Additional Topics
Submitter's Name/Affiliation: William Prindle, Deputy Director, ACEEE

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Why Energy Efficiency Requires Explicit Treatment in Climate Policy

ACEEE wants to emphasize to the Committee the importance of engaging energy efficiency in any effective national climate policy. As the studies we have cited elsewhere in our responses to the Committee's questions have shown, energy efficiency is one of the most cost-effective ways to address carbon emissions, and it can lead to a climate policy that produces net economic benefits, not penalties, for the economy.

Yet energy efficiency will not happen automatically through a broad, upstream cap-and-trade program, because efficiency occurs downstream, at the end-use level. This means that emissions traders typically will not accept emission reductions credits from energy efficiency as valid, because reductions in energy use do not assure upstream emission reductions. This is particularly problematic in the power sector.

Our analysis leads us to the conclusion that to be engaged effectively in climate policy, efficiency requires two key policy commitments:

1. A direct allocation, or auction, of allowances to entities charged with acquiring energy efficiency and other clean energy resources.
2. Parallel, complementary policies outside the cap regime, which are designed to achieve targeted energy savings in the most cost-effective way. These include energy efficiency resource standards (EERS), public benefits funds (PBF), and appliance standards

The Modeling of Climate Policy Must Better Address Efficiency's Benefits

We suggest that the climate science argument is largely completed. Virtually all serious analysts agree that carbon emissions are already creating serious climate problems, and that serious policy responses are needed. The zone of contention has now shifted to the world of economics, asking not whether we should reduce carbon emissions, but can we do it at an acceptable economic cost?

ACEEE has reviewed the major economic modeling studies conducted to date on climate change policy, and we find a marked divide in their approaches. One school takes a highly aggregated view of the economy, applies the estimated effects of climate policy in a fairly simple and aggregated way, and produces findings that tend to show somewhat negative economic impacts. The EIA, MIT, and CRA international studies of the Climate Stewardship Act fall in this category[1].

[1] Energy Information Administration. 2003. *Analysis of S.139, the Climate Stewardship Act of 2003.* Washington, D.C.: U.S. Department of Energy, SR/OIAF/2003-02). http://www.eia.doe.gov/oiaf/servicerpt/ml/pdf/sroiaf

Sergey Paltsev et al.. 2003. *Emissions Trading to Reduce Greenhouse Gas Emissions in the United States: The McCain-Lieberman Proposal* Cambridge, MA: Joint Program on the Science and Policy of Global Change, Report 97.

Additional Topics
Submitter's Name/Affiliation: William Prindle, Deputy Director, ACEEE

Another set of analyses tends to look in more depth at the technology and sector impacts that would result from climate policy, including shifts of capital, energy, and labor resources among various sectors of the economy. These more fine-grained studies tend to show that carbon emissions can be realized at much lower levels of economic impact, and indeed can produce positive net economic benefits.[2]

We urge the Committee and others in Congress to take a more intensive look at the economic modeling issues around climate change, especially those that involve energy efficiency. Having studied this topic, we offer two key observations:

- Some macroeconomic models do not assess the economic effects of energy efficiency with any specificity. They tend to simply simulate energy price increases in the economy and assume that energy efficiency will occur through price elasticity effects. They tend to treat reduced energy expenditures simply as a reduction of output from a given sector, ignoring the inter-sectoral substitutions of capital, energy and labor that more detailed models capture.
- Some models use a general equilibrium approach in which it is assumed that energy technology is optimally deployed in the economy. This means that any shift in the technology mix must, by the design of the model itself, impose costs on the economy. Yet ACEEE and others have amply documented that market barriers and other forces extensively limit the deployment of cost-effective technologies, meaning that a large measure of efficiency investment can occur at net savings to the economy.

Given these limitations in some of the models used to assess the economic impacts of climate policy, we urge the Committee to conduct a thorough investigation of these issues, so that a more balanced picture can be developed of the likely economic impacts of climate policy. At the

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Anne E. Smith, Paul Bernstein, and W. David Montgomery. 2003. *The Full Cost of S.139, With and Without Its Phase II Requirements* Washington, D.C.: Charles River Associates.

[2] Barrett, James, et al. 2005. *Jobs and The Climate Stewardship Act. How Curbing Global Warming Can Increase Employment.* Natural Resources Defense Council.

Barrett, James and J. A. Hoerner, *Clean Energy and Jobs: A Comprehensive Approach to Climate and Energy Policy* (Washington, D.C.: Center for a Sustainable Economy and the Economic Policy Institute, 2002)

Energy Innovations: A Prosperous Path to a Clean Environment (American Council for an Energy-Efficient Economy (ACEEE), The Alliance to Save Energy, Natural Resources Defense Council, Tellus Institute, and Union of Concerned Scientists, June 1997)

Florentin Krause et al., "Cutting Carbon Emissions at a Profit (Part II): Impacts on U.S. Competitiveness and Jobs," *Contemp Econ Policy*, Volume 21 (2003)

Hanson, Don, and Laitner, John A. "Skip". 2004. "An integrated analysis of policies that increase investments in advanced energy-efficient/ low-carbon technologies". *Energy Economics* 26 (2004) 739– 755.

Hahneman, Michael, et al. *Managing Greenhouse Emissions in California.* The California Climate Center at UC Berkeley. 2006.

Sanstad, Alan H., Stephen J. DeCanio, and Gale A. Boyd, "Estimating Bounds on the Macroeconomic Effects of the Clean Energy Future Policy Scenarios," *Energy Policy*, Volume 29, Issue 14 (November 2001)

moments, opponents of climate policy action have been able to use a few modeling approaches to claim that vigorous climate policy would exact a heavy toll on the economy.

Yet at least as many analysts have found that climate policy, if studied in enough depth, can be shown to generate positive economic impacts. In the RGGI modeling process, the states used the REMI regional input-output model to assess economic impacts. REMI found that RGGI would create small but positive economic impacts, increasing regional output, employment, and personal income in the region. When an increased commitment to energy efficiency was modeled in RGGI, the economic benefits increased several fold. Consumer energy bills fell by up to $100 per year.[3] These results suggest that Congress should take a harder look at the economic analyses conducted for the Climate Stewardship Act, and that for future consideration of climate policies, the Committee should seek a more balanced set of economic analyses.

[3] Lisa Petraglia & Dwayne Breger. *REMI Impacts for RGGI Policies based on the Std REF & Hi-Emission REF*. Presentation to the RGGI Stakeholders meeting, November 17, 2005.

Design Elements of a Mandatory Market–based GHG Regulatory system
Executive Summary
Submitter's Name/Affiliation: Gary L. Rainwater, Ameren Corporation

Additional General Topics

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments.

In evaluating the points in the White Paper, the absence of a specific legislative context and structure, such as a discussion draft or bill, makes it difficult to fully assess the relative importance of various design features. The possible importance of emissions trading and other design features such as banking, borrowing, offsets, baseline protection and credit for early action, allocation of allowances, compensating mechanisms, multi-year baselines and phased-in compliance would be highly dependent on the stringency of the targets and timetables and the availability of technologies to respond to such a program. The interrelationship of key design elements can only be seen within a specific legislative context or structure, not in isolation or even in series. Should the Committee draft or review a legislative proposal, we look forward to having the opportunity to review and comment on it before it is formally introduced.

In the next few years, the combined carbon dioxide (CO_2) emissions of China and India are projected to surpass the U.S.'s CO_2 emissions. This demonstrates the importance of considering global and multinational emissions of GHG in the cost effectiveness of any program, as well as ensuring the US economy is not harmed through commensurate trade agreements or loss of manufacturing jobs.

Design Elements of a Mandatory Market–based GHG Regulatory system
Executive Summary
Submitter's Name/Affiliation: Gary L. Rainwater, Ameren Corporation

While endorsing neither a mandatory regulatory regime nor any of the specific proposals or concepts in the White Paper, Ameren believes that it is important to consider the following issues if it is decided that a mandatory program is necessary.

I. Technology

Technology is the key to addressing GHGs. There is currently no viable and cost-effective technology to scrub CO_2 from power plant emissions, making the achievement of short-term mandatory reduction targets problematic. Coal-fired power plants are important for baseload power generation options because of their use of a readily available domestic fuel source which makes it a key component of our nation's energy independence. However, they are carbon intensive, and while improvements are being made in increasing generation efficiency, perfecting the technology to capture the CO_2 emissions and turn those plants into zero- or lower-emitting generators is still years away. Mandatory carbon regulation or setting a carbon price does not necessarily encourage technology development. For GHGs, we strongly support programs to encourage the development and deployment of emission reducing technologies.

II. Cap

If it is found necessary to meet goals, the nature of the cap would be important. Generally speaking, Ameren would favor a carbon or GHG intensity-based cap over one based on absolute emission reductions. A carbon intensity approach is consistent with the fact that economic growth and technological development are needed. A gradual approach, focusing on intensity,

would allow time for development and deployment of zero- and lower-emitting technologies, and could also yield significant reductions. Furthermore, absolute emission reductions are simply not achievable in the short term given the current global energy infrastructure and expected economic growth.

If a cap-and-trade program is established there would need to be a safety valve designed to limit the cost per ton of GHG reduced in order to constrain the serious negative impacts on the economy, lost jobs and businesses moving overseas that would result from the imposition of a cap on GHGs.

III. Offsets

Offsets would be an important feature of any mandatory system. Due to the global nature of GHGs, entities subject to GHG regulation should have the option to undertake activities or projects anywhere in the world. For example, it may be much more cost-effective from a global perspective for a regulated entity to take actions to reduce GHGs or emissions intensity in China or India under the AP6 than to take those same actions at its facilities in the US.
Under an economy-wide program, it would be important to allow offsets to be taken without limitation. Artificial constraints or quotas on offsets are economically unsound and unnecessarily raise costs.

An important aspect of offsets is the concept of their ownership. The recently proposed changes to the Department of Energy's 1605(b) guidelines for voluntary reporting of GHG highlights

this concern. The proposed change assigns offsets to the property owner, which has caused some entities to slow the development of offset projects. Any mandatory program that includes offsets should allow those offsets to be directly available to the entity that contractually and financially caused them to be created.

Additional Topics
Submitter's Name/Affiliation: Robert Shults/APX, Inc.

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

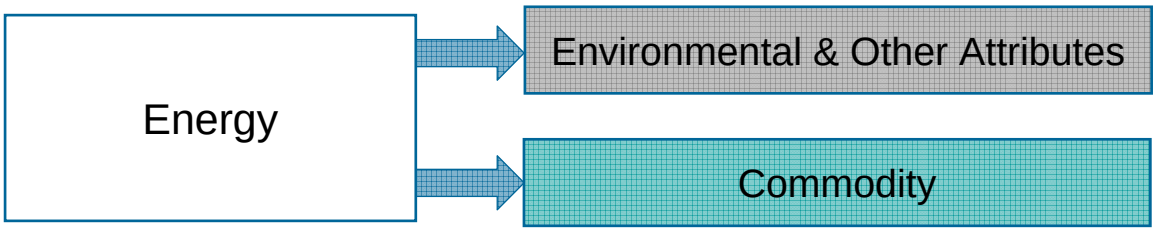
APX, Inc. (APX) is pleased to offer this proposal to the Senate Energy and Natural Resources Committee (Committee) in order to facilitate the April 4th Climate Conference on the design elements of a mandatory market-based greenhouse gas regulatory system. In addition to responding to Question 3, APX is addressing an additional topic related to the design of a mandatory market-based program. APX's vast experience in developing and administering environmental tracking programs makes it uniquely qualified to comment on the methodology for administering such a program.

The Committee has asked for comments on four important questions related to the design elements of a mandatory market-based greenhouse gas regulatory system. In addition to considering the four main questions, APX would recommend that the Committee address the question of how best to implement such a program to ensure the flexibility and accountability required at a cost that does not overly burden the stakeholders. In response to this additional topic, APX provides the following comments.

APX recommends that the Committee consider a certificate-based program for tracking greenhouse gas attributes to ensure an auditable, flexible program capable of meeting the needs of all stakeholders. In this document APX will provide relevant information on the benefits of considering a centralized certificate-based accounting and verification system to track greenhouse gas attributes and title of such attributes.

1. What is a certificate-based program?

   The premise of a certificate-based program is to separate the commodity from its attributes in order to allow each of the energy components to be managed independently.



   Once the attributes have been separated from the commodity, the commodity owner may dispose of the commodity in the market based upon the value of the commodity. The attributes associated with the energy may then be managed in a separate market designed for the attributes. The attributes may be associated with greenhouse gases or any other attribute that has been deemed to have positive or negative value. Such attributes may then be traded in a secondary market which is established specifically for those attributes.
2. What is a centralized certificate-based accounting and verification system?

A centralized certificate-based accounting and verification system tracks attributes and their associated title. These systems are widely recognized as the "best practice" for enabling renewable energy trading programs, and are the only systems in production in North America capable of supporting high-volume, multi-region programs. More specifically, these systems:

- Include an electronic platform that places a value on the benefits of predetermined preferable attributes (emissions, renewable, labor, fuel type, allowances)
- Create attribute certificates and track the transfer of title of such certificates
- Authenticate attribute claims and ensure no duplication of certificates
- Provide a means of electronically trading certificates between buyers and sellers
- Utilize an internet-based system that provides visibility and easy access to all stakeholders (participants, regulators, management)

3. Why is a centralized certificate-based accounting and verification system the right method for managing a mandatory market-based greenhouse gas regulatory system?

   Given the complex nature of managing a program that will provide mandatory, market-based limits and incentives on emissions of greenhouse gases, there must be a flexible infrastructure and methodology which will eliminate many of the potential difficulties of creating a broader market for greenhouse gas attributes. A certificate-based system allows the rules to evolve and the marketplace to grow -- regionally and internationally -- with little impact on how the program is administered or what systems are required to monitor it. Some of the specific benefits of a certificate-based system are that it:

   - Provides a means of monitoring valued attributes
   - Ensures that attributes are not double counted
   - Enables the monitoring of compliance and regulatory attribute requirements
   - Provides a means of adding liquidity to attributes market
   - Facilitates the development of attribute markets
   - Reduces transaction costs for attribute buyers and sellers
   - Introduces administrative and cost efficiencies
   - Provides third-party verification of attribute claims
   - Addresses data confidentiality concerns
   - Authenticates attribute marketing claims
   - Allows easy internet access for buyers and sellers of attributes
   - Utilizes a flexible technology infrastructure that allows easy modification of attribute rules
   - Is indifferent as to who is regulated or where
   - Allows trading with other cap and trade programs
   - Provides economic incentives which encourage similar programs

APX commends the Committee for contemplating a comprehensive and effective national program of mandatory, market-based limits and incentives on emissions of greenhouse gases that

slow, stop, and reverse the growth of such emissions. APX recommends that the Committee be mindful of the complexities of implementing such a program and consider the best alternative for administering a mandatory program. APX would appreciate the opportunity to address the Committee to provide details about the success of similar programs around renewable power and our vision of how a national certificate-based greenhouse gas program could work.

Additional Topics
Submitter's Name/Affiliation: Dr. Stephen J Asztalos

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Hon. Senators Domenici and Bingaman,

I am a nuclear physicist with a strong interest in the climate change.
Global warming is not the latest scientific craze. The effect was predicted in the middle of the 19th century, before CO2 emissions had a demonstrable effect on the climate. Current climate models are now able to accurately reproduce the Earth's temperature profile of previous decades and there is little reason to believe that the validity of their extrapolation into future decades. The results of such extrapolations provide a sobering message for those who prefer inaction on climate change. Thus, I applaud your broad and timely consideration of emissions legislation.

The world's scientific community has come to near universal agreement that climate change is due, in part, by man-made emissions. (A recent review of 973 scientific articles on climate change showed nearly all to be consistent with a measurable effect.) Consequently, we have an obligation to mitigate the results of climate change before the consequences are too dire to consider. The U.S., which regrettably has yet to provide leadership in climate change mitigation, can still seize the opportunity. Furthermore, predictions of economic calamity due to emissions control has been shown to be false. On the contrary, the State of California has shown that the development and introduction of climate-mitigation technology is likely to be a boon for the local economy. In a similar vein, it has been shown that CAFE standards could be boosted by the introduction of familiar technology with little or no sacrifice in power or safety.

Industry continues and will continue to promulgate inaction.
Unfortunately, this is an extremely short-sighted approach. Left unchecked, climate change will transcend borders, states and corporate boardrooms. This is precisely the role of government - to implement (potentially unpopular) programs that have timescales beyond those considered in corporate boardrooms.

The U.S. has a historic opportunity to resume leadership in climate change legislation. I believe that our economic health is tied to the strength of yet-enacted climate change legislation. Climate change is upon us, but much more change can be prevented if we act now.

Most Sincerely,

Dr. Stephen J Asztalos

Additional Topics
Submitter's Name/Affiliation: Rev. Jim Ball, Ph.D., Executive Director, Evangelical Environmental Network; Spokesperson, Evangelical Climate Initiative

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Please begin your comments here. (no page limit):

While I write as an individual, my comments are meant to be consistent with the views expressed by the leaders affiliated with the Evangelical Climate Initiative (ECI) and the ECI's statement, *Climate Change: An Evangelical Call to Action* (see www.christiansandclimate.org). I serve as one of the spokespersons for the ECI. I am also Executive Director of the Evangelical Environmental Network (EEN).

Nearly 90 senior evangelical leaders (e.g. Rick Warren, author of *The Purpose-Driven Life*) have signed the ECI's *Call to Action*, which states: "In the United States, the most important immediate step that can be taken at the federal level is to pass and implement national legislation requiring sufficient economy-wide reductions in carbon dioxide emissions through cost-effective, market-based mechanisms such as a cap-and-trade program. On June 22, 2005 the Senate passed the Domenici-Bingaman resolution affirming this approach, and a number of major energy companies now acknowledge that this method is best both for the environment and for business. We commend the Senators who have taken this stand and encourage them to fulfill their pledge."

Thus, our policy principles are consistent with the Sense of the Senate Resolution on climate change.

One word to highlight from the quotation above is "sufficient." We are calling for "sufficient economy-wide reductions" to begin to help our country meet the challenge of global warming.

The Domenici-Bingaman white paper does not explore what "sufficient economy-wide reductions" would mean; targets and timetables are not presented in the paper. While we are not policy experts, I would like to highlight the ethical importance of targets and timetables and their calibration.

From an ethical perspective, the most important aspect of any climate change legislation is that it begins to put our country on a greenhouse gas (GHG) emissions trajectory that leads to real reductions in the future that reduces or mitigates as much as possible the impacts of climate change in a manner that does not do significant harm to our economy. The evidence is clear that voluntary approaches have not worked. A mandate is needed.

Our concerns are very concrete. As the ECI statement says: "Millions of people could die in this century because of climate change, most of them our poorest global neighbors." The ECI statement makes clear why we ourselves are called to action: "Christians must care about climate change because we are called to love our neighbors, to do unto others as we would have them do

unto us, and to protect and care for the least of these as though each was Jesus Christ himself (Mt. 22:34-40; Mt. 7:12; Mt. 25:31-46)."

As citizens we bring our Christian concerns for the welfare of the most vulnerable with us into the policy arena. Addressing climate change is a values issue. For leaders affiliated with the ECI, protecting those yet to be born from the impacts of climate change is a pro-life issue.

For these reasons, we feel that any mandatory policy solution must provide a robust enough price signal to the marketplace to immediately effect investment decisions related to GHG emissions, helping to put the U.S. on a GHG emissions path to significantly mitigate the impacts of climate change on the most vulnerable. At the same time, the "glide path" for reductions must be calibrated in a way that does not do serious harm to the economy. This is why targets and timetables are critical from an ethical perspective. They must be robust enough to influence investment behavior sufficient to deal with the problem, but not so stringent as to cause significant economic harm.

If we were to use the current trading price for carbon in Europe as a proxy for a carbon price in the U.S., then the $7 per ton safety valve price currently proposed by the National Commission on Energy Policy (see p. 23 of the NCEP's report) is probably too low to accurately reflect the cost of carbon as determined in the market. It raises the question as to whether $7 per ton is an adequate starting place to create a robust price signal. Finally, a 5% annual rise in the safety valve price as suggested by NCEP seems anemic.

We leave it to policy experts to provide informed suggestions to policy makers as to the precise nature of the targets/timetables calibrations to achieve this ethical goal. However, part of our role is to point out that in terms of legislation the ethical heart of the matter is to be found here in the effective tuning of this targets/timetables calibration.

Respectfully submitted,

Rev. Jim Ball, Ph.D.
Executive Director
Evangelical Environmental Network
Spokesperson, Evangelical Climate Initiative

Additional Topics
Submitter's Name/Affiliation: Gretchen Boise, MD

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Any system set-up to regulate future emissions should take into account the exponential effects of global warming at its base.

Gretchen Boise, MD

Additional Topics
Submitter's Name/Affiliation: Ralph Moran/BP America, Inc.

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Key elements of a successful emissions trading program include:

- Multiple policy instruments working in parallel to address GHG mitigation across sectors and to incentivize technology and markets for lower carbon energy
- Government-set mandatory caps and administration with clearly defined consequences for non-compliance
- Robust systems for measuring, monitoring, and reporting emissions
  - Third-party verification; transparent registries; standardized methodologies are all essential. Underpinning systems should be developed in such a way to give maximum compatibility with existing national and international tools & protocols
- Long-term investment confidence and appropriate accountability
  - In order to promote significant (permanent) behavioral/operational changes and new technology investment, the market and regulations must provide a clear long-term framework for investment
  - There must be alignment between incentives and actions of emitters
- Broad Coverage – large region and multi-sector
  - A large market is more cost effective - distributing the economic burden & increasing opportunities for low-cost abatement measures. The market may be increased through an offset programme or linkage to other trading systems
- Compatibility with existing (and future) policies - any emissions trading program should be developed to work in harmony with existing regulations and be flexible to change as new policies and measures emerge.

Additional Topics

Dallas Burtraw and Karen Palmer / Resources for the Future / March 13, 2006

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

- The safety valve limits program costs but unless it is symmetric (ceiling and floor) it has unfortunate incentive and efficiency properties.

Symmetric Safety Valve

The National Commission on Energy Policy recommends use of a safety valve, which is included in the EIA price forecasts that we use for our simulations. A safety valve provides the assurance that the cost of the regulations (the price of emission permits) will not rise above a pre-established ceiling. The system does this by adding permits in excess of the emissions cap when the price of permits hits the ceiling. The safety valve protects against the feared economic repercussions that would be brought about by excessively high control cost. This is an understandable perspective for when the cost of the policy is not known and can efficiency enhancing.[1] However, experience with permit policies in practice suggest that underestimation of cost is as real of a possibility as overestimation.[2] For example, analyses of the SO_2 market shows that costs were substantially overestimated for that program.

The one-sided safety valve as described in the Senate White Paper has the potential to impose significant cost on the program and on specific parties. The long-term strategy to address climate involves diffusion of new technologies. Early adopters will be incurring risk associated with new technology, but one of their considerations will be the potential reward from success. The reward includes the economic value to themselves or others from avoided emissions. The ceiling on the allowance price limits the potential reward from an investment in the event that allowance prices are higher than expected. However, if allowance prices are lower than expected there is no limit to the potential loss from the investment. Consequently, the one-sided safety valve creates an asymmetric payoff function for early adopters. The one-sided safety valve could impose significant costs on the community of innovators and early adopters and this possibility undermines the incentive for investors to embrace innovative technologies.

A simple remedy to this incentive problem would be to adopt a general approach of a symmetric safety valve. The symmetric mechanism would adjust a quantity target in two ways: (a) in the case of unanticipated high compliance costs, it places additional allowances on the market at a predetermined price, as described in current safety valve proposals; and (b) in the case of unanticipated low compliance costs, the mechanisms adjusts the emission target by removing allowances from the market.

A symmetric safety valve approach could accommodate unexpected increases in the cost of compliance by expanding the cap, and it could accommodate unanticipated declines in cost by decreasing the emissions cap. Also, a symmetric approach would provide stronger incentives for continual technological innovation than a one-sided safety valve.

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[1] Pizer, William, 2002. "Combining Price and Quantity Controls to Mitigate Global Climate Change," *Journal of Public Economics*, 85:3, 409-434.

[2] Harrington, Winston, Richard D. Morgenstern, and Peter Nelson, 2000. "On the Accuracy of Regulatory Cost Estimates," *Journal of Policy Analysis and Management*, 19:2 297-322.

Additional Topics
Submitter's Name/Affiliation: John Cairns,Jr., Virginia Polytechnic Institute and State University

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

I have been solving environmental problems since 1948 [credentials at http://www.johncairns.net] and global warming is the worst of the problems to be solved! The Senate hearings hit many of the basic issues. A significant number of mainstream scientists feel we have already passed the tipping point where the positive feedback loops take over. May your efforts be successful!
John Cairns,Jr.

Additional Topics
Submitter's Name/Affiliation: Dr. Michael Canes, LMI

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Please begin your comments here. (no page limit)

Comments on "Design Elements of a Mandatory Market-Based Greenhouse Gas Regulatory System"
Authored by Senators Pete V. Domenici & Jeff Bingaman
February 2006

The White Paper raises several important questions concerning methods to constrain greenhouse gas (GHG) emissions in the United States. The Paper focuses on a Cap and Trade (C&T) system, and asks how best to implement such a system. However, it does not question whether such a system is justified in light of present scientific information, it does not consider the cost of such a system, it does not request information on other means to constrain GHG emissions, it does not ask whether present U.S. policies are working, and it does not seek means to strengthen such policies. These omissions are unfortunate. Further, some of the very questions raised in the White Paper suggest why a C&T system is not a wise choice. Better policy choices exist and should be explored before a C&T system is considered.

Climate Change Science Does Not Justify Extreme High Cost Policy Action

The state of climate change science continues to evolve, with new insights gained as models are improved and evidence obtained. Warming to date is within the long term historical range and can be only partly attributed to anthropomorphic behavior. Though insight is gained from the use of climate models, they have great difficulty matching the timing and location of warming trends, and are far from reliable predictors of future trends. Scientists continue to propose and test new hypotheses concerning warming, including what its effects would be on the U.S. Observation, measurement and hypothesis testing is how the science will continue to advance, not through a "consensus" process. For now, this science suggests that policies should be considered to reduce the growth of GHGs and to adapt to warming, but it does not suggest drastic measures that would cost much more than what they would gain.

A Cap & Trade System Would Impose Large Costs on the U.S. Economy

A C&T system would impose high costs on the economy because energy is an input to the production of GDP and because fossil fuels supply approximately 85% of total US energy use. Artificial constraints on fossil use would reduce aggregate output because they would force substitution of higher cost inputs for energy, and by so doing would reduce the aggregate product of capital and labor.

A number of economic studies corroborate this conclusion. In 1998, EIA examined the economic effects of a cap on U.S. GHGs imposed to conform with the Kyoto Protocol (without trading) and estimated that costs could approach 4% of GDP annually by 2008-2012.[1] A 2003 Charles River Associates study found that a C&T system as proposed by Senators Lieberman and McCain (with trading) would cost $350-$760 per household in 2010, depending on which of two versions of their proposal were enacted.[2] DRI and others have similarly estimated high costs to the economy from capping U.S. carbon emissions, even with a trading system.[3] More recently, in 2005, EIA examined policy recommendations of the National Commission on Energy Policy, which included a C&T system with a safety valve in the form of sales of additional permits if the price exceeded certain levels. Even with the safety valve, EIA estimated reduced consumption in every year between 2010 and 2025, with the level reaching $470 per household by 2025 (in $2000, about $550 per household in today's dollars).[4] Clearly, the imposition of a C&T system in the United States is likely to cost many tens of billions of dollars per year. The science of climate change does not justify the imposition of such costs.

A C&T System is an Inferior Means to Constrain US GHGs

Questions raised in the White Paper suggest how difficult it would be to administer a C&T system in the US. The paper suggests an "upstream" system would be simpler than a "downstream" system, but even an upstream system would present many challenges. There are literally thousands of U.S. producers and importers of fossil energy, which means that even controlling CO_2 alone through a C&T system would be difficult. In addition, if other greenhouse gases such as methane and PFCs were to be controlled through a cap and trade system, many farmers, chemical companies and others would have to be included. A C&S system is bound to be extremely complex and difficult to administer, no matter how far upstream it is placed.

Nor is complexity the only serious problem with such a system. The White Paper raises the issue of to whom "free" emission rights should be given. It asks whether such free rights should be granted for energy technology development and deployment, adaptation research, low income consumers, all consumers, early reduction credits, an offset pilot program, fossil fuel producers, electric generators, energy intensive industries, agriculture and small business. These very questions raise the specter of rent seekers throughout the economy petitioning the Federal government for "free" emission rights. Such rent seeking in itself would consume resources, up to the value of what is sought. Estimates vary, but if the per metric ton cost of a permit were around $25 (roughly the current price in the EU), that alone would imply rents of nearly $200 billion/year. Resources spent fighting for income redistribution in the form of free allowances is

[1] U.S. Department of Energy, Energy Information Administration, Office of Integrated Analysis and Forecasting, "Impacts of the Kyoto Protocol on U.S. Energy Markets and Economic Activity, Washington DC, 1998.
[2] Anne E. Smith, Paul Bernstein & W. David Montgomery, Charles River Associates, "The Full Costs of S.139, With and Without its Phase II Requirements," Washington DC, October 27, 2003.
[3] Joyce Y. Brinner, DRI, Inc., "Commentary: The Impact of Meeting the Kyoto Protocol on Energy Markets and the Economy," in *Climate Change Policy: Practical Strategies to Promote Economic Growth and Environmental Quality*, American Council for Capital Formation Center for Policy Research, Washington DC, 1999. Brinner estimated annual costs exceeding 1% of GDP.
[4] U.S. Department of Energy, Energy Information Administration, Office of Integrated Analysis and Forecasting, "Impacts of Modeled Recommendations of the National Commission on Energy Policy," Washington DC, April 2005.

a deadweight cost to the economy, not counted in the economic studies referenced above. Nor is it healthy for the U.S. political system to encourage such rent seeking. The public already is skeptical concerning monies spent to gain access to U.S. policy makers, monies frequently spent on the kind of rent seeking which a C&T system with free allowances would encourage. This is yet another reason why a C&T system should be avoided.

If the U.S. government were convinced that reductions in GHGs should be compelled through policy measures, it would be better to approach the matter through the tax system, with some form of a carbon tax. Economic theory strongly supports this conclusion. A 1999 study by Pizer estimated that such an approach would be about 5 times as cost effective as a C&T system.[5] More recently, in a paper presented to the American Economic Association, Nordhaus reached similar conclusions.[6] Thus, even were the US to embark on a compulsory constraint path, a tax would be the better approach.

U.S. Record on GHG Reductions

Fortunately, the public record gives strong reason to avoid such a compulsory approach at this time. The facts are that U.S. policy has aimed at reducing aggregate GHGs for some time, that its policies have been successful, and that even more can be done using voluntary approaches.

What are these facts? Through investment in R&D and a wide variety of voluntary partnership programs with U.S. firms, government policy has encouraged the adoption of less energy intensive and less GHG intensive means of production and consumption. While Federal policy is not the only influence, it has consistently supplemented market forces in these directions. The result has been consistent reductions in energy intensity and in amounts of greenhouse gases produced per unit of U.S. output, reductions that compare favorably with activity elsewhere in the world.

U.S. energy intensity data are available from the EIA as far back as 1973. The summary table below shows such intensity in that year, 1990 and 2004. From 1973 to 1990 U.S. energy intensity fell by 31%, and from 1990 to 2004, by another 22%.

Energy Consumption per $ of U.S. GDP (1000 BTU/$ in $2000)

1973	17.44
1990	11.91
2004	9.32

EIA also provides data for the carbon intensity of U.S. GDP. According to these data, between 1990 and 2003, U.S. carbon intensity decreased by 21%. This rate of change compares

[5] William Pizer, "Choosing Price or Quantity Controls for Greenhouse Gases," *Climate Issues Brief No. 17*, Resources for the Future, Washington DC, July 1999.
[6] William D. Nordhaus, "After Kyoto: Alternative Mechanisms to Control Global Warming," Paper prepared for the American Economic Association Session on Global Warming and the Kyoto Protocol, December 2005.

favorably with many other OECD countries, and with other major economies around the globe. A summary table below illustrates this point.

Carbon Intensity, by Country 1990 & 2003
(MMT/$1000 US in $2000)

	1990	2003	% Change
U.S.	**.19**	**.15**	**21**
Brazil	.13	.15	-15
France	.09	.08	11
Germany*	.15	.12	20
UK	.14	.10	29
Russia**	1.67	1.43	14
Japan	.07	.07	0
China	1.48	.70	53
India	.59	.51	14
S. Korea	.22	.22	0

*1991 to 2003
**1992 to 2003

President Bush has committed the U.S. to a further 18% reduction in GHG intensity between 2002 and 2012. If this is accomplished, U.S. carbon intensity will fall to between .12 and .13, approximately the present level of Germany. Between 2002 and 2004 U.S. GDP increased 7% while GHGs increased 3%. Only 11 months of data are available for 2005 but so far it suggests that annual GHGs increased slightly if at all, whereas GDP rose another 3.5%. If so, GDP will have risen over 10% over 3 years while GHGs rose about 3%. That would imply more than a 7% reduction in GHG intensity in three years, well ahead of the President's pledged schedule.

Immigration Often Isn't Accounted for in U.S. GHG Statistics

This record is all the more remarkable in the light of U.S. immigration statistics. Immigration in effect moves the production of GHGs from other countries into the U.S. For example, between 1990 and 2002 the US population increased by an estimated 39.2 million, or roughly 16%. Total (legal and illegal) immigration over this period is estimated at 14.3 million. The offspring of previous immigrants account for another 7 million or so. Thus, previous and present immigration account for a little over 50% of the population increase over that period.

Between 1990 and 2002 U.S. GHGs increased by 12.4%. Even if immigrants and their offspring produce fewer GHG emissions than other Americans, they add significantly to the U.S. total. For example, even if the per capita GHG emissions of immigrants and their offspring are only 50% those of other Americans, they still would have accounted for over a quarter of the increase in U.S. emissions over the period. No other OECD country is experiencing anywhere near such immigration numbers, implying that the U.S. record relative to other such countries actually is better than the simple data suggest.

Additional Topics
Submitter's Name/Affiliation: Dr. Michael Canes, LMI

A Voluntary, Technology Based Approach is a Superior Means to Constrain U.S. GHGs

It is not necessary to adopt a compulsory system to reduce U.S. GHGs. Present U.S. policy, which emphasizes a voluntary, technology based approach, is working well and can be further improved.

There are several paths by which U.S. GHG emissions can be reduced. These include greater energy efficiency, lower carbon forms of energy production, greater capture of CO_2 and of methane emissions, and fewer emissions of non-fossil fuel related greenhouse gases. All of these can be encouraged through development of new technologies and through encouragement of public and private sector entities to adopt such technologies.

Both private sector firms and Federal agencies already are conducting R&D on a wide variety of energy production and energy efficiency technologies. The higher energy prices of the past few years and the possibility that these prices will be sustained for the foreseeable future provide strong stimulus both to engage in such R&D and to adopt new technologies as they are proven out. The Federal government can expedite this process by trying out technologies in its own facilities and vehicles, and by providing incentives to private firms to do the so as well. Stronger investment incentives will induce firms to turn over their capital stock at a more rapid rate, resulting in more rapid adoption of energy efficient technologies and fewer GHG emissions per unit of output.

Federal agencies also are sponsors of, and participants in, a wide variety of voluntary GHG reduction programs. EPA, DOE and the Department of Agriculture engage in private-public partnerships, energy efficient product labeling, best practice identification, data banks and other means to encourage U.S. firms to reduce their GHGs. Thousands of U.S. firms participate in one or another of these programs, and in similar types of partnerships with environmental groups, state governments and others. EPA has estimated that its voluntary programs alone will result in a reduction in aggregate U.S. greenhouse gases of about 9% of projected GHGs in 2010.

Federal policy should recognize the effectiveness of agency-led voluntary programs and provide strong support for them. Because of their importance, it should also hold the programs to account for such support. Each of the various Federal partnership programs should be encouraged to report its results in terms of verified GHG reductions, and to project what it will accomplish in the future. Those that demonstrably are achieving significant reductions should be further supported and encouraged.

Finally, federal agencies themselves should be encouraged to publicly report their GHGs and to establish plans to reduce them. Through example and persuasion, the Federal government also should encourage state and local governmental entities to report their GHG emissions. The greater the public dissemination of such data, the more likely that reductions in public sector emissions will take place.

Additional Topics
Submitter's Name/Affiliation: Dr. Michael Canes, LMI

Additional Topics
Submitter's Name/Affiliation: Citizens' Alliance for Responsible Energy

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Indexed Emissions and Market-based GHG Control

Imposing a hard cap on carbon emissions will strangle industrially-based economic growth within the U.S. The choice of regulatory approach—whether fuels and fuel producers themselves are regulated ("upstream approach") or whether fuel consumers are regulated ("downstream regulation") will have great bearing on the ultimate outcome.

Depending on how the final cap and trade legislation is structured, the effects could range from increased fossil fuel import dependency (in the case of upstream regulation) to outsourcing of nearly all U.S. heavy industry (in the case of downstream regulation.) The overall economic impact of a plan based on fixed caps would be highly detrimental to America's economy, and by extension, its global position of power.

One alternative that would slow GHG emissions growth without causing serious economic damage entails borrowing a page from the wage indexing playbook, and creating a system of "indexed emissions growth" coupled with a carbon trading system. An indexed emissions plan aims to arrest emissions growth by giving the private sector incentive to use its capital and ingenuity to find ways of reducing the greenhouse gas intensity of industrial operations as well as motor vehicles.

How to build such a system?

The first step in building an "indexed" GHG emissions control system would be several years of detailed economic and scientific study, so as to create a full base of objective empirical evidence.

If the economic and scientific facts supported imposing such a system, the second step would be a 5-year trial run designed to test the system's effectiveness in arresting GHG emissions growth. An ideal testing ground would be the power generation sector, which produces 40-percent of U.S. greenhouse gas emissions. In addition, utilities already trade sulfur dioxide emissions allowances as part of an acid rain reduction program and their experiences would likely help them adapt more quickly than other sectors to a CO2 regulatory regime.

An indexed GHG emissions system would work as follows. If CO2 emissions grew by an average of 1.5 percent per year from 1990-2005, then allowable 2006 CO2 emissions growth would be capped at one-percent or .80 percent and carbon allowances trading could be used to help large emitters make the cut.

The idea is that relative emissions growth will be slowed, but that the economy will still have room to expand each year. Greenhouse gas intensity per unit of GDP in the U.S. has fallen at an average rate of 1.5 percent annually for more than 20 years. An indexed cap would spur private sector innovation and efficiency increases that would drive emissions growth down even faster, while still leaving room for growth in the vital industrial sector.

Additional Topics
Submitter's Name/Affiliation: Citizens' Alliance for Responsible Energy

Why This Plan is Superior to Fixed Cap-and-Trade

- An "indexed" emissions regulation system capitalizes on, and would reinforce the trend of falling U.S. GHG emissions per unit of GDP.
- It would foster innovation by giving companies incentives to reduce industrial processes' GHG intensity, but would still allow industrially-based economic expansion.
- It would give strong market incentives for expanding the role of nuclear energy.
- It would give greater incentives for clean coal and CO2 sequestration development.
- It would help fuel the growth of carbon allowance trading on financial markets
- If the U.S. financial exchanges can build a strong position in the emissions trading business, this would make is much easier to integrate our carbon mitigation program with those of other countries.

Possible Downsides

- Compliance and monitoring would be a significant administrative challenge, but no bigger than that which cap-and-trade would pose
- It would still be difficult to persuade major developing world GHG emitters such as China and India to participate

Recommendation

We offer Committee Chairman Domenici and his esteemed colleagues a 3-point plan to put the U.S. on a path that reconciles the need for GHG emissions controls with the need for economic growth to maintain prosperity and create jobs for millions of new workers in coming years.

Point 1:
Kick off a detailed, non-partisan study of the issues involved in setting up an indexed GHG emissions control system, such as that outlined above.

Setting up a carbon emissions control regime of any type would be a monumental step for the U.S. and as such, warrants a serious scientific and economic due diligence effort so that national leaders will have a thorough range of empirical evidence to help them make good decisions.

Los Alamos, Sandia, Oak Ridge and other U.S. national laboratories can bring cutting edge scientific expertise to bear on the subject. In addition, the U.S. should seek to observe and learn from the European Union and other Kyoto signatories who are required to implement CO2 control programs. These countries would be eager to share their experiences and offer advice when they see that the U.S. is beginning to seriously consider how to deal with climate change.

Point 2:
Launch an aggressive nuclear energy program.
Roughly 40-percent of U.S. CO2 emissions come from fossil fuel power plants. The U.S. currently generates about 20-percent of our power from nuclear energy. If this share were to double, power sector emissions would fall dramatically. Streamlining the permitting process for utilities wanting to build new nuclear power plants would be an excellent first step.

Additional Topics
Submitter's Name/Affiliation: Citizens' Alliance for Responsible Energy

Waste storage is another critical hurdle that nuclear power must clear. The national laboratories could assist the industry in solving these problems.

Point 3:
Get China and India to sign on to a GHG emissions control regime.

If the world's second and fifth largest GHG emitters are not bound by an emission control system, then the system will put developed economies at a competitive disadvantage, while simultaneously failing to arrest overall GHG emissions. This would be the worst of both worlds and the willingness of large developing world emitters to participate in a binding agreement should be a key condition for determining whether or not the U.S. participates.

Additional Topics
Submitter's Name/Affiliation: Clean Air Task Force

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

The Necessity of Moving Forward Expeditiously

CATF commends Senators Domenici and Bingaman for moving forward this discussion, and for seeking to move forward legislation establishing mandatory emission limits. This exercise will elicit passionate views on a number of legislative design issues, as is to be expected. But it is important that such differences of viewpoint not paralyze action.

In this regard, two considerations should be kept in mind:

1. *Timing matters.* Most analyses of the greenhouse problem suggest that this decade and next is a critical point in the trajectory of world emissions and that the opportunity to stabilize climate may be lost if we do not begin to deflect the "business as usual" emissions case downward in the next ten-twenty years. As NASA Goddard Institute Director James Hansen observed recently,

> The Earth's climate is nearing, but has not passed, a tipping point beyond which it will be impossible to avoid climate change with far-ranging undesirable consequences. These include not only the loss of the Arctic as we know it, with all that implies for wildlife and indigenous peoples, but losses on a much vaster scale due to rising seas. . . .This grim scenario can be halted if the growth of greenhouse gas emissions is slowed in the first quarter of this century.[1]

Work by NASA Goddard Institute, the IPCC and other research bodies suggests that constraining warming to 2 degrees C from pre-industrial levels – a widely accepted threshold for dangerous anthropogenic interference -- would require, at a minimum, a decline in the rate of CO2 emissions *growth* immediately, with an *absolute decline* beginning by mid-century, [2] as well as a decrease in non-CO2 greenhouse forcing agents such as methane, black carbon and ozone.[3] This will not be easy, given the fact that CO2 emissions are presently increasing by more than 100 million metric tons annually.

Much of the timing urgency stems from the long-lived nature of carbon in the atmosphere (100-200 years) combined with the long-lived nature of energy-transforming capital assets, particularly power generation, fuel infrastructure, and buildings. Every year in

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[1] Hansen, Dr. James E. Hansen, National Aeronautics and Space Administration, Goddard Institute for Space Studies, presentation to the American Geophysical Union, December 6, 2005.
excerpted in "The Tipping Point," New York Review of Books, Jan 12 2006

[2] Hare B and M. Meinshausen 2004. How Much Warming are we Committed to and How Much Can be Avoided? Summary Report No. 93. , October ,

[3] Hansen, J, et. al. 2005. Efficacy of climate forcings. *J. Geophys. Res.* **110**, D18104, doi:10.1029/2005JD005776.

which high-carbon capital investments – like new pulverized coal power plants -- are made commits us to a 50-60 year stream of carbon emissions, which then have a century-plus atmospheric "overhang." For example, a 1,000 megawatt conventional pulverized coal plant commissioned today will likely, over its fifty-sixty year lifetime, emit more than 100 million metric tons of carbon, regardless of carbon policies put in place five years from now. As with accumulating principal on a financed-interest mortgage, time works against our continued carbon "spending."

As a result, it is important to weigh the theoretical attractions of any carbon regulation scheme against the *political complexity of getting it enacted in a timely way.*

2. *Any legislative regime must be seen as a first step only.* Most analyses have concluded that stabilization of atmospheric temperature at 2 degrees C higher than pre-industrial levels will require reductions in CO2 emissions in developed countries of 75% or more by 2100.[4] None of the major proposed legislation at present adopts such a target for the United States. Moreover, it is politically unlikely that such a firm target would be politically acceptable unless and until more experience is gained with a carbon-limited regime, and technological and economic options to achieve such targets become more obvious than they are today. Accordingly, any climate regime under discussion today should be seen as a starting step, not a final one. There will inevitably be additional ratchets and requirements if we continue to take the problem seriously. This is another argument for getting started, not getting it perfect.

It would be a huge lost opportunity if this discussion does not lead to legislative activity. CATF pledges whatever support it can provide to move the process along.

