allocation negotiations as well as the complex and shifting analyses that are required to develop a “fair” method of allocation. Furthermore, the EU undertook an exhaustive analysis of marginal abatement costs across a huge range of industry sectors in a multi-year study that cost millions of Euros. The sectors it predicted as making major contributions to emission abatement (Germany’s coal sector) were instead

¹¹ For a discussion of SO₂ prices and forecasts, see: Aulisi, A., et al. 2000. *From Obstacle to Opportunity: How Acid Rain Emissions Trading Is Delivering Cleaner Air*. New York, NY: Environmental Defense. For a discussion of NO_x prices and forecasts in the Ozone Transport Commission NO_x trading program, see: 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 NO_x Budget Program*. Washington, DC: World Resources Institute.

¹² D. Ellerman, personal communication, 2005.

overtaken by facts on the ground (rising natural gas prices) while other sectors identified cheaper cuts than forecast.

Ironically, the ascendance of emissions trading in the 1990s as the preferred method of regulating air emissions was propelled in large part by the notion that market-based systems alleviated government regulators from the task of deciding how, where and when to make emissions reductions. In other words, one of the advantages of a market-based system over traditional “command and control” regulation is that it provides greater flexibility to industry and explicitly recognizes the inherent limitations of government agencies to fully know and understand all of the factors affecting the decisions to reduce emissions. This advantage helped bring about the U.S. acid rain program for sulfur dioxide (SO₂) emissions trading as well as the state and federal trading programs for nitrogen oxides (NO_x).

To establish methods for the free allocation of allowances, however, government policy makers appear to be putting themselves back into the morass that market-based is theoretically meant to alleviate. 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 NO_x) given that GHG emissions arise from so many sectors and sources. 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. An allowance auction, however, avoids this problem.

Despite the many theoretical and practical advantages of an allowance auction, it has been used only sparingly to date, though this may be changing. The federal SO₂ trading program in the U.S. uses a small annual auction of roughly 2 percent of the allowances, but this auction was designed simply to facilitate price discovery and market activity in the 1990s when emissions trading was still a novel concept. An allowance auction as a primary method for distributing allowances, however, has not been used and was recently rejected by EU countries when they launched their ambitious GHG trading program, presumably due to political pressures from industry.

During 2005-7, allocation of allowances in the EU ETS is about 6 billion tons of CO₂, and as of December 2005 these represented a total asset value of around 130 billion Euro (US\$153 billion).¹³ If the U.S. were to launch a similar emissions trading system to cover downstream emissions from large point sources (power plants and industry, as is the case with SO₂ and NO_x), 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.¹⁴

Given this magnitude, one can see how each industry and each special interest will seek to apply maximum pressure on government policy makers to distribute the allowances in its favor

¹³ Presentation by Lars Olof Hoolner (European Commission), 2006.

¹⁴ 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.

and free-of-charge – a bitter fight for the annual “rents” that is likely to impart high administrative costs and delays in implementation.¹⁵ Indeed, the decision by the Federal Communications Commission to auction the telecommunications spectrum was based on such concerns.¹⁶ Each industry and special interest may also be expected to use their proprietary information about their operations to their advantage and negotiate for a generous allocation of allowances despite the inefficiencies and distortions that would theoretically arise. The one regulated entity that is most likely to prefer an auction, new entrants into the system, may not be sufficiently organized (or even exist) to lobby for it.

In contrast to the EU’s reluctance to use an auction, the Regional Greenhouse Gas Initiative (RGGI) among seven Northeast states includes a potentially substantial auction. Each RGGI state will withhold a minimum of 25 percent of the allowances to be used for a “consumer benefit or strategic energy purpose,” potentially including promotion of energy technologies, mitigation of electricity ratepayer impacts, and funding the administration of the program. Many of these allowances may be auctioned or otherwise sold by the states into the market. Such a large withholding from the allowance pool is groundbreaking and unprecedented among market-based systems. It may have resulted largely due to arguments and analyses made during the public stakeholder dialogue for RGGI that free allocations create a windfall for many regulated firms. Despite the large withholding, as much as 75 percent of the RGGI allowances may be allocated free of charge, so the distribution method is actually a hybrid.

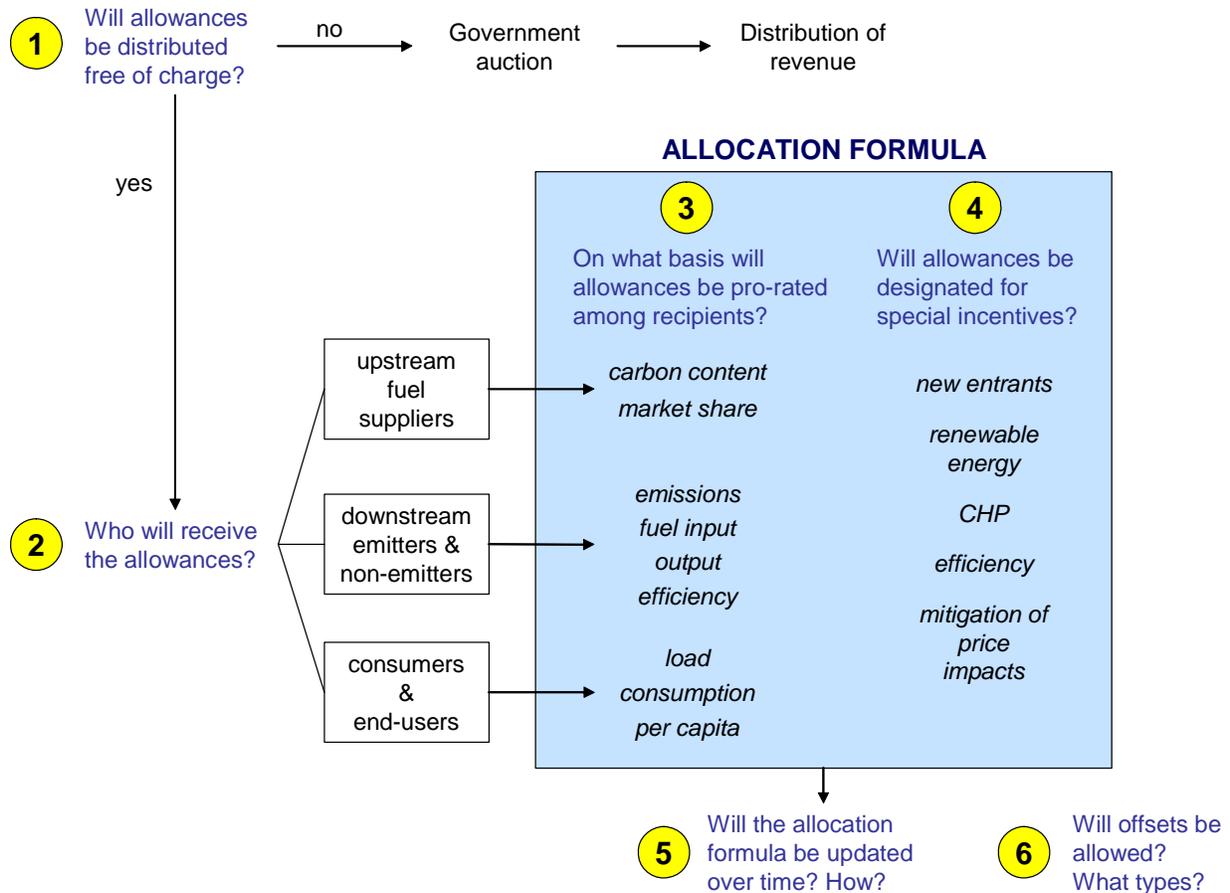
For allowances that are free rather than auctioned, the options for distribution are complicated, and the optimal choice is not entirely clear. The white paper by Senators Domenici and Bingaman identifies the major issues and rationales for allowance allocation. Perhaps the most complex aspect of allowance allocation is how these major factors are inter-related and even contingent upon one another. Figure 2 illustrates a series of six key decisions, or variables, that unfold in the process of choosing an allocation system, beginning with the question of free versus auction. If the decision is to distribute allowances free of charge, then a series of five inter-dependent variables unfolds:

