Testimony of Dr. Jonathan Pershing

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

I am very pleased to be here to speak to a critical issue, and one which I am very glad you are considering: the link between climate change and energy security. Both are among the most pressing challenges faced by the world – and I believe their solution offers a major opportunity for the United States to assume a role of international leadership.

Meeting growing global energy needs while avoiding environmental damages – most particularly those related to increasing greenhouse gas emissions and the impacts of global climate change – will be a daunting challenge. In many cases, however, policies to address both problems are aligned. Thus, for example, policies to increase energy efficiency, which reduces energy demand as well as greenhouse gas emissions, and policies to promote renewable energy, which diversifies energy supply and provides non-emitting electricity, act to address both challenges.

Unfortunately, not all energy solutions behave so optimally. Some fuel choices may increase energy security, but also increase environmental damages (expansion of conventional coal is a good example). Others may reduce greenhouse gas emissions, but – at least with present technology – create security risks (such as the disposal of nuclear waste, or the risk of terrorist use of fissionable materials).

It is clear that a policy that addresses only one of these intertwined issues will not be successful. We must address environmental aspects of energy security, and the energy security implications of environmental protection. This can be done through price signals that place a value on greenhouse gas emissions, through policies that support energy efficiency, and through the support of new, clean technologies – both in the US and in the other OSCE countries – that lead to a safe and secure, diversified energy supply.

A Climate Change and Energy Security Framework

In the fall of 2007, WRI teamed with the Center for Strategic and International Studies to explore the intersection between energy security and climate change. A first report from this partnership was released in February 2008, "Managing the Transition to a Secure, Low-Carbon Future." That paper is attached as an Annex to this testimony

The report introduces a set of guiding principles for developing and evaluating policy options for an energy-secure, low-carbon future. These principles fall into two categories: effectiveness and political feasibility.

In short, the effectiveness criteria call for policies to:

- Be global and integrated, noting that no single country can "solve" either the climate or the security problem alone;
- Promote but not depend on technological breakthroughs, recognizing that technology can (and will) change, but that actions can be taken with current technology, and waiting for new solutions will, through inaction, exacerbate the problems;
- Apply to a robust range of future scenarios and adjust to evolving circumstances, understanding that our best projections of future energy and environmental constraints are likely to be in error, and that effective policies will need to be adaptable to be successful.

Simultaneously, policies must be politically feasible. This means that they must:

- Be developed with multiple time horizons in mind. A policy that meets only today's political needs may not last over the longer term – and conversely, one designed only for the year 2100 may have little impact on current problems.
- Recognize costs. No policy will be free. The costs of capital for investing in new technologies and in paying for environmental protection may all be substantial. However, these must be compared against the costs of inaction: absent action, climate change damages are projected to be well over five percent of global GDP, while the costs of energy insecurity include blackouts, high oil prices, and a decline in public welfare.
- Be carefully integrated with other political priorities. Thus, for example, policies that sought to promote biofuels initially had multiple objectives: they were intended to promote energy security as well as reduce greenhouse gas emissions. Unfortunately, they also have had a significant impact on food prices, and the associated agricultural practices have led to increased nutrient loading and declining water quality, as well as soil erosion. Such unintended consequences, while difficult to forecast, can only be prevented with careful and thorough integrated policy assessments.
- Create space for development needs. The climate agenda is one that can only be solved with ALL countries participating – including large developing nations that still have 1/10 or less the per capita emissions of the developed world – and that furthermore, in some cases do not even have supplies of energy adequate to power a single light bulb for millions of citizens. A policy framework that does not satisfy these development concerns will likely be rejected internationally – and thus will solve neither the energy nor the environmental challenges.

While much of the emphasis on security for this hearing focuses on energy, it should also be noted that there are broader, and potentially even more serious security concerns related to climate change. One of the expected impacts of global climate change is increased population migration and conflict over natural resources, particularly water. For example, in Kenya, over 10 million people live in arid and semi-arid areas, and over 60 percent of the population lives below the poverty line. Kenya is already seeing increasing population pressures, overgrazing, and recurring conflicts between pastoralists and farmers, factors that have contributed to its recent violence and political turmoil. These conflicts will be further exacerbated by climate change, which is expected to bring increased frequency and severity of both floods and droughts.[1]

[1] Government of Kenya (2002). *First National Communication to the UNFCCC*.

Migrations from Africa and Asia into the OSCE region are likely to exacerbate tensions – both within the region, and between the OSCE countries and their neighbors. Conflicts such as these raise security concerns throughout the globe and further demonstrate the urgent need to address the world's changing climate.

