THE SUSTAINABLE ENERGY TOP TEN AWARDS 2001

Viewpoints From the Leading Proponents of Sustainable Energy Policies and Practices in the United States

SUSTAINABLE ENERGY INSTITUTE

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January 2002

Senator Jeff Bingaman
Congressman Sherwood Boehlert
Lord Browne of Madingley
Governor Parris Glendening
Senator James Jeffords
Jonathan Lash
Senator John McCain
Jennifer Morgan
John Rowe
Takehisa Yaegashi

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Introduction

About the Awards

The Sustainable Energy Top Ten awards highlight the contribution of ten key leaders to the development of sustainable energy policies and practices in the United States. The awards, combined with the interviews provided in this report, aim to educate the American public on sustainable energy issues by helping them get to know the leading proponents for sustainable energy in this country, and to hear these leaders' messages as directly and clearly as possible. The awards also recognize these ten individuals for their achievements and encourage others to follow suit. SEI intends to issue awards every two years.

In granting these awards, SEI considers leadership in the following areas: strategies for reducing carbon and other emissions from fossil fuels; energy efficiency measures; renewable energy technologies; low-and zero-emission vehicles; next-generation nuclear energy technologies; mass transit and smart growth policies; and carbon sequestration technologies. In short, these are the leaders who have done the most to maximize U.S. energy security in a manner that reduces pollution and environmental degradation.

Recipients of the SETT awards are the individuals judged by SEI's independent board of directors to be the most influential proponents of sustainable energy policy and practices in the United States today. The selection criteria consider (1) dedication to innovative and progressive ideas on sustainable energy policies and practices; (2) uncommon leadership within and beyond one's own organization in advocating and implementing sustainable energy solutions; and (3) major impact on national thinking and actual practices contributing to a sustainable energy future. SEI also seeks bipartisan representation among the ten awardees, and a mixture of government, private sector and NGO leaders.

About the Awardees

The inaugural series of Sustainable Energy Top Ten awards goes to:

Senator Jeff Bingaman (D- New Mexico), Chairman, Senate Energy and Natural Resources Committee, for his leadership in moving the nation to a sound energy policy that balances increased production with energy efficiency, with emphasis on the deployment of new technologies.

Congressman Sherwood Boehlert (R- New York), Chairman, House Science Committee, for his determination to enact higher fuel efficiency standards for SUVs, against stiff opposition from party leadership, for pushing emissions cuts from power plants and for promoting alternative fuel vehicles.

Lord Browne of Madingley, Group Chief Executive, BP, for leading the petroleum industry in acknowledging and confronting global warming, for committing to reduce BP's own carbon emissions and for pursuing opportunities in renewable energy.

Governor Parris Glendening (D) of Maryland, for his leadership first in Maryland and now nationally in advancing "Smart Growth" land use policies, for initiating greatly-expanded use of mass transit in Maryland and for ordering state-owned facilities to reduce energy consumption significantly and increase the use of renewable energy.

Senator Jim Jeffords (I- Vermont), Chairman of the Senate Environment and Public Works Committee, for introducing the "Four-Pollutant" bill seeking to cut power plant emissions of CO_2 and three other pollutants, and for his longstanding leadership on behalf of renewable energy technologies and advanced technology vehicles.

Mr. Jonathan Lash, President, World Resources Institute, for his leadership in the sustainable development community and for WRI's influential work in the fields of energy and global climate change.

Senator John McCain (R- Arizona), Ranking Republican Member, Senate Commerce, Science and Transportation Committee, for holding a series of hearings during 2000 and 2001 drawing national attention to the climate change problem, and for proposing a cap-and-trade system to control U.S. emissions of greenhouse gases.

Ms. Jennifer Morgan, Climate Change Campaign Director, World Wildlife Fund, for her international leadership on climate change issues as head of the WWF delegation to the Kyoto Protocol climate negotiations and for actions to educate the public on the subject.

Mr. John Rowe, Co-CEO and President, Exelon Corporation, for promoting the use of landfill methane, wind, photovoltaic and other renewable energy technologies at Exelon and for committing to explore next-generation nuclear technologies for possible future deployment.

Dr. Takehisa Yaegashi, Senior Chief Engineer, Toyota Motor Corporation, for his ingenuity and foresight in developing Toyota's highly fuel-efficient and successful hybrid vehicle and for his broader work developing advanced environmental technology at Toyota.

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The SEI Board of Directors would like to thank the following individuals who labored hard throughout the conception and organizing of the awards project, the research supporting the selection of awardees, the arrangement of the Top Ten interviews and the preparation of this report: J.W. Arnold, Juliette Brown, Julie Dargis, Tammie Harris, Susan Hsu, Pakeeza Khawaja, Marcus King, Juan Lopez, Virginia Morisset, Daniel Moss, Robyn Rektor and Douglas Shaw. In addition, SEI would like to express its thanks to the many dedicated staff members of the Top Ten awardees for their cooperation throughout this project, particularly Senate staff members working under very challenging circumstances following the anthrax attacks against the U.S. Senate in October. Finally, SEI offers deepest thanks to the sponsors of this project for their financial support and involvement in the effort.

Summary and Recommendations

Overview of the Issues Discussed

SEI posed questions to the ten awardees concerning a broad range of issues that make up the energy challenges now facing the United States. Probably the greatest sustainable energy challenge of our time, and the subject of great continuing debate, is how to combat global climate change while allowing continued economic growth and improvements in quality of life in both developed and developing nations. Related challenges are reducing persistent urban air pollution, acid rain and other public health and environmental impacts of energy production and use, both from the transportation sector and from electric power plants and other stationary sources.

Strategies for responding to these related environmental challenges dominated the discussions in our interviews. The interviews help to answer basic questions such as:

- How can we improve automobile fuel efficiency to reduce consumption?
- How much can we cut energy use without making major lifestyle changes, by using more efficient appliances, smart technologies and less-polluting vehicles and by reducing waste, and not necessarily using less air conditioning, driving less or driving smaller vehicles?
- Can new and cleaner generating technologies reduce our reliance on fossil fuels soon enough to make a difference in preventing further climate change and declining urban air quality?
- Can improved land use patterns that reduce the reliance on individual automobiles lead to significant cuts in energy consumption and associated emissions in the United States?
- Can we reduce greenhouse gas emissions and stabilize atmospheric levels without serious economic consequences?
- Are there acceptable and affordable ways to capture and sequester carbon from the combustion of fossil fuels, to allow continued use of fossil fuels in a "decarbonized" manner?
- Can new technologies help us improve domestic energy security and reduce our dependence on Middle East and other foreign oil?

Based on the comments of the Top Ten award recipients, we outline in the following pages the nation's challenges on climate change; reducing dependence on oil; developing new technologies for both generating cleaner power and using less of it; and improving land use patterns to reduce energy consumption. We then summarize the central messages from the awardees to policymakers, to industry and to the public.

Catching Up With the Rest of the World on Climate Change

At the close of 2001, with an international agreement now in place that aims to bring about significant reductions in greenhouse gas emissions in participating countries, the link between emissions of greenhouse gases and global climate change is almost universally accepted and viewed as a serious problem. The third assessment report of the Intergovernmental Panel on Climate Change, issued earlier this year, predicted that world temperatures will rise by 1.4 to 5.8° C (2.5 to 10° F) in the next century. In the words of Senator John McCain, who convened a hearing on May 1, 2001 to hear testimony on the report, "It's a pretty compelling case that we have a problem. I don't think we can ignore it and hope it works itself out." Lord Browne of Madingley, BP's Group Chief Executive, echoes the remark: "For years there has been undeniable evidence of a problem that merits action."

Unfortunately we have yet to come to grips with what to do about it here in the United States. A brief review of the political controversy and its history is instructive.

President George H.W. Bush signed the UN Framework Convention on Climate Change in 1992, which calls for achieving a "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." The U.S. Senate later ratified the Convention. But unfortunately the Convention gave little detail as to how this stabilization would be accomplished, at what level or by what measures. The countries that are parties to the Convention have therefore held several further negotiating conferences to establish and agree upon a path forward.

At the third such conference of the parties (COP), in Kyoto, Japan in 1997, then-Vice President Gore brokered an agreement under which developed nations including the United States agreed to reduce greenhouse gas emissions by at least 5% below 1990 levels by the first implementation phase, 2008 and 2012. In response to U.S. pressure, this Kyoto Protocol to the UN Framework Convention also developed a system of emissions trading and other flexibility mechanisms. These measures will both lower the cost of reducing greenhouse gas emissions worldwide and help channel investment into financing clean energy technologies in developing countries. Developing nations were not required to meet these targets during the first phase, consistent with the original Convention as accepted by President Bush. The logic behind exempting developing nations from the first phase targets was that an effort should first be made to redress cumulative emissions to date that have raised global temperatures as much as they have, the vast majority of which have come from developed nations.

The coal, petroleum, automobile and other U.S. industries have lobbied hard for the past

decade to block an international agreement on the reduction of greenhouse gas emissions. Prior to the Kyoto COP-3 meeting, the industry's Global Climate Coalition succeeded in getting the U.S. Senate to unanimously approve a resolution, introduced by West Virginia Democrat Robert Byrd and Nebraska Republican Chuck Hagel, advising the President that the Kyoto Protocol should not be signed if 1) it did not include a requirement for reduction commitments from all countries, or 2) it would result in serious harm to the U.S. economy. The World Wildlife Fund's Jennifer Morgan calls the first of these provisions a "very clever lobbying ploy" by the GCC, who "recognized that developing country commitments were completely off the table in the international negotiations. They knew that the framework convention that George Bush, Sr. signed said that developed countries should take the lead on this issue because they were primarily responsible for the problem."

Since that time numerous key corporations have abandoned the GCC out of disagreement with its principles and strategy, including BP, Shell, DuPont, Ford, DaimlerChrysler, Texaco and General Motors. Nevertheless, certain industrial interests continue to exercise tremendous pull with a sympathetic Bush Administration.

Bush Administration Policy

As is by now well known, during his Presidential campaign George W. Bush promised to seek multipollutant legislation once in office that would cut emissions of sulfur dioxide, nitrogen oxides, mercury and carbon dioxide. In a September 29, 2000 campaign speech in Saginaw, Michigan, Bush stated: "We will require all power plants to meet clean air standards in order to reduce emissions of sulfur dioxide, nitrogen oxide, mercury and carbon dioxide within a reasonable period of time." A fact sheet accompanying the speech indicated that a Bush administration would "establish mandatory reduction targets for emissions of four main pollutants: sulfur dioxide, nitrogen oxide, mercury and carbon dioxide."

In keeping with this pledge, newly-appointed Environmental Protection Agency Administrator Christine Todd Whitman, meeting with counterparts at a G8 Environmental Ministerial Meeting in Trieste, Italy in March 2001, commented that "the Bush Administration is committed... to working with the business community to reduce greenhouse gases in the most cost-effective way possible. In last year's campaign, for example, the President proposed mandatory reduction targets for emissions of carbon dioxide and other pollutants from utilities." Whitman signed a communique with other G8 environment ministers stating that "We commit ourselves... to strive to reach an agreement on outstanding political issues and to ensure in a cost-effective manner the environmental integrity of the Kyoto Protocol."

Whitman's actions in Trieste served as a lightning rod for Kyoto opponents — most notably Senator Hagel, who complained to the White House to the point that the issue was raised at a March 5 domestic policy meeting with the President. Days later Bush reversed his campaign pledge, writing that "I do not believe... that the government should impose on power plants mandatory emissions reductions for carbon dioxide, which is not a 'pollutant' under the Clean Air Act." On March 22 Bush National Security Advisor Condoleezza Rice told visiting European Union leaders: "The Kyoto Protocol process is dead." EPA Administrator Whitman later added, "We have no interest in implementing [the Kyoto Protocol]. If there's a general agreement that we need to be addressing the global climate change issue, [the question is] how do we do it in a way that allows us to make some progress, instead of spending our time committed to something that isn't going to go."

The Administration's move to shun the Kyoto process was met with outrage among the other parties to the framework convention, as well as here within the United States. But the outrage abroad served to catalyze the previously moribund international climate change talks. Unexpectedly, with the U.S. on the sidelines delegates hammered out a compromise in Bonn, Germany in July 2001 and thumbed their noses at Washington. Says Morgan, the leading U.S. NGO player at the talks, "The Bonn agreement is solid. The political will and determination behind the countries who forged it is great. It was a combination of determination to do something about climate change and determination that one country should not be able to determine the fate of the world on an international relations issue." At the subsequent COP-7 meeting in Marrakesh, Morocco in November 2001, the Bonn agreement was codified into a legal text several hundred pages in length.

Domestic Approaches

While we can perhaps thank President Bush for inadvertently propelling international climate change talks forward, here in the United States we must ask, what should we do next? How can we ensure that the United States acts responsibly in the coming years with respect to cutting these emissions, even if we do not sign up to the Kyoto commitments? It should be noted that U.S. emissions of greenhouse gases are much higher than elsewhere in the world — 25 metric tons per capita of CO_2 equivalent in 1998, vs. a range of 8 to 15 metric tons in most other industrialized nations. If we continue on our present course, estimates are that U.S. carbon emissions will be 26% higher in 2010 than they were in 1990, rather than down 7% as required under Kyoto.

For starters, many forward-looking companies are beginning to figure out ways to reduce carbon emissions in a cost-effective manner, often producing economic benefits in the form of reduced energy consumption. BP's Lord Browne told SEI that by 2000 BP had already cut its own greenhouse gas emissions five percent from 1990 levels and that the company expects to cut another five percent in about three more years. Browne said proudly, "we were the first major firm to leave the GCC in 1996 because we were unhappy with some of the positions it was taking." Senator McCain notes that "some of the measures industry will have to take to reduce CO_2 emissions will cost

money obviously, but others might actually produce economic benefits, for example if the reductions result from using energy more efficiently. The IPCC's third assessment report, issued earlier this year, indicated that about half of the emissions reduction targets may be achieved with a net economic benefit. That sounds like the basis for action to me."

Morgan described the Climate Savers program, involving companies who have voluntarily committed to cut emissions because of the economic gains from energy efficiency measures. Exelon Chairman John Rowe feels that power industry measures to cut carbon emissions will have a net economic cost to society, but that "if we do it cleverly we can make that cost relatively small." He also hopes that "if we are very diligent about doing this, but frugal, we might be able to make this a net benefit for our company."

But voluntary industry measures are not likely to produce the kind of large-scale reductions needed to combat global warming in a timely and effective manner. Some form of national program is likely to be necessary, involving mandatory carbon cuts or at a minimum very strong incentives to adopt cleaner technologies and to reduce pollutants. Exelon's Rowe says "we cannot rely on the word 'voluntary.' I think we need incentives built into the marketplace so that you get more economic advantage by producing less carbon. In due course we will be forced to address mandatory caps or carbon taxes." Morgan calls on the Bush Administration and others to come up with "a national binding plan to reduce greenhouse gas emissions."

This could be achieved today, if policymakers would recognize the efforts by leading corporations to reduce greenhouse gases in an affordable way, and establish measures to stimulate others to do so as well. Toyota's Takehisa Yaegashi, for example, described the "mindboggling" challenge — successfully met — of developing a car in just two years that would double fuel efficiency compared to the existing Corolla class. With the success in achieving this with the Prius, says Yaegashi, Toyota's top management "came to expect that 'if you can do this in the Prius case, you can do it for other vehicle development projects as well.'" Yaegashi takes pride that "other manufacturers will soon market their own hybrid vehicles" and that Toyota "played a key role in triggering this trend in the global industry."

Industry leaders like BP, Toyota and Exelon — and there are numerous others — have demonstrated that significant cuts in greenhouse gas emissions are achievable without economic fallout and indeed with long-term benefits. Most of these companies remain highly profitable, and as Yaegashi says the market for the Prius was much greater than Toyota had expected. But will Corporate America be willing *en masse* to make voluntary investments in cleaner technologies that may not show returns for five or ten years? It is difficult to imagine. But the U.S. Congress and the Bush Administration can join together and produce a carbon reduction strategy that recognizes the extraordinary capabilities of industry once given the necessary incentives for innovation and leadership, and thus lead the nation forward on this critical environmental challenge in a responsible manner.

Policy Measures

The principal policy measures now under consideration are a "Four Pollutant" bill in the House and Senate, that mirrors President Bush's September 2000 campaign pledge to mandate cuts for SO_2, NO_X, CO_2 and mercury emitted by electric power plants; and a measure originally introduced by Senators Robert Byrd (D-West Virginia) and Ted Stevens (R-Alaska) that would require development of a climate response strategy and a commitment to develop new technologies. Though the Adminstration now plans to propose a three-pollutant bill that would leave out carbon, Senator Jim Jeffords (Independent- Vermont), Chairman of the Environment and Public Works Committee, vows to "proceed with a four pollutant bill, regardless of the Administration's proposal." Jeffords just finished two hearings on the bill and plans to mark up legislation in early 2002. The bill proposes to:

- Cut nitrogen oxides from power plants by 75 percent from 1997 levels, and sulfur dioxide by 75 percent below Phase II of the Clean Air Act's Acid Rain Program requirements.
- Cut mercury emissions from power plants by 90 percent from 1999 levels, and return carbon dioxide emissions to 1990 levels by January 1, 2007.
- Require every power plant to clean up to the same level required for new power plants by the facility's 30th birthday, or five years after enactment of the Act, whichever is later, thus eliminating "grandfathering" of old plants.

The Byrd-Stevens measure, which is milder than the Four Pollutant bill in that it steers clear of mandating carbon cuts, has been incorporated into the comprehensive energy bill introduced by Senate Majority Leader Tom Daschle (D- South Dakota) and Energy and Natural Resources Committee Chairman Jeff Bingaman (D- New Mexico). It would establish a Federal office dedicated to developing a climate response strategy, and calls for a national commitment to develop new technologies to reduce carbon emissions. It would also promote research on climate adaptation strategies, mitigation of climate impacts and climate change science.

It is difficult to predict the prospects for these measures. To be sure, Congressional willingness to act on global warming has improved in the last two or three years, and some movement is afoot. One reason may be that the high-stakes 2000 elections are over. Says World Resources Institute President Jonathan Lash,"the dynamics obviously changed completely when it was no longer about Al Gore." Lash notes that Republican Senator Ted Stevens, who has generally voted with conservatives on environmental issues, has now expressed concern that there is already evidence of climate change in Alaska and that it is time to do something about it. Jennifer

Morgan notes the moderate Republicans who have come forward favoring action on climate change since President Bush took office, like Senator Susan Collins of Maine who has co-sponsored the Four Pollutant bill, and Senator Stevens who co-sponsored the measure described above. Says Morgan, "these developments weren't in the cards in 1997, and I think it demonstrates the complete gap between the President and members of his own party on this issue." Jeffords says "there does seem to be a new appreciation in the Senate for the potentially overwhelming impacts that global warming may have on our environment and economy."

Whether the new attitude is enough to bring about serious measures to combat climate change, like the Four Pollutant bill, remains to be seen. WRI's Lash feels there are reasonable prospects the Four Pollutant bill will pass, but cautions that it may take time. Whether 2002 is going to be the year that ends our long-standing inaction on climate change could hinge on two factors: reassuring Congress about the participation of developing countries; and laying out clearly the potential negative economic impacts of staying out of the Kyoto Protocol. We consider these in turn.

Developing Country Participation

Again, the principal basis for Congressional hostility towards the Kyoto Protocol since 1997 has been concern over the delayed participation of developing countries. The Top Ten interviews served to clarify misconceptions here in the United States in this regard. As noted earlier, the 1992 UN Framework Convention signed by President Bush, Sr. and ratified by the Senate provided that developed nations should take the lead on reducing greenhouse gas emissions, as they have caused most of the global warming that has occurred to date and have the resources to take action first. Accordingly, the 1997 Kyoto Protocol did not require developing nations to meet emissions targets during the first phase. It would be inconsistent with the 1992 Climate Convention to ask them to do so, and the Global Climate Coalition's argument that they should is clearly disingenuous. Nevertheless, the U.S. Congress and Bush Administration need to see clear evidence of forward progress on emissions reductions in developing nations as the basis for moving forward.

Jonathan Lash emphasized that developing countries are already taking significant action to reduce emissions despite being spared mandatory cuts under the first phase of Kyoto. China, for example, has made reductions faster than the United States, "not because of climate [but] because energy efficiency and pollution control are important priorities for them." Lash proposes that we construct a "system of obligations" under which developing countries could gradually take on commitments to become much more efficient, while also leaving themselves room to expand output.

Congressman Sherwood Boehlert, while maintaining that "developing countries should be in the process right from the beginning," says "we've got to be realists: we're the haves, they're the have-nots." To get beyond the impasse here in the U.S., Boehlert suggests setting a target for developing countries — e.g., a 1/2% reduction in emissions by 2020 — as "evidence of a commitment for everybody to be part of the solution."

In short, if it helps to re-engage the U.S. in the climate negotiations, we could propose U.S. participation in Kyoto (or at least U.S. domestic action) based on some degree of developing country commitment, the negotiation of which should be achievable. For example, developing countries could be asked to accept commitments in a future period (e.g., by 2022, ten years after the Kyoto targets) in return for promises of the technical and financial aid needed to achieve them. Commitments could also be negotiated in terms of reductions in carbon intensity, or in other terms that do not necessarily require short-term reductions in use of fossil fuels. Morgan says the developing country role will indeed continue to be part of the negotiations, and is confident based on discussions with those governments that "once the industrialized world takes the first step, these developing nations know that they need to come in and play that role." New legislation could instruct the Administration to negotiate along these lines at the next Conference of the Parties.

Cost of Staying Out of Kyoto

Perhaps more importantly, it is critical to demonstrate that staying out of the Kyoto process could wind up being more expensive to the United States than going in.

McCain summarized it best: "There's going to be a world marketplace for buying and selling emission reductions, and we are now running a big risk that American companies will be left out... It's important to ensure that what we do here will be recognized and tradable globally." Morgan explains that U.S. companies who will eventually have to meet mandatory emission limits here would want to have access to "the Russian cheap tons of carbon reductions, or to the lower hanging fruit in many Central European countries." But if we stay out of Kyoto, or join too late: access denied.

Allowing domestic trading of greenhouse gas emission allowances, as proposed by Senator McCain and Senator Joseph Lieberman (D-Connecticut) last August, would allow industry within the United States to find the least-cost means of lowering emissions, probably for net economic gain because of the reduced energy requirements. This would parallel a greenhouse gas trading system introduced in the United Kingdom last year, and a European Union-wide system scheduled for introduction in 2005. Participating in a global trading system that allows access to the "low hanging fruit," as Morgan calls it, will allow for even greater efficiencies. Says BP's Lord Browne: "Carbon trading is one of the most promising options because it works in a very cost-effective way."

Further efforts are clearly needed in order to convince lawmakers of the economic attractiveness of moving forward with significant U.S. cuts in greenhouse gas emissions. Clearly,

certain industry sectors — represented by the companies still present in the Global Climate Coalition — could be hurt by such policies and will continue lobbying hard to block them. The coal industry, which supplies fuel for roughly half of the nation's electricity today, knows that it could lose market share unless major gains can be made in the ability to sequester carbon originating in coal. U.S. and other automakers also fear the costs of retooling to produce more efficient engines. But it seems only a matter of time before it becomes obvious that the overall economics of cutting emissions will be attractive to the United States, and before this view will prevail over the opponents of mandated emissions cuts.

So what does America need to do? First, it is clear that we need to recognize our own responsibility. As Senator McCain states: "I would not have pulled the U.S. out of the Kyoto process. The rest of the world is moving forward, but we produce 25 percent of the world's greenhouse gas emissions and obviously have a responsibility too." This will require greater public appreciation of the climate change problem and of U.S. inaction to date. Then, we need to establish national policies that encourage more efficient use of energy and greater reliance on non-carbon-emitting power sources, so that we achieve our fair share of the reduction in atmospheric concentrations of greenhouse gases in cooperation with the rest of the world. Ultimately, we need mandated cuts in carbon and other greenhouse gas emissions, and the first such cuts should be instituted rapidly.

Exelon's John Rowe says we need national goals; incentives built into the marketplace to produce less carbon; and a federal position on how much reduction in carbon emissions is going to be required and when. WWF's Jennifer Morgan calls on the Bush Administration and others to develop a national binding plan to reduce greenhouse gas emissions. Once emission reductions and the learning process begin, says Morgan, the United States will be able to use its technological wherewithal to tackle the challenges, and could reconsider its position on Kyoto.

Arctic Oil, or More Efficient Cars and SUVs?

None of the awardees expressed interest in moving forward with oil drilling in the Arctic National Wildlife Refuge at this time. Instead, there was strong support for the argument that improving the fuel efficiency of our cars and trucks would be more effective in bringing the supply and demand of transportation fuels into balance— while also of course being much cleaner.

Senator Jeffords indicated that "the American people don't want to see ANWR spoiled for 6 months' worth of gas," while Jonathan Lash suggested "oil production in ANWR could only make a marginal contribution to solving the nation's oil security problems." Senator McCain feels that "Arctic drilling may not be the answer to recent energy problems or the quick fix to improving national energy security," and cautions that "looming filibuster challenges will make an ANWR debate in the Senate very difficult." Jeffords also commented on the political realities, predicting that it will ultimately be difficult to get the necessary Senate votes to approve drilling in ANWR.

Awardees also commented on how Americans value ANWR's pristine beauty and protected status. Jeffords opposes drilling in ANWR, noting that he would like to reduce our dependence on foreign oil supplies but that "I don't believe we need to do that at the expense of one of America's true natural treasures." Boehlert noted that "that 'radical' Dwight David Eisenhower thought [ANWR] was a pretty pristine area that we ought to try to preserve." Boehlert attacked ANWR proponents' estimates that the drilling program could provide 750,000 jobs across America, noting that the figure is "inflated by at least a factor of 15."

There appears to be frustration among ANWR opponents that supporters are citing the California energy crisis of last year as well as the September 11 terrorist attacks on the United States as arguments in favor of ANWR. Boehlert commented: "We're led to believe that if we okay ANWR, we're going to have lower prices at the gas pump tomorrow, and no blackouts in California— neither of which had any relationship whatsoever to the oil supply." Boehlert adds: "If you start yesterday in ANWR, the earliest you'll get anything out is probably seven years."

Exelon's John Rowe seems to feel we should steer clear of a debate on ANWR, remarking that "there's a great deal to be accomplished on less controversial lands." Still, he feels that something clearly needs to be done to increase domestic supplies: "At least a solution should be reached for gas... I don't think over the next one to five years ANWR is really the issue, but in the long run you've got to have an awful lot of gas or you've got to have nuclear, and I don't think we'll have huge additions of nuclear in the next few years."

Energy Committee Chairman Bingaman is clearly concerned about gas supplies and argues for a gas pipeline from the Prudhoe Bay region on Alaska's North Slope to the continental United States. His comprehensive energy bill provides financial incentives to encourage the private sector to build the pipeline, which he says could provide gas for 30 years.

On the demand side of the oil balance, awardees suggested that raising Corporate Average Fuel Economy (CAFE) standards for light trucks and SUVs would "save more in oil and sooner than even the most optimistic projections of economically recoverable oil from the north slope of ANWR" (Boehlert), and that we should "take a long hard look" at raising fuel efficiency standards for cars and trucks (Jeffords). The House of Representatives defeated the Boehlert Amendment to its comprehensive energy legislation in August, following a bitter debate concerning the potential for increased traffic fatalities if efficiency standards are raised and manufacturers are forced to comply by making smaller and lighter vehicles.

Awardees expressed strong views to the contrary. Boehlert complained that during the

House debate, "one of the other committee chairmen got up and said, there will be dead bodies on our highways because of this demand for higher fuel efficiency. He claimed erroneously that the National Academy of Sciences said the Boehlert Amendment will kill people, which was, of course, a total fabrication." Senator McCain cited the National Academy of Sciences position that "it is possible to achieve better fuel economy without having to compromise passenger safety." Likewise, Senator Jeffords cited NAS's finding that "existing technology would allow us to increase the efficiency of our cars and trucks while maintaining the same levels of performance and safety."

It is worth noting the National Academy of Sciences position on the fuel economy vs. safety question, as expressed in its 2001 report, *Effectiveness and Impact of Corporate Average Fuel Economy (CAFE) Standards:*

> If an increase in fuel economy is effected by a system that encourages either downweighting or the production and sale of more small cars, some additional traffic fatalities would be expected. However, the actual effects would be uncertain and any adverse safety impact could be minimized, or even reversed, if weight and size reductions were limited to heavier vehicles (particularly those over 4,000 lb). Larger vehicles would then be less damaging (aggressive) in crashes with all other vehicles and thus pose less risk to other drivers on the road.

There was little sympathy for industry complaints that modifying vehicles to achieve higher fuel efficiency will simply impose too great a burden on the industry. Governor Parris Glendening of Maryland noted that automobile manufacturers have claimed in the past that higher fuel efficiency was impossible but that "prior administrations put the standards in and they have been met. We ought to keep the pressure on them." Boehlert, who has emerged as the House — if not Congressional — champion for tightened CAFE standards, recounted the history by noting that ever since 1975, when the first CAFE standards were introduced, "there has been the notion that we'll be a nation of people all driving compacts and sub-compacts. They've also claimed it will have a devastating financial impact on the industry, forcing us to lay off thousands of people. Neither of these things happened. They just re-tooled and continued producing bigger cars that were more fuel efficient."

Unfortunately, Detroit is still in a mode of churning out increasingly oversized — and highly profitable — SUVs with very poor fuel efficiency, like the Chevy Tahoe and Suburban, the Cadillac Escalade, the GMC Yukon, the Lincoln Navigator and the Ford Expedition, and now newcomers in the "giant" car category like GM's Hummer H2 and DaimlerChrysler's Wagen. These travelling power plants average only about 15 miles per gallon.

We are still waiting for signs of leadership from the nation's automakers on the fuel efficiency front, as well as with respect to advanced technology vehicles (see below). Instead of such leadership, what persists is a longstanding competition among the Big Three for shares of the highly lucrative gas-guzzler market, feeding a consumer addiction that has reached epidemic proportions. Ford did pledge last year to improve SUV fuel economy fleetwide by 25% by 2005, but with its largest SUVs getting only 12 to 13 mpg in the city and 16 to 18 on highways, this isn't saying much. These merchandising/marketing strategies stand in stark contrast with Toyota's long-term planning horizon, which led them to conclude in the early 1990s that "We had to face squarely the challenge of addressing global environment problems," as Yaegashi explains. "Otherwise, we concluded, Toyota could not survive in the next century." Morgan warns that "the auto companies will be having very bad *deja vu* back to the 1970s when the Japanese automakers were ahead of them on technology."

Would tighter fuel efficiency standards threaten the American way of life? Not according to Boehlert, who explains that "we're not saying you're going to have to curtail your driving habits, or sacrifice your vehicle of choice. I think the American people have a right to drive a fuel efficient SUV." Boehlert feels "we have failed miserably in showing the consumer that what we're proposing for SUVs is in their interest. You can still have your SUV, but you'll visit the gas station less frequently because you're going to get more miles."

There is some hope on the horizon, as the Big Three automakers all say they'll introduce their first hybrid gas-electric SUVs between 2003 and 2004, and are working on advanced technologies like fuel cells for future deployment. But the rest of their fleets will continue to be heavy guzzlers until these companies meet higher CAFE standards than they do today.

