Testimony before the United States Senate
Committee on Environment and Public Works
Honorable Barbara Boxer, Chairman

On global warming issues in the power plant sector

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Before the Senate Committee on Environment and Public Works

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Thank you, Chairman Boxer and members of this committee for inviting me to testify today on global warming issues in the power plant sector.

I offer the following points for your consideration as the committee deliberates on global warming policy.

I. Global warming policy is not risk free.

There is a tendency in the global warming debate to see peril and risk only in mankind's enhancement of the greenhouse effect and to view global warming policy as risk free. However, there are risks on both sides of the ledger.

A thought experiment suggested by columnist Jonah Goldberg spotlights the often-neglected risks of global warming policy.[1] Goldberg writes:

> Earth got about 0.7 degrees Celsius warmer in the 20th century while it increased its GDP by 1,800 percent, by one estimate. How much of that 0.7 degrees can be laid at the feet of that 1,800 percent is unknowable, but let's stipulate that all of the warming was the result of our prosperity and that this warming is in fact indisputably bad (which is hardly obvious). That's still an amazing bargain. Life expectancies in the United States increased from about 47 years to about 77 years. Literacy, medicine, leisure and even, in many respects, the environment have improved mightily over the course of the 20th century, at least in the prosperous West.

To this list of achievements we might add the near quadrupling of the human population combined with substantial long-term increases in global per capita food supply.

Here's the thought experiment. Suppose we had the power to impose carbon caps or taxes on previous generations. Assuming, again, that all global warming in the 20th century was due to economic activity, how much global growth would you be willing to sacrifice to avoid how many tenths of a degree of global warming? Would we be better off today if the 20th century had half as much warming but also half as much growth? I doubt anyone on this committee would answer "yes." Had there been only half as much growth, millions of our brethren today would not even exist, and the lives of millions more would be nasty, poor, and short.

This should make us a bit circumspect when evaluating cap-and-trade proposals and other global warming initiatives. Global warming policy has a high *potential* to restrict future growth, because ours remains very much a fossil-energy-dependent civilization. In fact, demand for fossil energy worldwide is increasing. The Energy Information Administration (EIA) projects a 71 percent increase in global energy consumption between 2003 and 2030, with three quarters of the increase occurring in developing countries.[2]

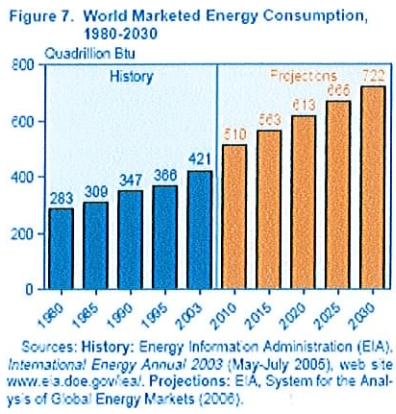


Figure 7. World Marketed Energy Consumption, 1980-2030

Sources: **History:** Energy Information Administration (EIA), *International Energy Annual 2003* (May-July 2005), web site www.eia.doe.gov/iea/. **Projections:** EIA, System for the Analysis of Global Energy Markets (2006).

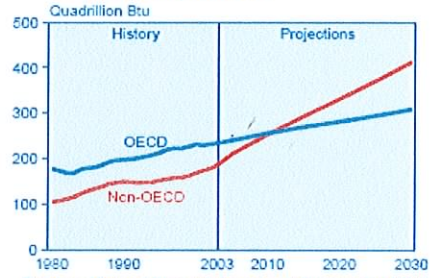


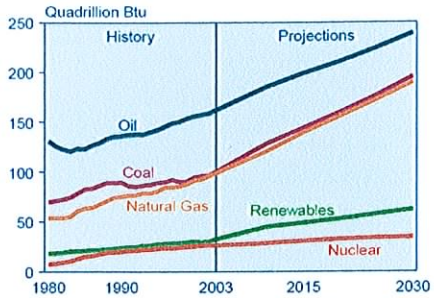
Figure 8. World Marketed Energy Use: OECD and Non-OECD, 1980-2030

Sources: **History:** Energy Information Administration (EIA), *International Energy Annual 2003* (May-July 2005), web site www.eia.doe.gov/iea/. **Projections:** EIA, System for the Analysis of Global Energy Markets (2006).