Achieving Greater Energy Security *and* Environmental Protection

Energy security and environmental goals need not be at odds. Improvements in energy efficiency and reductions in energy demand provide a "double win," reducing pressure on energy sources as well as reducing greenhouse gas emissions and other pollution. Some supply measures provide the same double advantage. For example, lower-carbon energy sources such as wind, solar, biomass, and hydropower provide domestically produced energy that can substantially reduce emissions compared to fossil fuels.

On the other hand, some supply-side measures present conflicts between energy security and climate goals. Many domestic fuel options (e.g., oil shale, oil sands, and extra-heavy oil deposits) result in higher carbon emissions than traditional resources. Likewise, climate change strategies that replace high-carbon fuels with lower-emitting energy sources can decrease energy security. Switching from coal combustion to natural gas in the power sector is an effective means to reduce GHG emissions. However, many regions import a large fraction of their natural gas. For instance, Europe relies heavily on natural gas imports from Russia, which holds almost 30% of the world's natural gas reserves (Iran ranks second).[2] Approximately 40% of Europe's natural gas imports come via pipeline from Russia. As much as 30% of Italy's overall consumption of natural gas and over 40% of Germany's are provided by Russia, putting them at risk should Russian supplies become unstable.[3] Unsurprisingly, the European Union lists diversification of energy sources and a new treaty framework for energy cooperation with Russia as key energy priorities alongside its emissions reduction goals.[4]

The key is to approach energy and environmental policies from a perspective that integrates these two concerns, rather than treat them as separate goals that might pull in opposition to each other.

In July 2007, WRI analyzed the energy security and climate change impacts of a variety of energy measures, with energy security defined to include sustainability as well as traditional aspects of sufficiency, reliability, and affordability. The analysis found several options with positive energy security and climate characteristics, but also some options that helped one issue and hurt the other. A "bubble chart" (Figure 1) was developed to inform the policy choices under consideration, placing each energy option on the graph according to positive or negative impact on each of these issues. [5]

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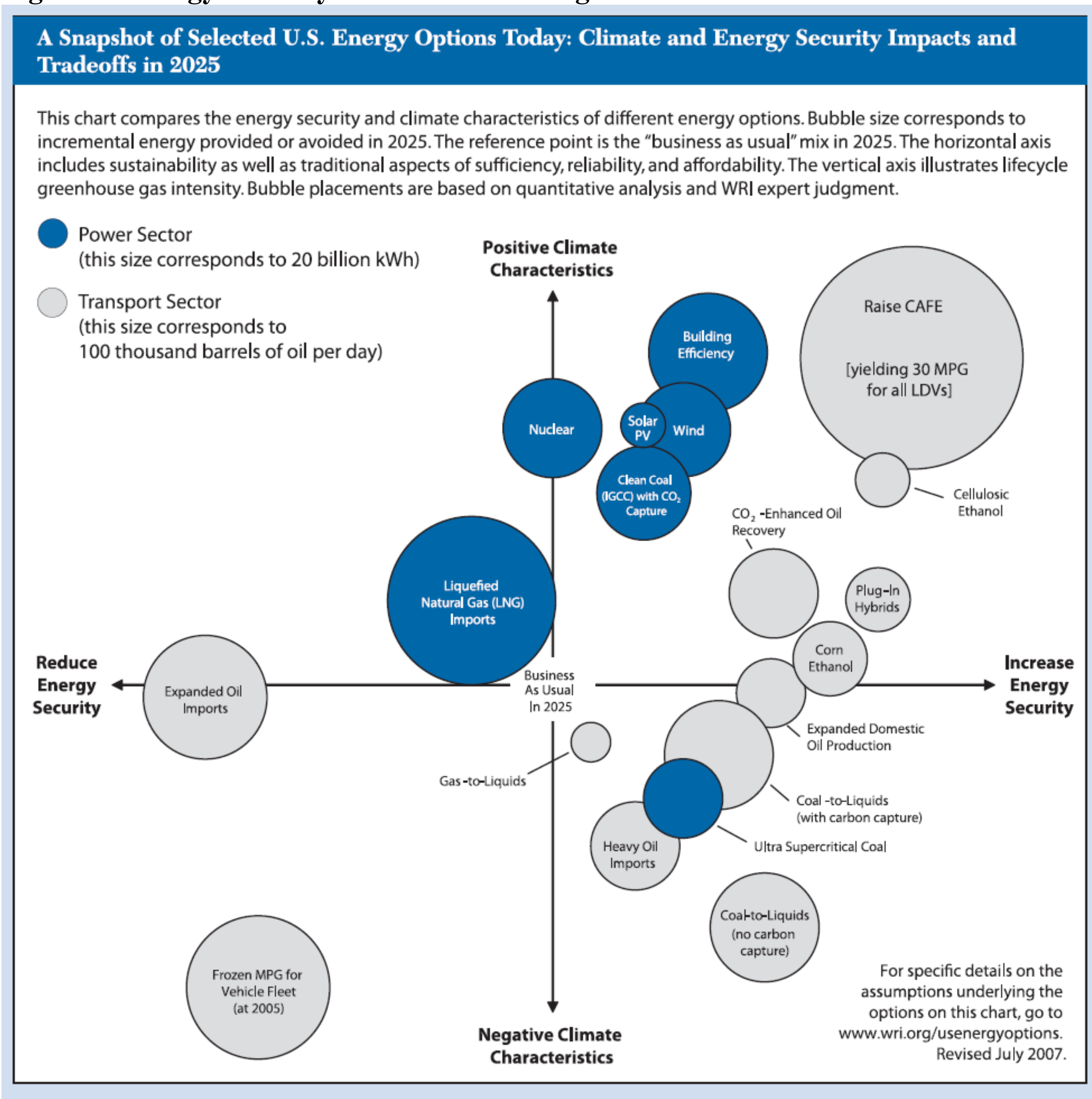
[2] EIA International Energy Outlook 2007
[3] BP Statistical Review of World Energy June 2007
[4] BBC News, March 9, 2007. http://news.bbc.co.uk/2/hi/europe/4783996.stm
[5] Jeffrey Logan and John Venezia (2007). *Weighing U.S. Energy Options: The WRI Bubble Chart*, Washington, DC: World Resources Institute.