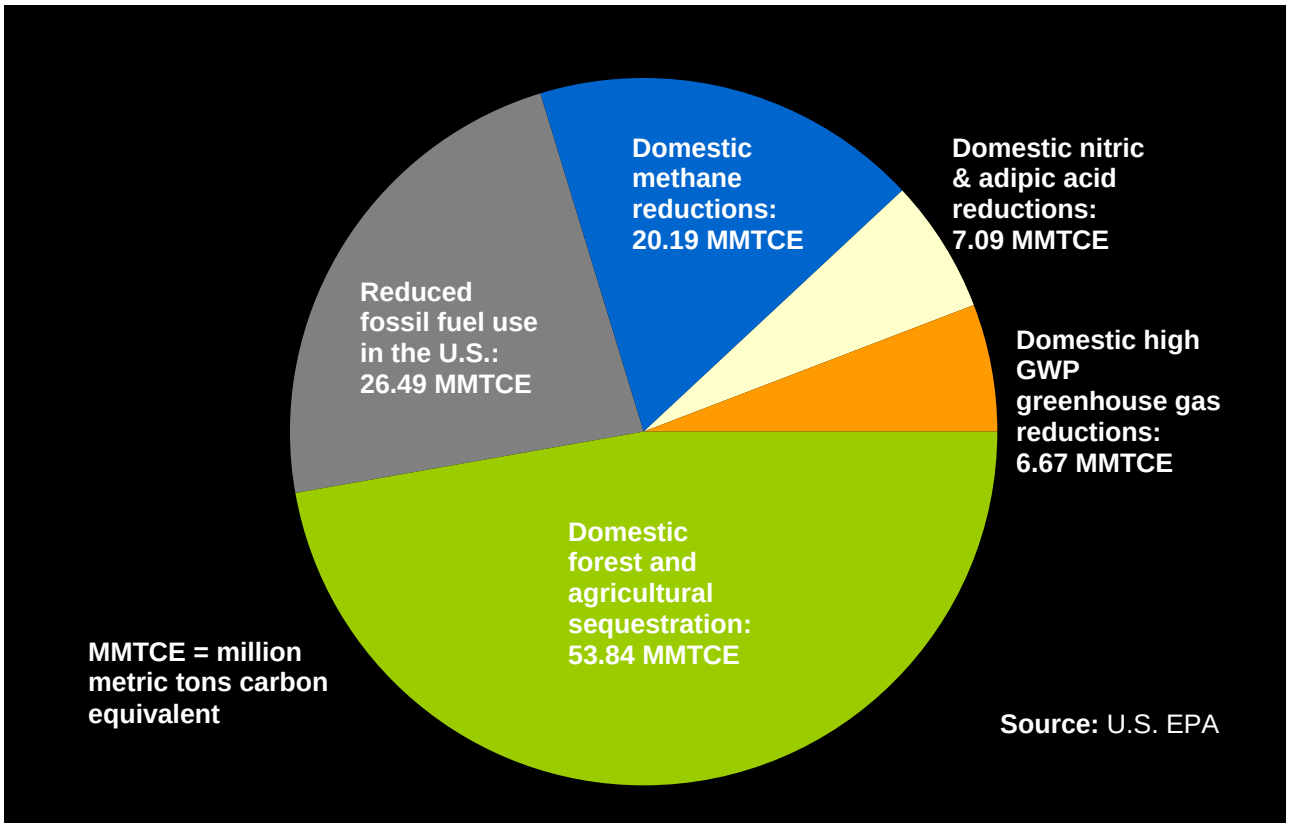
[4] O'Neill, Brian C. and Michael Oppenheimer, Dangerous Climate Impacts and the Kyoto Protocol, 2002, Science, Vol. 296, 1971-972.

Additional Topics
Submitter's Name/Affiliation: Michael J. Bradley, The Clean Energy Group's Clean Air Policy Initiative

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

The following figure is referenced in our response to Question 1:

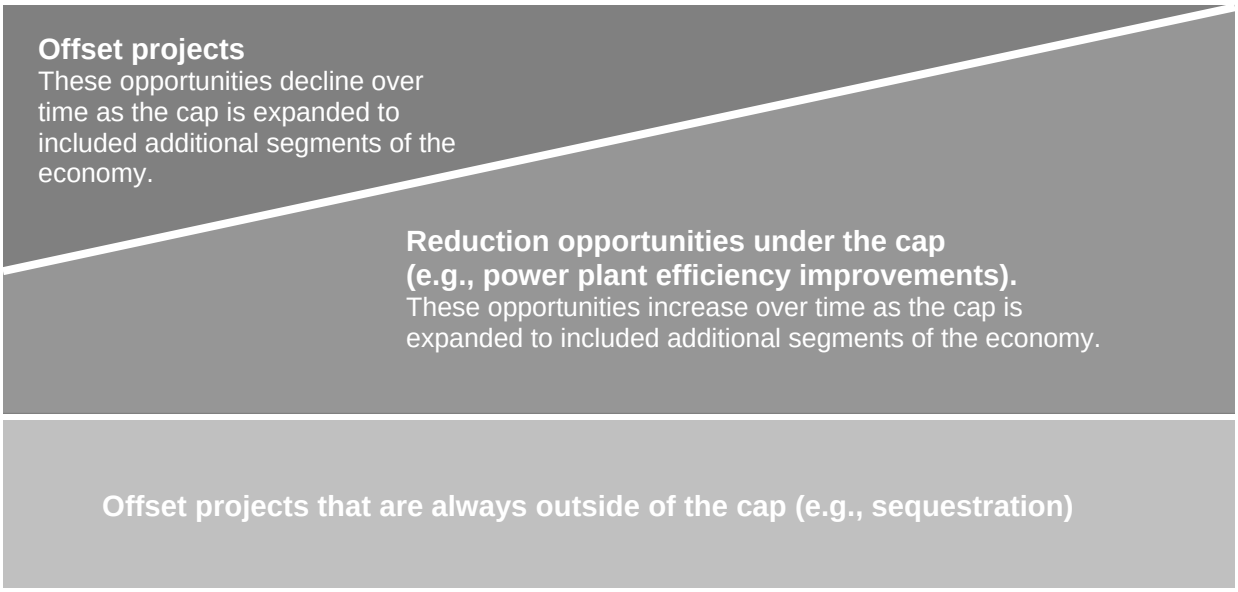
Figure 1. GHG Emission Reduction Opportunities by Category at $2.50 per ton of CO_2



Additional Topics
Submitter's Name/Affiliation: Michael J. Bradley, The Clean Energy Group's Clean Air Policy Initiative

The following figure is referenced in our response to Question 2d:

Figure 2. Transitioning to an economy-wide approach (i.e., bringing more sources under the cap) transitions reduction opportunities from offset projects to capped emissions sources. Some project categories (e.g., sequestration projects) will always remain outside of the cap.



Additional Topics
Submitter's Name/Affiliation: (Congressional Budget Office)

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

A cap-and-trade program for carbon dioxide emissions would offer a way to set an overall limit on the level of carbon dioxide emissions while relying on economic incentives to determine where and how emission reductions occur. Such a program would probably reduce the costs of meeting an emission-reduction target, but it would not necessarily balance actual costs with the expected benefits achieved by the target. As described below, including a "safety valve" in a cap-and-trade program could help achieve that goal.

A cap-and-trade program with a safety valve would combine an overall cap on total emissions with a ceiling on the allowance price. If the price of allowances rose to the ceiling (or safety-valve) price, the government would sell as many allowances as was necessary to maintain that price. Thus, if the safety valve was triggered, the actual level of emissions would exceed the cap. The cap would be met only if the price of allowances never rose above the safety-valve price.

If policymakers had complete and accurate information on both the costs and benefits of achieving various limits on emissions, the inclusion of a safety valve would not offer any economic advantages. With full information, policymakers could set the cap to the level at which the cost of the last ton of emissions reduced in order to meet the cap was equal to the benefit from that reduction. However, neither the costs nor the benefits are known with certainty. For that reason, the best policymakers can do is to choose the policy instrument that is most likely to reduce the cost of making a "wrong" choice. Choosing a cap that is too stringent would result in excess costs that are not justified by their benefits. The inclusion of a safety valve that limited the price of allowances to the expected benefits of incremental emission reductions would avoid that outcome.

The advantages of including a safety valve in a cap-and-trade program stem mainly from the fact that the cost of limiting a ton of emissions is expected to rise as the cap becomes more stringent, whereas the expected benefit of each ton of carbon dioxide reduced is roughly constant across the range of potential emission reductions in a given year.[28] Because the additional benefit created by each additional ton of carbon that is reduced as the cap is tightened is expected to remain constant (even though it cannot be known with certainty), yet the additional cost is expected to rise by an unknown amount, a safety valve could help prevent excess costs. A safety valve would limit the cost of additional emission reductions to the expected benefit of those emission reductions.[29]

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28. That constancy occurs because climate effects are driven by the total amount of carbon dioxide in the atmosphere, and emissions in any given year are a small portion of that total. Further, reductions in any given year probably would be considerably less than the total baseline emissions for that year.

29. Limiting emissions of carbon dioxide with a tax on carbon emissions (set equal to the expected benefit of reducing emissions by one ton) could offer additional economic advantages over a cap-and-trade program with a safety valve. If the costs of reducing emissions were greater than expected, the tax would perform in the same manner as the safety valve. However, if the costs of reducing emissions were less than expected (and thus, the cap was less stringent than might have been justified by actual costs and

benefits), the tax could offer additional advantages. The tax could motivate more emission reductions than would have been required by the cap—keeping the cost of emission reductions in line with the benefits that they were expected to create. Available research indicates that a price instrument, such as a tax or safety valve, would offer economic advantages over a cap as long as policymakers did not feel it necessary to make extremely large emission reductions in the near term to avoid passing a threshold level of atmospheric concentration—that is, a point at which incremental increases in emissions would lead to a large increase in the incremental damages caused by those emissions. For a more detailed description of the advantages that a tax and a safety valve offer, along with an illustrative example, see Congressional Budget Office, *Limiting Carbon Dioxide Emissions: Prices Verus Caps* (March 15, 2005).

Additional Topics
Submitter's Name/Affiliation: (Insert your Name/Affiliation here)

Peter B Danzig, PhD/Computer Networking Entrepreneur and Professor

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Please begin your comments here. (no page limit)

Since emissions are cumulative and remain in the atmosphere for a millennium, it's crucial to cut emissions quickly. The longer we wait, the more steeply we'll need to cut them in the future to hit any particular climate target. The US needs to achieve 75% global GHG reductions by 2050 to keep global climate from warming an expected 2-3 degrees C. My thesis is that it's essential to promote regulatory mechanisms in a mandatory market-based scheme, or else we will be unable to increase energy efficiency and drive the steep emission reductions needed.

Expected Climate versus Probability Distribution of Future Climate

Three degrees is the expected warming in climate models. That means that there is a 50% probability that the warming will exceed 3 degrees, and there's a good chance (1 in 6) that the climate will warm by 5 degrees, for any doubling of GHG. There's a 3% chance that the climate warms by 10 degrees.

Conceptually, a 5 degree warming will give the state of Maine the climate currently enjoyed by the state of Georgia. Regardless of increased warming, sea level will rise 1 meter by 2100 because of our past GHG emissions simply due to the thermal expansion of water. That is, the warming we've already experienced has yet to transmit itself from the ocean's surface to its depths. As the deep ocean waters heat, they will expand and sea levels will rise. Sea levels will rise by more than a meter due to future melting of the Greenland and Antarctic ice sheets, and by further thermal expansion as temperatures continue to rise. If we let the climate warm by 3 degrees (2.4 degrees more than they've risen so far) then we'll accumulate 2 more meters (for a total of 3) of sea level rise simply due to the thermal expansion of water. Besides threatening population centers in Florida and the Gulf, a meter's rise in San Francisco will move sea water far up the San Francisco delta and destroy much of the wetlands supporting the wild birds of the Pacific Flyway. Through two more degrees of warming California will lose half of its winter snow melt, causing increased competition for water, which will further draw sea water into the delta, as more fresh water is diverted for agriculture, industrial, and residential use.

As climate feedback effects become more prominent (e.g. methane release from warmed permafrost, heat transfer to the seas due to the decrease in reflected light from decreased arctic ice, decrease in oceanic carbon dioxide uptake rate), we will learn whether the 75% reduction is sufficient, too little, or too much. However, the sea level rise is predestined. We will have to adapt to a meter's rise and probably several more.

Additional Topics
Submitter's Name/Affiliation: (Insert your Name/Affiliation here)

Hybrid Regulation and Market Approach

Energy infrastructure financed today remains in place for fifty or more years. Since emissions are cumulative and remain in the atmosphere for up to a millennium, it's crucial to improve energy efficiency today to defer the need for new energy infrastructure until such time that we can de-carbonize it. California's experience demonstrates that regulatory agencies can reduce GHG emissions at negligible economic cost. California use half as much electric power per person as the rest of the nation due to the cumulative actions of the California Energy Commission. If the rest of the nation follows California's lead, we can halve GHG emissions from the country's electric sector solely by driving efficiency. I suggest a hybrid market based system that allows state energy commissions to create carbon credits, properly audited, through their regulatory actions. Then these commissions can sell credits to energy producers, in an upstream based approach.

I am concerned that a pure market approach, without agencies to consolidate small opportunities, may fail to capture efficiency gains made possible by regulation. Let me present an example. California recently regulated the reflectivity of roofing material. The new roofing materials drop home air conditioning needs by 10-15% without significantly increasing roofing cost or decreasing choice of roofing color and texture. How can we capture this opportunity in a pure market based system? Certainly individual consumers cannot sell micro-carbon credits, based on their choice of roofing material. We need agencies to drive industries to increase the energy efficiency of its products; otherwise industries lack market pressure to design more efficient products. Suppose a state regulates its rooftops. It estimates their carbon value using the mechanisms established by this legislation, sells these credits, and passes these on as consumer and builder rebates?

Low and Fixed Income Households and Adaptation

The cost of adaptation is elusive to estimate, will exceed the cost of offsetting GHG reductions, and do not capture the catastrophic economic damage and loss of life of future severe weather events. Deferring emission reductions today and counting on increased adaptation tomorrow may substantially decrease the quality of life for low and fixed income households. Adaptation is not simply an issue of keeping Florida and the Gulf states from sinking below sea level. Adaptation includes creating a sufficient water supply for California and the Southwest (the Grand Canyon states today experiencing their worst drought in 500 years). Adaptation includes changing the nature of our inner cities to limit the heat island effects that killed 40,000 Europeans in the 2003 summer heat wave. Adaptation may include what the world does to offset the predicted 10% decrease in agricultural output in Africa and South America. Adaptation strategies to protect corral reefs, polar bears, and limited range plants and animals are complicated by issues of land use.

We need to act now to prevent substantial warming rather than focusing on adapting to it. I believe that low and fixed income households will be the ones that suffer most from severe weather events associated with substantial warming. When I think of Katrina storm damage, I think of the inner-city poor. When I think of summer 2003 and the deadly European heat wave, I think of the fixed-income elderly. I believe that we should leave issues of energy price relief to

state utility commissions and focus this program on creating funds for energy research and creation of policy that drives emission reductions. My concern with a pure market-based system that fails to address regulation is that modestly raised energy prices do not drive dramatic improvement in energy efficiency.

Consider the energy expenses of fixed income consumer. For example, consumer devices like cable and satellite TV set top boxes consume $10-$35 a year of electricity. What market force will drive the energy efficiency improvements that can drop their energy use to what's technically possible today, $3-$8 a year, saving money and emissions? The set-top manufacturers don't currently have energy efficiency in their sights, and modest increases in energy prices will not create demand for highly-efficient devices. In fact, most consumers can't choose the properties of the device provided by the cable or satellite company. California addresses this process in a manor analogous to the EPA's energy star program. From time to time, California monitors the state of the art, and bans the sale of excessively inefficient products that cost consumers, increase emissions, and drive expansion of the power grid and generators. We should allow a regulatory agency to consolidate efficiency gains, sell the resulting carbon credits, and distribute the income to manufacturers that cooperate. This will protect households more effectively than simple cash payments to consumers, and will drive corporate earnings of the manufacturers.

Decreasing resource demand by enhancing efficiency decreases demand for oil and gas and puts downward pressure on energy prices. Deferring new efficiencies simply adds to consumer prices and potential energy shortfalls. Further it doesn't protect households from severe weather events and need for further adaptation.

Century of Energy Innovation

As American innovation in the last quarter century built the computer industry, innovation in the coming two quarter centuries will focus on de-carbonizing energy and on raising energy efficiency. If America doesn't take the lead in these technologies, we will cede the major economic opportunity of the 21st century to Europe and Asia. We need research to build a national electric backbone, research and demonstration projects to gasify coal and sequester its carbon, research and demonstration of "nuclear incineration" technologies, and research and commercialization of solid-state lighting. The more we coddle the current incumbent technologies and industries, the further we risk ceding these technologies as we ceded the automotive industry to Asia. We face an "innovator's dilemma" as we worry about fairness to current practice, we cede the major new opportunity of the century to our international competitors. Let's focus on the 75% GHG emission reduction target, and deprecate worries of increased consumer prices and international competitiveness. In doing so, we invest for the future and protect our position the world's most vibrant economy.

Additional Topics
Submitter's Name/Affiliation: Robert Deck, University of Toledo

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Sirs,

I wish to strongly support the proposed bill to restrict CO2 emissions.
It is very important that such restrictions begin as soon as possible.
Global warming is already having significant effects, most of which are negative.
We cannot take the chance that more severe effects will not follow.
Thanks for your attention to this message.
Sincerely,

Robert T. Deck
Professor of Physics
University of Toledo
Toledo, OH, 43606

Additional Topics
Submitter's Name/Affiliation: Skiles W. Boyd/DTE Energy

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

DTE Energy Thoughts on Forest Carbon Sequestration Accounting

Afforestation has the potential to be implemented on a scale that could have a fundamental impact on U.S. utility industry CO_2 emissions. However, the current accounting for the sequestration associated with forest restoration makes it a prohibitively expensive way to reduce CO_2 emissions. Unless this accounting is changed, one of the best available near-term tools for CO_2 reduction will produce little more than "showpiece" projects. Just as poor accounting conventions lead to poor investment decisions in the business world, the accounting for forest sequestration will lead to significant under-investment unless modified.

Carbon is sequestered in trees over very long time periods – many decades. Business planning timeframes are much shorter – only a handful of years. This mismatch is the crux of the problem with the current accounting for forest carbon sequestration.

Figures 1 and 2 depict the rate at which carbon is sequestered in trees in the Lower Mississippi River Valley – one of a number of areas with substantial marginal farmland suitable for forest restoration. As the graphs make clear, a century is required for trees planted in this area to fully achieve their sequestration potential. Roughly thirty-five years are required for the trees to achieve half their eventual sequestration. In the first ten years after planting almost no carbon is sequestered (3% of the eventual total.)

FIGURE 1

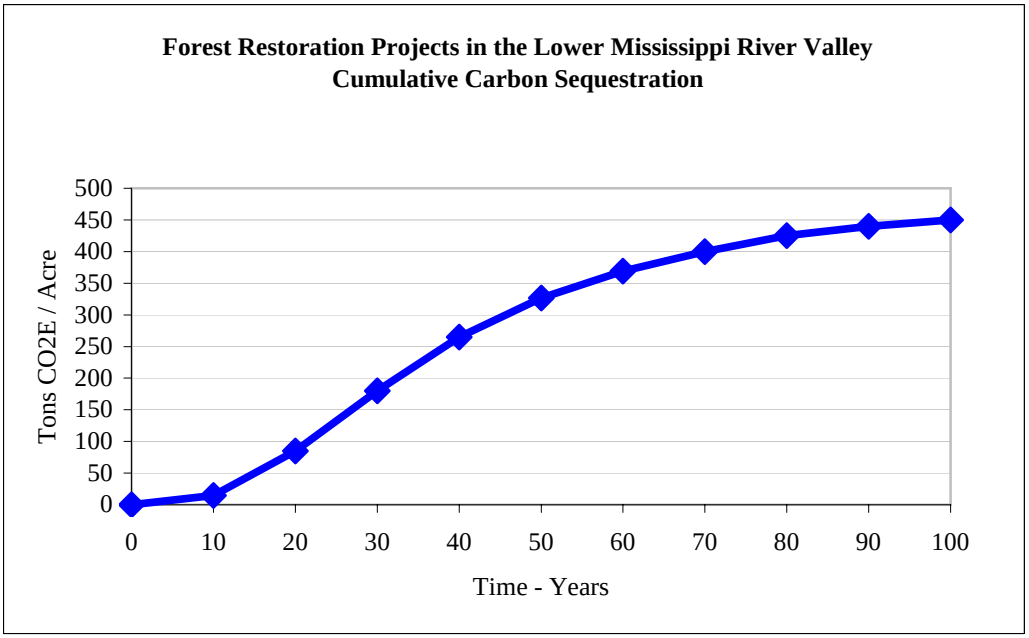
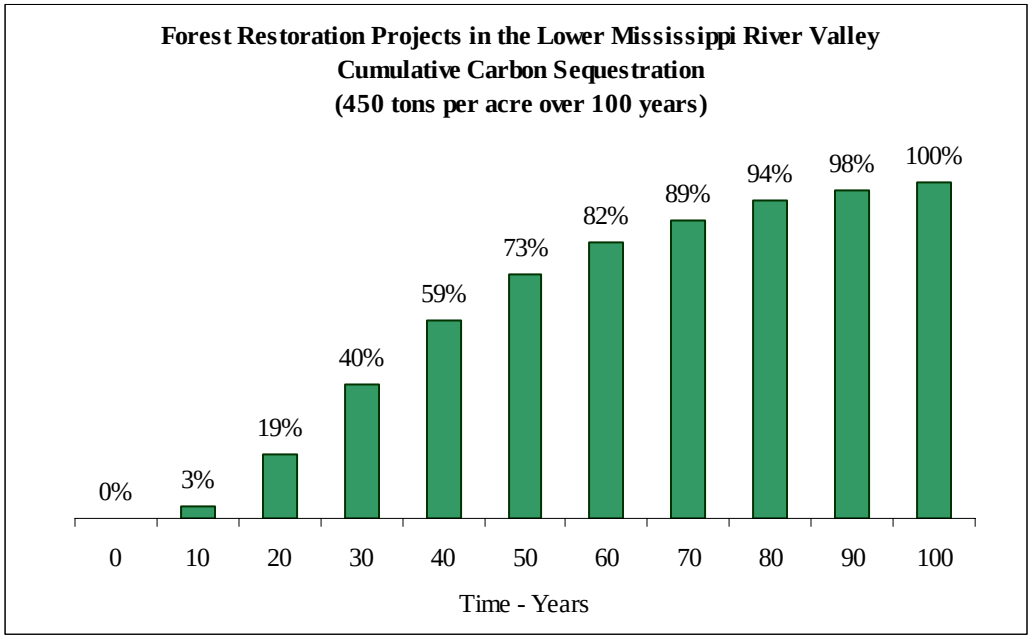


FIGURE 2



Developing a sensible accounting policy for forest sequestration requires taking an appropriately long-term view of both global climate change and the manner in which forests mitigate it. Put differently, making forest restoration a viable option requires giving credit up front for tons that will be sequestered in future decades.

Giving current credit for future sequestration would solve the two principle issues associated with the present accounting methodology. Because businesses would know up front the credit they would receive for an investment in forest sequestration, they would not be required to adopt excessively long planning time horizons. Similarly, as will be shown in some detail later, giving current credit for future sequestration makes forest restoration economically workable.

One approach to address this issue is to introduce discounting. Under such an approach, the current sequestration credits awarded for forest restoration up front, but would be discounted by a factor less than 100%. Take, for example, the application of a 25% CO_2 credit discount rate for forest restoration in the Lower Mississippi River Valley. The additional acreage planted to offset the discounting would lead to the targeted sequestration being achieved in about 50 years, not 100. Further, in the end the acreage would sequester 133% of the CO_2 targeted – an overproduction of 33%.

If discounting is adopted to allow up front credit for forest carbon sequestration, DTE Energy believes that a discount rate of up to 25% would be appropriate for regions that approximate the Lower Mississippi River Valley. This would result in workable economics, the achievement of 80% of the targeted sequestration within 40 years, and overproduction in the long run of 33%.

Additional Topics
Submitter's Name/Affiliation: Skiles W. Boyd/DTE Energy

One of the attractive features of forest restoration is that it has the potential to produce results at a scale that is significant when considered in light of the overall U.S. effort to address climate change. A few facts make this clear:

- The U.S. electric power sector consumes nearly 1 billion tons of coal annually.
- This coal generates about 2.1 billion tons of CO_2.
- It is estimated that there are 5 to 25 million acres of marginal farmland available for forest restoration in the Lower Mississippi River Valley alone.
- Assuming sequestration rates of 450 tons per acre, forest restoration in the Lower Mississippi River Valley could provide 2-11 billion tons of CO_2 offsets.
- The EIA Annual Energy Outlook 2003 reference case projects that electric power sector CO_2 emissions above 2000 levels will total 10 billion tons by 2025 (2 billion by 2014).
- Forest restoration in the Lower Mississippi River Valley could offset this emission increase.

Given that the Lower Mississippi River Valley is only one of many areas with marginal land available for carbon sequestration (albeit one of the most studied,) forest restoration has the potential to make a very material contribution to U.S. efforts to address climate change for several decades.

Of course, forest restoration is ultimately limited in its ability to address the potential impacts of climate change. In the end, new energy technology will be required. Technology development and the efficient turnover of capital stock require time, though, and forest restoration could provide an important bridging solution in the interim.

Additional Topics
Submitter's Name: Duke Energy

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Duke Energy Corporation[1] (Duke Energy) appreciates the initiative taken by the Senate Energy and Natural Resources Committee to solicit public comment and initiate a policy dialog on design elements of a mandatory, market-based greenhouse gas (GHG) regulatory policy. In early 2005, Duke Energy adopted a corporate policy position supporting the establishment of a federal economy-wide market-based climate policy.[2]

Duke Energy appreciates the opportunity provided by the Committee through this White Paper process to address issues related to the design of a mandatory market-based GHG emissions reduction program. In addition to the topics specifically addressed in the White Paper, Duke Energy has strong views on a number of other design issues as outlined below.

First, Duke Energy believes that a U.S. climate change policy should reduce GHG emissions gradually over a long time horizon, beginning the effort in the near term. Such an approach can give the economy a glide path into limits on emissions, allowing capital stock to turn over with a smaller risk of "stranded" investment. Duke Energy believes that this principle is consistent with the Sense of the Senate Resolution's call for limits and incentives that "slow, stop and reverse the growth of such emissions at a rate and in a manner that . . . will not significantly harm the United States economy." In Duke Energy's view, the National Commission on Energy Policy's (NCEP) proposal for a cap-and-trade program generally embodies an appropriate approach to timing and stringency.

Second, it is critically important that *any* comprehensive U.S. climate change policy include a focused, long-term technology strategy with reliable long-term funding. It will not be possible to make substantial reductions in GHG emissions without new technologies.

Third, it is Duke Energy's belief that, in order to provide a safeguard that a program will "not significantly harm the United States economy," the program should provide price certainty. For a cap-and-trade program, this kind of certainty can be achieved through a safety valve mechanism such as that reflected in the NCEP's proposal. Indeed, most economists agree that a long-term strategy to reduce GHG emissions should involve an approach that imposes a gradually increasing price on emissions (or the carbon content of fuels) instead of emissions caps because the pricing approach is the most efficient way of managing uncertainties related to costs

[1] Duke Energy Corporation is a Fortune 500 company headquartered in Charlotte, NC, that supplies, delivers and processes energy for customers in the Americas. More information about the company is available on the Internet at: http://www.duke-energy.com. Although Duke Energy and Cinergy have announced plans to merge in the near future, these comments reflect the views of Duke Energy. We understand that Cinergy expects to submit separate comments on the White Paper.

[2] Duke Energy's position on GHG policy can be found at http://www.duke-energy.com/company/ehs/policies/gcc/.

and benefits. A report issued by the Congressional Budget Office (CBO) in 2005 concluded that "[e]missions prices are more efficient than emissions caps."[3]

To this end, Duke Energy urges the Committee to consider the full range of market-based approaches to climate change policy, including a carbon tax approach, which reflects the pricing method. Recognizing that the White Paper expressly limited its questions to issues surrounding the design of a cap-and-trade program, Duke Energy has focused its submission primarily on that approach. However, it is Duke Energy's strong belief that a carbon tax also deserves careful scrutiny by Congress.

In particular, Duke Energy respectfully disputes the White Paper's implicit characterization of carbon taxes as something other than a "market-based" approach.[4] A carbon tax most assuredly *is* a market-based approach and is entirely consistent with the Senate of the Senate Resolution's directives on establishment of a climate change policy. Economists have long emphasized that the value of a carbon tax is that, like a cap-and-trade approach, it establishes a price for emissions in the economy, providing an incentive to firms and households to adopt their least-cost reduction options.[5] Robert Hahn, Executive Director of the AEI-Brookings Joint Center, has stated: "Both fees and [tradable] permits have the potential to reduce costs relative to a command-and-control system by providing an incentive to search for the lowest cost reductions first."[6]

Importantly, like an upstream cap-and-trade program, a carbon tax can be designed to achieve economy-wide coverage. Moreover, a tax approach offers greater administrative simplicity than a cap-and-trade program. Administering a carbon tax would not require the establishment of a national trading system, which would involve the development of new monitoring and accounting mechanisms both for the government and for the participating entities. For these reasons, the CBO recently concluded that a carbon tax would be "relatively simple to administer."[7] In particular, the many questions raised in the White Paper provide clear

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[3] Congressional Budget Office, *Limiting Carbon Dioxide Emissions: Prices Versus Caps* (2005), available at www.cbo.gov, at 2.

[4] *See* White Paper, p. 1 ("We recognize that there are many ways to structure a regulatory program and that there are entirely different approaches that might include a carbon tax, technology incentives and voluntary programs, but we have limited our consideration here to 'mandatory market-based systems' contemplated by the Sense of the Senate Resolution.")

[5] For example, 2500 economists, including eight Nobel Laureates, signed a statement in 1997 calling for the application of market-based policies to address global climate change. Their statement included carbon taxes under the definition of market-based policies. The statement reads, in part:

> The United States and other nations can most efficiently implement their climate policies through market mechanisms, such as carbon taxes or the auction of emissions permits. The revenues generated from such policies can effectively be used to reduce the deficit or to lower existing taxes.

See http://www.rprogress.org/publications/econstatement.html

[6] Robert Hahn, *The Economics & Politics of Climate Change* (1998), at 15-16.

[7] Congressional Budget Office, "Budget Options" (Feb. 2005), at p. 338 (Revenue Option 53).

evidence of the difficulties that arise when trying to develop a fair and effective allowance allocation scheme for a GHG cap-and-trade program. With a tax approach, these difficulties would be largely avoided.

Indeed, the combination of price certainty and administrative simplicity offered by a carbon tax has led most economists to favor the tax approach over a cap-and-trade program, even if the latter incorporates a safety valve mechanism. Thus, the CBO has determined that a carbon tax is more likely to maximize total benefits relative to its costs.[8]

[8] Congressional Budget Office, *Limiting Carbon Dioxide Emissions: Prices Versus Caps*, *supra* note 3.

Additional Topics
Submitter's Name/Affiliation: (Myron Ebell/Competitive Enterprise Institute et al.)

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Please begin your comments here. (no page limit)

The additional comments submitted are a collaborative effort and are submitted on behalf of the Competitive Enterprise Institute, FreedomWorks, the American Legislative Exchange Council, and the Free Enterprise Action Fund.

1.1 Some of the "findings" in the White Paper (WP) are, at best, questionable. Yes, greenhouse gases are accumulating in the atmosphere, but it is not clear whether the temperatures have risen outside of the range of natural variability or, if they have, whether it's due to anthropogenic contributions to greenhouse gases.

1.2 There is no empirical basis for the "finding" that there is an increase in either the severity or frequency of floods and droughts, or that these are now beyond the ranges of natural variability.

1.3 To make any statement about natural variability, we have to look at natural variations over millennia. Unfortunately, robust data over such long periods are not available.

2.1 The WP makes three implicit assumptions for which it provides no backing. The general approach suggested in the white paper towards addressing climate change is flawed.

2.2 First, it assumes that the net impacts of climate change, particularly for the United States, are negative now or will soon become negative.

2.3. Second, the WP assumes that the period between the present and the time over which net impacts turn negative is so short that we have to take actions now.

2.4 Third, it assumes that the most efficient method of reducing the net damages from climate change is through reductions in climate change (i.e., emission reductions) rather than through methods to adapt to climate change or reduce society's vulnerability to the impacts of climate change.

2.5 This submission will provide information that, in fact, contradicts these implicit assumptions.

3. How urgent is it that we commence GHG emission reductions over the next few decades?

3.1 To answer this question, we need to find out whether the net cost of climate change is currently negative, and if it's not negative today, when is it likely to turn negative. Once having

established when that might occur, one approach would be to start serious emission reductions 50 years in advance of that time, under the assumption that it would take 50 years for emission reductions to be translated into temperature reductions.

3.2 Is the net impact of climate change negative today?

3.2.1 The short answer is that we don't know that it is negative today. If we look at the broad picture, in part because of the various activities that contribute to climate change—energy use, agriculture and forestry—the U.S. has never been more prosperous and better-off. Moreover, despite some year-to year variations, the productivity of climate-sensitive sectors of the U.S. economy, in particular, agriculture and forestry, has been increasing steadily.

3.2.2 Empirical evidence does not support the claim that floods and droughts are more frequent or severe today than they have historically been.

3.2 The IPCC (Climate Change 2001: Impacts, Adaptation, and Vulnerability, pp. 940-944) suggests that the net global impact of climate change might well be positive for globally averaged temperature increases in the range of 1-2^{o}C. Given that the negative impacts of climate change are expected to hit developing countries first, this suggests that for the United States, at least, net impacts might be positive for a greater amount of temperature change.

3.3 Other analyses for the United States suggest that the net impacts of the U.S. should be positive at least for a 2.5^{o} C increase, but might be slightly negative if it increases by 5.0^{o} C (Mendelsohn 2000).

When might the net impacts for the U.S. become negative?

According to the Global Historical Climatology Network (GHCN), for an area approximating the 48 contiguous states,[1] the average temperature for land surface area has increased at a rate of 0.05^{o} C per decade between 1880 and 2005, and 0.27^{o} C per decade between 1979 and 2005. Assuming, arbitrarily, that the 1979-2005 trend is a better indicator for future temperature trends for the U.S. land surface, then over the next 80 years, the temperature will increase by 2.2^{o} C. This suggests that the temperature will not have increased sufficiently to result in net negative impacts for the U.S. by 2085. [See Figures at the back.]

Further, let's assume that it takes 50 years to turn over our energy infrastructure from start to finish once a decision to do so has been made. In that case, we have at least until 2035 [= 2085 minus 50 years] until we launch any kind of an emission reduction campaign.

A corollary to the above result is that <u>emission reductions occurring before then will reduce the net well-being of the U.S. population for the next eight decades and more</u>.

So we should ask you to clarify and justify why the United States should undertake GHG reductions between now and at least 2035.

[1] This is for a quadrangle between 133.1W, 49.0N, 48.5W and 22.7N.

It might be argued that global climate change affects not just the United States, but the rest of the world. And we agree. But then we must ask whether reducing GHG emissions is the best way to improve the well-being of the globe and/or reduce global damages associated with the impacts of climate change. This will be addressed below.

An alternative method of determining when the impact of climate change on the United States might turn negative would be to rely on model results to estimate the future increase in U.S. land surface temperature. However, there is no *a priori* reason to favor the use of model data unless it can be shown that the model(s) have reproduced relatively accurately past U.S. surface temperatures and precipitation patterns at scales that are relevant to impacts analysis, that is, at the scale of watersheds.

We await such a model analysis. Until that time, extrapolating from empirical data of the recent past is probably the most robust approach to projecting future climate change.

Regarding the assumption that reducing climate change is the most effective and efficient method of reducing damages due to climate change, and that such reductions are urgently needed:

In the short to medium term it is, in fact, more efficient and effective to reduce the vulnerability of society to climate-sensitive hazards and threats that could be exacerbated by climate change. The fundamental reason for this is that climate change will exacerbate existing problems rather than create new ones (Goklany 2003, 2005a). These include problems that have frequently been invoked to argue for immediate reductions in GHG emissions – problems such as agricultural production, hunger, malaria and other climate-sensitive diseases, coastal flooding, water shortages and threats to ecosystems (see, e.g., King 2004)

This allows us to compare the future contribution of climate change to these problems and compare them with contributions from other sources. Such comparisons based on studies sponsored by the UK government and which have used the UK Met Office's general circulation models (GCMs) in conjunction with various IPCC scenarios indicate that for the most part, the global contribution of climate change through 2085 to each of the above hazards and threats is relatively small compared to the contribution of non-climate-change related factors. The exception to this rule is the case of coastal flooding. However, it is much more efficient to deal with problems related to coastal flooding through measures that would protect the coast than through reductions in GHG emissions. The details of these studies can be found in Goklany (2003, 2005a, 2005b).

Therefore, reducing climate change will, for the most part, only reduce the smaller portion of the problems due to hunger, malaria, water stress, coastal flooding, and habitat loss, whereas efforts to reduce the vulnerability to these problems more generally would address the whole problem. As an example, consider malaria. Measures to reduce vulnerability to malaria via, say, a malaria vaccine would reduce the threat to the entire population at risk of malaria in 2085 (estimated at 9,100 million people), whereas halting climate change at its current level would at most reduce the population at risk by 323 million. That is, the latter approach would address about 3.2 percent

of the population at risk, whereas the former approach would address 100 percent of the problem.

In addition, the former approach is a lot cheaper. The UN Millennium Project estimates that the current toll of malaria can be reduced by 75 percent through currently available methods at a cost of $3 billion per year. On the other hand, $3 billion will have virtually no effect on GHG emissions, and even less on the population at risk of malaria because it takes decades for such reductions to be manifested as temperature reductions, and, by contrast, the Kyoto Protocol, despite its ineffectiveness, would cost the world around $160 billion per year.

Moreover, the technologies, systems and institutions that would be needed to address current vulnerabilities to malaria would be very useful in combating malaria tomorrow, whether it is caused by climate change or a non-climate-change-related factor.

One can go through a similar exercise for each of the impacts noted above and show that, at least through 2085 (i.e., the foreseeable future), one can get far more risk reduction by investing $10-20 billion per year in reducing vulnerability to existing climate-sensitive problems that are urgent than through reductions in GHG emissions (Goklany 2005c).

Such an approach, moreover, would help developing nations surmount some of the major hurdles they face in their quest for sustainable economic development. This is because the climate-sensitive risks noted above, i.e., infectious and parasitic disease, hunger, water stress, etc., are among the most critical hurdles they face in that quest.

I. The findings contained in the WP are based on speculation, short-term data and are not necessarily supported by the latest science. We believe that all speculation should be checked against empirical data, preferably long term data, because one should not make long term policy based on short term data.

In the following we will focus on the details of the first finding, which we will show lack empirical support from long term data.

Sea Level Rise

Church's (2005) latest estimates are that sea level will rise by about 34 cm (or 13 inches) by 2100. By contrast, portions of coastal Louisiana could lose up to one foot of elevation over the next decade (NOAA National Geodetic Survey, July 2003). Moreover, estimates of the global cost of protecting against a 50cm rise by 2100 have been estimated by the IPCC's SAR to be in the range of $1 billion per year. We suspect that your program, whatever it is, could more than pay for this amount.

There is indeed a lot of media attention on the melting of the Greenland and Antarctic Ice Sheets. However, we would recommend going beyond the headlines and digging into the studies that have been quoted.

Additional Topics

Submitter's Name/Affiliation: (Myron Ebell/Competitive Enterprise Institute et al.)

Regarding the claim that Greenland and West Antarctic Ice Sheets are melting:

1. We believe it's an error to focus on one or a portion of an ice sheet, e.g., the Greenland or the West Antarctic ice sheets. It is important to look at all ice sheets at once, as Zwally et al. (2005), for instance, have done. Moreover, changes in the combined ice sheet mass should be viewed in the broader context of the other factors contributing to changes in sea level.

2. An excerpt from the abstract of the Zwally et al. follows:

> Changes in ice mass are estimated from elevation changes derived from 10.5 years (Greenland) and 9 years (Antarctica) of satellite radar altimetry data from the European Remote-sensing Satellites ERS-1 and -2. For the first time, the d*H*/d*t* values are adjusted for changes in surface elevation resulting from temperature-driven variations in the rate of firn compaction. The Greenland ice sheet is thinning at the margins (-42 ± 2 Gt a^{-1} below the equilibrium-line altitude (ELA)) and growing inland ($+53 \pm 2$ Gt a^{-1} above the ELA) with a small overall mass gain ($+11 \pm 3$ Gt a^{-1}; -0.03 mm a^{-1} SLE (sea-level equivalent)). The ice sheet in West Antarctica (WA) is losing mass (-47 ± 4 Gt a^{-1}) and the ice sheet in East Antarctica (EA) shows a small mass gain ($+16 \pm 11$ Gt a^{-1}) for a combined net change of -31 ± 12 Gt a^{-1} ($+0.08$ mm a^{-1} SLE). The contribution of the three ice sheets to sea level is $+0.05 \pm 0.03$ mm a^{-1}.

This translates into a sea level rise of 5 millimeters per 100 years, or less than 0.2 inches per 100 years. Even if Zwally et al are off by a factor of 100, net SLR from these three ice sheets does not pose "substantial risks" as your "findings" contend.

How fast is the Greenland Ice Sheet melting, if at all?

1. Based on a 9-year long record, Rignot and Kanagaratnam (2006) estimate that the Greenland Ice Sheet is losing 224 cubic kilometers (km^3) per year. That means it will take another 5,400 years to melt the remaining 1,200,000 km^3 in that ice sheet, which might raise sea level by 23 feet (7 meters). That is a sea level rise of 0.05 inches per year. While this might be a catastrophe for the ice sheet in the long run, it's not clear why it should be viewed as a socio-economic catastrophe.

2. However, Rignot and Kanagaratnam's estimate is based on a composite of empirical data for glacier melt and model data for the ice sheet.

3. Based on 11-years worth of satellite altimetry data, that is, empirical data, Johannessen et al. (2005) estimate that there is net growth of the Greenland ice sheet (despite melting on the margins).

4. Zwally et al. (2005), based on 10.5-years worth of satellite data, also find that the there is a net accumulation of ice in Greenland.

Additional Topics
Submitter's Name/Affiliation: (Myron Ebell/Competitive Enterprise Institute et al.)

5. Given the year-to-year variations in climatic parameters, I submit that the length of the record is insufficiently long to draw any conclusions one way or another from any of these studies, and would caution against any rush to develop long-term policy on short-term data. But there is nothing in any of these papers that suggests any of this melting is: (a) catastrophic for humanity, or (b) outside of the bounds of natural variability.

6. We also submit that conclusions based on empirical data are likely to be more robust than estimates relying partly on model data.

How fast are the Antarctic Ice Sheets melting, if at all?

1. As noted, focusing on just the West Antarctic ice sheet is misleading.
2. A recent paper by Velicogna and Wahr finds that Antarctic Ice Sheets are losing 152 km^3/year of ice, which is equivalent to 0.4 mm/year of global sea level rise.

3. This paper is, however, based on 34 months of data.

4. Moreover, given the various caveats in the paper itself regarding the basic technique used to estimate the volume of ice melt, it's not clear how robust is their methodology. See CO_2 Science (2006).

5. Nevertheless, if one accepts the Velicogna and Wahr results as valid, these two ice sheets are raising sea level by 1.6 inches per century.

6. Zwally et al. (2005) suggest that the Antarctic Ice Sheets are contributing 0.08 mm per year to sea level rise, which would be equivalent to 3.2 inches per century (to which one should add/subtract changes due to the Greenland Ice Sheet). Such a rate of increase does not constitute "substantial risk".

We should also note the following regarding temperature and sea ice trends in the Antarctic:

1. Turner et al. (2005) in the International Journal of Climatology indicate that:

> "Although there is no evidence of Antarctic-wide warming or cooling over the last 40 to 50 years…there has been a broad-scale change in the nature of the temperature trends between 1961–90 and 1971–2000. Ten of the coastal stations …have long enough records to allow 30-year temperature trends to be computed for both these periods; of these, eight had a larger warming trend (or a smaller cooling trend) in the earlier period." [p. 293]

This is not consistent with global warming.

2. J. Liu et al. 2004. Interpretation of recent Antarctic sea ice variability. GRL 31, L02205, doi:10.1029/2003GL018732.

> "Overall, the total Antarctic sea ice extent (the cumulative area of grid boxes covering at least 15% ice concentrations) has shown an increasing trend (4,801 km2/yr). This is smaller than previous studies have suggested, and is not statistically significant. However, the total Antarctic sea ice area (the cumulative area of the ocean actually covered by at least 15% ice concentrations) has increased significantly by 13,295 km2/yr, exceeding the 95% confidence level. The upward trends in the total ice extent and area are robust for different cutoffs of 15, 20, and 30% ice concentrations (used to define the ice extent and area)." [p. 2]

Floods and Droughts

The discussion paper claims that the frequency and severity of floods and droughts are increasing. Let's examine the data.

With respect to global floods:

Kundzewicz et al. (2004), based on an examination of 195 worldwide hydrological time series of maximum annual flow, report that:

> "The report presents results of a study on change detection in world-wide hydrological time series of maximum annual river flow. The study is limited to a subset of discharge time series held at the Global Runoff Data Centre (GRDC) in Koblenz, Germany (GRDC, 2003). Out of more than a thousand long time series made available by GRDC, a dataset consisting of 195 long series of daily mean flow records was selected, based on such criteria as length of series, topicality, lack of gaps and missing values, adequate geographic distribution, and priority to smaller catchments. The analysis of 195 long time series of annual maximum flows, stemming from the GRDC holdings does not support the hypothesis of general growth of flood flows. Even if 27 cases of strong, statistically significant increase have been identified by Mann-Kendall's test, there are 31 decreases as well, and most (137) time series do not show any significant changes. Some regional patterns have been observed. However, a caution is needed, that in case of strong natural variability, a weak trend, even if it exists, cannot be detected by statistical testing." [Emphasis added.]

With respect to floods in the US:

Several studies suggest that, in general, North American flooding tends to become both less frequent and less severe when the planet warms, although there have been some exceptions to this general rule.

Fye et al. (2003), based on annual proxies of moisture status provided by 426 climate-sensitive tree-ring chronologies, indicated that the greatest 20th-century wetness anomaly across the United States was a 13-year period that occurred in the early part of the century, when it was considerably colder than it is now. They also indicated a wetter period of 16 years from 1825 to

1840 and a prolonged 21-year wet period from 1602 to 1622, both of which occurred during the Little Ice Age, when, of course, it was colder still.

Ni et al. (2002) developed a 1000-year history of cool-season (November-April) precipitation for each climate division in Arizona and New Mexico, USA, using tree ring chronology. They found that several wet periods comparable to the wet conditions seen in the early 1900s and post-1976 occurred in 1108-20, 1195-1204, 1330-45 (which they denominate "the most persistent and extreme wet interval"), the 1610s, and the early 1800s, all of which wet periods are embedded in the long cold expanse of the Little Ice Age, which is clearly revealed in the work of Esper et al. (2002).