World energy consumption is projected to grow 71% from 2003 to 2030, with three-quarters of the growth in developing countries. Source: EIA

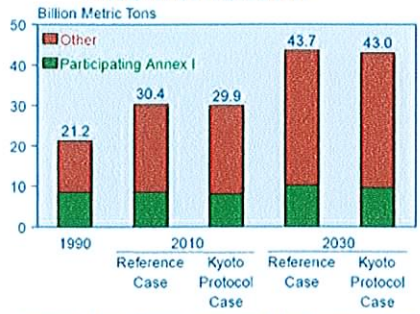
Most of the increase in energy demand will be met by fossil fuels, with the result that in 2030, fossil fuels are projected to supply about 86 percent of world energy consumption—roughly the same percentage as in 2003.[3] As a consequence, and notwithstanding Kyoto, CO_2 emissions worldwide are projected to rise from 21.2 billion metric tons in 1990 to 29.9 billion in 2010 and 43 billion in 2030.[4]

Figure 3. World Marketed Energy Use by Energy Type, 1980-2030



Sources: **History:** Energy Information Administration (EIA), *International Energy Annual 2003* (May-July 2005), web site www.eia.doe.gov/iea/. **Projections:** EIA, System for the Analysis of Global Energy Markets (2006).

Figure 6. World Carbon Dioxide Emissions in Two Cases, 1990, 2010, and 2030



Sources: **1990:** Energy Information Administration (EIA), *International Energy Annual 2003* (May-July 2005), web site www.eia.doe.gov/iea/. **2010 and 2030:** EIA, System for the Analysis of Global Energy Markets (2006)

Kyoto notwithstanding, fossil energy consumption and CO2 emissions increase substantially. Source: EIA

You have probably heard that China is building new coal-fired power plants at the rate of one every week to 10 days.[5] In late 2004, the *Christian Science Monitor* (CSM) reported that three countries—the United States, China, and India—are planning to build nearly 850 new coal plants, "which would pump up to five times as much carbon dioxide into the atmosphere as the Kyoto Protocol aims to reduce."[6] These new plants, the CSM article concluded, would "bury" Kyoto:

> By 2012, the plants in three key countries—China, India, and the United States—are expected to emit as much as an extra 2.7 billion tons of carbon dioxide, according to a Monitor analysis of power-plant construction data. In contrast, Kyoto countries by that year are supposed to have cut their CO_2 emissions by some 483 million tons.

Other countries are also building new coal plants:

> With natural gas prices expected to continue rising, 58 other nations have 340 new coal-fired plants in various stages of development. They are expected to go online in a decade or so. Malaysia, Japan, Indonesia, Thailand, and Turkey are all planning significant new coal-fired power additions. Germany also plans to build eight coal plants with 6,000 megawatts capacity.

A more recent article reports that Germany—yes, Kyoto-loving Germany—may build 26 new coal-fired power plants.[7] Last week *Planet Ark* reported that demand for thermal coal in Russia is expected to triple by 2020, with coal-based generation doubling its share of Russian power production from about 20 percent to 38-40 percent.[8]

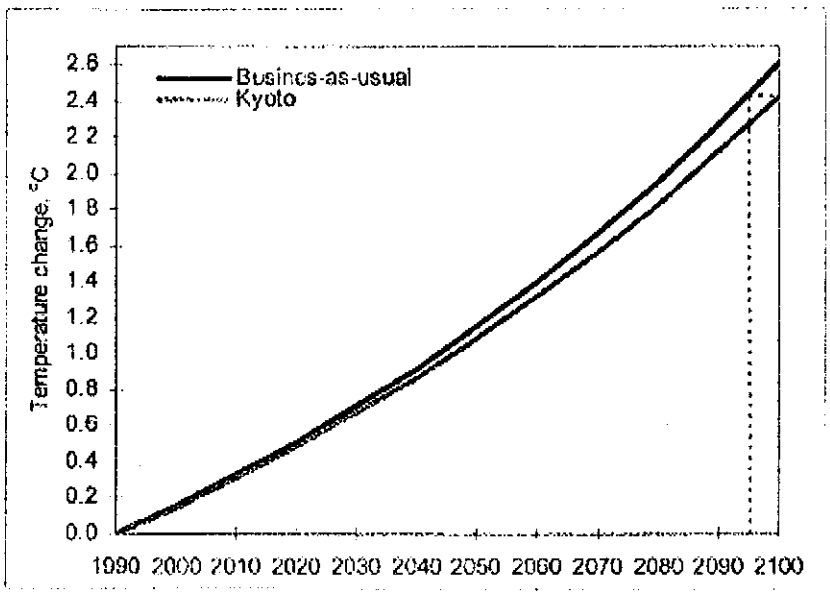
The conclusion I draw from these facts is that the economics of fossil energy in general, and coal-based power in particular, remain highly favorable compared to the alternatives.