Figure 1. Energy Security and Climate Change Tradeoffs in the United States

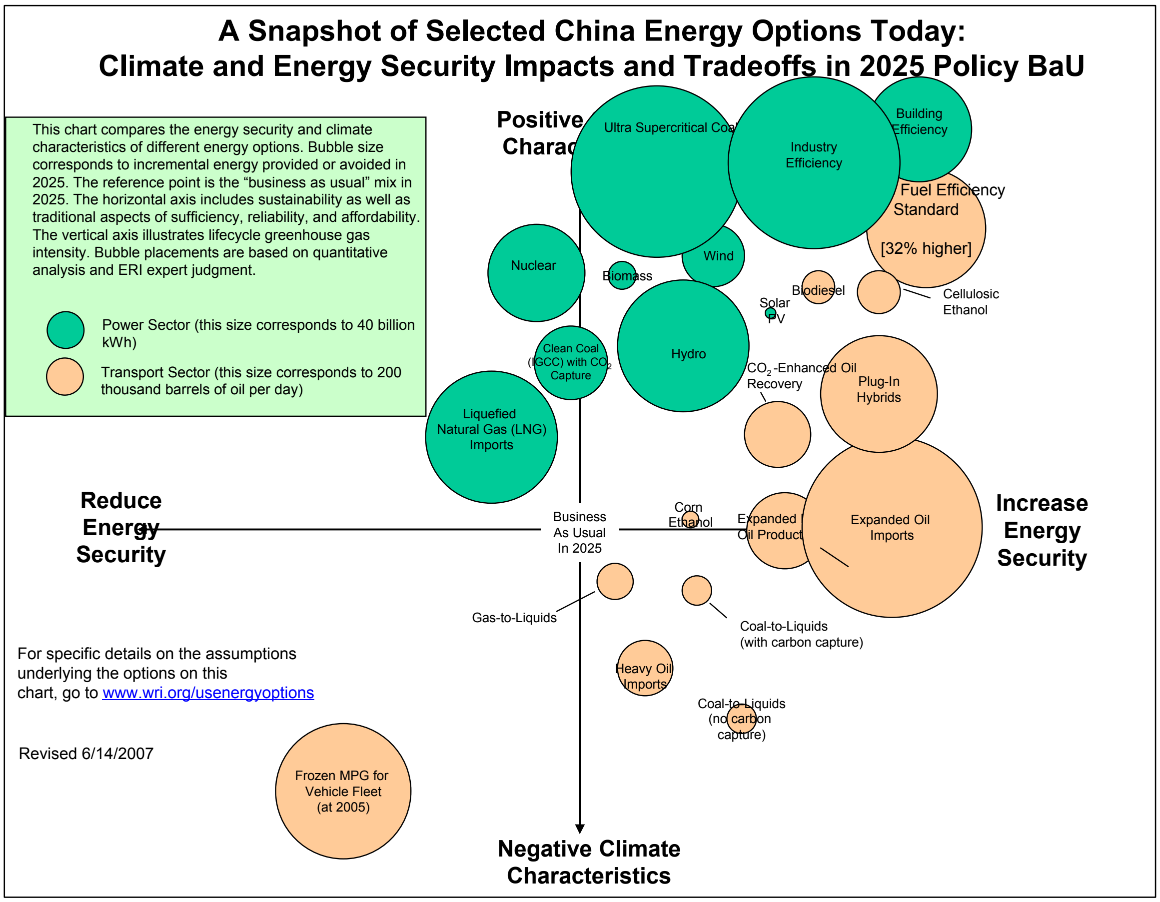


Unsurprisingly, efficiency measures and renewable energy supplies fare well on both of these scales. Carbon capture and storage associated with advanced coal plants provides security and climate benefits as well, as it allows the use of domestic coal supply without the greenhouse gas emissions typically associated with the fuel. Emission-free nuclear power scores high for climate characteristics, but does not necessarily improve energy security. Global uranium reserves are just as unevenly distributed as oil and natural gas, meaning that for many countries securing adequate supplies of uranium