- Who will receive the allowances?
- On what basis will the allowances be pro-rated among recipients?
- Will allowances be designated for special incentives?
- Will the allocation formula be updated over time?
- Will offsets be allowed into the trading system? (also applicable to an auction approach)

¹⁵ Cramton, P. and S. Kerr. 1998. Tradable Carbon Permit Auctions: How and Why to Auction Not Grandfather. Discussion paper 98-34. Washington, DC: Resources for the Future.

¹⁶ Ibid

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) NO_x Budget Trading Program and the subsequent state-federal NO_x 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, is an illustration of how allocation is an inherently political issue at the expense of economic efficiency and analysis. The SO₂ allocations were subject to considerable political influence that resulted in myriad provisions and adjustments to the formulas, creating winners and losers among the states and the regulated firms, for example:¹⁷

¹⁷ For a complete description of the SO₂ allocation system, see: Ellerman, D. et al. 2000. Markets for Clean Air: The US Acid Rain Program. Cambridge, UK: Cambridge University Press.

- 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, or 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).¹⁸ Undersubscription was also exhibited in the state set asides set up under the OTC NO_x program.¹⁹ 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 withholding in RGGI, and the increasing number and size of NO_x set asides in the NO_x SIP Call Trading Program.²⁰

¹⁸ 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.

¹⁹ 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 NO_x Budget Program. Washington, DC: World Resources Institute.

²⁰ U.S. Environmental Protection Agency. 2005. Draft Report. State Set-Aside Programs for Energy Efficiency and Renewable Energy Projects Under the NO_x Budget Trading Program: A Review of Programs in Indiana, Maryland,

Turning to NO_x allocation formulas more broadly, the details of how the OTC NO_x 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 NO_x SIP Call trading program, the practice of state-by-state allocation was continued. States that choose to participate in the NO_x 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.

Unlike the SO₂ and NO_x programs, the RGGI program is unique in that it also includes a provision for developing project-based emissions reductions, or “offsets,” which occur outside of the regulated sector. An offset provision can be viewed as an adjunct to the allocation formula for a market-based system. For example, if a market-based system is designed to cover some sectors but not others, and therefore allowances are distributed to some sectors but not others, an offset mechanism could be used to provide incentives for emissions-reducing activities in the uncovered sectors. In other words, an offsets program is a means to integrating activities into a market-based system that otherwise do not fit within the allocation. To illustrate, RGGI will initially include the following offset types: landfill gas capture and combustion; sulfur hexafluoride capture and recycling; afforestation (transition of land from non-forested to forested state); end-use efficiency for natural gas, propane and heating oil; methane capture from farming operations; and projects to reduce fugitive methane emissions from natural gas transmission and distribution.

Implications for a U.S. federal system

Taking the experiences of existing market-based systems into account, several observations emerge. Distribution of allowances is predominantly a political issue – albeit one with significant economic implications. Allocation by auction has considerable practical and theoretical strengths as opposed to free allocation (grandfathering). However, in most instances these have not been sufficient to overcome industry opposition. As greater experience is gained with market-based systems, however, the appeal of an auction is probably increasing, due to both the difficulties with setting free allocations and the recent precedent set by RGGI. If a free allocation is pursued, the allocation formula is shaped by five inter-related design variables that must be considered simultaneously. The political and economic appeal of an auctioning approach will also depend on how the revenues are allocated.

Massachusetts, Missouri, New Jersey, New York, and Ohio. EPA 430-R-03-005. Washington, DC: U.S. Environmental Protection Agency.

***Question 3:** Should a U.S. system be designed to eventually allow for trading with other greenhouse gas cap-and-trade systems being put in place around the world, such as the Canadian Large Final Emitter system or the European Union emissions trading system?*

In this response we present a rationale for the following:

1. Linking emission trading systems is desirable where possible, but can be done successfully only where a number of conditions are satisfied.
2. These conditions are principally those of mutual confidence. Market participants need to have faith in the relevant monitoring, verification and legal regimes in each system. There is no need for an overlying institutional structure.
3. These criteria suggest that linking with emission trading systems in developed countries such as the European Union and Canada is both desirable and, depending on the design features chosen in a U.S. system, feasible. Conversely, for the foreseeable future the emergence of cap-and-trade systems in countries such as China and India that can be linked to a system in the U.S. is both implausible and potentially undesirable. The use of project-based mechanisms, however, may allow low-cost emission abatement options in these countries to be exploited.