The Power of New Technologies

Advanced Technology Vehicles

Boehlert, like many of the Top Ten awardees, places great faith in technology to answer energy and emissions challenges in the transportation sector. He succeeded in placing provisions in the final House of Representatives energy bill that would provide grants to local governments, schools and airports for shifting their fleets to alternative fuel vehicles. On the Senate side, Jeffords has introduced a bill to provide tax credits to persons purchasing fuel cell and hybrid vehicles, and encouraging the sale of alternative fuels and investment in related infrastructure. Jeffords stresses that "hybrid vehicles and fuel cell vehicles offer tremendous potential when it comes to decreasing our dependence on foreign sources of oil." And at the state level, Governor Glendening has provided tax credits for the purchase of fuel efficient vehicles in Maryland; state government fleets are starting to use alternative fuel systems, and the necessary fueling infrastructure is now being expanded.

BP's Lord Browne also looks to the automobile sector to create more efficient vehicles. Says Browne, "I've heard exciting reports about gasoline direct injection and the impact it could have on fuel economy. There are also opportunities for a new business in LPG-fueled or CNG-fueled vehicles if we provide the infrastructure needed to fuel them. And don't forget fuel cell-powered vehicles." Browne insists that the automobile and oil industries must work together "to come up with solutions that defy the defeatist notion that mobility and clean air are incompatible," and argues that it is possible to "produce a radically lower level of emissions."

Representing the automobile sector, Toyota's Dr. Yaegashi emphasizes the importance of educating consumers so that they choose clean vehicles, rather than relying on regulations. Says Yaegashi, "market oriented incentives rather than regulations, and education of consumers to raise awareness, are probably the most helpful forms of government support. The U.S. Congress is now deliberating on possible measures to support cleaner, more fuel-efficient environmental technologies including advanced technology vehicles... Incentives that attract the attention of consumers should increasingly be prioritized."

Yaegashi spoke of the potential for a variety of new engine technologies. He noted that various hybrid concepts, combining two different technologies into one system, are possible and should be emphasized. Possibilities include hybrid compressed natural gas (CNG), hybrid diesel and hybrid fuel cell vehicles. Lash also spoke of the great opportunity presented by hybrids, which represent "a very basic technology shift that can be made without rebuilding the infrastructure."

Renewables and Energy Efficiency

In the short run, the most important source of clean energy will continue to be improvements in energy efficiency. The technical potential is beyond dispute, as expert studies have repeatedly shown that the United States can achieve the same level of energy service – lighting, heating, transportation, etc. – with smart technologies that require one-third or less energy. The examples given earlier by Lord Browne and Jonathan Lash illustrate how smart companies are already voluntarily achieving greenhouse gas reductions through efficiency improvements, often saving money in the process. The Toyota example is proving that there is a growing market for gas saving vehicles – if they include stylish looks, safety and comparable performance.

In the long run, renewable energy technologies promise to substitute for a large share of our energy needs while responding to the problem of climate change and the persistent, global problem of urban air pollution. While currently small relative to fossil fuels, they are growing remarkably fast (20 to 30 percent per year) and improving dramatically in cost and performance. In some regions wind energy is already competitive with conventional sources of electricity, and where available, energy from geothermal sources, wood and agricultural residues and small hydro facilities is both economically competitive and environmentally preferable. Even relatively expensive solar photovoltaics were in great demand this year in California, highlighting the value of freedom from the volatility of energy markets. While it is perhaps not surprising that leading environmentalists like Jennifer Morgan refer to generating 20 percent of energy from renewable sources as soon as 2020, Shell Oil also recently issued a report recognizing that 50 percent may by possible by the middle of the century. Some companies, like BP and Exelon, have already begun to recognize the commercial potential in alternative energy as a strategic business.

The renewed attention to the link between energy and security is widely seen as a justification for greater government involvement in energy policy. However, as several of our awardees noted, the Administration has unfortunately chosen to focus most of its policies on fossil fuel production to the exclusion of conservation and renewables. This is despite the fact that alternatives offer independence from foreign suppliers, more job creation, less environmental disruption and greater long run opportunity for exports. Several pending legislative proposals would redress this imbalance. In something of a departure from past policies, the current thinking is to focus on creating markets for conservation and renewable energy as well as enhancing traditional support for research and development. An example is the program within the State of Maryland, which relies in part on government procurement of green power in its own buildings and of advanced technology vehicles for its own fleets to enhance the market for such alternatives. The state government aims to lead the residential, commercial and industrial sectors by example.

The Clean Power Act introduce by Senator Jeffords, which allows trading of emission reduction obligations by utilities, illustrates another type of market approach. The most direct support for renewable energy utilization is in proposals for renewable portfolio standards – mandatory minimum percentages for power from defined renewable sources. In the comprehensive energy legislation introduced by Senators Bingaman and Daschle, the RPS is set at 10% by 2020, while Senator Jeffords' bill calls for 20% by 2020. Renewables other than hydroelectric power currently contribute approximately 2% to U.S. electricity supply.

Next-Generation Nuclear Energy Technologies

Several of the awardees recognized nuclear energy's benefits in avoiding greenhouse gas emissions as well as other air pollutants, even as it continues to face public concern primarily related to the safety of nuclear reactors and the wastes they produce. WWF's Morgan was an exception, noting "We don't think you need to increase or utilize nuclear power in order to have the emission reductions that are needed to stabilize climate change at safe levels."

Public concerns may be shrinking in recent years, due in part to public recognition of nuclear energy's clean air benefits. A recent survey for the Nuclear Energy Institute revealed that 65 percent of Americans now

favor the use of nuclear energy as one of the ways to provide electricity — a record since the survey began in the early 1980s. The number opposed also fell below 30% for the first time.

Besides recognition of nuclear's clean air benefits, the declining public concerns may also reflect the improved performance of nuclear power in the United States in recent years. While improving their safety record, U.S. nuclear plants are also cranking out more kilowatt-hours of electricity than in the past. Exelon's John Rowe commented that each of the company's numerous renewable energy initiatives is smaller than the increases the company has made to generating capacity just by improving its nuclear plants. Nuclear energy's contribution to the total U.S. power supply has held steady at about 20% throughout the last decade, despite no new nuclear plants being built and total power generation increasing by roughly 25% from 1990 to 2000.

Even with public support apparently growing, nuclear technology will likely remain controversial. Nevertheless, existing nuclear power plants in this country are a valuable component of the generating mix due to their wide-ranging clean air benefits, avoiding not only carbon dioxide but also sulfur dioxide, nitrogen oxides, mercury and other pollutants from fossil fuels that cause serious public health and environmental impacts. But nuclear power is not without its challenges. Nuclear plants, while being economical to operate due to their low fuel costs, have high up-front capital costs that have been a deterrent to building more and will certainly continue to be as the deregulation of the industry progresses. Meanwhile, assuring the safety of nuclear plants requires constant vigilance on the part of plant operators. Moreover, used fuel is accumulating at power plant sites, with national efforts to develop an underground repository being much delayed. And there are continuing non-proliferation concerns regarding used fuel, as well as concerns that the material could be an attractive terrorist target.

In hopes of capturing the clean-air benefits of nuclear power in possible future nuclear plants, while overcoming these challenges presented by existing plants, Senator Bingaman says his energy bill focuses on "R&D on next-generation nuclear plant designs that could offer significant improvements over existing plants. We're especially interested in reactor designs out there that might be more passively safe." Bingaman notes a DOE R&D program on next-generation designs funded at about $11 million per year, that he hopes to raise to about $20 million. The hope of industry, national laboratories, universities and others involved is that a new generation of nuclear reactors will offer economic, safety, waste management and proliferation advantages over existing ones.

Exelon's Rowe spoke of his company's investment in one of these promising next-generation designs, the Pebble Bed Modular Reactor. Said Rowe: "We are looking at a next generation that would be simpler to build; modular, in the sense that you can do it in small blocks; easily standardized; and relatively passive in its operation." On passive operation Rowe elaborated that a great deal of the safety design of a nuclear plant involves active systems that would prevent loss-of-coolant accidents in the event of a pipe break or other failure. "The pebble bed technology is designed to be more passive... The fuel is designed not to be able to melt."

If new designs can be commercialized that are not only less costly to build but also less complicated to operate safely, then nuclear could play an expanded role in replacing fossil fuels and thereby significantly cut emissions. If new designs can also be developed that are less vulnerable to misuse, then nuclear technologies could also be utilized in developing countries, along with enhanced use of renewables, without presenting a proliferation risk and without allowing increases in pollution that will surely occur if these countries turn to coal instead. Finally, it is important to note that several of the new designs are capable of being built entirely underground. With terrorist threats against U.S. nuclear plants in the wake of September 11, this may be highly desirable for future facilities.

Disposal of nuclear waste continues to be the Achilles' heel of nuclear power. There appears to be a high level of confidence in the scientific community that nuclear waste can be safely disposed of and isolated from the environment for thousands of years, but waste disposal is probably still the number one public concern about nuclear power. The political factors that contributed to the 1987 decision by Congress to site the candidate repository site at Yucca Mountain, Nevada, and the continuing delays and controversy the government has encountered in trying to win approval of Yucca Mountain as a scientifically acceptable site, have undoubtedly fueled public concerns.

The nuclear power plant operators who generated this waste and have paid the government for its disposal have grown increasingly impatient with the slow pace of progress. Inventories of spent fuel at reactor sites continue to accumulate. Thus far the problem has not appeared to deter utilities interested in building new reactors, like Exelon, but it potentially could if there are further delays. Otherwise, the number one concern of electric power companies potentially interested in building a next generation of reactors will continue to be their high up-front capital costs.

Carbon Capture and Sequestration

The vast global reserves of fossil fuels and the well-established infrastructure for their extraction, processing, delivery and use combine to make the option of removing carbon from these fuels well worth considering as one of the paths to a carbon-free energy future. CO_2 can be removed by capturing it from flue gases following combustion, or by chemically converting fossil fuels into hydrogen and CO_2. Based on current understanding, the most attractive system appears to be a combined-cycle approach in which coal is converted into natural gas, the gas is combusted to drive a gas

turbine to generate electricity and the waste heat is used to drive a steam turbine.

In any of these CO_2 capture scenarios, the recovered CO_2 would then need to be sequestered, either in geologic formations, such as oil and gas wells or underground aquifers, or in deep oceans. These measures would add significantly to the cost of coal-fired electricity, but could be competitive with other carbon-free energy options.

Jeffords commented that such carbon sequestration techniques could be an important part of efforts to combat climate change in the coming decades. Lash and Rowe both spoke of the value of tropical rainforests as carbon sinks, and the potential attractiveness of spending money to preserve them not only for their own sake but for the carbon absorption benefits as well.

Smart Growth: Taming Urban Sprawl

Many urban communities throughout the United States face problems related to "urban sprawl." Census data show that in recent decades many people throughout the country have chosen to leave crowded or declining urban centers for suburban communities. People have done this seeking a higher quality of life — bigger homes, larger yards, safer communities. But as more and more people choose the suburbs over the city, suburbs are expanding further and further into once rural lands. This is coming at a heavy price both to the quality of life and the beauty of our rural landscapes.

In many areas, once rural roads are now congested by heavy traffic. Commutes are getting longer. Rural landscapes are being lost to highways, housing developments and strip malls. At the same time, suburbanization is threatening the health of urban and inner-suburban areas. Instead of redeveloping these urban and older suburban communities, the trend in the United States has been to abandon older communities and instead develop new communities in areas where land is cheap.

Some leaders in the United States, like Governor Parris Glendening and Senator James Jeffords, are beginning to challenge this pattern of development. They are calling instead for "Smart Growth." The basic idea behind smart growth is to encourage development in urban and inner-suburban areas rather than rural areas. Promotion of mass transit is an integral part of smart growth policies.

Smart growth can make us less energy-intensive and therefore less polluting. As Governor Glendening suggests, smart growth lessens the need to depend so heavily on the automobile. If new growth is concentrated around public transportation hubs, then people can use public transportation to get to work. Currently taxpayers support urban sprawl through Federal funding of our interstate highway system. If those funds were redirected to developing mass transit, it could help reduce reliance on the automobile. In addition, if new development is encouraged around new or existing public transportation hubs rather than in the distant suburbs, then people could live closer to their work, shops and schools. This could also help reduce the increasingly long hours people are spending on the road.

While sparing our rural landscapes, revitalizing urban areas and improving air quality, smart growth and more accessible mass transit have the added benefit of reducing our demand for transportation fuels. Smart growth does not discourage economic development. Instead, it re-directs investment so as to improve the quality of life in our urban communities. As supporters of smart growth, Governor Glendening and Senator Jeffords encourage changes in government policy supportive of mass transit and urban redevelopment.

Findings and Recommendations

Washington is now gearing up for a final round of debate on comprehensive energy policy, which will take place in the U.S. Senate and subsequently in a House-Senate conference. This follows Vice President Cheney's Task Force recommendations last May and the House of Representatives' passage of H.R. 4 last August, a comprehensive energy bill which echoed most of the Task Force recommendations. The House bill offers over $30 billion in tax breaks to industry and is production-oriented, directing only $6 billion towards energy efficiency and conservation measures. The bill also provides for only a very small increase in vehicle fuel efficiency standards; omits measures designed to cut emissions of greenhouse gases; and proposes to open the Arctic National Wildlife Refuge to oil development.

Since the House passed its bill, of course, the terrorist attacks of September 11 have greatly heightened concerns about not only national security but also energy security. There are differing philosophies concerning the best ways to ensure energy security— ranging from more production of fossil fuels to expedited development of alternative technologies to improved energy efficiency. The Top Ten awardees clearly voiced interest in a more balanced energy policy approach than that adopted last August by the House of Representatives.

In addition to comprehensive energy legislation, Congress is also now beginning debate on multi-pollutant legislation imposing new limits on sulfur dioxide, nitrogen oxides, mercury and possibly carbon dioxide. As lawmakers debate all these issues, SEI urges them to listen to the messages from the Sustainable Energy Top Ten awardees, who suggested a number of areas for policy change, as summarized above. The following recommendations from SEI build upon the messages offered in the interviews:

General Conclusions

1. New technologies are the key to national energy security and to a sustainable, carbon-free energy future. America needs to develop and widely deploy smarter technologies for both producing and using ener-

gy, including such things as direct-injection internal combustion engines; advanced technology vehicles; high efficiency lighting and heating and cooling equipment; fuel cells; hydrogen-based fuel cycles; next generation nuclear technologies; and methods of decarbonizing fossil fuels. The federal government needs to increase substantially its funding of research and development efforts in these areas, and provide greater incentives for development and use of new carbon-free technologies.

2. Changing how we produce and use energy will yield benefits for public health and the environment, for national energy security and for our economy. Improving human productivity per unit of energy consumed, and changing the types of energy sources we use, will allow the United States to reduce sharply its dependence on foreign oil; its emissions of greenhouse gases and sources of urban air pollution; and, in the long run, its overall spending on energy.

3. These improvements can be achieved without requiring major lifestyle compromises. A shift to cleaner energy sources and more efficient uses of energy will reduce environmental pollution and our dependence on imported oil, without regressive impacts on the quality of life such as less use of air-conditioning or heating. Similarly, advanced engine technologies can dramatically reduce fuel consumption and pollution from vehicles even if we are not ready to change our driving habits. Even without lifestyle compromises, however, there is plenty of room to eliminate energy waste, such as by reducing standby power consumed by equipment that is turned off (so-called "energy vampires").

4. Changes in land use patterns, already under way, will also have large benefits in reducing energy consumption and protecting the environment. Smart Growth development strategies and increased use of mass transit can reduce the dependence on individual automobiles, resulting in decreased commute lengths; less gasoline consumption and motor vehicle emissions; less of a toll on wildlife habitats and on our rural landscapes; revitalized urban and inner-suburban areas; and safety benefits.

Message to the General Public

1. Speak up to elected officials. Americans should send the message to lawmakers across the political spectrum that they expect a clean energy future and one without further global warming, and demand accountability. The strength of the public message is critically important; a better-informed public that makes its desires known to lawmakers will lead to better comprehensive national energy and environmental policies.

2. Demand better products and greener energy. As customers, stockholders and neighbors of Corporate America, Americans should convey the message that they expect more energy-efficient appliances and vehicles that will reduce pollutants, and expect the companies themselves to reduce emissions in the manner already demonstrated by the leading, environmentally-progressive companies. For example, SUV drivers should insist that Detroit commercialize improved engine technologies and accept higher fleet-average fuel efficiency standards for SUVs. Furthermore, despite currently-low gas prices, Americans should make fuel economy a major factor in vehicle selection, thereby generating increased competition within the automotive industry to produce greener vehicles sooner. Citizens should also demand green, non-polluting electric power sources.

3. Encourage action at the state and local level. State and local governments should set targets for improved energy efficiency in their own buildings and vehicle fleets, and for increasing the share of power needs that are met by carbon-free sources. At the same time, state and local governments should adopt Smart Growth policies and shift transportation spending from highways to mass transit.

4. Recognize the power of schools to enhance personal responsibility for sustainable energy. Just as schoolchildren have so effectively led American families to practice recycling in the past decade, so too can they now bring about better energy habits if educated on their importance. Educators should increase emphasis on the public health and environmental impacts of energy use, as well as ways we can reduce energy consumption, in school curricula. Tools such as WRI's safe climate website (see Lash remarks), allowing individuals to calculate their "carbon footprint" and figure out ways to reduce it, should be widely adopted as teaching materials. As a part of this, pupils may be educated on the benefits of shifting to more energy-efficient Energy Star appliances and fuel-efficient vehicles, and of driving less. Improved public understanding can also increase the likelihood of achieving significant progress in advancing sustainable energy policies.

Message to Detroit and Other Industry Sectors

1. Energy-consuming companies should continue efforts to cut greenhouse gas and other harmful emissions. Progressive companies have demonstrated that emissions can be reduced without great pains and in many cases with near-term payback in reduced energy costs. Industrial emissions of greenhouse gases are, in fact, already declining in the United States, but not enough to make up for the significant increases in the utility, residential, commercial and especially transportation sectors.

2. The nation's automobile manufacturers should aggressively pursue energy-efficiency improvements for internal combustion engine vehicles as well as maximal introduction of advanced technology vehicles, and should accept higher fuel economy standards. Improvements such as gasoline direct-injection and hybrid-electric vehicles should be introduced as soon as possible across the spectrum of vehicles. Fuel cells running on hydrogen offer the promise of gasoline-free mobility, and industry efforts should be accelerated. The industry's lobbying against tightened CAFE standards for SUVs and pickup trucks is highly detrimental to the nation's efforts to improve urban air quality and cut greenhouse gas emissions. The Environmental Protection

Agency reports that the transportation sector's greenhouse gas emissions rose 18% between 1990 and 1999.

3. The electric power industry has a continuing obligation to make its generating fleet cleaner, requiring continuing efforts on advanced renewable and nuclear energy technologies as well as pollution control technologies on fossil fuel plants. The development of carbon-free power generation should become an industry priority, which will likely only happen as a result of federal standards or incentives to cut emissions. The industry should also support tightened national energy-efficiency standards for appliances and equipment. Finally, while most power companies support new three-pollutant legislation rather than a four-pollutant version that includes limits on carbon, the industry should accept that some cuts are almost certain to be required in the United States eventually, and that U.S. absence from the Kyoto Accord denies U.S. companies access to international trading in credits for greenhouse gas emissions, which would be economically advantageous.

Message to Washington

1. The single most important and achievable near-term measure to reduce U.S. emissions of greenhouse gases and other urban air pollutants is to tighten fuel efficiency standards for all classes of motor vehicles. Vehicles on the road in the United States today average only 20.4 miles per gallon, a 21-year low and far less than vehicles in Europe and Japan. This largely reflects the steady shift to larger vehicles over the last decade, including SUVs, pickups and minivans. Fuel efficiency can be improved through new engine technologies, rather than necessarily making cars smaller and lighter.

2. New technologies for producing and efficiently using energy must be more aggressively researched and developed with federal government support, and standards and incentives must be provided for their deployment. As noted above, the United States should increase substantially its funding of research and development efforts on cleaner engines and advanced technology vehicles; high efficiency heating and cooling equipment; hydrogen-based fuel cycles; next generation nuclear technologies; and methods of decarbonizing fossil fuels. A Renewable Portfolio Standard, providing market incentives for the use of renewable energy technologies, should be adopted forthwith. The United States should also establish tightened efficiency standards for appliances and equipment, such as air conditioners, heat pumps and commercial heating and refrigeration equipment.

3. Lawmakers should recognize that many measures to cut greenhouse gas emissions will save rather than cost us money, and that staying out of the Kyoto Protocol could cost rather than save us money. Even if only economic — not health and environmental — costs are considered, many actions to cut greenhouse gas and other emissions from fossil fuels are cost-beneficial by virtue of reducing energy costs. At the same time, our absence from Kyoto means that U.S. companies will be left out of the international marketplace for buying and selling emissions credits, including the opportunity to purchase cheap tons of emissions reductions in Russia and Central and Eastern Europe.

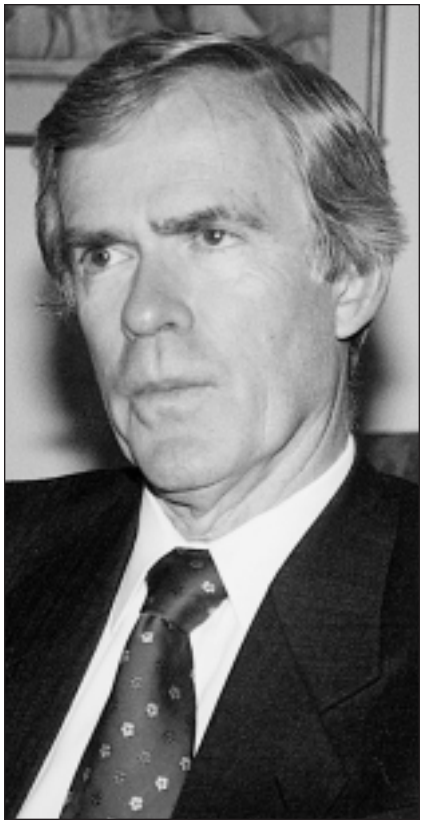
4. The United States should develop a domestic cap and trade system with an initially modest cap, so as to establish market incentives to cut greenhouse gas emissions and to begin a trading system. A compromise that could be more politically acceptable today than the current four-pollutant bill would be to pair such a cap on all greenhouse gas emissions with new three-pollutant legislation regulating sulfur dioxide, nitrogen oxides and mercury from the electric power industry. In combination with tightened CAFE standards, the nation could then find itself heading towards Kyoto compliance and more willing to ratify the Protocol when its likely impacts are better understood to be acceptable.

5. The United States should work constructively with developing nations to minimize growth in greenhouse gas emissions as those economies expand. Consistent with 2. above, we must focus on exporting clean energy technologies as economical alternatives to expanded utilization of fossil fuels in the developing world. We should also explore opportunities for debt-for-environment swaps where they are attractive in preventing further greenhouse gas emissions. Finally, while the United States has limited credibility at this time with developing nations who are parties to the Kyoto Protocol, we should seek in further negotiations to obtain an initial commitment from developing nations as soon as possible to reduce carbon intensity by a modest percentage and by a date certain, which could help skeptical U.S. lawmakers accept the Protocol.

6. Lawmakers should provide the needed incentives for private industry to construct a natural gas pipeline from Alaska's Prudhoe Bay region to the continental United States. Natural gas is a relatively clean, bridge fuel to the future. The Prudhoe Bay reserves can provide gas supplies for more than 30 years and prevent the United States from becoming heavily dependent on imported natural gas, as we now depend on imported oil.

7. The United States should not weaken "New Source Review" enforcement without first establishing new emissions standards applicable to new as well as existing pollution sources. Existing U.S. lawsuits to enforce New Source Review have successfully challenged clear violations of law that prevent progress in reducing urban air pollution. The federal government should not drop these suits, as state governments have insufficient resources to pursue them on their own, nor should it relax New Source Review standards. Settlements that have been achieved have led to important progress in cutting emissions. Without them, it will continue to be an enormous challenge to improve urban air quality. If new three- or four-pollutant legislation is enacted that applies equally to new and existing sources, the regulatory distinction between old and new will be eliminated and New Source Review enforcement could become obsolete at that time.

Awardee Profiles



Senator Jeff Bingaman (D-New Mexico) Chairman, Senate Energy and Natural Resources Committee

As the chairman of the Senate Energy and Natural Resources Committee, Senator Jeff Bingaman (D-New Mexico) is one of the most influential legislators on energy issues on Capitol Hill. On December 5, along with Senate Majority Leader Tom Daschle (D-South Dakota), Bingaman introduced the Energy Policy Act of 2002 (S. 1766). This bill will serve as the foundation for comprehensive energy legislation in the Senate in early 2002, and seeks to balance energy production with energy efficiency. In recognition of his leadership on energy issues, SEI is honored to present one of its Top Ten Awards to Senator Bingaman.

Bingaman told SEI, "You can't have a sound energy policy that is based only on production, or only on conservation. We've got to focus on both. Our energy policy has got to combine programs that boost supplies with programs that use those supplies more efficiently." Thus, the Bingaman-Daschle legislation seeks to ensure "a diversity of fuels and technologies so our future energy supplies are adequate and affordable," and promotes the efficiency of energy use.

The proposed legislation differs markedly from the House-passed energy bill (H.R. 4) in a range of areas, including climate change, CAFE and renewable energy technologies. In his floor statement introducing his bill on December 5, Bingaman stated, "Every study of how to mitigate the possibility of global climate change comes up with a list of policy measures that relies heavily on increased energy efficiency and new energy production technologies with lower greenhouse gas emissions. Because of this intimate connection, much of energy policy and much of climate change policy is interlinked. To do one is, by implication, to do the other. And to ignore one while doing the other is to risk unfortunate and unintended consequences."

Bingaman also is pushing for an increase in CAFE standards, telling SEI, "Our transportation sector consumes 67 percent of all oil in the U.S. Vehicle fuel efficiency improvements will bring the U.S. far closer to reducing its reliance on foreign oil than practically anything else, including drilling in the Arctic Refuge."

Additionally, Bingaman stresses the role that advanced technologies can play in a national energy policy. Citing the need for more fuel diversity, Bingaman argued to SEI, "It only makes sense for the United States to lead the world in renewable technologies." He also noted the role that nuclear energy can play in reducing greenhouse gases, and advocated research and development on next-generation nuclear plant designs.

A former Attorney General of New Mexico, Bingaman was first elected to the Senate in 1982, and is currently serving his fourth term. He became chairman of the Energy and Natural Resources Committee in the summer of 2001.

Congressman Sherwood Boehlert (R-New York) Chairman, House Science Committee

As a leading voice in the Republican Party for renewable energy resources and energy efficiency, Representative Sherwood Boehlert (R-New York) has been a particularly active proponent of cutting emissions of air pollutants and of raising automobile fuel efficiency. In recognition of his leadership role and legislative efforts to advance these causes, SEI is pleased to present one of its Top Ten awards to the congressman.

Since becoming chairman of the House Science Committee in January 2001, Boehlert has been actively involved in the ongoing debate over developing a national energy policy. He fought to include provisions encouraging the use of alternative fuel vehicles and increasing investment in renewable energy technologies in the comprehensive energy legislation (H.R. 4) which passed the House this summer. Chairman Boehlert also offered an amendment which would have raised fuel efficiency standards for sport utility vehicles and light trucks (CAFE standards), but that amendment was defeated in the final House bill.

Boehlert told SEI, "I knew in the closing arguments of the debate on the CAFE amendment that I won on the merits but that I was going to lose the votes…I have strong feelings about fuel standards for SUVs. Our saving grace, I think, is going to be the United States Senate."

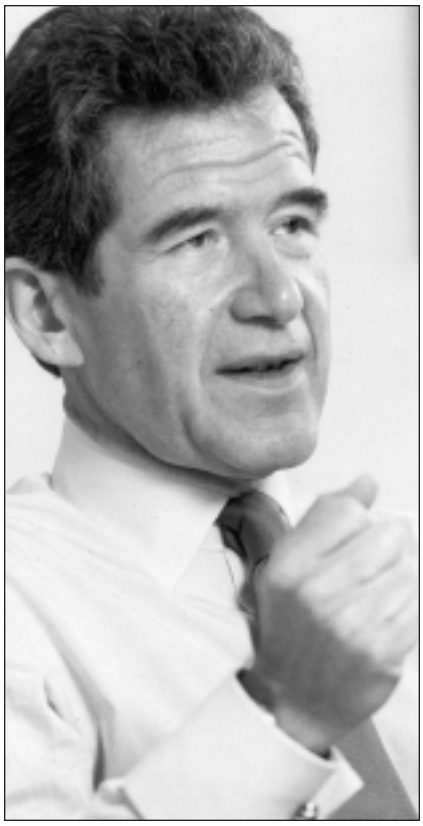
The priorities of the chairman were made clear when he chose "The Role of Renewable Energy and Energy Efficiency" as the subject of his first Science Committee hearing. His opening statement asserted that "…[T]he real energy crisis is not the current situation in California or the price spikes in natural gas or heating oil …The real problem is that, nationally and globally, our energy profile is irresponsible and probably unsustainable — environmentally, economically and from a national security point of view."

Boehlert is currently co-sponsoring, along with Representative Henry Waxman, the House version of the "Four-Pollutant" bill, which would cut emissions of sulfur dioxide, nitrogen oxides, carbon dioxide and mercury from power plants. Regarding climate change, Boehlert told SEI, "We have a very heavy responsibility and we've got to lead by example," but emphasized that developing nations must be part of the process right from the beginning, "even if it's minimal." Boehlert suggested a formula for developing nation participation that could help gain U.S. commitment to the Kyoto process.

Boehlert has been an outspoken supporter of enforcement of New Source Review requirements, and has urged President Bush not to drop ongoing lawsuits against utilities who are accused of violating these requirements. He complains that Midwestern utilities have been turning old plants into new sources but getting "a free ride on emissions." Boehlert hopes that new emissions control legislation will apply to all plants, old and new, so that it will no longer be necessary to debate what constitutes a new source.

Finally, Boehlert has introduced a bill to establish an alternative fuel vehicle demonstration program within the Department of Energy. A second proposal would establish a pilot program within the Department to facilitate the use of alternative fuel school buses through grants for energy demonstration and commercial application of energy technology.

First elected to the House of Representatives in 1982, Boehlert is currently serving his tenth term representing central New York. He began serving on the Science Committee in 1983. The Committee has jurisdiction over a wide variety of topics, including research and development initiatives within the Department of Energy and the Environmental Protection Agency.



Lord Browne of Madingley
Group Chief Executive, BP P.L.C.

As group chief executive of BP P.L.C., Lord Browne — formerly Sir John Browne, last year made a Lord — has been one of the leading corporate figures in confronting greenhouse gas emissions, and in promoting clean energy and sustainable development. In recognition of these proactive efforts, SEI is pleased to present one of its Top Ten awards to Lord Browne.

Browne told SEI, "There's a view around that business is the cause of many of the world's environmental problems, but I hope we are moving beyond that argument. The real issue we face is whether business should take an active or passive role on environmental regulations that are enacted in response to mounting public concern."

He continued, "At BP we're activists. Business is an incredibly dynamic force — it constantly offers new choices in response to the needs of consumers…[W]e don't share the fatalism behind the view that there must be a trade-off between growth and environmental protection. But no resource-based business can survive in the long run by ignoring public perceptions about such major global issues as climate change."

