Framing the Global Warming Policy Debate

by Peter Asmus and Barry Ziskin

INTRODUCTION

The record heat and drought of 1988 piqued the general public's interest in global warming. The 1980's were noteworthy since people witnessed four of the five hottest summers recorded in history. Circumstantial evidence has convinced many atmospheric scientists that a combination of human activities are prime contributors to this warming trend. Are recent high temperatures and droughts a coincidence? Or are these record-breaking hot and dry days linked by the common thread of global warming?

Scientists do not agree about the likelihood of global warming. Most would agree, however, that human activity is drastically changing the earth's atmosphere. The resulting increased climate variability, whether warming or cooling, requires the government to respond with more than an endorsement of the *status quo*.

A delicate balance exists between continued industrial growth and the protection of a healthy environment. Governments from around the world are seeking to define that balance. Scientific uncertainties should not hinder efforts toward reducing projected levels of greenhouse gases in the atmosphere. In addition, the policies that reduce greenhouse gas emissions may also solve a host of other environmental, economic, and national security concerns.

SCIENTIFIC UNCERTAINTY

Weather forecasting is complex and inexacting. Predicting global climate change is far more risky. Forecasters lack sufficient data. Therefore, the atmosphere's complexity makes forecasting local weather changes due to global climate variations supremely difficult.

Currently, average global temperatures are about one degree Fahrenheit warmer than they were 100 years ago. This is significant since a change of only two degrees Fahrenheit separates today's climate from that of the little-ice-age period, which affected North America and Central Europe from the thirteenth to the seventeenth century. Atmospheric scientists, such as William Kellogg of the National Center for Atmospheric Research in Boulder, Colorado, report that recent data of temperature changes in the vast oceans also confirm the global warming trend.

A. Consequences of Global Warming

The U.S. Environmental Protection Agency (EPA) believes that an ever increasing body of evidence supports projections that global warming trends will cause the sea level to rise two meters by the year 2010. As local temperatures rise, scientists predict that proportionately more of California's precipitation will come in the form of rain. A shift from snow to rain in the winter would cause flooding during the wet season and would intensify summer droughts due to decreased snowmelt. A small temperature increase of two degrees Fahrenheit could result in flooding much of the Central Valley, reducing some of the world's most productive farmland into saline pools and spillways.

The EPA warns that air quality throughout California will continue to diminish if warming trends persist. Ozone levels in San Francisco could rise three times above levels that are already in excess of health standards. If global warming projections are true, disease and mortality rates may rise in human populations throughout the world. Lush American fields of grain could become expansive deserts. Tree populations might migrate northward to more temperate climates, shifting certain crops and traditional American lifestyles to foreign borders. These are the scenarios that global warming models portray.

B. The Greenhouse Effect

Scientists agree that the greenhouse effect, which warms our planet, does exist. Scientists differ, however, in their calculations of how this greenhouse effect influences global warming. A small minority believe that an accelerated greenhouse effect could cause an overall cooling of global temperatures.

To understand the greenhouse effect, imagine the earth as a fragile, enclosed greenhouse.

Glass allows light to enter, but will not allow heat to escape. The earth's atmosphere, like a blanket made of carbon dioxide and other greenhouse gases, traps heat like the glass enclosing a greenhouse. Botanists can regulate the heat in the greenhouse by opening vents to release the accumulated heat. Unfortunately, human activities can inadvertently close the earth's vents. These activities, such as burning fossil fuels and deforestation, create excess greenhouse gases in the atmosphere and prevent the release of the earth's accumulated heat.

Ironically, this greenhouse effect is critical to humanity's survival. Without this shield, oceans would freeze and life as we know it would not exist. The earth's surface would be sixty-five to seventy degrees Fahrenheit colder.

The global warming debate centers around whether the impact of human activities is accelerating the greenhouse effect. Irving M. Mintzer of the *World Resources Institute* estimates that the addition of carbon dioxide and other greenhouse gases has already committed the earth's surface to at most a 2.5 degree Fahrenheit increase above the pre-industrial average global temperature. Many scientists believe that increases in certain atmospheric gases are creating a momentum of interactions that once set into motion may be difficult, if not impossible, to stop.