Clarifying Question 3a:

- Do the potential benefits of leaving the door open to linkage outweigh the potential difficulties?

Linking with other emission trading systems is *a priori* highly desirable.

The same principle applies to emission trading as to other kinds of trade: the more the better. In particular, there are two main reasons to lean towards linking a U.S. emission trading system with foreign counterparts:

1. Economic

Many studies show that a wider group of participants in an emission trading system will tend to reduce the cost of meeting a given emission reduction target. This cost saving will be greatest where the participants face very different marginal abatement costs. For example, when the U.S. Ozone Transport Commission (OTC) designed a cap-and-trade program for NO_x emissions, the primary target for regulation was electricity generators (the largest stationary source of emissions). The OTC decided to also include industrial facilities such as petroleum refineries and pulp and paper mills. These sources displayed flexibility in a wide range of compliance strategies.²¹ Industrial sources became net sellers of allowances, suggesting that they had lower marginal control costs than electricity generators. By including industrial sources, the NO_x trading program was more flexible, achieved greater reductions in emissions, and lowered the overall program costs.²²

Linking emissions trading systems internationally is likely to produce significant cost savings. The reason for this is straightforward, and underlies the rationale for all trade: different participants will face different costs of making cuts in the short, medium and long terms. Furthermore, these differences are extremely hard to identify in advance. The experience of the European Union is salutary: before implementing its Emission Trading System (ETS), the EU undertook an exhaustive analysis of marginal abatement costs across a huge range of industry sectors in a multi-year study that cost millions of Euros. The sectors it predicted as making major contributions to emission abatement (e.g., Germany's coal sector) have been overtaken by facts on the ground (rising natural gas prices) while other sectors have identified cheaper cuts than forecast. Inclusion of more players in more sectors helps to increase innovation while keeping costs down.

²¹ Compliance strategies included switching to cleaner fuels, modifying production processes, replacing boilers, modifying combustion, installing control technologies, and retiring or deferring units. U.S. Environmental Protection Agency (EPA). 2004. Industrial Source Participation in the OTC NO_x Budget Program. Washington, DC: U.S. EPA Office of Air and Radiation.

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 NO_x Budget Program. Washington, DC: World Resources Institute.

2. Political

Climate change is a global problem requiring international collaboration in finding solutions. The emergence of a clear U.S. policy that actively links to trading systems elsewhere will go a long way to reestablishing the U.S. as a leading participant in implementing climate solutions. Linking emission trading systems will also tend to equalize the abatement costs faced by American companies with those of their competitors in other participating countries such as Europe and Japan, thus significantly reducing competitiveness concerns.

It is worth noting that the legislation implementing the EU emission trading system very specifically leaves the door open to links with other emission trading systems. Furthermore, the EU explicitly removed any reference to the Kyoto Protocol in its relevant text (the so-called “Linking Directive”²³), thus signaling its willingness to link to any similar system that might emerge in the U.S.

²³ 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

Clarifying Question 3b:

- If linkage is desirable, what would be the process for deciding whether and how to link to systems in other countries?

Linking is possible even between quite different emission trading systems. The most important issues are not ones of strict harmonization but of mutual confidence.

The nuts and bolts of a market-based system are the monitoring and reporting of emissions inventories by the companies participating; the verification of these inventories by credible third parties; and recourse to a credible legal system that will enforce emission limits and punish fraud. These institutional underpinnings are, in one form or another, essential for any traded market. However, in the case of emission trading this importance is magnified because the very commodity being traded owes its existence to government mandate. If companies suspect that enforcement of the emission caps will be weak or that any government will be tempted to flout the rules by issuing surplus allowances, the incentive to use trading as a means of making cleaner investment decisions will be greatly diminished.

These factors are vital for establishing a functional market-based system, but in the U.S. and other developed countries some factors can be taken for granted. Linking to the EU ETS for instance means linking to a system in which the monitoring and verification are robust and the legal enforcement of caps is likely to be reliable. These conditions are less likely to be found in some developing countries or economies in transition (see discussion of “Emission trading systems in developing countries” below.)

Where this mutual confidence exists, most specific features of the systems do not need to be harmonized in order for a successful linking to be possible. The systems can cover different sectors, include different gases and employ different monitoring methodologies.

There are a few **essential** components that either need to be harmonized, or will be de facto harmonized automatically if systems are linked. These include compliance penalties, price caps and a common unit of exchange. If the two systems cover countries that engage in cross-border trade in electricity with each other, this imposes some design constraints.

There are some features for which harmonization is **helpful but not essential**. Differences in these features between systems can add significantly to cost and complexity, but do not preclude linking. Notable among these is the use of intensity targets.

Finally, some features present no technical difficulty but are so important that some degree of harmonization might prove **politically necessary**. The most significant issue here is the stringency of the regime.

Features that must be compatible:

Compliance

The most important aspect of two linked trading systems that needs to be coordinated is the compliance regime. In a linked system that combines different compliance regimes, the most lenient regime effectively applies to all.

The simplest way of applying an incentive to comply with emissions targets is to set a financial penalty for non-compliance. The EU ETS applies a financial penalty of 40 Euro (rising to 100 Euro from 2008) for each ton of CO₂ not covered by an EU allowance, as well as restitution of the excess emissions with an equivalent cut the following year.²⁴ If the EU were to link its scheme with one in which the penalty was only 10 Euro, then traders would ensure that emissions were matched with allowances in the EU and any non-compliance would migrate to the more lenient regime. In effect, the non-compliance penalty for the entire system would be 10 Euro.

This is fairly simple to see in the case of a fixed price penalty, but the complexity rises greatly for other forms of compliance and incentive mechanisms. In the case of the UK ETS,²⁵ participants who opted into the program were given an 80% reduction on their payments under the “Climate Levy” (a carbon tax). The penalty for non-compliance is the forfeiture of that reduction. In the case of the Danish CO₂ Quota Act, which only covers the power sector, a non-compliance financial penalty of DKK40 (around \$6) per tonne of CO₂ applies, a relatively small sum. However, a Danish company in non-compliance also becomes ineligible to bid for government contracts – a far greater incentive to ensure compliance. However, while these compliance mechanisms may be effective within a single country and its trading system, they have no effect on companies in other countries. Therefore, if trading systems are linked, these compliance mechanisms do not cross over.