Brown et al. (1999) analyzed various properties of cored sequences of hemi-pelagic mud deposited in the northern Gulf of Mexico for evidence of variations in Mississippi River outflow over the past 5,300 years. This group of researchers found evidence of seven large mega-floods, which they describe as "almost certainly larger than historical floods in the Mississippi watershed." In fact, they say these fluvial events were likely "episodes of multi-decadal duration," five of which occurred during cold periods similar to the Little Ice Age.

Noren et al. (2002) employed several techniques using sediment cores extracted from thirteen small lakes distributed across a 20,000-km2 region in Vermont and eastern New York to identify the frequency of storm-related floods. Their results indicated, in their words, that, "the frequency of storm-related floods in the northeastern United States has varied in regular cycles during the past 13,000 years (13 kyr), with a characteristic period of about 3 kyr." Specifically, they found there were four major peaks in the data during this period, with the most recent upswing in storm-related floods beginning "at about 600 yr BP [Before Present], coincident with the beginning of the Little Ice Age." In addition, they note that several "independent records of storminess and flooding from around the North Atlantic show maxima that correspond to those that characterize our lake records [Brown et al., 1999; Knox, 1999; Lamb, 1979; Liu and Fearn, 2000; Zong and Tooley, 1999]."

In addition, Shapley et al. (2005), using a variety of proxy records for a 1000-year period for the Northern Great Plains, found that that neither floods nor droughts have gotten more frequent and/or more severe during the current warm period.

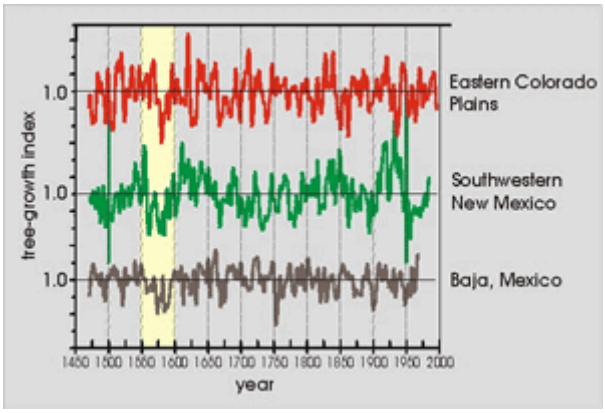
With respect to US droughts:

Long-term records indicate that the droughts of the past 100 years are well within the bounds of natural variability. The following is information taken from: *North American Drought: A Paleo Perspective,* by the staff of the NOAA Paleoclimatology Program, 12 November 2003, available at http://www.ncdc.noaa.gov/paleo/drought/drght_data.html

The Last 500 Years

Additional Topics
Submitter's Name/Affiliation: (Myron Ebell/Competitive Enterprise Institute et al.)

A gridded network of tree-ring reconstructions of Palmer Drought Severity Index (PDSI) for the last 300 years has been used to create a set of maps of the spatial pattern of PDSI for each year, back to AD 1700. This set of maps enables an assessment of the droughts of the 20th century compared to droughts for the past 300 years. An inspection of the maps shows that droughts similar to the 1950s, in terms of duration and spatial extent, occurred once or twice a century for the past three centuries (for example, during the 1860s, 1820s, 1730s). However, there has not been another drought as extensive and prolonged as the 1930s drought in the past 300 years.



Longer records show strong evidence for a drought that appears to have been more severe in some areas of central North America than anything we have experienced in the 20th century, including the 1930s drought. Tree-ring records from around North America document episodes of severe drought during the last half of the 16th century. Drought is reconstructed as far east as Jamestown, Virginia, where tree rings reflect several extended periods of drought that coincided with the disappearance of the Roanoke Colonists, and difficult times for the Jamestown colony. These droughts were extremely severe and lasted for three to six years, a long time for such severe drought conditions to persist in this region of North America.

Coincident droughts, or the same droughts, are apparent in tree-ring records from Mexico to British Columbia, and from California to the East Coast (See examples in the graph to the right). Winter and spring drought conditions appear to have been particularly severe in the Southwestern U.S. and northwestern Mexico, where this drought appears to have lasted several decades. In other areas, drought conditions were milder, suggesting drought impacts may have been tempered by seasonal variations.

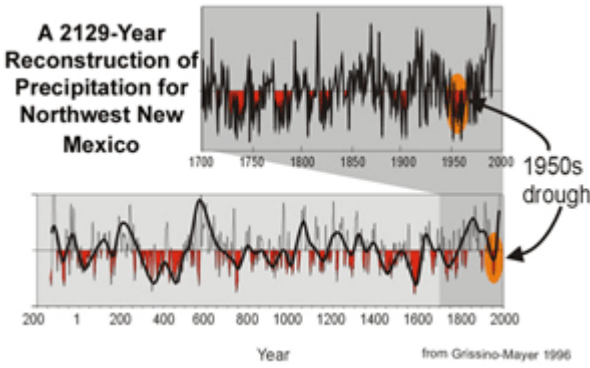
The Last 2,000 Years

When records of drought for the last two millennia are examined, the major 20th century droughts appear to be relatively mild in comparison with other droughts that occurred within this time frame. Even the 16th century drought appears to be fairly modest, when compared to some early periods of drought. Although there are still a few high resolution (offering data on annual to seasonal scales), precisely dated (to the calendar year), tree-ring records available that extend back 2,000 years, most of the paleodrought data that extends back this far are less precisely dated and more coarsely resolved. These records reflect periods of more frequent drought, or drier overall conditions rather than single drought events, so it difficult to compare droughts in these records with 20th century drought events. However, the 20th century can still be evaluated in this context, and we can assess whether parts of the 20th century or the 20th century as a whole were wetter or drier than in the past with these records. The studies below illustrate some paledrought records for the past 2,000 years:

Additional Topics
Submitter's Name/Affiliation: (Myron Ebell/Competitive Enterprise Institute et al.)

A 2129-Year Reconstruction of Precipitation for northwestern New Mexico
Source: Henri Grissino-Mayer. 1996. A 2129-year reconstruction of precipitation for northwestern New Mexico, U.S.A. Pages 191-204 in J. S. Dean, D. M. Meko, and T. W. Swetnam, editors. *Tree Rings, Environment and Humanity*. Radiocarbon, Tucson, AZ

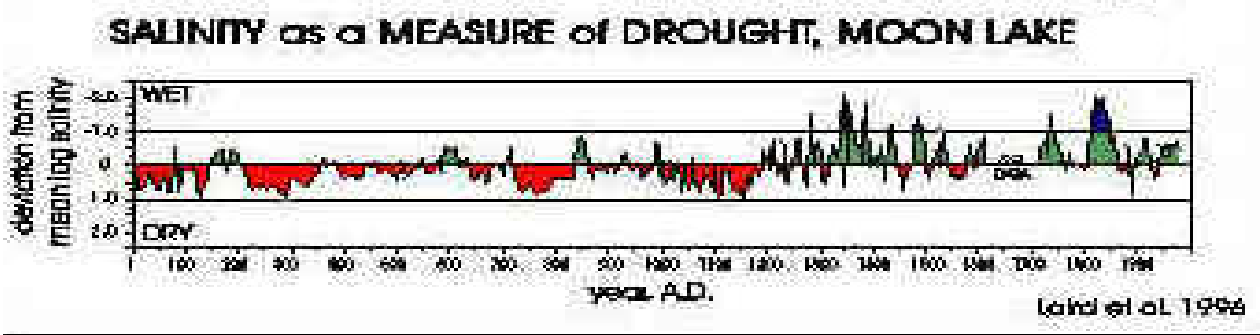
Extraordinarily long-lived trees have been found growing in the El Malpais volcanic field of west-central New Mexico. The oldest living tree found at this site is a 1274-year old Douglas-fir, the oldest known tree of this species in North America. Samples from this and other old trees were augmented with subfossil wood, from logs and remnants of living trees, to generate a 2129-year tree-ring chronology extending back to136 BC.



Not only are the El Malpais trees old, but they are sensitive to precipitation and thus, excellent recorders of past rainfall. The chronology was used to reconstruct annual precipitation for northwestern New Mexico for the past two millennia, as shown in the graph on this page (the units are standard deviation from the mean). The top graph shows the reconstruction for the years 1700-1992. The 1950s drought was the most severe drought 20th century drought in this region, but when viewed in the context of the past three centuries, it appears to be a fairly typical drought. However, when the 1950s drought is compared to droughts for the entire reconstruction, back to 136 BC (bottom graph), it is clear that the 1950s drought is minor relative to many past droughts. A number of the severe droughts of the past spanned several decades, the most recent occurring in the second half of the 16th century.

Greater Drought Intensity and Frequency before A.D. 1200 in the northern Great Plains.
Source: Laird, K. R., S. C. Fritz, K. A. Maasch, and B. F. Cumming. 1996. Greater drought intensity and frequency before A.D. 1200 in the Northern Great Plains, U.S.A. Nature 384:552-554.

Fluctuations in lake salinity records, inferred from fossil diatom assemblages, were reconstructed for Moon Lake, North Dakota. Different kinds of diatoms favor more or less saline conditions, so an analysis of the types of diatoms found in the layers of lake sediment can be used to reconstruct variations in salinity. The changes in salinity are a reflection of drought variability in this region over the last 2000 years. The sediments were sampled at an average interval of 5.3 years, and radiocarbon and lead- 210 dates provided age control. The gap in the record from the early 17th to the early 18th century is due to loss of data from the core drying out.



Additional Topics
Submitter's Name/Affiliation: (Myron Ebell/Competitive Enterprise Institute et al.)

One of the notable features about this paleodrought proxy is the abrupt shift in the data about A.D. 1200. This record raises the possibility that different, relatively stable drought "states" or "modes" may have existed over the past 2,000 years. The graph on the right shows a marked shift between high and low salinity conditions around A.D. 1200, suggesting a change in general drought characteristics about this time. Before A.D. 1200, this record indicates regular and persistent droughts, specifically pronounced during the years of A.D. 200-370, A.D. 700-850, and A.D. 1000-1200. In sharp contrast with the period prior to ca. A.D. 1200, the current mode of drought appears relatively wet and free of truly severe drought.

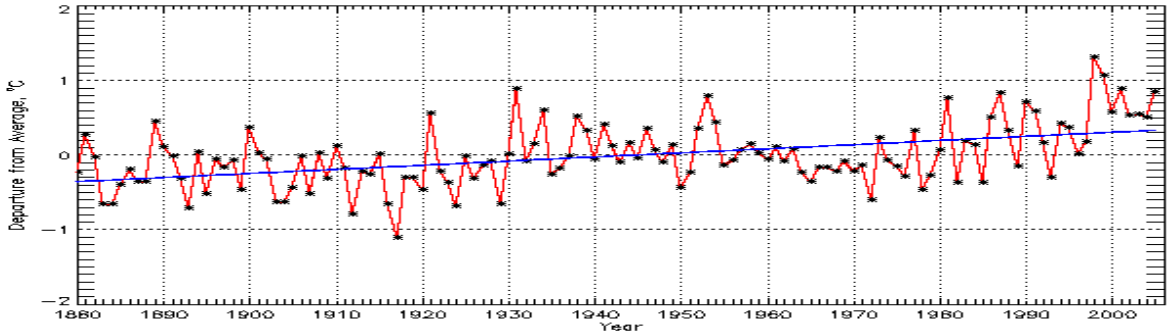
These research results suggest that the current mode of drought variability encompassing the modern instrumental record is not representative of the full range of drought variability displayed in this record. It is important to note that similar lake sediment records for this part of the northern Great Plains do not all reflect the shift in variability at AD 1200, so additional investigations are needed to confirm such a shift. The mechanisms for major shifts in drought variability in the past are not understood, and currently, there is no explanation of a climatic process that could lead to a mode change.

With respect to Extreme Events in General

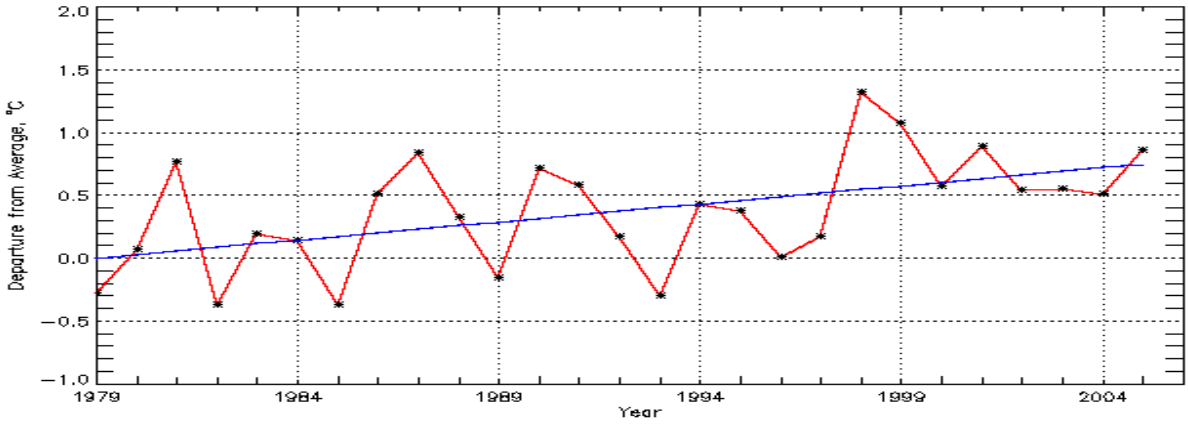
Average deaths per year from climate and weather related events (i.e., drought, extreme temperature, famine, flood, slides, wave/surge; wild fires, wind storm) declined worldwide by over 95 percent between the 1930s and 2000-2003, while death rates declined overall by 98.5 percent [Goklany 2005c, based on EM-DAT, the OFDA/CRED database; this database probably missed a number of events in the early years, which suggests an even stronger downward trend. If famines are excluded then both deaths and death rates peaked during the 1920s]. Similarly, long term data from the United States on cumulative deaths and death rates due to hurricanes, floods, lightning and tornados show that they peaked in the 1970s, and have since declined by over 50 percent for deaths, and 64 percent for death rates [Goklany 2000 and personal communication].

Similarly analysis of property losses due to hurricanes and floods for the United States indicate that, once the increase in the amount of property at risk due to increased population and wealth are factored out, the trend in losses are not upward. [Goklany 2000, Pielke et al. 2005, Pielke and Landsea 1998, Downton et al. 2005.]

Additional Topics
Submitter's Name/Affiliation: (Myron Ebell/Competitive Enterprise Institute et al.)
Time series: Temperature January-December , 1880 - 2005
GHCN Land Surface Data Set
Selected Region: Longitude: -133.1 to -48.5 Latitude: 49.0 to 22.7
Trend: 0.05°C/decade Significance: 100.0%



Time series: Temperature January-December , 1979 - 2005
GHCN Land Surface Data Set
Selected Region: Longitude: -133.1 to -48.5 Latitude: 49.0 to 22.7
Trend: 0.27°C/decade Significance: 98.3%



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END.

Additional **General** Topics
Submitter's Name/Affiliation: William L. Fang, Edison Electric Institute

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

The Edison Electric Institute (EEI) commends Senators Domenici and Bingaman and the Senate Energy and Natural Resources Committee for soliciting input from our industry and the public on important greenhouse gas (GHG) regulatory design issues raised in "Design Elements of a Mandatory Market-Based Greenhouse Gas Regulatory System" (hereinafter referred to as the White Paper), released on February 2, 2006. While there are few clear or easy answers to the four sets of questions posed in the White Paper, we look forward to an opportunity to participate in the Committee's April 4, 2006, workshop in order to address these and other issues.

I. EEI's Position On Global Climate Change

EEI strongly supports voluntary technology and carbon intensity-based approaches to the global climate change issue, which we believe can achieve significant results. For example, in 2003 our industry reported 260 million metric tons of carbon dioxide (CO_2)-equivalent reductions, avoidances and sequestrations, or 63 percent of all such tons reported to the federal government. Thus, EEI endorses robust budget support and implementation of the Energy Policy Act of 2005 (EPAct 2005), particularly titles XVI and XVII and other climate and energy technology-related provisions (*e.g.*, clean coal technology, nuclear energy, renewables (including hydropower), etc.) that will facilitate a broad portfolio of diversified generation resources. These areas were emphasized by the President in his State of the Union address as part of his Advanced Energy Initiative.

Additional **General** Topics
Submitter's Name/Affiliation: William L. Fang, Edison Electric Institute

At the outset, we note the critical international dimensions of global climate change and the importance of investment overseas in technologies and practices contributing to sustainable development, a cleaner environment and reduced GHG emissions and emissions intensity. In three years the combined CO_2 emissions of just two nations, China and India, are projected to surpass the U.S.'s CO_2 emissions. See graphic 1 in the Appendix.[1] **These realities demonstrate the importance of international partnerships and other voluntary, technology-based multinational agreements such as the Asia-Pacific Partnership on Clean Development and Climate (AP6)[2] to address GHGs.**

Any international or national proposals addressing the climate issue should be evaluated in accordance with the following principles:

- Flexible, cost-effective, voluntary activities should be the cornerstone of supply- and demand-side actions to reduce, avoid or sequester GHGs. In partnership with two Administrations, the electric utility industry through the Climate Challenge and now Power Partners[SM] has been leading industry in highly successful voluntary actions to address GHGs since 1994. Power Partners[SM] and other voluntary programs emphasizing reductions in carbon intensity and emissions, such as those under the

[1] Similarly, driven in large part by China and India's emissions, the total CO_2 emissions of emerging economies (developing nations) will also exceed those of mature economies (developed nations) in 2009. The appended graphic and the projection in this footnote do not take into account CO_2 emissions from countries with economies in transition (*i.e.*, Eastern Europe and the former Soviet Union republics), which could be characterized as either developing nation emissions or developed nation emissions. Either way, the year in which developing nation GHGs exceed developed nation GHGs is fast approaching.

[2] The six AP6 nations – the U.S., China, India, Japan, Australia and South Korea – currently emit nearly half of the world's CO_2 emissions related to fossil fuel consumption and flaring.

Climate VISION program of the Department of Energy and the Climate Leaders program of the Environmental Protection Agency, should be actively pursued and expanded.

- GHG actions should be comprehensive, involving all nations, all sources and sinks, all GHGs and all sectors of the economy. Because of the global nature of the climate issue, concerted actions to address GHGs should occur internationally, through such treaties as the Framework Convention on Climate Change and bilateral and multilateral partnerships on sustainable development and climate.

  All sectors of the economy should be involved. Approaches that focus on only one or a limited number of sectors could cause severe economic harm on that sector or sectors – resulting in closed plants and lost jobs and driving business overseas – by unnecessarily and unfairly focusing costs on that sector or sectors. Graphic 2 in the Appendix demonstrates the importance of an economy-wide approach by showing the relative performance of the major sectors of the U.S. economy in reducing carbon intensity from 1990-2003.

- GHGs should be addressed within an energy, as well as an environmental, context. Factors such as energy security, affordable and reliable electricity, and economics should be considered in addressing GHGs. For the power sector, consideration of all of these factors argues in favor of a broad and diversified portfolio of generation resources that result in the production and delivery of electricity at an affordable price

to consumers. Energy efficiency measures and electrotechnologies in end-use applications are also important in reducing carbon intensity and GHG emissions.

- Technology is the key to addressing GHGs. There is no "silver bullet" or "magic bullet" technology to scrub CO_2 from power plant emissions, making the achievement of short-term mandatory reduction targets problematic. There is only one zero-emitting baseload option currently available, which is nuclear power. Encouraging the development of new nuclear power plants has begun with provisions of EPAct 2005, and should be continued in any climate policy. The other principal baseload option available, coal-fired plants, has a readily available domestic fuel source and will likely remain a key component of the nation's generating mix. Yet it is the most carbon intensive, and while improvements are being made in increasing generation efficiency, perfecting the technology to capture the CO_2 emissions and turn those plants into zero- or lower-emitting generators is still years away. To achieve the long-term reductions necessary to limit CO_2 concentration increases to twice pre-industrial levels, as some have suggested, would require the development of even more advanced technologies.

Thus, strategies should only be adopted to encourage 1) development and implementation of zero- and lesser-emitting generation technologies, taking into account economic turnover of capital stock, and 2) robust voluntary measures that reduce carbon emissions and emissions intensity. Finally, there should be serious international and national discussion of the best ways to provide incentives and

funding for technology research, development, demonstration and deployment, with the ultimate goal being a less carbon-intensive economy.

II. General Comments And Overview

The White Paper appears to contemplate a mandatory cap-and-trade regulatory regime for GHGs. While endorsing neither a mandatory cap-and-trade regulatory regime nor any of the specific proposals or concepts in the White Paper, EEI believes that it is important to fully engage in discussions of climate policy.

Following are some key factors that the Committee should bear in mind as it contemplates GHG regulatory schemes:

- **The most critical element in any cap-and-trade proposal would be the stringency of the targets and timetables**. "As always, the main determinant of cost is the stringency of the measure." A. Smith, J. Platt and A. Ellerman, "The Cost of Reducing SO_2 (It's Higher Than You Think)," Public Utilities Fortnightly 29 (May 15, 1998). Other design features would be overshadowed by this overriding mandate.

  The nature of the cap would also be important. Generally speaking, EEI would favor a carbon or GHG intensity-based cap over one based on absolute emission reductions. A carbon intensity approach is more consistent with the fact that economic growth and technological development are needed. A gradual approach, focusing on intensity, would allow time for development and deployment of zero- and lower-emitting technologies, and could also yield significant reductions. Furthermore, absolute emission

reductions are simply not achievable in the short term given the current global energy infrastructure and expected economic growth. This is exemplified by the projected inability of the vast majority of countries subject to emissions limits under the Kyoto Protocol to meet those limits.

- **Also as critical is the availability of viable and cost-effective technologies to respond to any mandatory program.** None of the Clean Air Act programs has been mandated without a thorough review of the viable technologies and their cost-effectiveness in responding to the mandate. As discussed in section I, for GHGs we are lacking that critical link to technologies, and that is why we strongly support the development and deployment of such technologies. Moreover, depending on how it is structured, mandatory carbon regulation or setting a carbon price would not necessarily encourage technology development. W. Montgomery & A. Smith, "Price, Quantity, and Technology Strategies for Climate Change Policy," Human-Induced Climate Change: An Interdisciplinary Assessment (Oct. 11, 2005; to be published by Cambridge Univ. Press 2006).

- **Also significant in any cap-and-trade proposal would be a safety valve designed to limit the cost per ton of GHG reduced in order to constrain the serious negative impacts on the economy, lost jobs and businesses moving overseas that would result**

from the imposition of a cap on GHGs.[3] While a safety valve would be important in limiting the economic impacts of a GHG cap, its significance would diminish if it were to ramp up too much or too fast. Some analysts believe that the market price of all GHG credits would rise quickly to the safety valve level.

- Offsets that are not part of allowances or permits provided under the cap (in other words, an allowance for activities or projects that are "off budget"[4]) would be another important design element. In systems that are less than comprehensive in approach (*i.e.*, that do not cover all sources and sinks of GHGs), **offsets are critically important to minimize the cost of complying with mandatory GHG regulatory schemes.** From an economic standpoint, many actions that can be taken to address GHGs are located outside of utility generating systems. From the perspective of the global nature of GHGs, it also makes sense for utilities and other entities subject to GHG regulation to have the option to undertake activities or projects anywhere in the world. P. Bernstein, W. Montgomery & S. Tuladhar, "Potential for Reducing Carbon Emissions from Non-Annex B Countries through Changes in Technology" (Sept. 2005). For example, it may be much more cost-effective from a global perspective for a utility to take actions to reduce GHGs and GHG emissions intensity in China or India under the AP6 than to take those same actions in its service territory.

[3] We note that any mandatory cap – whether expressed in terms of absolute tons or intensity – would increase the cost of energy, decrease the demand for energy and negatively affect the U.S. economy.

[4] While we do not endorse the Kyoto Protocol, we note that its clean development mechanism (CDM) allows for offsets outside of the cap. Implementation of the CDM has been fraught with problems – problems that should be studiously avoided in an appropriate offsets program under a cap-and-trade regime. Nonetheless, any U.S. cap-and-trade regime should not bar entities from using CDM credits.

Moreover, it makes sense for utilities and other entities to undertake offsets projects to address the non-CO_2 GHGs, where actions may be particularly cost-effective. *See* D. van Vuuren, J. Weyant & F. de la Chesnaye, "Multi-gas scenarios to stabilize radiative forcing," Energy Economics 102, Vol. 28 (2006).

In short, geographic or "where" flexibility is crucial for those who need to reduce GHGs or carbon intensity. Under an economy-wide program, it would be important to allow offsets to be taken without limitation. Artificial constraints or quotas on offsets are economically unsound, raise costs unnecessarily and, as pointed out above, make no sense from a global climate standpoint.

- **A GHG emission trading system would be far more costly, complex and difficult to administer than the Clean Air Act title IV acid rain program.** While there are certainly valuable lessons to be learned from the sulfur dioxide (SO_2) cap-and-trade program, that program would pale in comparison to an international[5] or national GHG cap-and-trade regime encompassing all GHGs, all sources and sinks, and all sectors of the economy.[6] As Anne Smith wrote in her study for EEI, "The Challenges Ahead For Emissions Trading Programs: Nitrogen Oxides and Greenhouse Gases" vii, viii (March 1999) (emphasis in original):

[5] Questions 3 and 4 of the White Paper suggest linkage of any U.S. cap-and-trade system with foreign cap-and-trade systems and an international approach to controlling GHGs.
[6] We note that the costs of compliance and investments in pollution control technologies under the Clean Air Interstate Rule, Clean Air Mercury Rule and particulate matter rule will amount to billions of dollars through 2018, and would be additional to the costs incurred in meeting a mandatory CO_2 reduction target.

> It is apparent that trading of utility SO_2 emissions poses consistently lesser challenges to achieving an efficient program design and to the ability of the market to generate significant cost reductions compared to [NO_x and GHG emissions trading programs].
>
> * * * *
>
> **In conclusion, it would be a mistake to expect the SO_2 experience to be easily repeated by NO_x, or especially for GHG[s]. . . .**In the case of GHGs, there is still some potential to avoid egregious limitations in a domestic emission trading program, but the political challenges are large.

In commenting specifically regarding each of the above points, the absence of a specific legislative context and structure in the White Paper – such as a discussion draft or bill – makes it impossible to fully assess the relative importance of various design features. The relative importance of emissions trading and other design features – such as banking, borrowing, offsets, baseline protection and credit for early action, allocation of allowances, compensating mechanisms, multi-year baselines and phased-in compliance – would be highly dependent on the stringency of the targets and timetables and the availability of technologies to respond to such a cap. To state it another way, analyzing the components of the White Paper in isolation is neither particularly practical nor realistic. Moreover, the interrelationship of key design elements can only be seen within a specific legislative context or structure, not in isolation or even in series. All issues in a cap-and-trade system are linked, and the whole may be greater – or lesser – than the sum of its individual parts. Should the Committee draft or review a legislative proposal, we look forward to having the opportunity to review and comment on it before it is formally introduced.

Additional Topics
Submitter's Name/Affiliation: Environmental Defense

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

This section includes the table *Climate Change Policy Design Choices* referenced in the Executive Summary.

Also, for the convenience of members and staff, we have included Environmental Defense's responses to four questions posed by Senator Feinstein in her letter dated February 23, 2006.

Additional Topics
Submitter's Name/Affiliation: Environmental Defense

Climate Change Policy Design Choices

Policy Design Element	Policy Choice	Discussion
Level of Performance	1. Establish level in the law (such as 2000 or 2010 level of emissions) or multi-year targets. 2. Formula to determine level of performance (such as averaging of base years). 3. Fixed levels of performance (based or informed by a formula or concept).	These approaches can provide both market and environmental certainty of what the target is. They can incorporate concept of *slow, stop, and reverse* while still fixing the schedule of emissions level in law and providing benefits of such. **Predictability and steady policy allow markets to minimize cost volatility.**
Timing	No requirement that timing is same for all sectors (i.e. utilities first, then manufacturing, then transportation).	Can base phase-in schedule for different sectors (and sub-sectors) based on a variety of criteria.
Offsets	1. Agricultural 2. International 3. Reduction in deforestation	Increasing the eligibility for offsets increases supply of allowances and lowers costs to all. **Can be a very powerful tool to lower overall costs.**
Affected Entities	Currently: 1. Utilities, transportation fuels, manufacturing, large commercial. 2. 10,000 tons per facility CO2E 3. 10,000 tons coal	Can break down affected entities into smaller sub-sectors. For some sub-sectors, 10,000 tons per facility CO2E may not be the right cutoff.
Allocation	CSIA and Bingaman leave almost all decisions regarding allocations to the Secretary. Allocations decisions are an opportunity to assess and affect risk/cost exposure of industry sectors and sub-sectors. Allocations can be revisited on a periodic basis.	No reason to assume that all affected entities should be financially responsible for an equal percentage reduction in emissions (even though cap-and-trade will determine where actual reductions are made). Utilities and large manufacturing could be responsible for X percent while small manufacturing (or specific industries) could be responsible for Y.
Banking and Borrowing	1. Criteria for borrowing 2. Life of banked allowance	**Liberal banking and borrowing can lower costs.**
Compliance/Penalty Mechanism	1. Twice market price of allowance *and* requirement to make allocation up in next period. 2. Or Secretary uses penalty payment to purchase and retire additional allowances.	Compliance mechanism can help provide market signals and maintain environmental integrity of program.
Specific Provisions	1. Exemption of Source Categories (specify or provide authority) 2. Targeted Assistance Programs 3. Assistance proving technology	1. Must reduce total # of allowances for entities by amount of exemption 2. Ensure targeted assistance brings votes

Additional Topics
Submitter's Name/Affiliation: Environmental Defense

Senator Feinstein – Question 1

"What level of greenhouse gas (GHG) reductions will be required in the next 10-15 years to avoid an unacceptable risk of dangerous climate change?"

Summary: The best available scientific evidence indicates that, in order to maximize the probability of avoiding dangerous, irreversible climate change, the U.S. must begin decreasing its total GHG emissions as soon as possible and not later than 2010. Time is running out: for a better than 50% chance of avoiding dangerous climate change, developed countries—including the U.S.—must begin slowing their emissions immediately, and poorer nations must begin slowing emissions within a few years. One representative scenario would be for wealthy nations to decrease emissions to at least 10-15% below 2000 levels by 2020; emissions from poorer large-emitting nations would need to begin falling below a business-as-usual pathway by 2010 and start decreasing by 2025. Total global GHG emissions must begin falling by 2020. Delaying action and discouraging participation by developing countries increase the probability of dangerous climate change and make future emissions reductions more difficult and expensive. On the other hand, bold U.S. leadership that encourages near-term action by developing nations, particularly tropical forest nations, where rainforest destruction is the largest source of GHG emissions in the developing world, can help reduce the probability of dangerous climate change.

What is dangerous climate change?
The effects of climate change are already evident—more extreme storms, more intense heat waves and droughts, melting ice and rising sea levels. The best available scientific information indicates that there are temperature thresholds for additional effects of climate change—some of which would be catastrophic and irreversible (see Table 1). Staying below these thresholds lessens the chance that the effects will occur.

Table 1. Synthesis of published sources: Estimated temperature thresholds for irreversible, dangerous climate change (in degrees Celsius above pre-industrial levels).

Threshold (°C)	Effect
Less than or equal to 2	Regional declines in food production[1]
	Severe damage to Arctic and alpine ecosystems[2]
	Decline and possible extinction of some Arctic and alpine species
	Widespread death of coral reefs[3]
1.7 – 2.7	Irreversible disintegration of the Greenland ice sheet if threshold exceeded for more than a few decades, leading to sea level rise of up to 20 feet and submergence of heavily populated coastal areas[4]
2 – 3.5	Collapse of thermohaline circulation ("the ocean conveyor belt")[5]
2.5	Complete disappearance of Arctic summer sea ice[6]
	Collapse of traditional hunting societies
	Extinction of polar bears
	Accelerated warming due to reduced planetary reflectivity
2.7 – 3.7	Irreversible disintegration of the West Antarctic ice sheet[7]
	Additional sea level rise of 15 feet
3	Massive dieback of Amazon rainforest[8]

Global temperatures have risen 0.7 °C since pre-industrial times. As a result, regional declines in food production and severe damage to Arctic, alpine, and coral reef ecosystems are already underway and are likely to continue. However, if greenhouse gas emissions are aggressively managed so that global average temperature does not exceed 2 °C above pre-industrial levels, there is a reasonable chance of avoiding additional, irreversible changes such as the loss of the Greenland ice sheet and its attendant rise in sea level of up to 20 feet.

How can we avoid dangerous climate change?
State-of-the-art climate models indicate that atmospheric concentrations of GHGs (expressed as CO_2 equivalents) must eventually stabilize at or below 450 ppm in order to have at least a 50% probability of staying below the 2 °C threshold. If GHG were stabilized at 400 ppm, the probability of avoiding dangerous climate change would increase to almost 90% and if they were stabilized at 550 ppm the probability would drop to only 25%.[9] Pre-industrial GHG levels were about 280 ppm and today they are a little less than 380 ppm.[10]

In theory, there are myriad GHG emission trajectories that lead to any given GHG concentration target. However, the choice among these trajectories is constrained by the need to avoid an economically infeasible rate of GHG emissions reductions. We start from the premise that, given capital stock lifetimes, technology diffusion rates, and other constraints, emission reductions above roughly 2.5% per year globally could present such significant economic challenges for nations as to be potentially infeasible.[11] Applying this constraint, we find that there is a very narrow window of time to act before the "train leaves the station" and the world is locked into a choice between irreversible, dangerous and economically disruptive climate change or steep emission reduction requirements and consequent economic disruption. For keeping options open and ensuring that the world is not locked into this choice, the build-up of GHG in the atmosphere must slow immediately and global emissions must begin to decrease by about 2020.

Figure 1 illustrates one possible emissions trajectory that meets the economic constraint and stabilizes GHG at 450 ppm. By 2020, global emissions are 10% less than the emissions projected for business-as-usual (IPCC. 2000. *Special Report on Emissions Scenarios*); this represents a 25% increase relative to 2000. After 2020, global emissions decline and by the end of the century they are 50% of the 2000 emissions.

It is unrealistic to impose this 10% reduction from business-as-usual on all countries. Most of the GHG in the atmosphere today are from the developed nations, and the per capita emissions from the developed nations are on average about three times larger than those of the developing nations. Moreover, developing nations are much more dependent on increasing energy production to provide an acceptable standard of living for their peoples.

There are many different possibilities for sharing the burden between developed and developing nations. One such scenario is shown in Figure 1. In this scenario (offered for illustrative purposes only), developed nations would start reducing emissions no later than 2010; by 2020 their emissions would need to be 13% below 2000 levels. (Nations participating in the Kyoto Protocol have a head start in reaching these targets.) Developing nations would begin reducing emissions below business-as-usual in 2010, so that their emissions would be about 5% below business-as-usual by 2020 and begin to decrease after 2025. Similar scenarios for different GHG

concentration targets are shown in Table 2. Note that the probability of avoiding dangerous climate change drops substantially as emissions targets are relaxed.

International agreements that allow the trading of emission allowances among countries could ease the burden on the U.S. and other developed nations. Significant emission offsets could be obtained from tropical-forest nations (such as Brazil) by compensating them for reductions in their rates of deforestation. Deforestation in these nations currently adds about 7.5 billion metric tons of CO_2 to the atmosphere each year.[12] A 13% reduction in GHG emissions from the developed nations corresponds to about 2.5 billion metric tons of CO_2 equivalents. Thus decreases in deforestation rates have the potential to make significant contributions to the overall goal of stabilizing GHG concentrations at a level and in a time frame that can avert dangerous climate change.

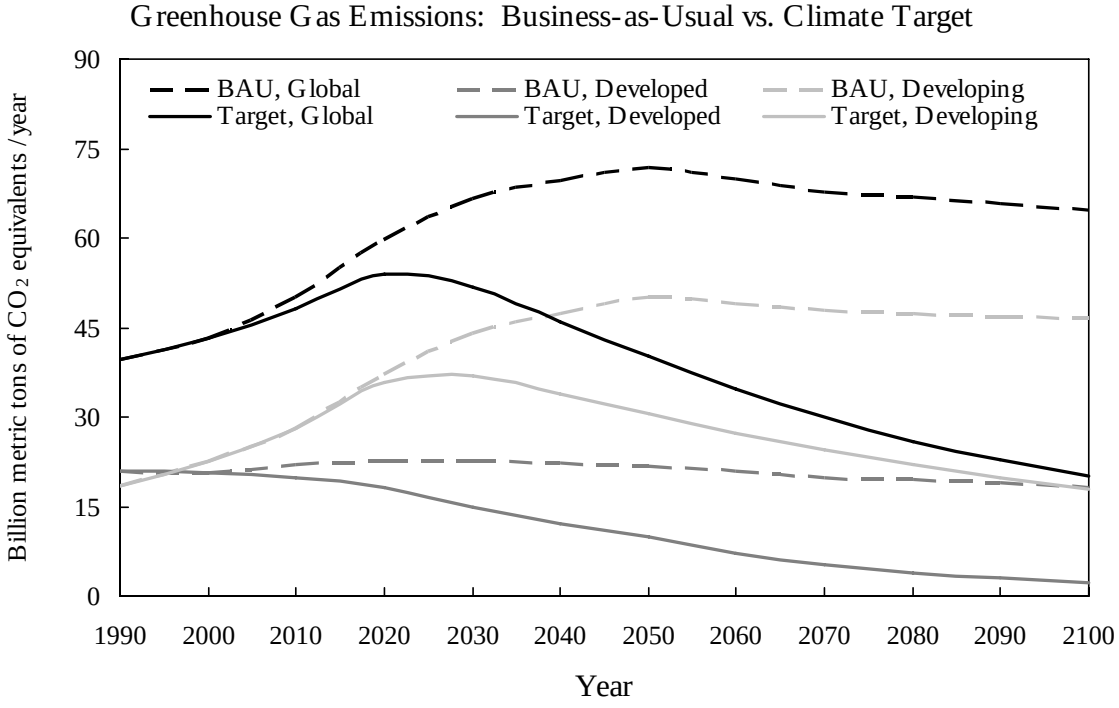

Figure 1. GHG emissions over time for the globe, developed nations, and developing nations, in a business-as-usual ("BAU") scenario and a climate "target" scenario that stabilizes GHG concentrations at 450 ppm CO_2 equivalents with a 50% probability of avoiding dangerous climate change. Dashed lines show BAU trajectories and solid lines show trajectories that meet the 2°C climate target. Black, dark gray, and light gray lines show emissions from the globe, developed countries, and developing countries, respectively.

Table 2. Emission reductions required to meet GHG concentration and probability targets

Study	GHG Concentration Target (ppm CO_2 equiv.)	Probability of Staying Below 2 °C Threshold	Emissions in 2020		
			Global (% Change from 2000)	Developed Countries (% Change from 2000)	Developing Countries (% Change from BAU)
Environmental Defense	450	50%	25%	-13%	-4%
den Elzen & Meinshausen[13]	400	87%	11%	-22%	-16%
	450	60%	21%	-16%	-7%
	500	40%	28%	-11%	-2%
	550	25%	30%	-10%	0%

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Senator Feinstein – Question 2

Can domestic farms and forests provide low cost offsets that help prevent climate change with out posing serious harm to the U.S. economy? If so, what is the best way to involve farms and forests in the market? If not, what role would you provide for farms and forests?

In a word, yes. As one of just a few industrialized nations that that has maintained and protected a vast acreage of farms and forests, the United States is uniquely positioned to look beyond traditional "on system" emissions reductions and use our rural assets to take advantage of some of the most cost effective climate solutions available. A market-based climate policy that allows for agriculture and forestry offsets enables us to capitalize on the remarkable ability of farmers and foresters to both *reduce emissions* of heat trapping gases and *actually remove* heat-trapping gases from the atmosphere.

Trees and plants take up carbon dioxide—the major greenhouse gas—and store the carbon in leaves, branches, trunks, stems, roots, and soil, "exhaling" the oxygen that humans can breathe. The stored carbon is referred to as "sequestered carbon". Large repositories of sequestered carbon, such as forests or large tracts of farmland, are referred to as "sinks." Farmers and foresters can protect the atmosphere by protecting and enhancing sinks as well as curbing other sources of emissions from their operations.

Farmers are adopting a wide variety of innovative practices that enhance uptake and reduce emissions of greenhouse gases. Nationwide, farmers are adopting innovative cultivation techniques like: no-till farming; enhancing riparian areas; using precision application of fertilizer; choosing cover crops carefully; exploring animal waste offset opportunities, such as methane digestion projects at dairy farms; and embracing many other sensible agricultural practices to make a positive difference in the fight against global warming.

Forest landowners can also take steps to protect the atmosphere. By replanting degraded lands, sustainably managing timber harvests, and protecting old growth forests, they promote greenhouse gas uptake and avoid the greenhouse gas emissions associated with forest loss.

A market-based policy is ideally positioned to capture these climate benefits and reward landowners for climate protection. Under a traditional system of market incentives, emitters of greenhouse gases would have their emissions capped, and they would be required to either meet the level of the cap or purchase extra emission reductions from another regulated party. If the rules are modified to allow for agriculture and forestry offsets, however, greenhouse gas emitters have the additional option of purchasing agriculture and forestry "offsets"—credit for carbon sequestration and emissions reductions achieved by agriculture and forestry operations—from rural landowners as a means of meeting their emissions cap. Because the atmosphere benefits equally whether the reduction in greenhouse gases comes from an industrial source or any other source, agriculture and forestry offsets would be on an equal footing with other sources of emissions reductions.

Additional Topics

Submitter's Name/Affiliation: Environmental Defense

Importantly, this type of crediting system would provide a new stream of income for America's rural economy while benefiting the climate system. Additionally, numerous studies have shown that agriculture and forestry offsets are among the most cost efficient emission reductions; therefore, including these forms of emission reductions in a system of market incentives not only benefits rural landowners, but also provides an important measure of cost efficiency across the market created by a national emissions limit.

Senator Feinstein – Question 3

Will the cap-and-trade market provide sufficient incentive to develop new technologies to reduce emissions, or do we need additional funding? If we need additional funding, what would you recommend as a source of funding (e.g. auctioning some of the allowances, tax revenues from profits on emissions trading, or some other source)?

Environmental Defense believes that the market demand created by a stable and predictable emissions limit will be the primary driver for taking innovation from the lab and placing it into the field. In their article in the August 2004 edition of *Science*, Robert Socolow and S. Pacala state: "Humanity already possesses the fundamental scientific, technical, and industrial know-how to solve the carbon and climate problem for the next half-century."

There are many examples from the past where technologies had been proven but required a change in public policy before they were widely deployed in a new application. The catalytic converter in automobiles is one such example. Another important case is Integrated Gasification Combined Cycle electricity generation, commonly referred to as IGCC. IGCC is a proven technology with tremendous potential when coupled with other processes for low-carbon power generation. IGCC is ready to move to scale and, therefore, lower operating cost under the market incentive of a national greenhouse gas emission limit.

There are, however, requirements that any market-based climate policy must meet so that the market signal is its strongest. One of the most important is the certainty of the target. The level of the target informs the market of the size of demand for emissions reductions and offsets and, in turn, informs potential investors as to the likely demand for new technologies, alternative fuel sources, and offset projects. If the target varies unpredictably from year to year, it will increase uncertainty for many project and technology investors and could adversely affect their access to investment capital. Another requirement is lead-in time. The sooner climate policy is enacted, the longer markets will have to prepare. The longer we wait to enact policy, the shorter time period we will have to make reductions. Every delay increases costs. A third important component is an effective compliance program. Price signals must demonstrate to regulated entities that it is more economic to achieve emissions reductions than not. If a compliance programs allows entities to avoid their target by paying the government a fee, the ability of markets to provide the necessary level of technological innovation will be severely retarded.

The U.S. government currently funds a variety of research and development initiatives. Many of these initiatives pursue multiple goals: alternative sources of energy, opportunities for agriculture, low emission technology, and enhanced battery capabilities. There will still be a role for this type of research and development after the enactment of climate policy. But, in order to prevent the confusion of goals, traditional government research and development programs should continue to be authorized and appropriated in a separate process from the implementation of regulatory climate change policy meant to reduce emissions. Likewise, the administration of allowances in the regulatory program should not be subject to the annual appropriations process.

Senator Feinstein – Question 4

How can we best structure a market to incentivize China, India, and other developing nations' reduction of GHG emissions, and to do so in a way that provides economic opportunities for California and other U.S. companies to offer technology transfer to these developing nations?

The first thing the United States needs to do is to re-engage in negotiations with other countries, including developing nations, in order to establish a schedule of greenhouse gas limits that will stabilize atmospheric concentrations of such gases at an appropriate level before inducing irreparable harm. The present policy of telling these countries that voluntary measures are sufficient and that they can rely on technology assistance is self-defeating – and, in fact, is scarcely believed by these countries.

Linking the U.S. GHG emissions regime with developing countries can provide an incentive for those countries to control their emission levels and provide a supply of low cost emissions offsets for U.S. firms. Criteria for such linkages are discussed in our response to Question 3 of the White Paper (attached).

Finally, the United States has long held an advantage in world markets for products and services that require high-technology, high-value added, and complex engineering and industrial processes. These characteristics define exactly the types of energy efficiency and emissions reducing technologies that are required to meet the challenge of climate change policy. As long as the U.S. remains at the forefront of these fields, we will sell into these markets. But countries like India and China are not standing by idly. Environmental protection is becoming increasingly important to their citizens, and their industry is beginning to respond. If we wait too long to adopt domestic climate change policy and to spur the innovative power of our markets, we may find ourselves as buyers rather than sellers.