How then could governments significantly restrict fossil energy use, especially coal-based power, and not adversely affect the health and welfare of millions?

II. Regulatory strategies like the Kyoto Protocol can achieve only inconsequential reductions in global warming and, thus, are all economic pain for no environmental gain.

Let's grant for the sake of argument that global warming is a serious problem.[9] Are regulatory strategies like the Kyoto Protocol a smart way to deal with it?

Based on favorable scientific assumptions, the Kyoto treaty would avert only 0.07°C of global warming by 2050.[10] That's too small an amount for scientists to detect. Put somewhat differently, Kyoto would postpone the arrival of a 2.6°C warming by five years—from 2095 to 2100. See the Figure below.



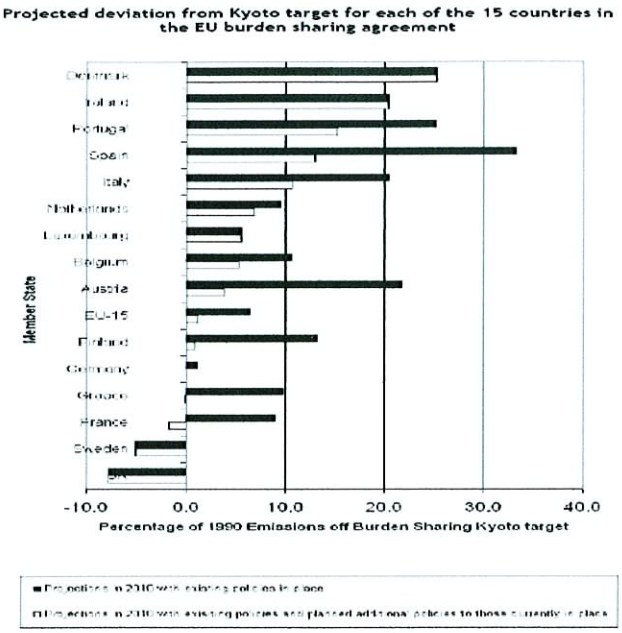
Kyoto postpones the arrival of a 2.6°C warming by five years; Source: Lomborg (2007)[11]

Similarly, Kyoto would avert only 1 cm of sea-level rise by 2050 and 2.5 cm by 2100.[12] It would have no measurable effect on hurricane strength, even if global warming makes hurricanes stronger, and none on malaria-related mortality, even if global warming increases the population at risk of exposure to malaria.[13]

However, although Kyoto would provide no discernible climate protection, it would cost the U.S. economy tens to hundreds of billions of dollars in higher energy prices, lost jobs, and lower GDP.[14]

Kyoto advocates might respond that the treaty is only a "first step." But even the first step is economically onerous. Most of the EU-15 countries are not on track to meet their

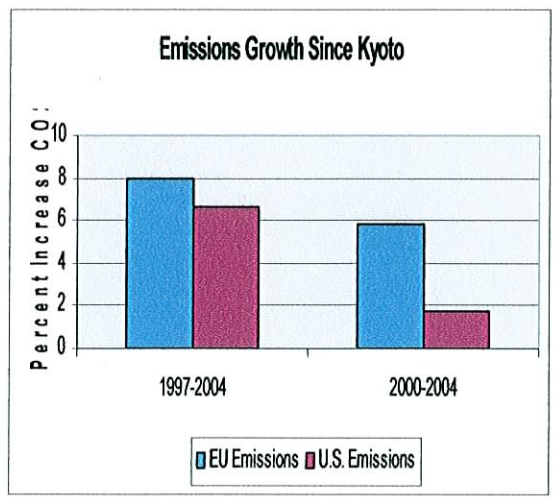
Kyoto targets,[15] even though European compliance is facilitated by the dubious advantages of low economic growth and low population growth. See the Figure below.



IIB. A negative value indicates a country will more than meet its Kyoto target.

Source: Institute for Public Policy Research, Traffic Lights Report (Dec. 27, 2005)

Ironically, although the European Union ratified Kyoto and the United States did not, EU emissions have increased more rapidly than U.S. emissions since 1997, the year Kyoto was negotiated, and since 2000.