C. Sources of Greenhouse Gases

The atmospheric components responsible for the greenhouse effect are called greenhouse gases. The most important, along with their contribution to the greenhouse effect, include: water vapor and clouds, eighty percent; carbon dioxide, ten percent; methane, four percent; and chlorofluorocarbons (CFCs), three percent. Other trace gases also impact global temperatures. The global warming debate has focused on carbon dioxide because it is the most important greenhouse gas introduced by human activities. Before the industrial revolution in the late 1700's, the atmospheric concentration of carbon dioxide was about 290 parts per million. Today, scientists estimate the carbon dioxide level at between 345 to 350 parts per million. Between 1958 and 1979, atmospheric levels of carbon dioxide increased seven percent! At present, industrial sources of carbon dioxide increase at .4 percent annually; methane one percent annually; CFCs almost five percent annually.

Energy consumption and land use are the primary contributors to increases in greenhouse gases. Fossil fuel combustion in power plants and cars produce the largest share of greenhouse carbon dioxide. Each American generates about one ton of carbon dioxide annually. In addition, farming operations that generate animal waste, as well as landfills, contribute to atmospheric methane levels. A small minority of scientists believe that methane may someday be more important than carbon dioxide in the global warming equation.

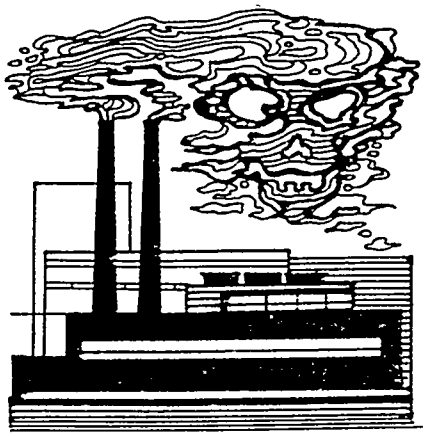
Deforestation also causes global warming by cutting off sources of carbon dioxide uptake. During photosynthesis vegetation absorbs carbon dioxide and converts it into oxygen. Furthermore, deforestation adds carbon dioxide to the atmosphere when the carbon in trees converts to carbon dioxide during tree burning.

The rate of carbon dioxide uptake and conversion is highest in the fast diminishing tropical rain forests. This problem is not limited to countries such as Brazil and China. Less than five percent of California's ancient old growth forests remain intact. These old growth groves are among the largest sequesterers of atmospheric carbon dioxide in the United States.

Many scientists believe that the impacts of this consistent rise in greenhouse gases may not be felt for twenty to forty years. Factors such as volcanic activity, ocean temperatures, and solar cycles influence our weather patterns and complicate global warming calculations. Scientists admit their models are crude. But many feel that they underestimate rather than overestimate the degree of warming and the associated negative climatic and economic impacts.

D. Disagreement Among Experts Over Global Warming Trends

Some experts dispute the evidence of global warming, while others warn that the world may someday be unable to regulate its own temperature and sustain life. The latter group predicts that a positive feedback loop will intensify the problem. These scientists argue that the expanding hole in the ozone layer will also increase incoming solar insolation, further accelerating the warming trend. In addition, the greenhouse effect could be enhanced by rising ocean temperatures that drive more carbon dioxide out of the water and into the atmosphere.



Courtney Smith From "RE:SOURCES"

Dr. Arthur Rosenfeld of Lawrence Berkeley Laboratories believes that global warming may cause the Great Plains to suffer droughts reminiscent of the 1930's Dust Bowl. His reasons are sound and rational. When oceans heat up, evaporation increases. In addition, the ocean has a larger thermal mass than the land, and the land heats up faster than the ocean. The land will lose moisture faster than the evaporating ocean can create precipitation. Rainfall will increase, "but the rain may be lagging by 50 years. Billions can starve in 50 years," warns Rosenfeld.

Natural phenomena could work to undo some of the impacts of global warming. For example, warmer temperatures might stimulate more evaporation from the oceans and thereby increase humidity. More humidity increases cloud cover, some argue, which could block out incoming solar radiation and cool the surface of the earth. On the other hand, the rising humidity may increase the greenhouse effect, creating an even denser blanket of gases to surround the earth.