Additional Topics
Figdor/U.S. PIRG

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

I. Environmental Effectiveness and Ecological Certainty Must Underpin Any Global Warming Program

Senators Domenici and Bingaman fail to ask the fundamental question of what level of emission reductions should a program to limit global warming emissions achieve and on what timeline. The senators do, however, suggest that a goal of the mandatory, market-based program envisioned in their white paper is to "avoid destructive interference with the world climate system."[1] Such a goal requires substantial near-term emission reductions; otherwise, we will not be able to stabilize greenhouse gas concentrations at or near 400 parts per million, which research suggests is needed to avoid dangerous climate change.[2]

Almost 15 years ago, the U.S. and most nations of the world agreed to the United Nations Framework Convention on Climate Change, with the ultimate objective of stabilizing greenhouse gas concentrations in the atmosphere at a level that prevents "dangerous anthropogenic interference" with the climate system.[3]

Two criteria used by the Intergovernmental Panel on Climate Change to define "dangerous anthropogenic interference" are (1) damage to or irreparable loss of unique and threatened systems and (2) large-scale singular events, such as the breakup of the polar ice caps or collapse of the North Atlantic ocean current that moderates temperatures in Northern Europe.[4]

Global warming is putting increasing pressure on unique ecosystems such as coral reefs, the Arctic, and alpine regions and could damage them severely, depending on the ultimate level at which we stabilize greenhouse gas concentrations and the resulting temperature increases.[5] For instance, an increase in global temperatures of about 1°C above industrial levels is likely to lead to extensive coral bleaching.[6] Coral reefs are home to 25 percent of all marine life and provide the main barrier against the worst ravages of storms, hurricanes, and typhoons in many coastal areas.[7] The loss of the Greenland ice cap may be triggered by a regional increase of 2.7°C above current levels, which corresponds to a global temperature rise of about 2°C above pre-industrial levels.[8] If the Greenland ice sheet melts completely, it would raise global average sea levels by more than 20 feet[9] – perhaps over centuries, not millennia[10] – devastating the world's coastal cities and population centers. Studies suggest that a global temperature increase above 3°C over today's levels could shut down the ocean current that moderates temperatures in Northern Europe.[11] Such temperature increases are well within the range of climate change projections for the current century.[12]

To prevent "dangerous anthropogenic interference" with the climate, James Hansen, director of NASA's Goddard Institute for Space Studies, warns that we must limit further warming to under 1°C.[13] This target is similar to that adopted by the European Union (EU), which recently stated, "...with a view to achieving the ultimate objective of the UN Framework Convention on Climate

Change, the global annual mean surface temperature increase should not exceed 2°C above pre-industrial levels."[14] The EU target allows for 0.4°C additional warming over Hansen's target, since temperatures have already risen 0.6°C over pre-industrial levels.[15]

Recent research finds that limiting warming to 2°C above pre-industrial levels with a relatively high degree of certainty requires the concentration of carbon dioxide equivalent to stay below 400 parts per million (ppm). Stated another way, if concentrations were to rise to 550 ppm, it is unlikely that the global mean temperature increase would remain below 2°C.[16]

Given that carbon dioxide is a persistent gas that can remain in the atmosphere for more than 100 years, the longer we allow the pollutant to build up in the atmosphere, the deeper the pollution cuts ultimately will need to be to stabilize greenhouse gas concentrations at a level that avoids dangerous consequences. A joint statement by the science academies of 11 nations, including the U.S., recently warned, "Failure to implement significant reductions in net greenhouse gas emissions *now* will make the job *much harder* in the future" (emphases added).[17] For example, if action to reduce emissions is delayed by 20 years, we would need to reduce emissions at an annual rate that is three to nine times greater than would be required for immediate action to meet the same temperature target.[18]

There is no justification for delay in reducing pollution from today's levels. A 2005 international symposium on avoiding dangerous climate change, convened by British Prime Minister Tony Blair, recently concluded that "[t]echnological options for significantly reducing emissions over the long term already exist."[19] In addition, there are many benefits, including economic benefits, to sharply reducing global warming pollution and hastening America's transition to a clean energy future. A January 2006 study, for instance, concluded that California likely can reach Governor Schwarzenegger's target of reducing the state's global warming pollution to 1990 levels by 2020, with a net gain for the state economy. The researchers analyzed eight policies and found that they can achieve almost half of the 2020 targets while increasing Gross State Product by about $60 billion and creating more than 20,000 new jobs.[20]

The longer we wait to reduce global warming pollution, the harder the task will be in the future. In the last year, leading climatologists have concluded that the world is warming more quickly than expected and with potentially more damaging long-term consequences.[21] A March 2006 study, for instance, found that the Antarctica ice sheet is melting much more quickly than had been predicted, which has enormous implications for increases in sea level.[22] A few weeks earlier, researchers reported that Greenland's ice sheet is melting twice as fast as previously believed.[23] Dr. Hansen, one of the world's leading climatologists, warns that we are nearing a climate "tipping point."[24]

If a goal of the regulatory program envisioned by Senators Domenici and Bingaman is avoiding dangerous interference with the climate system, then environmental effectiveness and ecological certainty must be central design elements of the program.

II. Analysis of the Bingaman Legislation: Digging a Deeper Hole

In June 2005, Senator Bingaman introduced the "Climate and Economy Insurance Act of 2005" as an amendment to the Energy Policy Act of 2005 (H.R. 6).[25] The legislation is based on one piece of an energy policy recommended by the National Commission on Energy Policy (NCEP).[26] Below we analyze the ability of the legislation to achieve the near-term pollution cuts that scientists say are needed to avoid a climate "tipping point."[27]

Rather than reduce global warming pollution from today's levels, Senator Bingaman's legislation only aims to slow the increase in pollution. The legislation would slow the rise in pollution over the next two decades by just 23 percent, ultimately allowing global warming pollution to increase by 20 percent by 2015 and 35 percent by 2025 over today's levels, according to the Department of Energy's Energy Information Administration (EIA).[28]

In addition, while the legislation includes a fast-track mechanism to allow Congress to adjust certain aspects of the program to potentially achieve additional emission reductions, the basic structure of the legislation limits its environmental effectiveness. Specifically, the legislation:

- *Lacks environmental integrity*. Rather than setting science-based limits on pollution, the legislation would establish non-fixed "emissions intensity" targets that would allow levels of global warming pollution to fluctuate based on the strength of the economy and the price of pollution "permits." As a result, the legislation fails to guarantee any level of emission reductions.

- *Allows companies to buy their way out of reducing pollution.* The legislation would allow companies to buy pollution permits from the government rather than reduce their pollution. As a result, the legislation would achieve *less than half* (41 percent) of its promised emissions reductions in 2025, according to EIA.

- *Sidelines the Environmental Protection Agency (EPA).* Global warming is the most serious environmental issue our country faces, yet EPA, the federal agency with the mission and expertise to protect the environment, would not run the global warming program created by the legislation.

- *Could give billions of dollars in windfall profits to polluters.* While the legislation recognizes the potential to create windfall profits for companies, at least a portion of the pollution permits would be distributed at no cost to companies, and only a small number of the permits would be auctioned.

Overview of the Bingaman Legislation

Absent any legislation, EIA projects that U.S. global warming pollution will increase from 6.0 billion metric tons of carbon dioxide equivalent in 2003 to 8.8 billion metric tons of carbon dioxide equivalent in 2025, a 46 percent increase.[29] Senator Bingaman's legislation is designed to slow this increase in pollution,[30] but it would not stop pollution from increasing or reduce pollution from today's levels.[31]

The legislation would only *slow* the rise in emissions, and not by much. The legislation would slow the increase in emissions from 2003 to 2025 by 23 percent, falling far short of stopping emissions from continuing to increase or reducing emissions from today's levels.[32]

Indeed, the legislation would allow global warming pollution to increase through 2025, the final year of EIA's projections. EIA estimates that the legislation would allow global warming pollution to increase by 20 percent by 2015 and 35 percent by 2025 over today's levels.[33] In 2025, the U.S. would have to reduce its emissions by 21 percent just to get back to today's levels.[34]

EIA projects that the Bingaman legislation would achieve most of its pollution reductions over business-as-usual by cutting emissions of non-carbon dioxide greenhouse gases. These gases, such as methane and nitrous oxide, are the "low-hanging fruit" of greenhouse gas reductions, representing a small share (3.5 percent) of the total U.S. greenhouse gas emissions covered under the legislation.[35] Yet, the legislation would achieve an estimated 64 percent of its emission reductions from greenhouse gases other than carbon dioxide.[36]

Moreover, economic incentives and policies that are already in place may achieve the same cuts in non-carbon dioxide global warming pollution. For example, the decay of organic waste in landfills produces methane—a potent global warming gas, but also a source of useful energy for electricity generation and other purposes. Capturing and converting landfill gas to electricity results in a net decrease in global warming emissions. Landfill gas-to-energy projects are already supported by a variety of regulations and financial incentives, including the Clean Air Act, federal tax credits, state renewable energy standards, and dedicated funding programs for renewable energy.[37] In fact, landfill gas consumption doubled nationwide between 1994 and 2002,[38] without additional financial advantages from carbon trading programs, and likely will continue to grow.

The Bingaman legislation would reduce carbon dioxide from the transportation sector and power plants, by far the largest sources of global warming emissions, by just one percent and six percent, respectively, in 2025 over business-as-usual. This means that emissions from these sources would increase substantially over 2005 levels (by 40 percent and 31 percent, respectively, by 2025).[39]

Because the legislation requires such modest emission reductions, it also fails to take advantage of technologies that are available today to reduce pollution and our dependence on oil and other fossil fuels. According to its proponents, the Bingaman legislation is designed to develop technologies to address global warming pollution 20 years from now,[40] but energy efficiency and renewable energy could substantially reduce global warming pollution today.

Energy efficiency measures can reduce electricity demand, thereby reducing fossil fuel consumption and global warming pollution. In the past two decades, energy efficiency standards for household appliances alone have reduced global warming emissions by 53 million tons per year. By 2020, new or updated standards for major appliances such as air conditioners will reduce the need for up to 150 new medium-sized (300 megawatt) power plants.[41] Conservative

estimates suggest that the U.S. has the potential to reduce electricity use by 28 percent by 2020 through energy efficiency.[42]

Increasing the capacity of proven renewable energy sources such as solar, wind, geothermal, and biomass also can significantly reduce global warming pollution. Currently, only about 2.3 percent of the country's electricity comes from non-hydropower renewable energy sources. The technical potential of wind, biomass, and geothermal resources in the U.S., however, is four times greater than our current total electricity consumption.[43] The technology to harness these resources is available today, and costs have dropped dramatically over the past few decades.[44] Under the Bingaman legislation, however, the U.S. would obtain only an estimated 4.6 percent of its electricity from non-hydropower renewable energy sources in 2025.[45]

An economy-wide program to limit global warming pollution should be one of the many policies that drive the transition from fossil fuels to a smarter, cleaner energy future, which is a necessity for the economy, national security, public health, and other reasons. The Bingaman legislation, however, would reduce total U.S. fossil fuel consumption by just one percent in 2015 and three percent in 2025 compared with business-as-usual.[46] The Bingaman legislation also would not reduce our dependence on oil, allowing petroleum consumption to increase by 37 percent over the next 20 years.[47]

Structural Flaws in the Bingaman Legislation

Although the Bingaman legislation includes a mechanism for fast-tracking congressional consideration of certain strengthening changes to the program that could result in additional emission reductions, the basic structure of the legislation limits its environmental effectiveness. Indeed, EIA recently analyzed more stringent emissions intensity targets and permit prices than those included in the Bingaman legislation and found that emissions would increase through 2030 in all but one scenario. Under every scenario, emissions failed to fall below today's levels through 2030, the final year of the analysis.[48] The legislation's four major structural flaws are discussed below.

Flaw #1: The Bingaman legislation lacks environmental integrity.

Non-fixed pollution limits

Rather than setting science-based limits on pollution, the legislation would establish non-fixed emissions intensity targets that would allow levels of global warming pollution to fluctuate based on the strength of the economy and the price of pollution permits. Emissions would exceed target levels when the price of permits hits $7 per metric ton, as EIA projects would be the case from 2016 to 2025, the final year of EIA's analyses. By setting emissions limits based on permit prices instead of the best available science, the legislation fails to guarantee any level of emission reductions.

This lack of a scientific framework is in sharp contrast to other major environmental laws. For instance, the Clean Air Act requires the EPA to establish primary national air quality standards to limit pollution levels, based strictly on the health effects of the pollutants. EPA must review the latest science every five years and adjust the standards as needed to protect public health with an

adequate margin of safety. EPA also must set secondary air quality standards, again based on the best science, to protect the environment.[49]

Stabilizing levels of greenhouse gas concentrations in the atmosphere will require a global effort, but as the world's largest global warming polluter, the U.S. can and should take the lead in setting science-based limits on global warming pollution that will sufficiently reduce our contribution to the global problem.

In addition, the emissions intensity targets in the Bingaman legislation are determined based on 2006 projections of 2009 emissions levels and GDP—both of which are uncertain. If the GDP projection underestimates actual economic growth in 2009, for instance, the bill would slow the growth in emissions even less than anticipated. EIA's projections of economic growth have been significantly off in the past. In 2004, the U.S. economy grew by 4.2 percent,[50] 40 percent faster than was assumed in EIA's projection (3.0 percent).[51]

While economic factors should be one component of U.S. decision-making on global warming, they should not be the primary determinant of our actions. The emissions intensity framework assumes that addressing global warming will negatively affect the economy, but that is a false choice. For instance, a January 2006 study concluded that California likely can reach Governor Schwarzenegger's target of reducing the state's global warming pollution to 1990 levels by 2020, with a net gain for the state economy. The researchers analyzed eight policies and found that they can achieve almost half of the 2020 targets while increasing Gross State Product by about $60 billion and creating more than 20,000 new jobs.[52]

Mechanism for congressional review
The legislation would establish a fast-track mechanism for Congress to adjust three components of the program, including the intensity targets, permit price, and distribution of permits, using the Congressional Review Act (CRA). These reviews, however, would be based solely on whether other countries are taking comparable action to address global warming rather than on our evolving scientific understanding of the threats posed by global warming.

Specifically, congressional action under the CRA would be triggered by a report submitted by the president no later than January 2015 and every five years thereafter. The report would be based on recommendations by an interagency group established by the president to review whether other industrialized countries and certain developing countries have taken action to address global warming that is comparable to action taken by the U.S. The interagency group also would analyze whether the U.S. program has increased electricity imports from Canada or Mexico. Based on these determinations, the interagency group would recommend whether or not to modify elements of the Bingaman global warming program, which would serve as the basis for congressional action.

The legislation allows the president to request reports from the National Research Council to support the interagency review process but fails to require that decisions be based on the latest science on global warming.

Flaw #2: The legislation allows companies to buy their way out of reducing pollution.

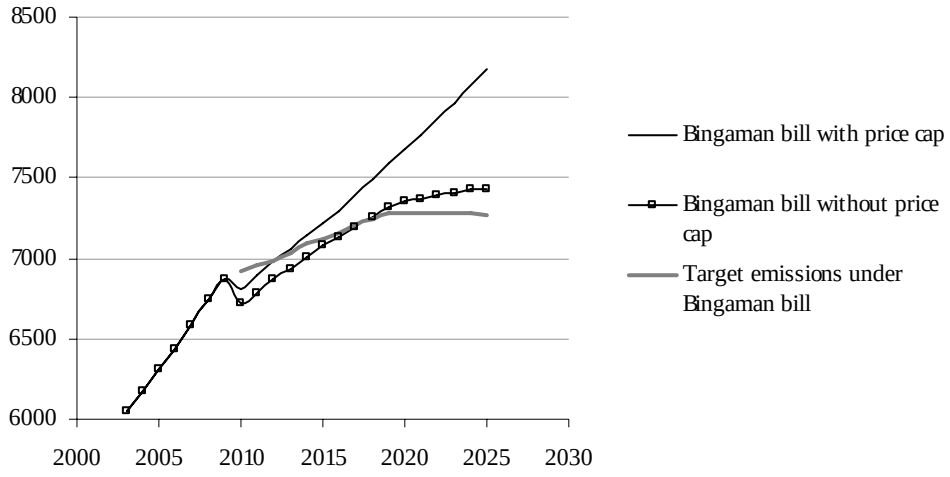
The Bingaman legislation fails to meet even its modest targets because the legislation allows companies to buy pollution permits from the government in lieu of reducing their pollution. The initial price of such permits would be capped at $7 per metric ton of carbon dioxide equivalent, with the price increasing by five percent per year. Thus, if a company chooses, it could make payments to the government rather than reduce its pollution.

The $7 price cap is very low. As of March 1, 2006, a metric ton of carbon dioxide was trading on the European carbon market for about 27 Euros, or $32 U.S., far above the $7 cap in the Bingaman legislation.[53]

The price cap undercuts the legislation's ability to even slow increases in pollution. According to EIA, the emissions intensity targets in the legislation "would not be achieved over much of the projection period" because of the price cap.[54] In fact, the Bingaman legislation would achieve *less than half* (41 percent) of its promised emissions reductions in 2025.[55]

The figure below illustrates projected emissions under the Bingaman legislation as written and without the price cap.

Figure. Effect of the Price Cap on Emissions under the Bingaman Legislation (in million metric tons of carbon dioxide equivalent)[56]



Letting companies buy their way out of pollution reductions undermines the integrity of the program, allowing pollution to increase far beyond the legislation's modest goals.

Proponents of the Bingaman legislation suggest that the price cap would not be triggered if technology progresses at a faster pace than EIA assumes.[57] EIA ran several "high-technology" sensitivity analyses of NCEP's suite of policy recommendations, including the global warming proposal. EIA noted, however, that the NCEP policies would be unlikely to drive the kinds of

breakthrough research and development assumed in the high-technology cases. According to EIA, comparing the high technology case to the standard reference case "will tend to overstate impacts of the NCEP recommendations."[58]

Flaw #3: The legislation would sideline the Environmental Protection Agency.

The Department of Energy (DOE), not the EPA, would run the Bingaman global warming program. Global warming is the most serious environmental issue our country faces, yet the federal agency with the mission and expertise to protect the environment would have a minor role at best in the program. Bill Reilly, EPA Administrator from 1989 to 1992 under the first Bush administration, recently stated, "[t]he time will come when we will address seriously the problem of climate change, and [the EPA] is the agency that's best equipped to anticipate it."[59]

It would be a big mistake to put the nation's global warming program in the hands of DOE, which does not know how to run such a program. EPA, on the other hand, has more than 10 years of experience implementing and enforcing the Clean Air Act's Acid Rain program, a cap-and-trade program.

In addition, DOE's mission is in part to promote U.S. energy sources, giving the department a serious conflict of interest and greater subjectivity to industry rather than environmental concerns.

Flaw #4: The legislation could give billions of dollars in windfall profits to polluters.

While the legislation recognizes the potential to create windfall profits for companies, at least a portion of the pollution permits would be distributed at no cost to companies, and only a small number of the permits would be auctioned. Initially, just five percent of the permits would be auctioned; the quantity of auctioned permits would increase slightly starting in the third year of the program at a rate of 0.5 percent per year up to a maximum of 10 percent of the total permit pool.

Carbon permits have substantial monetary value. All research shows that giving away more than a fraction of carbon permits for free would create billions of dollars in windfall profits for polluters.[60]

If permits were priced at $7 per metric ton, for instance, the total value of greenhouse gas emissions in 2010 would be nearly $57 billion. If permits were priced at $25 per metric ton, the total value would be more than $202 billion in 2010.[61] By comparison, the total value of permits in the Acid Rain program is $2 billion to $3 billion annually.[62]

Rather than giving permits away for free, companies that emit pollution should be required to purchase permits, creating a "polluter pays" mechanism. The proceeds should be directed toward energy efficiency and other public benefit programs, reducing the overall cost of the policy, accelerating the transition toward less carbon-intensive fuels, and enabling the country to meet meaningful pollution reduction targets.

Conclusion

The longer we wait to reduce global warming pollution, the harder the task will be in the future. Leading scientists say that we have a limited time to act to avoid a climate "tipping point." Unfortunately, the legislation filed by Senator Bingaman last year would allow global warming pollution to increase for at least 20 years. Even if Congress used the bill's fast-track mechanism to strengthen the program in the future, the structure of the bill limits its environmental effectiveness. Congress should reject this approach and instead develop and support a science-based solution that reduces emissions from today's levels and puts the country on the path to achieve the long-term emissions reductions that are needed to stop the worst effects of global warming.

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Additional Topics
Submitter's Name/Affiliation: Stephen Ramsey/David Slump for General Electric

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

1. GE's Suggestions on Key Program Elements

- GE supports development of market-based programs to slow, eventually stop, and ultimately reverse the growth of emissions of greenhouse gases (GHGs).

- The program adopted should provide a fair distribution of emissions reductions proportionate to a sector's contribution.

- The program should not unreasonably inhibit growth, as growth coupled with incentives will provide the resources necessary for industries to modernize with cleaner, more efficient technologies.

- Early adopters should be rewarded in any system, and the program should continue and expand incentives, such as a long-term production tax credit, for renewable and innovative energy sources.

- Consideration should be given to a national renewable or carbon portfolio standard to provide consistency across the country.

- Proposed legislation should incorporate incentives for increased energy efficiency requirements for buildings, heating, air-conditioning, lighting, motors and other products as those sources of emissions can be great opportunities to reduce energy demand.

- The design of a market-based program needs to carefully consider the impact on the national goal of energy security and our need to expand our utilization of abundant, indigenous coal. The use of coal for power is just one facet of the energy security picture, but coal-to-liquids, coal-to-chemicals and coal to synthetic natural gas holds the promise of a significant reduction of our dependence on foreign oil and increasingly, foreign supplies of liquefied natural gas. With the recent escalation of oil and gas prices, the economics have turned positive for displacement by coal-based products. The uncertainty of regulatory treatment of coal-based plants represents a risk that could inhibit investment in these technologies. Any plan should provide for allocations that allow these coal-based approaches to be fully developed consistent with carbon reduction goals.

- Coal-to-hydrogen represents an opportunity for affecting the transportation and industrial sectors in a way that is consistent with both our energy security and carbon reduction goals. For example, IGCC can be configured to produce both hydrogen and power with carbon capture and sequestration. Incentives for accelerated development of this option – both from the demand and generation sides – need to be included in an overall plan.

- The most critical element for any program, whether economy-wide or sector-based, is inclusion of a mechanism that assures that carbon is priced in the energy equation. Without a value for carbon, older, higher emitting technologies will continue to dominate the market place as they have a price advantage over newer, cleaner technologies that cannot be overcome until costs of emissions are monetized and a sufficient number of such cleaner technologies are built and operational. An example is IGCC Cleaner Coal Technology with the capacity for carbon capture.

- Climate change can most effectively be addressed by technology. Technology-forcing incentives and requirements are a necessary element of any program. If the program's objective is to slow, eventually stop, and ultimately to reverse the growth in emissions, public policy should encourage parallel efforts (1) to accelerate deployment of existing, proven lower emitting technologies to slow emissions, and (2) to encourage development of next generation, break-through technologies to stop and reverse emissions. Technology research initiatives should be facilitated primarily through a robust public-private research and development program. A strong preference should be given to technologies that expand our ability to re-establish the US as a technology leader in the energy sector by generating opportunities to export lower emitting technologies to developing and rapidly growing countries.

2. GE Technologies

GE Energy: GE builds a range of technologies for solar, hydro, wind, waste gases, oil and gas, coal, and nuclear applications for the energy industry whose widespread adoption in the U.S. and worldwide will help to slow the growth in emissions of GHG.

Solar Energy

- GE offers complete solar packages for residential systems, remote home and village systems, commercial systems and remote off-grid industrial systems.

- GE 's complete solar electric systems include solar modules ranging in size from 30 watts to 165 watts; quick connect wiring, power electronics, an inverter, and power meters and monitors. The modules have a 25-year warranty and feature heavy duty anodized frames and weather-resistant junction boxes for easy and safe field interconnection.

- In December 2005 GE released its highest power and highest efficiency solar module to date. The new 200-watt solar module offers higher output per square foot, which will allow GE to increase the amount of power generation per square foot of roofing space by 20 percent. This will result in savings for customers on both material and labor costs while reducing the amount of roof space needed for power generation.

Wind Energy

- GE is one of the world's leading wind turbine suppliers, with over 7,000 worldwide wind turbine installations comprising more than 5,600 MW of capacity. GE currently designs and produces wind turbines with advanced wind turbine blades ranging from 1.5 to 3.6 megawatts.

- GE Energy delivered 1,346 wind turbines worldwide during 2005 - more than a 200 percent increase over 2004's total

Natural Gas With Better Efficiency

- Gas plants today in the U.S. provide 20 percent of the US's energy. Gas turbines have 68 percent less carbon emissions than supercritical coal. The current operating fleet has an average efficiency of ~ 53 percent. GE's 7F and H turbine technologies have a 55 percent and 60 percent combined cycle efficiency. The 7F has more than a decade of experience in high efficiency gas turbine technology. Accelerating the upgrade of existing turbines with new more efficient gas turbines will save energy and reduce emissions.

- GE's LMS100® simple-cycle gas turbine offers 100 megawatts at 46 percent thermal efficiency with a wide range of operating flexibility for peaking, mid-range and base-load operation. Based on an average peaking season of 2,184 hours, the LMS100 reduces CO_2 emissions by more than 30,000 tons when compared to a typical simple-cycle 100-megawatt gas turbine plant. That is equivalent to the CO_2 emissions created by more than 5,000 passenger cars in the United States each year. This same CO_2 reduction is equal to the amount of carbon dioxide absorbed by approximately 7,400 acres of forest.

Combined Heat and Power (Jenbacher Gas Engines)

- GE is one of the world's leading manufacturers of cogeneration units for power generation. GE's Jenbacher gas engines are known for their high efficiency, low operating cost and exceptionally high reliability. The engines combine a high output density with low exhaust emissions and low-cost construction. Recently, Jenbacher units have been used to:

  - Power a new 10.6-megawatt power plant in Queensland, Australia that will use waste coal mine gas pumped from an active coal mine. Combustion of waste coal mine gas in Jenbacher gas engines allows the coal mine owners to mitigate the amount of the greenhouse gas that would otherwise be vented into the atmosphere.

  - Provide power for the 2006 Winter Olympic Games in Torino, Italy. GE Energy's Jenbacher gas engine business provided five cogeneration units for three new power plants to support the city of Torino, Italy for the recent Olympic Winter Games.

- Power a landfill methane gas-to-energy plant at the Basse di Stura landfill in Italy -- one of Italy's largest landfill energy projects. In 2004, GE provided six Jenbacher engines to combust methane from the landfill. By burning methane, Italy is encouraging the development of landfill energy plants to help reduce the country's greenhouse gas emissions.

Coal-Based Electric Generation

- In the United States, fifty percent of existing electrical generation is coal-based. The average efficiency of the US coal fleet is 30 percent. Newer coal technologies like IGCC can achieve efficiencies of 39 percent, which will reduce CO2 emissions by between 23 and 35 percent compared to existing units without sequestration. Given that 50 percent of US generation is coal-based, this would yield significant reductions.

- In addition to the importance of upgrading the efficiency of the existing fleet of coal-fired generation, the U.S. and the rest of the world are also at a significant crossroad with regard to new coal-fired generation. According to data compiled in 2004 (by Platts, the Energy Publishing Division of McGraw- Hill), China could add 562 coal-fired plants, India 213 plants, and the U.S. 72 plants within the next eight years. More recent figures in the U.S. suggest that over 118 permits for new coal-fired generation are now being considered -- with more proposals in the last 12 months than the previous 12 years. Given the 50-year expected lifetime of these plants, it is important that a significant fraction of these new coal generation plants be carbon capture ready, with technologies such as IGCC.

- Unless steps are taken quickly, most new coal plants built in the U.S. and abroad will be supercritical pulverized coal plants. While these plants are more efficient than much of the current US installed base, they do not have the capacity to capture carbon. Unless action is taken now, a significant opportunity will be lost.

Nuclear Generation:

- GE offers the proven Advanced Boiling Water Reactor (ABWR) design nuclear power plant. The ABWR nuclear plant is an economically competitive option for utilities that need additional base-load power generation capacity. The ABWR provides low cost, emission-free electricity. It can be built in only four years for a cost ranging from $1,400 to $1,600 USD per kW, depending on the host country. The ABWR has been licensed in three countries, including the United States, Japan and Taiwan

- GE has also developed the Economic Simplified Boiling Water Reactor (ESBWR) with advanced passive safety systems from our ABWR design. The ESBWR is a 4500 MWt reactor that uses natural circulation for normal operation and has passive safety features. GE submitted an application for final design approval and standard

design certification for the ESBWR on in August 2005. Design approval is expected by 2007.

- The Super-PRISM is a GE advanced reactor design for compact modular pool-type reactors with passive cooling and decay heat removal. Modules are 1000 MWt, fission products are removed in reprocessing, and resultant wastes are shorter-lived than usual. The commercial plant concept uses six reactor modules to provide 2280 MWe. This design meets Generation IV criteria including generation cost of less than 3 cents/kWh.

Deleted:

GE Transportation: GE's transportation businesses are committed to developing the most fuel-efficient products to power the air and rail transport sectors.

Air Transport

- GE continues to pioneer the world of flight by looking for ways to make it more energy efficient and quieter. GE's latest engine, the GEnx, will use advanced compression and combustion technology to achieve dramatic gains in fuel efficiency and performance with lower emissions than existing engines in its thrust class. The GEnx aircraft engines sold in the next 20 years will emit an estimated 77 million fewer tons of greenhouse gases than would have been produced by older GE CF6 engines.

Rail Transport

- The new GEVO 12-cylinder diesel engine in the EVOLUTION Series locomotive produces the same 4,400 horsepower as its 16-cylinder predecessor, and it does so using less fuel.

- Compared to GE's locomotives built in 2004, a single EVOLUTION Series locomotive will consume 189,000 fewer gallons of fuel in its lifetime - enough to power another EVOLUTION Series locomotive for seven months.

GE Consumer and Industrial

ENERGY STAR Appliances and Lighting Products

- GE is a leading producer of ENERGY STAR home appliances and lighting products. The US Department of Energy and US Environmental Protection Agency recognized GE as an "ENERGY STAR Partner of the Year" for each of the past three e years, and in 2006 awarded GE the "Sustained Excellence Award." Between 2002 and 2005, GE invested over $350 million to develop and market high-efficiency appliance products, and now offers as ENERGY STAR qualified 140 models of dishwashers, 201 models of refrigerators, 24 models of clothes washers, 58 consumer lighting products and 39 commercial lighting products. Of the screw-in compact fluorescent

lamps GE sold in 2005, 99% were ENERGY STAR qualified, which means that they use up to 75% less energy than standard incandescent bulbs.

Motors

- GE offers two lines of premium efficiency motors called the X$D Ultra® and the Ultra 841™ motor. GE offers the X$D Ultra® and Ultra 841™ motor in more than 380 catalogue configurations. These motors meet or exceed NEMA Premium Nominal efficiency standards and exceed all NEMA Premium Minimum Guaranteed efficiencies. Replacing one 100 HP 1800 RPM motor sold before 1997 when the US first imposed motor efficiency standards (of which there are hundreds of thousands in service today) with a GE X$D Ultra® or Ultra 841™ motor would annually save enough energy to power two US households for over 15 months.

3. **The Need for an Independent Evaluation**. We recommend that the Committee consider an independent evaluation of the benefit of implementing a comprehensive program of GHG reductions on the one hand versus the impact on our economy of implementing such a program on the other hand. The evaluation should be competed as soon as possible. The evaluation should:

- Consider whether the amount of GHG reductions that can be expected to result in the US as a result of the operation of the status quo of federal and state laws, regulations and voluntary programs will result in stabilizing or reducing the GHG emissions in the US to an acceptable level;

- Consider the likelihood and length of time it will take for a purely voluntary program (and the types of voluntary mechanisms) for GHG reductions that will result in significant reductions and stabilize GHG emissions at an acceptable level;

- Bench mark the existence and effectiveness of voluntary programs in the US and elsewhere in the world to produce appropriate reductions of GHG;

- Identify and evaluate the cost-benefit of mandatory controls, laws and regulations that could be used to stabilize the emissions of GHG to acceptable levels and the likely time frame and economic impact to do so.

- Identify the technologies that exist to address GHG emissions; the need for government incentives for full development of these technologies; and a likely time frame and cost for their implementation.

- Evaluate the level of acceptance by the industry sectors that will feel the greatest economic impact of a mandatory program of controls on GHG emissions, and actions that could ameliorate the impacts on those sectors.

Additional Topics
Mary Luevano / Global Green USA

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

The potential formation of pollution "hotspots" resulting from a national carbon market is a real concern for low-income communities located adjacent to fossil fuel generators that contribute to these communities' non-attainment of air quality standards.

Often the carbon emissions of a fossil generator track with its efficiency and thus if carbon emissions are high, in the absence of scrubbing technology, so to are the emissions of ozone precursors and particulates per unit of output. Therefore, in many cases, notwithstanding other emissions markets for NOx, if fossil fuel generators have the allowances or credits to cover their carbon emissions it is a good bet that their emissions of particulates and ozone precursors will also remain steady. This link between carbon and local air pollutants is often strongly evidenced by peaking fossil generators, generators that are frequently located in or near the low-income communities of load centers.

Global Green USA is developing models for "Hotspot Gate-keeping" (HSG) in which geographic areas identified as at risk for hotspot formation (of local air pollutants that are demonstrated as linked with carbon emissions) would be required to adopt restrictions to discourage the import of carbon emissions allowances / credits above a certain threshold to covered entities. These restrictions, in the form of a tariff (with revenues recycling to the community) on imported carbon emissions allowances / credits or a reduction in their compliance values, would ensure air quality in our most at risk communities is not negatively impacted by a new national carbon market.

It is important to note that the restrictions created by the inclusion of an HSG system in the Committee's legislation would not dampen the health of a future national carbon market. If included in the bill's market design, a HSG system would only engage the electricity sector. Within that sector, only the dirtiest plants that are located in the communities with the worst air quality would see import restrictions. Further, the HSG model seeks to "restrict" the import of emissions allowances and credits not "ban" them. This is a critical mechanism to make sure that the flexibility created via a market-based climate policy would not enable increased degradation of the already dangerous air quality in our low-income communities. Global Green USA looks forward to exploring hotspot gate-keeping model designs with the Committee.

Additional Topics
Submitter's Name/Affiliation: John Coequyt / Geenpeace US

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Global Warming Impacts

No one knows how much warming is "safe". What we do know is that climate change is already harming people and ecosystems. Its reality can be seen in melting glaciers, disintegrating polar ice, thawing permafrost, dying coral reefs, rising sea levels, changing ecosystems and fatal heat waves. And it is not only scientists that are witnessing these changes. From Inuit in the far North to islanders near the equator - people are already struggling with the impacts of climate change.

But all of this is only the beginning. We are already experiencing dangerous climate change and we need to act to avoid catastrophic climate change by limiting global warming to 2oC. While not all regional effects are yet known, here are some likely future effects if we allow current trends to continue:

Relatively likely and early effects of small to moderate warming

- Sea level rise due to melting glaciers as global temperature increases.
- Massive releases of greenhouse gases from melting permafrost and dying forests.
- A high risk of more extreme weather events such as heat waves, droughts and floods.
- Severe impacts on a regional level. For example, flooding, drought, erosion and wetland loss will increase substantially.
- Natural systems, including glaciers, coral reefs, mangroves, arctic ecosystems, boreal forests, tropical forests, prairie wetlands and native grasslands will be severely threatened.
- An increase in existing risks of species extinction and biodiversity loss.
- The greatest impacts will be on the poorer countries least able to protect themselves from rising sea levels, spread of disease and declines in agricultural production in the developing countries of Africa, Asia and the Pacific.

Longer term catastrophic effects if warming continues

- Greenland and Antarctic ice sheet melting or disintegration. Unless checked, global warming may trigger the irreversible meltdown of the Greenland ice sheet, which would add up to twenty feet of sea-level rise over several centuries; there is new evidence that the rate of ice discharge from the West Antarctic is accelerating from a region that has long been recognized as a source of potential instability as a consequence of global warming.[1][2][3]

[1] Oppenheimer, M. and R. B. Alley (2005). "Ice sheets, global warming, and Article 2 of the UNFCCC." Climatic Change 68(3): 257-267.
[2] Mercer, J. H. (1968). Antarctic Ice and Sangamon Sea Level. Commission of Snow and Ice: Reports and Discussions, Bern, International Association of Scientific Hydrology.

- The Atlantic Gulf Stream current slowing, shifting or shutting down, having dramatic effects in Europe, and disrupting the global ocean circulation system;
- Catastrophic releases of methane from the oceans leading to rapid increases in methane in the atmosphere and consequent warming.

[3] Mercer, J. H. (1978). "West Antarctic Ice Sheet and Co2 Greenhouse Effect - Threat of Disaster." Nature 271(5643): 321-325.

Additional Topics
Submitter's Name/Affiliation: Prof. Karlene Gunter, Dept. of Biophysics, Univ. of Rochester, Rochester, NY

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

However you design the nuts and bolts of a mandatory system, the system needs to be put in place as soon as possible. Human-caused emissions of heat-trapping gases are contributing to rising global temperatures and negatively impacting health, economy, and the environment. In order to avoid the worst consequences of global warming, we need to act now to reduce our emissions. . As the national academies noted, "carbon dioxide can remain in the atmosphere for many decades. Even with possible lowered emission rates we will be experiencing the impacts of climate change throughout the 21st century and beyond. Failure to implement significant reductions in net greenhouse gas emissions now, will make the job much harder in the future."

Here in New York State, we can expect more lake effect snow and an increase in drought and flood events.

Additonal Topics
Submitter's Name/Affiliation: Hinkle/Technology Transition Corp.

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Analysis and Decision Making We'd like to offer some discussion and concern about the role of economic modeling dominating the policy design debate. As noted earlier, the heart of a GHG reduction process is motivating market behavior and deploying technologies that follow simple rules observed but not invented by humans—burn less, pollute less. The bulk of the analysis has been framed by economists, who largely have no empirical referents, and must depend upon theory and abstract formulations to estimate market behaviors. Not all investment or thermodynamics follow these principles. Much can be learned about parts of the overall GHG reduction problem in this setting, but we need to realize that the strength of the inferences we make are limited. Dollar metrics and permanent or transient market failures barely describe our plight. **After all, simulations are best at formalizing our ignorance about a system.**

For geophysical and biological effects, we have both theory-driven and historical and empirical evidence. We should be comfortable enough with some of those results to be convinced to take action. Since there is no science of the future, we have to construct synthetic realities that taper away from our present into imagined states. We have weaker support for a GHG program design, and this where the artwork lies: where fallible judgment and practical politics need to step in to forward the action.

There is some confluence between results from EIA's National Energy Modeling System (NEMS), used on a variety of possible approaches: McCain Lieberman, Carper-Alexander, NCEP, etc. Do we learn more or less by going to MIT or RFF? How much do we trust the hunches these models operationalize? Much is at stake here. For instance, a key result—we find that several independent analyses (using NEMS over and over may not give independent results) converge on a critical effect like how much an NCEP-like program is likely to cost the average consumer: three different approaches appear to show $38/yr, $78/yr and $100/yr.

Some would ague that this is a small share of household disposable personal income, compared to the size of the global climate problem, and $7/t with modest cap growth seems to be the "best" solution because it "efficiently" begins to change the shape of the GHG growth curve. If we believed this, why don't we trade off the amorphous value proposition about individual consumer impact against his preference for action? Such analysis isn't readily available, and what difference does it make if we resolve to get started on GHG reduction on a national scale? There seems to be a safety zone somewhere here that suggests we could be a bit more aggressive, not rob the consumer and create more value in the secondary and tertiary markets for credits. What seems to have evolved, however, is an evangelical quest to simply use the NCEP approach because its advocates have convinced mainly themselves of its worth.

Of course, this is where advocacy begins, and beliefs are formed. If we have truly adjustable parameters in a low-priced safety valve with modest cap growth, then can't we identify a feasible range of policy choices, then get to work trying to build a regulatory system that has the ability

to correct itself, thereby lowering both the risk of being entirely wrong and avoiding some unknowable magnitude of future damage? That's why the performance of the actual regulatory body that gets built to accomplish GHG reductions is so important, yet has had next to no thought put into it and why we center our arguments about the formation of a GHG Management Corporation.

Economic Efficiency vs. Strategic Choices The recent literature is full of the self righteousness of "economic efficiency", as if everyone knew this well and there was universal agreement on such an abstract concept of Faith Healing. NCEP and RFF argue that this criterion alone should drive Federal decision making about GHG reduction. Yet the Congress has consistently and often said that there are a whole range of strategic variables that motivate its outlook—like the size of the import bill, offshore wealth transfers, energy security, economic development potential, jobs in a world market, energy efficiency gains, carbon footprint reductions, cost effectiveness, quality of public investments, and the vulnerability that arises from our lack of fuel diversity. "Economic efficiency" only works for nearly perfect markets. Perhaps the Congress has, after all, a firmer grasp on reality.

We'd like to offer a practical example of what dynamic policy analysis will be like out on the landscape, where real GHG reductions will take place. Croatia's national oil company, INA/Naftaplin (their exploration and production firm) coproduces and vents over 1 M ft3 of CO2/day. INA accounts for about 20% of the GDP of Croatia. Without any market for CO2, it will continue to be a mere waste stream. CO2, however, can be reinjected into oil reservoirs, and utilized as a working fluid in recovering much more oil from mature, low production oil fields. The U.S. has been a pioneer in perfecting these techniques, but they are rarely used elsewhere.

With funding from the U.S Trade and Development Agency and INA, an extensive engineering feasibility study has just been completed, done by an American firm specializing in such work (incidentally, DoE, who has the primary responsibility for GHG work in the U.S., was not interested in this project because it was not a scientific project, did not involve a national lab, had potential commercial value, and Croatia had signed the Kyoto Protocol—no matter that they had no real life projects underway that were beyond bench scale, and actually would put large quantities of CO2 into the ground—offering many learning opportunities—the World Bank, TDA and the Export-Import Bank were very interested).

Early results showed that the break even oil price was about $16/b, and all the vented CO2 could be used and sequestered. Before the EU's ETS, carbon was trading in the World Bank's Prototype Carbon fund at $3.50/t. This translated into about $.35/b for a credit—meaning nothing to the project cash flow.

New results, with oil now at $45-$50/b, and the ETS at $32/t in a real market, show that the credit alone will likely be worth over $5/b of new, incremental oil production. The carbon credit thus becomes a real swing variable in the decision making, the U.S. government learns nothing from a staunch ally in SE Europe (sour gas is produced in great quantities in nearby Romania, Hungary, in the FSU, and across a wide strategic region—all the CO2 is vented), but a new market for U.S. pumps, compressors, construction and design is opened up. The primary

Additonal Topics
Submitter's Name/Affiliation: Hinkle/Technology Transition Corp.

U.S govt. agency for GHG reduction is too remote to realize the significance.

Are there some lessons here? With a dedicated and purposeful GHG reduction program, the Congress might want to reorder U. S. priorities, redeploy $ from a wandering and unfocused climate change program, dedicate itself to achieving real GHG reductions, encourage and assist promising projects worldwide (as a Joint Implementation partner, or to purchase and bank credits, etc.), create a purpose-built agency whose only goal is to achieve meaningful GHG reductions in a market framework, and satisfy a critical range of strategic variables in making its technology and project investments. The NPV for the Croatia project is expected to be about $300 M at a 10% discount rate—there is substantial upside potential, and a GHG corporation could realize a useful return from being a partner—thereby creating a dividend to the U. S. Treasury, a tradable or bankable carbon credit and ridding the atmosphere of another carbon source. There are many such opportunities, but it takes an alert and purposeful devotion to a clear mission.

There is much exciting work to be done.

Additional Topics
Submitter's Name/Affiliation: Hobson, Physics, University of Arkansas

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Global warming is already approaching a point of no return. This is most evident in the Arctic, which might be Earth's canary in the coal mine. The Arctic system is moving toward a new state that falls outside the envelope of recent Earth history. A summer ice-free Arctic Ocean within a century is a real possibility. The change appears to be driven largely by feedback-enhanced global warming, and there seem to be few, if any, processes within the Arctic system capable of altering the trajectory.

The feedback mentioned here is the ocean's reflectivity: As ice melts, the Arctic reflects less sunlight, which warms the ocean further, which melts more ice, and so forth. This feedback can enhance global warming by a factor of up to seven. This causes substantial warming of surrounding landmasses, reducing winter snow duration, which reduces reflectivity even further, producing further warming. The entire region is caught in a feedback spiral, and scientists are already asking, "Is the Arctic we know today already lost?"

Of course, it's not just the Arctic. Glaciers are melting everywhere, sea levels are rising, hurricane intensities are increasing, other extreme weather is increasing, and biological organisms are migrating northward or going extinct, just to list a few consequences.

It's reached a point where a few serious scientists believe it's already too late to turn things around. David King, chief scientific adviser to the British government, says that the only realistic way to meet energy demands while warding off catastrophic warming is a rapid and massive deployment of a new generation of nuclear power stations. But this isn't on the horizon in Britain or anywhere else.

These is an extreme opinion, but I'm hearing it more frequently from good scientists. More moderate opinions, including mine, have it that renewable energy, a gradual phase-out of coal plants (which are far more dangerous than nuclear plants) in favor of renewables and nuclear, and serious energy standards, could solve the problem if instituted rapidly. The goal must be to reduce global fossil fuel use by at least two-thirds within the next few decades. To mention one hopeful example, Sweden's prime minister has announced plans to end oil use entirely by 2020, without turning to nuclear power.

America's current non-response to humankind's greatest threat will be seen by future generations as criminal. Americans, forming 5 percent of the planet's population, cause 25 percent of the problem. We have a president who has trouble even recognizing that global warming exists, let alone doing anything about it. We are willing to sacrifice American lives in a disastrous war with Iraq over access to oil, yet unwilling to demand practical efficiency measures that would save far more oil than could be imported from Iraq even if that war should, miraculously, succeed.

My background: I am a physicist, a textbook author (Physics: Concepts & Connections, 4th edition, Prentice Hall, 2006), and an observer of the global warming situation since 1980. My textbook includes physics-related societal issues, and contains a large section on global warming, so I keep up on the topic. See my website at http://physics.uark.edu/hobson/.