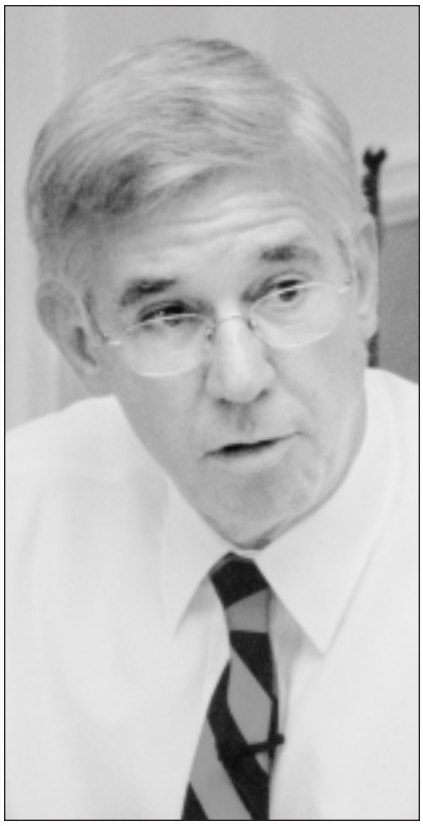
Reflecting that philosophy, Browne and his company have often been industrial leaders in addressing environmental issues. In 1997, BP surprised many of its colleagues by declaring that global climate change was a serious problem. In 1998, the company made a public commitment to reduce its carbon emissions worldwide by at least 10% from a 1990 baseline by the year 2010. BP has also been at the forefront of the oil industry in improving air quality. In 1999, it was the first oil company to offer gasoline with reduced sulfur voluntarily.

BP has also established a "Green Operations Technical Program" focusing on greenhouse gases. The program has resulted in reduced emissions both in the United States and internationally. BP has also joined forces with eight other energy companies in the CO_2 Capture Joint Industry Project to try to reduce emissions through the development of advanced CO_2 separation and geologic storage technologies.

Addressing the issue of carbon emissions, Browne concludes, "Few have been prepared to accept responsibility on this issue, and that has to change. It's too easy to try and find shelter under the idea that the science surrounding these environmental issues is still uncertain. Science will always be provisional to a degree. We may not fully understand all of the relationships involved here…but for years there has been undeniable evidence of a problem that merits action."

Through its wholly owned subsidiary BP Solarex, and its "Plug in the Sun" Program, the company now installs solar panels on the roofs of many of its newest filling stations as a way of promoting solar energy. Additionally, BP is pursuing opportunities in the areas of natural gas, renewables, energy efficiency and hydrogen fuel cells. In May 2000, BP purchased nearly 20% of Green Mountain Energy Company, the leading provider of cleaner electricity to over 100,000 residents of California, Pennsylvania and New Jersey. Consumers will have a selection of electricity blends that combine renewable sources with natural gas.

Lord Browne began his association with BP in 1966, and has held a variety of exploration and production posts in Alaska, New York, San Francisco, London and Canada. He also has served as chief financial officer of the Standard Oil Company in Ohio.



Governor Parris Glendening (D)
State of Maryland

Through his Smart Growth Program, Governor Glendening has emerged as a national leader for preserving open space, protecting natural resources and slowing suburban sprawl. In recognition of these landmark growth management efforts, SEI is pleased to present one of its Top Ten awards to the Governor.

Glendening's Smart Growth Program was enacted by Maryland's 1997 General Assembly. The Initiative consists of several programs which collectively seek to direct state resources to revitalize older developed areas, preserve open space lands and discourage sprawling development into rural areas. While noting that in Maryland, Smart Growth is primarily an environmental policy to protect open space, the Governor suggests that another central aspect of the policy was reducing the amount of energy we consume as a society. Glendening told SEI, "we're still consuming in the United States such a disproportionate amount of energy compared to the rest of the world. In part, it's because of the over-reliance on the individual automobile. It seems to me that the real solution, the long-term solution, must be not just controlling emissions and increasing mileage per gallon, but to reduce the reliance on the car."

He elaborated, "I believe there are only two ways really to do this. One is to change land development patterns" so that people live close to where they work. Second, "we've got to recognize that more roads do not solve the problem. What we need is a substantial investment by both state and local, but also the federal, governments in mass transit." Maryland has begun a $3 billion program to expand mass transit across the state, seeking to double ridership by 2010.

In addition to Smart Growth, Governor Glendening has acted to promote the use of "green energy." An executive order issued in March 2001 creates a commission to make recommendations and set criteria for constructing and maintaining energy efficient and environmentally responsible state facilities.

The order sets a new goal for the procurement of electricity, calling for at least 6% of consumption in state-owned facilities to be produced from "green energy." Additionally, the governor's action encourages wider adoption of energy-efficient office products, the use of renewable energy components, state purchases of alternative fuel and low-emission vehicles and the reduction of waste production. The order seeks to attain specific goals, including the reduction of energy consumption in state buildings by 10% per square foot by 2005 and 15% per square foot by 2010.

Glendening emphasized the important role the federal government must play with respect to sustainable energy. In addition to federal investment in mass transit, the governor highlighted the need for the federal government to take the lead in combatting climate change and to keep pressure on automobile manufacturers to achieve higher fuel efficiency standards.

First elected Governor of Maryland in 1994, Glendening is currently in his second term. He recently served as chairman of the National Governors Association, and used that position to promote Smart Growth policies on a national level. Prior to becoming governor, Glendening served as the County Executive of Prince George's County, Maryland from 1982-1994.

Senator James Jeffords (I-Vermont) Chairman, Senate Environment and Public Works Committee

Since first being elected to Congress in 1974, Senator Jeffords (Independent - Vermont) has been a consistent advocate for environmental protection and one of Congress' strongest supporters of renewable energy. In recognition of this leadership on environmental and renewable energy issues, and his sponsorship of the "Four-Pollutant" bill to reduce pollutant emissions, SEI is pleased to present one of its Top Ten awards to the Senator.

Jeffords is the new chairman of the Senate Environment and Public Works Committee, which gives him a particularly influential voice in shaping policy on issues ranging from climate change to alternative fuel vehicles. However, Jeffords' commitment to energy and environmental issues has long been clear. In 1976, he founded the Solar Coalition, a small group of Representatives and Senators committed to maximizing the potential of solar and renewable technologies through aggressive federal leadership. Additionally, he has been a strong supporter of tax credits for renewable energy and alternative fuel vehicles. He was one of the primary sponsors of the wind and biomass tax credit in the early 1990's and successfully fended off efforts to repeal the credits. In 1999, the Senator ensured that the wind energy production tax credit was extended.

Senator Jeffords told SEI, "Our nation continues to rely on fossil fuels for most of our energy, but we are on the verge of major changes in the way we generate energy. Wind energy….will likely continue to play a dominant role in new energy generation. I believe that other promising technologies…will soon see similar growth spurts… I think it is time for the United States to take the lead not only in developing these new technologies, but in utilizing them."

The Senator's actions reflect these words. This year, he introduced four bills aimed at promoting sustainable energy. First and foremost, the Clean Power Act of 2001 (the "Four-Pollutant" bill) seeks to reduce electric power plant emissions of nitrogen oxides, sulfur dioxide, mercury and carbon dioxide by January 1, 2007. The bill would cut aggregate power plant emissions, and would set modernization standards for outdated power plants.

The Senator has also introduced legislation to ensure that efficient sources of electricity, such as combined heat and power systems, are able to transmit power to the nation's electricity grid by establishing uniform and nondiscriminatory interconnection standards. He has co-sponsored a third proposal which would provide tax credits to taxpayers who buy clean fuel-cell and hybrid vehicles.

Most recently, the Senator introduced the Renewable Energy and Energy Efficiency Investment Act of 2001. The legislation creates a market-driven and flexible policy mechanism called a Renewables Portfolio Standard (RPS) that would require all retail electric providers to sell an increasing percentage of electricity derived from renewable sources, beginning at 2.5% in 2002 and reaching 20% in 2020. The bill would establish a system of tradable renewable energy credits (RECs) to provide flexibility in meeting the renewable goals. The legislation establishes a system benefits trust fund that would provide matching funds to states to promote energy efficiency programs and investment in promising renewable energy technologies.

A member of the House of Representatives from 1975 - 1988, Jeffords has also served as Vermont Attorney General. He was first elected to the Senate in 1988 and is currently in his third term.

Jonathan Lash
President, World Resources Institute

As president of the World Resources Institute, Jonathan Lash has been a leader in the sustainable development community and a vocal proponent of taking action to combat climate change for years. In recognition of his leadership on these issues, SEI is pleased to present one of its Top Ten Awards to Jonathan Lash.

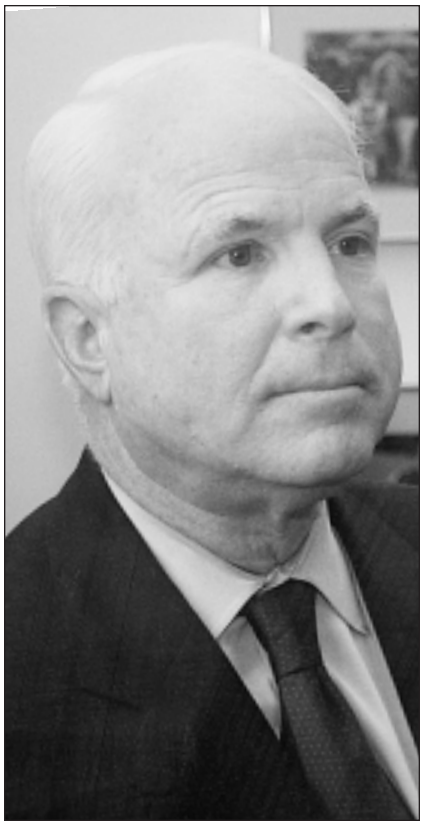
In addition to its expertise in sustainable development, WRI has sought to address the issue of climate change in an aggressive manner. In 1999, the organization committed to reducing its own CO_2 emissions to zero by 2005, and WRI expects to achieve and attain this goal. As a way of reducing emissions, Lash is particularly supportive of a "reverse auction," in which the government would request proposals from different sectors for investments to reduce CO_2 emissions, and then buy the cheapest CO_2 reductions.

Noting the Bush Administration's position on climate change, Lash told SEI, "We are technologically the most advanced nation on earth and we have the greatest technological resources. Solving the climate problem is going to involve enabling other nations, particularly developing countries, to expand their economies while reducing their use of fossil fuels…If we approach this as an international opportunity…then this becomes one of the big opportunities of the 21st century. But as long as we keep approaching it as a threat, it's going to become one of the big problems of the 21st century."

WRI is involved in a variety of climate change projects. Along with a Hungarian group, WRI is conducting a project entitled "Capacity for Climate Protection in Central and Eastern Europe." The project seeks to assist countries in these regions with their efforts to find less emission intensive development paths, and to create policy and institutional frameworks to comply with the UNFCCC and Kyoto Protocol.

WRI is also using digital communication and analytical tools to research, analyze, and disseminate information on the source, direction, and magnitude of investment in fossil-fuel based electricity generation from developed to developing countries. Additionally, Lash's organization is involved in two partnerships which address this issue—the Green Power Market Development Group (GPMDG) and the Greenhouse Gas Protocol Initiative (GHG). The GPMDG seeks to "develop and catalyze new markets for environmentally friendly "green power" by working with industrial and commercial companies interested in reducing their reliance on non-sustainable forms of energy. In a project called "Thinking Long-Term," WRI is exploring how energy efficiency and renewable energy technologies can help reduce the social and environmental impacts of global climate change over the next 100 years.

A former head of the Vermont Agency of Natural Resources and Commissioner of Environmental Conservation, Mr. Lash served as the co-chair of the President's Council on Sustainable Development from 1993 until 1999. In this role, he helped lead a group of government, business, labor, civil rights and environmental leaders as they developed recommendations for national strategies to promote sustainable development.



Senator John McCain (R-Arizona) Ranking Member, Senate Commerce, Science and Transportation Committee

As the ranking Republican (and former chairman) of the Senate Committee on Commerce, Science and Transportation, Senator John McCain (R-Arizona) has been instrumental in drawing national attention to climate change issues. Between May 2000 and May 2001, as Committee Chairman, McCain organized five hearings on the subject. Additionally, he plans to co-sponsor legislation with Senator Joseph Lieberman (D-Connecticut) to establish a domestic cap-and-trade system to control U.S. emissions of greenhouse gases in the most cost-effective manner. For these efforts, SEI is pleased to present one of its Top Ten Awards to Senator McCain.

Referring to global warming, McCain told SEI, "…[I]t's a pretty compelling case that we have a problem. I don't think that we can ignore it and hope that it works itself out, so that's why Senator Lieberman and I have introduced the cap and trade proposal." McCain acknowledged the difficulty of determining where the cap should be set, but believes the cap and trade system is the right system for the U.S.

McCain elaborated, telling SEI, "I also think there's going to be a world marketplace for buying and selling emission reductions, and we are now running a big risk that American companies will be left out….When we set up a national cap and trade system, our industries will be able to gain the experience they'll need to stay competitive with other nations' industries that are playing in the global trading system." McCain added that he would not have pulled the U.S. out of the Kyoto process, noting that the U.S. produces 25 percent of the world's greenhouse gases.

In addition to the cap and trade proposal, Senator McCain has supported tougher fuel efficiency standards for cars. He acknowledges that the debate over CAFE standards is complex because it affects the environment, public safety and the economy. But he told SEI, "it is possible to achieve better fuel economy without having to compromise passenger safety." In addition, McCain argued that "Congress can and should continue to work aggressively to bring about improvements in combustion and engine control technology, including alternative fuels, that will let us reduce tailpipe pollution and greenhouse gases." Furthermore, McCain has introduced and supported legislation that provides incentives to develop alternative forms of energy, such as solar, wind, geothermal and biomass.

Named in 1997 as one of Time Magazine's "25 Most Influential People in America," McCain commands growing leadership status and visibility. He is best known for his independently driven presidential campaign and his pursuit of campaign finance reform. The high-profile senator graduated from the U.S. Naval Academy in 1958 before embarking on a 22-year career as a naval aviator. In 1967 his plane was shot down over Vietnam, and he was held as a prisoner-of-war in Hanoi for more than five years, much of it in solitary confinement. After retiring from the Navy as a Captain in 1981, McCain went on to represent Arizona in the U.S. House of Representatives for two terms before being elected to the Senate in 1985. In his third reelection to the Senate in 1998, he received nearly 70 percent of the vote.

Jennifer Morgan
Climate Change Campaign Director, World Wildlife Fund

As director of the World Wildlife Fund's Climate Change Campaign, Jennifer Morgan has gained immense respect and influence on the international stage of climate change policy. In recognition of her leadership role on climate change issues, SEI is pleased to present one of its Top Ten Awards to Jennifer Morgan.

Morgan has worked tirelessly to advocate international policies to combat global climate change. She heads the WWF delegation to the Kyoto Protocol climate negotiations and assumed a lead role in pressing for international closure to the treaty, which called for targeted emissions reductions from industrialized countries. Morgan told SEI, "The Kyoto Protocol is the only game in town internationally and one which the United States has played a leadership role in shaping…Ultimately I think that the impacts of climate change are likely to be immense and long-lasting. And as the world's largest economic power and biggest contributor to the problem, the U.S. should be involved in trying to combat it."

Morgan's recent criticism of the Bush administration for withdrawing from the Kyoto Protocol has been well publicized. In a Washington Post Op-Ed in November 2000, Morgan emphatically closed the debate over uncertainties about the science on climate change, writing, "It's time to act…Just last month, the international Intergovernmental Panel on Climate Change…confirmed that global warming is occurring and will accelerate if greenhouse gas pollution is not curbed. For all practical purposes, that debate is over."

Morgan continues to campaign on the argument that the U.S. would stand to gain long-term competitive advantages in the market by accepting the Kyoto Protocol. "The protocol includes many of the concepts and approaches that the United States has advocated both nationally and internationally for years, including market mechanisms," Morgan told SEI.

Morgan also recognizes a need for public education regarding energy in homes, where the energy comes from and the impact emissions have on the atmosphere. She has worked hard to break down complex environmental issues for an increasingly concerned public. Morgan told SEI, "The idea of doing something about global warming is not an idea to change the American way of life…I think that's a myth that needs to be broken. If anything, I think the idea of doing something about global warming can actually build upon the American way of doing things, like developing new technologies as we've done historically."

Morgan received her master's degree from the American University in International Affairs, and previously held positions at the Natural Resources Defense Council and the National Audubon Society. Morgan has served as coordinator at the U.S. Climate Action Network, which comprises more than 200 environmental groups worldwide working on global climate change.

John Rowe
Co-CEO and President, Exelon Corporation

Formed by the merger of Unicom Corporation and PECO Energy in October 2000, Exelon Corporation is one of the nation's largest electric power companies. As co-CEO and president of Exelon, John Rowe has been a leading force in industry in promoting the use of renewable energy as well as next-generation nuclear technologies. In recognition of these efforts, SEI is pleased to present one of its Top Ten Awards to John Rowe.

Mr. Rowe informed SEI, "I tend to look at [sustainable energy options] as a kind of continuous improvement obligation. We've got to stop looking at environmental issues as an answer to the question, 'When have you done enough?' and accept that there is a continuing obligation to make our generation fleets cleaner and more effective in each passing decade, and that that's an obligation that never goes away."

Rowe advocates a bigger role for nuclear energy, and firmly believes that the world is "not going to get to a lower carbon future without an enhancing role for nuclear." Exelon has sought to increase the efficiency of its nuclear fleet. The company has also invested in the advanced Pebble Bed Modular Reactor, and hopes to build them.

Rowe believes that the Kyoto Protocol was not acceptable in its original form, but differs from many industry leaders in thinking that eventually the United States will have to have some form of mandatory carbon reductions.

Rowe told SEI, "We think that continuing to hammer away at renewables is important. …We're going to see higher and higher premiums on equipment that provides for more efficient uses of energy than we have for a while. In my opinion there have been very substantial gains over the past decade in the ability to make air conditioners, computers and other things run efficiently, and we'll see both legally and economically more incentive to do that sort of thing."

ComEd has been purchasing renewable energy for over ten years. The company has provided $225 million in start-up capital for the Illinois Clean Energy Community Trust, which will be used to finance energy efficiency initiatives, renewable energy resources and environmental programs. The company has also been an industry leader in photovoltaics (PV), having installed PV at its facilities and having committed $12 million to Chicago for the purchase and installation of photovoltaic power systems at certain city sites. In addition to photovoltaics, Exelon has promoted landfill methane projects as simple, basic technologies which happen to work very well in converting gases into fuel.

Prior to the formation of Exelon, Mr. Rowe served as the chairman, president and chief executive officer of Unicom Corporation and its subsidiary Commonwealth Edison (ComEd). This position included the oversight of ComEd's renewable energy activities. A past chairman of the Edison Electric Institute, Rowe has also served as the president and chief executive officer of New England Electric System and Central Maine Power Company.

Dr. Takehisa Yaegashi
Senior Chief Engineer, Toyota Motor Corporation

Toyota's hybrid Prius has been hailed as the embodiment of what the 21st-century vehicle should and will be. The Prius combines gasoline and electric power systems to maximize energy efficiency, produce total emissions one-tenth that of gasoline-powered vehicles and reduce carbon dioxide emissions by half. As the mind behind the Prius and as its chief engineer, Dr. Takehisa Yaegashi is credited for his ingenuity and foresight. In recognition of his role in the development of this vehicle, SEI is pleased to present one of its Top Ten Awards to Dr. Yaegashi.

The investment in the Prius was a bold and innovative step by Toyota that proved to be a promising one. "The first expectation was that the number of customers might be small, and that the response might be slow," Yaegashi told SEI. "But in fact the market responded much faster than we had expected. I felt that public awareness was changing."

Amidst the unveiling of the Prius to the American public last year, Yaegashi called for a balance between competition and cooperation among automakers in order to protect our shared environment while harnessing the maximum power of energy technology. He also recognized that research and development on environmental technology is essential if the automobile is to remain a viable mode of transportation into the 21st century.

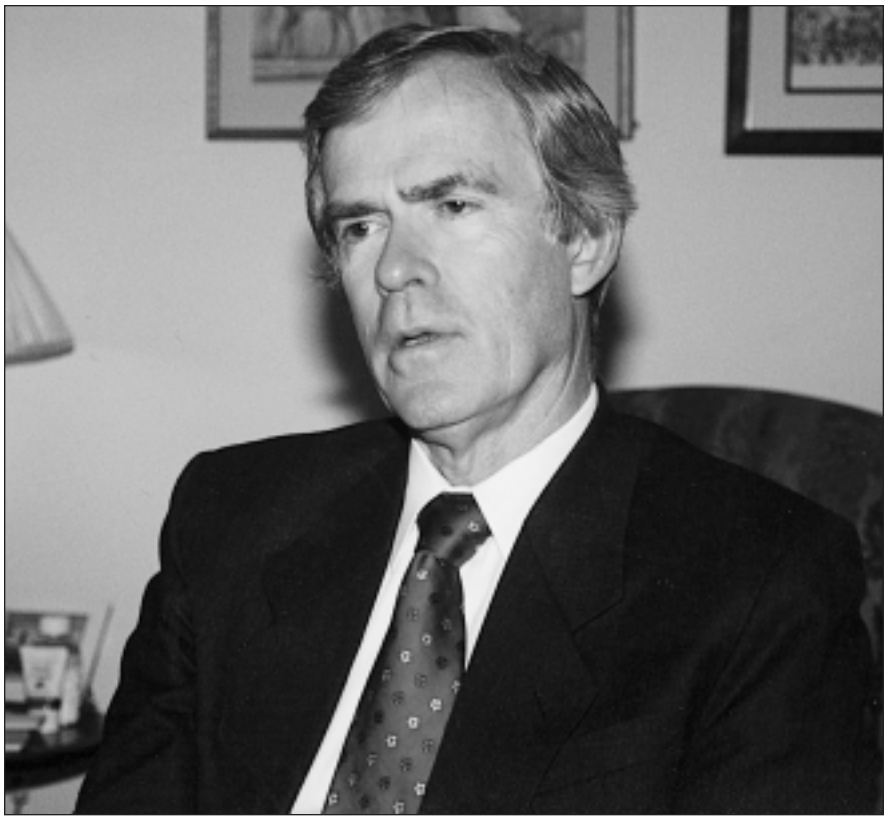
Yaegashi believes the hybrid could eventually rival gasoline-powered vehicles in the 21st century, and has named three elements — innovative technologies, reduced costs and appropriate infrastructure — as essential to bringing the vehicles into practical use and acceptance. "The reaction from the other global manufacturers has been even larger than from the market," Yaegashi told SEI. "I think we had an impact to initiate a kind of trend and attract more attention to the hybrid system as a real alternative."

Yaegashi also spoke of extending the hybrid system to larger models, noting the market demand in both Japan and the U.S. for larger vehicles. He told SEI, "We made the decision to introduce the hybrid in the car class because we thought that was the easiest way to penetrate the market. But of course, in the long run, we have a plan to make larger hybrid vehicles, more efficient than conventional vehicles. The Estima hybrid launched this year is one example in that direction." Referring to the U.S. specifically, Yaegashi continued, "We have to meet [American market] needs, but at the same time we constantly try to improve our technical capability so that it would fulfill both needs — the consumers' preference for larger or more powerful cars, and the environmental need for cleaner emissions and better fuel efficiency. We are now developing another hybrid system for the Crown class cars as well."

Yaegashi has invested his expertise and skills into the research and development of advanced environmental technology at Toyota since 1969. He began by focusing on R&D, and later became the System Chief Engineer of the Hybrid Propulsion System Project, which was installed in the Prius.

SENATOR JEFF BINGAMAN (D-NEW MEXICO)
CHAIRMAN, ENERGY AND NATURAL RESOURCES COMMITTEE

DECEMBER 18, 2001



Comprehensive Energy Bill

SEI: *Chairman Bingaman, could you please begin by providing an overview of the comprehensive energy bill you've just introduced, S.1766?*

Bingaman: Certainly. The Energy Policy Act of 2002, which Majority Leader Tom Daschle and I introduced on December 5, seeks to balance energy production and energy efficiency. It's going to ensure that we have a diversity of fuels and technologies, so our future energy supplies are adequate and affordable — including renewables, natural gas, oil, coal, hydropower and nuclear power. Second, we're going to improve the efficiency and productivity of our electric transmission system and the efficiency of energy use. The bill also addresses infrastructure security, climate change and other areas of environmental protection.

I think we can achieve these goals if we accelerate developing and introducing new technologies, and if we create flexible market conditions. We need to empower consumers to make energy choices benefit them individually, but also society as a whole. So we're talking about combining technology and policy innovation in order to pursue a diverse and robust energy system. This mix can be seen in the provisions of our bill that relate to its first major goal — adequate and affordable supplies of energy.

A tremendous amount of work has gone into this bill, involving several Senate committees. In my committee alone, we held more than 50 hearings in the 106th and 107th Congress relevant to this bill. It's a starting point for the next phase of the Senate's consideration of energy policy, which Senator Daschle has scheduled for the first work period of next session.

SEI: *Could you comment on the House energy bill, H.R.4, and which elements you agree with and don't agree with?*

Bingaman: I'll offer some general impressions. My first concern is that H.R.4 fails to address electricity. It also does not address ways to reduce greenhouse gas emissions, and it fails to provide a meaningful increase in fuel efficiency standards for light trucks, SUVs and minivans. Nor does it make significant investments in energy efficient technologies or renewable energy sources. Instead it gives away billions in tax breaks for mature technologies, without providing an offset for these additional tax breaks. Only 17 percent of the tax incentives in there would help fund real conservation measures and alternative energy resources. And, of course, the Republican bill follows President Bush's proposal to open the Arctic Refuge to oil development. The majority of Americans disagree with these actions, and so do I.

Now ANWR has dominated a lot of the energy policy debate, and in fact it has really complicated efforts to develop energy policy in the Senate. So I'd like to be clear on why I don't think opening up this ecosystem to drilling is an essential part of our national energy policy. There are many areas in this country with outstanding resource potential that already have been leased and are ready for exploration and

production. That so many of these areas are not being developed may be an indication that other barriers to domestic oil and gas production may exist that we should be addressing in legislation. Those other barriers may be more important to our energy supply picture than the question of ANWR.

The excessive focus on the Arctic Refuge has diverted attention from a much more important energy supply problem: our growing dependence on foreign imports for natural gas. The biggest Alaska energy issue, in my view, is not ANWR oil, but Arctic gas. Those folks supporting drilling the Wildlife Refuge because of a concern about jobs — they should take a look at the gas pipeline. That's where the jobs really are. That's the real deal.

Our bill provides financial incentives for the private sector to build a pipeline and bring these huge natural gas reserves down from the Prudhoe Bay region in Alaska. There's over 30 trillion cubic feet of gas up there. And if you take the whole North Slope of Alaska, you have a resource estimated at over 100 trillion cubic feet. Our estimates are that once we get the pipeline built, it's going to give us gas for at least 30 years. This would obviously help stabilize natural gas prices.

So I think the Senate has got to be proactive on this, and make it happen now because there is significant private sector interest in doing it right now. Otherwise, we're just going to become as dependent on foreign natural gas as we are now on imported oil.

Now if you compare our bill, and things we've already passed, with the very broad recommendations made by Vice President Cheney's Task Force last May, you see that we've addressed nine of out ten of the Task Force's recommendations. The House energy bill only addresses five or six. I think that puts into perspective the criticisms that we have heard that ours was some sort of partisan exercise.

Now, what in H.R.4 do I agree with? I'd have to say that the provisions in H.R.4 that address research and development are pretty solid and, frankly, remarkably similar to what Senate Democrats had proposed last spring. Throughout the development of our bill, I've always said that new science and new technology are at the core of any solution to our nation's energy challenges. So I'm pleased to see that the House did a good job in that area.

SEI: *It seems that the House and Senate are likely to be pretty far apart on energy policy, not to mention the White House and the Senate. How do you see this moving forward?*

Bingaman: I'm looking forward to the debate early next year when the Majority Leader brings our bill to the floor. I think Senator Daschle did the right thing by not trying to jam energy legislation into the schedule this December. Energy is too important to do in a rushed, half-baked fashion. I think it's only fair to let Senators take this comprehensive bill home over the break and study it in detail before we come back next year. It's a solid product that will withstand close scrutiny. And if there are problems, we will debate them and fix them. A lot is at stake in this debate — our national security, our future economic prosperity and the jobs of millions of Americans. So it's more important to do it right that it is to do it in a hurry. And I hope that in the coming weeks, as our bill receives the careful attention of my colleagues, we'll be able to come together in Congress and with the Administration, and combine a thoughtful analysis of our current energy challenges with a willingness to take the bold policy steps needed to address them. We owe that to the American people.

SEI: *How would you assess the impact of September 11 on what the nation needs to do about energy?*

Bingaman: One area where we need to reconcile energy policy with broader concerns in society has to do with energy infrastructure security. The events of September 11 caused many to think again about the potential security vulnerabilities of our nation's energy infrastructure. This is an area where a considerable amount of work already has been done. Particular emphasis was already given to security against energy supply disruption a decade ago, during the Desert Shield and Desert Storm operations. A lot more thought then went into it in the aftermath of the West-wide electricity blackout in 1996, and during the period leading up to Y2K. Yet, there's still more to be done to address longstanding challenges in energy security policy, and our bill contains several provisions relevant to that.

One of them is to give FERC (the Federal Energy Regulatory Commission) authority to promulgate rules to protect the reliability of our power grid. Another focuses on the Strategic Petroleum Reserve, which is our insurance policy against a cut-off of oil from the Middle East. Since the SPR was established in the 70s, the legal authority to operate it has periodically expired, and sometimes bills to reauthorize it have been held up in Congress as leverage on other legislation. Our legislation permanently reauthorizes both the SPR and our participation in international activities to deal with energy supply disruptions. Our bill also requires the President to fill the SPR to its current capacity, and to study how to make it even more effective as a hedge against future supply disruptions.

Finally, we clarify the Department of Energy's current authorities to assist industry in responding to increased security concerns

The biggest Alaska energy issue is not ANWR oil, but Arctic gas. That's the real deal.

related to the vulnerability of critical energy infrastructure. We're creating a new dedicated R&D program on this, as well as a new advisory committee involving all stakeholders concerned about energy infrastructure security.

Climate Change

SEI: *The Intergovernmental Panel on Climate Change issued a report by 700 scientists earlier this year predicting that average world temperature will rise by as much as 10°F over the next 100 years. With the U.S. apparently staying out of Kyoto while other nations move forward, how do you feel we should proceed toward reducing emissions of carbon and other greenhouse gases? What can the U.S. do while others ratify and implement Kyoto?*

Bingaman: Climate policy is the common thread among a lot of the provisions we're discussing, and one of the most important public policy challenges of the 21st century. Energy production and use are leading sources of greenhouse gases, so climate change policy and energy policy are inseparably linked. The comprehensive energy legislation we're producing has to make a positive and long-term contribution to environmental health. There are many provisions in our bill — like increased energy efficiency, and more renewables — that contribute to this goal.

The provisions involving energy efficiency are going to deliver significant benefits in terms of reduced emissions of carbon dioxide. For example, the industrial energy efficiency provisions in our bill are estimated to reduce CO_2 emissions by up to 71 million metric tons by 2010 and 95 million metric tons by 2020.

SEI: *Quite a few bills have been introduced in the Senate this year concerning climate change. Could you describe what approach you've taken in the comprehensive energy bill?*

Bingaman: We did incorporate certain provisions from those other bills, particularly the bipartisan climate change bill sponsored by Senators Robert Byrd (D-West Virginia) and Ted Stevens (R-Alaska), which received unanimous support in the Committee on Government Affairs. What we're aiming to do is to put in place a strategic plan based on four key elements. First, as a basis for policy development, the bill would establish a National Office of Climate Change Response and direct this office to develop a climate response strategy, to be completed within a year of enactment. Second, it calls for a national commitment to develop the next generation of bold, breakthrough energy technologies. Third, it expands research into possible climate adaptation strategies as well as ways of mitigating climate change impacts. And fourth, it would expand research to help resolve the remaining scientific and economic uncertainties.