In contrast, Kenneth Watt, a professor of zoology at the University of California, Davis, argues that the media has created the global warming hype and that global cooling is occurring. He rationalizes that temperature data from urban weather stations is not an accurate gauge of world temperatures because of the so-called "heat island effect." Watt believes that as urban areas expand, they tend to become warmer than rural regions. Therefore, Watt claims, temperature data from urban weather centers is misinterpreted. Despite Watt's interpretation, the actual temperature data from Los Angeles reveals a warming trend occurring much more rapidly than Watt would expect. A study of the weather data reveals that from 1940 to 1985 temperatures in Los Angeles increased by five degrees Fahrenheit.

Watt's argument does not warrant downplaying the greenhouse effect's impact. Societal initiatives to increase energy efficiency and lessen polluting lifestyles would only be stifled. The present fossil fuel-based economy would continue to pollute the atmosphere. Instead, society should focus attention on ways to mitigate the polluting impact of present technologies used in power generation and transportation.

Watt fears that special interests, such as the nuclear power industry, may be promoting the global warming threat for economic self-interest. However, in any policy debate on a cutting edge issue -- such as global warming -- the battle of ideas is intense. What makes the global warming challenge so fascinating is that two polarized elements of the energy industry -- nuclear and renewable -- lobby from the same side of the issue.

E. The Nuclear Industries Role in Global Warming

Indeed, one reason the global warming theory has become so visible is because part of the energy research infrastructure remains obsessed with proving that nuclear power is the fuel of tomorrow. Although the nuclear power industry is rapidly declining, the industry views global warming as a business opportunity because nuclear power plants do not release significant amounts of greenhouse gases.

The following data, presented by Ralph Nader's *Public Citizen* group, amplify the challenge facing pro nuclear activists. From 1980 to 1989 the average construction costs for a nuclear power plant increased four-fold to reach a peak of $4,590 per kilowatt per reactor completed in 1989. Operation and maintenance costs have risen sixty-nine percent. The report also noted the blemishes on the industry's safety and waste disposal record. Safety-related modifications mandated in 1980 due to the Three Mile Island incident have only been completed at twenty-foury of the nation's 112 licensed-to-operate reactors.

One clue to the outcome of the nuclear industry's fate may come from the public vote in Sacramento, California, to shut down Rancho Seco last June. Supporters for continuing the plant's operation centered much of their campaign around the global warming argument. But voters, focusing on the costs and operating history of the plant, were not swayed by

these supporters attempts to pin an environmental label on the twin cooling towers.

F. Need for Action

Scientists and energy company executives can not agree on what actions to take. Policy makers, nonetheless, do not have the luxury of procrastination. A vast array of policies that make inherent economic sense -- regardless of the vagaries of global warming -- must be pursued now. At the very least, carbon budgets, which account for the inflow and outflow of atmospheric carbon dioxide, should be rapidly developed. Carbon budgets can provide atmospheric scientists with a starting point for studies of the impacts of increased humidity and coal burning on global warming. The potential catastrophe from global warming requires an adequate insurance policy. Appropriate government policies can insure that our continued pollution of the atmosphere does not harm the long-term health of our economy, our resource base, and our environment.

FEDERAL ACTIONS

Scientific uncertainty is the excuse given by the U.S., along with Japan, the United Kingdom and the U.S.S.R., to not move aggressively on setting greenhouse gas reduction targets. However, recent testimony of Secretary of State James A. Baker III undermines President's Bush's wait and see attitude on setting specific goals to reduce greenhouse gas emissions.

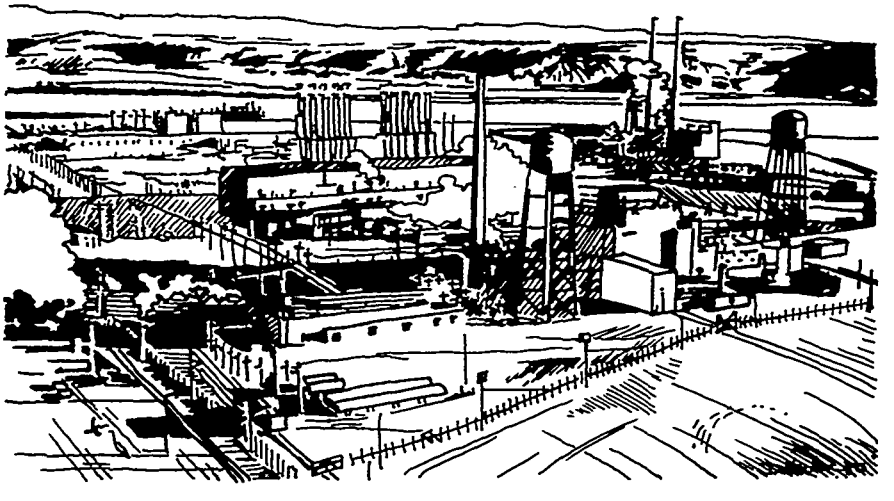
"We can probably not afford to wait until all of the uncertainties have been resolved before we act," said the Secretary of State when speaking before the new Intergovernmental Panel on Climate Change (IPCC) in January 1990. "We should focus immediately on prudent steps that are already justified on grounds other than climate change. These include reducing CFC emissions, greater energy efficiency and reforestation."