requires importing. In addition, difficulty in disposing of depleted uranium and concerns about nuclear proliferation can mean that nuclear power is actually less energy secure in some regions than traditional fossil-based power generation.

Applying a Joint Environmental and Security Framework to Developing Economies

A similar approach to linking climate and security can be applied to developing countries. In some ongoing work being jointly undertaken by WRI and the Energy Research Institute of the National Development and Reform Commission of China, a similar "bubble chart" was prepared for China by Dr. Jiang Kejun (see Figure 2).

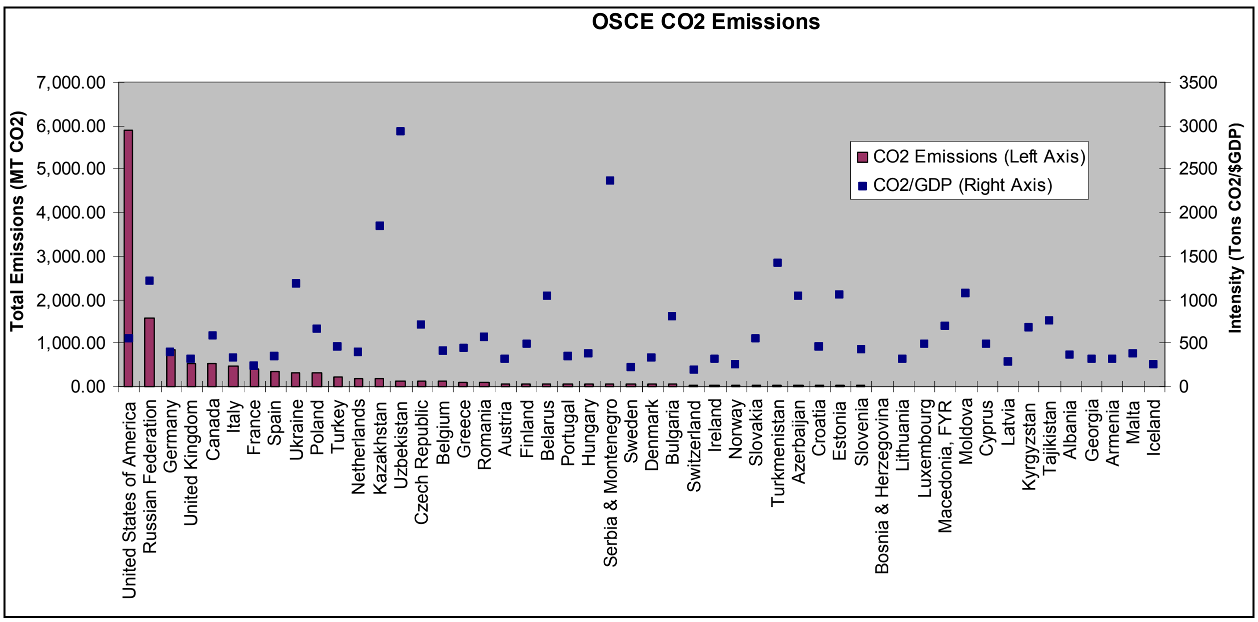
Figure 2. Chinese "Bubble Chart"