The necessary administrative structure also has to be put in place. So the Byrd-Stevens proposal in this bill establishes several new offices, within both the White House and the Department of Energy, that will focus our national attention and better coordinate an effort that currently seems ad hoc and scattered.

The Byrd-Stevens proposals also recognize that we truly need an industrial revolution to begin to solve the climate change problem. So the bill contains provisions that build on research and technology efforts already under way at the Energy Department, by establishing an aggressive R&D effort in DOE's new Office of Climate Change Technology.

Besides the Byrd-Stevens proposals, we've included climate change-related provisions from other Senate committees, including my committee, the Commerce Committee and the Environment Committee. These include a major expansion in climate change science research on oceans and the atmosphere; the development of a national database of greenhouse gas emissions from major sources; and a strengthened focus on exporting clean energy technology to developing countries that are likely to experience major growth in greenhouse gas emissions in the next few decades.

It's just good common sense to focus on opening and expanding clean energy markets, and on increasing U.S. clean energy technology exports to countries around the world. It will help address our energy security, economic development and global environmental protection goals all at the same time.

A lot is at stake in this debate — our national security, our future economic prosperity and the jobs of millions of Americans.

I think the climate change proposals in our bill are going to be broadly acceptable to most of the Senate. We're not proposing to enact unilateral, mandatory emission reductions of greenhouse gases; we are focusing on programs that will protect the environment while being highly beneficial to U.S. industry. We have to make sure our energy choices don't lead to inefficient or wasted energy investments that have to be written off prematurely because we didn't consider their climate consequences. Industry needs to have certainty about the rules of the road linking energy and climate. So I think there's a good chance that this part of our energy debate can bring Senators together across the aisle in support of a comprehensive and bipartisan approach to climate change.

Deregulation and Reliability

SEI: *As deregulation has progressed, we have seen some decreased willingness by utilities to build more power plants. Reserve*

margins have been decreasing, as energy use grows and supply does not grow commensurately. In the deregulated world, how can we ensure the continuing reliability of electric power supplies?

Bingaman: Well the bill repeals the Public Utility Holding Company Act of 1935, which has limited some companies from entering new markets to build generation facilities. Besides supply issues though, we also need a reliable transmission system that is ready for the challenges of the 21st century, and unfortunately we are operating with a design that is practically a century old. The recent problems in California and the West illustrate the vulnerabilities of the current system. But the fact is, those problems and unresolved issues remain in our electricity markets.

But there are also important opportunities. During the next few years, billions of dollars of investment will be planned and committed to electric generation and transmission. Those investments will have 30- to 50-year life spans.

The central challenge we face with electricity is to have two things: first, market institutions that ensure reliable and affordable supplies of electricity, and second, policies that favor future investments in new technologies that give consumers real choices over their energy use. There are a number of provisions in our energy bill which do just that.

Advanced Technologies

SEI: *SEI is very interested in technological solutions that can help the United States advance to a more sustainable energy future. We commend you for your emphasis on developing a next generation of "breakthrough" technologies as part of the energy bill. Could you please share with us first your thoughts on increasing our efficiency in using energy?*

Bingaman: I would be pleased to. I have said repeatedly throughout the past year that you can't have a sound energy policy that is based only on production, or only on conservation. We've got to focus on both.

As I've just said, modernizing our national electricity system is one major way we can use our supplies of energy more effectively. The second way is to increase the efficiency of the various uses of energy across the board — in vehicles, in industry, in appliances and in buildings.

Let's start with vehicles. Our bill contains two provisions on this: one mandating higher fuel efficiency in vehicles purchased by federal agencies for civilian use; another establishing a framework for the Energy Department to assist states in expanding buy-back programs that will get old, inefficient vehicles off the roads.

But the major initiative in this area, on CAFE (Corporate Average Fuel Economy) standards, will come when our bill reaches the floor. The Commerce Committee is working hard on a proposal to tighten the standards. The House Republican bill has a very weak provision on this subject, which translated into only a half-mile increase in the CAFE standard. We have to do better if we want to have a sound energy policy. That's because our transportation sector consumes 67 percent of all oil in the U.S. Vehicle fuel efficiency improvements will bring the U.S. far closer to reducing its reliance on foreign oil than practically anything else, including drilling in the Arctic Refuge.

Apart from the vehicle standards, let me tell you what else the bill provides with respect to energy efficiency measures, because this is a major emphasis of the bill and there are a number of very important provisions. The bill will improve national energy efficiency through a series of initiatives involving federal buildings, schools and public housing; reduce energy use in manufacturing and other industries; require increased efficiency for numerous consumer and commercial products; and reauthorize important federal grant programs that allow low income families to pay their energy bills and reduce their energy costs.

First of all we are targeting Federal energy use, which is a major area of opportunity. I have long argued that the federal government should lead the nation by example in the use of cost-effective technologies that consume less energy. This would include lighting, appliances, windows and heating and air conditioning systems. In most cases, retrofitting a federal building with modern energy-efficient equipment provides a rapid payback in lower energy costs.

Industry needs to have certainty about the rules of the road linking energy and climate.

So we can save taxpayer dollars, while also creating a larger market for some of these technologies, and leading by example. We've determined that taxpayers will save $250 million annually under the bill. And we've included a provision to require Congress to make changes right here in the Capitol building complex too. We'd like to see the new Capitol Visitor's Center outfitted with state-of-the-art energy efficient technologies.

Then beside the Federal sector, we've included a new program to improve energy use in elementary and secondary school buildings. This comes from a bill recently introduced by Senator Hillary Clinton (D-New York). The industrial sector is an extremely important component too, because nearly 40 percent of all U.S. energy consumption is there. We know there's a lot of room for improvement here, so the bill authorizes DOE to enter into voluntary agreements with industry to reduce their consumption by 25 percent over 10 years.

For commercial and consumer products, we're setting new efficiency standards that would

almost double the savings of the House energy bill, H.R.4. Some of those additional savings would come from enacting the efficiency standard for central air conditioners and heat pumps issued by the Clinton Administration. That standard would have increased the current minimum efficiency of air conditioners by 30 percent.

Our bill also authorizes DOE to develop efficiency standards for a number of other commercial and consumer products, like vending machines and commercial refrigerators, freezers and heaters. We've also included efficiency standards right in the bill for certain products like torchiere lights. And finally the bill also addresses "standby power," based on a provision that Senator Byron Dorgan (D-North Dakota) and I worked out, along with a coalition of manufacturers and efficiency advocates. President Bush spoke out on this last summer when he dubbed these products "energy vampires," that use about 4 percent of the electricity in the average home, and named Secretary of Energy Abraham the chief vampire slayer.

We're calling for a strong increase in R&D spending for energy efficiency. The funding increase — from $810 million currently projected for FY2003 to just over $1 billion in FY2006 — will support efficiency progress across a broad spectrum.

The final big item in our bill related to energy use and efficiency involves a number of programs to help working families. One of these is the Low Income Home Energy Assistance Program (LIHEAP), and the other is the Weatherization Assistance Program. It was painfully evident across the country last winter that these programs need adequate funding, as millions of families struggled to pay their energy bills. Funding for LIHEAP should be well over $2 billion annually. And the Weatherization Assistance Program has weatherized over 5 million homes since the program was created in 1979, but this is only 17 percent of the eligible households. Clearly, more can and should be done.

Renewable Energy Technologies

SEI: *Moving on to the supply side of the energy equation, renewable energy technologies have thus far had difficulty in penetrating the market very significantly. What do you feel are the prospects, and what can or should the federal government be doing?*

Bingaman: A lot. Our bill contains numerous provisions to enhance the contribution that renewable energy can make to the nation's energy mix. Under the business-as-usual approach of the House energy bill, the contribution from renewables will not grow much over the next 20 years. The result would be an energy system, particularly for the production of electricity, that will go from being 59 percent based on coal and natural gas to 80 percent based on these two fuels. That over-dependence would leave us very vulnerable to shortfalls in the delivery of either of these fuels, and consumers exposed to severe risks of price spikes. We need more diversity in the ways in which we produce electricity in this country, not less.

And that kind of over-dependence doesn't make sense when you look at the commitments to renewable energy that we have been seeing from other countries, particularly in Europe. It only makes sense for the United States to lead the world in renewable technologies. We have abundant domestic renewable resources, and there's likely to be strong growth in the world market for these technologies in the future. But we're not leading today, and if we are going to in the future, we need to do a better job of getting renewables into our own markets.

Our bill boosts the future use of renewables in several ways. First, we're providing market incentives that should triple the amount of electricity produced from renewable energy over the next 20 years. These include a Renewable Portfolio Standard that creates a market for new renewable sources of electricity, be they wind, solar, biomass or more hydroelectric generation at existing dams. We're also requiring Federal electricity purchases to grow to 7.5 percent renewables by 2010.

Second, the bill greatly expands the contribution of renewable fuels, such as ethanol and biodiesel, to powering vehicles in transportation. By 2005, 75 percent of the Federal government's vehicles that can burn alternative fuels will be required to, creating more market certainty for renewable fuels and their associated infrastructure.

Third, the bill removes existing regulatory barriers affecting renewables. For example, wind and solar power can be effectively tapped by small, distributed generation systems. But current practices and rules in the marketplace often discriminate against distributed generation. The bill fixes this by requiring electric utilities to offer their customers "net metering." Related to that, the bill also requires easier interconnection for distributed energy production into the interstate transmission grid, and directs states to examine ways to facilitate the interconnection of distributed energy in local electric distribution systems.

It only makes sense for the United States to lead the world in renewable technologies.

Fourth, the bill promotes the use of renewables by disseminating information about, and facilitating access to, areas with high resource potential, particularly on public lands. There are many places in the nation, particularly in the West, that have significant, untapped renewable energy potential. And finally, like with energy efficiency, we need to enhance R&D programs on renewables. Under our bill, DOE R&D programs on renewables will grow from $500 million in FY2003 to over $700 million in FY2006. We want to expand these programs consistent with the recommendations of a distinguished Presidential task force that were issued in 1997.

These measures are balanced in our bill with a strong commitment to our other, more traditional energy supply sources, but they need the kinds of stimulus I've described in order to get us the diversity of fuel supply that we need in this century.

Nuclear Power

SEI: *Moving on to nuclear energy, Senator, your bill would require DOE to study next-generation nuclear power plants offering safety, proliferation, efficiency and waste management improvements. Can you discuss the kinds of improvements you are looking for?*

Bingaman: Let me say first of all that in parallel with the R&D we need on renewables, R&D is also the key to the future of our nuclear power industry. Nuclear power is already an important contributor to our nation's energy supply picture. Nuclear reactors emit no greenhouse gases, so on that basis one would think that they are an option we should be looking at for the future. But nuclear plants have other characteristics that are not as attractive. They continue to have high up-front costs compared to other generating options; the nuclear waste problem is not solved; and nuclear safety is a continuing concern for the public. Also, our cadre of nuclear scientists and engineers is growing older and dwindling, and we're not seeing a large supply of students being trained to help us deal with nuclear issues in the future.

So our energy bill takes on these problems by focusing on R&D on next-generation nuclear plant designs that could offer significant improvements over existing plants, and on a program to strengthen departments of nuclear science and technology at universities around the country. We're especially interested in reactor designs out there that might be more passively safe, for example if the fuel itself is made of materials that cannot melt down in the reactor, so you don't depend on a lot of operator actions to keep the plant safe. There's an ongoing study and a small R&D program at DOE already on next-generation nuclear technologies, to the tune of about $11 million per year, and we'd like to raise this to about $20 million.

Besides the enhanced R&D, our bill also contains a partial reauthorization of the basic nuclear liability statute, the Price-Anderson Act. The part that's in our bill deals with liability of Department of Energy nuclear contractors, including the national laboratories that are such a significant source of our national nuclear expertise. The other main part of the Act, dealing with the commercial nuclear power industry, is being developed by the Environment Committee. The full Senate will likely deal with it when this bill is debated next year.

Closing Message

SEI: *Do you have any particular closing message for your Senate colleagues with regard to sustainable energy?*

Bingaman: Well, one thing that bears repeating is that I consider scientific and technological advances as the key to solving our nation's energy challenges. And really, the pervasive cross-cutting theme of our bill — whether you're talking about efficient uses of energy, renewable energy technologies, advanced nuclear energy concepts, carbon sequestration, what have you — is that we need to have a very aggressive and forward-looking energy R&D program.

I think there's a pretty clear consensus in the Senate that new science and new, breakthrough technologies are the core elements of getting to a clean energy future. But the policy still isn't there, and now is the time to do something about it, because the Federal government has a role. It's hard to believe, but the government's spending on energy technology R&D is equivalent to what it was in 1966, even though our economy is three times the size. We've got to build a 21st century energy system, and this just has been sadly neglected.

New science and new, breakthrough technologies are the core elements of getting to a clean energy future.

Congressman Sherwood Boehlert (R-New York)
Chairman, House Science Committee

September 5, 2001

SEI: *Chairman Boehlert, can you first of all give a brief overview of the major pieces of energy related legislation that you've introduced this year, and what they would accomplish?*

Boehlert: Well, we've passed the Alternative Fuel Vehicle program, which will provide resources for local governments to assemble alternative fuel vehicle fleets. The bill authorizes $200 million for these grants. This is a big one. There is also a related school bus program. Both of those are in the final package that was approved by the House, HR 4.

And this year is the first year that we've introduced grants for alternative fuel vehicles at airports, the AIR-21 grants. The $20 million is for ten demonstration grants, up to $2 million apiece, for airports to acquire non-emitting vehicles. Most of the airports are in areas that are not in attainment under the Clean Air Act, so it makes sense to try to address the problem there. This legislation was enacted last year, but this is the first year of money.

The overall energy package has lots of key programs, including major increases in renewables and conservation, programs based on a bill from Congressman Bartlett. We also offered an addition to the Hydrogen Act based on Congressman Calvert's bill.

Our portion of the energy bill was reported out of our Committee by voice vote, the only one from all the major committees that enjoyed that support. The reason for that was that we worked it out together with everybody. It wasn't the Chairman's bill or a majority bill, it was a Committee bill, and we genuinely had an outreach program to get the best ideas we could and incorporate them. When you get a bill that deals with ultra deep drilling, clean coal technology and nuclear energy, all pretty hot-button controversial issues, and we pass it by voice vote, you see that we did a lot of hard work to bring everybody together and build a consensus for something that we could all proudly identify with.

It was a good bill. That was our contribution to the energy package. In the end, however, I didn't care for the contributions from the other committees so I voted against it, and tried to amend it in several instances. The problem was that the minuses from the other committees outweigh the pluses overall. First of all, we couldn't touch the tax provisions that came out of the Ways and Means Committee, and they provide all sorts of financial incentives to do things that I'm not particularly anxious to do, like encouraging more oil drilling and encouraging new coal plants that do not meet tough environmental standards.

Arctic Oil, or More Efficient SUVs?

I would hope people would make their judgments based on facts. If you elevate the CAFE standards for light trucks and SUVs from the artificial low of 20.7 miles per gallon, and treat them like all other passenger vehicles — which 95 percent of them are used as — and go up to 27.5, you save more in oil and sooner than even the most optimistic projections of economically recoverable oil from the north slope of ANWR. But what happened was that we lost the battle in the minds of the public, because people see this vast north slope of Alaska that is a wilderness, and say "why not drill up there?" First of all, 95 percent is already open for business. There are rigs all over the place. We just want to preserve a small portion, just four or five percent of the northeastern slope, which that "radical" Dwight David Eisenhower thought was a pretty pristine area that we ought to try to preserve.

SEI: *You may not have lost the public relations battle on that yet.*

Boehlert: We did initially and I'll tell you this: I knew in the closing arguments of the debate on the CAFE amendment that I won on the merits but that I was going to lose the votes, when one of the other committee chairmen got up and said, there will be dead bodies

on our highways because of this demand for higher fuel efficiency. He claimed erroneously that the National Academy of Sciences said that the Boehlert Amendment will kill people, which was, of course, a total fabrication.

SEI: *What's really at play here? What's underlying the arguments out there that tighter CAFE standards would lead to more traffic fatalities?*

Boehlert: Well, false arguments. First of all, going all the way back to 1975 when the first CAFE standards came in, there has been the notion that, as one of the big auto executives said, we'll be a nation of people all driving compacts and sub-compacts. They've also claimed it will have a devastating financial impact on the industry, forcing us to lay off thousands of people. Neither of these things happened. They didn't lay off thousands of people; they just retooled and continued producing bigger cars that were more fuel efficient.

So I have strong feelings about fuel standards for SUVs. And why did we lose the battle? Because the opponents got the unions involved, and it looked like the amendment would threaten jobs. And members of Congress, quite frankly, would kill to preserve jobs in their district at a time when the economy is a little bit shaky. The threat doesn't even have to be real or to have any merit. It's just the threat and it scared the bejesus out of a lot of people.

So the whole combination of the auto industry and the unions, and just the overall threat of jobs, combined to lead to the defeat of the two amendments. One is ANWR — I mean ANWR, can you believe this: they said it can provide 25,000 jobs for the teamsters, and 750,000 jobs across America. What are they smoking? It's not going to happen. The actual number is something like 45,000, and even that has a lot of assumptions built into it. Even taking their assumptions, and realistic versions, it drops down to 40 some-odd thousand jobs. So they inflated the numbers by at least a factor of 15.

And members didn't get deeply involved in the details. They were dealing with a concept and so if they got involved in the details they might have thought differently. Our saving grace, I think, is going to be the United States Senate.

SEI: *Do you feel confident that the Senate will have a more careful debate of the merits of tightening the CAFE standards?*

Boehlert: I do. I'm praying, you know. And although in California the so-called crisis is over — they haven't had a brownout since last May and they're unlikely to have them — people are paying $2.00 a gallon for gasoline, and were led to believe that if we okay ANWR, we're going to have lower prices at the gas pump tomorrow, and no blackouts in California — neither of which had any relationship whatsoever to the oil supply. If you start yesterday in ANWR, the earliest you'll get anything out is probably seven years. And then they said, well, the people of Alaska want it, so it can't be all that bad. They love that great environment up there. Hell, if I lived in Alaska I'd probably want it too. Every man, woman and child in the state gets a check for about $1900 as their royalties from the drilling.

Climate Change

SEI: *The recent report from the Intergovernmental Panel on Climate Change predicts average world temperatures rising as much as 10°F over the next 100 years. What are your views in general on climate change and how do you feel the U.S. should proceed toward reducing carbon and other greenhouse gases?*

Boehlert: First of all, it is for real. Some people are trying to make it out as just some dream that some guys have — the "greenies" like Boehlert. And there are others that think it's a vast left wing conspiracy. It's neither.

Looking back, all the President had to do would have been to talk with any of the other world leaders from our great allies, and he would have discovered they give it a very high priority. And I think there's been a change in the President's reaction since he made his initial misstep in dealing with the issue. Look: I can't argue with him when he faults Kyoto as a flawed process. I can't maintain that Kyoto is perfect and we should adhere to it chapter and verse. And I'm very mindful of the reality of the Senate's Byrd Amendment in 1997, where they voted "no dice," 95 to zip, unless those little guys like China and India are partners to it all.

So we've got a big responsibility, but not exclusive responsibility. If he had said initially that we have questions with the whole process of Kyoto, but we have no doubt that global climate change is for real and we have to deal with it in a forthright, responsible way, but we just don't like Kyoto, it would have been accepted. But he didn't do it that way.

If you elevate the CAFE standards for light trucks and SUVs, you save more in oil and sooner than even the most optimistic projections of economically recoverable oil from ANWR.

But I'm encouraged. You have to talk about a Four Pollutant Bill but also a Three Pollutant Bill, which leaves out carbon. I think the Three Pollutant Bill is going to make it. And so people say, well, but we want four. I don't blame them for wanting four; so do I. But I'm a great baseball fan, and I'll tell you, if you get three out of four, I can guarantee you a place in the Hall of Fame.

The fact of the matter is, we're going to have further reductions in NOX and SOX, and we're going to deal with mercury for the first time ever. And the President has not backed away from that. He backed it as Candidate Bush. He has reaffirmed his endorsement as President Bush. When I met with him the first week in August, one on one in the Oval Office, it was a very good meeting. I suggested to him that his endorsement of that Three Pollutant Bill is really appreciated.

I would like him to endorse the Four Pollutant Bill. I understand the circumstances, but let's go forward with the Three Pollutant Bill, and put the full weight of the Administration behind it. The endorsement is fine but I want his enthusiasm, and I think we're going to see it.

SEI: *Are you ready to give in on mandatory carbon reductions?*

Boehlert: Never ready to give in. What I'm suggesting is, if I'm starving and I'm hungry, I'm going to go to the table. I might not get the full seven-course meal, but we've got to be realists in this world and we've got to deal with political realities, which is that the Administration faces a Congress that is evenly divided.

SEI: *Looking globally, the Administration has for the moment bowed out of the international negotiations and said they would develop an alternative proposal. Do you think the U.S. should pursue an alternative and try to get the international community to go along with that, or should we just go our own way with a domestic solution?*

Boehlert: I think we've got to go forward on several fronts. We're going to continue the dialogue around the globe with responsible world leaders, because it's a global problem. To the President's credit, he has reasserted his belief that global climate change is for real, not some wacko idea. And he has endorsed my bill to elevate the EPA to cabinet level status.

We're not going to embrace Kyoto; that's the reality. So what is the alternative? I think we've got to constantly be exploring alternatives, constantly maintaining an open, no-holds-barred dialogue with other world leaders. Everybody wanted to hammer George Bush over the head on this; I'm not one of them. I was a delegate for Bush. I've known him for 20 years and I like the guy. I don't agree with the way he started off his Administration with respect to the environment. I don't agree with his energy policy. But there's a lot more that I do agree with.

And to his credit, after that infamous statement on Kyoto and global climate change, the President started inviting environmental leaders into the White House to brief the cabinet. These guys do not see eye to eye with the Administration. It's a measure of the man that he invites people in who he knows are going to give a message contrary to the standard Administration line. He has an outreach program and is genuinely interested in getting more information, and may be able to adjust his thinking based on that.

SEI: *Concerning developing nation participation: You mentioned earlier the concerns in the Senate when they voted in 1997 to send a "warning shot" to the Administration not to enter into an agreement that excludes meaningful participation by developing nations. How and when should developing nations join into this process?*

Boehlert: They should be in the process right from the beginning, but we've got to be realists: we're the haves; they're the have-nots. We can't expect them to bring the guys from the Little League up to the major leagues and face the number one pitcher. But they've got to be part of the process. I don't have the grand design, but we cannot just say, look, you're disadvantaged, we're advantaged, so you don't have to do anything, we're going to start the process ourselves. No, they've got to — right from the beginning — be involved, have some ownership, some stake in the process, even if it's minimal.

Developing nations should be in the process right from the beginning, but we've got to be realists: we're the haves; they're the have-nots.

SEI: *Well, how do you deal with the fact that we've got to take corrective action for the emissions that are already out there, that have raised the temperature as much as they have already, versus prospective actions to prevent further warming, which have to be taken by everybody?*

Boehlert: I don't have the path to get where we want to get. There's not a doubt in my mind that the industrialized nations have a greater responsibility, and primarily the U.S. But once again, it is very difficult to go back home and tell any constituency, any place in America, liberal, conservative, moderate, left or right, that we're going to go it alone and we have the responsibility to provide all leadership for all people under all circumstances.

We have a very heavy responsibility. We have got to be the first off the line. We've got to lead by example. There are a lot of things we must do, but there are some things others have to do and no one gets a free ride. People don't like the concept of a free ride. I can understand why Senator Byrd got everybody to just run up and vote aye. That was not a long roll call. They probably all voted in the first 15 nanoseconds because it made a lot of sense.

So maybe we could set a date, say 2020, by which time we want half of one percent reduction by developing nations, or something along those lines. I don't know what it is, but there has to be evidence of a commitment for everybody to be part of the solution because everybody is contributing to the problem.

they're increasing capacity and really turning old plants into new sources, but getting a free ride on emissions. And in the process, we're continuing to see that cancer spewed out and dumped on the Adirondack lakes. More of our lakes are being damaged every single day.

SEI: *Have you discussed this with the Administration since they've undertaken the new review?*

Boehlert: We've shared our thoughts with the President and the EPA. Our main point was that new lower standards — I mean, the Three- or Four-Pollutant approach — will apply to all plants, old and new, so that then, there will no longer be a debate about what constitutes a new source. But let me add that I would oppose weakening New Source Review enforcement without at the same time putting new regulations in place. I would also oppose dropping the lawsuits, which are based on genuine violations of the law as legitimately interpreted in the past. The companies that have settled already have promised significant reductions in pollutants. We shouldn't be doing things to reverse that progress.

Boehlert: I think the Administration made a mistake on efficiency standards for air conditioners. What some in the industry have told me is that they can have dramatic improvement in efficiency and it's cost effective for the consumer. You're going to get a payback in a relatively short period of time, like five years.

The Debate Over Fuel Efficiency for SUVs

Boehlert: SUVs are another good example. We have failed miserably in showing the consumer that what we're proposing for SUVs is in their interest. You can still have your SUV, but you'll visit the gas station less frequently because you're going to get more miles. So we're not saying you're going to have to curtail your driving habits, or sacrifice your vehicle of choice. You should be standing up and applauding and writing your representative to support this amendment. There are a lot of efficiencies that can be incorporated into appliances and to every vehicle that you plug in some place. And the payback period is a relatively short period of time.

The Automotive Industry News had a front page article on SUVs in which they dissected the whole vehicle and what efficiency increases you could get from various improvements. The basic pitch was off-the-shelf technology at a relatively low cost. This allows you to have your vehicle of choice, without sacrificing weight which could be less safe, while improving efficiency dramatically at an affordable price. If people would just properly inflate their tires, there would be a rather substantial savings.

The companies that have settled [New Source lawsuits] already have promised significant reductions in pollutants. We shouldn't be doing things to reverse that progress.

New Source Review

SEI: *New Source Review: As you well know, EPA is considering changes to their enforcement policy. Could you comment?*

Boehlert: Well, you know what I don't like? I don't like the fact that I drive up in the beautiful Adirondacks in upstate New York, where national treasures, 500 lakes, are dead. And you know why they're dead? Because those people out in Ohio and Indiana and places like that hoodwink the rest of us.

What these midwestern utilities are doing is not everyday maintenance to keep their old plants together with band-aids. The theory was that we would get to better air quality levels by requiring new plants to be cleaner, but that we needed to grandfather these old plants or else we would put the companies out of business. The fact of the matter is, they're doing more than upgrading their old facilities;

Energy Efficiency

SEI: *The Sustainable Energy Institute is very interested in technological solutions that can help the United States advance to a more sustainable energy future, perhaps allowing this to happen without requiring behavior adjustments like less driving or less use of air conditioning. Some people will not compromise on those points. In this context, could you share with us, first, your thoughts on possible advances in renewable energy technologies as well as technologies for achieving increased energy efficiency?*

SEI: *The National Academy of Sciences report noted that there are engine technologies out there today that are already available in Europe and Japan, offering significantly reduced fuel consumption.*

Boehlert: Off the shelf.

SEI: *The critics of tightening CAFE standards for SUVs say that the manufacturers would have to respond by making smaller and lighter vehicles, which would lead to more fatalities.*

Boehlert: The critics are wrong. And these are the same critics who came to Capitol Hill and said, if you, the Congress of the United States, require the auto industry to put in seat belts, it will have a devastating financial impact and result in thousands of jobs being lost. Well, we now require seat belts and thousands of jobs were not lost. It didn't have a devastating financial impact. In fact, the best days were ahead for the auto industry. And in the process, over the years, we've saved thousands of lives.

SEI: *So what do we need to do to make those technologies move forward? Do you have to have a regulatory-driven incentive for higher standards or is there some way of encouraging Detroit to develop these more efficient engine technologies?*

Boehlert: I have sort of lost confidence in our collective ability to encourage Detroit to do the responsible thing. I think the advocates have got to do a better job of convincing the public that what we are proposing is in their interest.

In my own family, my wife and youngest daughter survived a horrible accident almost five years ago, when they were hit head on by a woman who was drunk out of her mind. My wife ended up with three herniated discs which will impact her forever, but she might have been dead had she not had her shoulder harness and lap belt. My daughter, who was driving, had a couple of bruises and nothing else because she had an instant inflatable airbag.

But I remember Lee Iacocca coming here, when I was a staff guy on Capitol Hill and he was a young hotshot for Ford, telling Washington you can't do this, you can't mandate all these features that you say are safe, because there's no evidence to prove it and it would be so devastating to the industry. And then, fast forward a number of years and he's Chairman of the Board of Chrysler and he's on TV saying, we produce the safest car on the road today, we're ahead of the government, we've got airbags and all these things and that's why you should buy Chrysler.

SEI: *I want to read to you a quote by Trent Lott. This was in an issue of Roll Call back in March: "The American people have a right to drive a great big road hog SUV if they want to and I'm going to get me one." Any reaction to that?*

Boehlert: Yeah, I don't like a road hog but I think the American people have a right to drive an SUV, a fuel efficient SUV, and we have proven that we can do it at a minimal cost and to the great advantage of the American populace.

Nuclear Energy

SEI: *Nuclear energy: Could you comment on the prospects for advanced nuclear technologies such as the Generation IV technologies? Should the federal government be doing more in this area? The House gave the program $60 million for next fiscal year.*

Boehlert: You cannot eliminate nuclear energy from the equation. Nuclear provides 20 percent of our domestic requirement and in countries like France it's up to 80 percent. The challenge is not to just forget about nuclear forever, but to guarantee as much as humanly possible, that the nuclear energy that we produce is safe and that we know how to safely deal with the spent fuel. So I think nuclear energy — and I agree with the Administration — has to be part of the overall mix.

SEI: *Do you support the construction of new nuclear power plants?*

Boehlert: I do not give a knee-jerk negative reaction to those proposals but they have to be very, very carefully and thoroughly evaluated. And we have to make certain that the science is there and discard all the emotional arguments and deal with the facts. And that's why I love the National Academy of Sciences as a valuable resource for the Congress.

One of the big reasons you can't eliminate nuclear from the equation is the carbon reduction benefits. Probably the cleanest form of energy from an environment standpoint would be nuclear.

SEI: *Nuclear fusion: This falls under your jurisdiction too, as Chairman of the Science Committee. The U.S. is continuing a sizable research program into fusion, which doesn't get a lot of publicity. Are we doing enough?*

Boehlert: I think fusion offers great promise for the future. We need to invest heavily, more than we are currently investing, because of the great promise it offers. There's no guarantee in anything in this business, but this is a good investment of the taxpayer's dollars. And I want to maintain our world leadership.

We're not saying you're going to have to curtail your driving habits, or sacrifice your vehicle of choice.

Republicans and the Environment

SEI: *Chairman Boehlert, Gregg Easterbrook wrote in the New York Times magazine on August 19 that "For some reason deeply seated in the party's psyche, Republicans keep failing to come to terms with environmental sentiment. Environmentalism is to Republicans what defense is to Democrats: the issue they just don't know how to deal with and really, really wish would go away." Can you comment on the state of environmental issues in the GOP, particularly in light of the House's rejection of your CAFE Amendment?*

Boehlert: Yes. I would say that Gregg makes the mistake a lot of people have made: he talks about Republicans as if they are a single entity. But starting with Teddy Roosevelt and right up to the present time, there are a lot of Republicans that are demonstrating in very tangible ways that they are concerned about the environment and they are actively involved in trying to develop responsible public policy to deal with the environment. And I think the list is growing.