Price Cap

In the interest of limiting the cost of an emissions trading system, a debate arises over whether to use price caps on allowances prices. In the case of linked ETS, the lowest price cap that applies in any of the systems will effectively apply to all of them. The reason for this is similar to that for compliance penalties above: an efficient trading system will tend to equalize the price for all participants, and the option to buy more allowances at a given price will prevent the market price from rising above that level across the system. Consequently, price caps would have to be harmonized by policy makers; otherwise, the market would essentially harmonize the price caps automatically.

²⁴ Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission trading within the Community and amending Council Directive 96/61/EC.

²⁵ See http://www.defra.gov.uk/environment/climatechange/trading/uk/pdf/trading-rules_rev2.pdf for the rules of the UK ETS. These rules were given statutory force in the Waste and Emissions Trading Act 2003.

Traded electric power

Power generation can be covered in an emissions trading system either directly (by applying emission caps to generators) or indirectly (by allocating emissions to the consumers of the electricity). A common way of dealing with power sector emissions is necessary if there is cross-border trade of electricity between the countries covered by the trading systems. This is necessary to avoid double-counting the emissions: once at the point of generation, and again at the point of consumption. Thus, trading systems in the U.S. and Canada, which have significant cross-border flow of electricity, would need to treat electricity in the same way, but the EU and the U.S. could afford to have separate approaches.

Features for which harmonization is helpful but not essential:

Beyond the short-list of essentials, there is a large number of features that can differ between linked systems. These differences may affect economic efficiency and/or environmental integrity, but do not necessarily preclude linkage. These have been explored extensively elsewhere,²⁶ but we highlight some of the most prominent issues here:

Use of absolute emission targets

In particular, a system based on intensity targets can trade with one based on absolute emission caps, but doing so adds greatly to complexity. The UK has experience with such linking, and this was due to the need to incorporate industry agreements based on intensity within a new emission trading system. A “gateway” was put in place to prevent inflation of emissions in those sectors covered by absolute caps. In order for trading between the two groups to take place, intensity performance is first converted into absolute tons of CO₂. These tons can then be traded, but the gateway prevents a *net* flow of emissions from the intensity-based sector into the sector covered by an absolute cap. These intensity-based metrics are being phased out in the UK.

Inclusion of project offsets

It is possible to exclude certain project types from one system that are allowed in another. For instance, the EU system allows the trading of credits from the Kyoto Protocol’s Clean Development Mechanism (CDM), but this would not automatically mean that these credits could be traded into a U.S. system. In practice, however, an exclusion of the credits in a U.S. system would be notional only, as CDM credits could be used in the EU to “free up” allowances that could be traded into the U.S. system. Harmonization would thus increase transparency and efficiency, but not fundamentally affect prices or environmental integrity.

²⁶ Haites, E., Mullins, F., 2001. Linking Domestic and Industry Greenhouse Gas Emission Trading Systems, EPRI, International Energy Agency (IEA) and International Emissions Trading Association, Paris.

Registries

An electronic registry is needed to track the ownership of allowances within the trading system. Multiple registries can serve this function, but the more harmonization between them the better. However, it is worth noting that the EU member states are employing a number of different registries. Certainly, linking two trading systems would not require the merging of their registry.

Features that may be politically necessary:

Stringency

The relative stringency of the targets in each system does not affect the technical performance of the system but may preset a political obstacle to linking systems. In principle, linking two systems with widely diverging allowance prices could provide economic benefits to players in both systems. However, if the result of linking two systems is that there is a large net financial flow in one direction (and flow of allowances in the other direction), this may be politically challenging for both the “buyer country” and the “seller country.”

For the buyer country, the political challenge may seem counterintuitive. After all, for companies in the more ambitious and expensive system their cost of compliance will go down (they will get cheaper allowances from the seller country). However, emission trading makes costs explicit, and experience in the EU suggests that governments attribute the costs to the emission trading system itself. Where these financial flows are from one country’s companies to their international competitors, the system may be (negatively) perceived as a form of international subsidy. Also, the environmental community in the “buyer country” is likely to see the linking as undermining the integrity of their system.

For the seller country, the potential backlash to linking is clear. On its own, the seller country enjoys a relatively low cost of allowances – a reflection of the low stringency. As in any emissions trading system, some percentage of the regulated companies will choose to rely on the market and buy allowances as their primary strategy for compliance. If the system is linked to a more stringent and expensive trading program, however, the more stringent program will immediately begin drawing allowances from the other until the prices reach equilibrium. As a result, some of the companies in the less stringent system will be faced with higher compliance costs, and these costs may get passed on to their consumers. On the other hand, companies who were positioned to be sellers in the less stringent system would get a higher price for their allowances.

Clarifying Question 3c:

- What sort of institutions or coordination would be required between linked systems?

Linking emission trading systems needs very little in terms of process or supervision.

Assuming that the basic conditions of linking are met and there are no insurmountable political obstacles, the process itself is simple. The regulatory authority responsible for each system needs only to agree to recognize the allowances of the other for the purposes of fulfilling commitments within its own system. This recognition does not even have to be mutual. This has already been proposed in the RGGI system: participants in RGGI are permitted, under certain circumstances, to surrender EU allowances against their obligations.²⁷ For this, no formal approval from the EU is necessary since any legal or natural person can hold EU allowances. A call to an emissions broker will be enough to secure a supply of allowances. Since anyone can buy EU allowances, the EU did not itself have to be involved in this decision. However, efficiency and political cooperation will be best served in the future by mutual recognition.

In the period to 2012, the recognition of U.S. allowances in the EU (or any other party to the Kyoto Protocol) is more complex. The EU ETS contributes directly to the compliance of EU countries with their Kyoto targets. EU allowances are “tracked,” or mirrored, by so-called “assigned amount units” (AAUs), the emissions trading currency under the Kyoto Protocol. Allowances bought from a U.S. system would not provide such AAUs and would compromise the ability of EU countries to meet their obligations under the Kyoto Protocol. In the longer term this problem need not apply.