Additional Topics
Submitter's Name/Affiliation: Karen Holl/University of California, Santa Cruz

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Please begin your comments here. (no page limit)

I am not an expert on cap and trade emissions for pollutants but rather I am an ecologist. I am writing to provide strong scientific support for a mandatory cap on greenhouse gases which is long overdue. The Intergovernmental Panel on Climate Change, a consensus of numerous international scientists agrees that we are already suffering the effects of anthropogenic climate change in the form of melting glaciers, sea level rise, and increased temperatures, as well as the direct effects of elevated carbon dioxide. These changes will increasingly have negative impacts on human health, the U.S. economy and the environment. We cannot afford to not take steps to limit greenhouse gas emissions.

Where I live in California, increasing temperatures will result in decreased snowfall, which is our main water storage, resulting in increased flooding and drought, and unreliable water resources. The will in turn affect that agricultural economy of the state.

The Bush administration has said that there is not a scientific consensus that humans are changing the climate, which is simply incorrect. The Bush administration has also said that taking efforts to curb greenhouse gas emissions will hurt the U.S. economy. In fact, not taking action on greenhouse gas emissions will have drastic effects on the U.S. economy at regional, national, and global scales.

Therefore, I strongly endorse your effort to implement caps on greenhouse gas emissions, which is one of many efforts that need to be made to slow anthropogenic climate change.

Additional Topics
Submitter's Name/Affiliation: (Insert your Name/Affiliation here)

Submitter's Name/Affiliation: Michael A. Bowman
Contact: Michael A. Bowman
Email: mike@echogreen.org
Phone: 303-570-9277

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Please begin your comments here. (no page limit)

The implementation of a mandatory cap and trade system with no limits on domestic farm, ranch and forest offsets. Approved practices may include the following: Conservation tillage, Planting trees on marginal and sensitive lands, planting biofuel crops, biomass production & harvest, methane capture and intensive, rotational grazing of grasslands.

Additional Topics
Submitter's Name/Affiliation: Frank Muller-Karger Institute for Marine Remote Sensing/IMaRS College of Marine Science University of South Florida

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Dear Senators Domenici and Bingaman:
However you design the nuts and bolts of a mandatory system to reduce heat-trapping emissions, the system needs to be put in place as soon as possible. Human- caused emissions are contributing to rising global temperatures and negatively impacting health, economy, and the environment. In order to avoid the worst consequences of global warming, we need to act now to reduce our emissions.

The urgency for taking action on global warming is clear.
As the national academies noted, "carbon dioxide can remain in the atmosphere for many decades. Even with possible lowered emission rates we will be experiencing the impacts of climate change throughout the 21st century and beyond.
Failure to implement significant reductions in net greenhouse gas emissions now, will make the job much harder in the future."

Thank you for your efforts in helping address this serious issue.

Sincerely,
Frank Muller-Karger

Additional Topics
Submitter's Name/Affiliation: The National Association of Manufacturers

Submitter's Name/Affiliation: The National Association of Manufacturers
Contacts: Keith McCoy, Bryan Brendle
Email: kmccoy@nam.org, bbrendle@nam.org
Phone: 202-637-3175; 637-3176

Introduction

The world continues to look to the United States for innovative solutions and leadership on energy and environmental issues. Energy and environmental leadership in the U.S. historically has been driven by technological advancements encouraged by government policies that reflect our tradition of entrepreneurship. As you know, Congress recently enacted a new comprehensive set of tools that will encourage innovative solutions through the development of advanced energy technologies and initiatives found in the Energy Policy Act of 2005, which was signed into law only six months ago. Forward-looking leadership must provide full implementation and funding for these authorized energy programs in the law in order to propel U.S. energy policy into the 21st Century. A mandatory cap on carbon emissions is not the answer and will likely undermine the U.S. economy while creating the framework of an uncertain environmental outcome.

By way of background, the National Association of Manufacturers (NAM) is is the nation's largest industrial trade association, representing small and large manufacturers in every industrial sector and in all 50 states. Headquartered in Washington, D.C., the NAM has 10 additional offices across the country.

The NAM's mission is to enhance the competitiveness of manufacturers by shaping a legislative and regulatory environment conducive to U.S. economic growth and to increase understanding among policymakers, the media and the general public about the vital role of manufacturing to America's economic future and living standards

The NAM's Policy on Climate Change

The NAM recognizes that there is a relationship between economic growth, global energy consumption and the environment. The NAM also recognizes that concern about the potential impact of human activities on the earth's natural greenhouse effect has become an international issue. However, there remains considerable scientific uncertainty and disagreement regarding human impacts on climate, and there is an inability to predict accurately future climate change. In fact, observational data have not confirmed evidence of global warming that can be attributed to human activities. This argues that any proposed policies to reduce greenhouse gas emissions must be subject to thorough and open public debate, including consideration of their impact on the U.S. economy and its international competitiveness. We believe any U.S. climate change policies should be voluntary, cost-effective, compatible with our marketplace economy, flexible, global in scope and involve all of our trading partners, and take into account all greenhouse gas sources and reservoirs. Therefore, the NAM opposes any federal or state

government actions regarding climate change that could adversely affect the international competitiveness of the U.S. marketplace economy.

The NAM also recognizes that knowledge of the environment is not static, nor is our ability to protect it. Technological advances developed by the marketplace have greatly minimized and continue to reduce the environmental impact of domestic energy production and consumption. The NAM encourages policies which recognize these technological advances and allow for balance between economic growth and protection of our environment.

The NAM Opposes Federal Policies That Will Increase Market Demand for Scarce Natural Gas, Increase Reliance on Energy Imports, and Undermine Domestic Energy Security

Federal rules mandating air emission reductions, combined with federal moratoria restricting the development of abundant natural gas and oil resources on the Outer Continental Shelf (OCS), have already strained the supply for natural gas. These dual policies have resulted in sky-rocketing costs, increased reliance on imports, and undermine domestic energy security. If the federal government moves forward with any form of carbon emission mandate, more manufacturers and power generators will be forced to switch from plentiful coal resources to more scarce natural gas. U.S. consumers currently pay among the highest prices in the world for natural gas, approximately $6.60 per million British Thermal Units (BTUs). The U.S. price is substantially higher than many of our major trading partners, including China, South Korea and Japan. The Energy Information Administration (EIA) Annual Energy Outlook 2006 released on December 12, 2005 forecasts continued high natural gas prices for all sectors of the economy. Any constraints on the use of coal, through mandates on carbon emissions and other greenhouse gases, can only make a very bad situation worse.

Natural gas costs have had a strong adverse impact on the manufacturing sector since 2000. The chemical industry alone estimates that 100,000 jobs were lost since 2000 as a direct result of the high natural gas prices due to the gas supply and demand imbalance. Over half of the fertilizer capacity in the United States is shut in or closed permanently. The chemical industry has gone from the lead net export industry in the United States to a net importer of chemicals. Other industries, including plastics, aluminum, steel, metal heat treating, glass and paper are struggling to stay afloat in the current natural gas cost environment. The manufacturing sector as a whole has lost more than three million jobs since 2000. If sky high natural gas costs continue, much of the technological know-how and industrial base that will be necessary to increase carbon efficiency will be sent overseas. The U.S. must promote policies that advance innovative manufacturing, which will lead the world in developing technologies that will address current and future environmental challenges, including climate change.

A Mandatory Cap and Trade Program Will Hurt Manufacturers

A recent NAM study, *The Impact of Energy and Environmental Policy Choices on U.S. Manufacturing, U.S. Economic Growth and Energy Markets[submit this for the record]*, determined that actions such as mandatory cap and trade proposals would increase the price of gasoline and diesel by 8 to 9 percent by 2010. Manufacturers would pay 57 percent more for

natural gas, and electricity would increase by 39 percent. Furthermore, manufacturing production would decrease by 4.1 percent and trade systems and employment would decrease by almost 3 percent. In other words, mandatory cap and trade would only exacerbate the economic hardships that the manufacturing sector is currently experiencing.

Emission reporting provisions should not be adopted by Congress in the absence of some demonstrated need, because regulatory requirements will undoubtedly be costly. Creating additional paperwork for the many commercial, industrial, agricultural and other interests potentially impacted, whether large or small, will neither enhance environmental quality nor address the nation's energy problems. Moreover, the secretary of energy long ago established an "inventory of national aggregate" GHG emissions under section 1605(a) of the Energy Policy Act of 1992 (EPAct) and annually publishes that data. In addition, electric utilities now report their carbon dioxide (CO_2) emissions under section 821 of Public Law 101-52. Further, the EPA and the secretary of state jointly prepare an annual, comprehensive Greenhouse Gas (GHG) inventory pursuant to the United Nation's Framework Convention on Climate Change (UNFCCC) with much of the data derived from the DOE.

Congress Must First Address the Numerous Climate Change Provisions Within the Energy Policy Act of 2005 Before Initiating a Review of Climate Change Policy

The Energy Policy Act, approved by Congress and signed into law by the President in August 2005, advances responsible action on potential climate change. Specific new policies address climate change through new technologies that will diversify America's energy portfolio, promoting clean, affordable and reliable energy for decades. Below is a one-page summary of these new policies, followed by the details on specific new provisions. These have been categorized into technology development, technology adoption, and energy source adoption.

Long-term technology development: Basic research in the energy bill could lead to fundamental reductions in GHG emission trends even with a healthy growing economy. These new technologies also could be used in developing countries where greenhouse gas emissions are growing most rapidly. Funded research could lead to significant advances in:

- Hydrogen Fuels -- funding enhances the potential for practical use of hydrogen fuels by addressing everything from safe delivery to the codes and standards for hydrogen use.
- Coal Gasification, Carbon Sequestration and Efficiency Improvements – could allow coal to be used to generate carbon-free or low-carbon electricity.
- Fuel Cell Research -- will address technical and cost issues and potentially speed fuel cell use in residential, commercial and transportation applications.
- Energy Conservation and Efficiency – the Next Generation Lighting Initiative and initiatives like advanced electric motor control device research could significantly reduce overall energy use, further reducing GHG emissions.

Near- and medium-term technology adoption. The energy bill promotes or requires actions to improve energy efficiency and reduce greenhouse gas emissions throughout the economy. Actions include:

- National Requirements for increased ethanol use and decreased petroleum use;

- Federal Agency Requirements covering metering, percentage reduction schedules and new options for contracting to reduce energy use and GHG emissions;
- Communities and States have new funding for energy efficient appliance programs, weatherization assistance and state energy conservations plans;
- Efficiency Standards and Incentives for Public Housing will improve energy efficiency;
- Efficiency Standards and Incentives for Individuals and Businesses adds energy conservation standards for a wide range of commercial appliances and other products.

Near- and medium-term adoption of new energy sources. A wide range of specific actions promoting the supply of zero and low-GHG energy sources include:

- Renewable Energy options for increased production of renewable energy on federal lands;
- Natural Gas incentives and reduction of barriers to marginal or unconventional natural gas and installation of LNG terminals will increase supplies of this lowest-carbon fossil fuel;
- Nuclear Power options improve, promoting continued use of carbon-free nuclear power, development of new modular nuclear reactors.

The Energy Bill's Contribution
To Energy Efficiency and Responsible Climate Policy

The energy bill advances the following significant actions on potential climate change.

Technology Research, Development and Demonstration

Hydrogen

- Authorizes $1.25 billion over 10 years for the Next Generation Nuclear Plant Project for research, development, design, construction and operation of an advanced, next-generation, nuclear energy system leading to alternative approaches to reactor-based generation of hydrogen. (Title VI -- Nuclear Matters, Sec. 641-645)
- Authorizes $3.2 billion over five years for programs enhancing the potential for using as an energy source in the US economy. Program elements address:
    - Hydrogen and Fuel Cell Technology Research and Development ($1.92 billion);
    - Hydrogen Supply and Fuel Cell Demonstration Program ($1.31 billion);
    - Development of Safety Codes and Standards ($38 million);
    - Reports ($7.5 million); (Title VIII – Hydrogen)

Energy Efficiency

- Authorizes $1.8 billion over nine years for the Clean Coal Power Initiative for projects that advance efficiency, environmental performance or cost competitiveness of coal gasification and related projects. Establishes a 50% thermal efficiency target for coal gasification technologies and 7% improvements in thermal efficiencies of existing units. (Title IV- Coal, Sec. 401)
- Authorizes $2.6 billion over eight years for energy efficiency and conservation research, development, demonstration and commercial applications including:

    - Minimum $350 million over eight years for the Next Generation Lighting Initiative for energy efficient advanced solid-state lighting technologies. (Title IX: Research and Development, Sec. 912)
    - Creates National Building Performance Initiative to, in part, energy conservation. (Title IX: Research and Development, Sec. 913)
    - Minimum $21 million over three years for research, development and demonstration for improving performance, service life and cost of used vehicle batteries in secondary applications. (Title IX: Research and Development, Sec. 915)
    - Establishes the Energy Efficiency Science Initiative. (Title IX: Research and Development, Sec. 916)
    - $780 million over three years for advanced cost-effective technologies to improve the energy efficiency and environmental performance of vehicles. (Title IX: Research and Development, Sec. 911)
    - $4 million over 2 years for advanced control devices to improve the energy efficiency of electric motors, including those used in industrial processes, heating, ventilation, and cooking. (Title IX: Research and Development, Sec. 911)
- $768 million over three years to promote distributed energy and electric energy systems including:
    - High Power Density Industry Program to improve the energy efficiency of data centers, server farms and telecommunications facilities; (Title IX: Research and Development, Sec. 921)
    - $40 million over two years for Micro-Cogeneration Energy Technology for increased efficiency in small-scale combined heat and power for residential applications; (Title IX: Research and Development, Sec. 923)
    - Distributed Energy Technology Demonstration Program to accelerate utilization of efficient and low-emitting technologies such as fuel cells, micro-turbines and combined heat and power systems. (Title IX: Research and Development, Sec. 924)
    - Electric Transmission and Distribution Programs to ensure in part, energy efficiency of electrical transmission and distribution systems. (Title IX: Research and Development, Sec. 925)
- Authorizes $1.137 billion over three years for R&D and commercial application programs to facilitate systems including innovation for existing plants (including mercury removal), integrated gasification combined cycle, advanced combustion systems, turbines for synthesis gas derived from coal, carbon capture and sequestration research and development, coal derived chemicals and transportation fuels, liquid fuels derived from coal, solid fuels and feedstock, advanced coal related research, advanced separation technologies, and fuel cells for the operation of synthesis gas derived from coal. (Title IX: Research and Development, Sec. 962)
- Establishes a Federal/State cooperative program for research, development, and deployment of energy efficiency technologies. (Title I -- Energy Efficiency, Sec. 127)
- Authorizes $65 million over three years to establish a research partnership to develop and demonstrate railroad locomotive technologies that, in part, increase fuel economy. (Title VII – Vehicles and Fuels, Sec. 751)

- Mandates a study of feasibility and effects of reducing the use of fuel for automobiles. (Title VII – Vehicles and Fuels, Sec. 773)
- Calls for a study of how to measure energy efficiency. (Title XVIII – Studies, Sec. 1802)
- Provides that the Federal government use energy efficient technologies in their buildings and vehicles associated with the National Park System, National Wildlife Refuge System, National Forest System, National Marine Sanctuaries System, and other public lands and resources managed by the Secretaries of Interior, Commerce and Agriculture. (Title I – Energy Efficiency, Sec. 111)
- Creates an amendment to the Low-Income Home Energy Assistance Act of 1981 permitting the State or an agent thereof to purchase renewable fuels, including biomass. (Title I – Energy Efficiency, Sec. 121)
- Requires a report on failure to comply with deadlines for new or revised energy conservation standards. (Title I – Energy Efficiency, Sec. 141)
- Provides $250 million over 5 years toward a joint program with NASA to develop ultra-efficient engine technologies for aircraft, with goals including a fuel efficiency increase of at least 10%, and a reduction of the impact of landing and take-off nitrous oxides emissions on local air quality of 70%. (Title VII – Vehicles and Fuels, Sec. 758)
- Provides $40 million over four years for a program to improve technologies for the commercialization of a combination hybrid/flexible fuel vehicle or a plug-in hybrid/flexible fuel vehicle. (Title VII – Vehicles and Fuels, Sec. 706)
- Provides that the Secretary shall accelerate efforts directed toward the improvement of hybrid vehicle technologies. (Title VII – Vehicles and Fuels, Sec. 711)
- Provides that the Secretary shall accelerate efforts to improve diesel combustion and after-treatment technologies for use in diesel fueled motor vehicles. (Title VII – Vehicles and Fuels, Sec. 754)
- Provides that the Secretary will carry out a program of research, development, demonstration, and commercial application of technologies for ultra-deepwater and unconventional natural gas and other petroleum resources exploration and production in order to maximize the value of natural gas and other petroleum resources of the US, by increasing the supply, through reducing the cost and increasing the efficiency of exploration and production, while improving safety and minimizing environmental impacts. (Title IX – Research and Development, Sec. 999A, 999B)

<u>Renewable Energy</u>

- Authorizes $22.27 billion over three years for renewable energy research, development and demonstration including:
    - $738 million for Biofuels research aimed at making fuels that are price-competitive with gasoline or diesel in internal combustion or fuel- cell-powered vehicles; (Title IX: Research and Development, Sec. 931, 932)
    - $450 million over three years for Concentrating Solar Power Research Program for the production of hydrogen including cogeneration of hydrogen and electricity. (Title IX: Research and Development, Sec. 931, 934)
    - Hybrid Solar lighting R&D for novel lighting that combines sunlight and electrical lighting. (Title IX: Research and Development, Sec. 934)
- Establishes a Federal/State cooperative program for research, development, and deployment of renewable energy technologies. (Title I -- Energy Efficiency, Sec. 127)

- Establishes the Advanced Biofuel Technologies Program to demonstrate advanced technologies for the production of alternative transportation fuels. (Title XV – Ethanol and Motor Fuels, Sec. 1514)
- Requires a study of the Energy Policy Act of 1992 and its impact on alternative fueled vehicle technology, availability of technology and cost of alternative fueled vehicles. (Title XVIII – Studies, Sec. 1831)
- Provides a tax credit of 30% of the cost of any qualified alternative fuel vehicle refueling property built. (Title XIII – Energy Policy Tax Initiative, Sec. 1342)
- Provides $300 million over five years for the creation of a photovoltaic energy commercialization program, in order to accelerate growth of the industry, reduce fossil fuel consumption, attain the goal of installing solar energy systems in 20,000 Federal buildings by 2010, and to develop program performance data to support policy decisions on future incentive programs with respect to energy. (Title II – Renewable Energy, Sec. 204)
- Establishes that the Secretary prepares detailed roadmaps for the research, development, and other related programs of solar and wind technologies. (Title VIII – Hydrogen, Sec. 812)
- Authorizes $250 million for production incentives for cellulosic biofuels. (Title IX – Research and Development, Sec. 942)
- Establishes a program for education and outreach on biobased fuels and biobased products consisting of training programs and education. (Title IX – Research and Development, Sec. 947)
- Creates an amendment to the 1986 code providing bonds to be held by qualified applicants for the use of renewable energy in the creation of electricity. (Title XIII – Energy Policy Tax Initiatives, Sec. 1303)

<u>Nuclear</u>

- Authorizes $1.18 billion over 3 years for Nuclear Energy research, development, demonstration and commercial application activities including:
    - Research to examine reactor designs for large-scale production of hydrogen using thermochemical processes. (Title IX: Research and Development, Sec. 952)
    - Generation IV Nuclear Energy Systems initiative to advance understanding of efficiency and cost opportunities for next generation nuclear power plants. (Title IX: Research and Development, Sec. 952)
- Provides a tax credit of 1.8 cents per kilowatt-hour of electricity produced and sold by advanced nuclear power facilities. (Title XIII – Energy Policy Tax Initiatives, Sec. 1306)

<u>Sequestration</u>

- Establishes a grant program to provide incentives to promote the capturing, transportation and injection of CO_2, and to promote oil and natural gas production from the Outer Continental Shelf and onshore Federal lands by providing royalty incentives to use enhanced recovery techniques. (Title III – Oil and Gas, Sec. 354)
- Mandates research on technologies to capture carbon dioxide from pulverized coal combustion units. (Title IX – Research and Development, Sec. 963)

- Institutes loan guarantees for projects that avoid, reduce, or sequester anthropogenic emissions of greenhouse gases and employ new or significantly improved technologies. (Title XVII – Incentives for Innovative Technologies, Sec. 1703)

Science

- Authorizes $13.9 billion over three years for basic science research that could have significant implications for long-term trends in the nation's greenhouse gas emissions. (Title IX: Research and Development, Sec. 961). These programs include:
    - $1.1 billion for Fusion Energy Science Program (Sec. 972);
    - Fission and Fusion Energy Materials Research Program (Sec. 978);
    - $74.7 million for Catalysis science research that may contribute to new fuels for energy production and more efficient material fabrication processes (Sec. 973);
    - Nanoscale science and engineering research (Sec. 971);
    - $995 million for Advanced scientific computing for energy missions (Sec. 967);
    - Genomes to Life Program with a goal of developing technologies and methods that will facilitate production of fuels, including hydrogen, and convert carbon dioxide to organic carbon (Sec. 977).
- Provides $5 million for a project to demonstrate the viability of high-energy electron scrubbing technology. (Title IV – Coal, Sec. 416)

Technology Adoption

International

- Directs the Secretary of State, in coordination with the Administrator of the U.S. Agency for International Development, to provide assistance to developing countries specifically for projects to reduce greenhouse gas intensity. (Title XVI – Climate Change, Sec. 1602)

National Private Sector -- Energy Use Policies

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- Establishes a self-sustaining national public energy education program that will cover, among other things, conservation and energy efficiency, and the impact of energy use on the environment. (Title I -- Energy Efficiency, Sec. 133)
- Authorizes $450 million over five years to create a comprehensive national public awareness program regarding the need to reduce energy consumption, the benefits of reducing energy consumption during peak use periods, and practical, cost-effective energy conservation measures. (Title I -- Energy Efficiency, Sec. 134)
- Authorizes the Secretary of Energy to enter into voluntary agreements with energy intensive industrial sector entities to significantly reduce the energy intensity of their production activities. (Title I -- Energy Efficiency, Sec. 106)

National Private Sector -- Efficiency Standards and Incentives

- Creates energy conservation standards for commercial clothes washers, icemakers, refrigerators, freezers, air conditioners, and heaters. (Title I -- Energy Efficiency, Sec. 136)

- Authorizes $6.2 million for pilot projects designed to conserve energy resource by encouraging use of bicycles in place of motor vehicles. (Title VII – Vehicles and Fuels, Sec. 755)
- Authorizes $94.5 million over three years to reduce energy use by reducing heavy-duty vehicle long-term idling. (Title VII – Vehicles and Fuels, Sec. 756)
- Authorizes $45 million over three years to reduce energy use by reducing locomotive long-term idling. (Title VII – Vehicles and Fuels, Sec. 756)
- Authorizes $25 million over five years for a biodiesel testing partnership with engine, fuel injection, vehicle and biodiesel manufacturers to test and improve biodiesel technologies. (Title VII – Vehicles and Fuels, Sec. 757)
- Authorizes $17.5 million over five years for CAFÉ enforcement obligations. (Title VII – Vehicles and Fuels, Sec. 771)
- Establishes a DOE/EPA voluntary Energy Star Program under the Energy Policy and Conservation Act to identify and promotes energy-efficient products and buildings. (Title I -- Energy Efficiency, Sec. 131)
- Directs the Secretary of Energy in cooperation with EPA to undertake an educational program for homeowners and small businesses on energy savings from properly maintained air conditioning, heating, and ventilating systems. (Title I -- Energy Efficiency, Sec. 132)
- Adds energy conservation standards definitions for additional products (e.g. lamps, battery chargers, refrigerators, external power supply, illuminated exit sign, low-voltage, transformer, traffic signal module) to the Energy Policy and Conservation Act. (Title I -- Energy Efficiency, Sec. 135)
- Initiates a rulemaking under the Energy Policy and Conservation Act to evaluate and improve the effectiveness of current energy efficiency labeling on consumer products. (Title I -- Energy Efficiency, Sec. 137)
- Provides a tax deduction of a maximum of $1.80 per square foot, adjusted for the aggregate amount of the deductions from all prior years, for energy efficient commercial buildings. (Title XIII – Energy Policy Tax Initiatives, Sec. 1331)
- Provides tax credits to promote energy efficiency for qualifying entities under the following categories: construction of new energy efficient homes; certain non-business energy property; energy efficient appliances; residential energy efficient property; business installation of qualified fuel cells and stationary micro-turbine power plants; and business solar investment. (Title XIII – Energy Policy Tax Initiatives, Sec. 1332, 1333, 1334, 1335, 1336, 1337)
- Provides tax credits for fuel cell, advanced lean burn technology, hybrid, and alternative fuel motor vehicles. (Title XIII – Energy Policy Tax Initiatives, Sec. 1341)
- Establishes grant and loan programs given on a competitive basis from the Federal level, state level, or both, to eligible entities to achieve significant reductions in diesel emissions in terms of tons of pollution produced and diesel emissions exposure. (Title VII – Vehicles and Fuels, Sec. 792, 793)
- Provides a tax credit of maximum 20 percent of the qualified investment, for investments in clean coal facilities. (Title XIII – Energy Policy Tax Initiatives, Sec. 1307)

<u>Federal Agencies</u>

- Directs Secretary of Energy to revise Federal building energy efficiency performance standards to require, if life-cycle cost-effective, that new Federal buildings achieve energy consumption levels at least 30 percent below the most recent version of ASHRAE or the International Energy Conservation Code. (Title I -- Energy Efficiency, Sec. 109)
- Promotes plans for energy and water savings measures in Congressional buildings as well as reductions in energy consumption in federal buildings nationwide. (Title: I -- Energy Efficiency, Sec. 101)
- Establishes percentage reduction schedule for fuel use per gross square foot of Federal buildings for 2006 through 2015. (Title: I -- Energy Efficiency, Sec. 102)
- Calls for all Federal buildings to be metered or sub-metered to promote efficient energy use and reduce electricity costs. (Title I -- Energy Efficiency, Sec. 103)
- Directs federal agencies to procure Energy Star or FEMP designated-energy efficient products. (Title I -- Energy Efficiency, Sec. 104)
- Permanently extends and expands existing federal agency authority to contract with energy service companies to assume the capital costs of installing energy and water conservation equipment and renewable energy systems in federal facilities, and recover life-cycle energy cost savings over the term of the contract. (Title I -- Energy Efficiency, Sec. 105)
-
- Promotes increased use of recovered mineral component in Federally funded projects involving procurement of cement or concrete. (Title I -- Energy Efficiency, Sec. 108)
- Amends the Energy Policy Act of 1992 to require Federal agencies to purchase renewable sources of fuel. (Title II – Renewable Energy, Sec. 203)
- Amends Energy Policy and Conservation Act to promote Federal agencies' use of alternative fuels in duel-fuel vehicles. (Title VII – Vehicles and Fuels, Sec. 701)
- Requires energy savings goals for each Federal agency and requires the use of fuel cell vehicles, hydrogen energy systems, and stationary, portable, and micro fuel cells. Authorizes $450 million over five years to achieve these goals. (Title VII – Vehicles and Fuels, Sec. 782, 783)
- Mandates a study on energy conservation implications of widespread adoption of telecommuting by Federal employees. (Title XVIII – Studies, Sec. 1803)
- Requires a study on the amount of oil demand that could be reduced by oil bypass filtration technology and total integrated thermal systems and feasibility of using the technologies in Federal motor vehicle fleets. (Title XVIII – Studies, Sec. 1805, 1806)

<u>Communities and States</u>

- Amends the Energy Conservation and Production Act and reauthorizes $1.8 billion over three years for weatherization assistance. (Title I -- Energy Efficiency, Sec. 122)
- Authorizes $325 million over three years and amends the Energy Policy and Conservation Act to promote State review their energy conservation plans, with a state energy efficiency goal of a 25 percent or more improvement by 2012 compared to 1992. (Title I -- Energy Efficiency, Sec. 123)
- Authorizes $250 million over five years for State energy efficient appliance rebate programs. (Title I -- Energy Efficiency, Sec. 124)

- Authorizes $150 million over five years for grants to State agencies to assist local governments in constructing new energy efficient public buildings that use at least 30 percent less energy than comparable public building meeting the International Energy Conservation codes. (Title: Energy Efficiency, Sec. 125)
- Authorizes $60 million over three years for grants to local government, private, and non-profit community development organizations, and Indian tribes to improve energy efficiency, develop alternative renewable energy supplies, and increase energy conservation in low income rural and urban communities. (Title I -- Energy Efficiency, Sec. 126)
- Authorizes $125 million worth of grants over five years to States to develop and implement building codes that meet or exceed the energy efficiency of the most recent building energy codes. (Title I -- Energy Efficiency, Sec. 128)
- Calls for a study of State and regional policies that promote utilities to undertake cost-effective programs reducing energy consumption. (Title I -- Energy Efficiency, Sec. 139)
- Authorizes $25 million for States to carry out programs that encourage energy efficiency and conservation of electricity or natural gas. (Title I -- Energy Efficiency, Sec. 140)

Public Housing

- Encourages increased energy efficiency and water conservation through amendments to the U.S. Housing Act of 1937 by promoting installation of equipment conforming to new standards. (Title I -- Energy Efficiency, Sec. 151)
- Requires public housing agencies to purchase energy-efficient appliances that are Energy Star products or FEMP-designated products when purchasing appliances unless these products are not cost-effective. (Title I -- Energy Efficiency, Sec. 152)
- Includes energy efficiency standards in amendments to the Cranston-Gonzalez National Affordable Housing Act. (Title I -- Energy Efficiency, Sec. 153)
- Directs the Secretary of Housing and Urban Development to develop and implement an integrated strategy to reduce utility expenses at public and assisted housing through cost-effective energy conservation, efficiency measures, as well as energy efficient design and construction. (Title I -- Energy Efficiency, Sec. 154)

Energy Source Adoption

Renewable Energy and Increased Efficiency

- Mandates that motor vehicle fuel sold in U.S. contain 4 billion gallons of renewable fuel in 2006, rising to 7.5 billion gallons in 2012. (Title XV – Ethanol and Motor Fuels, Sec. 1501)
- Authorizes study of the potential for increasing hydroelectric power production capability at federally owned or operated water regulation, storage, and conveyance facilities. (Title XVIII – Studies, Sec. 1834)
- Prioritizes funds for renewable energy production incentives, placing emphasis on solar, wind, geothermal and closed-loop biomass technologies. (Title II – Renewable Energy, Sec. 202)
- Establishes goals for the share of federal government purchases of electricity from renewable sources to the extent economically feasible and technically practicable. (Title II -- Renewable Energy, 203)

- Authorizes $36 million for the establishment of a Sugar Cane Ethanol Program to promote the production of ethanol from sugar cane. (Title II – Renewable Energy, Sec. 208)
- Authorizes $125 million over ten years for grants to facilities that use biomass to produce electricity, sensible heat, transportation fuels or substitutes for petroleum-based products; and for grants to persons researching ways to improve the use of biomass or add value to biomass utilization. (Title II -- Renewable Energy, Sec. 210)
- Improves geothermal energy leasing procedures, terms and conditions to increase use of geothermal energy. (Title II -- Renewable Energy, Subtitle B)
- Facilitates use of the OCS for alternative energy sources such as wind power and ocean thermal energy. (Title III – Oil and Gas, Sec. 388)
- Calls for a study of the potential for renewable energy on Federal land and make recommendations for statutory and regulatory mechanisms for developing these resources. (Title XVIII – Studies, Sec. 1833)
- Establishes a program to encourage domestic production and sales of efficient hybrid and advanced technology diesels. (Title VII – Vehicles and Fuels, Sec. 712)

Natural Gas Supplies

- Provides incentives to continue natural gas production on low-yield (marginal) properties by reducing the royalty rate when prices fall. (Title III – Oil and Gas, Sec. 343)
- Provides incentives for natural gas production from deep wells in the shallow water of the Gulf of Mexico. (Title III – Oil and Gas, Sec. 344)
- Extends royalty relief for natural gas production in the deepwater of the Gulf of Mexico. (Title III – Oil and Gas, Sec. 345)
- Authorizes $125 million over five years to reduce fugitive methane emissions by establishing a program to properly plug and abandon orphaned, abandoned, or idled wells on federal land. (Title III – Oil and Gas, Sec. 349)
- Authorizes $350 million over five years to facilitate timely action on natural gas leases and permits and creation of Best Management Practices for processing permits. (Title III – Oil and Gas, Sec. 362)
- Requires the creation of a Memorandum of Understanding between the Department of Interior and Department of Agriculture to facilitate natural gas development on National Forest lands. (Title III – Oil and Gas, Sec. 363)
- Establishes a Federal Permit Streamlining Pilot Project to expedite processing of natural gas permits. (Title III – Oil and Gas, Sec. 364)
- Facilitates the building of LNG terminals thereby increasing the supply of natural gas. (Title III – Oil and Gas, Sec. 311)
- Authorizes $155 million over 5 years for research aimed at facilitating production of natural gas from Methane Hydrates. (Title IX – Research and Development, Sec. 968)
- Provides incentives to promote natural gas production from natural gas hydrates. (Title III – Oil and Gas, Sec. 353)

Nuclear Energy Technologies

- Reauthorizes for 20 years the Price-Anderson Act, the long-standing liability insurance system for all nuclear operations in the country. This system has existed for more than

40 years and never required payment from the federal government. (Title VI -- Nuclear Matters, Sec.602)

- Improves the regulatory treatment modular reactors, facilitating the installation of new, more cost effective nuclear power reactor designs. (Title VI -- Nuclear Matters, Sec. 608).

The NAM supported and key voted Senators Hagel and Pryor's amendment to the Energy Policy Act of 2005 that provided an incentives-oriented, cost effective plan for improving greenhouse gas emissions intensity, which addresses both domestic and international components. As you know this amendment passed 66-29 and was accepted by the House. Hagel-Pryor provides incentives, loans, loan guarantees, and other financial assistance for advanced climate technology or systems, including coal gasification, carbon sequestration, advanced nuclear power, and renewable energy. It would provide incentives for companies to export this technology to the developing world. Moreover, the amendment would direct the State Department to act as the lead agency for integrating the goal of reducing GHG intensity in developing countries into U.S. foreign policy.

As you can see, there are many provisions in the Energy Policy Act of 2005 and the tax title that take a positive approach to increasing energy efficiency and providing incentives for clean coal technology, nuclear and renewable energy sources, as well as facilitating increases in natural gas supplies. We urge you to oppose a "command and control" approach by seeking to establish mandatory carbon dioxide cap and trade and mandatory carbon dioxide reporting schemes. Such schemes will undermine the very purposes of the Energy Policy Act of 2005 before it has a chance to bear fruit. The Act is needed to increase the supplies, the infrastructure and the efficiency with which energy is used to create economic growth, jobs and quality of life. EIA's AEO2006 analysis shows the progress that can be made in improving the energy intensity of the economy if programs authorized by the Act are fully funded.

Thank you for the opportunity to express our views.

Additional Topics
Submitter's Name/Affiliation: Michelle Manion, NESCAUM

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

In addition to the fundamental design considerations such as the point-of-regulation, allowance allocation, and international trading, NESCAUM provides the following recommendations for other important features necessary for an effective mandatory, market-based GHG program:

- **Credible, rigorous, mandatory reporting of GHGs—**A credible, rigorous, and transparent mandatory reporting system for greenhouse gas emissions is an essential building block of an effective, well-functioning emissions trading market. In order to establish a meaningful and accurate baseline, the US should require large emitters to begin reporting their GHG emissions at least two to three years in advance of the emissions cap taking effect. Just as is required for publicly-owned corporations under financial reporting requirements, emissions reporting standards should be designed to achieve accuracy and completeness. Emissions reports should be subject to independent verification.

  At this point in time, the only federal program for reporting of greenhouse gases, the voluntary 1605b program administered by the US Department of Energy, has been found wholly inadequate by both industry and environmental advocates, even for purposes of voluntary emissions reporting. Common criticisms of 1605(b) include its lack of rigor, completeness, and inadequate baseline characterization. While forthcoming revisions are expected to make modest improvements to 1605(b), this system has neither the necessary credibility nor sufficiently transparent, sound standards. It should not be used as the basis for a mandatory reporting system. US EPA's emissions allowance trading system, which supports the federal Acid Rain program, is a much more credible and valid template for the development of a mandatory GHG emissions reporting system.

  Also important to independent verification of a transparent and credible mandatory reporting program is the existence of long-term publicly reported information that is available to quality-check reported GHG emissions data. In the case of the electricity generation industry, this has existed through reporting of unit-specific fuel consumption and other data under Form 767 of the Energy Information Administration (EIA). The EIA, however, now proposes to terminate reporting under Form 767. This will severely undermine the ability to verify data in future mandatory GHG reporting from the electricity generation sector. We strongly urge that Form 767 reporting continue at EIA to ensure that a valuable and long term information resource remains available, which will be crucial for the credibility of future GHG reporting and emissions trading.

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- **Early action crediting—**Because the implementation of a US mandatory GHG program is likely a few years off at the very earliest, the program should make specific provisions for early reductions of GHG emissions achieved in advance of a federal program. Specifically, the program should provide allowances to entities that can credibly establish

that reductions were made that would not have happened as a matter of course. Eligibility for early action allowances should be granted first and foremost to entities subject to existing mandatory GHG programs such as the regional cap-and-trade program currently being implemented by several Northeast states.[1]

Failure to recognize early actions may unnecessarily penalize early innovators, and will discourage entities from making meaningful reductions before the start of a federal program, in the hopes of receiving a larger allocation of allowances or of lowering their overall compliance costs. Given the magnitude of the longer-term climate challenge, the program must send encouraging signals to capital markets that the risk of investing in emerging technologies will be fairly compensated.

- **Role of Complementary Policies**—Because of price inelasticity for products such as electricity, auto transportation and other necessities, a GHG trading system may lead to higher prices that consumers will absorb but not necessarily lead to reductions in energy use. Establishing a GHG trading system must be complementary and not a substitute for other federal programmatic efforts that would reduce GHG emissions. Several New England states, for example, have taken actions to address market barriers such as establishing renewable portfolio standards for electricity generation, and Connecticut has established a "Leading by Example" initiative in which state governments establish goals and timelines to reduce GHG emissions in the operation of government buildings and in the provision of government services.

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[1]The Regional Greenhouse Gas Initiative (RGGI), which sets a cap on carbon dioxide emissions from electricity generating units larger than 25MW, is scheduled to take effect in 2009.

Additional Topics
Submitter's Name/Affiliation: Sandra Ely/New Mexico Environment Department

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

If we are to "slow, stop, and reverse the growth" of GHG emissions, it will be important to establish a declining cap and reduce the number of allowances as part of a "mandatory market-based system" over time. A declining cap over decades will provide a predictable and stable business climate that will allow business to better plan technological investments. The emission reductions glide path would be subject to periodic review based on science, economics and international cooperation. Such an approach would provide business certainty and help assure that we meet our long-term emission reduction goals. Governor Richardson has set GHG emission reduction targets of 2000 levels by 2012, 10% below by 2020 and 75% below by 2050. The federal program should have similar reduction targets.

Providing a mechanism for purchasing (and selling) offsets expands the flexibility of the program. In some circumstance, offsets may be a more cost effective way to reduce GHG emissions. However, the quality of the offsets must be verifiable and an effective structure must be established by which they can be traded.

Additional Topics
Submitter's Name/Affiliation: Gregory A. Norris/Harvard School of Public Health

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Researchers at the Harvard School of Public Health continue to study the economy-wide public health impacts of making the economically cost-effective investments that are now available to increase energy efficiency in the US residential sector.[1] The integrating metric used in these studies is the same one used by the World Health Organization to characterize total burdens of disease: Disability-Adjusted Life-Years. The analyses also use the ISO-standardized method of Life Cycle Assessment in order to account for total "upstream" and "downstream" emission and health consequences throughout the economy.

We suggest that the findings of this ongoing research provide input to the Senate's deliberations about the design of a mandatory market based program on greenhouse gases, in two ways.

First, our research addresses another example, to be added to the one of transportation noted on page 4 of the Senate's White Paper[2], of an energy-consuming sector composed of hundreds of thousands of points of end-use which together comprise a major portion of total US energy use (and public health burden). Some of this energy use is traced to electricity generation, but a significant remaining share is on-site combustion of fossil fuels; this argues against the use of a downstream reporting system that targets only major point sources (in response to Question 1).

Second, the use of public health outcomes as an integrating metric could be very helpful to the Senate in its policy design deliberations, because it puts the impacts of changes within the economy, changes in fuel affordability among the poor, changes in greenhouse gas emissions, and changes in correlated pollutant emissions (especially primary and secondary particulates, but also mercury) on an equal footing. That is, our research includes and integrates pathways from economic output to health, from energy-based changes in household disposable income to health, from greenhouse gas emissions to health, and from emissions of other pollutants to health.

Question 2a asks "What criteria should be used to determine how R&D funds are spent and which projects are chosen?" We suggest that public health outcomes provide one powerful and integrative criterion to consider, including as it does both economic and environmental pathways.

Question 2c asks "What portion of the overall allocation pool should be reserved to assist consumers", and how such funds should be distributed among our nation's households. We suggest that public health outcomes provide one powerful, fair, and comprehensive basis for evaluating the impacts of such design decisions on the people and welfare of our nation.

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[1] See, for example, Nishioka Y, Levy JI, Norris GA. Integrating Air Pollution, Climate Change, and Economics in a Risk-Based Life Cycle Analysis: A Case Study of Residential Insulation. *J of Human and Ecological Risk Assessment, Special Edition, "Human and Ecological Risk Assessment and Life Cycle Assessment: Intersections, Collisions and Future Directions"* 2006 12(3).

[2] "Design Elements of a Mandatory Market-Based Greenhouse Gas Regulatory System", Sen. Pete Domenici and Sen. Bingaman, February 2006.

Additional Topics
Submitter's Name/Affiliation: David Doniger, Natural Resources Defense Council

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

While recognizing the value of the White Paper in advancing consideration of global warming legislation, NRDC believes it is critical to look at all relevant aspects of the legislative proposal under development.

The landmark June 2005 Sense of the Senate resolution called for legislation to set mandatory market-based limits to slow, stop, and reverse the growth of global warming pollution. The actual bill under consideration, however, is significantly less ambitious than the Senate resolution. The bill proposes to follow the NCEP's recommendation to take a small first step with emissions limits that address only an initial 15-year period, leaving further reductions until a second political decision a decade from now. Taking into account the impact of the bill's $7/ton "safety valve," the bill will only slow emissions growth, not reverse or even stop it.

The bill is based on the judgment that the political system cannot absorb more than a small first step, and that there is still time to take a second political decision on emission reductions a decade from now. That latter half of that judgment may have been correct if we had taken the first mandatory steps five or 10 years ago. But if the goal is to stop short of truly dangerous CO_2 concentrations (staying below 450 ppm), there isn't sufficient time for this "two-step" strategy.

The question is whether there is a more ambitious, but still centrist and bipartisan approach to successful climate legislation – a package with the potential for more effective climate protection while still meeting the needs of business constituencies.

The "slow start/crash finish" dilemma

Most serious climate scientists now warn that there is a very short window of time for beginning serious emission reductions if we are to avoid truly dangerous greenhouse gas concentrations without severe economic impact. Delay makes the job harder. The National Academy of Sciences recently stated: "Failure to implement significant reductions in net greenhouse gases will make the job much harder in the future – both in terms of stabilizing their atmospheric abundances and in terms of experiencing more significant impacts."[1]

In short, a slow start means a crash finish – the longer emissions growth continues, the steeper and more disruptive the cuts required later.

If we start soon, we can stay on the 450 ppm path with an annual emission reduction rate that gradually ramps up to about 2.8% per year. But if we delay a serious start by 10 years and

[1] National Academy of Sciences, *Understanding and Responding to Climate Change: Highlights of National Academies Reports*, p.16 (October 2005), http://dels.nas.edu/dels/rpt_briefs/climate-change-final.pdf (emphasis added).

continue emission growth at or near the business-as-usual trajectory, the annual emission reduction rate required to stay on the 450 ppm path jumps two-fold, to 5.7% per year. (See Figure 1.)

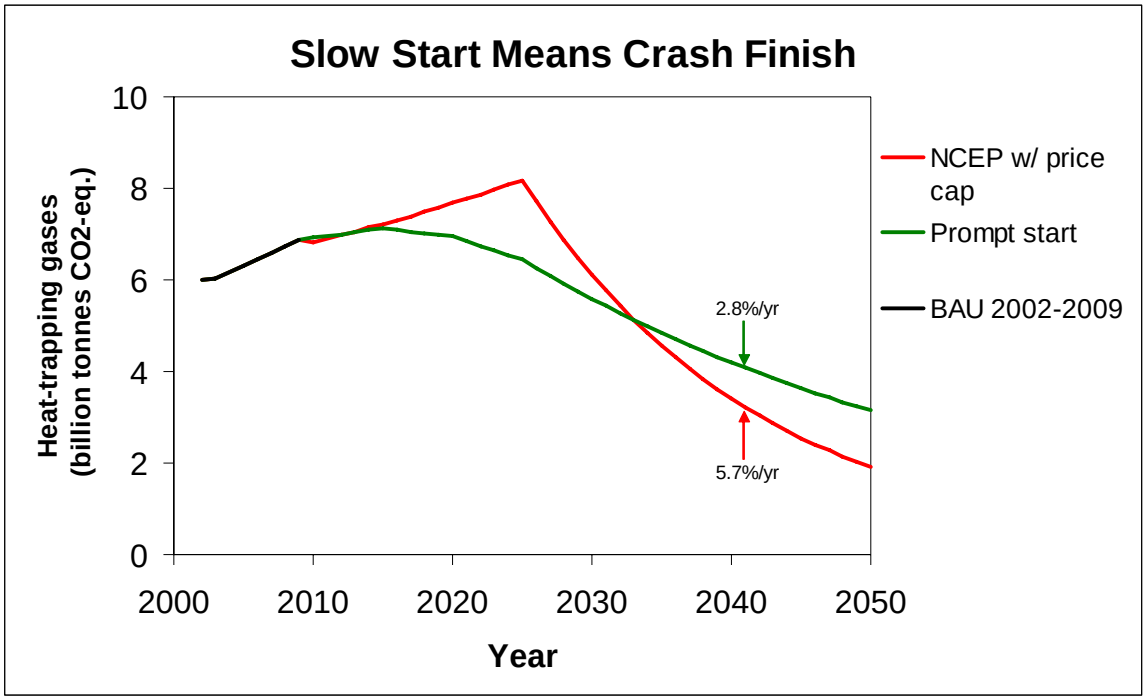

Figure 1. Total cumulative emissions (2002-2050) for both scenarios are 75 billion tonnes carbon-equivalent (GtC). This budget is an indicative U.S. share (20%) of the global emissions budget required for stabilizing the concentration of CO_2 in the atmosphere at 450 ppm. The "Prompt start" (green) curve follows the emission reduction schedule proposed above. With reductions starting in 2016, emissions need to decline by 2.8%/year from 2026-2050 to result in total cumulative emissions of 75 GtC over the period. The "NCEP w/ price cap" (red) curve follows the emissions path projected by EIA through 2025 for the cap and trade policy proposed by NCEP (including the proposed "safety valve" price cap starting at $7/ton$CO_2$). To meet the same 75 GtC emissions budget, emissions must decline much more rapidly, by 5.7%/yr, from 2026-2050.