Many of the options proposed for US policy apply equally to China – which surpassed the US as the world's largest greenhouse gas emitter in 2008, according to the International Energy Agency – and is becoming an increasingly large player in global energy markets. Freezing fuel efficiency standards is a poor choice for both countries, just as promoting plug-in hybrids is a good one for both. However, some key differences also emerge: China is currently looking at the need to continue to find oil to fuel its extraordinarily rapid growth – and this is increasingly being found with imported fuels. Thus, whereas for the United States, expanded oil imports show up as a negative on the security axis, for China, diversification of supply through imports shows up on the positive side; their alternative is domestic shortfalls. As on the US chart, these imports are seen as climate neutral, due to uncertainty over the liquid fuel that would otherwise be used as a substitute.

Another element may apply to developing countries (particularly the emerging economies in the OSCE region): that of energy intensity. As seen in Figure 3, there is a bimodal distribution in the greenhouse gas intensity of economies. The US, Canada, and most of Western Europe is relatively efficient, producing substantially greater national wealth for every unit of GHG emissions. Conversely, many of the countries in the former Soviet Union are much more GHG intensive. This is a function of older and less efficient equipment, sustained lack of market pricing for energy, and inadequate institutions. While making the transition to a more efficient economy will continue to create dislocations, the long term effect will be not only reduced emissions, but a more globally competitive commercial and industrial sector. However, the transition will clearly be difficult; as competition increases, there will be a tendency to defer needed infrastructure investments that will be required – both to assure long term performance, and to meet environmental and energy security goals. Policies that promote energy efficiency, including provisions of training and capacity building programs for these countries, should thus be part of the GHG and energy security solution.

Figure 3. GHG Emissions and Intensity in OSCE Countries, 2004



Source: WRI, CAIT

Policy Recommendations for the United States

This testimony has sought to provide a broad overview of criteria for aligning environmental and energy security policy. U.S. policymakers have a variety of opportunities to incorporate these principles into upcoming legislation, as well as into deliberations within the OSCE itself. Several of those policy options are discussed below.

Cap-and-trade legislation

There is a widespread consensus that capping GHG emissions will require a price signal to the market. Furthermore, the scientific consensus suggests that the cap must be quite stringent: to avoid substantial climate related damages, US (and global) emissions must be reduced by approximately 80 percent by 2050.

A number of bills have been introduced for discussion in various Congressional committees that seek to set such caps. Perhaps the most advanced of these is S.2191, The Climate Security Act of 2007, introduced by Senators Lieberman and Warner, which was passed out of the Senate Environment Committee late in 2007. That bill would set a cap, and allow the trading of permits to meet it at a reduced cost to the economy. The bill would also provide a new source of revenues to invest in building infrastructure and capacity for a more secure energy future. According to the Department of Energy's recent analysis of S.2191, estimates are that several trillion dollars in revenue would be raised over the next 22 years from the auction of emissions allowances.[6] This compares favorably to the International Energy Agency's projections for US energy investment – which over the same time period will necessitate approximately $5 trillion in investment. Revenues could in part be used to diversify the nation's energy supply, from funding research, demonstration, and deployment of carbon capture and storage and renewable energy projects, as well as investing in programs to encourage energy efficiency and demand reduction. In addition to auction revenue, allowances themselves could be set aside from the general pool and given to entities for these purposes.

Decisions on how to allocate revenues could be applied using the guidelines outlined above. Thus, in meeting the test for effectiveness, revenues should be spent on programs that meet both energy security and environmental goals. Programs should be designed to promote technological breakthroughs, as well as building on currently available technologies in areas such as energy efficiency, renewable energy and capture and storage. Secure long-term funding from auction revenues can help address the long-term time horizon of the climate change problem – while assuring that adequate investment is made in alternative energy technologies that will power our future economic growth. Finally, recognizing the national and global context of both energy security and climate, a portion of the proceeds should be set aside for international action – supporting joint technology development, as well as critical capacity and institution building.