As this suggests, linking emission trading systems does not imply the creation of new governing bodies or other oversight. The essential ingredient is confidence in each country’s monitoring, verification and legal systems. In practice this is likely to restrict such linking in the first instance to systems in OECD countries, but this can be evaluated on a case-by-case basis. In practice, a simple memorandum of understanding between the respective regulating bodies could be all that is necessary.

Emission trading systems in developing countries

The white paper by Senators Domenici and Bingaman refers to “a trading system that includes emission reductions in key developing countries such as India and China” as a desirable objective. This formulation covers a number of potential options, but here we will briefly discuss the application of market-based system in these countries. There is little prospect of implementing an ETS in either India or China for the near future, although there are clear prospects for engaging with these countries on meaningful emission reductions²⁸. The barriers to

²⁷ To be precise, using outside credits such as EU allowances is only permitted if the market price for carbon averages more than \$7 per allowance over a 24 month period.

²⁸ In 2005 WRI undertook a substantial analysis of policy-based approaches to cutting emissions in developing countries. See Bradley, Rob & K.A. Baumert. 2005. *Growing in the Greenhouse: Protecting the climate by putting*

implementing an ETS in China or India are technical, institutional and political.

From the technical point of view, emissions in developing countries are growing at a pace too rapid and unpredictable to form the basis for enacting a Kyoto-style “cap” on national emission levels.²⁹ For example, models project that India’s emissions in 2025 will be somewhere between 73 and 225 percent above today’s levels. In China, the difference between the low and high estimates of emissions growth (50 and 181 percent, respectively) amounts to 1,025 million tonnes of carbon, a quantity that exceeds the combined current emissions of India, South Korea, Mexico, South Africa, and Brazil.³⁰ Under conditions of such uncertainty, at what conceivable level would a country “cap” its emissions? Formulating caps under this level of uncertainty amounts largely to a guessing game with enormous environmental and economic consequences.³¹ The uncertainty problem, however, is much less acute in industrialized countries (many of which are already implementing fixed targets under the Protocol), where underlying economic conditions are more stable and can be more accurately forecasted.³²

Second, the institutional, legal and technical capacities discussed above may not exist in many developing countries. New laws and regulations that cover the entire economy may be needed. Countries must have the ability to exercise regulatory control over their private and public entities and must apply appropriate sanctions in cases of non-compliance.³³ Perhaps most significantly, credible emission caps require quantitative precision, and thus high-quality monitoring tools and robust national GHG inventories that are developed in accordance with international standards. This would be a major challenge as, to date, almost all developing countries have reported difficulty in compiling their emissions inventories under the United Nations Framework Convention on Climate Change.³⁴

development first. Washington, DC: World Resources Institute, available at:

<http://climate.wri.org/growingingreenhouse-pub-4087.html>

29. See Yong-Gun Kim & Kevin A. Baumert, *Reducing Uncertainty Through Dual-Intensity Targets*, in BUILDING ON THE KYOTO PROTOCOL: OPTIONS FOR PROTECTING THE CLIMATE 109, 129 (Kevin A. Baumert et al. eds., 2002) (“Negotiating emission controls is challenging precisely because of pervasive uncertainties: Countries do not actually know what they are agreeing to.”).

30 Data in this section are from Navigating the Numbers, a comprehensive effort undertaken by WRI to evaluate a wide range of indicators, as well as their implications for target-setting. See Baumert, K.A., T. Herzog, and J. Pershing, 2005. *Navigating the Numbers: Greenhouse Gas Data and International Climate Policy*. Washington, DC: World Resources Institute, available at: http://climate.wri.org/pubs_description.cfm?PubID=4093.

31. With respect to the environmental outcomes, guessing wrongly on a target level would have considerable implications. If the target is set too loosely it will have no environmental benefit. Such a target might even weaken the environmental outcome of the treaty in the event that excess emission allowances are transferred to other countries through Kyoto’s international emissions trading provisions. In other words, the environment might be better off if the country had never taken a target to begin with. On the other hand, if the target is set too stringently (i.e., too few emissions are allowed), it may constrain economic development or, alternatively, lead to treaty non-compliance or target renegotiations. Given their aversion to risk, developing country governments are likely to avoid emission targets that have the potential to adversely affect economic growth, even if that potential is remote. See generally Kim & Baumert, *supra* note 9.

32. Baumert et al., *supra* note 10.

33. Willems S. & Baumert K., 2003, *Institutional Capacity and Climate Actions*, OECD/IEA, Paris, at 25–26.

34. U.N. Framework Convention on Climate Change, Subsidiary Body for Implementation, 17th Sess., New Delhi, India, Oct. 23–29, 2002, *Fourth Compilation and Synthesis of Initial National Communications from Parties Not Included in Annex I to the Convention*, 28, U.N. Doc. FCCC/SBI/2002/16 (Oct. 1, 2002) (noting that almost all Parties reported difficulties stemming from the lack of quality data, lack of technical and institutional capacity, and problems related to methodologies), available at <http://unfccc.int/resource/docs/2002/sbi/16.pdf>.

Politically, India and China have made clear on numerous occasions³⁵ that they are not prepared to take on emission caps. It is true that one reason for this has been the reluctance of the U.S. to commit to reductions itself, but even a shift in US policy should not be expected to change policy in India or China in the near term. These countries point to their far lower levels of economic development and far lower per-capita emissions³⁶ as a reason for this reluctance. Most hopes for engaging them in an ETS spring from the idea of allocating surplus allowances (so-called “hot air”) as an inducement. Experience with this approach, which was used to bring Russia and other post-Soviet economies into the Kyoto Protocol, is not promising. The political prospect of “reaching” climate goals by making large financial transfers to Russia is not one that appeals to many Kyoto Parties, and it is unlikely to be much more tempting in the case of China.