In the past, some analysts have argued that the delay/crash action scenario is actually the cheaper course, because by then (somehow) we will have developed breakthrough technologies. But it should be apparent that the crash reductions scenario is implausible for two reasons. First, reducing emissions by 5.7% per year would require deploying advanced low-emission technologies at least several times faster than *conventional* technologies have been deployed over recent decades. Second, the effort would require prematurely retiring billions of dollars in capital stock – high-emitting power plants, vehicles, etc. – that will built or bought during the next 10-20 years under short-term and lenient targets.

It also goes without saying that U.S. leadership is critical. Staying on the 450 ppm path requires other developed countries to reduce emissions at similar rates, and requires the key developing countries to dramatically reduce and ultimately reverse their emissions growth. Other countries are unlikely to act on the necessary scale if the U.S. does not lead.

Is there a more ambitious, yet still centrist, approach?

Under the current proposal, we would take only a small first step to slow emissions growth, but put off decisions on reversing emissions growth to a future political decision a decade down the road.

This approach has shortcomings from both environmental and business perspectives. As noted above, from the climate protection standpoint, it risks locking us into dangerous CO_2 concentrations or requiring reductions to be made later on a disruptive crash basis – or both.

From the business standpoint, a small first step does not provide certainty or stability. If the long-term emission reduction pathway is known, companies can determine the optimal pace of technology investments. But if the target is identified no farther out than 10-15 years, and what follows is only a big question mark, markets cannot function efficiently. In addition, if global warming remains an unresolved political issue, businesses will have to continue managing a constant stream of new legislative proposals and other forms of political pressure. Finally, businesses will still run the risk of crash reductions being imposed later.

Thus, a small first step, even though mandatory, may leave both the climate and economic systems as much in limbo as the status quo. Without taking away from the political value of the Bingaman-Domenici initiative, it is important to ask whether there is a way to build a bill that is both sufficient to meet the climate challenge and still centrist enough to pass. We think the answer is "yes."

Toward that end, we want to propose three strategic changes to the bills:

- Adding long-term, declining emission limits,
- Adopting borrowing as a new cost-control device, and
- Refocusing the safety valve price as a trigger for presidential/congressional review.

These three proposals would complement the allowance allocation discussion already launched by this White Paper, namely whether there are strategic uses of valuable allowance allocations to advance needed technologies, protect consumers, and meet the needs of key constituencies. Together, these four elements can be the key to developing centrist, bipartisan support for truly effective climate protection legislation that also protects the economy.

The case for the three proposed strategic changes is explained below.

1) ***Long-term declining emission cap.*** An effective bill needs to address the long-term need to slow, stop, and reverse emissions growth by including a progressively declining cap. The cap would hold cumulative U.S. emissions to a fair share of a world-wide emissions budget that keeps CO_2 concentrations from rising above 450 ppm. This requires cutting U.S. emissions to roughly half current levels by 2050, as in Figure 1.

Additional Topics
Submitter's Name/Affiliation: David Doniger, Natural Resources Defense Council

Consistent with Figure 1, NRDC recommends setting a declining cap as follows:

- Freeze emissions in 2010, and hold them steady through 2015.
- 0.5%/yr reduction for 2016-2020
- 1.5%/yr reduction for 2021-2025
- 2.8%/yr from 2026 onward

Though set in law at the outset, the declining cap would be subject to periodic presidential or congressional review and adjustment, based on science, economics, and the state of international cooperation.

This longer-term approach would accomplish three goals: Putting the U.S. on a path to meet our real climate protection needs, providing longer-term business certainty, and opening the door to a new and innovative cost-control proposal.

2) ***A new approach to controlling costs.*** While the cap-and-trade model has worked well for acid rain control, many observers believe a cap-and-trade program for global warming needs some safeguard against unanticipated costs. That has led to the NCEP-Bingaman proposal for a $7/ton "safety valve."

The fundamental problem with the safety valve – and with offsets in other legislative proposals – is that both options break the cap without ever making up for the excess emissions. Simply put, the cap doesn't decline or, worse, keeps growing. A better approach to cost-control is possible.

Adopting long-term emission limits opens the door to a new cost-control proposal – allowing firms to *borrow* future emissions allowances, repaying them later with interest. This would supplement the more familiar option of *banking* (making reductions in advance) that is already built into current proposal. Together, banking and borrowing can stabilize long-term costs and eliminate the risk of price spikes while preserving the environmental integrity of the long-term caps. The ability to control costs while maintaining the long-term emissions caps is a clear advantage over either the safety valve or offsets, which allow permanent emissions increases.

3) ***Repurposing the "safety valve."*** With borrowing as the primary cost-control mechanism, the safety valve should be refocused for a different purpose – as a trigger for presidential/ congressional review. Thus, in addition to regular reviews at prescribed intervals (e.g., every five or 10 years), an earlier review would be triggered if (even after borrowing) the cost-per-ton still rose above a specified price for a sustained period. Based on the current science, economics, and state of international cooperation, Congress would then decide whether or not to modify the cap and schedule.

We would like to explore whether these three ideas, together with strategic use of emissions allowance allocations, have the potential for bridging the gap between environmental and business interests and for building centrist, bi-partisan support for more effective climate legislation.

Additional Topics
Submitter's Name/Affiliation: Orion Energy Systems, LTD

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Exhibit A

"Orion Virtual Power Plant"

Displaced Capacity Energy Model™

Electric Generation Comparison

Traditional vs. Orion

Wisconsin

500 MW Coal Plant

Prepared by Orion Energy Services

January 8th, 2003

Additional Topics
Submitter's Name/Affiliation: Orion Energy Systems, LTD

Orion Displaced Capacity Energy Model™

Executive Summary

A critical component of the current energy policy debate has focused on developing enough system capacity to efficiently, safely, and reliably meet the escalating demand for electricity witnessed in recent years. The traditional method for capacity expansion has been the construction of new generation plants and transmission systems; however, in recent years a growing resistance to this method has developed among property owners and environmental groups alike. In addition, the financial constraints of power plant construction have encouraged many public utilities and other energy providing firms to seek out creative capacity expansion methods. Orion Lighting and Energy Services has developed such a solution through the Orion Displaced Capacity Energy Model™ (ODCEM™) system. The ODCEM™ is designed to provide immediate capacity relief to electricity providers through the application of its technology. The core of the ODCEM™ system is Orion's patented and award-winning fixture, the Illuminator series, which replaces traditional industrial/commercial light fixtures on a one for one basis. The typical impact is a 50% reduction in base load energy use and a greater quantity of higher quality light. Moreover, with additional controls the Orion technology can provide an additional 25-50% in peak load capacity relief.

The installation of 4200 Orion fixtures, replacing traditional technology, can provide 1 megawatt of base load capacity relief to the electrical system. Orion installs utility-grade-metering systems in order to document and verify the capacity relief provided by the ODCEM™ system. The ODCEM™ allows Orion to sell blocks of displaced generation to energy providers and public utilities in any increments of megawatt capacity required. The utility or energy provider realizes capacity gains at a much faster rate with the ODCEM™ system than with the traditional methods of capacity expansion. The capacity gains are realized immediately upon installation of the Orion system, instead of four-five years in the future as with the construction of a traditional generation facility.

Orion has already implemented and proved the concept underlying the ODCEM™ system in the larger commercial and industrial projects they have undertaken. In addition to the increase in capacity gains associated with the ODCEM™, the system also generates a number of valuable ancillary effects, which benefit the greater community as a whole. For example, the ODCEM™ provides capacity relief without building increased generation; thus it provides a substantial degree of environmental pollutant relief.

Furthermore, it has been documented that compact fluorescent lighting systems, like the Illuminator series, increase worker productivity, reduce employee sick time and increase product quality, all of which will benefit firms, which install the ODCEM™ system in their facilities. The ODCEM™ system does not sell lights or conservation, rather it sells aggregated, displaced capacity to energy providers and public utilities. As mentioned above, the key issue facing utilities and energy providers is a shortage of generation capacity. Clearly, the ODCEM™ system can be a major component of the capacity relief plans, and the ODCEM™ can be implemented at a lower cost than traditional generation.

Additional Topics
Submitter's Name/Affiliation: Orion Energy Systems, LTD

Orion Displaced Capacity Energy Model™ - Electric Generation Comparison

The projected market for commercial and industrial applications of the ODCEM™ in the state of Wisconsin is approximately **500 Megawatts (MW)** of displaced electric capacity.

Summary: Traditional Generation vs. Orion Displaced Capacity Energy Model™ (ODCEM™)

Issue	Traditional	ODCEM™
Method	Construct Coal-Fired Power Plant	Install ODCEM™
Capacity Gained	500 Megawatts	500 Megawatts
Capital Expenditure	$675 Million (minimum)	$500 Million
Operation and Maintenance +Fuel Costs[i] (Annually)	$74.5 Million per Year Composed of: O&M Costs: $31.4 Million/Year Fuel Costs: $43.1 Million/Year	None
Distribution Losses (Annually)	Minimum: 3% of O&M + Fuel Costs; Minimum $2.2 Million/Year	None
Transmission Losses (Annually)	Minimum: 3% of O&M + Fuel Costs; Minimum $2.2 Million/Year	None
Transmission System Investment[ii]	$189.41/MW/Mile, assuming an average investment of 257 Miles of system investment Investment: $24.3 Million	Not Required
Reserve Margin Cost[iii] (90 MW)	121.5 Million	90 Million
Load Curtailment Opportunities	No Load Curtailment Opportunities	Additional 125-250 MW of Load relief
Amperage Savings[iv]		Based on project experience, an amperage savings of $200.57 per displaced kW, Savings: $100.3 Million
Lead Time	4-7 Years (minimum)	Immediate
Rate of Return	+12% Rate of Return for Utilities	+12% Rate of Return for Utilities
Additional User Benefits	None	Increased Quality Control, Better Product Presentation, Reduced Sick/Injury Time, Increased Productivity and Increased Profitability

Additional Topics
Submitter's Name/Affiliation: Orion Energy Systems, LTD

Power Plant Availability	Planned Outages Necessary	100% Availability
State Trade Imbalance Effect	None	Positive, reduction in state trade deficit due to generating fuel costs $43.1 Million per year)
Investment Savings	None	$131.5 Million[v]
Avoided Energy Costs:	None	Ten Year Impact: $988.3 Million[vi]
Projected Flow Through/Multiplier Effects	None	Ten Year Impact: $2.24-$2.76 Billion[vii]

Additional Topics
Submitter's Name/Affiliation: Orion Energy Systems, LTD

Summary: Environmental Impacts of 500 MW of Capacity Relief over Ten Years

Issue	Ten Year Impact[viii]
Carbon Dioxide (CO2) Emissions Reduction	29,988,000 tons
Sulfur Dioxide (SO2) Emissions Reduction	110,185 tons
Nitrogen Oxides (NOX) Emissions Reduction	255,635 tons
Mercury Emissions Reduction[ix]	2.3 tons
Coal Consumption Reduction[x]	23,120,000 tons (Savings of $431,419,200 over ten years)[xi]
Emission Reduction Equivalencies[xii]	Emission Reductions are equivalent to: 1) Planting 7,336,500 acres of trees 2) Removing 56,631,500 automobiles from the road 3) Reducing Gasoline Consumption by 3,634,909,090 gallons 4) Reducing Crude Oil consumption by 86,545,455 barrels
Health Benefits: American Lung Association has shown that for every ton of NOX and SO2 emitted: 0.0015 Premature Deaths Occurred 0.0008 Cases of Chronic Bronchitis Were Found 0.0007 Hospital Visits Occurred 0.2143 Work Days Were Lost	Ten Year Impact: Reducing NOX and SO2 by 365,820 tons will have the following impacts: Reduce Premature Deaths by 548.7 (54.87/yr) Reduce Cases of Chronic Bronchitis by 292.7 (29.27/yr) Reduce Hospital Visits by 256.1 (25.61/yr) Reduce Lost Work Days by 78,395 (7,839.5/yr)

Additional Topics
Submitter's Name/Affiliation: Orion Energy Systems, LTD

Flow-through/Multiplier Effects (Wisconsin Market):

To fully address the impacts of the installation of the Orion Displaced Capacity Energy Model (ODCEM™) on the economic development of a region, one must investigate the multiplier effects associated with the installation of the ODCEM™ and the construction of a traditional generating facility. The multiplier effect refers the additional income generated by an increase in planned investment/spending (Gordon, pp. 67-68; Branson, p. 45). In other words, a multiplier of 2 would imply that every $1 increase in planned investment would eventually generate $2 in income for the region's economy. The additional income is generated by the additional jobs and demand generated by the increased investment, which translates into greater disposable income for the region (Fountain, pp. 3-4). The multiplier effect of an increased spending has three components:

1) Direct Effects: The increase in regional income associated with the workers and materials required to construct a traditional power plant or the installation of the ODCEM™;
2) Indirect Effects: The increase in regional income associated with the workers and materials required to supply the raw materials/components required for the construction of a traditional power plant or the installation of the ODCEM™ to the end-use firms; and
3) Induced Effects: The increase in regional income associated with the increase in demand for goods and services from regional firms associated with the increased disposable income in the region (Fountain, pp. 3-4).

When investigating the multiplier effects of investing in a traditional power plant or the ODCEM ™, one must look at two separate multipliers, the general goods and services multiplier to be used to assess the impact of traditional plant construction and the installation of the Orion Virtual Power. To assess the impact of investment in traditional plant construction, the general economic multiplier of 2.06, as defined by the United States Department of Energy, is employed. To assess the impact of the installation of the ODCEM ™, on the other hand, the Department of Energy's energy efficiency investment multiplier of 2.32 per $1 invested is employed. The energy efficiency multiplier is higher because spending on energy efficiency initiatives (like the ODCEM ™) has a greater impact on the regional economy than traditional plant construction (see Department of Energy, ww.eren.doe.gov/cities_counties/enrgyeff.html, pp. 2-3). In other words, a dollar invested in traditional generating capacity will generate $2.06 in income for the local economy, while an investment of $1 in the ODCEM ™ will generate $2.32 of income for the local economy.

The following chart details the impact of the installation of a 500 MW Orion Displaced Capacity Energy Model™ versus the construction of 500 MW of traditional generating capacity over ten years.

Additional Topics
Submitter's Name/Affiliation: Orion Energy Systems, LTD

Tradition Coal-Fired Generation vs. ODCEM™ for 500 MW of capacity

Capital Cost:

$675 Million (traditional) vs. $500 Million (ODCEM™)

ODCEM™ Cost Savings:

Capital Investment: $175 Million
O&M +Fuel Costs: $74.5 Million per Year (Ten Year Impact: $745 Million)
Distribution Costs: $2.2 Million per Year (Ten Year Impact: $22 Million)
Transmission Costs: $2.2 Million per Year (Ten Year Impact: $22 Million)
Transmission System Investment: $24.3 Million

Avoided Energy Costs associated with the Installation of the ODCEM™:

Capital Investment + O&M Costs + Fuel Costs + Transmission Costs + Distribution Costs + Transmission System Investment = $988.3 Million

Investment Savings:

Amperage Savings: $100.3 Million
Reserve Margin Cost: $31.5 Million

Total Investment Savings:

Amperage Savings + Lead Time Costs = $131.8 Million

Multiplier Impact:

Traditional Generation: *$1,403.6 Million*
Generation: $1,390.5 Million
Transmission: $50.1 Million

Total ODCEM™[xiii]: *$1,635.5 Million*
ODCEM™ Impact: $1,160 Million

Capital Differential: ***$360.5 Million***
Reserve Margin Savings: $64.9 Million
Transmission System Investment: $50.1 Million

Final Multiplier Impact:

Total ODCEM™ – Total Generation = $195 Million

Analysis: **Therefore, the $675 Million spent on the capacity initiative generates $195 Million more for the local economy if invested in the installation of 500 MW of the ODCEM™ than the construction of a 500 MW facility.**

Flow Through Effects:

Additional Topics
Submitter's Name/Affiliation: Orion Energy Systems, LTD

The additional flow-through effects for the regional economy can be detailed as follows:

Multiplier Impact:	$195 Million
Capital Differential:	$175 Million
O&M + Fuel Cost Multiplier[xiv]:	$1.534 Billion
Transmission + Distribution Cost Multiplier:	$90.64 Million
Investment Savings:	$271.5 Million

Total Impact: ***$2.266 Billion***

Additional Information:

This implies that the installation of a 500 MW ODCEM™ system will provide an additional $2.266 Billion increase to income of the region where it is installed due to capital cost savings, investment savings multipliers, O&M Cost Savings, Fuel Cost Savings and Distribution Cost Savings.

In addition, it should be noted these flow-through effects capture the savings each customer received through the installation of the ODCEM™ technology in their facilities. The reduction in energy consumption delivered by the ODCEM™ technologies is captured in the O&M + Fuel Cost Savings. To see this, consider the following. For a one-customer market, the energy savings associated with the installation of the ODCEM™ would amount to the required reduction in energy generation for the utility. Therefore monetary benefits of the energy savings to the customer are captured in the O&M and Fuel Cost saving to the utility, and to include their value in the preceding economic analysis would double count their impact, and unduly inflate the savings estimates.

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[i] Based on 8,000 hours of operation per year. Source: "Costs of Producing Electricity from New Plant, 2004 and 2020." Table 9, pg. 75; Energy Information Administration, *Annual Energy Outlook 2002*, Washington, DC: United States Department of Energy, December 2001, pg. 75.

[ii] Based on average distance and MW delivered of proposed Wisconsin transmission projects; information is available from the Wisconsin Public Service Commission.

[iii] When power plants are built, 18% of the capacity they provide is intended to provide a reserve margin (i.e. capacity in excess of maximum peak demand), therefore the cost to provide this margin is the cost of construction ($1.35 Million/MW) times the amount of Megawatts in reserve (90 MW), or in this case - $121.5 Million. Since the ODCEM™ removes load from the system, it does not require the construction of additional reserve capacity and therefore the reserve margin cost for the ODCEM™ is zero.

[iv] Based on Project Experience.

[v] Investment savings represent the initial costs avoided by investing in the ODCEM™ to both the customer and the community. These savings include the amperage savings ($100.3 Million) and the cost of providing an 18% reserve margin ($131.5 Million).

[vi] The ten-year impact of the flow through impacts is calculated by taking the sum of the capital expenditure differential ($175 Million in the first year) plus ten years of savings from O&M Costs, Fuel Costs and Distribution losses. The capital expenditures differential is the difference between the cost of building a traditional power plant and installing the Orion Displaced Capacity Energy Model. Flow through effects are the sum of the O&M + Fuel Costs per year ($74.5 Million), the minimum Distribution Losses associated with the Traditional Power Plant per year ($2.2 Million), the transmission system investment savings ($24.3 million) and the cost savings to provide an

18% reserve margin ($31.5 Million). It does not include the additional cost of the installation of any new transmission lines necessary. The savings generated by the flow through effects are available to be distributed and reinvested in the local state economy.

[vii] Sheet Attached.

[viii] Based on 8,000 Hours of operation per year.

[ix] According to the Energy Information Administration, 0.2 pounds of Mercury Emissions are produced for every 1,000 tons of coal consumed in the generation of electricity.

[x] According to Wisconsin Department of Administration, Energy Division, in Wisconsin Energy Statistics 2000, in 1999 23,450,000 tons of coal to generate 40,558,000 MWh of electricity. Therefore, it takes 0.578 tons of coal to generate a MWh of electricity.

[xi] Coal Consumption based on 1999 levels being extended over ten years, this is a reasonable project considering that the plans put forth by Wisconsin Investor Owned Utilities included a portion of their capacity based on coal generation. The cost of coal is also the 1999 level, as cited in Wisconsin Energy Statistics – 2000, of $18.66 per ton.

[xii] The equivalency calculations are generated using a program available through the United States Environmental Protection Agency and they are calculated based on the kWh reduction associated with energy efficiency initiatives.

[xiii] The multiplier effect includes the $500 million spent on the initiative times the 2.32 energy efficiency multiplier and since the ODCEM™ requires $175 Million less in capital investment, these funds are freed up to be re-invested in the economy and will have the general economy multiplier effect of 2.06.

[xiv] Since the ODCEM™ does not require spending on O&M + Fuel Costs ($74.5 Million per Year), these savings can be reinvested into the economy and generate income with the general multiplier. The same is true for the distribution cost savings.

Additional Topics
Submitter's Name/Affiliation: Eileen Claussen/Pew Center on Global Climate Change

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

The Pew Center respectfully wishes to submit material on two additional topics: cost containment and recent climate science.

Additional Topic #1 – Cost containment: a function of the whole package

The Pew Center and most of the over 30 large corporations surveyed by the Center believe that, rather than focusing on any one design element in isolation, any bill must be evaluated as a whole, especially in minimizing the costs to covered entities and the economy. The issue is raised by a design question not specifically mentioned in the White Paper: the concept of a "safety valve." Under a safety valve provision, exemplified by the recommendation of the National Commission on Energy Policy (NCEP), covered entities would be allowed to pay the implementing agency a specified amount per ton of GHG instead of submitting emissions allowances, thus capping the cost per ton at the specified "safety valve" level. In fact, a safety valve is only one tool for providing cost containment. Moreover, it is one that could limit environmental effectiveness of the program and present complications for linking to other trading programs (as discussed in response to Question 3). A GHG cap-and-trade program can be designed to minimize costs using a variety of other approaches:

- selection of moderate targets and timetable;
- advanced notice of policy;
- banking of allowances and offsets;
- borrowing of allowances;
- staggering compliance deadlines;
- extending compliance deadlines;
- providing consumer dividends (payments made to energy consumers to compensate them for any increased energy costs);
- providing relief for individual emitters;
- inclusion of offsets;
- linkage with other trading systems; and
- complementary policies that drive energy efficiency and technological innovation

Additionally, low price caps act as a tax. Taxes have been shown to be fairly ineffective in the short term at eliciting significant results. (See attached chart on cost containment mechanisms.)

The companies surveyed by the Pew Center hold a wide range of opinions about the policy benefits of a safety valve, though most say that a safety valve may be politically necessary. Of companies that favor a safety valve, or at least think it might be politically necessary, several note that \$7/ton of CO_2 (the initial level recommended by NCEP) is too low to

achieve significant emissions reductions or to drive market-based transition to a wide range of low-carbon technologies. If a safety valve is used, it should be set high enough to encourage meaningful change. For instance, integrated gasification combined cycle (IGCC) coal or supercritical pulverized coal electric power generation combined with carbon capture and sequestration (CCS) may only become economically viable on a self-sustaining basis (without continued government subsidy) with CO_2 values at or above $25-35 per ton. This does not necessarily mean the safety valve should be set immediately at $25-$35 per ton. Rather, the starting point and growth curve of the safety valve must be such that the net present value of paying it will be more than what companies project will be that of investment in IGCC-CCS.

One company notes that mere inclusion of some reasonable cost limit may be more important for getting legislation enacted than the limit's specific level. The presence of a safety valve, even at a high dollar level, could undercut assertions that GHG regulation will bring about the "end of the economy," since it would remove from consideration the modeling results that posit extreme cases of unlimited cost. Another company notes that, when GHG regulation is viewed as inevitable and may affect upstream energy producers, financial structuring for large new oil and gas production projects may not be possible without a price cap, since otherwise these projects would involve a large unknown liability that constrains equity value and cash flows.

A few companies oppose a safety valve altogether because of its distortionary effect on the market, or only favor a safety valve with a sunset clause. Companies express concern that a safety valve would complicate linkage between the U.S. carbon trading market and the cap-and-trade programs of other countries, which likely would increase the cost of U.S. reductions and reduce the economic efficiency of the system. Some companies point out that the market, left to develop without interference, will develop a range of financial products and services that provide cost certainty to firms but are less distortionary than safety valves. Under a mature carbon emissions trading market with adequate certainty about cap levels beyond the short term, financial services firms will offer hedging products such as forward call options that allow companies to lock in a maximum cost.

Additional Topics
Submitter's Name/Affiliation: Eileen Claussen/Pew Center on Global Climate Change

Additional Topic #2 – Recent Climate Science

The Pew Center commends the Senate Energy Committee for addressing the climate change issue and urges a continued high level of effort – especially in light of recent developments in climate science. In the past 3 years, and especially in 2005-06, the science attributing global warming to human enhancement of the greenhouse effect has become very compelling. At the same time, globally distributed impacts of climate change have occurred in patterns that are readily explained by global warming, and not by natural variations in regional climate. Many changes that have been predicted by models are now occuring.

1. Attribution of global warming to the enhanced greenhouse effect. Scientists have tested alternate hypotheses of natural versus anthropogenic forcings to explain observed climate change. Two recent studies illustrate the state of the science in this endeavor, but represent a small fraction of the studies that have produced similar conclusions.

   a. *Physical simulation of 20th century surface warming*: A study (Meehl et al. 2004. Journal of Climate 17:3721-3727) by scientists at the National Center for Atmospheric Research (NCAR) examined a variety of natural (solar, volcanoes) and anthropogenic (GHG, ozone, sulfate aerosols) forcings on global surface temperature, comparing model output with observed changes during the 20th century. The study found that all of these factors act additively and all must be included as forcings in the model in order to closely mimic the observed temperature change. During the last half of the 20th century, the largest forcing explaining warmer global temperatures was anthropogenic GHG. These and many other results directly contradict claims that models fail to mimic observed changes.

   b. *Physical simulation of heat penetration into the oceans.* Scientists at Scripps Institution of Oceanography, Lawrence Livermore National Lab, the UK's Hadley Center, and NCAR produced a study (Barnett et al. Science 309:284-287) showing that the global ocean basins are warming simultaneously as a result of global greenhouse warming. Whereas natural variations occur at different times, and often in direct opposite patterns, in different ocean basins, there has been a simultaneous warming of all the major ocean basins over the past 40 years. Moreover, the pattern of penetration of warming at different ocean depths varies from basin to basin. Modeling of natural internal variability alone did not reproduce these complex patterns, whereas combining internal variability with GHG forcing did. Hence, using a very different approach from the study above, scientists once again find that observed patterns of climate change can only be mimicked when anthropogenic GHGs are included as a climate forcing.

   c. *Physical simulation of the increasing height of the tropopause*. The tropopause is a region of the atmosphere that separates the lower atmosphere (troposphere) from the upper atmosphere (stratosphere). Its height is determined by physical conditions in the troposphere and stratosphere, among them being the temperature of the troposphere below and the stratosphere above. As these conditions change, the height of the tropopause changes in response. Forcings that either warm the troposphere or cool the

stratosphere tend to increase the tropopause height, whereas those that cool the troposphere or warm the stratosphere decrease troposphere height. Changes in solar radiation and volcanic particles are natural forcings and changes in stratospheric ozone and tropospheric greenhouse gas concentrations are anthropogenic forcings.

Scientists from the US, UK, and Germany teamed up to test whether they could simulate observed changes in the height of the tropopause based on changes in the natural and/or anthropogenic forcings and their physical understanding of atmospheric dynamics (Santer et al. 2003. Science 301:479-483; Santer et al. 2004. Journal of Geophysical Research 109:D21104). Observations revealed a 620-foot increase in tropopause height between 1979 and 2001. The scientists obtained a similar increase in the simulated tropopause height when their model was forced by anthropogenic GHG and stratospheric ozone depletion (from man-made chemicals). About 40% of the effect was from GHG and 60% from ozone depletion. Including natural variability of solar input and volcanic emissions in the model had little effect on this outcome, suggesting that enhanced greenhouse warming and stratospheric ozone depletion were the main causes of global tropospheric height increase (Santer et al. 2003. Science 301:479-483; Santer et al. 2004. Journal of Geophysical Research 109:D21104). Because of the Montreal Protocol, ozone depleting substances will decline in the future. GHGs, however, are expected to increase. Hence, the model predicted that tropopause elevation will continue to rise in the future mainly because of anthropogenic GHG.

2. Linking major climate change impacts with global warming. In recent years, several important impacts have been observed that are readily explained by human-induced global warming. In some cases, global warming plus regional variability combine to produce impacts, but natural variability alone cannot explain the observations.

   a. Global ice cover – In recent years, glaciologists and oceanographers have been surprised by the unprecedented rates of change in global ice cover, both for Arctic sea ice and land-based glaciers and ice sheets.

   Greenland: The second largest land-based ice sheet, with enough water to raise the global sea level by 6 meters if melted, covers the Greenland continent. Fifteen years ago, glaciologists believed that the Greenland ice sheet was in balance (i.e., not losing or gaining ice). Over the past decade, glaciologists documented rapid melting around the coasts of Greenland and adjusted their estimates to reflect a net loss of ice due to melting. In February 2006, new satellite-based measurements of ice flow were published, revealing that Greenland is losing ice even more rapidly than realized as a result of ice flowing into the sea at high rates. This work doubled the estimated rate of ice loss from Greenland and its contribution to the rate of global sea level rise (Rignot et al. 2006. Science 311:986-990).

   Antarctic ice sheet. Western Antarctica is losing ice rapidly. Until recently, East Antarctica was thought be gaining ice, but now is thought to be just in balance, such that future warming could quickly shift it to net ice loss. Overall, Antarctica appears to have

lost about 450 km^3 of ice just in the past three years (Velicogna. 2006. Science Online, March 2). Because these results are from the GRACE satellites launched in 2002, we do not know how long Antarctica has been losing ice. Antarctica holds enough ice to raise sea level by 70 m if melted.

Arctic sea ice: Arctic sea ice is being lost at an unprecedented rate, reaching a record low area during summer 2005. Some scientists estimate that by the end of the 21st century the Arctic Ocean will be completely free of ice during the summer, a condition that probably has not existed for at least a million years (Overpeck et al. 2005. EOS 86:309-312). This loss of ice has important implications for global climate change and for Arctic ecosystems and wildlife (Arctic Climate Impact Assessment. 2005. Cambridge Univ. Press, New York).

Mountain glaciers. For several decades, glaciologists have documented a continuing worldwide loss of mountain glaciers, which continue to dwindle at an accelerating rate (Dyurgerov. 2006. AAAS Symposium, St. Louis; Dyurgerov, 2005. INSAAR Occasional Paper No. 58, Univ. of Colorado). Billions of people around the world depend solely on glaciers for their water supply. In Central Asia, mountain glaciers are retreating rapidly and may be virtually gone within decades, creating a billion environmental refugees (V. Aizen, 2006. AAAS Symposium, St. Louis).

The global trend. There is a clear pattern of globally distributed loss of ice indicative of global greenhouse warming, and not isolated regional losses of ice resulting from natural regional variability, as asserted by some. While some regions of the globe may presently be in a phase of natural warming, in addition to enhanced greenhouse warming, other regions are in natural cooling phases that will also reverse at some point. Hence, the overall loss of ice is a fingerprint of global warming.

b. Hurricanes – In 2005, two independent studies found that hurricanes were becoming more intense worldwide (Emanuel, 2005. Nature 436:686-688; Webster et al. 2005. Science 309:1844-1846). All ocean basins where tropical cyclones develop exhibited this change in recent decades. Immediately, some responded that this upswing resulted from natural variability, rather than from greenhouse warming. However, they overlooked the well-established knowledge that natural cycles do not occur in sync across the various basins. In fact, they tend to vary in opposite phases, for instance, in the North Atlantic and North Pacific basins. The existence of a trend of intensification in all six of the tropical cyclone-producing ocean basins thus represents a fingerprint of global warming, consistent with the enhanced greenhouse effect and not with natural variability alone.

c. Species changes – Two recent studies have documented apparent connections between changes in species and anthropogenic climate change. One study (Root et al. 2005. Proceedings of the National Academy of Sciences 102:7465-7469) found that 130 species, including many different plants and animals, have responded to earlier spring temperatures between 1970 and 2000. The power of this study, however, was that it linked these changes statistically to a climate model, demonstrating that the relationship between the timing of spring biological events (such as timing of flowering or migration)

was well correlated with GHG-driven climate change, but not with natural variability alone. The species were distributed throughout Europe, North America, and Asia, thus representing a large portion of the Northern Hemisphere and not a particular region. Hence, the same type of response occurred regardless of differences in regional climate variability, again suggesting a global driving mechanism. The correlation with anthropogenically driven climate demonstrates that this global response can be explained by enhanced greenhouse warming, but not by natural climate variability alone.

A second study (Pounds et al. 2006. Nature 439:161-167) linked widespread mass amphibian extinctions in the tropics to the timing of climate change events associated with sea-surface and atmospheric temperatures. Warm years, which have increased in frequency over time, are followed closely by extinction events. Also, the majority of recorded extinction events are associated with warm years. While extinction rates correlate with the large-scale warming trend, they do not correlate with local variability associated with regional El Nino events, once again demonstrating that a global trend, rather than regional variability, is the more likely explanation for the impact. The authors explained this relationship as a function of pathogen outbreaks fostered by the observed warming and moistening trend in tropical mountain environments as a result of climate change.

Additional Topics
Submitter's Name/Affiliation: Eileen Claussen/ Pew Center on Global Climate Change

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Please begin your comments here. (no page limit)

Possible Cost Containment Strategies that can be used with Emissions Trading Programs

Table 1. Measures that provide **price certainty** to regulated entities and may or may not provide environmental certainty

Mechanism	Description	Where used	Enviro Certainty	Strengths	Weaknesses
Safety valve (variation 1 – cap not assured)	Places a ceiling price on CO_2 permits. When price hits this level, one of many things may happen, e.g.: • the program administrator (government) sells additional allowances at this specified price • regulated entities pay the amount of the safety valve as a tax or into a fund without acquiring an allowance Additional allowances are **not** made up in later	Bingaman-NCEP (S.Amdt.868) proposal (submit allowance or pay $7 per metric ton of CO_2 initially) UK trading system offers companies the option of paying the UK Climate Levy or taking an emissions target. Amount varies by industry.	No environmental certainty if price cap is low. More likelihood of certainty if cap is high.	a) Generates revenue for the government – though this may be considered a weakness to the extent such revenue generation is considered a tax. b) Potential revenue recycling -- revenue received from safety valve payment could improve the efficiency of the program by reducing less efficient taxes in other parts of the economy (similar to the "double dividend" of auctioned allowances). c) Payment into a fund could be potentially more popular with industry than an undirected tax, especially if dollars directed at efforts that improve sectoral industrial efficiency.	a) Level of reduction is uncertain. Depending on the safety valve level, the cap may be broken and emissions levels may not be significantly affected. b) Difficult to know the level of price that encourages the appropriate level of control. c) Innovation efforts are limited to those that are below the safety valve price. Depending on the level of the safety valve, the incentive for innovation (the reward for innovation) may be significantly reduced. d) If perceived as a tax, may diminish public acceptability of policy. e) With relatively low targets, small danger of high prices and thus no economic justification for cost certainty. f) Could result in taking money from private sector investment and giving it to government, potentially without a link to emissions reductions.

Mechanism	Description	Where used	Enviro Certainty	Strengths	Weaknesses
	periods.				g) Can make linking to other trading systems difficult or impossible. h) If linking permitted, could set international prices because of arbitrage. (This could be limited by allowing only government-to-government trading or only if country price was equal or above international price.)
Safety valve (variation 2 – cap assured, firms responsible)	Same as safety valve 1, but additional tons are made up in later periods by firms (similar to penalty or to borrowing).	McCain-Lieberman (S.1151) allows borrowing and has a penalty for non compliance (see below).	Yes	Same as safety valve 1, plus: d) Private sector retains liability for reductions and incentive for improvement.	Same as safety valve 1, except (a).
Safety valve (variation 3 – cap assured, government responsible)	Same as safety valve 1, but additional tons are made up in later periods by government	The Canadian government implemented a $15 CD/metric ton price guarantee, which will likely be paid into a fund and tons made up by government purchase.	Yes	Same as safety valve 1, except (a), (b).	Same as safety valve 1, except (a) and plus: (i) Government has liability instead of private sector. (j) Cost to government is uncertain, even though cost to firms is certain.
Penalty Cost	The penalty for noncompliance is set such that it can effectively offer an upper bound on the allowance prices. Penalties should provide an incentive to stay within the program and as such should be higher than the expected cost of compliance.	Acid rain, initially $2000/metric ton EU ETS Phase I penalty is 40 euros. Phase II is 100 euros. New South Wales has a $13 penalty for non compliance McCain-Lieberman has a penalty of 3x the market value of	Yes if tons are made up and/or level is high. No if tons are not repaid and level is low.	If set high enough, does not interfere with the market. Sends a signal to comply. Can be set to level the playing field to assure that those who comply are not put at a competitive disadvantage by those who fail to comply U.S. companies typically prefer to avoid the bad press associated with penalties.	If tons are not repaid and the level of the penalty is too low, compared to other options, companies may choose to pay the penalty rather than invest in options that reduce emissions. To the extent that this is set low and becomes a cost containment mechanism rather than an enforcement mechanism, the term "penalty" may be viewed as inaccurately pejorative by some firms.

Additional Topics
Submitter's Name/Affiliation: Eileen Claussen/ Pew Center on Global Climate Change

Mechanism	Description	Where used	Enviro Certainty	Strengths	Weaknesses
	To distinguish from safety valve, often repayment of allowances is required and level is relatively high.	the allowances that are not submitted. Bingaman-NCEP has a penalty of 3x the safety valve price for each allowance not submitted.			

Table 2. Measures that **minimize costs** of compliance and provide **environmental certainty**

Mechanism	Description	Where used	Strengths	Weaknesses
Safety valve (variation 4 – flexibility expansion)	When safety valve price is reached, different compliance strategies are allowed to minimize permit prices. (Increases offsets, extends compliance periods, etc.)	RGGI		Requires that compliance strategies (e.g., offsets, and other flexibility mechanisms) be restricted before the safety valve is reached, which is not preferable. Can significantly increase program complexity and administrative costs
Circuit Breaker	A scheduled decline in the cap is delayed, cancelled (or even reversed) when the trigger price is exceeded.	Proposed by some environmental advocates to minimize the threat of future more stringent targets. Proposed in lieu of a safety valve.	Avoids price spikes that would result from increase target stringency.	Does not provide cost or price certainty. Prices may still rise. Does not provide regulatory (target) certainty to firms. Does not provide environmental certainty beyond the first cap.
Allocation	Allowances given freely to those with targets can be seen as industry compensation for additional control costs.	Acid Rain Program EU ETS	Allocation does not impact the efficient function of the market. May compensate firms for the cost of control and help keep consumer prices low.	Distributional/competitive equity concerns. May give companies "windfall" profits, which may not get passed along to consumers in the form of lower energy prices. Firms see higher profits and consumers see higher prices.
Full banking of allowances and offsets	Firms are able to make reductions at any time and use those efforts toward compliance at any time.	McCain-Lieberman bill Acid Rain Program EU ETS, phase I	Allows a firm to determine when it is most cost effective to make reductions or buy offsets. Intertemporal flexibility reduces overall program cost.	More reductions may occur immediately and if not utilized in the near term could serve to increase the near term price of carbon Alternatively, if targets are seen as stable in the long run, firms may not make excess reductions and a bank of permits might be slow to develop and would thus not be available to prevent price spikes that might occur unexpectedly.

Additional Topics

Submitter's Name/Affiliation: Eileen Claussen/ Pew Center on Global Climate Change

Mechanism	Description	Where used	Strengths	Weaknesses
Offsets	Emission reductions that occur voluntarily outside of a regulated requirement but which can be used in place of regulated requirements. For example, reducing one ton of methane emitted from an unregulated landfill could be seen and counted as an equivalent reduction for a firm that is required to reduce 1 ton of methane at its gas processing facility.	Proposed in McCain-Lieberman, Bingaman-NCEP, and RGGI but limited. EU- ETS, international (CDM and JI) offsets only. Oregon, Washington new electricity rules Canadian Carbon trading system RGGI – regional offsets only New South Wales carbon reduction effort for electricity providers – regional reductions only.	Sends a market signal to the entire economy that carbon has a value. Provides an incentive for action and innovation in a wider variety of industrial sectors than a cap and trade program without offsets. The larger the pool of offsets to choose from, the more competitive the market for those offsets and the lower the cost. Unlimited usage of offsets allows a company to cost effectively manage their control costs. Allows a firm to choose the least cost path towards compliance. Gives firms the ability take advantage of the natural capital turnover rate by paying someone else to reduce. All reductions regardless of sector or location are equivalent in terms of climate change mitigation.	May allow financial capital to flow out of region. Offsets (and ancillary benefits) may not happen within the focus sector(s)/location(s). Monitoring, verification and compliance may be complicated.
Stagger deadline for compliance	Stagger the dates by which entities are scheduled to comply, avoiding a spike in demand for permits at the compliance deadline.	RECLAIM	Smooths out demand for permits and helps to avoid price spikes. The market determines the incentive for innovation.	Potentially more difficult to administer.

Additional Topics

Submitter's Name/Affiliation: Eileen Claussen/ Pew Center on Global Climate Change

Mechanism	Description	Where used	Strengths	Weaknesses
Incentives for improved energy efficiency	Effort is aimed at reducing energy consumption. This can be consumer consumption or industrial consumption. Incentives, in the form of rebates, tax credits, accelerated depreciation etc., are given to promote more energy-efficient technology or better energy management.	Common	Energy efficiency is relatively cost effective. Reducing energy demand is a national goal. Consumers are made better off or "whole".	Behavior change is a long-term effort and required sustained effort. Depending on structure of effort, may distort the market.
Consumer Dividends (can be used to compensate for higher prices)	Payment is made to energy consumers to compensate them for the increased energy costs.	Alberta gas rebates. Alaska gives back a resource dividend to state residents (may be to compensate them for higher resource costs)	Addresses consumer cost issues directly. Consumers are happy. Revenue recycling through lump sum payments to consumers in the form of rebates for energy expenditures should not reduce the efficiency of the program. Consumers would have the same incentive to efficiently use household energy sources because the rebate will not change the marginal cost of these energy sources. The energy expenditure commitment by the states will not distort the market for emissions allowances.	Wealth transfer back to consumers may in turn raise incomes and result in higher levels of energy consumption. Does not send a specific signal for energy conservation. Difficult to know how much to compensate. (How much of rate is due to policy?) Inefficient to manage—may cost more to administer than the resulting benefits.
Hedging with forward contracts	Put and Call options are utilized to "lock in" a commodity price	Common practice in commodity markets	Little government involvement. Full advantage of the market-based approach is observed	Markets must be relatively mature and liquid. Rule certainty is essential before these types of financial tools will be made available.

Additional Topics

Submitter's Name/Affiliation: Eileen Claussen/ Pew Center on Global Climate Change

Mechanism	Description	Where used	Strengths	Weaknesses
Extension of compliance deadline	If price of allowances reach some specified level, the compliance deadline is extended. Such an extension will relieve short-term demand pressure for permits. Near term price of allowances should stabilize or fall. Firms would have more time (and hopefully) more options that would serve to reduce longer term permit prices. In essence this is similar to borrowing.	RGGI	The market for permits continuously determines the appropriate price and level of innovation and does not need additional government assessment. Cap remains intact. The reward for innovation is set and paid for by market forces.	A delay in compliance may not increase options and may only increase the level of reductions that a firm is liable to make in later periods. Complicates regulatory certainty to firms and may delay significant action. May make timely program review more difficult.
Borrowing	Firms or governments are allowed to borrow allowances from future allocations. This could be with or without a cost of borrowing. (The cost could be in terms of dollars or tons.)	McCain-Lieberman includes borrowing at a cost of 10% of tons borrowed per year. Kyoto's 1.3x metric ton penalty in the second period is a form of borrowing.	The market for permits continuously determines the appropriate price and level of innovation and does not need additional government assessment. Since climate change is a long-term problem, the timing of reductions is not a significant issue Cap remains intact. The reward for innovation is set and paid for by market forces. Provides additional time for capital stock turnover that will result in potentially larger future reductions outside of the initial compliance period.	Logistically, difficult to administer and enforce. Requires the setting of future caps to ensure meaningful borrowing and repayment. Firms may be afraid to assume they would get credit for future reductions if they borrow on future allocations. Firms may eventually lobby for "loan forgiveness."

Additional Topics

Submitter's Name/Affiliation: Eileen Claussen/ Pew Center on Global Climate Change

Mechanism	Description	Where used	Strengths	Weaknesses
Relief for individual emitters	Individual emitters or vulnerable sectors could apply for relief if it can show that its mitigation costs/ton are higher than some level. Government would allocate additional allowances to that emitter, and may or may not be required to make up reductions elsewhere.	Not used (possibly considered in EU for some sectors)	May allow relief to firms or sectors potentially hard hit by carbon constraints or high-energy costs. May have political support in key regions and may reduce concerns about capital and jobs moving off-shore.	Impacts regulatory expectations and may distort the level of innovation. For example, some analysts have suggested that the expectation that the California Energy Commission would provide air permit regulatory relief for the CA electricity sector if electricity price rose significantly kept industry from investing in new infrastructure that would have prevented the electricity price spike of the 2001. High administrative costs relative to release of additional allowances into market. Distributional and equity concerns. Does not provide a market signal for economy wide participation If government does not makeup for additional allowances, cap would be broken. Disincentive for emitters to reduce costs. Enormous potential for corruption.