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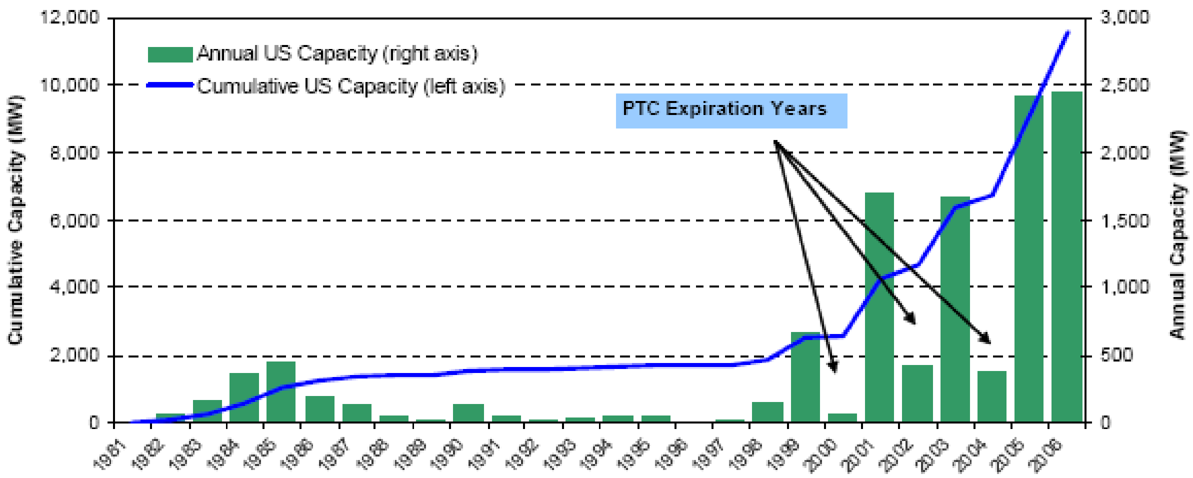
[6] Energy Information Administration, U.S. Department of Energy, "Energy Market and Economic Impacts of S. 2191, the Lieberman-Warner Climate Security Act of 2007," April 2008.

Fiscal legislation

A production tax credit (PTC) has proven extremely influential in the deployment of renewable energy in the United States, but for a variety of reasons, this provision is typically only enacted for a few years at a time. This intermittency has added considerable uncertainty to the market; a consistent policy signal could be far more effective. Research conducted at the Lawrence Berkeley National Laboratory (LBNL) suggests that a longer-term extension of the PTC could drive the installed cost of wind power down by 5-15% relative to a continuation of the present cycle of 1- to 2-year extensions (see Figure 4).[7]

Figure 4. U.S. Wind Power Capacity, Annual and Cumulative



Source: LBNL

As with a cap and trade program, extending the PTC meets the effectiveness criteria described above. The US has the largest total energy demand of any country in the world. Efforts to change US energy policy thus have global effects – decreased US demand improves both global energy security and reduces GHG emissions. Furthermore, an aggressive US renewable energy technology policy would stimulate the development of the new technologies that can subsequently be profitably exported internationally, leading to additional reductions in both global energy demand and GHG emissions. Finally, the PTC is technologically neutral – it does not pick a winner, but allows the market to choose. It is thus inherently robust against future scenarios and evolving circumstances.

A similar story emerges from a consideration of the political feasibility criteria. The PTC integrates multiple priorities. Not only are climate and energy security promoted, but increased use of renewable energy provides for new jobs, and leads to improved air quality.

[7] Wiser, R. "Wind Power and the Production Tax Credit: An Overview of Research Results," Testimony to Senate Finance Committee, March 29, 2007.