U.S. and EU emissions growth since Kyoto; Source: EIA data[16]

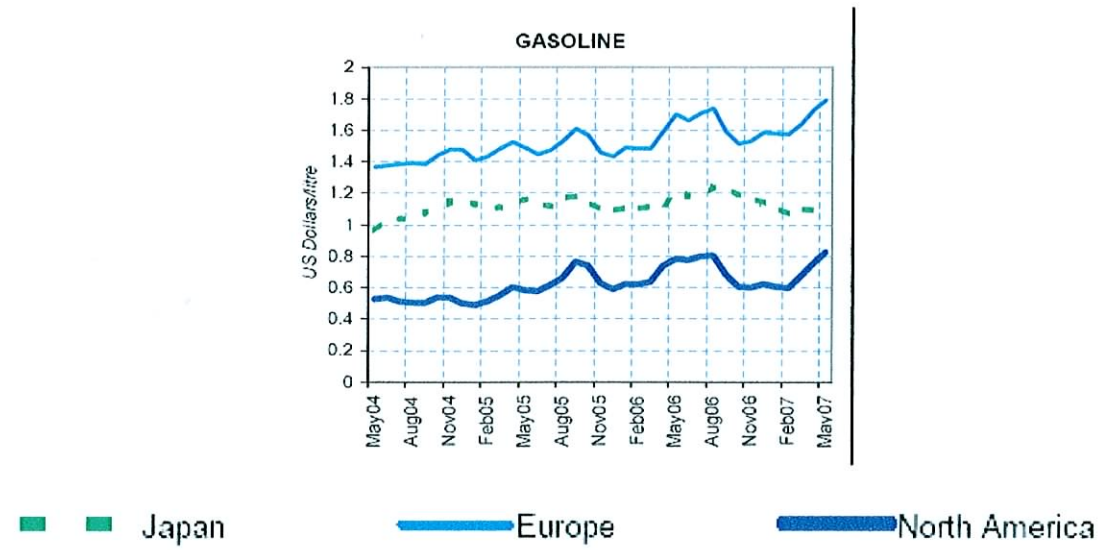
Japan and Canada are similarly failing to achieve their Kyoto targets.[17] At the end of 2005, Japan's emissions were 8.1 percent above 1990 levels. Canada's in 2004 were 26.6 percent higher than 1990 levels.

III. Penalizing fossil energy use, whether via regulatory caps or carbon taxes, is unlikely to foster the technological breakthroughs required to meet global energy needs without emissions.

A team of 18 energy experts led by New York University physics professor Martin Hoffert assessed possible technology options that might be used in coming decades to stabilize atmospheric CO_2 concentrations.[18] They examined wind and solar energy, nuclear fission and fusion, biomass fuels, efficiency improvements, carbon sequestration, and hydrogen fuel cells. The Hoffert team found that, "All these approaches currently have severe deficiencies that limit their ability to stabilize global climate." The researchers specifically took issue with the IPCC's claim that, "known technological options could achieve a broad range of atmospheric CO_2 stabilization levels, such as 550 ppm, 450 ppm or below over the next 100 years." World energy demand, they estimated, could triple by 2050. However, they found, "Energy sources that can produce 100 to 300 percent of present world power consumption without greenhouse emissions do not exist operationally or as pilot plants." Hoffert and his colleagues concluded that, "CO_2 is a combustion product vital to how civilization is powered; it cannot be regulated away."

Kyoto proponents might respond that they are not so much trying to "regulate away" CO_2 as create a market signal. Carbon penalties, they believe, will "green" energy markets, accelerating the transition to a hydrogen-solar future. Is this faith in the transforming power of carbon penalties justified?

Consider Europe's experience with motor fuel taxes. Many members of Congress think U.S. gasoline prices are too high. Yet consumers pay twice as much for gasoline in some European countries, due to high motor fuel taxes.[19] See the Figure below.[20]



In Europe, gasoline taxes may equal two and even three dollars a gallon. A one-dollar gasoline tax is roughly equivalent to a tax of $100 per ton of CO_2.[21] A three-dollar per gallon gasoline tax is an implicit $300 per ton CO_2 tax. That goes way beyond the carbon penalties contemplated in the global warming bills Congress is considering. But so far there has been no technological transformation in Europe. There is no miracle fuel. There are no zero-emission vehicles. Per capita car ownership is lower,[22] people drive smaller cars, and diesel vehicles dominate the market (because diesel fuel is taxed at lower rates than gasoline). But Europe is not one mile closer to achieving a "beyond petroleum" transport system than we are.