Additional Topic
Submitter's Name/Affiliation: Jeff Sterba, PNM Resources

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

* * *

Safety Valve

PNM urges the Committee to incorporate a safety valve in any mandatory cap-and-trade climate change program for the following reasons:

- In the near-term, absent a safety valve mechanism, if price spikes in the allowance market were to occur, a key consequence could be to encourage substantial switching to natural gas which is an undesirable outcome.

- Many of the issues surrounding allocations within the utility industry bear a keen relationship to reducing costs. Inclusion of a price cap would lower the stakes in the allocation battle and facilitate resolution of the issue.

- By providing a stable and predictable cost environment, a price cap would allow a more stringent program to be implanted over time.

Additional Topics
Submitter's Name/Affiliation: Terry Hudgens, President and CEO PPM Energy

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

The primarily goal of any greenhouse gas regulatory system should be to reduce greenhouse gas emissions in the most efficient way possible. A cap and trade system is usually designed to take advantage of market forces to allow parties to sell and acquire allowances in a manner that will reduce overall emissions. Customers of utilities responsible for regulated emissions usually bear the cost of such regulation. PPM Energy believes that, for the electric generation sector, it would be more cost effective to subject electric utilities to a Federal renewable portfolio standard (RPS) requirement. A RPS would require retail electric utilities to sell electricity generated from renewable resources in amounts that meet a specified target or to acquire renewable energy credits from other utilities or renewable electricity generators that have excess credits to sell.

The Senate in the 107th, 108th and 109th congresses adopted energy legislation containing a Federal RPS program proposed by Senator Bingaman that would have established a renewable energy requirement on most utilities escalating to 10% of their retail sales by 2020. According to Energy Information Administration (EIA) statistics, the greenhouse gas emissions reductions associated with the Bingaman RPS proposal are comparable to the emissions reductions in the electric generation sector expected from the National Commission on Energy Policy proposal (NCEP). However, the Bingaman RPS proposal achieves these reductions in a more economically efficient fashion. The NCEP proposal, by increasing fossil fuel prices, also raises consumer energy prices, including the price of electricity. In contrast, according to EIA statistics, the impact of the Bingaman RPS proposal on electricity prices is more benign because the RPS lowers natural gas prices by reducing the demand for gas in the electric generation sector. Lower natural gas prices also benefit industrial, commercial and residential gas consumers.

PPM believes the Bingaman RPS proposal (10% by 2020) would provide substantial benefits. However, we are not adverse to Congress exploring other portfolio standard proposal. For instance, a greenhouse gas emissions free portfolio standard that provides credits for electricity derived from renewable energy, nuclear power plants and coal gasification facilities that sequester all CO2 emissions, might be worthy of consideration.

Moreover, a RPS (or emissions free portfolio standard) can be designed to coexist with a cap and trade greenhouse gas emissions program applicable to the rest of the economy. For instance, a properly designed approach could permit those holding excess RPS credits to sell credits to those non-utility entities regulated pursuant to the greenhouse gas cap and trade system.

Additional Topics
Submitter's Name/Affiliation: Stuart V. Price, Principal, RSVP Communications

Submittal Due Date: Monday, March 13th at 5:00pm (EST)

Submittal Address: Climate_Conference@energy.senate.gov (Jonathan Black, 202-224-6722)

Conference Date: Tuesday, April 4th

Objective #1: Secure the assistance of a nonpartisan, professional media relations team to reach out to the general news media as well as to industry-specific media to explain the benefits of the new market-based control program. The selected media relations team would assume an objective posture, communicate the facts behind the market-based control program (rather than opinions), and be strongly encouraged to assume the project as pro-bono work.

Climate change may be one of the most significant global issues to face the U.S. Senate. Because this is a global issue that does not affect one political party more than the other, political leaders need to address it as a unified front.

From the general public's perspective, the most visible consequences of climate change include warmer days, more precarious energy supplies, more conscientious energy usage, more severe forest fires, and more extreme weather patterns. Such events may soon overwhelm other national priorities including the war on terrorism, questionable lobbying practices, and domestic surveillance. Implementing the mandatory market-based program will be a key strategy in mitigating greenhouse gas emissions and climate change ramifications.

The success of the market-based program will greatly depend on how it is conveyed to stakeholders both on and off Capitol Hill including industry groups, academia, general public, and international audiences. Communicating these messages will also help inform the public about Senate efforts to address the climate change issue. (Several energy companies – including Cinergy and Public Service Electric and Gas - responsible for major carbon dioxide emissions have expressed a willingness to adhere to mandatory emission guidelines.)

While the Energy and Natural Resources Committee has one of the finest and most effective media relations teams on the Hill, this charge would go far and beyond the normal call of duty and would necessitate an outreach effort dedicated to highlighting the mandatory market-based initiative and the growing issue of climate change.

Objective #2: Direct the media relations team to convey that the new GHG-control initiative is a patriotic endeavor and that green is the new red, white, and blue

Various national media have begun running articles highlighting scientific evidence of climate change, efforts in other nations to implement mandatory carbon emission controls, and the U.S. decision to implement voluntary emission guidelines. The media has not substantially reported on congressional efforts to step up the carbon control initiative – including the mandatory market-based initiative.

The selected media relations team could have the opportunity to explain how senators are striving to make the U.S. a leader in implementing climate change controls. The media relations team could emphasize that, as evidenced by Senate actions, protecting U.S. natural resources as a civic-minded duty. In part, this messaging could involve producing public service announcements for electronic media.

The media relations team could also reach out to appropriate media (e.g., The Weather Channel, public television, Discovery Channel, Animal Planet) to encourage programming that profiles how we must work together to manage and reverse climate change consequences. Such outreach may impart real scientific expertise to improve the scientific accuracy of programs directed toward the mass-market media. After all, a large segment of the general public obtains its information from these entertainment vehicles.

The media relations team could also encourage federal scientists from appropriate agencies (e.g., DOE, NOAA, NASA, Interior, EPA, and USDA) to offer their expertise to media representatives. This two-way communications effort would minimize the release of mistaken ideas and faulty scientific data directed to the general public.

Objective #3: Direct the selected media relations team to reach out to appropriate general news media and specific trade industry contacts to explain how the Senate is answering the four identified questions:

A) Who is regulated and where?
B) 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?
C) 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?
D) 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 National Commission on Energy Policy 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?

The selected media relations team could also step beyond the immediate charge of explaining the mandatory market-based control system by highlighting other climate change issues that the ENR Committee deems significant. This objective could involve delivering climate change information to general news media and distinct details to industry groups.

Additional Topics
Submitter's Name/Affiliation: Stuart V. Price, Principal, RSVP Communications

Communications Objective #4: Moving beyond the immediate market-based program, direct the selected media relations team to deliver information to both the general news media and industry-specific media explaining the Senate is embarking upon a bipartisan strategy to addressing climate change.

A) Information directed to general news media might include explaining how the Senate supports assorted climate change initiatives:
    1) How tackling the climate change issue will promote a new multi-trillion dollar green industry comprising sophisticated fossil fuel energy systems, advanced fossil fuel exploration and production measures, coal gasification systems, advanced nuclear energy designs, renewable energy supplies (including solar, wind, ocean current, and biomass), a hydrogen-based economy, carbon sequestration measures, hurricane-resistant buildings, innovative shoreline features, innovative transportation infrastructure, new fuels, hybrid automobiles, agricultural systems, and forest management
    2) How the U.S. needs to take the lead on the World Stage in controlling GHG emissions and implementing innovative control strategies
    3) How the new mandatory market based control program will serve as a bridge for nations to step beyond the Kyoto Protocol, a document the U.S. Senate has recognized as seriously flawed, and address climate change in an effective manner that will not damage the U.S. economy
    4) How the mandatory program may expand research and development operations in the private sector and at premier national laboratories including Los Alamos National Laboratory, Sandia National Laboratory, and Brookhaven National Laboratory

B) Information directed to industry specific media (e.g., trade industry journals, energy companies, engineering firms, brokerage houses, and commodity traders) might include explaining how the Senate supports the following initiatives:
    1) Intricacies of the market-based strategy
    2) How new market-based control strategies will encourage innovative technologies including coal gasification, CO2 sequestration, and alternative vehicle fuels
    3) How proven CO2 sequestration activities can involve pumping the gas into oil fields to recover additional product (note: Administration support through the Department of Energy, Office of Fossil Energy)
    4) How the new market-based strategy may encourage innovative fossil fuel exploration and production technologies (note: Administration support through the National Energy Technologies Laboratory activities) to harvest:
        A. Offshore fossil energy reserves
        B. Methane hydrates
        C. Tar sands
        D. Heavier or sour crude petroleum containing added sulfur
    5) How the market-based strategies may encourage clean nuclear energy technologies (e.g., Administration support through the Department of Energy for Generation IV reactors)

6) How energy companies are designing new materials to support high performance, energy efficient automotive vehicles
7) How the market-based strategies may encourage using advanced nuclear reactors to produce hydrogen fuel and usher in a hydrogen economy
8) How advanced refining technologies will be needed to process less desirable grades of petroleum
9) How advanced renewable energy technologies will be encouraged (note: Administration support through the National Renewable Energy Laboratory activities)
10) How Green Trading has become a mainstream market-driven solution with Increased focus and attention on commercialization of clean technology, renewable energy and market-driven emissions solutions.
11) How Wall Street employs trading solutions for carbon emissions (along with SOX and NOX)
12) How the European Union presents an international model for carbon emission trades
13) How proven gasification technologies offer means by which operators can take full advantage of U.S. coal reserves
14) How the nation of India has become the first country to join the DOE FutureGen project to build an emissions-free, coal-fired power plant
15) How the Administration's March 2006 agreement with India will promote clean nuclear energy business opportunities in that growing nation

Objective #5: Direct the media relations team to explain how the Senate values firsthand education as regards climate change for its constituents. This might involve encouraging science and technology centers (including members of the Association of Science-Technology Centers to exhibit climate change materials and display information explaining how citizens can do their part to minimize global warming

Finally, the selected media relations team could encourage citizens to further their own education as regards climate change. Rather than depending on media outlets to provide information, the general public could be encouraged to attend science and technology centers to learn about recent climate change findings first-hand.

END

Additional Topics
Submitter's Name/Affiliation: Caroline Choi, Progress Energy Corporation

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

We commend Senator Domenici, Senator Bingaman and the Senate Energy and Natural Resources Committee for soliciting input from our industry and the public on important greenhouse gas (GHG) regulatory design issues raised in the February 2 white paper. There are few clear or easy answers to the four sets of questions posed in the White Paper, but we look forward to working with the Committee in addressing these complex issues.

I. Progress Energy's Position On Global Climate Change

We are strongly committed to the long-term success of our customers, shareholders and employees and to the future of the Southeast region we serve. Progress Energy is a regional energy company focusing on the high-growth Southeast region of the United States. The company has more than 24,000 megawatts of electric generation capacity, supplied by 23 coal-fired steam units, eight oil-fired steam units, as well as gas-fired, nuclear and hydroelectric facilities that serve more than 2.9 million customers. Our company has many important responsibilities to fulfill, including providing reliable and affordable electric service.

We recognize the importance of the global climate change issue as well as its enormous scale and complexity. We are actively learning about the rapidly evolving science of climate change. We have learned that even stabilizing carbon dioxide concentrations in the atmosphere will require a major technological revolution and a very long-term, sustained focus at the international, national and state levels. Even with the considerable scientific uncertainties and the need for much more research, we believe that there is sufficient understanding of the issue and its potential consequences to warrant action.. While there is no single fix to reduce greenhouse gas emissions, we are committed to developing consensus-based strategies with policymakers and stakeholders.

We are taking a number of operational steps to increase efficiencies and avoid or reduce carbon dioxide emissions. For example, Progress Energy has undertaken combustion optimization projects to improve efficiency at our fossil-fueled plants. We have robust energy-efficiency programs in the Carolinas and Florida, and an aggressive demand-side management (DSM) program in Florida. Progress Energy is investing in fuel cell technology and participating in research and pilot projects to test the feasibility of using hydrogen as a fuel source. We also have announced our intent to pursue new nuclear generation. Earlier this year, we announced the site for a Carolinas plant and we plan to announce a site in Florida later this year.

We continue to evaluate future options that we think are realistic in our service territory. Addressing a significant global environmental issue such as climate change requires balanced solutions. These include expanding conservation and efficiency programs, developing and deploying new energy technologies, using cost-effective renewable resources and building

advanced, more efficient power plants. As conversations and ideas on how to address global climate change continue to unfold, we will assess and act on the best mix of options to address the issue. Based on the state of cost-effective technology available today, we strongly support a voluntary, technology-centered, carbon intensity-based approach to the global climate change issue.

Below, we have articulated principles that we believe should be incorporated into any global climate change policy. While the Company participates in developing a national climate change policy, we will continue to actively engage others to develop consensus-based solutions.

Progress Energy believes in the following principles to address global climate change:

- Climate change policies should be comprehensive in that they include all sectors of the economy, cost-effective in that they are supported by rigorous economic analysis, and achievable in that the goals and schedule are realistic.
- Climate change policies should be designed to promote substantial technological innovation on multiple fronts and timely, cost-effective deployment of technologies.
- Climate change policies should not harm the economy or our ability to provide reliable, affordable electric service to our customers.
- Climate change policies should promote fuel diversity by encouraging renewable energy, advanced nuclear, gas and clean-coal technologies.
- The global nature of climate change requires a national policy framework, informed by international developments and commitments.
- The country's regional differences require flexibility in the implementation of policy solutions.
- While participating in the national policy debate, we will work with stakeholders in our region to develop consensus-based strategies to address climate change and help our region succeed as future national policies are implemented.

II. General Comments And Overview

While endorsing neither a mandatory cap-and-trade regime nor any of the specific proposals or concepts in the white paper, we believe that it is important to engage in discussions on global climate change policy. The questions posed appear to be focused on a cap-and-trade approach. We believe that other options should be considered as well.

Following are some key factors that the Committee should consider as it contemplates greenhouse gas regulatory schemes:

- **Targets and timetables** are the most critical element in any cap-and-trade proposal. They establish the platform upon which other design features (e.g., banking, allocations, credit for early action) are built. Progress Energy would favor a carbon intensity-based cap or a GHG intensity-based cap over one based on absolute emission reductions. A carbon intensity-based program accounts for economic growth and promotes efficient production. This is a particularly attractive feature for the growing Southeast region.

Additional Topics
Submitter's Name/Affiliation: Caroline Choi, Progress Energy Corporation

- Significant in any cap-and-trade proposal would be a **safety valve**. Such a proposal would limit the cost per ton of GHG to constrain the potentially, negative impact on the economy. While a safety valve would be critical in limiting economic harm, its value would diminish if it were to increase quickly.

- Geographically flexible, **off-system offsets** should be allowed under a cap-and-trade program. From an economic standpoint, many actions that we and other utilities can take to address GHGs are located outside of our generating systems. Because of the global nature of greenhouse gases, it would make sense for entities subject to GHG regulation to have options worldwide. For example, it may be much more cost-effective for a utility to take actions that reduce GHGs and GHG emissions intensity in China or India under the Asia-Pacific Partnership (AP6) than to take those same actions in its service territory.

  In short, geographic flexibility is crucial for those who would need to reduce GHGs or carbon intensity. Under an economy-wide program, it would be important to allow offsets to be taken without limitation.

The absence of a specific legislative proposal and structure in the white paper makes it impossible to fully assess the relative importance of various design features. The relative importance of emissions trading and other design features – such as banking, borrowing, offsets, baseline protection and credit for early action, allocation of allowances, compensating mechanisms, multi-year baselines and phased-in compliance – would be highly dependent on the stringency of the targets and timetables. In addition, the interrelationship of key design elements can only be seen within a specific legislative context or structure, and not in isolation. All issues in a cap-and-trade system are linked, and the whole may be greater – or significantly different – than the sum of its individual parts.

We recognize that global climate change is a significant issue that presents a business risk. In addressing the complex issue of global climate change, we must balance economic and environmental issues with our obligation to provide affordable, reliable electric service. We plan to employ a balanced approach that boosts conservation and efficiency programs, increases the use of renewable sources of energy, advances the development and deployment of new energy technologies, and uses advanced nuclear and clean-coal technologies to address demand and customer growth. We hope that you also take a balanced approach as you work to advance the discussion on how best to address global climate change.

Additional Topics
Submitter's Name/Affiliation: Alexander Rau, Climate Wedge Ltd.

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

I wish to take a bottom-up view to the design of mandatory market-based carbon constraints by focusing on the tradeable instruments that form the basis of carbon markets, and recommend a few simple actions that Congress could take to promote the start of a market for emissions reductions well in advance of any final legislative action on a mandatory emissions program.

Any market-based approach to imposing mandatory carbon emissions controls inevitably boils down to two key considerations: the magnitude of the reduction target, both at the national, sectoral, and company-specific levels [i.e. the top-down view], and the actual units of trading and the rules that determine how they can be traded [the bottom-up view]. Most discussions of how to design a federal regulatory system for greenhouse gas emissions tend to address the former consideration by looking at the steady-state operation of cap-and-trade schemes, when in fact there is little discussion of how the underlying emissions market gets started. As we have seen now with the rocky start to the pilot phase of the European Union ETS, this transitional period is critical to the overall success and integrity of the program and is best understood from the bottom up.

Despite the veritable zoo of different instruments that make up the tradeable units in the international carbon markets today [AAUs, EUAs, CERs, ERUs, VERs, VCUs, etc], there are really only two kinds of classes: allowances and credits. Both tend to be denominated in "tons of carbon dioxide equivalent", but allowances are permits issued by the government to regulated entities under an existing cap, whereas credits are emissions reductions which have been generated by a specific carbon abatement project which reduces emissions independent of a formal cap or jurisdictional baseline, instead calculating the reductions at the project activity level.

Project credits, which are often confusingly referred to as "offsets", are in principle more flexible than allowances as they need not be tied to a particular regulatory scheme or jurisdiction. This flexibility gives Congress the opportunity to encourage the development of a market for emissions reductions here in the United States ahead of implementation or even agreement of a cap or other mandatory emissions constraint, which is clearly a much more politically and legislatively challenging process. By sending a few simple signals to the market and giving priority to determining the rules by which project credits can be created and recognized under future regulation, Congress can encourage the private sector to begin developing projects to reduce emissions and thus launch a robust project emissions market already today.

Developing a market in advance of major legislation

First, and foremost, the private sector needs strong signals from Congress and the Federal Government that some form of mandatory carbon constraints are imminent, whether it be a

formal cap and trade scheme, a performance-standard approach, or any of the other approaches that deserve careful consideration during this consultation phase initiated by the Senate White Paper. The Sense of the Senate Resolution passed on June 22, 2005 does itself give such a signal to the private sector because of its bipartisan political backing. Any subsequent action that can strengthen this message to the private sector and further indicate that mandatory steps to reduce greenhouse gas emissions are on the near horizon must be strongly encouraged.

Second, the private sector also needs assurance that regulated companies and entities will be allowed to use flexible mechanisms – namely emissions trading and project credit mechanisms – to meet a significant part of their targets.

Strong signals from Congress on the above two concerns alone could promote the start of a market for project credits ahead of major legislative action or any federal appropriations. Currently there is little demand for carbon credits in the United States and thus little incentive for project developers to undertake emissions reduction projects, except for certain renewable energy projects operating in the green power markets. However, with strong signals of impending carbon constraints and the availability of flexible response options, the incentives will quickly shift in favor of more rapid development of such projects and encourage the private sector to begin "prospecting" for carbon reductions.

We saw this take place in the Kyoto framework where the project markets of the Clean Development Mechanism and Joint Implementation were active many years before ratification of the Kyoto Protocol, and also see this today in the nascent trading of offset projects already occurring in the Northeastern states, well in advance of the 2009 start date of the RGGI scheme. Furthermore, it would be especially prudent to give these signals to the market today given that the development times of many GHG projects are of the order of the timeframe that would be required for enacting mandatory federal emissions constraints.

The only additional guidance Congress should give to kick start the project market here in the US is that early action on the part of project developers and their sponsors among the potentially regulated companies will be recognized in any subsequent implementation of mandatory emission constraints. The government is familiar with this argument, having chartered the DOE Voluntary Reporting of Greenhouse Gases (1605b) Program to document and encourage early action on the part of companies which reduce their direct emissions. However, the 1605b program is primarily concerned with the direct/indirect emissions of entities [which provide the foundation for allowance trading in cap-and-trade schemes], and not certifying project-based emissions reductions. Encouraging the latter function as well would solidify the link to early action credit for those companies and entities that are considering investing in GHG reduction projects.

Clearly, credit for early action in the project markets will require a set of standards for determining the quality and integrity of the resulting emissions reductions. The project markets, in particular here in the US, are full of credits of questionable accounting and environmental integrity, so care does need to be taken to develop a robust set of criteria for determining what project credits should be eligible for early action credit. Of particular importance for the integrity of the project markets are the reliability of the project emissions boundaries, baseline

calculation methodologies, and additionality. That being said, we also must guard against setting eligibility standards that are too strict and thus choke off the development of the market before it even starts. A proper balance can be found in the emerging standards for "voluntary carbon units" or VCUs [www.voluntarycarbonstandard.org], which ensure a strict level of confidence in the emissions reduction baselines and calculations while minimizing bureaucratic hurdles and barriers.

Congress should therefore prioritize a process to put in place the rules by which credits can be monetized from greenhouse gas reduction projects. There is already a wealth of information and experience in the international project markets, such as the Clean Development Mechanism and Joint Implementation, and much of the groundwork for determining "what is a good credit" already exists so this task need not be particularly complex.

With these steps in place and firm signals from Congress regarding impending carbon constraints, the use of flexibility mechanisms, and recognition of early action for abatement projects, the market should have all the components necessary to activate, and thus ultimately begin reducing greenhouse gas emissions well ahead of any actual imposition of caps or constraints. Trading can start today and give US companies experience in using market-based approaches to reducing their emissions, thus better position them for the mandatory caps or carbon constraints that subsequently come on line. Furthermore, encouraging the development of a robust domestic project credit market today does not constrain Congress's ability to determine any aspect of the actual regulatory framework. In fact it expands the options available for bringing onto the system sectors which are not easily regulated under a cap, such as transportation or the residential/consumer sectors. And finally, there is no real negative economic impact associated with project markets, only a positive effect in seeding a market that encourages the development and deployment of low carbon technologies.

Additional Topics
Submitter's Name/Affiliation: British Embassy Washington (Reilly)/UK DEFRA

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Please begin your comments here. (no page limit)

UK Comments on Elements of a Mandatory, Market-Based Greenhouse Gas Regulatory System:

Emissions trading is a market-based mechanism that delivers emission reductions at the least cost location. In doing so, it lowers the overall costs of combating climate change, and it is particularly suited to the emissions of greenhouse gases, which have the same effect wherever they are emitted. This view has been shared by industry in the UK, who have been generally supportive of emissions trading. They see the alternatives, such as a carbon tax, as less flexible, less cost effective, and less able to drive investments in low carbon technologies as they are unable to reward positive action.

The experiences of the European Union Emissions Trading Scheme (EU ETS) has clarified a number of findings on the economic rationale and competitiveness. For example:

- The EU Poles Model in 2000 estimated a cost reduction of about 25% in meeting targets as a result of emissions trading, recognising this was an underestimate as baseline case - no trading already assumed optimal costs.

- The EU ETS is linked to international mechanisms such as Clean Development Mechanisms and Joint Implementation which contributes to these reduced costs – the European Commission estimated a further 20% at the time of the proposal.

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- A recent report1 found that the EU ETS should allow the EU to achieve its Kyoto target at a cost of between EUR 2.9 billion and EUR 3.7 billion annually. This is less than 0.1 % of the EU's GDP. Without the scheme, compliance costs could reach up to EUR 6.8 billion a year.

[1] EU Action Against Climate Change - European Communities, 2005

- On competitiveness, overall the findings2 do not support the view that the EU ETS threatens the competitiveness of industry in Europe for most sectors, providing that EU Member States take a broadly consistent approach.
-

Some of the net benefits defined so far include:

- As a result of the demand for credits, the UK has become the major player in the international carbon market, as a centre for world trading.

- The CDM market has been estimated to be worth around $10bn by the OECD - on the basis of low cost per tonne assumptions. Point Carbon Estimates will triple this year. IADB - and the total market value of CDM credits will be US$2.8-21 billion.

- CDM already set to deliver 800mt savings up to 2012.

- The UK's Climate Change Projects Office have estimated that there are already private funds of over €1bn dedicated to investment in carbon markets in London alone.

- Companies involved in the carbon market floated on the London Stock Exchange Alternative Investment Market in London for nearly a £1 billion capitalisation.

Although most countries are thinking in terms of what would best suit their domestic markets and frameworks, it is sensible to keep an eye to the future, and what may happen when a number of successful trading schemes are up and running. It is worth considering some of the benefits and issues when initially designing a trading scheme, for example:

- Through linking trading schemes, over time, the allowance price in the two emission trading regions will converge until equal (subject to exchange rate fluctuations). This ultimately reduces the amount of high cost abatement and compliance and leads to a net welfare gain.

- Through linking, the size of the market increases. This in turn leads to more trades and improved market liquidity. The larger and more liquid a market, the more efficiently it will allocate resources towards the least cost abatement options.

- Greater liquidity in turn leads to increased stability, reduced price volatility, and reduced risk. It enables the scheme to better cope with unpredictable variables, such as weather, as by spreading the geographical area and increasing the market size these variables have less impact.

- In an addition to marked improvements in economic efficiency, linking is consistent with a multi-lateral approach to dealing with climate change, and it is a powerful sign of coordinated international action to tackle an international issue.

[2] Carbon Trust - The EU ETS Implications for Competitiveness: http://www.thecarbontrust.co.uk/carbontrust/about/publications/European%20Emissions%20Trading%20Scheme_Implications%20for%20industrial%20competitveness.pdf

- The EU Emissions Trading Scheme itself demonstrates the feasibility and the benefits of linking trading schemes as, in many respects, it is itself a linked network of 25 schemes (likely to be extended to 27 with the accession of Bulgaria and Romania to the European Union in 2007).

Key design elements of a United States trading scheme:

1. Mandatory, economy-wide, tradable-permits system.

Comment: A mandatory trading system reduces competitive distortions by having all companies in one sector liable to the same regulations; it improves liquidity and price competitiveness by increasing the number of allowances in the overall market, and it enables government to cost effectively deliver on more challenging emissions reduction target.

Experience from the UK Emissions Trading Scheme has shown that environmental targets are weakened by a voluntary scheme as it tends to attracts those businesses that consider they could easily meet their targets (either because of downsizing or change in activity) and then have allowances to sell. Also, as companies bid in their own targets, they tend to be less challenging.

Future issues: It is technically possible to link absolute and voluntary schemes. The problem only arises if there are significant differences in the levels of effort in the targets of two schemes. As voluntary schemes by nature tend to be less stringent this issue may frequently arise. It is essentially an issue of equity/competitiveness – as the stringent scheme, in particular, is likely to want to seek a (relatively) level playing field for sectors that are covered in both trading schemes. Although any inequities would exist regardless of whether the schemes are linked, the inequities would become more evident if linking occurs.

2. Environmental target based upon annual reductions in emission intensity.

Comment: A cap and trade system allows for Government to regulate the amount of emissions produced in aggregate by setting the overall cap for the scheme but gives companies the flexibility of determining how and where the emissions reductions will be achieved. It provides certainty for government over the emissions reduction target. It provides certainty to business regarding the extent of emissions reductions required, and in doing so it helps to produce greater long term certainty regarding the price of carbon. This is critical because as conditions of certainty improve, particularly around the carbon price, so does the ability of the trading scheme to stimulate the necessary investments in low-carbon technology that will deliver the emissions reductions needed.

The alternative approach to a cap-and-trade scheme is a baseline-and-credit scheme that employs relative targets. Relative targets (or rate-based targets) involve an emissions rate per unit of output or activity (e.g. GDP or energy consumption). Accordingly, the total emissions in the

scheme is linked to economic growth, and in theory, therefore, emissions can actually grow under this type of scheme. In addition, relative targets are more administratively complex than absolute targets and there are challenges involved in determining the relevant metric (e.g. unit of output, energy input) and monitoring the chosen metric.

Robust monitoring, reporting and verification ("MRV") is fundamentally important to the confidence in the units being traded (and consequently in the value of those units). Therefore, it is required to ensure integrity of the Scheme and an even playing field for all participants. Monitoring requirements should be clear and unambiguous, but have built in them some flexibility to deal with smaller installations and unusual situations. Early engagement with industry to develop robust and consistent monitoring requirements without excessive cost is recommended, as is the provision of sufficient detail in monitoring and reporting plans for the industry to know what is expected. If targets for MRV are set, then experience in the UK has shown that industry will meet them and often go further.

Future issues: Linking one scheme to another scheme with poor MRV standards, or lax enforcement of these standards, would be technically possible, but would put the environmental integrity of the tighter scheme at risk. This is because allowances issued in the other scheme would not necessarily represent real emission reductions. It may result in a lower allowance price, but environment efforts are squandered.

Again, it is technically possible to link absolute and relative schemes, but there are a number of issues that need to be considered in determining whether such a link is desirable. These include environmental integrity because if a scheme with an absolute cap is linked to a scheme with relative targets, the total number of emissions in the combined schemes would grow if there was an increase in output in the relative scheme. There is also a competitiveness impact as those installations with relative targets have a competitive advantage over their counterparts in absolute schemes.

3. Cost cap.

Comment: A safety valve or price cap fixes an upper limit on the price that installations need to pay for allowances. It can be implemented in different ways for example, by issuing additional allowances at the level of the cap, or reimbursing installations who have purchased allowances above the price cap. It is recognised to have some benefit in reducing the cost of 'excessive' quantity-based targets and is also, arguably, a way of limiting price volatility during the early stages of a scheme. It is not something, however we support. This is for the following economic and environmental reasons:

<u>Economic</u>

- A market functions with optimum efficiency when free from government intervention. The introduction of a price cap distorts this free 'carbon' market, thereby reducing its efficiency and effectiveness as an instrument, and increasing trading costs per user.

- Industry is incentivised to abate only up to the level of the price cap. This potentially encourages smaller scale, less efficient investments and, in particular, fails to encourage those who could do more at the least cost. "Savings" to industry as a result of a price cap are therefore reduced in the long-term.

- The financial burden and associated risk is, through a price cap, transferred from industry to government. This is arguably a questionable use of public money and of increasing concern once schemes are linked.

- Where there are economy wide targets in place for emissions, if a price cap allows for the issuance of further credits, then more drastic reductions in sectors outside of the scheme will be required. These reductions are likely to be harder, more costly to implement, and with more of the costs potentially falling on the government. The financial burden of reducing emissions across the whole territory is therefore increased, not decreased.

- It should also be remembered that the cost to operators of meeting targets can to some extent be contained without needing to resort to price caps by permitting use of offsets such as JI/CDM credits.

- Finally, in the longer term, the purported 'price certainty' benefit of a price cap reduces as a cap is likely to need readjusting.

Environmental

- Triggering a price cap can lead to a rise in emissions. This is because emissions greater than those allowed in the capped trading scheme will be permitted through, for example, the payment of a tax, the purchase of investment units, or the issuance of further credits. This is likely to result in reduction targets not being met. The exact reason for this increase will depend upon the scheme's definition of a price cap.

- Depending on the type of price cap, there is a danger that the environmental integrity of the allowances remaining in the trading scheme will be reduced. They could, for example, be compromised by the purchase of investment units in a 'technology' fund that ultimately can not guarantee genuine, measurable reductions, or by purchase of cheap, lower quality 'hot air' credits from overseas. Such credits are not linked to genuine reductions.

Future issues: The presence of a low safety valve/price cap in one of the linked schemes would cause problems for any future thoughts of linking to other schemes, unless the cap was set at a level that is (almost) always above the market price. However, linking to a scheme with a low cap would be difficult on environmental and practical grounds:

Environmental

- The free flow of allowances between linked schemes means that should environmental integrity issues be raised in one scheme they will, through trading, be transferred to the linked scheme. An increase, for example, in the number of allowances in the capped scheme through government issuance will, therefore, eventually feed through to the

linked scheme and could result in this second scheme failing to meet its own reduction targets. Alternatively, lower quality 'hot air' allowances could be transferred into a linked scheme such as the EU ETS where they are not allowed. This would dilute the linked scheme's environmental integrity.

Practical

- A link is problematic in practical terms if the price in each scheme is markedly different. If linked, it is likely that there would be a large demand from installations in the scheme without a cap for allowances in the scheme with a cap. The price cap management options would soon be triggered and potentially soon exhausted unless a gateway of some sort was put in place. However, the presence of a gateway that restricted the purchase of allowances by outsiders in the price cap scheme, though effective in controlling purchase volumes, is damaging to linking. This is because, if the price cap is too low, it is likely to be continuously triggered - in effect, therefore, it would be as if there were no link at all. This problem would remain until either the price cap is removed, or it is set at a level higher than the market price in both schemes.

4. Permit allocation.

Comment: Auctioning encourages the full cost of carbon to be taken into account in investment decisions - if all permits were auctioned business would have to ensure that it had sufficient allowances to cover its emissions - much simpler and more effective. However, full auctioning can lead to larger companies buying the whole allocation, and so destroying the competitiveness of the scheme (as has been seen in other trial trading schemes for greenhouse gases).

Free allocation requires government to allocate a valuable asset to business, and so can be difficult to do without agreement on benchmarks – for the EU ETS, it also allows industry to negotiate to improve their free allocation – for example if Germany is more generous to a sector than the UK is, its business will do better.

It is sensible to keep a balance between allocation and auction to preserve competitiveness – at present the UK has 5% auctioning for phase I of the trading scheme, a planned increase to 10% for phase II, and discussions will start soon about the percentage of auction permits for phase III.

For any expansion of auctioning, we would like to see greater use of benchmarking as this recognises early action. It is difficult to agree industry wide benchmarks but the European Commission will be looking to provide a strong steer in its upcoming review.

5. Congressional review in 2015 and every five years thereafter.

Comment: To encourage the sort of long term investment in capital infrastructure that will reduce carbon emissions, businesses need to know that there is going to be a value of carbon

over the whole investment timescale. For capital infrastructure we are often talking 15-25 years, and often much longer. This does not mean that businesses need to know what the exact price of carbon will be, as that is for the market to decide (much as the oil markets work today), but there needs to be certainty that there will be a price.

Therefore, a system of 5 year phases with certainty on the next phase not firming up until a year before the end of the current phase, will only drive relatively short-term investment decisions and not the type of infrastructure investment we need to seriously reduce carbon emissions.

The challenge for any scheme is to deliver a framework that is long enough to give sufficient investor confidence in the deployment of low carbon technology, but this is often not the timescale that government frameworks operate on. The compromise could be to have 're-openers' on a long scheme but to set out clearly the criteria on which intervention will take place. This would allow business to assign a probability risk-rating of this event occurring.

One of the other certainties business will look for is the expansion of the scheme to incorporate other sectors for example aviation, or other greenhouse gases - even if there is no current possibility of this occurring, it would be sensible to allow for the possibility in the future, and allowing the design to accommodate such changes. Each transition period causes more uncertainty in the markets, and so industry will need the rules of engagement to be clear about how such decisions will be made, and over what timescale.

6. Long-term emission reduction pathway.

Comment: US GHG emissions intensity fell at about 1.95% per annum on average over the period 1990 to 2003; falls of 2.4% and 2.8% per annum as recommended by the Commission over the periods 2010 to 2020, and beyond 2020 respectively would therefore be significant improvements on the historical rate. Whether or not emissions actually started to decline in the latter period would depend on whether growth in GDP fell below 2.8%; the US Energy Information Administration believes that the growth prospect of the US economy over the period to 2020 to 2030 is about 2.8% per annum which would mean that emission leveled out rather than declined.

- END -

Additional Topics
Submitter's Name/Affiliation: Robert E. Rutkowski

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Dear Senators:

The US Senate Committee on Energy and Natural Resources, led by Chairman Pete Domenici (R-NM) and Senator Jeff Bingaman (D-NM), has developed a white paper on the design elements of a mandatory market-based greenhouse gas regulatory system.

I understand the Committee is now accepting comments on the elements of the white paper; and, building on these comments, will subsequently host a conference on April 4th in Washington DC to conduct a further exchange of ideas.

Most of the paper is focused on the nuts and bolts of setting up a mandatory cap and trade system.
UCS, as well as other organizations, will respond to these technical design questions.

In addition to the technical comments, however, is a general category: "If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form." This is the perfect place to comment that the urgency of the situation requires mandatory reductions or to emphasize that the system should be put in place as soon as possible.

I believe that the Committee will find it very useful to hear from the scientific community knowledgeable about climate change, especially emphasizing the urgency of this issue. This urgency, of course, suggests that Congress should take action now to reduce heat-trapping gas emissions. It is critical that climate scientists convey this sense of urgency.

However you design the nuts and bolts of a mandatory system, the system needs to be put in place as soon as possible. Human-caused emissions of heat-trapping gases are contributing to rising global temperatures and negatively impacting health, economy, and the environment.
In order to avoid the worst consequences of global warming, we need to act now to reduce our emissions.

-- The urgency for taking action on global warming is clear.
As the national academies noted, "carbon dioxide can remain in the atmosphere for many decades. Even with possible lowered emission rates we will be experiencing the impacts of climate change throughout the 21st century and beyond.
Failure to implement significant reductions in net greenhouse gas emissions now, will make the job much harder in the future."

-- We need a strong emissions reduction plan to help slow global warming and thus prevent the worst-case scenarios from coming true.

Additional Topics
Submitter's Name/Affiliation: Robert E. Rutkowski

-- Climate change is a serious problem, and the potential impacts of a changing climate are likely to have serious ramifications on the ecology and economy.

Thank you for the opportunity to bring these remarks to your attention.

Mindful of the enormous responsibilities which stand before you, I am,

Yours sincerely,
Robert E. Rutkowski

Additional Topics
Submitter's Name/Affiliation: Michael J. Murray, Director of Legislative Policy, Sempra Energy

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

One issue that was addressed in your proposed amendment to the Energy Bill, but not in your White Paper, is that of cost containment. Your proposed amendments addressed this in two ways. First, GHG offsets were allowed, not to exceed 3%. Secondly, an initial "safety valve" cost cap of $\$7/TCO_2$ was established. Sempra Energy supports these concepts and strongly recommends that any mandatory climate change program contain provisions of this nature to improve the flexibility and cost effectiveness of such a program. In our response to Question 1, we pointed out that CO_2 is not the only GHG. The six major GHGs are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), perfluorocarbons (PFCs) and hydrofluorocarbons (HFCs). We therefore recommended that GHG emissions be measured in CO_2-equivalent metric tones, and credit be given for reductions of these other GHGs.

We believe that both banking and offsets should be integrated into any cap & trade program for the control of GHG, and that all GHG gasses be included. Banking would serve to encourage early reductions where possible, and since GHG emissions are cumulative, banking would not detract from the intent or impact of the program. Offsets created by GHG reductions outside of the program should not only be allowed, but also encouraged, as they would reduce the overall cost of the program. One offset opportunity is sequestration. If a user of a fossil fuel develops a way to sequester its CO_2 or other GHG emissions, credit in the form of offsets should be administratively available. Agricultural/forestry sequestration can also provide a valuable opportunity for cost effective offsets and should be encouraged, in part because of the other environmental benefits that derive from such programs. We believe limiting the use of offsets to only 3% is both unnecessary and counterproductive, and discourages other types of innovative technology development.

Additionally, we support the concept of having an option to pay a safety valve price for each CO_2 equivalent ton of GHG emissions emitted over an allowance allocation. This ensures that the program will not cause unintended significant economic consequences should the economy or market not respond or function as anticipated. We believe that both offsets and the safety valve are valuable components and not alternatives. The safety valve may limit the upside cost risks of the program, but does nothing to encourage low cost GHG reductions outside the program as an offset provision would. The safety valve would also not have the same positive affect on technology development, as would an offset program. Alternatively, an offset program would not ensure that the overall cost of the program would be controlled as the safety valve would.

Additional Topics
Submitter's Name/Affiliation: (Chris M. Hobson/Southern Company)

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Southern Company is pleased that the Energy and Natural Resources Committee has afforded interested parties the opportunity to comment on "Design Elements of a Mandatory Market-Based Greenhouse Gas Regulatory System," hereinafter the White Paper. Southern Company is also a member of the Edison Electric Institute (EEI) and hereby supports and endorses EEI's comments on the White Paper.

As the Committee knows, consideration of whether – and if so, how – to regulate greenhouse gas or CO_2 emissions is a question that has profound implications for the economy and energy policy of the United States. Fossil fuel use and the attendant greenhouse gas emissions are the basis of the modern lifestyle that we enjoy and to which millions around the world aspire. To reduce greenhouse gas emissions while continuing economic growth in both the U.S. and throughout the world will require the development and deployment of innovative, lower-emitting energy technologies. These technologies are not, despite the assertions of some, currently available at the scale and cost-effectiveness needed for wide deployment. They will need adequate development time and funding to be ready for widespread use in the next half century .

It is for these reasons that Southern Company strongly supports a voluntary approach to the climate change issue that focuses on development and deployment of innovative, cost-effective, lower-emitting technologies and on reducing the greenhouse gas intensity of the economy. A voluntary, intensity-based, technology-focused approach allows for continued economic growth while technologies are developed. Such a voluntary intensity-based approach is embodied in the Climate Vision program, which combines the voluntary actions of many major industry sectors with a goal to reduce the greenhouse gas intensity of the U.S. economy by 2012. Voluntary industry/government partnerships are also beginning to make major strides in the development of clean energy technologies. These include the incentives provided in the Energy Policy Act of 2005, as well as other federal/industry programs like FutureGen, in which Southern Company is playing a key leadership role.

A critical component of the voluntary technology development program is the sharing of current and new clean energy technologies with other nations. These efforts are ongoing as well, through efforts coordinated by the G8 and through the Asia-Pacific Partnership on Clean Development and Climate. Such international partnerships allow the developing world to adopt clean, efficient technologies as they increase their economic growth and energy use. These efforts allow climate change to be addressed in a pro-growth context.

In contrast to these successful voluntary programs that focus on economic growth and technology development, the White Paper appears to contemplate a mandatory, cap-and-trade based regulatory regime for GHGs. Real-world experience and modeling analysis both demonstrate how difficult and costly it is to make GHG emissions reductions in the face of robust economic growth. Mandatory emissions reduction programs – such as those instituted by

the European Union and by Canada -- have been adopted in an attempt to meet the targets of the Kyoto Protocol. The countries that have made such commitments and that have enjoyed economic growth – including Spain, Japan, and Canada -- are finding that they are not on track to meet their Kyoto targets. The countries that are on track to meet their Kyoto targets are generally those in the former Soviet bloc where significant economic restructuring has occurred since the 1990 baseline year. A few, like the U.K., made reductions early on by switching much power generation to natural gas, but are now shifting back to coal as natural gas prices have increased. It is clear that, given the current status of technology, these mandatory greenhouse gas reduction efforts are not proving successful in the context of economic growth.

Economic growth is extremely important to the U.S. as well. Specifically, in the Southeast, economic growth is projected to drive an increase in electricity demand of more than 30% over the next fifteen years. This trend is illustrated in Figure 1 below.

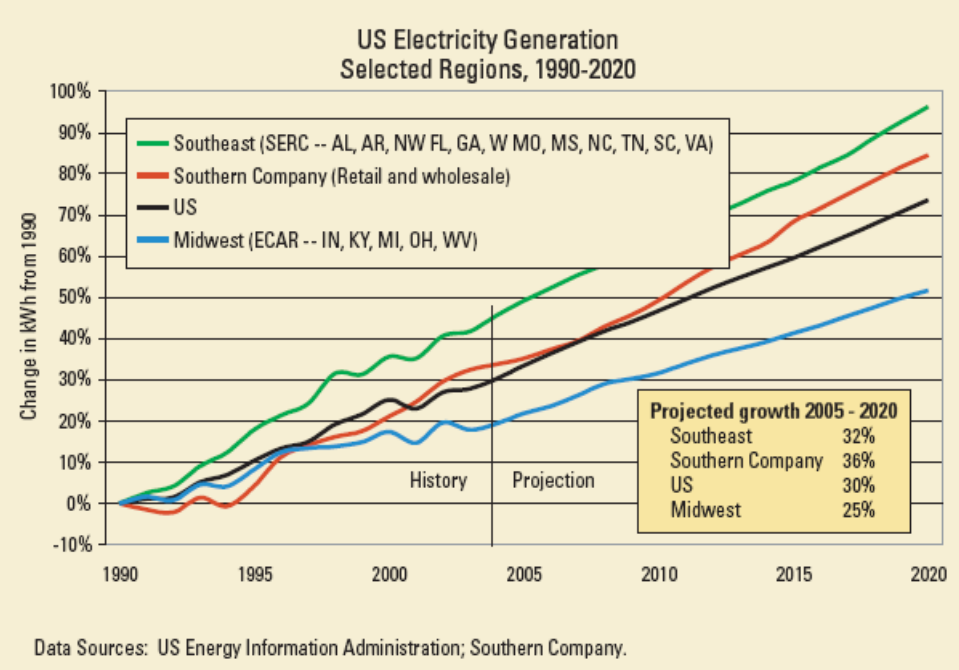

Figure 1

Internal modeling analysis done as part of a 2005 report to our shareholders[1] demonstrates how costly and difficult emissions reductions can be in the context of a growing economy. This report examined four different potential carbon price signals (see Figure 2) and found that, imposition of the "higher" price signal scenario (which starts at about $7/ton of CO_2 in 2012 and increases to about $13/ton by 2020) would reduce -- by a small amount -- the growth in CO_2 emissions from our generation, as shown in Figure 3.