It is important to stress that this does not mean that emission abatement potential in these countries cannot be harnessed. In many cases, project offsets similar to the Clean Development Mechanism of the Kyoto Protocol can realize low-cost emission abatement and the credits can be used to lower compliance costs in an ETS. For larger-scale changes in developing country development pathways, policy reform is necessary. For such reforms, a carbon price may not be the most useful signal, and other methods of policy-focused engagement are more promising.³⁷

Implications for a U.S. federal system

There are both political and efficiency reasons to design a system with an eye to potential linkage to other systems. Some decisions made in the design of a domestic US system can help or hinder the potential for such linkages. A simple compliance system based on financial penalties and the use of absolute emission targets are examples of features that make linking easier. Successful linkage will depend in large part on mutual confidence in the monitoring, verification and legal capacities underpinning each system. This will tend to make links to other industrialized systems more promising. It is doubtful whether such systems in major developing countries such as China and India are a realistic near-term prospect.

³⁵ These positions were restated most recently in the addresses of China and India to the G8 Summit at Gleaneagles in July 2005.

³⁶ In 2002 the average American emitted 6.9 times more CO₂ than the average Chinese, and 18 times more than the average Indian. Climate and other relevant data are freely available online through WRI’s Climate Analysis Indicators Tool: <http://cait.wri.org>

³⁷ See for instance Bradley & Baumert, *supra* note 8.

Question 4: If a key element of the proposed U.S. system is to “encourage comparable action by other nations that are major trading partners and key contributors to global emissions,” should the design concepts in the NCEP plan (i.e., to take some action and then make further steps contingent on a review of what these other nations do) be part of a mandatory market-based program? If so, how?

In this response we present a rationale for the following:

1. There is no single metric for evaluating relative efforts of different countries, although there is a range of metrics that can throw light on the question.
2. The United States has long accepted the principle of “differentiated” responsibilities in dealing with climate change. Given the widely varying national circumstances among countries, the appropriate consideration is whether international partners are taking *appropriate* levels of action rather than *equal* levels of effort to the United States.
3. While making part of United States policy formally *contingent* on specific actions in other nations would be counter-productive, formal or informal review of relative efforts are a normal part of international negotiations. The United States has several plausible options for providing incentives to developing countries to take action on GHG emissions

Climate change is a global problem. Accordingly, the U.S. should consider the efforts being made by other countries to limit GHG emissions as a relevant consideration in formulating its own response to climate change. Dangerous human-induced climate change cannot be avoided without significant participation of the major-emitting countries (Table 1). The 12 highest-emitting countries comprise 75% of global emissions (taking the European Union as a single entity). These countries also account for 77% of U.S. exports and an equal share of U.S. imports.³⁸ Focusing on the individual and collective efforts of these countries should be an important consideration of the U.S. government.

It is not necessarily the case, however, that all countries should be expected to undertake 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,³⁹ which has been ratified by the U.S. with unanimous support from the Senate.

³⁸ 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%).

³⁹ Article 3, United Nations Framework Convention on Climate Change (UNFCCC). 1992. Available at: <http://unfccc.int/resource/docs/convkp/conveng.pdf>.

Table 1. Top Greenhouse Gas Emitting Countries (CO₂, CH₄, N₂O, HFCs, PFCs, SF₆)

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.		

An evaluation of relative efforts across countries is not simple (see response to 4a). Likewise, how the U.S. establishes its actions as “contingent” on the actions of others will need to take into account the realities of international cooperation on such a complex issue (see response to 4b). On a positive note, the United States has several plausible options for providing incentives to developing countries to take action on GHG emissions (see response to 4c).

Clarifying Question 4a:

- What metrics are most valuable for comparison of developed and developing country mitigation efforts to U.S. efforts?

There is a series of metrics and indicators that, when taken together, enable reasonable comparisons to be made across countries. These metrics are both quantitative (e.g., emissions indicators) and qualitative (e.g., policies adopted).

However, international comparisons are fraught with challenges. For instance, it is not even obvious what it is that should be compared. The domestic mitigation *efforts* of a country, the *results* of those efforts, the efforts at helping *other countries*, and the overseas results achieved all seem to be relevant criteria when making cross-country comparisons.⁴⁰ Likewise, some policy actions (e.g., carbon tax) will result in *immediate* effects, whereas others (e.g., R&D) are expected to bear fruit over decadal timescales. Further complicating matters is that, as explained above, not all countries are expected to undertake the same level of efforts (or results). In particular, there is broad international consensus that those poorer countries with less financial, technological, and administrative capacities are not expected to expend the same amount of effort as other countries that have contributed to the build-up of GHGs in the atmosphere and have the financial and technological means to rein in emissions.

Recognizing the complexities, it is clear that no single metric alone can adequately capture the relative mitigation efforts. Accordingly, a basket of metrics should be considered together when attempting to make even-handed comparisons across multiple countries. A few of the most important indicators are discussed below. The indicators and observations below are drawn from WRI's Climate Analysis Indicators Tool⁴¹ and the 2005 WRI report *Navigating the Numbers: Greenhouse Gas Data and International Climate Policy*.⁴²

A. Emissions Indicators⁴³

1. Absolute GHG Emissions (six gases)

The absolute emissions indicator is important for two reasons. First, it is a measure of each country's marginal (i.e., annual) contribution to the atmospheric buildup of GHGs. Second, it is a measure that near-term policies and technological innovations can influence. Accordingly,

⁴⁰ See Philibert, C. 2005. *Climate Mitigation: Integrating Approaches for Future International Cooperation*. Annex I Expert Group to the UNFCCC. Paris: OECD/IEA.

⁴¹ Climate Analysis Indicators Tool (CAIT) version 3.0. 2006. Washington, DC: World Resources Institute. Available at <http://cait.wri.org>.

⁴² In 2005, WRI undertook a comprehensive effort to evaluate a wide range of indicators. See Baumert, K.A., T. Herzog, and J. Pershing. 2005. *Navigating the Numbers: Greenhouse Gas Data and International Climate Policy*. Washington, DC: World Resources Institute, available at: http://climate.wri.org/pubs_description.cfm?PubID=4093.

⁴³ Data on all of the indicators described can be accessed free of charge from WRI's Climate Analysis Indicators Tool (CAIT) (<http://cait.wri.org>). CAIT includes data for all countries, all greenhouse gases, and all major economic sectors.

country-level changes in absolute emissions should be evaluated *over time*. Attempts to evaluate the effects of a specific measure may call for the use of sectoral rather than national data (e.g., transportation, electric power, agriculture, etc.) (See Indicator 4 below).