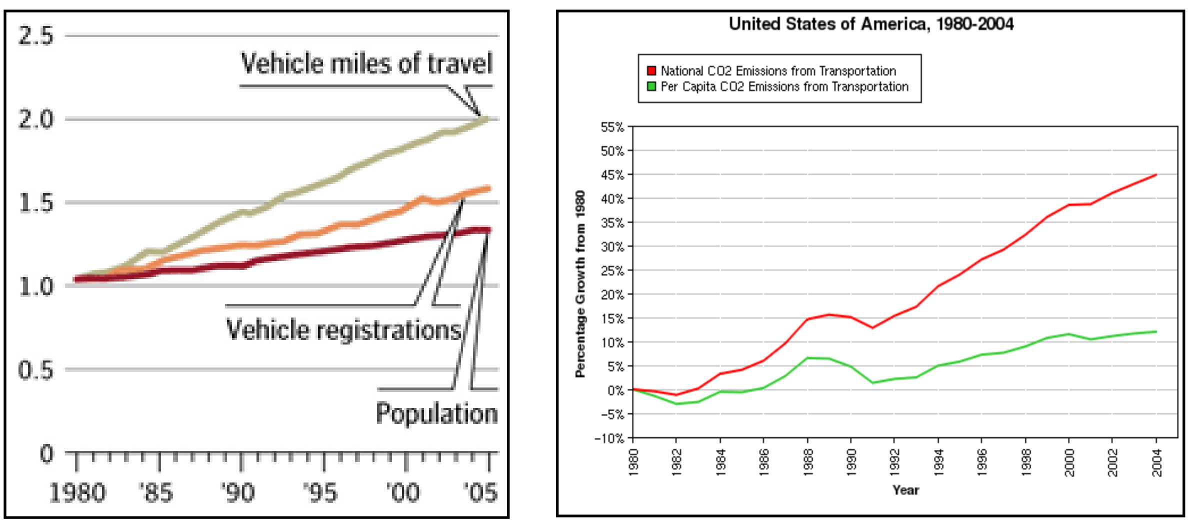
Transportation legislation

The most recent federal surface transportation bill, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), was enacted in 2005 and authorizes highway and transit funding through 2009.[8] As federal transportation legislation is reexamined over the next year, policymakers have the opportunity to ensure that climate change is included as a key consideration in defining spending priorities, both in terms of the impact that transportation use will have on U.S. greenhouse gas emissions, as well as the impact that climate change will have on the country's transportation infrastructure.

Historically, the focus of US transport policy has been on vehicle efficiency, and to a lesser extent on fuels. As can be seen in figure 5, the past 25 years has seen an increase in vehicle numbers and perhaps more importantly, an increase in the number of miles traveled. These have led to a significant increase in GHG emissions associated with transport, which the recent proposals for increased vehicle efficiency are only slightly damping.

Figure 5. (a) Growth in population, vehicle registration, and vehicle miles traveled, US, 1980 – 2005, 1980 index = 1. (b) US GHG emissions from transport 1980- 2004

(a) **(b)**



Source: Washington Post, May 1, 2008

Source: WRI, CAIT

Applying the criteria for aligning climate and energy security, a number of options emerge. Effectiveness criteria suggest that policies will be needed not only in vehicle efficiency, but also in fuel source (e.g., including plug-in hybrids, and possibly second generation, cellulosic biofuels), but also in solutions to promote reductions in vehicle miles traveled (e.g., through urban development initiatives, public transit programs, and other "smart growth" policies).

[8] Federal Highway Administration, U.S. Department of Transportation, http://www.fhwa.dot.gov/safetealu/index.htm

While technologies may be promoted in the US, such efforts are likely to have application globally – with US technology exports to the EU and other OSCE countries a clear opportunity. Managing the costs of such policies will be critical: while there may be near term costs in policy implementation, the longer term benefits are likely to be worthwhile. We are already witnessing a huge increase in fuel prices in the US. Policies initiated (or avoided) decades ago, that have stimulated only limited improvements in vehicle efficiency, and have led to increasing the distances that people travel for work, errands and leisure, have created a problem that only long-term steady policy efforts will reverse.

Biofuel legislation

The House and Senate are currently negotiating provisions for the 2008 Farm Bill, providing lawmakers an opportunity to craft biofuels subsidy provisions that support both energy security and environmental goals. These provisions will offer Congress an opportunity to revisit the existing biofuels policies enacted as part of the Energy Bill of 2007. While ethanol is seen by many as a way to increase energy security by producing more of the nation's transportation fuel domestically, its environmental impacts can vary widely depending on the crop used to produce the fuel and the method of production. In a study published by Tim Searchinger at Princeton University in February 2008 in Science, it was suggested that biofuels from corn would have even higher GHG emissions than gasoline, due to the land-use changes that can result from increased agricultural production (see Figure 6). Furthermore, recent evidence suggests that the increase in US production of ethanol has led to a major decrease in available corn and other grains for food (see Figure 7).