Indeed, despite implicit CO_2 taxes of $200 to $300 per ton on gasoline, EU transport sector CO_2 emissions in 2004 were 26 percent above 1990 levels, and are projected under current policies to be 35 percent above 1990 levels in 2010.[23]

EIA's analysis of the Bingaman-Specter draft legislation leads to a similarly dismal conclusion about the transforming power of carbon penalties in the electric power sector. The Bingaman-Specter proposal features a "safety-valve," under which emission permit prices would not exceed $7 per ton of CO_2 in 2012 and not increase by more than 5 percent annually above inflation. This relatively modest carbon penalty ends up having a huge effect on investment in coal-based electricity. Total energy from coal increases by 23 percent between 2004 and 2030, but that is "less than half the 53 percent increase projected in the reference case over the same time period." However, although high enough to deter investment in new capacity, allowance prices are "not sufficiently high to compensate for the increased capital and operating costs" of carbon capture and storage technologies. "As a result," says EIA, "power plants using carbon capture and storage are not projected to be commercially viable within the time frame."[24]

Now, you might think that if Congress just hits the power sector with a heavier regulatory hammer, utilities will invest in carbon capture and storage. There will be technological transformation. We will be a step closer to the day when we can meet people's energy needs without emissions.

I think it is far more likely that utilities will just stop building and operating coal plants. Remember, even a modest penalty of $7 per ton CO_2 cuts coal investment by more than half. Stiffer penalties would further erode the profitability of coal generation, driving investment into natural gas, nuclear, and wind—the high-cost end of today's electricity market—or perhaps out of the power sector altogether.

If anything, EIA's assessment of the Bingaman-Specter plan's impact on coal is conservative, because EIA does not model the effects on investor confidence of the political dynamic set in motion by carbon penalties.

Up to now the debate in Congress has been about *whether* to cap CO_2 emissions from power plants. Once a cap is enacted, no matter how modest to start with, there is a whole new ball game. Global warming activists will continually claim that Congress is not doing enough to save the planet. Accordingly, Congress will continually debate how

much and how fast to tighten the existing caps. The only "regulatory certainty" will be that regulatory costs will rise unpredictably. Few investors will want to put their money behind coal in such a risky investment climate.

IV. The history of the Acid Rain program *does not* support claims that substantial cuts in power plant emissions of CO_2 can be accomplished inexpensively.

We often hear that the Acid Rain cap-and-trade program established by the 1990 Clean Air Act Amendments (CAAA) shows that a similar program could reduce CO_2 emissions dramatically without decimating coal as an electricity fuel, and without significantly inflating consumer electric bills. We are told that industry estimates of the cost of sulfur dioxide (SO_2) emission permits turned out to be wildly overblown. We are assured that just as the SO_2 program did not doom coal-based power or make electricity unaffordable, neither would a carbon cap-and-trade system adversely affect U.S. fuel diversity or electricity consumers.

My testimony here draws on a forthcoming Competitive Enterprise Institute study by economist Ross McKitrick of the University of Guelph. Analogizing from the SO_2 cap-and-trade program to a global warming program is dubious for several reasons.

First, for two decades prior to enactment of the CAAA, U.S. SO_2 emissions had been falling. In fact, more than half of the post-1973 reduction in SO_2 emissions occurred before 1990. The CAAA SO_2 program built upon a steady downward trend in emissions. In sharp contrast, U.S. CO_2 emissions have risen fairly steadily since 1940, with dips of more than a year occurring only during energy crises and recessions. There is no long-term downward emissions trend to build upon.

Second, to comply with the SO_2 requirements, utilities (a) switched from using high-sulfur to low-sulfur coal and (b) installed scrubbers. Although there is low-sulfur coal, there is no low-carbon coal, and scrubbers for removing CO_2 do not exist.

What then of the claim that industry exaggerated the costs of SO_2 compliance? Industry projected that compliance costs in Phase I would run about $250 to $300 per ton. Instead, permit prices ranged from $100 to $150. One reason costs were lower than anticipated is that nobody foresaw the opportunity created by deregulation of the rail industry. Rail deregulation made it economical for eastern utilities to import low-sulfur coal from the Powder River Basin. This led to an over-investment in scrubbers, which also lowered marginal abatement costs. However, for Phase II of the program, industry forecasts were on the money. Permit prices were projected to range from $500 to $700 per ton. Prices trended upward to $500 per ton by the summer of 2004 and climbed above $1,500 per ton in late 2005 and early 2006.