2. GHG Emissions Per Capita

GHG emissions per capita is a useful indicator because it measures *relative* emissions. Looking only at absolute emissions (Indicator 1, above) may be misleading, particularly when making evaluations between developed and developing countries. Some developing countries, such as India, may have high absolute emission levels (5th in the world), but low emissions per capita (140th). For these countries, reductions in absolute emissions (Indicator 1) are very unlikely *even under aggressive emission reduction policies*. The reason is that most individuals in India do not yet have access to modern electricity and transportation services. Thus, cleaner development may restrain emissions growth, but not necessarily lead to an absolute decline in emissions.

Useful insights may be gained by examining changes in GHG emissions per capita *over time*. Many factors influence changes in absolute emissions (Indicator 1), including population growth, economic growth, changes in energy fuels, and changes in economic activities (e.g., shift toward services). Per capita trends over time control for the effect of population growth on emissions growth. For example, one factor that explains why U.S. emissions have consistently grown faster than Europe's is the U.S. population is growing at about four times the rate of Europe's.⁴⁴ Comparing absolute and per capita growth rates can reveal this effect.

3. CO₂ Intensity of Economy

CO₂ intensity is emissions per unit of activity (e.g., gross domestic product [GDP], at the national level). This indicator is a function of a country's fuel mix (CO₂ per unit energy) and energy intensity (energy per unit GDP). Energy intensity, in turn, is a function of energy efficiencies and economic structure (e.g., an economy dominated by heavy industrial production would likely have a higher energy intensity than one where the service sector is dominant).

CO₂ intensity is useful for two reasons. First, over time, this indicator is *not* driven heavily by economic and population growth (unlike Indicator 1). Second, the factors that do drive changes in CO₂ intensity—namely, fuel mix and energy efficiency—are important policy targets. Thus, examining trends in emissions intensity should reflect progress (or lack thereof) in these important areas. It should be noted, however, that even in the absence of climate change policy, this indicator tends to naturally decline in many countries, for example, due to technological development and shifts away from energy-intensive production processes, which has been the experience in the United States.

⁴⁴ See Baumert et al., *supra* note 42, at 23 (analyzing effects of population growth on U.S. and EU CO₂ growth over the 1990 to 2002 period).

4. Sectoral and Fuel Indicators

Depending upon the policy being assessed, there are a range of other useful indicators. Examples include:

- If policy efforts are aimed at shifting away from coal and oil consumption nationwide, an important indicator would be the carbon intensity of fuel supply (CO₂ emissions per unit of energy consumption).
- If policy efforts are targeted at motor vehicle efficiency, then CO₂ emission trends in the transport sector should be evaluated, including both absolute and per capita trends.

5. Energy Consumption Per Capita

This indicator is important for reasons similar to GHG per capita, however it also provides some additional context because energy use in many countries is the largest source of GHG emissions. Other factors held constant, countries with high energy use may be more capable of reducing GHG emissions through policy interventions compared to those countries with low levels of energy use. This is due in part to the differing penetration rates of energy-intensive goods, particularly across North-South lines. In many developing countries, the penetration of refrigerators, air-conditioners, televisions, computers, automobiles, etc.—all of which require energy—is low compared with industrialized countries. As societies develop, it is expected that energy use will increase, even in the context of climate policy interventions. However, the degree to which expanded energy consumption increases *emissions* will depend upon the carbon intensity of the fuel supply (see Indicator 4).

B. Socio-Economic Indicators

These metrics, while less useful for comparing actual emissions efforts, do provide critical context for evaluating national circumstances – which in turn aids in assessing the appropriateness of climate programs being adopted and implemented.

6. Gross Domestic Product (GDP)

GDP—the aggregate level of economic activity within a country’s borders—is important because it is a major driver of GHG emissions. Accordingly, changes in GDP over time can be an important variable in explaining changes in emission levels (Indicators 1 and 2). For example, it may be difficult to detect the effect of strong emission-reduction policies in the context of very rapid economic growth (e.g., China). Alternatively, some countries may have declining emissions due to economic recession even though they are making little effort to restrain emissions (e.g., Russia and Ukraine). Thus, GDP shifts can provide essential context for understanding absolute emissions shifts.

7. GDP Per Capita

GDP per capita (i.e., income levels) provides a reasonable, though imperfect, measure for comparing levels of economic development. GDP per capita is a crude proxy of financial, administrative, and technical capacity within a country. Low-income countries also tend to have low education levels, significant public health problems, and relatively poor governance capabilities. Accordingly, those countries with very low levels of income cannot reasonably be expected to expend the same level of effort and financial commitment to climate protection as those countries with high income levels.

C. National Policies

Quantitative metrics, such as those discussed above, are only conducive to assessing (1) the macro effects of climate policies (or lack thereof) and (2) the level of effort on climate policy that countries should reasonably be expected to undertake. Quantitative indicators do not measure the level of effort on climate policy that a country *actually undertakes*. To gauge actual efforts, it is necessary to assess the actual policies and measures adopted. In making these assessments, WRI recommends the consideration of the following factors that, when taken together, provide a basis for comparative assessments.

1. Form of Action. This may include the following:
 - a. *Fiscal Measures*. Taxes (including exemptions, credits, etc.), fees, etc.
 - b. *Market and Regulatory Measures*. Cap and trade, mandates (products, processes), standards, sectoral regulatory reforms (e.g., electricity), product labeling, etc.
 - c. *Industry Agreements*. Corporate challenges, public-private partnerships, etc.
2. Stringency/Magnitude of Action. What level of effort is required under the particular measure? E.g., level of emission target, size of tax or subsidy, stringency of technology or performance standard, etc.
3. Legal Character. Are the policies and measures mandatory? If so, what are the accountability provisions with respect to reporting and review of compliance?
4. Scope of Action. What sectors, processes, or fuels are covered? E.g., energy production, buildings, industry subsectors, transportation, waste, forestry, agriculture, etc. What share of a country's emissions do the policies and measures cover? Scope of action can also be international, in that they are aimed at assisting other countries, in particular developing countries (e.g., through aid, export credits, etc).
5. Status. Is the measure planned or already enacted?