Setting reduction targets for greenhouse gases would have aided the latter two policy initiatives. In addition, international limits on carbon dioxide emissions stimulate the development of new renewable energy technologies in the lesser developed countries. In contrast to the U.S. other countries already are acting on their own, which further justifies labelling the U.S. as the atmosphere's primary polluter.

A. The Need for U.S. Leadership in Reducing Global Warming

A reason for U.S. hesitancy in acting on global warming is that certain administration officials believe the U.S. should wait until the IPCC finishes its analysis of cost-effective responses. The IPPC has divided up the tasks of evaluating the impacts and solutions to global warming among countries from around the globe. Critics of this approach point out that the IPCC may not make any firm conclusions in the near future and dramatic action is needed now.

A proposal for a worldwide per capita carbon tax could dramatically demonstrate the U.S.'s contribution to world pollution. A Dutch government funded study spells out what a carbon tax would look like if based on carbon emitted per capita in 1986. According to this report, the United States leads the world in carbon dioxide emissions per capita. If a tax



was structured to proportionately allocate worldwide carbon costs, the U.S. would contribute $14 billion annually. The Soviet Union is next with $10.6 billion.

The carbon tax estimate highlights the need for the U.S. to play a leadership role in efforts to reduce global warming. The U.S. should do its part. U.S. efforts to at least stabilize carbon dioxide emissions would not disrupt the IPCC process, as claimed by President Bush. Such efforts would send a clear signal to the rest of the world that the U.S. is serious about saving the environment.

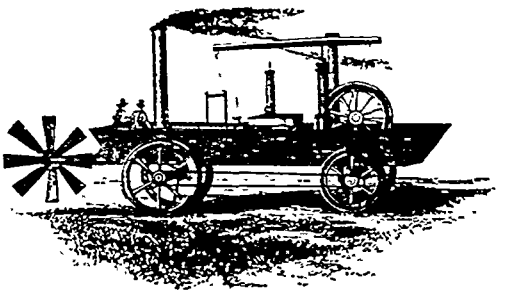
A program to reduce deforestation and encourage reforestation would help to reduce global warming. Brazil, for example, continues to cut down its tropical rainforests to help repay its foreign debt. The U.S. government should work with the World Bank and U.S. banking institutions to adopt a process for debt forgiveness conditioned on reforestation of tropical rain forests.

B. Economic Benefits From Reducing Pollution

The idea that the environment and economy must be always in conflict is a false premise perpetuated by those opposed to the carbon dioxide limits, such as President Bush's Chief of Staff John Sununu. Studies by *Pacific Northwest Laboratories*, for example, demonstrate that energy efficiency measures could greatly reduce air pollution in the Soviet Union with "no extra cost to the Soviet economy."

According to scientists at Lawrence Berkeley Laboratories, investments in improved efficiency would provide U.S. industry with a better competitive position in world markets, and free up more than $100 billion annually for capital investments in other U.S. industries. These studies show that the economy would benefit from new jobs in the energy conservation and construction industries. Increased energy efficiency would reduce emissions of carbon dioxide and other pollutants, lessen environmental damage, reduce the impact of global warming, and help to make the U.S. more competitive in world markets.

Steven Schneider, a climate expert at the *National Center for Atmospheric Research,* calls this approach a "tie-in strategy," since it would enable Americans to reduce the trade deficit, enhance competitiveness, free up capital for research, and reduce



greenhouse gases all at once.