Admittedly, it's a minority in the Party that give very high priority to the environment. The majority of the Party, and in fact the majority of Congress and of the American people, give a higher priority to the economy, health care and education, all very top priorities. A lot of people do not give a top priority to the environment until someone proposes something that is going to do damage, and then the response is off the chart.

This is a town where we take a poll every nanosecond. People look at these polls of what the top priorities are of the American people and see that the economy, health care and education are the top concerns, with the environment way down the list. And I say that's easy to explain: people don't think we're going to take leave of our senses, but let someone suggest something that will do obvious damage to the environment, and all hell breaks loose. Our faxes are on overdrive and telephones start ringing off the hook.

So I think there is an emerging majority within the Party, but it may take longer than I would like. I'm confident that the Republicans are going to maintain the majority in the House because of our overall program, and that confidence would be strengthened if we improved our performance as a party in dealing with the environment. As this evolves, I think you're going to find more Republicans that are becoming more active in environmental issues, because the evidence is clearly there. We are all being negatively impacted by the misdeeds of some, and that isn't fair.

By the way, do you know who started the Environmental Protection Agency? Richard Nixon. And do you know how he did it? It wasn't because a Democratic Congress jammed it down his throat; he did it by Executive Order. And the elder President Bush signed the Clean Air Act Amendments of 1990. Right there is the pen that President Bush used to sign it, November 15, 1990. That's one of my proudest possessions.

Voters, Speak Up

SEI: *Do you have any closing thoughts for the American people?*

Boehlert: Citizens can do what they do best: demonstrate their concern and their interest, and share it with their representatives, because this is the greatest form of government known to man. People in positions of responsibility in Washington actually listen and really do care about what their constituents think and say.

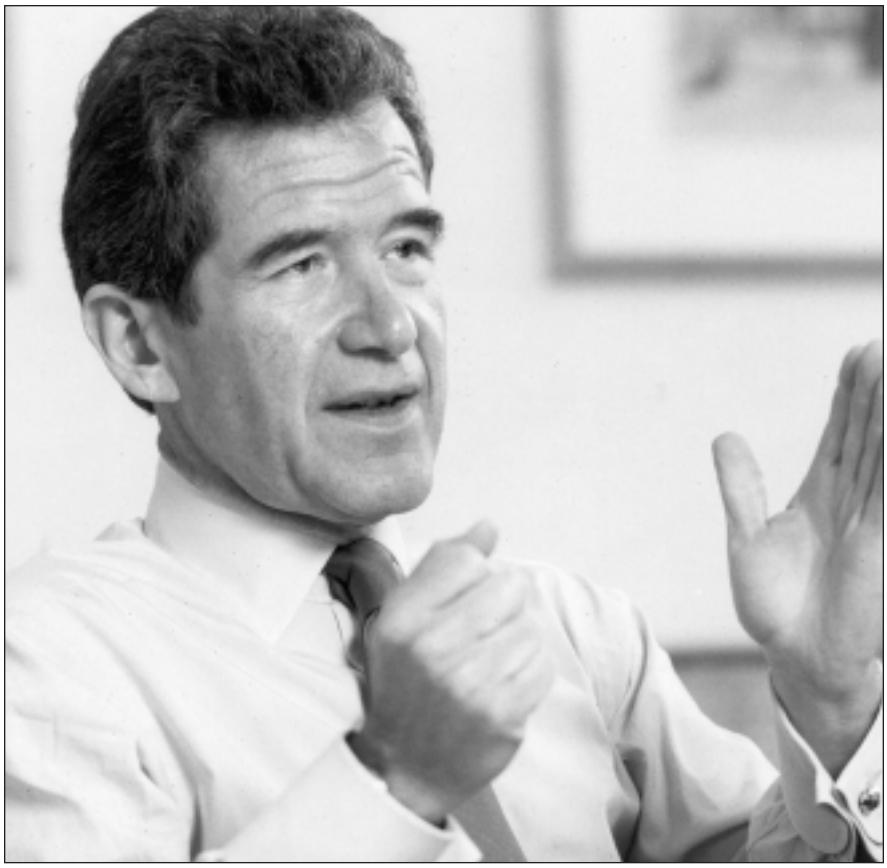
But if the constituents are silent on this, then we're going to be left to our own devices, and then only people who will be represented are those that can afford to have the high-priced lobbyists come pounding on our door, giving us horror stories about what's going to happen if we increase CAFE standards, or horror stories on what's going to happen if we don't drill in ANWR. The misconceptions will flow fast and furiously.

So the American people have to be involved. But my message to that is, take hope, because I think Congress is waking up to the reality more and more. We're a little bit behind the American people, who by and large seem more concerned about environmental issues than a lot of their elected representatives. The problem is, they're not as vocal as I would like them to be. So speak up.

Take hope, because I think Congress is waking up to the reality more and more.

Lord Browne of Madingley
Group Chief Executive, BP p.l.c.

November 16, 2001



SEI: *Lord Browne, would you please begin by giving us an overview of world energy demand today?*

Browne: Well, one of the key underlying factors is the growth of the global population and its impact on energy demand. At present the world uses more than 70 million barrels of oil a day. In another ten years that figure could be above 85 million barrels. In fact by 2010 total energy demand could be 30% higher than it is at the moment. Partly this is because global population is growing by 100 million a year and partly it's because world prosperity is increasing too.

There are plenty of resources to meet this demand — at least 40 years supply of oil at the current rate of consumption and 60 years worth of gas. The test for all of us is how these resources are used — the environmental issues associated with growing consumption. The challenge is to achieve growth and increases in the living standards of all the peoples of the world, but to do so in a way that isn't destructive of our shared environment.

Avoiding a Trade-off

SEI: *Given world population growth, how can rising energy demand be satisfied without damaging the environment further?*

Browne: There are several important elements in the mix, but one thing we should always keep in mind is the importance of maintaining a reasonable balance between the needs of global development and the needs of the environment. The notion that there has to be a trade-off between growth and a polluted environment is one we dispute. Our view is that it's possible to transcend such fatalism. The peoples of the developing world have the right to improve their living standards. We need to address this global problem with solutions that are inclusive.

Equally, we need to be realistic about the process. Our experience is that the environmental challenge is susceptible to a multiplicity of solutions. There is no one answer, not least because there is no single starting point — for governments and for companies. At BP we began by prioritizing our actions. I've been amazed by the ingenuity our people have shown in finding ways to cut emissions with minimal damage to the business. The crucial factor is the process of setting the right targets and using market mechanisms to achieve those targets.

SEI: *Why are targets so important, and can you give us some examples?*

Browne: The simple fact in business is that what gets measured tends to get managed. We're taking this step by step — identifying what can be delivered, establishing a way to monitor the data and then developing improvement targets through operational line management.

That's why we established a target in 1998 of reducing the greenhouse gas emissions from our own operations and activities, by 2010, by 10 percent from a 1990 baseline. We announced this commitment publicly and we incorporated it into the year-by-year performance contracts of our senior managers. Now, reducing our CO_2 emissions has become an element of our business plan. By the end of last year we'd achieved a reduction of five percent. That's a good beginning but we can see from opportunities already identified that we should be able to achieve the remaining five percent reduction in around three years time.

One of the underlying reasons for this progress is that we've virtually stopped gas flaring — the wasteful burning of gas — at our oil and gas production facilities in all circumstances short of emergencies. We've used advances in technology to capture and re-use the gas instead.

It's worth noting that only a small fraction of the world's carbon dioxide emissions is a result of human activities, and only 20 percent of these emissions come from the transportation sector. The other 80 percent come from static uses of energy in industry, power generation and the domestic and commercial sectors. The consumption and production of BP's products, for example, amounts to about 95 megatons of carbon each year. That's only one percent of the total carbon dioxide emissions from human activity worldwide. But that small fraction could threaten the equilibrium.

We've also invested $100 million to eliminate emissions of volatile organic compounds (VOCs) at our crude oil export terminal in Scotland. We weren't compelled by legislation to do that — we did it because we believed it was the right thing to do. And I think we've also made great progress with water. Every day as part of our operations we produce nearly five million barrels of water as well as three million barrels of oil and gas. We used to re-inject half that water and discharge the rest, but over the last three years we've reduced the amount of oil in the water we discharge by 40 percent. One of our refineries has responded to local water shortages by reducing its use of water by more than 70 percent in seven years.

SEI: *You mentioned eliminating VOCs because it was the right thing to do. Is that the driving force behind BP's decision to take such a progressive position?*

Browne: Well, the environment is a serious issue and it affects the public perception of business all over the world. There's a view around that business is the cause of many of the world's environmental problems, but I hope we are moving beyond that argument. The real issue we face is whether business should take an active or passive role on environmental regulations that are enacted in response to mounting public concern.

At BP we're activists. Business is an incredibly dynamic force — it constantly offers new choices in response to the needs of consumers. As I mentioned earlier, we don't share the fatalism behind the view that there must be a trade-off between growth and environmental protection. But no resource-based business can survive in the long run by ignoring public perceptions about such major global issues as climate change.

No business can be successful, either, if it ignores the views of its customers and its staff. The people who work for BP have their own convictions and concerns about the quality of life. When they come to work every morning, they don't leave behind their beliefs or their sense of responsibility. Four years ago some people doubted the wisdom of raising the environmental issue because they thought it undermined the whole drive of our business. I think you would now find a very widespread belief that this is a challenge we can and should take on — even if we don't have all the answers.

SEI: *How do you go about instilling this sense of corporate leadership?*

Browne: Corporate leadership involves a realistic and practical attitude toward change. We need to face the facts if our actions are to be properly considered. The key word is "we." Few have been prepared to accept responsibility on this issue, and that has to change. It's too easy to try and find shelter under the idea that the science surrounding these environmental issues is still uncertain. Science will always be provisional to a degree. We may not fully understand all the relationships involved here — and BP doesn't take any position on the science — but for years there has been undeniable evidence of a problem that merits action.

Reducing our CO_2 emissions has become an element of our business plan. By the end of last year we'd achieved a reduction of five percent. We should be able to achieve [a further] five percent reduction in around three years time.

What is really encouraging is the fact that the great majority of the public in the United States and Europe has been behind us. More than 70 percent of the American public believe that business should take the initiative in finding answers and that the right application of skills and technology can resolve these challenges.

No Longer on the Defensive

SEI: *It came as a surprise to many of your colleagues in the industry when BP declared in 1997 that global climate change was a serious problem. How did you deal with that?*

Browne: Yes, people did perceive BP as having taken a maverick view or as having left the church, so to speak. But I disagree with that.

Of course we had the option of postponing action and resisting legislation. But we decided to accept the challenge and to try to search for answers in a creative, progressive way. We were the first major firm to leave the Global Climate Coalition in 1996 because we were unhappy with some of the positions it was taking. As I say, basically it was a choice between an active and a passive response to our critics. Our feeling was, "What can we, in the oil and auto industries, do about this?"

We also felt — I did, and so did many BP employees - that it was time to stop being so defensive. It takes a toll when you are constantly faced with fundamental questions about your business and you constantly tell people there is nothing you can do. That's not the best way to give people a sense that they're working for a great organization.

Four years later, things have moved on and a good part of the industry is now acknowledging the need for a serious look at climate change and the related issues.

Urban Air Quality

SEI: *In addition to long-term challenges such as climate change, the oil industry faces shorter-term and more local issues related to air quality. What are your thoughts on the oil industry's role?*

Browne: It's true that the quality of the air we breathe is a more immediate challenge. Our green agenda in 1999 focused on the combination of mobility and choice because we believed it is possible to offer products that contribute to a progressive improvement in air quality while still providing people with the essential freedom of mobility and transportation.

We still believe it's possible but we need the help of the automobile sector to create vehicles which can use new fuels in the most efficient way. Our objective for gasoline has been pretty straightforward: unleaded, low benzene, low sulfur or no sulfur. Beyond these improvements in fuel, I've heard exciting reports about gasoline direct injection and the impact it could have on fuel economy. There are also opportunities for a new business in LPG- fueled or CNG-fueled vehicles if we provide the infrastructure needed to fuel them. And don't forget fuel cell-powered vehicles.

In 1999 we were the first oil company to voluntarily offer gasoline with reduced sulfur. In Atlanta we brought gasoline to the market averaging a sulfur level of 30 parts per million. To give you an idea of the impact of that, it was equivalent to eliminating more than 12,000 cars from the road every day. Now cleaner BP fuels — gasoline and diesel without lead, sulfur or benzene — are on sale in more than 60 cities worldwide.

Another initiative we're taking is to invest $1 billion over a period of seven years from 1998 to upgrade our refining technology worldwide and so improve product quality. By 2005, 40 percent of all the products we sell will be cleaner fuels.

SEI: *What are the main factors influencing automobile emissions, and how successful have BP's actions been in reducing emissions?*

Browne: As I said before, only 20 percent of emissions actually comes from the transportation sector. That said, this is another area where the growing global population, and especially the proportion living in cities, is a key factor. In 1899 the world population was 1.5 billion. In 2010 about 4 billion people will be living in urban areas alone.

We can't deny the luxury of mobility to all those now in a position to taste it for the first time. But they, too, want a clean environment. So the challenge for both the auto and the oil industries is to come up with solutions that defy the defeatist notion that mobility

For years there has been undeniable evidence of a problem that merits action.

and clean air are incompatible. I think we need to view the vehicle and its fuel as a single system, which can be optimized as a whole and be based on a new fuel mix and therefore produce a radically lower level of emissions. The resources and markets are available for it, and auto technology has also been advancing.

In any case, it's crucial that the automobile and oil industries work together on this. Auto and oil have always had a degree of mutual dependence, not least because the auto industry is our largest customer. We haven't always agreed on everything, but we've been an inseparable couple.

Policy Approaches

SEI: *And would you comment specifically on the different policy approaches to controlling greenhouse gas emissions?*

Browne: Well, there are three basic policy instruments, and they all use the market to change behavior. They are taxation, carbon trading and joint implementation. In each case the key lies in how carefully and how well you design the instrument to fit the situation, and how effectively you build in incentives for change.

Taxes can certainly change behavior, but the real test of any proposed tax should be its effectiveness in reducing greenhouse gas emissions. Taxes can easily bring in revenue without producing a desired change in behavior. In the UK more than two-thirds of the price of a gallon of petrol is accounted for by some sort of tax. Those taxes raise a lot of revenue, but consumption continues to rise because there are no better transport alternatives on offer. In other words, some taxes don't create real incentives for change.

The second policy instrument is carbon trading, which basically places a value on carbon emissions so they can be traded on an open market. We think this is one of the most promising options because it works in a very cost-effective way. That's why we designed our own scheme for trading greenhouse gas emissions across the 150 Business Units in BP. The system is up and running and we've traded the equivalent of 4.4 million tonnes of carbon dioxide since January, 2000. Our next goal is to extend the scheme to third parties — which, of course, would further reduce unit costs.

The third approach is joint implementation, which involves bringing different parties together and focusing on the most effective things in the places where they have the greatest impact on reducing emission levels. Ultimately this would lower the overall cost of abatement actions.

SEI: *What are your expectations for the Kyoto process?*

Browne: Kyoto is one step in the journey. The positive outcome of the Kyoto conference was the fact that industry and government were seen to be taking the issue seriously. The meeting set a framework and challenged governments to find ways to satisfy the objectives they set for themselves. As far as individual country participation in the Kyoto process is concerned, clearly the more governments that support the process, the better. After all, climate change is a global problem and it can't be resolved by Europe or Asia acting alone, or even by the western industrialized world alone.

We felt it was time to stop being so defensive. It takes a toll when you are constantly faced with fundamental questions about your business and you constantly tell people there is nothing you can do.

SEI: *What should government's role be in controlling emissions?*

Browne: Having seen incentives work in business, I believe incentive-based regulation is a key instrument that should also shape public policy. The use of incentives and targets is much more effective than imposing costs or prescriptive regulations. With the right incentives from government, you can encourage activities such as sequestration and the capture, re-injection and storage of CO_2 much more effectively. Another thing government can do is to increase support of scientific research into improving the quality of production.

BP-Solar

SEI: *BP is also investing in solar power as a renewable energy source. Could you explain the rationale?*

Browne: Solar energy certainly has the potential to contribute to climate change solutions over the next few decades. But right now solar power can provide only a tiny fraction of the world's energy needs. So it's hard to see solar replacing oil and gas as a prime source of energy supply in our lifetimes.

But, clearly, solar has a lot of potential which is why BP has invested about $200 million in photovoltaics and the development of solar power over the last five years. In 1998 we set a goal to grow BP Solar by tenfold over the following decade so that yearly revenues top $1 billion by 2008. Even now BP Solar is one of the largest solar power businesses in the world. We have a 20 percent share of the global market in solar electric equipment, and the business is growing at a rate of 30 percent a year. Incidentally, BP is also one of the largest private consumers of solar power, which we use to help power service stations.

The most important thing is that we've made a start. With appropriate government initiatives and public support and investment, I'm convinced solar can eventually become competitive in supplying peak electricity demand.

Setting a Constructive Example

SEI: *Are there any closing comments you would like to add?*

Browne: It's four years now since we set out our position on the environment — a position based on the belief that the trade-off between economic growth and protection of the environment was unacceptable and that business and technology could help solve many environmental problems. The position we've taken is built on optimism — on the conviction that we can make a positive difference. Since then we've achieved a good deal, but every element of the BP story is work in progress.

Over a slightly longer period — the past decade — external developments have confirmed the importance of action. We've seen a noticeable improvement in the efficiency of energy use, and we've learnt much about the potential that exists to reduce the carbon content of existing activity and products. We've also seen a shift in the energy mix towards the wider use of natural gas based on technical change, and we've seen consumers move to low sulfur fuels and more efficient vehicles as a result of price differentials established through tax systems.

All this suggests to me that action is in every way preferable to inaction. Four years ago I compared the environmental challenges we face to some of the great post-World War II challenges such as the creation of an open world trading system and the process of disarmament. That analogy still seems valid. Progress is possible and measurable but it won't be orderly or linear.

We need to view the vehicle and its fuel as a single system, which can... produce a radically lower level of emissions. It's crucial that the automobile and oil industries work together on this.

Governor Parris Glendening (D)
Governor of Maryland

August 28, 2001

Smart Growth

SEI: *Governor Glendening, we'd like to begin on the subject of urban sprawl. Could you comment on the problem of sprawl in general, why it exists, and why the U.S. has a particular problem with sprawl?*

Glendening: People don't wake up in the morning saying, "What is Smart Growth? I wonder what my elected officials are doing about it. I really care about this." And people that are interested in energy policy normally do not think of Smart Growth as one of the key parts of the solution to a very complex problem. But when that citizen wakes up and then has to sit in traffic, commuting two to three hours a day, and when that citizen has the frustrations of missing evening meals with the parents or with family or going to a daughter's soccer game, then all of the sudden they start to understand what sprawl is all about.

The same is true for energy consumption. We have worked very hard as a nation for the last 50 years to develop a policy of sprawl that has many negative impacts, one of which is in the energy area. We've been looking at it in Maryland primarily as an environmental policy to protect the open space, the forest land and the farm land, and as a policy to try to revitalize existing areas.

But as we got into this, it became clear that another central aspect of it was the amount of energy we consume as a society. So in effect, what happens is that our land use patterns force us, for the most part, into individual automobiles. To some extent, we've got to recognize that we all want more efficient automobiles on a miles-per-gallon basis. But perhaps what our goal really ought to be is to change the pattern so we don't have to have a daily reliance on an automobile, at least.

And it seems to me that with Smart Growth, there are two things that can help with that. One is to change development patterns so that people live close to where they work and have a much more traditional pattern of walking or convenient mass transit directly to work. The second is to have an extensive mass transit effort across the state.

Smart Growth simply recognizes that government policies in the past have supported sprawl. In fact, it started in a major way with the adoption of the interstate highway system which had the unintended consequence of opening up the suburbs and having the taxpayers pay for the cost of sprawl. This was reinforced by such things as government loan programs starting with the GI loan program, a good program to help the GIs and help homeowners buy homes, but it also opened up the suburbs.

SEI: *What can be done about existing sprawl? We can change development patterns for the future, but what can we do from an energy point of view to mitigate the impact of the existing sprawl, such as more mass transit, or less polluting vehicle types?*

Glendening: We've got to recognize that sprawl exists. We're not going to reverse the total pattern overnight, so we have to deal with it. The large picture is that we've got to reduce substantially any additional sprawl, but within our existing communities we ought to have policies that make us far more energy efficient.

First, we need substantial investment in workable, user-friendly mass transit. I am very pleased that in Maryland, as an example, we have started a $3 billion program to expand mass transit in a dramatic way across the state, with our goal being to double ridership by the year 2010. And in fact, in the last budget we adopted, the additional transportation money for the first time was equally divided between mass transit and road construction.

We're probably the first state in the country to achieve that equilibrium.

Second, within existing sprawl communities, we have to give people incentives to live and work in close proximity. We've started a program called Live Where You Work which has been adopted now by a number of states. What we do is put up state money joined by local and private sector money to help people purchase homes close to where they work, the ideal being to walk but certainly to have a bicycle or use mass transit as well.

Other policies that we have adopted include such things as requiring pedestrian and bicycle path construction now in almost all of our state road construction. Also, using our state transportation fund from gasoline taxes to help make downtown areas more livable. We now have a very significant $200 million program to work with local governments to make these areas more livable.

To summarize, the whole idea of Smart Growth for energy use is two major things. One is to reduce and eventually, we hope, eliminate sprawl so that we don't create more need for wasteful energy use. Second, within the existing communities, to more effectively utilize the resources of the community and reduce energy consumption, through programs such as mass transit and Live Where You Work.

I love this stuff. I have an absolute passion for it.

SEI: *Where does that come from?*

Glendening: Interestingly, it goes way back. I grew up in Florida, and I used to travel from Tallahassee, Florida where I went to school at Florida State, to Miami, sometimes just for long weekends, where I was working in a machine shop. Because I was poor and couldn't afford the toll expressway at the time, I took the back roads, which were Routes 441 and 27, which went right through a portion of the Everglades. And just in the years that I was at Florida State, I saw a road through the Everglades become a main street subdivision.

So when you go down to Broward County, Dade County and Palm Beach County and you see all these subdivisions on both sides of Routes 441 and 27 and all that, you should recognize that at one time that was all Everglades. They have filled it in. I wasn't particularly environmentally conscious at the time. But just driving through like one weekend a month, it dawned on me: Something is just terribly wrong here. Of course, now South Florida is paying a huge cost of not having the water supply because they filled in the drainage to Lake Okechobee. So I think that's where it really started.

SEI: *Finally, as President of the National Governors Association last year, what Smart Growth measures did you introduce?*

Glendening: One of the things we're trying to do is to provide leadership on the Smart Growth issue across the country, because Maryland is a relatively small state. Even if we do everything right and have a dramatic change in policy and effectively achieve all of our goals, we're still losing the environmental battle and the energy consumption battle nationwide.

And so I was pleased that when I chaired the Natural Resources Committee, for the first time ever the National Governors Association adopted a list of principles about land use. Historically, governors have been reluctant to get into that area and there have been a lot of partisan issues. And so when my colleagues asked me to serve as chair, I indicated that I wanted Smart Growth to be the number one issue for discussion, and I was pleased that they concurred in that. And a number of governors have started taking very active roles themselves, in some cases, in areas that might surprise you.

For example, when Governor Levitt of Utah came to me and said that they wanted to basically adopt our Smart Growth package, I was — I must say candidly — surprised because you don't historically think of Utah as being a sprawl area. But apparently this is happening around Salt Lake City and in the mountains adjacent. And he has gotten most of his programs adopted. Likewise, Governor Barnes in Georgia got this wonderful new authority, a state agency. They can override transportation and land use decisions in the roughly 100 local governments in the Atlanta area.

And when I called him to congratulate him, I was pleased when he told me that our discussion of Smart Growth got them thinking about what was going on. We did have a series of policy symposiums across the country on this issue, ranging from Arizona, where the discussion was in part what happens with states that have large federal land holdings, to Minnesota, where even Governor Ventura has jumped into this in a big way, to Governor Vilsak of Iowa who took a major lead. We also issued four reports, and I was very pleased that Smart Growth was the focus point for the discussion during the most recent NGA meeting.

Our land use patterns force us into individual automobiles. Our goal ought to be to change development patterns.

In September my colleagues will elect me President of the Council of State Governments, and we're going to continue Smart Growth as the number one focus so that this will be a forum for continuing national discussions.

Conservation and Renewables

SEI: *Turning now to the electric power sector, you issued an executive order in March calling for state-owned facilities to get at least six percent of their energy from renewables and aiming to reduce energy consumption in state buildings. Besides these measures affecting state-owned facilities, what are you doing to try and cut consumption state-wide as well as increase green energy use outside of the government sector?*

Glendening: First of all, we're trying to lead by example. I think that's very important, and so in our executive order we have set up a Green Building Council which is designed to develop high efficiency green buildings and will set requirements for the public sector in the future. In other words, as we build or lease, they must meet these requirements, but it will also serve as a model for the private sector. This is going to start to have a substantial impact.

Another part of the responsibility is a major educational program, again with the private sector and with the public. Our goal that we've outlined is to reduce energy consumption in state facilities by 10 percent by the year 2005 and by 15 percent by the year 2010. We are making major educational outreach efforts. Just as an example, the Energy Star label program: we're trying to make sure that the state uses these energy efficient appliances, but also that we promote public understanding of them far more aggressively.

On the purchase of electricity, we have set a goal of six percent of consumption coming from renewables for state-owned facilities. But also, we're working with the Public Service Commission to have the public understand that this is a choice and it's a choice that has major benefits for the public. We hope that, just as the big traditional utilities will be promoting their energy source, that we will serve a focal point to promote green energy use.

SEI: *And what can be done to assure continued demand for renewables now that we're in competitive electric power markets?*

Glendening: Well, obviously we're in a tough area here. I think part of it is marketing and promotion. But part of it is also tax policy and public policy. First of all, if all of the public and quasi-public agencies became major consumers of renewable energy, that would help create a market all by itself. And secondly, I think we cannot expect, quite candidly, that the traditional energy companies are going to make any effort to promote this in their extraordinarily large advertising budgets. So I think that state and local governments increasingly, and nonprofits, are going to have to pick up the responsibilities to have the public understand what is at stake here.

If state, local and other agencies, as consumers, can put a major emphasis on renewable green power, I hope that we can help create such a market that it will make it more competitive, and make sure that the same general rates are offered to private consumers. We want the same rates that are given to large public entities, such as state governments and state university systems, to then be available for the general public.

Transportation Sector

SEI: *You've described your interest and actions to promote public transportation, and your recent steps to devote more of Maryland's transportation budget to mass transit. What else can be done? What are your thoughts on fuel efficiency standards?*

If state, local and other agencies, as consumers, can put a major emphasis on renewable green power, I hope that we can help create such a market that it will make it more competitive.

Glendening: I think that fuel efficiency standards ought to be done at the national level simply because, in fairness to the manufacturers, it's awfully difficult if you have 50 different standards, with the exception of the tremendous success that California had several years ago. But it's hard for small states like Maryland or surrounding neighbors to do this.

I hope, although I'm not very optimistic, that the federal government, working with industry, will be able to get more successful standards and help achieve both the research and the implementation of those. I do recall the debate when the automobile manufacturers said it was simply impossible, and prior administrations put the standards in and they have been met. And I think we ought to keep the pressure on them.

The other part of this, however, is that no matter how good the standards are, we're still consuming in the United States such a disproportionate amount of energy compared to the rest of the world. In part, it's because of the over-reliance on the individual automobile. It seems to me that the real solution, the long-term solution, must be not just controlling emissions and increasing mileage per gallon, but to reduce the reliance on the car.

And I believe there are only two ways really to do this. One is to change land development patterns, because you can be the most environmentally sensitive person but if you live 40 miles from your job, you're going to drive at least 80 miles a day every day of the week, something unheard of in most of the world.

SEI: *And what are your thoughts about promoting alternative vehicle types?*

Glendening: Basically the same thing. I think there's a significant role for government in this, in terms of helping on research and tax credits and a variety of things, some of which we have adopted here in Maryland. For example, we've given tax credits for the purchase of fuel efficient automobiles, just as we have for fuel efficient appliances and so on. We also try to lead by example. A number of our fleets now will start taking either alternate energy or hybrid systems, and we are starting to expand our fueling opportunities across the state, building new plants and new facilities so that we can use these effectively.

But again, even if fuel efficiency reaches 40 miles a gallon, you're still using 40 miles a gallon. And so I think our goal has got to be the other part of the equation as well, that is, reducing the number of miles traveled. So the state, for example, participates now in our Live Where You Work program, trying to have our own employees live close to their work.

SEI: *It sounds like moving more towards a typical European land use model, which is generally more Smart Growth oriented. It's encouraging to hear that being pushed so hard here.*

Glendening: We're doing it. In Europe, you come to the edge of a town and there's a clear line — you're either in the town or you're in a rural area. And very few people who live in the rural areas actually work in the town. Until we get to something similar to that in most of our communities, we're going to be consuming an inordinate amount of energy.

New Source Review

SEI: *The Bush administration is considering changes to the New Source Review program that would relax enforcement of a key provision of the Clean Air Act. This, of course, has major implications for states and their ability to meet federally mandated air quality standards. Could you comment on that?*

Glendening: Well, without saying anything too partisan, I must tell you that I disagree fervently and very fundamentally with what appears to be the new Bush administration policy. I say "appears to be" because they're going out for review and so on. But I think it would weaken the Clean Air Act significantly. It would undermine efforts to provide effective and aggressive air quality standards.

The problem is that they are basing most of their conclusions only on the financial impact to the company. What they've got to understand is that the financial impact is extraordinary beyond just what happens to that one plant and that one company. You can say, well, there's this existing plant and it would cost them $50 million to upgrade their emission controls, and why should they spend that? But the real cost is the huge health impacts of degraded air quality.

More roads do not solve the problem. What we need is a substantial investment by both state and local but also the federal government in mass transit.

The second part is that we've got to recognize that more roads do not solve the problem. What we need is a substantial investment by both state and local but also the federal government in mass transit. Federal policy still is roughly 80 percent road construction, 20 percent mass transit, which means that federal policy basically subsidizes reliance on the automobile. And it's important to note that people riding mass transit have to pay for this, while people ride on most of the roads for free.

So we've got to change these policies if we're going to be effective. Try to improve fuel efficiency, which requires federal laws and federal participation in the solution, and change the rules of the game so people do not need to rely on the automobile regardless of how efficient they may be.

If we focused on the quality of life, what is happening on smog alert days for example, and then focused on the billions of dollars that we're spending on health costs, whether it's respiratory or heart disease or cancer that results from these air emissions, then what we've got to recognize is that the only fiscally sensible thing to do is to require these older plants to come up to the same standards as the newer ones.

I think they're wrong if they weaken this. I think the Clinton administration was right to try to go after this aggressively and I hope that they pause and think about what they're doing. It's somewhat ironic that even as they back away from any serious effort for expanding health coverage for many families, that this policy would increase the health costs for those same families.

of energy and causing a huge problem in air pollution and the warming of the global climate. So we must be there, and I think we're making a horrible mistake.