In short, the SO_2 program should inspire little confidence that a CO_2 control program would preserve coal as a viable electricity fuel. McKitrick summarizes:

The factors that led to low initial costs for sulfur—a well-established downward trend in emissions, policy-induced availability of low-sulfur coal and the effectiveness of scrubbers—do not apply to CO_2. When the benefits of scrubbers and fuel source-switching were exhausted, compliance costs of SO_2 control policies were as high or higher than forecast, as was the case with the EU carbon market.

V. Cap-and-trade establishes an OPEC-like carbon cartel empowering producers to restrict supply, raise consumer prices, and reap windfall profits.

This has been the European experience. Countries allocated emissions free-of-charge to 12,000 or so large emitters. Because the governments handed out permits for more tons of CO_2 than the permit holders emitted, the system did not even reduce emissions.[25] However, that did not stop many firms, notably German utilities, from raising consumer electric bills to cover their alleged compliance costs.

Many prominent U.S. corporations—Duke Energy, Alcoa, and Goldman Sachs, to name a few—now support Kyoto-style regulation. This does not mean that regulatory climate policy is good for the economy. It means that some firms can profit—at least in the short-run—from global warming regulation.

It started with Enron! Enron was one of the most influential corporate lobbyists for Kyoto. Enron was a natural gas distributor, and Kyoto would kill coal-fired electric generation, boosting demand for Enron's product. Enron also produced wind turbines—another product whose market share would grow in a carbon-constrained world. And Enron's energy traders expected to make juicy commissions on the purchase and sale of carbon credits. An internal Enron memo enthused that Kyoto would "do more to promote Enron's business than almost any other regulatory initiative outside of restructuring the energy and natural gas industries in Europe and the United States."[26]

Enron may be defunct, but energy-rationing profiteers abound. Consider Duke Energy, which merged with Cinergy in May 2005. An October 2006 study by the Pew Center on Global Climate Change includes a table on the per-ton cost of Cinergy's various greenhouse gas reduction projects in 2004.[27] The table shows that 97 percent of Cinergy's emission reductions came from efficiency improvements in its overwhelmingly coal-fired electric generating stations. Cinergy's investment of $1.94 million in efficiency upgrades reduced the company's CO_2 emissions by 349,882 tons. This works out to a cost of $5.54 per ton of CO_2 reduced.

Duke belongs to a coalition called the U.S. Climate Action Partnership, or CAP. One of CAP's "six principles" is to "reward early action."[28] What this "principle" means is that the government should award carbon credits, applicable to a future cap-and-trade program, for emission reductions firms made "voluntarily" in the past. Now, suppose Duke is awarded early action credits for Cinergy's reductions, Congress enacts Phase I of the old McCain-Lieberman Climate Stewardship Act, and CO_2-equivalent permits sell for $15 a ton in 2010 and $45 a ton in 2025, as estimated by EIA.[29] In that case, Duke would

reap a windfall profit of between 170 percent and 712 percent.

The important point is this. Duke can cash in its early credits only to the extent that other firms are constrained by regulation buy to them. The costs those firms incur have economic impacts. If absorbed by the firms, the higher costs result in lower employment, lower wages, or less innovation. If passed on to customers, the costs increase consumer prices.

A report[30] by the Congressional Budget Office (CBO) confirms that cap-and-trade programs transfer wealth from consumers and competitors to the lucky holders of carbon credits. According to CBO, "A review of the existing literature and of the range of CO_2 policies now being debated suggests that the value of emission allowances might total between $50 billion and $300 billion per year (in 2007 dollars) by 2020."

CBO also finds that the price effects of cap-and-trade programs are "regressive in that poorer households would bear a larger burden relative to their income than wealthier households would." CBO "estimated that the price rises resulting from a 15 percent cut in CO_2 emissions would cost the average household in the lower one-fifth (quintile) of the income distribution about 3.3 percent of its average income. By comparison, a household in the top quintile would pay about 1.7 percent of its average income."