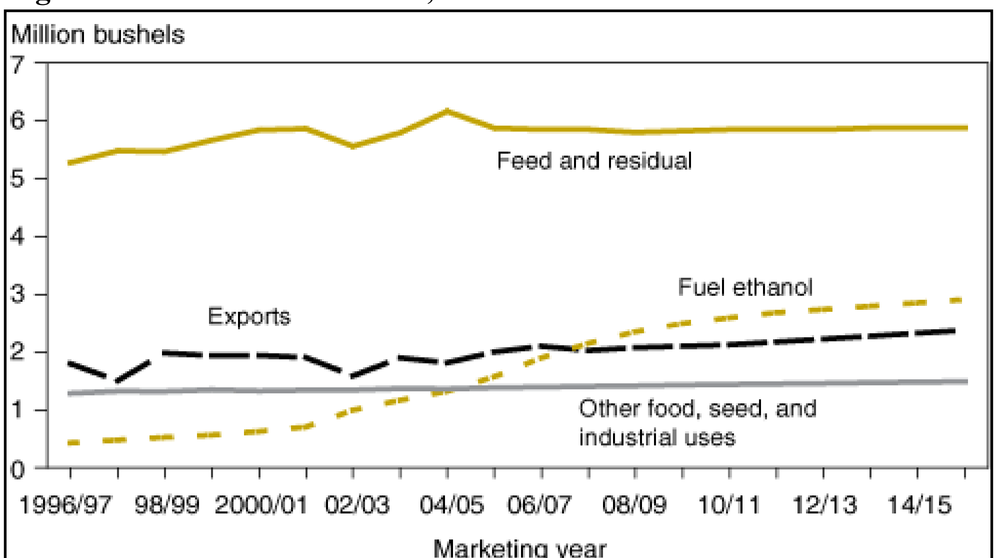
Figure 6. Comparison of GHG Well-to-Wheel Emissions by Stage from Gasoline and Ethanol-Fueled Vehicles – Grams (CO_2 equivalent) Per Kilometer Driven

	Making Feedstock	Refining Fuel	Vehicle Operation (Burning Fuel)	Net Land Use Effects		Total GHG	Change in net GHGs vs. Gasoline
				GREET Feedstock Uptake Credit	Land Use Change		
Gasoline	11	47	220	0		278	
Pure Corn Ethanol	72	121	215	-188		221	-20%
Corn Ethanol with Our Land Use Change Emissions	72	121	215	-188	316	536	93%
Biomass Ethanol	29	26	215	-188		83	-70%
Biomass Ethanol with our carbon charge	29	26	215	-188	336	418	50%

Source: Calculated with GREET 1.7(4) using default assumptions for 2015 scenario. Gasoline is a combination of conventional and reformulated gasoline. Ethanol emissions remove emissions of 15% gasoline from E85 fuels. GREET assumes 7.15 km/liter for ethanol (and rates for gasoline adjusted for higher energy content). The table deletes from Making Feedstock column the GREET 2.5 grams/km estimate of emissions from land conversion for corn ethanol but includes credit for direct soil carbon gain by switching cropland to switchgrass. Land use change emissions are amortized over 30 years. The land use change estimate for biomass assumes switchgrass produced on average-yielding U.S. corn fields, at 18 MT/ha (*S33*) without feed by-product. Numbers in columns may not sum due to rounding.

Source: Searchinger, et. al. *Science*, 2008.

Figure 7. US Corn Production, 1996 – 2015



Note: Feed and residual corn use is calculated by subtracting the other three categories plus ending stocks from total supply. Thus, the term "residual" refers to a statistical residual. Corn used in ethanol production is accounted for in fuel alcohol use. Distillers grains, a coproduct of ethanol production, are not accounted for in the balance sheet for corn.

Source: USDA agricultural projections.

Again using the criteria set out above, several policy choices emerge. Under the effectiveness criteria, it would be appropriate to use agricultural policy to steer biofuels incentives in an environmentally sound direction by supporting cellulosic ethanol over ethanol produced from corn. A more general solution – and one that would also help meet the robustness test, would be to offer support in proportion to the actual benefits achieved, such as life-cycle reductions in carbon emissions. This will require not only the elaboration of robust methodologies for calculating lifecycle emissions of biofuels, including the indirect land-use change impacts, but also the consideration of policies that promote technological breakthroughs: current commercial technology is not yet available to produce reduced-GHG ethanol from cellulose at competitive prices.

The political feasibility tests should also be applied, in particular those related to integrating biofuels policy into other political priorities. Promoting a fuel solution that simultaneously leads to a shortfall in food is clearly counter-productive. A coherent, multi-sector review of biofuels should be undertaken, and be made a pre-requisite to moving forward to further develop biofuels options. Such a review should consider not only food prices, but also forest practices (a potential downside of moving to cellulosic ethanol), nutrient loading, and soil and agricultural practices – any of which could fully offset the potential benefits from such a policy

Conclusions

Addressing the dual challenges of energy security and climate change while balancing economic, social, and political trade-offs will not be easy or without costs. However, by crafting policies that integrate these concerns, energy measures that advance both our broader environmental and energy security goals can be promoted and scaled up throughout both developed and developing economies. The criteria outlined here provide a guide to doing so.

Thank you for your attention. I look forward to answering any questions you may have.