The above classifications provide a starting point for making meaningful comparisons. Once policies and measures are classified, additional considerations include:

- Given that countries are not all capable of, or are expected to, perform equally, how much effort should a given country reasonably be expected to undertake?
- Across what timescales should efforts be evaluated? Should policies that result in certain and immediate emission reductions be weighted more heavily than policies that may result in longer term reductions?
- How to compare stringencies across different forms of policy actions (e.g., technology standard versus an emissions cap)?

Accessing National Policy Information

There is a large literature on national climate policies, although in many cases up-to-date information requires gathering information directly from national sources. However, there are also several international sources that compile information on multiple countries, including the following:

1. National Communications. The most comparable repository of climate change policies and measures enacted by governments can be found in the National Communications to the Climate Change Convention. Each National Communication includes a section describing the policies and measures countries have adopted to reduce GHG emissions. These reports are submitted approximately every three to four years by Annex I (industrialized and transition) countries, including the United States. One major shortcoming of these reports is their poor coverage of developing (non-Annex I) countries. These reports are available from the Convention Secretariat at: http://unfccc.int/national_reports/items/1408.php.

2. International Energy Agency (IEA) Policies and Measures Database. The IEA maintains a database of climate change policies and measures that are planned or adopted by IEA member countries (including the U.S.). This database can be queried by a range of criteria, including country, year (of policy/measure), policy type (e.g., fiscal, regulatory), sector, and energy source. The database is high quality, but has several limitations, including that it is limited to IEA member countries and includes only *energy-related* policies and measures. The database can be accessed at: <http://www.iea.org/textbase/pamsdb/search.aspx?mode=cc>.

3. WRI Draft SD-PAMs Database. Modeled on the IEA database, WRI is in the process of developing a database that details the policies and measures planned or adopted in selected *developing countries*. In addition to “climate-specific” actions, the database includes so-called sustainable development policies and measures (SD-PAMs); i.e., policies, programs, regulations or other measures implemented that aim to achieve national or local goals but that have a beneficial effect on the climate by reducing emissions of greenhouse gases. The database covers measures from a range of sectors, including building efficiency, energy production, industry, transport, agriculture, and forestry, and can be queried by country, policy type, sector or motivation. Although currently in draft form, the database is a useful tool for identifying the efforts that developing countries are taking toward reducing their emissions. The draft database can be accessed at: <http://cait.wri.org/sdpams>.

Clarifying Question 4b:

- What process should be used to evaluate the efforts of other nations and how frequently should such an evaluation take place?

There are a variety of means through which the United States should evaluate the efforts of other countries, including the following:

1. Comparison study

As discussed in the response to 4a, cross-country evaluations are not simple. There is no ready formula that can be used to make balanced international comparisons. Accordingly, a competent government agency could be tasked with undertaking a study involving the top 12-15 emitting countries (e.g., those shown in Table 1). This study should also include an evaluation of the United States' domestic actions and international efforts.

2. International negotiations

Intergovernmental negotiation processes regularly evaluate—formally or informally—relative efforts across countries. Indeed, this is a normal feature of international negotiations on trade, arms control, and environment, among others. For example, NATO's "burden-sharing" exercise involved "targets for national military participation, conscription of soldiers, investments in equipment, contributions to military infrastructure and real estate, and so on [T]he process was one of reciprocal scrutiny and cross-examination, with high-level officials spending months negotiating."⁴⁵

Prior to adopting domestic commitments, the United States should develop an understanding of the relative efforts of other countries. However, because the United States has contributed more than any other country to the buildup of CO₂ and other GHGs in the atmosphere, there is a widely-held expectation that the U.S. should take a leadership role in the international efforts to address GHG emissions. To date, the perceived lack of action by the U.S. has been used by some countries to forestall their own efforts on GHG abatement.

Along these lines, the United States should be very cautious about establishing criteria that other countries should meet as a condition for U.S. action. For example, in the 1997 Byrd-Hagel Resolution the U.S. Senate insisted that, as a condition of U.S. participation in a climate treaty, developing countries must adopt "specific scheduled commitments to limit or reduce GHG emissions . . . within the same compliance period" as the commitment of the United States.⁴⁶

Rather than enhancing U.S. bargaining power, the resolution was perceived as unreasonable by most governments and contrary to the Climate Convention—under which the United States

⁴⁵ Schelling, T.C. 2002. "What Makes Greenhouse Sense?" *Foreign Affairs*. May/June.

⁴⁶ S. Res. 98, 105th Cong. (1997).

and other industrialized countries promised to “take the lead in combating climate change.”⁴⁷ The perception created by the Byrd-Hagel resolution was that the United States was not serious about dealing with climate change. In this context, the resolution gave developing countries good reason *not* to take stronger measures to rein in emissions.

These kinds of legislative or policy formulations should be avoided in the future, as they have harmful, if unintended, foreign policy effects. Prior to adopting extra-territorial “conditions” on other countries, the United States should consider a “reciprocity test”: what would be the U.S. reaction, for instance, to a provision adopted by the Indian Parliament which conditioned Indian actions on those of the United States? Such measures are not a constructive way of addressing climate change and therefore should be discouraged by the United States and other countries. A more fruitful process is one where the United States engages in international negotiations and, to support those negotiations, undertakes even-handed evaluations of the efforts of all major emitting countries (including the United States itself). In the ensuing legislation, the form and stringency of U.S. actions adopted should be informed by the efforts of other countries. Experience suggests, however, that making U.S. action contingent upon the actions of other countries can be counter-productive for all parties.

⁴⁷ See UNFCCC, *supra* note 39, at Art. 3.1.

Clarifying Question 4c:

- Are there additional incentives that can be adopted to encourage developing country emission reductions?

Yes. There are a number of measures that the United States can take to incentivize 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.⁴⁸ WRI together with the World Business Council on Sustainable Development have developed guidance on how such project mechanisms can be made to work effectively⁴⁹.

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.⁵⁰

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

⁴⁸ 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.

⁴⁹ Greenhouse Gas Protocol: The GHG Protocol for Project Accounting. Available at <http://climate.wri.org/ghgprojectaccounting-pub-4039.html>

⁵⁰ 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.⁵¹ 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 CO₂ capture and storage.⁵²

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.

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

⁵¹ 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*.

⁵² 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*.