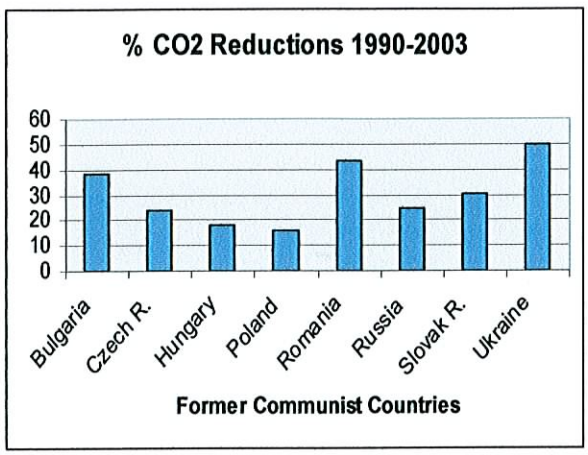
Renewable portfolio standard (RPS) programs—mandates requiring utilities to produce a specified percentage of their power from non-carbon or low-carbon energy sources—also transfer wealth from consumers and competitors to politically-favored producers. Senator Bingaman (D-NM) was pleased to announce EIA's finding that his proposed 15-percent RPS would raise consumer electric bills by less than one percent. He overlooks the wealth transfer effects. EIA estimates that a 15 percent RPS would shift about $18 billion annually from consumers to utilities.[31] EIA also estimates that the RPS will reduce power-sector CO_2 emissions by 222 million tons below the reference case in 2030. This means consumers will be paying $81 per ton of CO_2 avoided. That is significantly more than the "safety valve" price in Bingaman's cap-and-trade proposal.

There is a sure-fire way to squelch some (although not all)[32] of the rent seeking in global warming policy. Instead of allocating permits free of charge, make permits available only through competitive bidding in an auction open to all, and then prohibit permit holders from passing the costs on to their customers. That would take all the fun (and profit) out of cap-and-trade for most industry backers. It would go a long way to separate the energy-rationing profiteers from firms acting out of sincere environmental concern.

VI. Policymakers concerned about global warming should: (1) Support R&D, (2) reduce tax and regulatory barriers to innovation; and (3) target scarce international assistance efforts to save the most lives for each dollar invested.

The only countries that have substantially reduced CO_2 emissions over an extended period of time are the former Soviet Union and Eastern Europe. Their "method" was economic collapse. See the Figure below.

The main inconvenient truth in the climate debate is that nobody knows how to meet current, much less future anticipated, global energy needs with low- and non-emitting technologies. Regulatory climate strategies put the policy cart before the technology horse. Not until markets are capable of producing vast quantities of affordable energy without emissions would it be reasonable to consider mandatory emission reductions.



Percent CO_2 emission reductions of seven former communist countries, 1990-2003 Source: International Energy Agency data[33]

Everyone agrees that the solution to global warming is technology. How then should government foster technology development? Government-funded R&D is often wasteful. Nonetheless, an R&D strategy has merit, especially compared to carbon regulation and renewable energy mandates. Bjørn Lomborg recommends that all nations commit to spend 0.05 percent of GDP annually on R&D of non-carbon emitting energy technologies. A multi-lateral R&D program would have several advantages:

> This approach would cost about $25 billion a year, seven times cheaper than Kyoto and many more times cheaper than a Kyoto II. It would involve all nations, with richer nations naturally paying the larger share. It would let each country focus on its on future vision of energy needs, whether that means concentrating on renewable sources, nuclear energy, fusion, carbon storage, or searching for new and more exotic opportunities.[34]

A true "no regrets" option would be to reduce tax and other political impediments to innovation. A study by the International Energy Agency (IEA) finds that efficiency enhancements can lead to significant low-cost emission reductions in manufacturing operations. Surprisingly, some of the most efficient factories can be found in developing countries, simply because the factories are new:

> Much of the efficiency differences that have been identified can be attributed to the age of plants. New plants tend to be more efficient than older ones. As a consequence, the most efficient industries can in some cases be found in emerging economies where production is expanding. For example, the most efficient

> aluminum smelters are in Africa, and Brazil is among the most efficient cement producers. Similarly, some of the most efficient steel plants can be found in China. Industrial energy efficiency is consistently high in certain IEA member countries such as Japan, which has had active efficiency policies for decades.[35]

To accelerate efficiency improvement in the manufacturing sector, the power plant sector, and throughout the economy, policymakers should look for ways to lower the cost of replacing older plants and equipment with new capital stock. A study by the American Council for Capital Formation finds that the U.S. generally has less favorable capital cost recovery rules for electric generation, electric transmission and distribution, and petroleum refining than many of our trading partners. For example, in the rate of capital recovery for investment in combined heat and power systems, the U.S. lags behind all of the other countries surveyed (Brazil, Canada, China, Germany, India, Indonesia, Japan, Republic of Korea, Malaysia, Mexico, and Taiwan).[36] Sometimes the best thing government can do is get out of the way.