Nonetheless, the federal government has slashed conservation budgets throughout the 1980s. Federal funding for conservation and energy efficiency is one-third that of ten years ago. President Bush has further cut the 1991 conservation budget request by an additional fifty percent from the amount Congress approved. Once again our efforts to conserve energy pale next to those of foreign competitors. The United States consumes seventy-five percent more energy per dollar of gross national product than competitors such as France and Japan. However, U.S. research and development expenditures on conservation lag behind France, Japan, West Germany, and the United Kingdom.

CALIFORNIA'S ROLE

California has achieved a noteworthy reputation for its efforts to reduce dependence on energy sources that contribute to the greenhouse effect. California leads the nation in development of renewable energy resources. This state is responsible for over ninety percent of the world's current solar and wind electricity generation. Fifteen years ago California depended on fossil fueled power plants to supply eighty percent of the state's electricity supply. Today that percentage has been sliced in half. Over thirty percent of California's electricity is supplied by a mix of cogeneration (a term describing a facility's use of excess steam or other energy source to supply its own power), hydroelectricity, geothermal, biomass, solar and wind.

At one time, California incentives to stimulate the development of renewable energy, such as California's 1977 solar tax credit, were the highest in the nation. When coupled with the forty percent federal solar tax credit, California homeowners in the late 1970s benefitted from large subsidies when installing these energy saving technologies. Such incentives have expired and today America imports more oil than at any time in history.

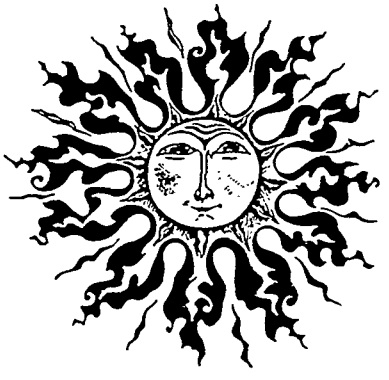
A. State Incentives for Wind Energy and Solar Power Systems

Caliornia's twenty-five percent tax credit for wind energy systems expired in 1987, but created a $2.5 billion industry consisting of 16,000 wind turbines that represent nearly 1,400 Megawatts of generating capacity. These wind power plants generate nearly two billion kilowatt hours per year, deliver nearly as much energy as a medium sized nuclear power plant, and cost a fraction of what conventional sources require to operate, maintain, and fuel. These wind power plants offset eleven million pounds of air pollutants and 1.8 billion pounds of greenhouse gases per year. In the late 1980s, the reduction of federal government expenditures for wind energy research and the expiration of the state and federal tax credits for the purchase of wind energy systems has allowed foreign manufacturers to dominate the world market for wind turbines. Today, European and Scandinavian countries manufacture most of the state of the art wind turbines that are installed in California and abroad.

Solar tax credits attracted Israel's *Luz International* to California. *Luz* now generates in California ninety percent of the world's solar electricity. The tax credits, when combined with long-term fixed-price power-purchase contracts with utility companies, provide the financial incentives needed to boost development of renewable energy technologies. However, a series of tax investment-related scams has made policy makers wary of endorsing both the expanding of tax credits and the fixed priced power purchase contracts pegged to future fossil fuel price increases.

B. Preference for Fossil Fuels

Fossil fuel power sources in California still continue to enjoy federal and state preferences. California, for instance, is the only state in the "lower 48" that does not impose an oil severance tax. These governmental allowances continue in spite of growing evidence that fossil fuels are responsible for much of our current environmental and energy dilemmas.



Last year, the California Legislature passed a modest ten percent solar tax credit (SB 227) limited to facilities which generate electricity. Earlier solar tax credits also applied to residential water and pool heating, so-called "passive solar" systems, and other similar conservation approaches.

Because of the mixed success of past renewable development programs, and the increasingly complex nature of utility power procurement practices, a comprehensive evaluation of the roles of state institutions, interest groups and current policies is needed to formulate a coordinated California energy policy. Since California continues to set the trend in energy policy, its response may have national and international repercussions.

C. California Policies Independent of Federal Action

California should adopt new energy and conservation policies regardless of complimentary or contrary policies emerging from Washington D.C. California now ranks as the third largest consumer of gasoline in the world.