Having said that, there are numerous opportunities for governors and other state and local leaders to speak out and use their influence to make sure the world realizes that where the Administration is on this is not necessarily where Americans are. As an example, I had my Secretary of the Environment testify recently at a European Union meeting of environmental ministers, that many of the governors strongly disagreed with the Administration on those programs.

To the extent that Maryland, for example, helps reduce energy consumption, helps on

Just as an example, where we sit right now, if global warming continues the way that they are projecting, much of the lower part of Annapolis would be under water.

Personal Responsibility

SEI: *Governor, do you have any closing message, including what citizens can do?*

Glendening: People must recognize that they have a personal responsibility. They must be willing to think about driving less, and purchasing energy efficient appliances even if they cost a bit more up front.

More importantly, I would urge citizens to become more aware, and demand accountability of their elected officials. In the last

In the last Presidential election, both campaigns really set aside the environment. The environment is an issue that people should consider when they vote.

Climate Change

SEI: *What do you think states, as opposed to the federal government, can do on the climate change issue? Is there anything we can do at the state level?*

Glendening: Well, first of all, here again I think the Bush administration is wrong to deny that this is a major problem and to deny that the United States of America must be a major participant in international agreements and even must be a leader. In fact, we're a leader in the exact opposite way. For a nation of less than six percent of the world's population, we are consuming an inordinate amount

things like mass transit versus automobiles and helps preserve open spaces, we will have some impact. But the problem is that even all 50 states moving aggressively still would not have the same impact as if you have the national government behind us. I think it's also part of our responsibility to speak out and lead, both lead to help people understand it's their individual responsibility to be part of the solution, but also to lead in a political awareness leading to public awareness of what is at stake.

Presidential election, both campaigns really set aside the environment. The environment is an issue that people should consider when they vote. As with education, health and the economy, the environment also determines our quality of life.

Senator James Jeffords (I-Vermont)
Chairman, Senate Environment and Public Works Committee

September 4, 2001

Overview of Bills Introduced

SEI: *Chairman Jeffords, this year you have introduced several pieces of energy-related legislation. I wonder if you could begin by giving us an overview of the bills you have introduced and what they would accomplish.*

Jeffords: Sure. I've introduced four bills this session that form the basis for ensuring a clean, sustainable energy future. The first bill, the Clean Power Act of 2001, reduces emissions from power plants of four major air pollutants: nitrogen oxides, sulfur dioxide, mercury and carbon dioxide. These emissions cause or worsen many of the nation's most serious public health and environmental problems including asthma, lung disease, premature mortality, acid rain, mercury contamination and global warming. The Clean Power Act requires cuts in emissions for these four pollutants that are both cost-effective and technologically feasible. With new generation and control technologies at our disposal, and trading mechanisms providing flexibility to the utilities, we can vastly improve the health and welfare of our great nation.

The second bill, the Combined Heat and Power Advancement Act of 2001, ensures that highly efficient sources of electricity, such as combined heat and power systems, are able to transmit power to the nation's electricity grid by establishing uniform and nondiscriminatory interconnection standards. Enabling these innovative, clean and efficient technologies to come online and be profitable will reduce energy costs and help protect public health and the environment. President Bush's proposed energy plan recommends the development of well-designed combined heat and power systems. The bill would ensure that CHP systems and other innovative technologies can interconnect with a local distribution utility and that the costs of such interconnections shall be just and reasonable, and not unduly discriminatory.

The third bill, the Clean Efficient Automobiles Resulting from Advanced Car Technologies (CLEAR) Act of 2001, provides tax credits to taxpayers who buy clean fuel-cell and hybrid vehicles, and to homeowners and corporations for the sale of alternative fuels and investments in related infrastructure used by these clean vehicles. This legislation is intended to reduce our petroleum dependency, increase our energy security, cut harmful emissions and improve diversity in our transportation sector. I think this bill has tremendous potential to encourage the development of new, advanced technologies that will help make our cities less smoggy, our energy dollar go further and our economy less vulnerable to petroleum price and supply fluctuations.

Finally, I recently introduced a bill, the Renewable Energy and Energy Efficiency Investment Act of 2001, to help renewable energy to become the option of choice for new energy generation. Renewables help reduce acid rain and other forms of air pollution, including greenhouse gas emissions, and provide high-tech jobs for U.S. workers. It's also important to emphasize that they are not subject to supply changes that lead to large fluctuations in the price of fossil fuels, and in fact they help us reduce our dependence on foreign sources of fossil fuels. So this bill would establish a renewable energy credit system to allow electric retail suppliers to provide 20% of their total electricity sales through renewable sources by the year 2020. The bill would also fill in the missing pieces for a truly balanced energy future by establishing a systems benefit fund to promote energy efficiency, simplifying the net metering system, and requiring electric power companies to disclose comprehensive information about their emissions.

SEI: *And how would that systems benefit fund work?*

A small non-bypassable and competitively-neutral wires charge would be placed on electric bills across the nation. The accumulated charges would go into the fund, from which a board would make matching grants to states, for development of renewable energy, low-income home energy needs, energy conservation and efficiency and related research and development.

SEI: *What do you think the prospects are for these pieces of legislation?*

Jeffords: With the passage of an omnibus energy bill in the House of Representatives in early August, and significant attention from the Administration focused on energy policy, the push is on to pass comprehensive energy legislation — something the Congress has not done for over a decade. The bills I described will be instrumental in moving us away from our dependence on fossil fuels to generate electricity and power. That's the kind of investment that will have positive effects on the health of our citizens and the health of our economy. And it's the kind of forward thinking that will truly address our energy supply problems in the future. I am pleased that these bills have bipartisan support and I am hopeful that they will either be incorporated into a larger energy package or will pass on their own merits in this Congress.

SEI: *Could you comment on the energy bill passed in the House?*

Jeffords: Well, I'm disappointed that the House package favors extraction and production over energy efficiency and environmental protection. It resurrects old energy ideas instead of introducing new energy innovation that would leave our children and grandchildren a clean, sustainable energy supply. Renewable energy, energy efficiency and environmental sustainability should be the focus of a twenty-first century energy policy. I will work to ensure that the Senate energy bill puts these priorities first.

SEI: *It seems that the House and Senate are likely to be pretty far apart in the changes they would like to bring about in U.S. energy policy. How do you see this moving forward?*

Jeffords: As I said, I am disappointed that the House did not seize the moment to pass a visionary energy package that would lead our nation to a clean, sustainable energy future. I am confident the Senate will take a much closer look at renewable energy and energy efficiency. These components are crucial. I believe the final energy bill will contain these programs, because this is what the American people support. For example, they don't want to see the Arctic National Wildlife Refuge spoiled for six months' worth of gas, when we can save that much with minimal improvements in the fuel efficiency of our cars and trucks.

SEI: *Do you think ANWR will be in the final bill?*

Jeffords: I oppose drilling in ANWR at this time. I have always been concerned about finding ways to reduce our dependence on foreign oil supplies, but I don't believe we need to do that at the expense of one of America's true natural treasures. I think it will be difficult for supporters of drilling in the Refuge to muster enough votes in the Senate to open this area up for drilling.

There are substantial challenges to bridging the differences between the House approach and what I expect the Senate will develop in an energy bill. I think the country recognizes the need to develop a long-term energy strategy. That will ultimately provide the necessary pressure to force the Congress to resolve any differences and provide true energy security for our nation.

SEI: *EPA is considering changes to New Source Review requirements for coal-burning and other facilities. What is your view on these changes?*

The American people don't want to see ANWR spoiled for six months' worth of gas, when we can save that much with minimal improvements in the fuel efficiency of our cars and trucks.

Jeffords: EPA has not yet proposed any specific modifications. Administrator Whitman indicated that the Administration would submit proposed changes to the regulations or the Clean Air Act as part of a three-pollutant bill addressing power plant emissions. I am willing to review the Administration's proposal if it is constructive and provides assurances of improvements in emissions control over and above those that we would have achieved using the current system, including full enforcement of the New Source Review requirements.

SEI: *But what would happen with carbon emissions if we proceed with this three-pollutant bill rather than the four-pollutant bill you are sponsoring?*

Jeffords: The Senate Environment and Public Works Committee will proceed with a four-pollutant bill, regardless of the Administration's proposal. EPA Administrator Whitman told the Committee that fuel switching and efficiency increases would occur in response to tight caps on the other three pollutants, and that this could lead to reduced carbon emissions. The actual reductions seem minor at best, and certainly substantially below our international commitments for the sector.

Carbon Emissions

SEI: *Senator, continuing on the subject of carbon emissions, the Bush Administration has for the moment bowed out of international negotiations on climate change, and is working on an alternative proposal to the Kyoto Protocol, to present to the next round of negotiations in Marrakesh in November. Do you see the four-pollutant bill as essentially a way for the United States to bear its share of carbon reductions, without actually signing on to Kyoto?*

Jeffords: The bill would require power plants to reduce carbon dioxide emissions to 1990 levels by 2007. Given that the first budget period in the Protocol is 2008-2012, the economic and regulatory incentives provided by the bill would encourage the sector to meet its proportional share of the nation's Kyoto targets in that timeframe.

The four-pollutant bill and the others I mentioned earlier will go a long way toward meeting our obligations under the UN Framework Convention, as a start, if they are enacted. But the Committee has also been reviewing emissions of criteria pollutants and greenhouse gases from sources other than power plants to see what other steps might be taken. The National Academy of Sciences has reported that there is an adequate technological basis for improvements in CAFE standards for automobiles. So under my direction, the Committee will continue to look for all feasible ways of reducing carbon emissions.

SEI: *Do you think there is a net economic advantage or a net cost to U.S. industry if U.S. carbon requirements do not keep pace with the international norm?*

Jeffords: Clearly, the U.S. will be at a distinct economic, technological, trade and international relations disadvantage if the Protocol enters into force without full U.S. participation.

SEI: *Why? Particularly on the economic front, is this what you are hearing from U.S. industry?*

Jeffords: New technologies will be developed, new alliances will be formed, new trading agreements will be signed — all on the basis of the targets in Kyoto. As a non-signer, the U.S. will be outside the negotiating room and could face additional non-tariff barriers. Our multi-national companies, in particular, will have additional accounting and operations burdens. Unfortunately, there are and have been few companies interested in publicly contradicting the President.

SEI: *The Bush Administration is not alone in its opposition to the Kyoto Protocol. Can you explain the Senate's 95-0 resolution that was passed in 1997? And do you consider the sense of the Senate to be any more in favor of carbon cuts today than it was then?*

Jeffords: The Senate's constitutional role is to provide advice and consent to the Executive Branch regarding treaties and appointed positions. In Senate Resolution 98 in the 105th Congress, the Senate advised the President that the Kyoto Protocol should not be signed by the U.S. if it did not include a requirement for reduction commitments from all countries, or if it would result in serious harm to the U.S. economy. It's important to underline that the Senate has not actually voted on ratification of the Kyoto Protocol, as signed by the President in 1998.

This year, H.R. 1646, the Foreign Relations Authorization Act, as passed by the House and also reported out by the Senate Foreign Relations Committee, includes a Sense of the Senate Resolution calling on the U.S. to demonstrate leadership in reducing emissions and in proposing revisions to the Kyoto Protocol or another international agreement to achieve binding targets and timetables for reductions of greenhouse gas emissions. So there does seem to be a new appreciation in the Senate for the potentially overwhelming impacts that global warming may have on our environment and economy.

SEI: *Can you comment on the differences between your proposed Clean Power Act and the bill addressing climate change that has been introduced by Senators Byrd and Stevens? How do they differ with respect to controlling carbon emissions, and where are legislative efforts now headed?*

Jeffords: The Clean Power Act places a cap on carbon dioxide emissions from the power plant sector, though the bill considers intersector trading as a way of making cost-effective reductions. The Byrd-Stevens bill is

The Senate Environment and Public Works Committee will proceed with a four-pollutant bill, regardless of the Administration's proposal.

primarily designed to use Federal research and resources to shift our economy and our energy production to a less carbon intensive mode and encourage voluntary reductions in the longer term.

Renewables; Energy Efficiency

SEI: *Senator Jeffords, SEI is very interested in technological solutions that can help the United States advance to a more sustainable energy future. Could you please share with us first your thoughts on possible advances in renewable energy technologies, as well as increased energy efficiency standards and improved technologies that can help meet those standards?*

SEI: *Could you also comment on the impact of deregulation, and what can be done to assure that there will be sufficient demand for renewables in competitive markets?*

Jeffords: Some of the biggest obstacles these technologies face involve inequitable treatment when attempting to connect to the local distribution grid or transmission system. As part of any changes that may be made to the electricity generation markets, we need to include requirements that renewable energy, combined heat and power systems and small scale distributed generation systems have fair and open access to the electricity grid. These technologies are ready for prime time. We just need to get them out on the electricity stage.

Nuclear Energy; Carbon Sequestration

SEI: *Third, could you comment on the prospects for advanced nuclear energy technologies, such as the so-called "Generation Four" technologies, as well as carbon sequestration, which could allow continued use of fossil fuels without increasing carbon load in the atmosphere?*

Jeffords: The biggest obstacle to new nuclear energy technologies involves the costs of building nuclear power plants and the methods of disposing of the waste. Nuclear power is still the most capital intensive of all our energy generation options. With new, competitive electricity markets, it may ultimately be construction costs that determine whether these new technologies will move from the lab to production.

The U.S. will be at a distinct economic, technological, trade and international relations disadvantage if the Protocol enters into force without full U.S. participation.

Jeffords: I look to wind energy as one of the best examples. Wind is the fastest growing form of energy in the world. In the last year almost 4000 Megawatts of new wind capacity were added worldwide. This technology is clean and sustainable. Fortunately, the United States still has vast untapped wind energy resources. I am proud that Vermont has been a leader in developing wind energy as well as biomass resources. We showed that these technologies are ready to start playing a larger role in our energy supply.

And there are important ways to increase our nation's energy efficiency. For example, we can encourage the use of combined heat and power systems. These facilities allow waste heat from electricity generation to be used for heating and cooling systems. This provides tremendous gains in efficiency. I have also been a proponent of much greater vehicle as well as appliance efficiency.

Automotive Technologies

SEI: *Second, how about automobile fuel efficiency standards, as well as development of hybrid, fuel cell and other vehicle types?*

Jeffords: The nation should clearly continue to explore more efficient ways of moving people from one place to another. The National Academy of Sciences recently reported that existing technology would allow us to increase the efficiency of our cars and trucks while maintaining the same levels of performance and safety. It is time that we take a long hard look at raising the minimum fuel efficiency standards for cars and trucks. Hybrid vehicles and fuel cell vehicles also offer tremendous potential when it comes to decreasing our dependence on foreign sources of oil. But we also need to adequately support mass transit options that help reduce the amount of miles we travel in our cars. Smart growth development strategies also play a large role in making mass transit accessible.

SEI: *But if these new technologies, such as the Pebble Bed reactor and other next-generation designs, can in fact be built at competitive prices, as their backers claim, do you feel that these would be attractive, partly in order to avoid future carbon emissions and reduce oil dependence?*

Jeffords: When and if it's shown that such technologies can be built at competitive prices, without large Federal subsidies or environmental problems, then we can continue to discuss their future role. In general, I would rather see a much larger portion of our electricity demand met through renewables.

SEI: *Even with new nuclear technologies, we face the continuing challenge of what to do with nuclear waste. In your view are there major technical obstacles to safe disposal of nuclear waste, or is this largely a political/NIMBY problem?*

Jeffords: Nuclear waste is certainly a difficult problem to deal with. Whether you support moving waste to a geologic repository or storing it on site, there are technical challenges that must be met. The Department of Energy has been investigating Yucca Mountain for some time. DOE is expected to release an analysis of the technical merits of Yucca Mountain by the end of this year. I will take a look at the results of that analysis before I make any judgments about the technical merits of the Yucca Mountain program.

Smart Growth Task Force

SEI: *Senator Jeffords, you co-founded the Senate Smart Growth Task Force in 1999 along with Senator Carl Levin. Can you comment on the activities of this task force and the Federal role in supporting state-level responses to urban sprawl? In particular, could you comment on the impact of land use planning on patterns of energy consumption?*

Jeffords: Yes. The Task Force provides Senators with a forum for education and coordination of efforts concerning sustainable growth patterns. The overall goal of the Task Force is to determine and promote ways the federal government can assist states and localities address their own growth management issues. Recently, the Task Force hosted two briefings highlighting the link between energy use and smart growth, specifically focused on housing and transportation. Understanding these relationships is critical to building smart communities that are energy efficient and offer multiple transportation options. Through reauthorization of the Transportation Equity Act, I hope to promote policies that work toward this goal.

Energy Mix

SEI: *In closing, would you care to comment on the mix of energy technologies in use in the world today and the changes to this mix that should be brought into effect, particularly as developing countries increase their energy consumption?*

Jeffords: Our nation continues to rely on fossil fuels for most of our energy, but we are on the verge of major changes in the way we generate energy. Wind energy is the fastest growing form of energy in the world and will likely continue to play a dominant role in new energy generation. I believe that other promising technologies such as biomass, geothermal, photovoltaic and fuel cells will soon see similar growth spurts, bringing them into the mainstream of energy generation. The reason is simple: these technologies promise clean, sustainable energy generation.

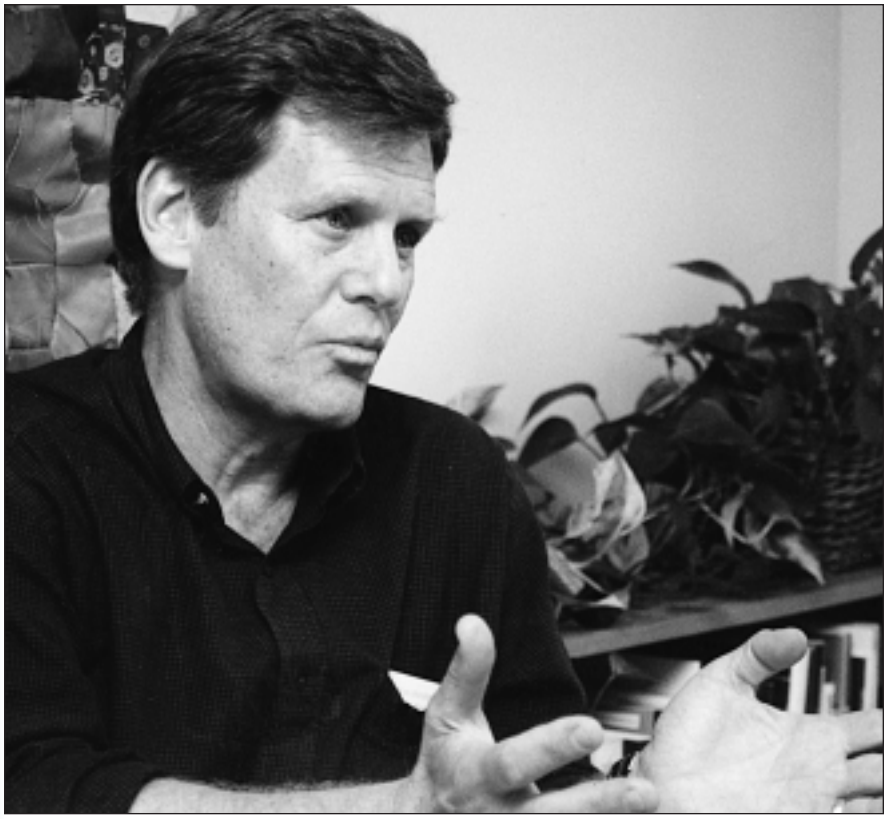
So I think it is time for the United States to take the lead not only in developing these new technologies, but in utilizing them. We should be a role model for how nations can grow their economies and protect their environments at the same time. It is time that we started to move these ideas from the laboratory to the marketplace, not only here but in other countries. This will have a positive impact on the health of people everywhere, the quality of the environment and the growth of our nation's and the world's economy.

We are on the verge of major changes in the way we generate energy. Wind energy is the fastest growing form of energy in the world. Biomass, geothermal, photovoltaic and fuel cells will soon see similar growth spurts.

SEI: *And on the subject of carbon sequestration?*

Jeffords: It will be a long time before we can completely phase out our use of fossil fuels, and sequestration could be an important part of any climate change effort for the next few decades, whether it is done through sinks or geological or deep ocean storage. But our best methods of reducing greenhouse gases in the atmosphere are still to reduce our use of fossil fuels through development of alternatives, and conservation and increases in efficiency.

Jonathan Lash
President, World Resources Institute
October 5, 2001



Pending Legislation

SEI: *Mr. Lash, could you begin by addressing the energy legislation that is now pending in Congress in broad terms: what do you feel are the priorities that should be included in the bill as well as the things that should not be included?*

Lash: We need to address energy policy within the context of the need to reduce CO_2 emissions. The longer we delay in sending that signal, the more damage will be done to the environment and the more expensive it's going to be to make the changes necessary.

One of the goals of the energy policy is to get new sources on line. Utilities have to decide how to proceed. They don't know when the country will require reduced CO_2 emissions. So they can't make a responsible decision in terms of the interest of their shareholders. The sooner we make that decision, the clearer it is, and the longer term it will be, the cheaper it's going to be to respond.

The Four Pollutant Bill is a very good way of sending that signal. I am also particularly interested in a proposal that might be called the reverse auction, in which the government would simply request proposals from different sectors for measures to reduce CO_2 emissions, and they just buy the cheapest CO_2 reductions. There would be a huge technology incentive. It would get people thinking about efficiency in a very successful way.

SEI: *Is that based on an existing auction system in other areas?*

Lash: There have been a couple of very interesting experiments in the natural resources area. There was an effort to get salinity out of the Colorado River after years and years of failed subsidies. Someone in the Bureau of Reclamation thought up the idea of just asking ranchers to bid based on tons of salt removed. They got the most spectacular response. There have also been reverse auctions to reduce harvests in different fisheries.

SEI: *The House and Senate are likely to be very far apart on how they'd like to change U.S. energy policy. Do you have a sense of how this is going to move forward?*

Lash: Ultimately, the answer to that question is going to come from the public. I don't think there is broad public support for energy bills that provide subsidies to fossil fuels. But there is growing public support for action on climate change.

SEI: *Along these lines, can you offer any comments on ANWR?*

Lash: My colleague Jim Mackenzie has done what I think is the best analysis of what's actually there and what it means in terms of energy supplies. His numbers show that oil production in ANWR could only make a marginal contribution to solving the nation's oil security problems.

I would agree with the environmental group positions on ANWR. It's ironic that if climate change goes far enough, fast enough, melting of the permafrost will fundamentally threaten the ecosystem in the wildlife refuge.

Climate Change

SEI: *Turning to climate change: First, since the U.S. is clearly not going to accept Kyoto any time soon, there seem to be two options: the Bush Administration idea to come up with an alternative to Kyoto, and move the international community to that, or just to proceed with the best possible domestic carbon reduction strategy and hopefully keep pace with the international community. Given where we are on Kyoto, what would you favor?*

Lash: Well, anything that we do domestically to reduce CO_2 emissions is better than nothing. Anything we do to send a signal that it is important to find sources of energy that reduce CO_2 emissions is an important step.

To go forward with an energy bill without a climate policy just seems completely illogical to me. Nevertheless, it doesn't look like the Administration is going to come up with a policy. Obviously, they have other priorities right now. They announced that they were rejecting the Kyoto Protocol and the Four Pollutant Bill. Then they said they were going to do a policy analysis. You'd think they'd do the policy analysis first before making the policy decisions.

SEI: *And what do you project will be the economic impact here? Is it a net cost or a net advantage, that we don't have to meet the target that the rest of the world is going to try to meet?*

Lash: I think it is a net cost for three reasons. Reason number one: the first best option for reducing emissions is improving efficiency. Efficiency reduces costs. Companies that are competing in a world where energy costs are a significant element of their production costs and have become more efficient are going to win. It's just getting ahead of the curve.

The companies that have already taken voluntary commitments and said, "we're going to go ahead and do this," are not doing it because they're going to get green points; it's because they're going to compete better. And they certainly look like a list of smart companies to me.

Second reason: the requirement to reduce CO_2 emissions is going to be a very large scale incentive for innovation. What happened with regard to the Montreal Protocol was that the companies that had to find means to eliminate CFCs, in fact, produced much better equipment and are technologically dominant in their field.

Third: this is a globalized economy, and most of the world is going to be operating with one set of values. American companies operate globally and they're going to have to be responding. Would General Electric or Ford like 50 different standards in 50 different U.S. states? They'd say that's the craziest thing they've ever heard. Well, we're about to create that system, supposedly to benefit our companies, and it isn't going to work.

SEI: *You have done some work concerning the role of developing countries in terms of carbon reductions. The critics of the Kyoto Protocol call for meaningful participation by developing countries before the U.S. signs up to the Protocol, even though we're responsible for the vast majority of emissions to date. How and when should developing nations join into the process?*

Lash: Let me correct an assumption implicit in your premise. In fact, developing countries are already taking significant action to reduce emissions. In the case of China, in fact, they are making reductions faster than the United States is. They're not doing it because of climate. They're doing it because energy efficiency and pollution control are important priorities for them.

So when the Chinese put their energy system on more of a market basis, when they took steps to shut down inefficient State industries, when they took steps to shut down the largest sources of pollution in the country, it turned out that they also reduced CO_2 emissions per dollar of output, very, very significantly, over a long period of time and much more than we have. They're becoming more energy efficient and more pollution efficient. And they have every incentive to continue to do that.

It is understandable why developing countries would be a little skeptical of taking on any burdens when the largest source of CO_2 and the largest economy, the most powerful nation, hasn't agreed to reduce its emissions. I mean, it's only in the United States that that would be hard to see. But putting that aside and dealing with your question explicitly, you can construct a system of obligations that talks about carbon intensity — CO_2 per dollar of output — by which developing countries could take on an obligation to become much more efficient, but leave themselves still room to expand their output. In this way, very, very poor people can increase their income, which is the thing they absolutely won't surrender and should not be asked to surrender.

You could even put in place a series of thresholds. When a country passes Threshold A, which might just be in terms of per capita emissions, they then have to take a carbon intensity target. When they pass Threshold B, they then have to take an absolute emissions target. And you could add into that a set of mutual obligations in terms of assistance that was provided.

A proposal like that, that appeared to reflect the reality of their needs, could get serious discussion. I don't think at this point you could get serious discussion coming in from the United States. The U.S. is perceived as having been so arrogant on this subject, and so unwilling to consider any point of view but

China is making CO_2 reductions faster than the United States, not because of climate but because energy efficiency and pollution control are important priorities for them.

their own, that ideas that come from us are probably dead on arrival. But that set of proposals could provoke a legitimate negotiation.

SEI: *Concerning political realities here in the U.S., do you consider the sense of the Senate to be more favorable towards carbon cuts today than when they had this unanimous vote in 1997?*

Lash: The dynamics obviously changed completely when it was no longer about Al Gore.

Recently, Senator Byrd made a powerful statement about why we needed to take action, as a witness on his own bill. Then his co-sponsor, the Ranking Minority Member of the Committee, Senator Stevens (R-AK), came and made a powerful statement of how he was already seeing climate change in Alaska and it was time to do something. Well, you didn't hear much about that in 1996. So I think they are looking for a course forward that enables them to say, well, now we have this plan, and it's a long dance to reach consensus about significant legislation but we're looking at how to put the bill in place.

SEI: *Do you think there are reasonable prospects for the Four Pollutant Bill or some kind of significant measure in the 107th Congress?*

Lash: Yes. We just don't know what's going to happen when. Life is unpredictable. It took 10 years to get the Clean Air Act reauthorized and produce acid rain legislation. It may take a while.

SEI: *Congressman Boehlert (R-NY) has indicated that there is now some movement towards a three pollutant approach rather than four. People with this view seem to feel that the reductions in the other emissions will bring about benefits on the carbon side as well. Any reaction to that?*

Lash: I think that would be a powerful statement that the political system wasn't actually ready to face this issue. So I think it would be a mistake. And if I were a utility executive, that would drive me absolutely nuts because it means, not only are you expected to invest in new capacity without knowing what the carbon futures are, but you're even expected to go back and make significant changes in existing capacity, and the country still won't tell you for sure whether that's it or you're going to also have to deal with carbon.

Incentives for New Technologies

SEI: *I'd like to turn to your views on new technologies. Renewables, first of all, have so far had a difficult time in penetrating the market. What do you feel are the prospects, and in terms of policy are there more things we should be doing to promote renewables?*

Lash: Well, wind is the fastest growing source of energy. The obstacles to wind right now appear to be (a) getting power from where we have supplies to where we have demand; and (b) policy obstacles in the electricity market.

It takes some force to drive changes in an existing infrastructure. If you're going to move to hydrogen and fuel cells, there has to be a reason why people choose to invest in that change, and investors are usually pretty smart. They want to make money and they're trying to figure out where they can make money. And if there's a set of policy signals that are separate from just what the market says, they have to be pretty clear for people to make those choices. Well, we just haven't had those policy signals in place, and I think we could accelerate that transition. And it's in our interest, economically and environmentally, to accelerate that transition.

SEI: *Could you also comment on the development of advanced technology vehicles, including hybrids as well as fuel cells and other things out there?*

Lash: Hybrids are a tremendous opportunity because it's a very basic technology shift that can be made without rebuilding the infrastructure. So that's a great opportunity.

In the next few decades, the auto companies need to make a transition from automobile manufacturing to mobility as their business. And if you think about providing 21st century mobility so that people get what they want, we have an enormous opportunity to be world leaders. We have a fabulous industry that is technologically very capable, and we don't seem to be providing many opportunities for that to happen.

SEI: *I know you also have an interest in carbon sequestration. Could you please comment on its prospects?*

The requirement to reduce CO_2 emissions is going to be a very large scale incentive for innovation.

Lash: I think we need to develop sequestration options where it's not a gimmick, but where we're getting multiple benefits, where we're upgrading soils, improving forest cover and so forth. We shouldn't ideologically eliminate something that provides those kinds of opportunities. We've just got to be able to count it right so that we really are getting climate benefits.

One return to an international theme on this is important. We are technologically the most advanced nation on earth and we have the greatest technological resources. Solving the climate problem is going to involve enabling other nations, particularly developing countries, to expand their economies while reducing their use of fossil fuels. The only way we have to do that is with technology. If we approach this as an international opportunity — just the same as we are thinking of developing collaborative security partnerships — then this becomes one of the big opportunities in the 21st century. But as long as we keep approaching it as a threat, it's going to become one of the big problems in the 21st century.

Alliance for Human Security

SEI: *Would you like to offer a closing message, first of all to Congress, regarding how the events of September 11th affect energy policy, and how it should affect what they do, and secondly to the public, concerning what citizens can do?*

Lash: Well, citizens can visit safeclimate.org, which is WRI's safe climate site, where citizens can go, calculate their carbon footprint, find out what they can do to reduce their carbon footprint and find access to the vendors who will sell them the equipment to do that. And it's fun. It's a very user-friendly website and it's a great way to demonstrate that really this isn't such a big deal, we can do this.

Let me also say something about the world after September 11th. If we pursue justice and security in the narrowest terms, and don't address any of the underlying causes that create the misery and poverty and powerlessness that Bin Laden is apparently trying to use to provoke the large scale war, then I don't think we'll end up with long term security. Long term security has to be about human security and human dignity.