[1] This report, entitled "Southern Company Environmental Assessment: Report to Shareholders" can be found on our website at: http://www.southernco.com/planetpower/report.asp?mnuOpco=soco&mnuType=ppb&mnuItem=oc

Additional Topics
Submitter's Name/Affiliation: (Chris M. Hobson/Southern Company)

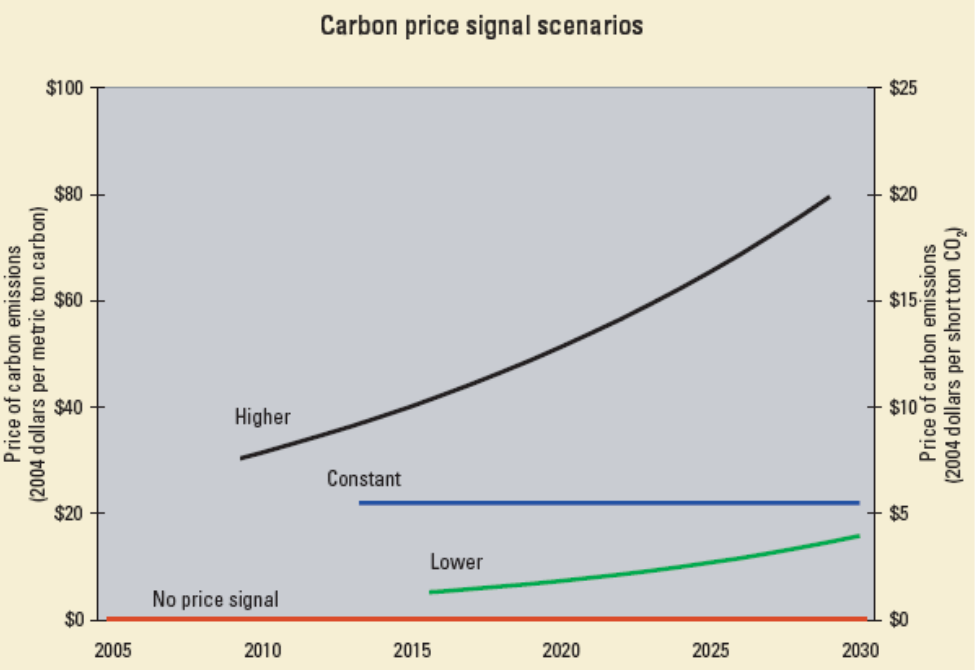

Figure 2

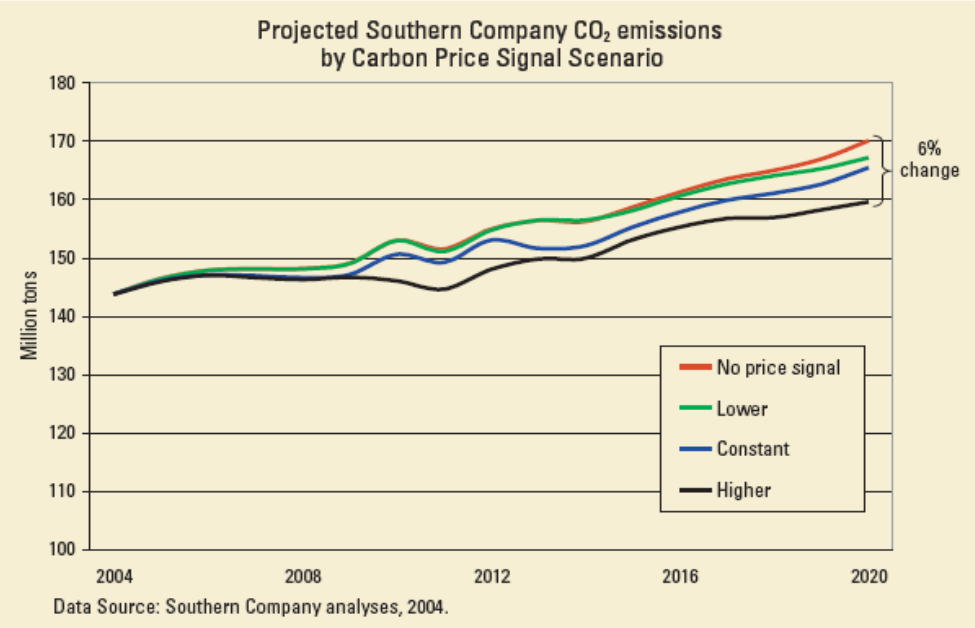

Figure 3

This carbon price signal is expensive: it would raise electricity bills for our customers by some 14% by 2020.

Modeling analysis also shows how the availability of new, cost-effective, non-emitting technology can reduce the burden. For example, when our report to shareholders examined the assumption that new, non-emitting technology is adopted, even without a carbon price – in the

form of two new nuclear units in 2015 and 2016 -- Southern Company's CO_2 emissions fell by 7% below 2020 projections. See Figure 4.

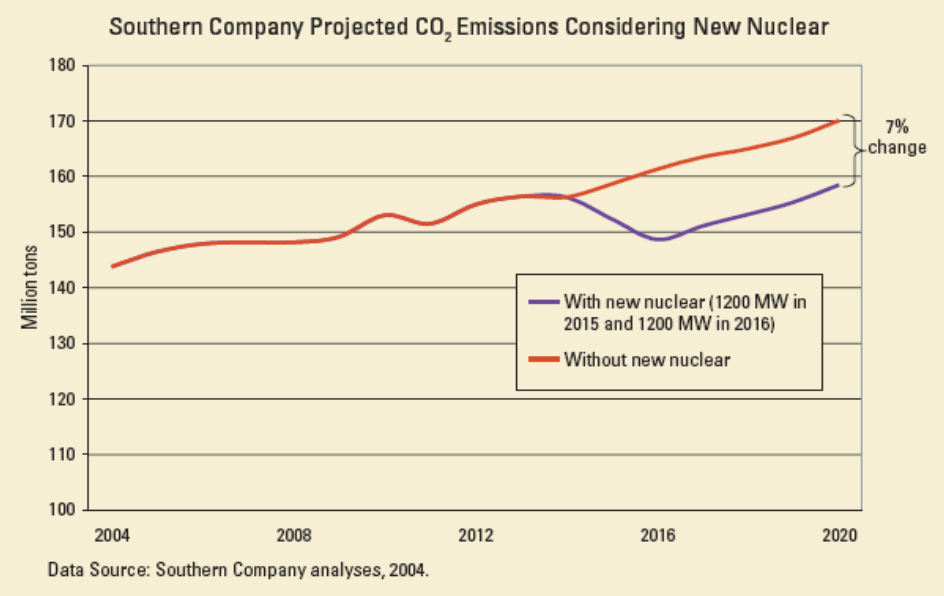

Figure 4

This demonstrates the crucial importance of the development and deployment of large-scale, cost-effective, low-emitting technologies.

Based on the results of this analysis, Southern Company's policy is to continue to support voluntary, technology-focused approaches to reduce greenhouse gas intensity. These make the most sense for us as company and for countries like the U.S. that are expecting sustained, robust economic growth well into the future. We oppose approaches that impose mandatory regulation of CO_2 and/or greenhouse gas (GHG) emissions – whether they are intensity-based, cap-and-trade-based, or tax-based.

While these comments from Southern Company do address certain aspects of a mandatory greenhouse gas regulatory program, these comments are made in response to the Committee's request only and should not be construed to constitute endorsement of any mandatory GHG reduction program. Nor should these comments be read to constitute endorsement of any of the proposals or concepts in the white paper.

It is important to note that the Committee's request for comments has left out critical elements of any GHG control program. These elements include:

1. The stringency of the reduction target -- and whether the target is tons-based or intensity-based. The U.S. and the Southeast both enjoy growing economies. We want to make sure that any program allows for that growth to continue.
2. The time allowed to achieve the target. Any policy to manage GHG emissions should consider the long-term nature of both the issue itself and the necessary technological development.

Additional Topics
Submitter's Name/Affiliation: (Chris M. Hobson/Southern Company)

3. The availability of technologies needed to meet the target and timetable contemplated. Cost-effective, low- to non-CO_2-emitting technologies are not yet available on a large scale. Any program must allow time for the development and deployment of such technologies, both in the U.S. and around the world.

4. A mechanism to limit any serious impact to the economy, such as a "safety valve."

5. A mechanism for regulated entities to be able to use emission reductions/sequestration credits in the form of "offsets" (other than a discussion of an "offset pilot program"). Offsets provide critical flexibility mechanisms that have the potential to mitigate the costs of any mandatory program.

These omissions make it difficult for interested parties to comment on the aspects of a mandatory program on which comments were requested.

Additional Topics
Submitter's Name/Affiliation: Gilbert Steiner, Ph. D.

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

The evidence is in. Human activity has already produced changes to the environment that are irreversible. The longer we wait to take effective action, the more such changes will occur, and they will occur with more dramatic and devastating effect. Action is needed now; the time for study is long past.

Gilbert Steiner, Ph.D.

Additional Topics
Submitter's Name/Affiliation: Tom Tietenberg/Colby College

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Your white paper doesn't mention safety valve pricing, but in my opinion it probably should. Given uncertainty about future compliance costs, industries like to have some of that uncertainty removed by imposing a price cap by year (that rises over time). If permit market prices rise above that price, sources have the option to pay that price for additional permits. This price cap should be set high enough that it would not be triggered under any normal circumstance, but under unusual circumstances it might keep prices from spiraling to unsustainable levels, precipitating the demise of the permit system.

This actually happened with the RECLAIM system in California and in my opinion served a useful purpose. The sulfur allowance program also has such a limit, though prices have never gotten that high. Even in that case, however, despite its never having been used I think it has played a useful role by providing sources with assurances about the upper limits for price rises.

It could even be possible to complement the safety valve price with a symmetric price floor so if price fall below a certain level that price, and not the market price would be paid. This would protect control investments that were initially justified by an assumption on the part of the investor that prices would be higher than they actually turned out to be.

Additional Topics
Submitter's Name/Affiliation: Shawn Glacken, TXU Corp.

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

About TXU

TXU manages a portfolio of competitive and regulated energy businesses. In TXU's unregulated business, TXU Energy provides electricity and related services to more than 2.4 million customers in Texas, more customers than any other retail electric provider in the state. TXU Power has over 18,300 megawatts of generation in Texas, including 2,300 MW of nuclear-fired and 5,837 MW of lignite/coal-fired generation capacity. TXU Wholesale focuses on optimizing its generation fleet and sourcing power at the lowest possible cost for TXU Energy. TXU is also one of the largest purchasers of wind-generated energy in Texas and North America.

TXU Electric Delivery operates the largest distribution and transmission system in Texas and the sixth largest in the country, providing power to three million electric delivery points over more than 100,000 miles of distribution and 14,000 miles of transmission lines.

Commitment to Fossil Fuels
In 2004 approximately 71% of the electricity TXU generated was from using fossil fuels like natural gas and coal. Responding to growing power demand throughout Texas, TXU has made significant long-term investments in coal-fired power generation; we plan to double the size of our coal portfolio in the next five years. The generation mix in Texas is approximately 69% natural gas, 23% coal and lignite, 6% nuclear and 2% wind, hydro and other renewables. With demand for natural gas causing prices to remain at all time high levels and coal at under $2 per million BTU, coal remains by far the most economically efficient energy source in the United States. TXU is committed to producing affordable electricity for its customers and to ensuring a prosperous economy.

Commitment to Voluntary Reduction of Greenhouse Gases
TXU is committed to exploring new technologies and methods of reducing greenhouse gases, but strongly believes that mandatory reductions of greenhouse gases would be costly to consumers and would have little or no corresponding impact on global climate trends. Future regulatory constraints on carbon dioxide emissions from fossil fuel generation would adversely impact fuel diversity, increase the use of expensive natural gas for electric generation, and make meeting energy needs in the state extremely costly and difficult.

Commitment to Diversifying Energy Sources and to Reducing Emissions Voluntarily
This is not to say TXU supports no action with regard to global climate change. Since 1990, we have added 2,850 MW of zero-emission electric generation to our generation fleet and purchased power portfolio. In 2004, over two percent of the energy we provided to our customers came from renewable wind energy. Power plant efficiency improvement projects, plus the increased blending of higher BTU coal with our native Texas lignite, resulted in the avoidance of more than two million tons of carbon dioxide in 2003.

Additional Topics
Submitter's Name/Affiliation: Shawn Glacken, TXU Corp.

TXU has had an extensive greenhouse gas emissions reduction program in place since 1995. The results of this program are reported to the U.S. Department of Energy each year through its 1605(b) Voluntary Reporting of Greenhouse Gas Emissions Program. Between 1991 and 2003, our program resulted in the reduction, elimination or sequestration of the equivalent of 219 million metric tons of carbon dioxide. This program represents the largest, voluntary reduction program in the United States for any investor-owned electric utility and the second largest reduction program in the country following that of the Tennessee Valley Authority.

Commitment to Shareholders
TXU has recently undertaken a highly successful internal restructuring, creating significant value for our customers and shareholders. This focus on our customers contributes to our pessimism regarding the costs and benefits of a mandatory cap on greenhouse gases, even one that is market-based and focused on emissions intensity. We are focused on ensuring that power supplies remain reliable and inexpensive, and legislation to cap greenhouse gases threatens this goal. Mandatory regulation of greenhouse gases would drastically alter the financial and operating dynamics of our generating portfolio and, consequently, our ability to deliver affordable, reliable power to our customers.

TXU is concerned that the actual result of a regulatory scheme to mandate a reduction in greenhouse gases will be to transport jobs, industry, and future economic development for the next generation of Americans to other countries that are seeking to expand their economies. We note that the Kyoto agreement is slated to complete its first phase in 2012 and the President's voluntary plan will be developed by that time. TXU believes it would be far wiser to observe achievements in the U.S. and abroad prior to 2012, and then determine, with all other nations, a global approach that does not threaten the U.S. economy.

In sum, while TXU has a strong interest in developing alternative sources of energy, in emissions-reducing technologies, and in reducing our emissions, we strongly believe that the most productive way to realize a reduction in greenhouse gas emissions is to encourage voluntary measures within a technology and development-oriented framework. These measures should focus on investments in research and development to create technologies that reduce emissions intensity for the next generation of power plants, automobiles, chemical plants, and other drivers of the economy. Requiring caps on emissions will only stifle creative responses and limit the resources available for long-term, viable solutions.

Additional Topics
Submitter's Name/Affiliation: William L. Kovacs/U.S. Chamber of Commerce

The U.S. Chamber of Commerce, the world's largest business federation representing more than three million businesses and organizations of every size, sector, and region, is pleased to provide this response to your call for comments about the Climate Change White Paper: "Design Elements of a Mandatory Market-Based Greenhouse Gas Regulatory System" (hereafter, White Paper).

Many of the U.S. Chamber's members are engaged in activities—such as energy production and use, manufacturing, technology development and deployment, insurance underwriting, and banking and finance—all of which in one way or another will be impacted by how the climate change issue is addressed. As such, the U.S. Chamber has a significant interest in the climate change issue and in the White Paper.

OVERVIEW OF CONCERNS

The U.S. Chamber's main interest is that first and foremost, any legislative initiative aimed at reducing greenhouse gas emissions must be true to the plain language of the Sense of the Senate Resolution that any actions taken to address climate change must not significantly harm the United States economy**.** It is important to note that the Resolution certainly does not say that any actions taken to address climate change must not significantly harm the United States economy *only in the near term*. Rather, the Resolution indicates that the economy must not be harmed, *ever*—in other words, not now, not tomorrow, not in the mid-term, and not in the long-term. If Congress had intended to allow the U.S. economy to be harmed at some point in time, it surely would have said so. Yet no member of Congress has gone on the public record stating that it would be okay at some point in time to harm the U.S. economy. Congress clearly understands that economic harm is never in America's best interest, hence the Resolution that actions taken must not harm the economy.

The reason for stressing this point is because the U.S. Chamber sees no indication that, with regard to addressing climate change, there has ever been a careful assessment of the long-term economic consequences and impacts of any legislatively proposed mandatory emissions control regime, which is sure to evolve with time. This observation is important, for as discussed in this "Additional Topics" portion of this submittal of the U.S. Chamber, if the price of carbon credits is allowed to rise over time, this is sure to impact the U.S. economy. Perhaps more problematic, such a legislative initiative is sure to place the U.S. at a competitive disadvantage in a global marketplace wherein developing nations fail to participate in mandatory regimes aimed at curtailing greenhouse gas emissions, even though in the future these developing nations will be major emitters of such gases.

Taken as a whole, unless due consideration is given to the long-term impacts of mandatory regimes for controlling greenhouse gas emissions, legislative efforts will neither satisfy the "no harm" imperative of the Sense of the Senate Resolution nor can they be expected to induce massive technological innovation. Indeed, there is strong reason to believe that the proposed framework will fail to get needed innovative technology up and running and out in the field when and where it is needed—Congress has already heard in previous testimony[1] given by Stanford University trained economist Anne Smith that a cap-and-trade program cannot stimulate massive technological innovation. Though this point must receive careful consideration, it is essentially ignored in the White Paper.

It is equally important that actions taken to address climate change not be carried out in isolation; rather, they must concurrently accommodate manifold other important issues—such as assuring the availability of an adequate energy supply over the long-term, providing for national and international security, and facilitating a smoothly operating global marketplace in concert with long-term sustainable development. In relation to the above expressed concerns, the U.S. Chamber believes that the White Paper will not suffice as an adequate framework for consideration of the climate change issue.

Moreover, the White Paper is built on a framework that is and will indefinitely continue to be muddled in controversy owing to conflict among competing interests, the inevitable intricacy of the proposed approach, and failure to provide a vision that accommodates the manifold needs of all the nations of the world and the global marketplace. In sum, the White Paper framework raises the looming prospect of having to depend on inefficient management systems of almost incomprehensible complexity and uncertainty. A greatly expanded dialogue must precede any legislative action, and this will take time to accomplish.

AVOIDANCE OF ECONOMIC HARM MUST BE ASSURED

The White Paper posits a cap-and-trade approach, but fails to address how serious economic harm can be avoided if the ceiling price on tradable carbon credits rises substantially, which over time, if the European Trading System is any indication, it surely will. Discussion of this matter must not be neglected. Some analysts[2] foresee carbon trading at $100/metric ton or more in some markets in the not too distant future—a mere matter of perhaps a decade—yet comprehensively addressing climate change in concert with all the manifold other pressing global issues will likely take a century or more.

One might argue that holding down the price of carbon credits will avoid economic harm. However, this is a hollow argument as it is an absolute certainty that long- and even mid-term maintenance of a low price cap on carbon credits cannot be assured. Simply put, holding carbon credits at a low price level will fail to stimulate deployment of carbon control/mitigation technologies. At a low carbon credit price, there is no incentive to deploy innovative technologies, because per ton of avoided emissions, the technologies are far more expensive than

[1] Prepared statement of Anne E. Smith, Ph.D., before the Committee on Energy and Natural Resources, United States Senate, Washington, DC, September 20, 2005.
[2] Grübler, A. "Managing the Global Environment," *Environmental Science and Technology* 2000, 34(7): 184A-187A.

the cost of low-priced emissions credits. For example, a recent analysis[3] performed at the Massachusetts Institute of Technology indicates that carbon capture and sequestration costs around $50-$100 per ton of avoided carbon emissions, will not work in all instances (presently available technology only works on some coal types), and in instances where it does work is not optimized and would, owing to capture and sequestration costs, result in a 50% or even greater cost of electricity to consumers. Who wants that? It would be far more advantageous to purchase low-priced carbon credits than to deploy such technologies.

It is therefore a virtual certainty that in a cap-and-trade regime, to encourage deployment of such expensive technology, the price of carbon would have to be allowed to rise to a much higher level. Let's not mislead the American public about this fact. It is disingenuous to speak of a low-price safety valve, as in short order it would prove to be a moving target that would inexorably rise to higher and higher ceiling levels. If it did not, greenhouse gas emissions control and mitigation would be minimal and needed technologies, to the extent that they are available, would not be deployed. This happenstance begs the question of what economic damage will be realized over time and at what level of lost U.S. competitiveness in the marketplace. The White Paper fails to address these issues. This is extremely worrisome with regard to protection of national interests, the cost of energy to consumers, and the strength of U.S. business and industry in the global marketplace.

As a further complication, safety valve price controls are a disincentive to technological innovation on a massive scale. Referring again to testimony[4] previously given to Congress by Dr. Anne Smith, note her observation that:

> *Even choosing a higher rate of escalation in the safety valve price would not provide a credible private incentive for R&D. This is because once new technologies are developed, the most attractive choice for a future government will be to let the price of carbon allowances fall to a level just sufficient to ensure those technologies' adoption. That carbon price will never be high enough to provide an adequate reward to those firms who invested in the R&D. This is because the large fixed cost of the R&D will be "sunk" by that stage of the game, and it will not be necessary for the government to pay it back ex post in order to induce those new technologies off the shelf and into the market place. So, here is the "Catch 22" we face: any announced future carbon price that is high enough to induce breakthrough R&D would not be credible; and any carbon price that is low enough to be credible will not be sufficient to induce breakthrough R&D.*

[3] David, J. "Economic Evaluation of Leading Technology Options for Sequestration of Carbon Dioxide" Ph.D. Thesis, Massachusetts Institute of Technology, May 2000; NB: A February 1, 2006 day-long "Clean Coal" seminar held at the Washington DC based think tank, Resources For the Future, strengthens these observations—refer to the following web site: http://www.rff.org/rff/Events/Clean-Coal.cfm, accessed February 27, 2006.
[4] Footnote 1, *Ibid*.

THE NEEDS OF DEVELOPING NATIONS MUST BE ACCOMMODATED

Developing nations such as China, India, Brazil, and Mexico will continue to expand their fossil-fuel dependent economies. By 2010, carbon dioxide emissions produced by transitional economies such as India and China, will surpass those of Europe and the United States combined, and their greenhouse gas emissions will inexorably continue to grow as their economies expand. In other words, absent some economically affordable, workable approach, globally, emissions are projected to continue at a rising rate far into the future.[5] Moreover, developing nations believe they have an indisputable right to grow their economies. Anyone who believes that India and China will agree to severely cut their use of fossil fuels and drastically curtail greenhouse gas emissions over the next two decades, and thereby place the growth of their economies in jeopardy, has a poor grasp of reality.

Among developing nations, as in the United States, it is generally recognized that whatever is done to address climate change must not be economically harmful. Developing nations see a mandatory cap on their allowable greenhouse emissions as unacceptable and have said so.[6] Unless affordable technology is available, the price of compliance with any emissions limit is seen as economically punitive, and this happenstance, developing nations will not accept.[7]

So far, this situation has prevailed and logically so for the reasons indicated above. The White Paper fails to adequately address this issue and has failed to provide any evidence that developing nations would willingly buy into what they see as an economically punitive, mandatory market-based greenhouse gas regulatory system. Yet, as greenhouse gas emissions are a global phenomenon, any approach aimed at their reduction must involve global cooperation. In addition, particularly as countries such as India and China will be major emitters in the near future, their participation in some productive manner toward addressing climate change must be assured. The White Paper fails to engage in a satisfactory consideration of how this might be achieved.

These observations aside, so far, measured against the framework of the White Paper, developing nations are effectively getting a free ride. This implies that if the federal government establishes a mandatory market-based greenhouse gas regulatory system predicated on near-term vision, the end result, given that developing nations will not follow a similar course of action, is that the U.S. will realize a marketplace disadvantage that will only worsen as the price of carbon credits rises. How is this good for American business and industry or the American consumer? Unless the White Paper takes full account of this economic disconnect, it will fail to measure up against the Sense of the Senate Resolution that the U.S. economy must not be harmed.

A further complication is that although business and industry stand ready to move available clean energy technologies into receptive markets, in many instances, such markets do not yet exist or are undersized or lack guarantees of structural and financial stability. Inter-governmental cooperation among partnering nations is needed, as this is a global issue of interest to developed and developing countries.

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[5] *International Energy Outlook 2005*, DOE/EIA-0484(2005), Energy Information Administration, Washington, DC, July 2005.
[6] Barrett, S. "Global Climate Change and the Kyoto Protocol," Chapter 15, *Environment and Statecraft: The Strategy of Environmental Treaty-Making* (Oxford University Press, 2003.
[7] *Ibid*.

Establishment of such marketplaces over the near- to mid- term in some instances, will first require negotiation of bilateral or multilateral agreements and implementation of robust financial and good governance arrangements. There must be fundamental agreements among partnering nations that, for example, protect monetary investments in deployed technologies and intellectual property rights, as well as assure implementation of governance structures that both facilitate and guarantee the commitments necessary for stable technology deployments. In formulating action time lines and accommodating fundamental differences, the individual capabilities and needs of participating nations must be taken into account and respected.

The good news is that while concurrent consideration of all these issues is a challenging problem, it is not one that is intractable. For example, the recently announced Asia-Pacific Partnership on Clean Development (APPCD)—whose benefits are essentially ignored in the White Paper—aims to frame these issues in concrete terms and to implement practical approaches to address them.

It is premature to forecast how the APPCD arrangement will influence innovative technology developments in the marketplace. The APPCD is in an early stage of development, needs time to firm up planned projects, and needs time to secure the increased involvement of international support institutions, such as the World Bank and International Monetary Fund. Marked absence of substantive discussion of this initiative in the White Paper constitutes a gross failure to comprehensively examine and assess all options to address climate change. Congress has acknowledged, for example in provisions of the Energy Policy Act (as discussed below), the importance of fostering technological innovation. Additional exploration and discussion of technological innovation must occur ahead of further legislative initiatives aimed at addressing climate change, and time must be allowed for this to take place.

TECHNOLOGY INNOVATION IS A CRITICAL NECESSITY

The White Paper observes: "Virtually all experts agree that significant technology advancements will be needed to adequately and affordably address climate change over the next century." The U.S. Chamber is in complete agreement that technological innovation is a critical necessity and that such innovation must occur over the long-term.

However, the U.S. Chamber does not believe that this issue can best be addressed through short term dialogue consisting of public comment to queries posed in the narrowly focused White Paper and limited, time-sensitive Congressional hearings on this issue. This is because experts also recognize that the scale of technological innovation is vast and will require over the long-term a huge expenditure of time, labor, and money.[8]

As noted previously, assurance of technological progress is also complicated by economic considerations—the difficulty of realizing an adequate return on R&D investment.[9] In addition, given the vast amount of resources that must be committed over the long-term, there are uncertainties about how to assure programmatic stability to technology innovation initiatives, as

[8] See: M.I. Hoffert, et al. "Energy Implications of Future Stabilization of Atmospheric CO2 Content" *Nature* 395: 881–884 (1998); and M. I. Hoffert, et al. "Advanced Technology Paths to Global Climate Stability: Energy for a Greenhouse Planet" *Science* 298: 981–987 (2002).
[9] Footnote 1, *Ibid.*

terms of political office are far shorter than the envisaged fifty- to one-hundred year time frame necessary for addressing climate change.

Further complexities exist. For example, there needs to be far more attention given to what technology pathways to pursue and how best to make efficient resource expenditures.[10] Other complications will arise as many competing technological innovators seek to become the priority recipients of allocated resources and benefits (such as favorable tax treatments). This matter too must be given careful attention.

Congress must also find an informative way to gauge (i.e., benchmark) technological progress. Without agreed upon benchmarks, it will be difficult to ascertain what is being accomplished and whether such accomplishments are occurring in an efficient manner. In addition, owing to the scale of a massive technological effort over a century-long timeframe, the management structure that guides it has the potential to be extremely complex, burdensome, and inefficient, with poor coordination of activities. How will harmony be established? Congress must take the time to examine this matter in great detail. The White Paper neither seeks nor provides any such insight about the long-term prognosis.

In framing consideration of technology in the context of the narrow focus of the White Paper rather than giving the issue far broader scope, the matter of technological need is marginalized—the White Paper primarily focuses on issues related to establishing a market-based system for carbon trading and on deciding how to allocate carbon credits. This approach fails to address the manifold technical and technological considerations noted in these comments.

Along with the legislative agenda for which this White Paper appears intended (i.e., providing a basis for introducing cap-and-trade legislation in this session of Congress) there seems to be the implicit conclusion that complex technological issues can be resolved in the short timeframe of this session of Congress. With all due respect, the U.S. Chamber does not believe that adequate consideration of long-term technological innovation can be satisfactorily accomplished in the timeframe of this session of Congress. While the technological opportunities established in the recently enacted Energy Policy Act of 2005 should be seen as a good first step, more attention is needed to comprehensively address this long-term issue.

DO NOT NEGLECT INTELLECTUAL PROPERTY

Perhaps the strongest argument for giving far more attention to technological innovation is that as the technology paradigm shifts over the forthcoming fifty- to one-hundred year timeframe, national economic prosperity will be heavily influenced by intellectual property ownership. If, for failure to engage in intensive technological innovation, the United States cedes intellectual property ownership to other countries, this could create significant marketplace positioning disadvantages.

As one example of this issue, recent reported success in producing almost perfect crystals of silicon carbide has lead to estimates that, in the future, the use of this material in control devices for power generation and distribution could eliminate the need to construct tens of billions of

[10] Footnote 8, *Ibid.*

dollars worth of new power plants.[11] Congress is well advised to take note that it was a Japanese research group that achieved the recent breakthrough in silicon carbide technology, not the United States.

NEED FOR A MORE COMPREHENSIVE VISION

The White Paper is an exercise in short-term vision. With regard to due consideration of likely impacts to the U.S. economy and to America's strength in the global marketplace, the framework approach discussed in the White Paper fails to provide a comprehensive consideration of the benefits and consequences of actions taken over the long-term. A far more comprehensive dialogue must take place.

This is not the time to be impatient or short-sighted. Climate change is simply too large and too complex an issue. Large-scale innovative technology development and deployment will require the expenditure of vast sums of money—perhaps trillions of dollars—over a fifty- to one-hundred year timeframe.[12] Taken as a whole, the vision that must emerge must be global, it must be long-term, and it must be far-reaching. The framework of the White Paper does not provide this vision.

Most importantly, it must be understood that climate change is a global issue and that any domestic legislation must successfully take this fact into account. Among other considerations, the necessary infrastructure for massive development of innovative technologies and for deploying them on a massive scale does not exist.[13] Moreover, in many countries, markets for these technologies do not exist.

Owing to its narrow focus on creating a near-term mandatory regulatory system, the White Paper fails to adequately address these issues. **The narrow focus of the White Paper is akin to searching for a silver bullet when in fact the search should really be for silver buckshot.** The former does not exist; the latter recognizes the nature of the target and of how to hit it. Far more creativity in planning a course of action than is laid out in the White Paper is advisable, particularly as the needs and capabilities of the nations of the world are many and varied. Simply put, the White Paper does not offer an approach that puts it all together.

To amplify understanding of the immense difficulty of formulating an effective strategy for addressing the climate change challenge, consider that to stabilize the atmospheric level of CO_2 at 550 parts-per-million (ppm)—roughly double what it was in pre-industrial times and substantially higher than the present level of about 370 ppm—could require having to generate as much as 30–40 terawatts (TW) of carbon-free power.[14] **That is three to four times the amount of power currently generated by all the fossil fuels in use in the world today**.[15] Such massive carbon-free power generation is not possible or feasible now because, as government and

[11] TR Editors, "A Carbide Revolution?" Technology Review (online); posted on the Internet, August 27, 2004 (1:15:12 PM) http://www.technologyreview.com/blog/index.asp.
[12] Kovacs, W. and Shaub, W. *Reality Check: Straight Talk About the Kyoto Protocol*, U.S. Chamber of Commerce, Washington, DC, 2005, http://www.uschamber.com/publications/reports/reality_check_kyoto.htm.
[13] Footnote 1, *Ibid.*
[14] Footnote 8, *Ibid.* [NB: One terawatt is one trillion watts.]
[15] *Ibid*.

academic scientists and engineers have demonstrated, existing technologies simply cannot provide this capacity, and needed innovative technologies do not yet exist.[16]

Given the apparent scale of the perceived climate change problem, major climate change interventions have the potential to be highly disruptive economically, particularly if implemented over a short time frame. Reported estimates of the costs of various fully deployed interventions are staggering, ranging from trillions to many tens of trillions of dollars or more, depending on to what extent the problem is to be fixed—one public official[17] has even suggested that, conservatively, the cost could approach one hundred trillion dollars. A recent article[18] appearing in *The Scotsman* reports that preventing global warming would cost the world economy roughly $18 trillion even under the most conservative assumptions.

The Bush Administration's Climate Change Technology Development and Deployment[19] Strategic Plan for the 21st Century indicates similar projections of cost impacts amounting to many trillions of dollars of incurred costs, depending on what greenhouse gas stabilization goal is sought and on what advanced technology scenario is pursued. Immense cost projections are what led to the recent Intergovernmental Panel on Climate Change Expert Meeting on Emission Scenarios conclusion that technological change is fundamental for (reducing) stabilization costs.[20]

Although these estimates of long-term capital outlays span a wide range, there is no doubt that the expenditure, whatever its precise amount, will be huge. Under these circumstances, climate policy built around a narrowly focused White Paper rapidly rushed through a tightly controlled vetting process that fails to allow time to take full account of long-term issues, such as are discussed above, appears highly inadvisable. It is simply not in the best interest of the American public. Resolution of these issues should not be forced for political reasons to fit a preconceived timeframe for introduction of climate change legislation in this session of Congress. A far more broad scope and lengthy debate must ensue, with allowance for much greater stakeholder engagement.

Adding strength to this assertion, it should be noted that many practical, real-world difficulties exist that constrain the global deployment of innovative technologies. In particular, many long-term capacity-building problems have not been addressed, yet they absolutely must be taken into consideration in order to create desired marketplace opportunities. Problems include the poor state of existing infrastructural, financial, governmental, and business environments within many developing nations, as well as internal political difficulties and lack of essential governance structures needed to facilitate and finance the successful importation and deployment of clean technologies.

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[16] *Ibid.*
[17] "But even in the most conservative estimate, it is a figure on the order of 100 trillion dollars. This is to say that it is three times more than the current world gross domestic product."—A. Illarionov, [former] Chief Russian Economic Adviser, remarks made during press conference, Alexander House, Moscow, Russia, October 3, 2003.
[18] Allister Heath, "Global Warming's £10 Trillion Cost" *The Scotsman*, August 2005 as posted at: http://business.scotsman.com/print.cfm?id=1821742005.
[19] Draft U.S. Climate Change Technology Program Strategic Plan, September 2005, as described at: http://www.climatetechnology.gov/stratplan/draft/index.htm.
[20] As cited in Footnote 19, *Ibid*.

BUILD ON EXISTING OPPORTUNITIES

Here and abroad, the business and industry sector is promoting clean technologies and taking action that will lead to the creation of innovative technologies not currently available. Key to getting these technologies to market is their development in a manner that assures their competitiveness in the global marketplace when and where they are needed. The recently enacted Energy Policy Act of 2005 contains more than sixty provisions that require the U.S. government to engage with the private sector to develop and deploy innovative energy technologies and to identify and take advantage of market opportunities for currently available energy technologies.

The Department of Energy aims to accelerate development and reduce costs of new and advanced technologies that avoid, reduce, or capture and store greenhouse gas emissions—the technology component of a comprehensive U.S. approach to climate change. The technologies developed[21] under the Climate Change Technology Program (CCTP) will be deployed among the United States' partners in the Asia-Pacific Partnership for Clean Development (APPCD) that was announced earlier this year by the Bush Administration. CCTP Director, David Conover, notes that the program's Strategic Plan provides a comprehensive, long-term look at the role for advanced technology in addressing climate change. It allows the U.S. and its partners to drive and capitalize on technological innovation far into the future. The APPCD, coupled with the technologies that will be developed, will have a significant impact in addressing this long-term challenge.

Current public-private partnerships include FutureGen, which is directed by the U.S. Department of Energy (DOE) and public-private initiative that will build the world's first and cleanest (zero emissions) integrated sequestration and hydrogen production research power plant over the next decade. Another DOE program, Climate VISION, assists industry efforts to accelerate the transition to practices, improved processes, and energy technologies that are cost-effective, cleaner, more efficient, and more capable of reducing, capturing, or sequestering greenhouse gases. Climate VISION links these objectives with technology development, commercialization, and commercial utilization activities supported by the private sector and the government. Within the transportation sector, the FreedomCAR and Fuel Partnership program supports pre-competitive, high-risk research needed to develop the transportation component and fueling infrastructure technologies to reduce the use of oil and minimize harmful vehicle emissions, without sacrificing freedom of mobility and vehicle choice.

Private entities as well have formed in-house programs that research, develop, and bring to market innovative energy technologies. For example, industry has spent millions of dollars in support of forest and other carbon sequestration projects that aim to promote carbon capture and storage in oceans, deep saline aquifers, abandoned coal mines, and other sites. Energy generation capacity at nuclear energy facilities, which emit no carbon dioxide, is being increased through

[21] The draft CCTP plan of action provides strategic direction and organizes about $3 billion in federal spending for climate change-related technology research, development, demonstration, and deployment, which is needed to reduce greenhouse gas emissions and power economic growth. This activity complements other efforts, including short-term measures to reduce greenhouse gas emissions intensity, advance climate change science, and promote international cooperation. The plan sets six complementary goals: (1) reducing emissions from energy use and infrastructure; (2) reducing emissions from energy supply; (3) capturing and sequestering carbon dioxide; (4) reducing emissions of other greenhouse gases; (5) measuring and monitoring emissions; and (6) bolstering the contributions of basic science to climate change. It outlines approaches toward attaining these goals, articulates underlying technology development strategies, and identifies a series of next steps toward implementation.

provisions in the Energy Policy Act that support the new construction of nuclear generation facilities. Industry has made long-term investments in renewable technology development, commercialization, and deployment, including wind and solar power, fuel cells, and increased energy storage capacity for intermittent power applications. Businesses are improving the efficiency of mining operations and are reducing carbon dioxide and methane emissions from mines.

Additionally, businesses are introducing new energy-efficient rail and other transportation technologies. Industry is reducing emissions of fluorinated compounds used in aluminum production. Highly efficient combined cycle energy generation system use is increasing. Methane emissions associated with the generation, transportation, and distribution of natural gas are being reduced. Indeed, the production of such alternative and advanced energy and fuel products, through the use of new technologies, makes oil shale exploration and production economically viable.

Over the next decade (near-term) and several following decades (mid-term) and beyond, it is critical to ensure the establishment of receptive global markets into which, where available, affordable clean energy technologies can be placed, when and where they are needed and, from a pragmatic point of view, it makes sense to use them.

Although business and industry stand ready to move available clean technologies into receptive markets, in many instances, such markets do not yet exist or are undersized. Inter-governmental cooperation among partnering nations is needed, as this is a global issue of relevance to both developed and developing countries. Establishment of such market places over the near- to mid-term in some instances, will first require negotiation of bilateral or multilateral agreements and implementation of facilitating financial arrangements. Moreover, there must be fundamental agreements among partner nations that, for example, protect monetary investments in deployed technologies, intellectual property rights, and that assure governance structures that facilitate and guarantee the commitments that are needed to make progress in technology deployments. In formulating action time lines, the individual capabilities and needs of participating nations must be taken into account and respected.

The good news is that while concurrent consideration of all these issues is a challenging problem, it is not one that is intractable. For example, the recently announced APPCD aims to frame these issues in concrete terms and implement practical approaches to address them. It is premature to forecast how this arrangement will influence clean energy technology market place development efforts, as the APPCD is in an early stage of development and, at a minimum, needs to firm up its organizational principles and identify early action projects. International finance organizations, such as the Export-Import Bank, Overseas Private Investment Corporation, and World Bank can help finance innovative technology development and deployment programs, and further commitments should be encouraged.

The APPCD was announced by the Bush Administration on July 27, 2005. Through it, the United States, Australia, China, India, Japan, and South Korea aim to accelerate clean energy technology development. The APPCD initiative focuses on voluntary, practical measures to create new investment opportunities, build local capacity, and remove barriers to the introduction of clean and more efficient energy technologies.

APPCD helps each country, consistent with its capabilities and needs, to implement nationally designed strategies for improving energy security, reducing pollution, and addressing the long-term challenge of climate change. It pursues a balanced approach to overcome poverty with policies that promote clean development, and it recognizes that action is needed to help developing countries adopt new energy sources and utilize clean energy technologies. Rapid, sustained economic progress of poor nations will lead to dramatic environmental improvements, and promoting technologies for generating energy that is clean, affordable, and secure is seen as a crucial pathway toward helping nations develop, while limiting pollution and improving public health.

The focus of the program is on cooperation to achieve practical results. It promotes the development and deployment of existing and emerging cleaner, more efficient technologies and practices that will achieve positive results in many areas. This includes energy efficiency, methane capture and use, rural/village energy systems, clean coal, civilian nuclear power, advanced transportation, liquefied natural gas, geothermal, building and home construction/operation, bioenergy, agriculture/forestry, hydropower/wind, and power/solar power. The actions contemplated recognize that addressing climate change requires sustained action over many generations by both developed and developing countries. As regards fostering the implementation of desired energy technologies, this undertaking has the potential to enable developing nations to leapfrog forward and deploy more advanced options for energy production than would otherwise be available or affordable.

In sum, over the long-term (a century or more), recognizing the monumental scale of the climate change challenge, it is important to bring about heightened efforts and commitments to support and carry out a massive program among the United States and partnering nations to develop and diffuse throughout the world innovative technologies that are not now available.

The July 6-8, 2005 Gleneagles G8 communiqué acknowledges the importance of climate change and provided an agreement to act toward addressing it.[22] Numerous provisions of the recently passed Energy Policy Act of 2005 address energy technology innovation. In sum, what the G8 communiqué, the Energy Policy Act Of 2005, the Sense of the Senate Resolution on Climate Change, and the Asia Pacific Partnership on Clean Development all have in common is a sense that economic dislocations or loss of competitiveness must be avoided, a recognition that the issue is global in scope, and that innovative energy technologies are key pillars of successful measures aimed at improving energy security, reducing pollution, and addressing the long-term challenge of climate change. To accomplish these objectives, it will be crucial to ensure a strong and sustainable global economy. In contrast, the White Paper aims to provide justification for rushing through Congress a narrowly focused piece of domestic legislation that lacks global scale as well as long-term vision and reach.

BENCHMARKS NEEDED

The United States and its international partners recognize that there is a need to carefully examine what can be achieved with practical uses of existing technologies and massive, long-term technological innovation. The challenge that remains is to find a way to integrate this

[22] The G8 group of nations includes: Japan, Italy, Canada, France, United States, United Kingdom, Germany, and Russia. Russia assumes the presidency of the G8 in 2006.

recognition into sensible policy and pragmatic actions that create viable market place opportunities. Developed and developing nations of the world must ensure the following:

- However the climate change challenge is defined, the way in which it is tackled must successfully and concurrently address all the myriad other issues about which there are significant concerns. This includes concerns about issues such as national and international security, protection of intellectual property, energy availability, environmental protection, sanitation, poverty reduction, and facilitating sustainable economic growth throughout the world.

- Any policy that addresses the climate change issue must be practical, not economically disruptive, and must work both here and abroad.

- Both developed and developing nations must have roadmaps and benchmarks for innovative technology development and deployment that lay out time frames and directions for research and development and aid policymakers in planning necessary monetary and other resource outlays.

- Expenditure of the requisite large sums of money and other resources needed for developing and deploying innovative technology must be focused on achieving the most beneficial gains over the long-term. This will require the involvement of all the nations of the world, consistent with their own individual capabilities and needs.

- Good and efficient use must be made of international financing mechanisms that are available for facilitating innovative technology development and deployment programs, such as are likely to be initiated in the context of the Asia-Pacific Partnership for Clean Development.

- Over the next decade and several following decades, it will be important to facilitate the establishment of receptive, stable markets into which, where available, affordable clean technologies that are available can be placed, when and where they are needed, and, from a pragmatic point of view, it makes sense to use them.

- Over the long-term (a century or more) recognizing the monumental scale of the climate change challenge, it will be important to bring about heightened efforts and commitments to a massive program among the United States and partnering nations to develop and diffuse throughout the world innovative technologies that are not now available.

The U.S. Chamber of Commerce is a leader in the effort to promote sensible development and deployment of clean and innovative energy technologies. Chamber engagement on the issue involves consultations with key policymakers and government officials both here and abroad, as well as with the Chamber's membership, the general business community, and through meetings, conferences, workshops, and educational and media outreach.

U.S. Chamber initiatives are exemplified most recently through its *Energy Technovations* conference, a high level meeting of senior business leaders, government officials, energy technology innovators, and the media. This conference highlighted forward trends in the energy industry, previewed new energy systems applications, and forecasted future energy technology

innovations. Undertakings such as this provide crucial educational outreach to today's policymakers and news media, enabling business and industry to show what is possible now and what will be possible in the future. The U.S. Chamber continues to commit resources to ensure that new energy technology opportunities are consistently brought to the attention of public policy decision makers.

Such activities within the business and industry sector are absolutely essential. It is widely recognized that the Kyoto Protocol cannot address the climate change challenge. Even if it were fully implemented and enforceable (which it is not—there is no enforcement mechanism with binding consequences), the overall level of greenhouse gases in the atmosphere will inexorably rise dramatically due to expansion of the world economy. Many countries committed to meeting modest greenhouse gas emission limitation targets under the protocol are now finding that accomplishing even initial modest goals is a task easier said than done. For the reasons stated above, the framework established in the White Paper will not rectify this situation and a much broader and lengthier deliberative process must ensue.

The U.S. Chamber thanks you for the opportunity to comment. Please feel free to contact me if you have any questions or require additional information.

Additional Topics
Submitter's Name/Affiliation: United States Conference of Catholic Bishops

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

See attached letter (PDF file).

Additional Topics
Submitter's Name/Affiliation: Donna Wysokenski

If there is an additional topic related to the design of a mandatory market based program that you would like to address, please submit comments on this form.

Donna Wysokenski, MS, MA Candidate in Environmental Science and Policy
Clark University,
Worcester, MA 01604

Dear Senators,

Whatever the specific details of the mandatory plan, it is critical that a system to reduce greenhouse gas emissions needs to be put in place very soon. Human-caused emissions of heat-trapping gases are contributing to rising global temperatures and negatively impacting health, economy, and the environment. In order to avoid the worst consequences of global warming, we need to act now to reduce our emissions.

The urgency for taking action on global warming is clear. As the national academies noted, "carbon dioxide can remain in the atmosphere for many decades. Even with possible lowered emission rates we will be experiencing the impacts of climate change throughout the 21st century and beyond. Failure to implement significant reductions in net greenhouse gas emissions now, will make the job much harder in the future."

I urge you to create an effective mandatory plan as soon as possible.

Sincerely,

Donna Wysokenski