In August 1989, the California Energy Commission (CEC) adopted an interim report on global warming. The report states that a temperature increase of 1.5 to 4.5 degrees Celsius (2.7 to 8.1 degrees Fahrenheit) is possible by the year 2080. The final report, due later this year, will include recommendations to the California Legislature on methods to delay possible global warming and to deal with its effects. A coordinated state energy plan is a logical response to the global warming threat, argues Assemblyman Byron Sher (D-Palo Alto), author of the legislation mandating the CEC study.

The CEC may soon place a $7 per ton value on carbon dioxide emissions in future electricity resource plans for the South Coast Basin. Given the uncertainty of global warming, this pilot project for southern California demonstrates responsible public policy development to help clean up Los Angeles's immense air pollution problem and protect against global warming.

An exciting state program that helps wean developing countries from fossil fuels is the CEC's

export technology program. This program represents an opportunity for developing nations to get off the petrochemical treadmill, in addition to creating a business development program for California's renewable energy industry. Such responses can avert an environmental tragedy by using proven cost-effective measures.

A December 1988 report by the *Electric Power Research Institute* predicts that because of its abundance, coal will supply about two-thirds of the additional energy needed worldwide over the next fifty years. The CEC's export technology program can help to avoid this massive contribution to atmospheric pollution and assist state industry, which needs foreign markets in order to survive. A well funded state grants program may facilitate access to this large market, estimated to be worth $19 billion in Thailand, Indonesia and the Philippines alone.

Last year, Assembly Speaker Willie Brown (D-San Francisco) introduced and passed legislation that would have set a twenty percent carbon dioxide reduction goal for California. In another display of hesitancy by our leaders, Gov. Deukmejian vetoed the bill, a gesture that parallels President Bush's inaction on international carbon dioxide reduction goals.

Measures designed to reduce carbon dioxide emissions from power plants also help remove other pollutants. For example, the California Public Utility Commission (CPUC) is currently incorporating an environmental adder to account for carbon dioxide emissions in programs that bid on future sources of electricity. An environmental adder acts to favor programs that help reduce carbon dioxide and other pollutants, such as nitrous oxides.

In November, an initiative on the ballot in California would impose carbon dioxide reduction targets of twenty percent by the year 2000 and forty percent by 2010. Polls show that it has a good chance of passing. If passed, the initiative's carbon dioxide reduction targets will accelerate the development of policies to increase energy efficiency and renewable energy projects in California.

D. Policies that California Should Adopt to Reduce Global Warming

Regardless of the November initiative's outcome, California should pursue the following three state policies that respond to the global warming:

(1) California should adopt a carbon tax on both stationary and mobile sources of emissions and use these funds to increase funding for the state's existing research and development program, known at the Emerging Technology Advancement Program (ETAP). While the CEC program has invested $17.2 million into thirty-five different projects which all benefit the environment, this amount pales compared to the $100 million or so that utilities annually invest in research and development. A public-private partnership approach, such as the Photovoltaics for Utility Scale Applications project (PVUSA), offers the best of both public and private sectors. ETAP could also be directed toward solving immediate environmental problems, such as air quality in the South Coast Air Quality Management District, as well as long term concerns, such as global warming.

(2) California should institute a joint CPUC and utility industry program to replace incandescent light bulbs with more efficient fluorescent bulbs. On the east coast, a unique coalition of utility companies and environmental groups are taking part in just such a program to install fluorescent bulbs in residential and commercial buildings. The Union of Concerned Scientists estimates that if the six billion dollars spent on the Seabrook nuclear power plant had been used to buy fluorescent bulbs at twelve dollars each, U.S. electricity demand would be reduced by twenty two percent.

(3) The other primary concern is the housing industry's woeful record on conservation. Eighty percent of California homes use thirty-five percent more energy than necessary. Some of the best programs to encourage residential energy conservation programs are energy efficient home mortgage programs. These programs have existed since 1980. Widespread adoption, however, has been hampered by the mortgage community's low opinion of these programs. The state could seize the moment and make energy efficiency mortgages an integral part of the state's comprehensive conservation program.

THE PUBLIC-PRIVATE PARTNERSHIP

After steep declines in funding for conservation programs in the late 1980s, an unusual coalition of public and private groups, consisting of environmentalists, utility companies, and ratepayers, has developed some innovative financial incentive programs. These programs enable shareholders and ratepayers to benefit from greater energy efficiency. The threat of global warming was a primary concern that motivated this coalition to initiate these policies and incentives. The proposed funding for these programs is eight times the total of the Bush administration's 1991 conservation budget proposal. These programs to increase energy efficiency are a logical first step to reduce global warming because they create such great economic benefits.