If you imagine a situation in which we begin with the narrow security collaboration, but then expand it and say, well, the world has helped us, now we're going to help the world with climate change; we're going to reduce our use of fossil fuels including oil, so we'll have more options in the future because we won't need Mideast oil as much; we're going to help the poor nations with education and microcredit and health so that people do have hope; we're going to address the fact that a third of the people in the world already face water scarcity, and that number is going to double in the next few decades, creating real tensions and insecurity; and we're going to recognize that rapidly growing populations are a threat to security; then, you can really imagine this alliance that we've built around security becoming an alliance for human security. If you have rapid climate change, the first people to suffer are the poor. Floods and drought create refugees, misery and insecurity. The poor of the earth are the very tinder that Bin Laden is trying to ignite.

The dynamics of the climate change debate obviously changed completely when it was no longer about Al Gore.

Senator John McCain (R-Arizona)
Ranking Minority Member, Senate Commerce, Science and Transportation Committee

November 13, 2001

Climate Change

SEI: *Senator McCain, you organized an extensive series of hearings focusing national attention on climate change during 2000 and 2001, as Chairman of the Commerce, Science and Transportation Committee. Could you begin by telling us your overall thoughts on the climate change problem based on what you've heard in these hearings?*

McCain: Sure. A big part of the hearings was receiving testimony about the increasing scientific evidence that supports a link between global warming and manmade emissions. The effects of this warming — melting glaciers, destruction of coral reefs, rising sea levels, extended growing seasons, etc. — are beginning to reveal themselves. So it's a pretty compelling case that we have a problem. I don't think that we can ignore it and hope that it works itself out, so that's why Senator Lieberman and I have introduced the cap and trade proposal.

SEI: *Could you comment on that proposal, which you announced on August 3? Would this get us to the Kyoto numbers?*

McCain: One of the first challenges to designing this cap and trade system is to determine the level where the cap should be set. That's turning out to be a great challenge in itself. The scientists are not sure where it should be. I would hope that we could establish a "sensitivity curve" to better understand the environmental effects of the various levels of CO_2 in the atmosphere. I'm learning that data to support this kind of analysis may not be so easy to construct.

Of course the President has effectively withdrawn the United States from the Kyoto process. We have to wait and see what the final numbers are from Kyoto, but we recognize the scope of this problem and we have to keep doing what we can domestically towards ultimately reducing CO_2 levels in the atmosphere. I think the cap and trade system is the right structure for our program within the U.S., and we're going to keep working on it. The delays from September 11 have obviously set us back, and we need to have more meetings with the scientists, with industry and with environmental groups to fully develop the system. It won't happen this year, but we're going to continue pursuing it.

SEI: *The Clean Power Act introduced by Senators Jeffords and Lieberman (the "Four-Pollutant" bill) would regulate power plant emissions including CO_2 . Can you comment on how cap-and-trade could work in tandem with this, and whether these bills might be merged?*

McCain: The proposed cap and trade bill with Senator Lieberman would be an economy-wide bill. I'm aware of the Four Pollutant bill and have not had discussions with them yet on merging. But recognize that the Four Pollutant bill would cover only the utility industry.

ANWR

SEI: *Could you comment on ANWR? Do you think ANWR is the answer to last winter's "energy crisis," or to the new war on terrorism, and do you think this idea will ultimately pass Congress?*

McCain: Arctic drilling may not be the answer to recent energy problems, or the quick fix to improving national energy security. However, America's energy needs are growing and it is imperative we explore alternative sources of power.

We can't hold the economy hostage to foreign energy suppliers, or allow rolling blackouts to become a part of everyday life in the America of tomorrow. I'm an advocate for conservation as part of a sound energy policy, but reality dictates that we need a balanced energy strategy that promotes conservation as well as production. As part of this strategy, we can increase our energy supplies by advancing nuclear power as well as renewable energy resources, which are clean and reliable energy sources.

There is a strong push for a comprehensive energy proposal to be considered by the Senate in this Congress, but there are looming filibuster challenges that I think will make an ANWR debate in the Senate very difficult.

But I also think there's going to be a world marketplace for buying and selling emission reductions, and we are now running a big risk that American companies will be left out. This is why I've said we should ensure that what we do here in the U.S. can be integrated on the international level, and that those reductions get fully recognized and are fully tradable once the global marketplace for greenhouse gas emissions emerges. When we set up a national cap and trade system, our industries will be able to gain the experience they'll need to stay competitive with other nations' industries that are playing in the global trading system. But it's important to ensure that what we do here will be recognized and tradable globally.

Of course, whether or not it will be will depend on the final details of the Kyoto Protocol. As I have stated before, I would not have pulled the U.S. out of the Kyoto process. The rest of the world is moving forward, but we produce 25 percent of the world's greenhouse gas emissions and obviously have a responsibility too. As far as developing nations, I think the US Senate has made it abundantly clear that developing nations should be included in any final CO_2 reduction plan.

Do you favor tightened CAFE standards, especially for SUVs, and do you think this will pass the Senate? Do you feel that improvements in engine technology can get us to higher fuel efficiencies, rather than necessarily making vehicles lighter and possibly less safe?

McCain: The debate over CAFE is complex because it affects the environment, public safety and the economy. It creates tension between the consumers' choices to drive inefficient vehicles and the environmental consequences that result from those choices.

CAFE standards, as the National Academy of Sciences reports, have produced many positive results, including reduced greenhouse gas emissions, a decreased dependence on foreign oil and lower fuel consumption. But at the same time, NAS reports that the standards have probably resulted in more traffic fatalities due to manufacturers downsizing and downweighting vehicles in order to comply with the standards. Our Committee will continue examining this issue, and it is imperative that we account for any unintended consequences of our actions.

But as the NAS committee suggests, it is possible to achieve better fuel economy without having to compromise passenger safety. Congress can and should continue to work aggressively to bring about improvements in combustion and engine control technology, including alternative fuels, that will let us reduce tailpipe pollution and greenhouse gases. Look, energy efficiency is a readily achievable goal that can be practiced by Americans in everyday energy-consuming activities. We should do all we can to encourage consumers to conserve and to have confidence in the newer and more energy-efficient technologies.

There's going to be a world marketplace for buying and selling emission reductions, and we are now running a big risk that American companies will be left out.

Kyoto Protocol

SEI: *Coming back to your cap and trade proposal, this idea, once enacted, would put the United States on course to reduce our greenhouse gas emissions on our own, even if we do stay out of the Kyoto Protocol. Critics of the Protocol and of mandated carbon cuts warn of devastating impacts on the U.S. economy. Can you comment on that?*

McCain: Well from what I've heard, some of the measures industry will have to take to reduce CO_2 emissions will cost money obviously, but others might actually produce economic benefits, for example if the reductions result from using energy more efficiently. The IPCC's third assessment report, issued earlier this year, indicated that about half of the emissions reduction targets may be achieved with a net economic benefit. So that sounds like the basis for action to me.

Steps We Can Take

SEI: *Your August 3 press release noted that "We should reward improvements in energy efficiency, encourage advances in energy technologies, and improve land-use practices." This captures many elements of SEI's philosophy, and we'd like to ask you a few questions concerning these steps.*

Advances in Energy Technologies

SEI: *Could you please share with us your thoughts on possible advances in renewable energy technologies? What can we do to ensure that these new technologies penetrate the market to the maximum extent possible?*

McCain: I strongly believe that our nation benefits from, and should have, a competitive and diverse energy mix. This should include renewable energy sources such as solar, wind, geothermal, biomass and others. I have been privileged to introduce and push for legislation providing incentives to develop such alternatives.

Nuclear Energy Technologies

SEI: *What about the prospects for next-generation nuclear energy technologies, such as the so-called "Generation Four" technologies? Should the Federal government be doing more in this area?*

McCain: I am a proponent of advancing nuclear power as a safe and cleaner source of energy. Legislation I proposed in prior years focused on developing inherently safe and economic nuclear reactors. Fortunately, the United States is among the world leaders in developing the next generation of nuclear energy systems that are expected to be safer, more reliable and secure.

Closing Message

SEI: *In closing Senator, do you have a message for your Senate colleagues regarding sustainable energy, and particularly the impact of September 11 on how we should approach energy legislation?*

McCain: Well, besides the strong defense of national security and precious liberty that we all enjoy, we are equally obligated to be wise stewards of public lands and resources. Every American has the freedom of choice. We are grateful for it, and we take responsibility for those choices.

Our populace is growing, and so is the demand to improve the lifestyle we are privileged to enjoy. As public servants, we have to act to promote the greater good for all Americans. Our actions do make a difference and some actions may require added discipline to benefit the greater good.

Political will is strong in both parties to reform and improve the nation's energy policies. Americans expect innovative and common sense solutions, not partisan rancor. By seeking a sensible middle ground, conservation and energy production can be mutually inclusive.

As the NAS committee suggests, it is possible to achieve better fuel economy without having to compromise passenger safety.

SEI: *Similarly, what Federal measures can be taken to accelerate the development and use of hybrid, fuel cell and other vehicle types?*

McCain: With each day, advances are reported in development of hybrid, fuel cell and more efficient vehicles arriving in the market. While market forces should help to facilitate consumer interest, the federal government can help to encourage consumer confidence and, where demonstrated to be cost-beneficial, to provide additional incentives to foster investments.

SEI: *In your view are there major technical obstacles to safe disposal of nuclear waste, or is this largely a political/NIMBY problem?*

McCain: Nuclear waste storage still poses a unique challenge. With the waste now stored at power plants and federal facilities across the country, we have a more diverse and problematic environmental risk than if the waste were stored at a safe, environmentally sound and monitored facility. But unfortunately there is political obstruction that continues to thwart the ability of Congress to uphold the federal government's legal obligation to ensure safe disposal and storage of nuclear waste.

Jennifer Morgan
Director, Climate Change Campaign, World Wildlife Fund
August 22, 2001

WWF and Climate Change

SEI: *Ms. Morgan, could you begin by explaining the role WWF has played in bringing attention to the need to mitigate climate change and to renewable energy technologies as part of the solution?*

Morgan: Well, we think we need to reduce greenhouse gas emissions because of the impact of climate change on wildlife and biodiversity. Society needs to move to a less carbon-intensive world, where fossil fuel doesn't play as large a role, and where renewable energy can and should play a large role.

At WWF, we've published economic reports looking at how the United States and other countries can meet their Kyoto Protocol targets. In each of those reports, renewable energy plays a large role, whether it be through a renewable portfolio standard in different countries or through bio-cellulosic ethanol. We are really trying to educate policymakers about the role of renewables and sustainable energy in the solution to global warming.

We also try to build public support for renewable energy in the United States and other countries. For example, we've been engaged with the ongoing energy debate here and have provided commentary on the Bush-Cheney energy plan and energy legislation.

SEI: *How does WWF coordinate its efforts on climate change with other NGOs?*

Morgan: We are part of the Climate Action Network (CAN), and actually WWF in the U.S. is currently the chair of CAN. Historically, WWF has been a very active player in this network. We think it's incredibly important that NGOs work together. Obviously, we're much more successful when we're together than when we're divided.

Nationally, we also work very actively with local and regional groups on some of the reports that we have published. For example, we did one called "Texas Global Warming Solutions." This report had a large section on renewable energy because Texas has tremendous potential in this area. We partnered with local Texas groups, went down to the state, brought this report, published ads in all of the Texas newspapers, met with then-Governor Bush and wrote a letter to the governor. We also did a mini-campaign to look at market share for renewables and the potential for Texas to be a leader in the global warming fight because of its potential for renewables.

U.S. Involvement on the International Level

SEI: *Can you express why the U.S. should be involved in an international agreement to reduce greenhouse gas emissions? And why should we do it despite the cost?*

Morgan: Well, I believe that global warming is the world's largest environmental threat. As the world's largest carbon polluter, the United States has unfortunately caused a good amount of climate change and has a great role to play in solving the problem of global warming. I also think that it's an issue that cuts across a whole range of sectors, from the environment to foreign policy. It's an issue where countries need to work together on a multilateral basis to come to a solution.

Also, the U.S. will not escape the impacts of global warming. Many of the wild places and wildlife Americans love will be impacted. The public cares about that and should be involved in the national debate about this issue.

I believe that we're now in a situation where any responsible government needs to actively engage in these international negotiations. The Kyoto Protocol is the only game in town internationally and one which the United States

has played a leadership role in shaping. The protocol includes many of the concepts and approaches that the United States has advocated both nationally and internationally for years, including market mechanisms. Having spent time and having worked in Germany, I can tell you the Germans weren't very keen on these mechanisms before Kyoto.

Ultimately, I think that the impacts of climate change are likely to be immense and long-lasting. And as the world's largest economic power and biggest contributor to the problem, the U.S. should be involved in trying to combat it.

As for your second question, I don't think it should be viewed as "despite the cost." It's actually going to bring economic opportunities. Every sector of our economy might not benefit, and that's where the rub comes. Still, having just spent a lot of time on Kyoto and having talked with other governments, I've learned that these nations' industries actually see a competitive advantage in the sustainable and renewable energy markets that are going to be evolving. They see the need to have a government role in setting an emissions limit and putting a price on carbon dioxide.

If the U.S. stays out of Kyoto, I think American companies are going to be at an economic disadvantage. Maybe the coal industry would be alright, but looking down the road, I think there are a lot of reasons why it would be a bad economic decision.

When President Bush made his statement on this issue, I said I thought he was wrong on the science, wrong on the economics and wrong on the politics. We've done a lot of economic analysis to show that if you start putting in place the policies that are needed, you could have a net economic gain to the U.S. while developing new resources.

Possible U.S. Actions

SEI: *The Bush administration has bowed out of international climate change talks and is apparently developing an alternative to Kyoto to present at the next conference of the parties in Marrakesh in October. But if the world moves forward under Kyoto and we stay out, what can the U.S. do while others ratify and implement it?*

Morgan: The Bush administration and other actors across the country should come up with a national binding plan to reduce greenhouse gas emissions. In the wake of Bonn (and even before), there has been interest in Congress and on the state level in several options, including having binding emission limits on power plants, a renewable portfolio standard, more efficient sport utility vehicles and a national binding cap on emissions.

I believe that if the United States develops such a plan, and people begin to understand that the cost of having such limits is not as great as they originally feared (as has been the case with many other environmental issues), people will see that it would really benefit them to be part of the Kyoto Protocol. The U.S. would have access to all of those market mechanisms that they really wanted to have. I hope that the administration will come back to the Kyoto Protocol at the end of the day. But in the meantime, the administration needs to focus on domestic measures.

SEI: *And what is your view on the four-pollutant legislation currently before Congress? Do you think this is an acceptable alternative to U.S. participation in Kyoto?*

Morgan: I don't see it as an alternative to the Kyoto Protocol, because the Protocol is an international treaty. I would see the four-pollutant bill as one way of meeting the targets for the United States in the Protocol.

I've really applauded Senators Jeffords, Lieberman, Collins and Snowe and Representatives Waxman and Boehlert in the House for coming out with this plan, especially in the face of an administration that has opposed carbon within a power plant strategy. I think there are certainly benefits of including carbon in any cap on pollutants. If you're a utility and you're looking at investments over the next few years, instead of facing death by a thousand cuts, you would know that carbon is going to be included and you might make different investment decisions.

Other nations' industries actually see a competitive advantage in the sustainable and renewable energy markets that are going to be evolving.

WWF is interested in having the concept of an auction included in the power plant legislation. We think an auction system is preferable for a range of reasons over either performance-based allocations or certain grandfathering. We're examining that now.

Alternatives to Kyoto

SEI: *What kinds of alternatives could the Bush administration present? Also, how solid is the Bonn agreement? Are there certain countries that could move back toward a potential U.S. position?*

Morgan: From everything that I've seen from the Bush administration, they are not going to produce any kind of serious alterna-

tive proposal. The question of whether they should have an alternative has been a matter of great debate inside of the administration.

I think the Bonn agreement is solid. I think that the political will and determination behind the countries who forged that agreement in Bonn is great. It was a combination of determination to do something about climate change and a determination that one country should not be able to determine the fate of the world on an international relations issue.

I think it would be quite difficult to turn that Bonn agreement around at this point in time, especially when you consider that what the Bush administration has done domestically is a model of decade-old strategies. These strategies, focusing on research and development efforts with no mandatory programs, have demonstrably not worked.

So to reiterate, I think that the administration should focus on its domestic plans and allow the rest of the world to move forward, and start reconsidering its position. That may sound like pie in the sky, but I think that once emissions reductions start occurring and a learning process occurs on how you actually do this, the United States could tackle this large challenge with all of the technological know-how that it has.

Problems for the Protocol

SEI: *Fundamentally, why do you feel there is such strong resistance by this Administration to the protocol?*

Morgan: I think President Bush's decision to oppose the Kyoto Protocol had everything to do with special interest politics. Industry members, specifically the coal, oil and auto industries, have for years run campaigns against the Kyoto Protocol. I think the President thus far has been fairly tone deaf to environmental issues overall. Other constituencies have been more important to him than the environmental constituency.

A challenge for the environmental community on Kyoto, global warming and sustainable energy in general is to find a way to galvanize the public so that the President cannot ignore the issue. If he makes a decision like he made on Kyoto, the backlash will be great. I don't think the Bush administration fully comprehended the ramifications of its decision. The challenge for the environmental community is to take the general concern that is out there on global warming and turn it into activism, so that decisions by the administration will affect how the President is viewed on energy and environmental issues.

SEI: *Since the 1997 Byrd-Hagel Resolution, and considering the Bush administration's position and the reaction of the public, do you see signs of a shift in the Senate?*

Morgan: I think that there have been tremendous changes since the Byrd-Hagel Resolution, and I also think there has been a lot of misinformation about that resolution. For example, it's often noted that the Senate has rejected the Kyoto Protocol. Well, we all know that the Senate vote happened before the Kyoto Protocol even existed. Obviously, there are concerns in the Senate on the economics and on the role of developing countries in the Protocol. But since that resolution was approved, and especially since President Bush took office and the Bonn meeting occurred, we're seeing moderate Republicans increasingly coming forth and taking positions on climate change. Senator Collins from Maine partnered up and introduced a power plant bill that includes CO_2. I don't think that would have happened if there wasn't some level of public support for action on climate change. And now, even the more skeptical Senators have produced climate change bills because they can no longer be seen as not caring at all about this issue.

For example there is the Byrd-Stevens bill, which calls for a long-term vision and a plan in a year. There is also the McCain-Lieberman exchange, which talks about a domestic cap and trade system, and this SUV and power plant legislation. These developments weren't in the cards in 1997, and I think it demonstrates the complete gap between the President and members of his own party on this issue.

The Bush administration and other actors across the country should come up with a national binding plan to reduce emissions.

The Role of Developing Countries

SEI: *Where do the developing countries fit in?*

Morgan: The developing country element of the Byrd-Hagel Resolution was a very clever lobbying ploy by the Global Climate Coalition and others. These groups recognized that developing country commitments were completely off the table in the international negotiations. They knew that the framework convention that George Bush, Sr. signed said

that developed countries should take the lead on this issue because they were primarily responsible for the problem. Therefore, these groups recognized that the best way to try to block Kyoto was to try to get developing countries to have to meet targets. That's why the resolution was so explosive.

I don't think that approach is either factually accurate or morally acceptable for a variety of reasons. After all, developed nations said that they would take the lead, and acknowledged that they were responsible for causing climate change. I also think part of the Byrd-Hagel Resolution and the developing country piece came out of a vacuum where there wasn't that much information. I think there's a lot more information now and a lot more thought has been given to the role that industrialized countries with highly sophisticated economies can play in addressing this problem.

To ask China and India to do the same thing as the United States when their emissions per capita are so much lower and when their ability to actually invest and try to make the changes is so much lower, is really just not realistic. Having said that, I think the developing countries' component will continue to be part of the negotiations. I think the actors that don't want Kyoto to happen will continue to push for that piece. But I have had many discussions with developing country governments. Once the U.S. — or once the industrialized world — takes the first step, these developing nations know that they need to come in and play that role.

One way of keeping them from doing that, of course, is to keep the industrialized countries from coming in. So it's a great strategic loop to try and just sabotage the Protocol.

WWF Report on American Participation in Kyoto

SEI: *WWF has a new report entitled "The American Way to the Kyoto Protocol." What are its most prominent findings, in terms of what the U.S. industry can do?*

Morgan: I think the industry can do a tremendous amount here. We have a program called Climate Savers, which consists of companies — IBM, Johnson & Johnson, Polaroid and Nike — who have all voluntarily committed to reduce emissions because they see the economic gain from instituting energy efficiency measures in their companies.

As for companies that are looking at carbon management plans (like DuPont and the companies I mentioned, and especially the multinationals), I think they are going to find themselves in a rather curious position. Their subsidiaries in other countries will have access to the Kyoto Protocol mechanisms that bring about cost effectiveness, and they won't.

Hopefully, if domestic legislation including a mandatory cap over a certain timeframe happens in the U.S., I would expect that those companies would want to have access to those mechanisms. Ironically, many of the companies will be at a disadvantage by not having access to many of the tools of the Kyoto Protocol. They would not have access to the Russian cheap tons of carbon reductions, or to the lower hanging fruit in many Central European countries. They would not have access to the Clean Development Mechanisms and projects in developing countries in the evolving carbon markets.

The American Way to the Kyoto Protocol shows that by putting in smart policies, the U.S. could have a net economic gain. Compliance with the Protocol targets, mostly through domestic efforts but also by using some of the mechanisms that are included in Kyoto, shows that you're better off with Kyoto than without. A big section of our report looks at the great domestic opportunities for efficiency, renewables and other technologies.

The Bush-Cheney energy plan and the President's Climate Change Technology Initiative really establish a situation where the U.S. will lose market share in the future. We'll be harkening back to the past — the auto companies will be having very bad *deja vu* back to the 1970s when the Japanese automakers were ahead of them on technology.

The Bonn agreement is solid. The political will and determination behind the countries who forged it is great.

Renewable Energy and Efficiency

SEI: *In terms of renewables, conservation and efficiency, what role do you feel the federal government should play? What's the right level of federal vs. private support?*

Morgan: I think the federal government should be more supportive of renewables, but not just research and development. It has to include deployment and commercialization strategies as well.

Take the wind industry as an example. It's quite striking. For example, look at the benefits that could come from wind for farmers in certain states where they can lease their land. The federal government could have a role in putting together those types of programs that would give or continue the tax credits. We could provide additional incentives for farmers and others to actually deploy the technology, rather than just putting in more research money.

As to federal versus private support, I think more resources need to be contributed from both sides. If they're really as serious about climate change as they say they are, companies like BP and Shell need to be investing more money into renewables than they currently are. These companies also need to consider moving from heavy fossil to a less fossil-centric world, but this approach would be completely against what their businesses have been practicing for years. If you look at transitions, we've gone from wood to coal and from coal to oil. Now it's time for the next transition.

So I would support both federal and private funding. However, there are a number of technologies from the current federal budget plans that I don't think should be further funded. For example, we don't support further funding for nuclear power. We would rather see money invested into some of the breakthrough technologies like fuel cells. This is an area where the federal government has not played as large a role as it could.

SEI: *And technologies that help meet increased energy efficiency standards?*

Morgan: In some cases, the technology is already there. Looking at cogeneration or wind, or the efficiency standards for air conditioners that were on the table, I think that American industry can meet those targets, and I think the American public believes that as well. You set a target and then go for it; that's the way our country has operated over the years. Technology definitely has a role to play, but it needs to be supported by policy goals.

But a technology strategy alone is not enough. Right now, we have this chicken-and-egg problem as a current debate. Some say that we need to wait for the technologies to be developed. Well, what's going to stimulate technology development? In my view, technology development will come when a signal goes to the market that they have to factor in the cost of CO_2 emissions. That comes from either a domestic or international mandatory cap.

SEI: *Turning to automobile fuel efficiency standards, we'd like to get your reaction to this quote from Trent Lott in Roll Call, March 2001. It says, "The American people have a right to drive a great big road hog SUV if they want to, and I'm going to get me one."*

Morgan: Yes, I remember that one. My reaction is that Senator Lott needs some more information. He obviously doesn't understand that you can make SUVs a lot more efficient than they currently are and simultaneously save money over time because of the money saved at the gas pump.

The idea of doing something about global warming is not an idea to change the American way of life, though. I think that's a myth that needs to be broken. If anything, I think the idea of doing something about global warming can actually build upon the American way of doing things, like developing new technologies as we've done historically.

Nuclear Energy

SEI: *WWF opposes nuclear energy as an eligible technology under the CDM. Is WWF against the continued use of nuclear energy in general, or specifically the idea of giving it credit for reducing carbon emissions?*

If domestic legislation happens in the U.S., U.S. companies will be at a disadvantage by not having access to many of the tools of the Kyoto Protocol such as the Russian cheap tons of carbon reductions.

Morgan: Well, we don't think that nuclear is the answer to global warming. We don't think you need to increase or utilize nuclear power in order to have the emission reductions that are needed to stabilize climate change at safe levels. We think that if there are limited resources that are going to go into technology development, those resources should go into technologies like fuel cells, photovoltaics and the commercialization of other sustainable technologies.

SEI: *Could you briefly tell us where this issue of including nuclear energy in the CDM left off at the talks in Bonn in July?*

Morgan: Well, developed countries should refrain from using nuclear in both the CDM and in joint implementation. In other words, developed countries should not try to do nuke projects for credit either in developed or developing countries. That doesn't mean they won't be able to use it in their own implementation plans, of course. But in our view that means that there will be no credits for new nuclear power plants under the Kyoto Protocol.

SEI: *Do you see the United States reducing the 20 percent of energy production which it currently gets from nuclear? And, if so, what other areas should be looked at to make up for the difference?*

Morgan: WWF is not an active player in the nuclear power debate in the United States. We'll be monitoring and seeing what is happening on the relicensing front. But we'll also be looking for alternatives if those plants don't get relicensed, and examining how that could be offset with other emission reductions. Rather than concentrate on nuclear, our main focus is to try to increase renewable energy and reduce CO_2 emissions.

Energy Technologies

SEI: *Summarizing then, would you care to comment on the mix of energy technologies used in the world today? And as developing countries increase their energy consumption, what changes should occur in this mix?*

Morgan: It's clear that the world needs to move to a less carbon-intensive energy mix if it's going to avoid the many impacts that are predicted in the IPCC's third assessment report. That can't happen overnight, but I think there is a range of fuels that can move us away from the most carbon-intensive, coal and oil. We can use gas in some places as a bridging fuel, and get institutions like the World Bank and related organizations to give loan guarantees for smaller scale projects that aren't necessarily building big grids around the world. The percentage of the population without electricity in developing countries is absolutely staggering, and in many of those countries there are tremendous opportunities for off-grid options.

The U.S. is calling on developing countries to reduce emissions, but we continue to dump old technologies or fund very heavy fossil technologies in developing countries. We need to put together a strategy where the international financial institutions move away from these large fossil projects to the benefit of developing countries on a range of issues including climate change.

Making progress in this area depends on the country and depends on the availability of resources. China's recent move away from coal is quite interesting. It is driven mostly by air pollution, but of course it has the climate benefit as well. We are now also seeing investments in places like South Africa and much of Southeast Asia. India also has tremendous potential for renewable energy.

As for new sources, I would include wind technology and fuel cells. Fuel cell technology is an area that is really very promising, and can be a breakthrough technology. And certainly solar needs to be developed further and to become more competitive. Attaining a mix where 20 percent of our energy is generated by renewables by 2020 is very feasible.

Citizen Involvement

SEI: *Would you like to offer a closing message, including perhaps practical suggestions about what U.S. citizens can do?*

Morgan: I think the most important message to U.S. citizens is that they have a great opportunity to help. People can do things like buying green electricity and supporting a shift away from dirty coal-fired power plants and into renewable forms of energy. They can buy more efficient vehicles, and do things in their homes to save energy and money. Basic things like putting blankets around hot water heaters, setting thermostats on timers and making sure their windows are efficient. And certainly, when buying new appliances, looking at Energy Star products.

The auto companies will be having very bad deja vu back to the 1970s when the Japanese automakers were ahead of them on technology.

Finally, Americans can stand up for themselves on this issue. Right now the federal government is promoting a future for America that is based on dirty, unhealthy energy sources. And I don't think Americans want their kids to grow up in a place which stresses the energy and environmental policies that the President and the Vice President proposed. So we at WWF would encourage them to stand up for themselves and their kids and let their legislative leaders and their President know that they want a clean energy future and a world where global warming isn't going to wreak havoc for themselves and for their kids and for the places that they love. There's a lot we can all do.

John Rowe
Co-CEO and President, Exelon Corporation
August 30, 2001

Climate Change

SEI: *Mr. Rowe, the Intergovernmental Panel on Climate Change issued a report this year predicting that world temperatures will rise by as much as 10˚F in the next century. What are your general views on climate change and how should the U.S. proceed to reduce carbon and other emissions?*

Rowe: Well, the projections of temperature change remain very soft, with very wide ranges, over very long periods of time. So my view is what Henry Linden at the Illinois Institute of Technology has best described as: "It's time to start doing something." It's time to start effecting policies in ways that reduce carbon emissions. But, personally, I do not think it is time to be doing what the Kyoto Accord originally called for, because I don't think it is achievable without horrible effects on our economy. More than that, I don't think most of the people who purport to be implementing Kyoto have any serious plans on how to do it.

The President was fundamentally right on the Kyoto Treaty, but he should lead, and others should help lead the United States, in coming up with a position that makes long-term control and, ultimately, reduction in carbon emissions a national policy. I think we should start doing things that we can do economically in the near future.

We need to emphasize things like carbon sinks; give higher priority to fuels other than coal; continue the conversion of our electric power base to natural gas, which is going on for economic reasons; and obviously, from our own record, continue to work in developing renewable resources where they are competitive or near competitive with coal.

SEI: *Do you see such measures having a net economic cost to companies like yours, or can you do it without a penalty?*

Rowe : Well, I think they will have a net economic cost to society, but if we do it cleverly we can make that cost relatively small. For a company like mine, it will have both a cost and a benefit. It will increase the cost of our fossil operations, but at the same time it ought to increase the value of our existing nuclear base, and increase the value of the investments we've made in capacity expansion in our nuclear fleet and in renewable resources. If we are very diligent about doing this, but frugal, we might be able to make this a net benefit for our company.

SEI: *Your description suggests then that you're approaching this from a sense of corporate social responsibility?*

Rowe : There's no doubt that a sense of corporate responsibility is part of it, as well as a sense that good business requires you to take the longer view rather than the shorter view where you can. It's very clear, and my colleague Corbin McNeill [co-CEO of Exelon] and I have spent some time discussing this, that both of us are more bullish on gas and nuclear than we are on coal. We both think that's more consonant with what public policy will require in the long term.

I'm very interested in seeing us not only experiment in the forms of renewables that are very expensive, like photovoltaics — which is sexy but costly — but also in things like methane recoverables and wind where we can. These are either competitive or near competitive and they have real megawatts creating a more sustainable portfolio.

I tend to look at this as a kind of continuous improvement obligation. We've got to stop looking at environmental issues as an answer to the question "When have you done enough?" and accept that there is a continuing obligation to make our generation fleets cleaner and more effective in each passing decade. That obligation never goes away.

SEI: *But for those out there in the industry who may not share your sense of having this continuous improvement obligation, do you think that it should be a voluntary matter?*

Rowe : Well, I do not believe it is adequate to rely on the word "voluntary." I think we need national goals. I think we need definitions of what's counted toward achieving those goals. I think we need incentives built into the marketplace so that you get more economic advantage by producing less carbon. In

due course we will be forced to address mandatory caps or carbon taxes. The trouble is that at the moment these issues are approached in a completely binary way. That is, if you believe something should be done, you must favor immediate mandates on the Kyoto basis, and if you don't think those are appropriate, you must be against doing anything.