Lomborg makes another reasonable recommendation based on the insight that it is not global warming per se that is worrisome, but the possible aggravating impacts of global warming on a number of pre-existing threats (for example, heat waves, drought, malaria, floods, hurricanes). Fortunately, although we do not know how to stop global warming at reasonable cost, we do know a lot about reducing social vulnerability to the threats that global warming may exacerbate.

All regulatory climate policies involve incurring relatively large costs in the present for relatively small or speculative benefits in the future. For a fraction of Kyoto's cost, industrial nations could dramatically reduce current death and suffering from HIV/AIDS, malaria, water-borne disease, and malnutrition. Alleviating those problems would have the added benefit of making poor countries wealthier and thus better able to manage the risks of climate change.

Similarly, changes in building codes, zoning, and government insurance programs could do much more to reduce hurricane-related risk, at far less cost, than any emission control program.[37]

Lomborg, working with four Nobel economists, other experts, and college students (70 percent from developing countries), ranked alternative investments to solve global problems according to how many lives could be saved and at what cost. The ranking—known as the Copenhagen Consensus—lists Kyoto and other climate regulation among the "bad investments." The Figure below summarizes the Copenhagen Consensus:

		Challenge	Opportunity
Very Good Opportunities	1	Diseases	Control of HIV/AIDS
	2	Malnutrition	Providing micro nutrients
	3	Subsidies and Trade	Trade liberalisation
	4	Diseases	Control of malaria
Good Opportunities	5	Malnutrition	Development of new agricultural technologies
	6	Sanitation & Water	Small-scale water technology for livelihoods
	7	Sanitation & Water	Community-managed water supply and sanitation
	8	Sanitation & Water	Research on water productivity in food production
	9	Government	Lowering the cost of starting a new business
Fair Opportunities	10	Migration	Lowering barriers to migration for skilled workers
	11	Malnutrition	Improving infant and child nutrition
	12	Malnutrition	Reducing the prevalence of low birth weight
	13	Diseases	Scaled-up basic health services
Bad Opportunities	14	Migration	Guest worker programmes for the unskilled
	15	Climate	Optimal carbon tax ($25-300)
	16	Climate	The Kyoto Protocol
	17	Climate	Value-at-risk carbon tax ($100-450)

Table 1 Global priority list from Copenhagen Consensus, 2004.[7]

Conclusion

Regulatory climate strategies impose relatively large costs in the short term for relatively small or speculative benefits many decades hence. Such policies have a high potential to exploit consumers and stifle economic growth.

Rather than put the policy cart before the technology horse, policymakers concerned about global warming should encourage worldwide R&D investment in non-carbon-emitting energy technologies. They should eliminate tax and other political barriers to market-driven innovation and capital stock turnover. They should also target international assistance efforts where each dollar invested can do the most good, recognizing that carbon suppression policies are a poor investment of inescapably limited resources.

Thank you again for opportunity to present my views. I would be happy to try and answer any questions you may have.

Bio

Marlo Lewis, Jr. is a Senior Fellow at the Competitive Enterprise Institute (CEI), where he writes on global warming, energy policy, regulatory process reform, and other public policy issues. Prior to joining CEI, Marlo served as director of external relations for the Reason Foundation and as staff director of the House Government Reform Subcommittee on Regulatory Affairs. He has published in National Review, the Washington Times, Investors Business Daily, the American Spectator, Tech Central Station, Energy, Pollution Liability Report, and The Hill. He has appeared on various TV and radio programs including Oprah Winfrey, C-SPAN, CNBC Capital Report, CBC-News Marketplace, and BBC TV. He holds a Ph.D. in Government from Harvard University and a B.A. in Political Science from Claremont McKenna College.

[1] Jonah Goldberg, "Global Cooling Costs Too Much: There are no solutions in the realm of the politically possible, http://article.nationalreview.com/print/?q=MmJiZDEyYzkxYWE0OWYxMWY4Y2ZjYzI2YmNmOGExMDE=.

[2] EIA, *International Energy Outlook 2006*, Chapter 1: World Energy and Economic Outlook 2006, http://www.eia.doe.gov/oiaf/ieo/pdf/world.pdf.

[3] EIA, International Energy Outlook 2006, Highlights, Figure 4, http://www.eia.doe.gov/oiaf/ieo/highlights.html.

[4] EIA, International Energy Outlook 2006, Highlights, http://www.eia.doe.gov/oiaf/ieo/highlights.html

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