A similar coalition of private and public interests can help the U.S. regain the lead in solar photovoltaic technology. PVUSA, the largest U.S. photovoltaic research project, could represent a new wave in U.S. efforts to become competitive in world energy markets. Recent utility and state efforts in this area address a cluster of inter-related policy issues -- from global warming to international competitiveness -- that can, theoretically, achieve broad support and funding. The hesitancy of some utilities to join PVUSA speaks to the reality of how long it may take to transform America's fragmented utility industry into a cohesive, creative industrial force.

If the U.S. continues to lose the photovoltaic market to foreign competition because of uncertainty over global warming, then the U.S. will suffer real economic losses from its backward environmental policies. The U.S. has fallen behind Japan and West Germany in the race to capture the photovoltaic market, which the U.S. once dominated. These countries may be providing America's photovoltaic hardware in the future if the U.S. does not soon coordinate its expertise and resources.

Germany provides an example of progressive action needed in the U.S. Germany receives half of the insolation -- a term used to measure sunlight -- necessary for operating photovoltaic systems than the amount received in the United States. But in 1989, the forward-looking German government spent $58 million (double America's investment) to stimulate development of this clean energy technology. In 1989, the world's largest manufacturer of photovoltaic cells, Arco Solar, sold its facilities to a German manufacturer.

A partnership between private and public interests to develop renewable energy technologies and increase energy efficiency would address important concerns about industrial competitiveness and the role the U.S. could play in reducing global warming. The U.S. economy and environment can only benefit from a strong public-private partnership to develop cost-effective energy saving technologies.

CONCLUSION

The threat of global warming offers a silver lining in the gloom and doom because, even if exaggerated, policymakers can use the threat for needed action. The global warming threat may prompt California and the rest of the world to finally adopt policies which make inherent economic and environmental sense. A Sierra Club report entitled *The Greenhouse Effect: The Need For California Leadership* emphasizes this point:

> As alarming as the Greenhouse Effect is, the fight against it will bring many benefits. Energy efficiency, including efficient transportation, will clean our city air, relieve traffic jams, cut acid rain, strengthen America's energy independence and relieve the trade deficit. California was once the leader in energy efficiency and renewable energy technologies. But now that the market is taking off, California has lost its lead to Japan and Western Europe. We can and must take back the lead -- for the sake of our economy, our environment, our quality of life, and, most of all, for the sake of our children.

Eaton, White, Brodie, *The Greenhouse Effect: The Need for California Leadership* (1990).

Global warming is a complicated issue, still fraught with scientific uncertainties. Studies, however, are under way. In the absence of federal leadership, California must take the initiative to protect the environment for future generations and strike out on its own. Given the stakes, there is no time to lose.

REFERENCES

Daniel Borson, Ken Bossong, Nancy Rader, et al. *A Decade of Decline - The Degeneration of Nuclear Power in the 1980's and the Emergence of*

Safer Energy Alternatives, Public Citizen -Critical Mass Energy Project, December 1989.

California State Assembly, Natural Resources Committee, *Global Warming - A Blueprint for State Response*, April 1989.

California State Senate, Special Committee on Solid and Hazardous Waste, *California 2050, A Report on Airborne Hazardous Particles and Greenhouse Effect*, March 1989.

M. Eaton, J.V. White, P. Brodie, *The Greenhouse Effect: The Need For California Leadership, Sierra Club Fourth Annual Green State of the State Report*, January 1990.

Environmental Protection Agency, *Potential Effects of Global Climate Change on the Unites States*, Volumes One and Two, October 1988.

D. Grueneich, A. Rosenfeld, D. Modisette,*Energy Efficiency as a Coordinated Environment and Energy Strategy*, Joint Committee on Energy Regulation of the Environment, April 1990.

Art Rosenfeld, et al., *Policies to Improve Energy Efficiency, Budget Greenhouse Gases and Answer the Threat of Global Climate Change*, (Department of Energy Contract No. DE-AC03-765F3098), January, 1990.

C. Schneider, *Preventing Climate Change - Issues in Science and Technology* - Summer 1989 p.55-62.

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