I don't fall in either camp. We ought to be taking some steps now. We should be building in some combination of a Four-Pollutant approach — but perhaps not the one that is pending in Congress now — and additional incentives so that we see more renewables developed, more conservation encouraged and the existing coal plant fleet cleaned up substantially and made more efficient, because efficiency is really important here. In addition, some of the oldest and least efficient coal plants should go. You get a huge pickup when you replace an old, inefficient coal plant with a new gas-combined cycle plant.

Now, I don't have the magic recipe for doing this. But at Exelon we tend to be aggressive in supporting energy efficiency standards for equipment and appliances. We attempt to get every megawatt-hour out of our existing nuclear fleet; we are implementing life extensions on the nuclear fleet; and we are investing in wind and methane.

SEI: *The precedent of the Clean Air Act tells us that air quality standards for ozone, for example, have not been met in many metropolitan areas, and that's even with caps that are set. Isn't some kind of legislative solution necessary? What would you change about the four-pollutant bill?*

Rowe : The bill would go further, faster than Kyoto, and I don't think the economy can tolerate that, nor do I think the American people would tolerate it. But I don't disagree with you on the importance of a legislative aspect. I think we will need legislation that involves carbon as well as the other three key pollutants that are at issue. I think there is going to be legislation requiring very substantial reductions in SOX, NOX and mercury on a defined schedule. I think that three-pollutant legislation will by itself help with some carbon issues because it will tend to push the least economic coal plants into retirement. But I also think that we have to do something on carbon. The issue is how much and when?

What troubles me here is that the more dramatic visions tend to come without any real program for meeting them. I know there's very important research being done on sequestering carbon in coal gasification now, and that may come to fruition and it would be wonderful. We are very proud of our research on the pebble bed reactor, which is an advanced form of nuclear reactor, but there isn't one of those plants built yet. And the research and work we do in renewables doesn't have a sexy answer there either. The average cost of photovoltaics that we've installed in the city of Chicago is over 40 cents a kilowatt-hour. So to my way of thinking, you must, on some schedule, begin to deal with mechanisms that limit increments of carbon. It's really a question of how much, how fast.

SEI: *Could you say more on the prospects for carbon sequestration?*

Rowe: Besides the research related to coal gasification that I mentioned, I'm very enthused about things like preserving tropical forests for carbon sequestration, because you'll get very substantial benefits and ecological diversity at the same time. That's the place where you get an ecological double or triple. We should be allowing companies to take credit for investments they make in preserving rainforests and the like in developing nations.

New Source Review

SEI: *Mr. Rowe, you're a native Midwesterner but you spent much of your career as a utility executive in New England. Where does that put you on the New Source Review issue, which has been largely a Midwest versus Northeast issue?*

Rowe: I think the New Source Review issue is to some extent a red herring. What we need are two things. We need a relatively clear definition that people can rely on as to what constitutes a new source and what does not. But at the same time, we need to reduce the importance of the distinction between new and existing sources. The difference in the regulations between existing and new plants is simply too great. When the next round of regulations on SOX, NOX and mercury are passed, we'll see that difference shrink.

SEI: *The four-pollutant bill pending in Congress would eliminate the "grandfathering" of older plants.*

Rowe: The Four Pollutant bill goes a bit further than what can be done economically at this time. But the proposal that a group of utilities we belong to, called the Clean Energy Group, has put together goes something like two-thirds or three-quarters that far. We think that might be a very powerful proposal.

SEI: *Relatedly, what do you see as the impact of electricity deregulation on the environment, and in particular, does deregulation encourage increased use of the older, more polluting coal-fired plants?*

We intend to keep at the R&D on renewables. We are proud of being a nuclear company, but we're keenly aware that lots of people have questions and concerns.

Rowe: What affects clean up is not deregulation or competition *per se*. It's the legal parameters that affect this, and the market conditions, more than whether it's deregulated or not. We've seen plants operate at very high capacity factors in recent years, but that's because what was a surplus of power five years ago has tightened up. Now, looking out into the next couple of years, we anticipate a period of relative surplus again in most parts of the country.

We believe the economic benefits of competition versus some kind of monopoly structure are very large indeed. But just like in any other area of economic operation, you have to make certain that the competitors play by a set of rules, which involve social priorities and externalities. If we see some beginning effort on carbon; if we see continued work on making natural gas available; if we see Three Pollutant legislation that requires clean up of old coal plants, I think we'll see substantial progress on these fronts.

Renewable Energy Technologies

SEI: *Moving on now to some new technology questions, could you share with us first your thoughts about possible advances in renewable energy technologies?*

Rowe: Sure. Right now, I am seeing very little in the way of new ideas, but it is very clear that wind power can play a larger role at economic prices today than it could 10 years ago, and that's because of improvements in the reliability and flexibility of technology.

One of our favorites, methane recovery, is a very primitive technology but it happens to work very well and the opportunities haven't been exhausted. We continue to experiment with photovoltaics, but unfortunately the prices remain very high. And in my view what's even more unfortunate is that some things which may not be totally renewable but have potential for truly high efficiencies, like fuel cells, haven't really been able to make a large impact. So I think we see a small, but very meaningful set of improvements coming from renewables.

SEI: *If anyone is going to take the leadership in the scale-up, and hoping that there will be economies of scale in things like fuel cells and photovoltaics, it seems like it would be large power companies like yourselves.*

Rowe: Or the manufacturers themselves, yes. We would love to. We would love to be the world pioneer in distributing very efficient gas-based technologies for people to use in distributed generation. But right now, it's simply a fact that in economics and reliability, the centralized power plant using gas combined cycle technology, with thermal efficiencies in the 50 or 60 percent range, is cleaner and more economical and far more reliable than nearly anything that's being done in distributed generation. Most of what's happening right now in distributed generation consists of internal combustion engines which are inefficient in terms of carbon, inefficient in terms of heat and relatively dirty in terms of other air emissions like NOX. Distributed generation is an area that just fascinates us, but what's happening does not tend to be clean.

We think that continuing to hammer away at renewables is important. Now that we have reached a period when natural gas and electricity prices are not always falling, we're going to see higher and higher premiums on equipment that provides for more efficient uses of energy than we have for a while. In my opinion, there have been very substantial gains over the past decade in the ability to make air conditioners, computers and other things run efficiently, and we'll see both legally and economically more incentive to do that sort of thing. There's probably more power in the word "conservation" than there is in the word "renewables" going forward.

The increased use of natural gas as fuel has a substantial, but somewhat erratic effect. For example, in New England, the economic power plants to add have been gas-combined cycle. They run a lot of the year and you get significant environmental improvement. In the Midwest, the economic power plants to add have been gas-fired peakers, which don't run that many hours and don't result in much incremental environmental improvement. But I think that will begin to change.

There is a continuing obligation to make our generation fleets cleaner and more effective in each passing decade, and that's an obligation that never goes away.

SEI: *Can you describe some of your most significant renewable energy projects at Exelon?*

Rowe: One of our most significant is the 75 megawatts of wind power that we have in Pennsylvania. Also, the work we have done with the City of Chicago on photovoltaics is very important as an R&D kind of effort, because constantly working with photovoltaics in anticipation of the day when they have a larger economic future is important.

In terms of megawatts, the most important initiatives are our landfill methane projects. I'm very proud of this. It's a simple technology but it takes gases that would otherwise go into the air and makes them into a fuel. We are also in the middle of several large wind power projects that I consider very substantial.

But I should say that in terms of total megawatts, each of these renewable initiatives is smaller than the number of megawatts we have added just by improving the Exelon nuclear fleet. We intend to keep at the R&D

on renewables. We are proud of being a nuclear company, but we're keenly aware that lots of people have questions and concerns. We want people to understand that if there is a more popular, easier way of providing environmentally acceptable energy, we will keep trying to find it. We're not against other ways. We're for them if we can make them economical.

A great many utilities have experimented from time to time with photovoltaics. In Chicago we have a joint effort between the city and our company. The city of Chicago, under Mayor Daley, is really committed to greening Chicago. They mean that in terms of genuine greenery, they mean it in terms of energy efficiency, they mean it in terms of advanced technologies like photovoltaics and they also mean it to be economical. They're pushing us to push the envelope all the time, and have required us as part of our franchise to set aside $12 million for photovoltaic projects. And I keep looking for other things we can do that add efficiency. Since Bill Aboldt became the Commissioner of Environmental Affairs, he's really given it a push. He doesn't just talk about it, he works with people to do it.

SEI: *What impact does deregulation have on the market for renewables?*

ROWE: Well, neither regulation nor competition will tolerate 40 cent per kilowatt-hour costs in our time. So in that sense it doesn't make a difference. I think competition cuts two ways for renewables. It's positive in the sense that you get more people willing to be more innovative than monopolies might be. It's negative in the sense that competition creates a ruthless drive for the lowest possible cost. And the only way you deal with that is to have a legislative framework that gives everybody the right mandates and incentives.

Energy Conservation

SEI: *Another question about deregulation, but as it relates to conservation. How does the large electric power company view the conservation issue today? What incentives do you have to not sell more power?*

Rowe: Almost none. And in my opinion the efforts that I was very much part of in the 1980s and early 1990s to use utilities as tools for funding conservation have very real limits. These were tools that were only used in states like New England and California which were already relatively high cost, and they caused a fair amount of adverse reaction from many industrial customers.

Some of the oldest and least efficient coal plants should go. You get a huge pickup when you replace an old, inefficient coal plant with a new gas-combined cycle plant.

The biggest single way you get more conservation is to let prices go up when shortfalls exist. There are lots of reasons why California is seeing more conservation this summer, but that is surely one of them. The two other ways you get it are through technological improvement — which is in fact going on as you've discussed earlier — and through increased requirements for efficient appliances. At Exelon we've worked on being more active in supporting efficiency standards for appliances and equipment. It's our view that electricity isn't just another commodity. It's a mix of commodity, pricing and vital public service. As long as you have that vital public service component, one needs efforts to make certain that people are using it efficiently.

SEI: *The priority of power company executives across the country has to be to deliver profits to shareholders, and people being inefficient about how they use electricity would seem to benefit your shareholders.*

Rowe: Sometimes. Of course it's in our interest that our rates not be disproportionately higher than another company's as a result of our trying to have more conservation. But I think it's in all of our long-range interests to have a society that deals with environmental issues rationally instead of irrationally. And to me, the efficient use of energy is part of long-term rationality in this area.

Put slightly differently, there are all sorts of proposals for environmental improvement, including carbon, that I consider draconian and wrongheaded. But doing nothing isn't the right answer either, and the right answer has got to be a constant look for ways that are more sustainable. There is no Holy Grail.

SEI: *And what about the consumer's role in making decisions about conservation?*

Rowe: The public interest in conservation comes mostly at the ballot box and not in economic decisions, and that's an unfortunate disjunction. If you take polls of how important consumers think conservation and environmental issues are, you get "very, very important" as the answer. It's important that long-term pricing and long-term legal decisions give consumers a clear message that the cost of wasting energy is going up. Then, they will back in the marketplace the same efficiency things they now advance in the polity.

Nuclear Energy

SEI: *Moving on to nuclear power, why is Exelon focusing on the pebble bed modular reactor? What kinds of improvements do you think it offers over today's reactors?*

Rowe: Well, we are looking for a next generation of reactor because all of us believe that

some day, a more sustainable future will require more nuclear capacity. We are looking at a next generation that would be simpler to build; modular, in the sense that you can do it in small blocks; easily standardized; and relatively passive in its operation.

Among the things that complicated life for today's generation of nuclear plants is that each plant tended to be a little different. They were very big. Their safety systems are very complicated and you have to have an absolutely unfathomable level of detail in the management of these plants. We want something that operates more simply and that the public can see operates more simply. The pebble technology on paper has those advantages, which is why we've put an R&D effort into doing it. But we ought to be very careful in saying there's a lot to learn before you would expand this beyond a test reactor.

SEI: *Do you believe you will eventually have to build more nuclear capacity in Exelon?*

Rowe: I don't know when, but I believe that sooner or later, we're going to have ever-tightening standards on carbon that will force a new generation of nuclear technology in this country.

SEI: *So you're not considering building advanced light water reactors, although some other utilities are interested in them.*

Rowe: At the moment, Corbin McNeill and our nuclear people feel the pebble bed technology has higher potential.

SEI: *And what is different about Exelon from the others? Why are you taking this leadership in investing and trying to promote this improved technology?*

Rowe: I think this is a very personal decision by my colleague Corbin McNeill, who has spent his life in the nuclear industry. It's his judgment that the potential cost effectiveness of the pebble bed reactor is simply substantially greater. Some others in the U.S. nuclear industry think there's less development to be done on the light water reactor, so they favor a further step that way. It's the difference in perception as to what will provide the most megawatts for the least cost.

SEI: *Can you go a little further on what you mean by passive safety?*

Rowe: Sure. Right now one of the key design criteria for a light water reactor is to prevent the loss-of-coolant accidents which would result in partial damage to the reactor core, or even, in an extreme case, partial melt of the core, as happened at TMI in 1979.

A great deal of the safety design in a nuclear plant is to prevent this kind of problem. And that involves active systems such as pumps, sprays, activation mechanisms and emergency ways of getting more water in when there is a pipe break or some other failure in the basic operating system. Things have to work to make them accomplish their ends. The pebble bed technology is designed to be more passive in that the basic operating conditions of the fuel are such that it does not overheat beyond the structural integrity of the fuel itself. It's designed not to be able to melt.

SEI: *Coming back to Kyoto and the recent Bonn negotiations, with the U.S. not participating meaningfully in the Bonn discussions last month, there was no strong proponent at the table for including nuclear as a Clean Development Mechanism, and it was rejected. How big a blow is that to the industry?*

Rowe: It makes us very unhappy, but we're hardly surprised. We believe that if people really want to be serious about reaching Kyoto-type numbers, whether it's in 2007 or 2017, they are going to reach a point where there are decisions made that this has to involve more nuclear. But it's more important to me at the present time that these issues be debated and that we reach a level of reality.

My biggest single concern about Kyoto and its offspring remains that the governments that profess to be enthusiastic about it rarely have plans to meet it. There are some countries that find that they can meet it easily because they've had huge coal-to-gas conversions, which have been driven by gas discoveries in the last several decades. There are other countries that are signing up for this that simply don't have meaningful plans to do it, and there's a level of cynicism that is destructive to either good environmental or energy policy.

I don't know whether the U.S. should have been there or not, but I know it's going to be a while before the nuclear issue is thrashed out so that there is a broader degree of consensus on its role. It will not surprise you that, being from a predominantly nuclear utility, I do not believe you're going to get to a lower carbon future without an enhancing role for nuclear. But I'm certainly willing to recognize that there is no consensus on this within the environmental community.

SEI: *What do you say to charges of corporate welfare, that the government is helping the nuclear industry and shouldn't be?*

Sooner or later, we're going to have ever-tightening standards on carbon and that is going to force a new generation of nuclear in this country.

Rowe: The government has basically sustained what exists in the nuclear industry and the government has an effect on the gas industry by where it allows drilling or not. Much as I would like to be a libertarian, the last 200 years of energy policy would not support the concept that this is a libertarian environment.

Right now there's more government money going to renewables. And the U.S. government manages to take a lot of money out of the nuclear industry. You do have fundamental issues in nuclear, like the 50-year-old promise that the government will build a high-level waste site, which it has not done. We in the nuclear industry would probably be happy to get along without new government money if government would keep its own promises. We pay for most of the government's program to build the high-level waste site, but they're not getting it done.

SEI: *Until they do, how do you reassure the public about the safety of the spent fuel that you're storing at your reactors?*

Rowe: We have a tremendous record of storing it safely. We show people how much protection there is around the fuel and the spent fuel pools. We show them what dry cask storage looks like. But the truth is, most of the public would rather this stuff were put in a deep storage place designed exclusively for that purpose, and that's why there's so much pressure in states like Illinois to get on with the federal project. We think the fuel is extraordinarily safe where it is, but the result of the current inaction on Yucca Mountain is that we have a hundred different little spent fuel storage places around the country, and we all know that we can build one underground that is better than that.

Pending National Energy Legislation

SEI: *On the energy legislation that's pending, what do you personally feel are the most important features that have to be included in this comprehensive energy bill?*

Rowe: I think it could be one bill or ten bills, but let me speak about the overall package. It seems to me that the elements have to include, first, a continued commitment to competition across the country, including the repeal of the Public Utility Holding Company Act and the mandatory power purchase parts of PURPA, and strong congressional backing for FERC's efforts to establish state regional transmission organizations, and schedules for all states to enter into this marketplace.

The second step has to be a continued effort to develop the resources we have so that we have a multi-fuel source energy policy in this country. I would include specifications on where development will be encouraged for gas on federal lands and where it will not. I would include the Yucca Mountain nuclear waste repository, and streamlined procedures for licensing a next generation of plants. And I would include defining the terms of support for different kinds of renewable sources of energy.

Third, we need new three-pollutant legislation, and we need some kind of federal position on how much is required on carbon and when. And fourth, we need more conservation and efficiency standards. I would include all four of those areas in the package as essential to a real energy policy.

SEI: *You didn't mention ANWR.*

Rowe: Well, I've never been there, but it's my opinion that in the short run, there's a great deal to be accomplished on less controversial lands. It's also my opinion that given what natural gas is, given modern day technologies, we ought to be able to come up with a long-term solution to the ANWR issue, but clearly that's as vexed as Yucca Mountain at present.

At least a solution should be reached for gas. Unless somebody can give me a policy that really makes a next generation of nuclear feasible very fast, the only thing we really have in this country as an energy policy is that gas makes it possible to have more electricity and cleaner electricity, and to maintain a low price.

We need some kind of federal position on how much is required on carbon and when.

I don't think over the next one to five years ANWR is really the issue, but in the long run you've got to have an awful lot of gas or you've got to have nuclear, and I don't think we'll have huge additions of nuclear in the next few years.

SEI: *Would you like to offer any closing thoughts?*

Rowe: There is no one, permanent and final answer to sustainability. The way to achieve a more sustainable energy future is to do things on a consistent basis that are cleaner. It is only in continuous improvement on the many roads to sustainability that you get real results.

Dr. Takehisa Yaegashi
Senior Chief Engineer, Toyota Motor Corporation
August 20, 2001

The following transcript is a translation of an interview conducted in Japanese.

Decision to Develop Hybrid Technology

SEI: *Good morning Dr. Yaegashi. To begin, we would like to ask you about Toyota's ambitious corporate decision to develop the Prius. Could you describe the brief history of the decision-making by top management?*

Yaegashi: Yes, it was a very large-scale project and there was certainly a major decision-making process. In the late 1980's, environmental problems were highlighted. In the context of motor vehicles, emissions regulations were much discussed. Clean air concerns were particularly growing in the United States, and especially in California. So in order to control urban air pollution such as photochemical smog, very stringent restrictions on mobile source emissions were promulgated that required us to make an innovative shift in vehicle technology, like electric vehicles (EV).

I was then the leader of vehicle emissions control technology here at Toyota. Urban air quality was the first concern, but we also understood that carbon dioxide emissions from vehicles, as well as other sources, were very important, and that issues concerning the control of CO_2 and other emissions could not be separated. One of the advanced vehicle technology alternatives that had been discussed earlier was the EV, but we did not feel the EV alone could replace the entire automobile population, so we considered other alternatives. It was our opinion that clean air and CO_2 emissions reduction both had to be satisfied. In the early '90s, a discussion was advancing within Toyota that we had to identify the powertrain that could meet such requirements.

As a result of this, a corporate decision was made. We felt that as an auto manufacturer, we had to face squarely the challenge of addressing global environment problems. Otherwise, we concluded, Toyota could not survive in the next century. In the process of this discussion, the "Toyota Earth Charter" was defined in 1992. This was after the California emission regulations and also around the time of the UNCED meeting in Rio.

So Prius development was part of this very large scheme. Various projects were considered and hybrid vehicle development was one of them. Together with the development of the hybrid, fuel cell vehicle development as well as improvements to the Internal Combustion Engine (ICE) were also regarded as important projects. We considered how we could improve conventional vehicles, and we thought that market penetration and cost were very important factors. Unless the alternative would be widely accepted in the market, we could not achieve the intended improvements in the environment.

Thus, one requirement was to find an alternative rather than the EV. The other requirement was to achieve performance equivalent to that of current conventional engine vehicles. So it was in about 1993-94 that the hybrid was more or less identified as the path to achieve those goals.

Car for the 21st Century

SEI: *We understand that your team was determined to develop the 21st century global standard car, and also, that you took on the challenge to carry out an unprecedented type of development, given the very limited lead time. Would you elaborate on these points? What aspects of the development were innovative and what was the image of global standard vehicle that you had?*

Yaegashi: Well, it was the vehicle development chief engineer, Mr. Takeshi Uchiyamada, who set the target to develop the car for the 21st century. I joined the project later as the leader of the hybrid system.

We tried to realize a new concept in the mass production segment, and that became the Prius project.

The new concept includes the high potential for contributing to environmental quality. As the means to achieve this goal, we chose the hybrid from among several different alternative powertrains.

Among our existing models worldwide, the Corolla class is the most popular, highest volume segment. Offering an innovative vehicle in the most popular category, without compromising key performance characteristics, is what we meant by "global standard for the 21st century."

SEI: *Because Toyota has a long history of success in automobile development, therefore, you always had the confidence in your ability to make conventional vehicles which would be accepted globally. However, to attain global acceptance of an innovative car, with new attributes, must have been challenging.*

Yaegashi: Of course, it was a very challenging project. The target that was given by top management was mindboggling. Mr. Uchiyamada first proposed a target of 50% improvement in fuel economy. However, Mr. Akihiro Wada, then the Executive Vice President responsible for technology, said this would not be sufficient and that it had to be at least twice as efficient. I guess his purpose was to cause a paradigm shift in us, because to double the efficiency meant that we needed a technological breakthrough. So, given that challenging target, we arrived at the conclusion that the powertrain had to be a hybrid.

I was in charge of development of the powertrain, but I was also overseeing overall clean engine R&D, including the engine equipped with hybrid. So, when the vehicle target was defined and the hybrid was chosen, we started from the selection of the appropriate hybrid system, studying each component of the system configuration.

SEI: *What was the most challenging thing that you experienced?*

Yaegashi: Well, it was really the aggressive timetable. I was assigned as project leader of the hybrid development project in 1996. It was less than two years from the targeted time the vehicle was to roll off the assembly line. Prior to that, when we first selected the hybrid system to be the next generation powertrain, it was more of a conceptual or an ideal decision. At that time, the target for the start of production had not been defined. It was after the hybrid choice was made that the very tight timeline was defined. Mr. Okuda, then President, was strongly in support of accelerating the timetable. We learned that it was less than 24 months before the start of production of the new system, and I was assigned as a leader of that project.

SEI: *So it was, in the first place, a very accelerated process.*

Yaegashi: Yes, schedule-wise, this development was beyond your imagination. Recognize that a totally new system was to be employed and the components of the vehicle were new. Of course there were some existing components but still, it was the first time to configure them into a new vehicle system.

SEI: *Normally, how long would it take to develop a vehicle?*

Yaegashi: Well, in the case of a vehicle with conventional technology, about 18 months to 2 years. But in this case, it was not a conventional technology but new technology. Powertrain development — particularly the engine and transmission — takes time. The basic important components such as the engine and transmission had to be tested and confirmed, at least 36 months before.

SEI: *You mean that at least a 3-year leadtime was necessary for new powertrain development, but top management ordered that you do it in 24 months.*

Yaegashi: Yes.

SEI: *So because of this, was the development process affected, and how so?*

Yaegashi: Yes, it was very much affected and had to be changed. The vehicle development plans themselves did not change much but the sequence had to be modified. In conventional development, the powertrain development comes first, and when its basis is established, vehicle development then follows. But because of the time compression in the Prius case, we had to do them in parallel, simultaneously.

SEI: *If the drivetrain changes, it would obviously impact vehicle design. So you had to coordinate them. Was that based on new knowhow?*

Yaegashi: Well, not exactly knowhow, but how you coordinate people and your working team is most important. How you can most efficiently move the team members around, pick up the most capable people and organize them in the most efficient way probably was the most challenging part.

We felt that as an auto manufacturer, we had to face squarely the challenge of addressing global environment problems. Otherwise we concluded, Toyota could not survive in the next century.

I'll give you an anecdote. In truth, the hardest part came after Prius. The management came to expect that "if you can do this in a limited time period in the Prius case, you can do that for other vehicle development projects as well." So, the highly efficient development process practiced for Prius set an internal standard of shorter lead time at Toyota Motor Corporation. And that was quite tough on us.

In any case, concurrent development of the drivetrain and the vehicle was quite important. Manufacturing, supplier development and configuration of vehicle and system development all had to be linked and carried out in concurrent fashion. And at that time, although actual practice with the concept of concurrent development was still limited, we had to do it.

SEI: *In conventional vehicle development, products have to become profitable within a defined period. But with this new type of car, it must have been very difficult to make a profitable business plan. Did you decide to launch the vehicle even if you would lose money initially? There was clearly some risk involved.*

Yaegashi: Well, we didn't intend to start a money-losing business. Actually, in the longer term and in a wider range, we did not think that we would incur losses by selling this model. The reason for this is that there was a clear program in place whereby within one model year the Prius would become a profitable project. The model was to create its own market, and in doing so the profitability of the vehicle would increase. Thus, there was a prospect that we could make this a viable business.

Despite the difficulties that we anticipated, there was an expectation of profitability. Having gained highly valuable experience as the pioneer in this market, we came to a new understanding of the meaning of success. It is with this new view that we envision a profitable future in which we continue to invest in further improvements.

SEI: *Prius was launched first in the Japanese market. Japan, the United States and Europe have different market characteristics. What is the prospect in the respective markets?*

Yaegashi: We did have a global plan and, in the first place, our goal with the hybrid was to make it a global car. In deciding the order or sequence of introduction in the market among the different regions, we tried, of course, the Japanese market first to see how it would perform. Then, with the experience and enhanced confidence obtained during one and a half years in Japan, we decided last year to launch the vehicle in Europe and in the United States.

Extension of Hybrid System to Larger Models

SEI: *In the United States, there is still a preference for large cars and high performance. What is your view on reducing emissions from such vehicles?*

Yaegashi: As I said, we had a global target to expand our business through the hybrid powertrain. The Prius was the first attempt down this path. We do not think that the Prius alone can promote us to a high profile position in the United States, but I think that Prius is a very powerful element for us to become a more global manufacturer.

Of course, in America, in addition to sedans, there is market demand for SUVs and vans, and more diversity in general. This tendency to move away from sedans is also appearing in Japan. We made the decision to introduce the hybrid in the car class because we thought that was the easiest way to penetrate the market. But of course, in the long run, we have a plan to make larger hybrid vehicles, more efficient than conventional vehicles. The Estima hybrid minivan launched in Japan this year is one example in that direction.

I agree that in the U.S. market, they love large cars and high output and we cannot neglect the market needs. We have to meet those needs, but at the same time we constantly try to improve our technical capability so that it would fulfill both needs — the consumers' preference for larger or more powerful cars, and the environmental need for cleaner emis-

To double the efficiency meant that we needed a technological breakthrough. We arrived at the conclusion that the powertrain had to be a hybrid.

Market Response to the Prius

SEI: *How did the market respond to the Prius? Was it different from your expectation?*

Yaegashi: Well, it was much bigger than we had expected. The market recognition and especially customers' acceptance was most important for the new powertrain's acceptance and for market penetration. Because the upfront cost or the purchase cost is higher than the conventional car in the same class, it was very important that the car win over consumers. The first expectation was that the number of customers, even if we had good grounds for recommending this car, might be small, and that the response might be slow. But in fact the market responded much faster than we had expected. I felt that public awareness was changing.

sions and better fuel efficiency. We developed and introduced another hybrid system for the Toyota Crown sold in Japan. The Lexus GS300 sold in the U.S. is derived from the Crown, although there are no plans currently to introduce a hybrid Lexus. Thus, more efficient technology will extend step by step to larger classes of cars.

SEI: *Toyota's launch of the Prius seems to have had a great impact on other global manufacturers, particularly the Big Three in the U.S. How did they respond, and was their reaction more or less what you expected?*

Yaegashi: My honest feeling is that the reaction or the response from the other global manufacturers has been even larger than from the market. Besides Honda, other manufacturers have not yet commercialized a hybrid system, but they certainly have made preparations and will soon market their respective version of the hybrid system. So, I think we had an impact in initiating a trend and attracting more attention to the hybrid system as a real alternative. I do think we played a key role in triggering this trend in the global industry, and I think we could take pride in this.

SEI: *After the Clean Air Act of 1970 was passed in the United States, Japanese car manufacturers, led by Honda and Toyota, developed very fuel-efficient cars as well. But it seems that this time you've had an even greater impact.*

Yaegashi: That's at least what I tried to target. I was involved in technical development at the time of the enactment of the Clean Air Act, and of course we worked very hard to achieve cleaner emissions. We were awarded by the Environmental Protection Agency for our contribution to cleaner air. But in parallel with the effort towards emission improvements, if we try to be a global player and make a global car for the 21st Century, we have to address CO_2 and the energy source problem, as well.

Fuel Cells and Other Advanced Technologies

SEI: *What about other advanced technologies like the fuel cell, as well as cleaner internal combustion engines and alternative fuels? Among the alternatives, the hybrid is already commercialized and is now an available option in the market. If you extend the timeline a little further, what is Toyota Motor Corporation's future strategy or perspective? And what is the fate of ICE cars?*

Yaegashi: Well, clean air is a very important issue and the hybrid is certainly one of the answers. Toyota does not think that the hybrid is a competitor to the ICE, or to compressed natural gas vehicles either, nor are these mutually exclusive solutions. Rather, the hybrid is a unique technology available for a production model that allows a combination of various alternatives. Hybrid CNG, hybrid diesel and even hybrid fuel cell vehicles can be developed too. Again, hybrid is a technology path through which various fuels can be adopted to work with this powertrain. Therefore we believe we should place more emphasis on the development of hybrid systems.

If you use the term "hybrid" in a broad definition, it simply means combining two different technologies into one system. The ICE is used as one source of hybrid. Besides hybrid options, fuel cells can be regarded as a direct electric power generator, but would also serve as the energy storage system mounted on board. That is, part of the energy from fuel cells could be used to drive the car, and regenerated energy can be stored again. Such a concept is already quite popular in the energy industry and the power generation business, but a similar concept can be adapted to mobile systems like automobiles as well.

SEI: *Toyota did not receive any financial support from the Japanese government in developing the hybrid system. Besides direct support of this nature, what kind of public policy measures do you think would be beneficial, as incentives for the penetration of such advanced technology?*

Yaegashi: Let me say first that competition among manufacturers and among technologies works better than government subsidies for the purpose of development. On the question of incentives, I had discussions on this issue with the U.S. regulatory authorities. Market oriented incentives rather than regulations, and education of consumers to raise awareness, are probably the most helpful form of government support. I think that the U.S. Congress is now deliberating on possible measures to support cleaner, more fuel efficient environmental technologies including advanced technology vehicles. In promoting a cleaner environment, the government has relied primarily on regulations. But I think incentives that attract the attention of consumers should increasingly be prioritized.

SEI: *Do you feel that consumer or mass-market awareness is more important than imposing strict regulations?*

Yaegashi: Yes, we have to provide commercial products that will satisfy and win over consumers. In the long run, when it is up to pure market mechanisms and consumer choice, we'd like to be able to sell our cars based on choice. Our ultimate goal is to serve the customers, and to make them feel that they benefit from choosing our cars. But in a transitional phase, support in the form of government incentives may help.

More efficient technology will extend step by step to larger classes of cars.

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