World Resources Institute

Sustainable Enterprise Program
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The International Climate Change Partnership Case: An Industry Association Faces the Climate Change Issue

"The ozone treaty is widely cited as the most successful example of international environmental cooperation to date and the best model for progress on such issues as climate change. Some argue, though that ozone was an easy issue—that strong scientific evidence, the lack of coherent industry opposition, and the availability of alternatives meant that CFCs would have been eliminated with or with out effective international institutions."[1]

In January 1996, Kevin Fay, director of the International Climate Change Partnership (ICCP), was reassessing the options facing the industry association he led. His immediate task was to formulate a response to a major scientific report recently released by the respected United Nation's Intergovernmental Panel on Climate Change (IPCC, which confirmed that emissions of greenhouse gases were warming the earth (see exhibit 1 for a timeline of key events). The media were giving increasing coverage to the issue. The *New York Times* had just reported that 1995 was the warmest year on record,[2] and *Newsweek* ran a cover story that blamed global warming for the blizzard that shut down much of the east coast of the United States in January 1996.[3] In the next few months, Kevin would also need to reexamine his association's strategy for participating in the international negotiations on a treaty to limit emissions of greenhouse gases.

Many of the ICCP's member companies had also been active in another industry association, the Alliance for Responsible CFC Policy, which played a major role in shaping the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer. This international treaty, which took seven years to negotiate under the auspices of the United Nations Environment Programme (UNEP),

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This case was written by David L. Levy and Aundrea Kelley to stimulate class discussion rather than illustrate effective or ineffective management techniques. Funding for this case was provided by the Sustainable Enterprise Program, and by the University of Massachusetts, Boston.

phased out worldwide production and use of most ozone depleting substances (exhibit 4). The treaty culminated thirteen years of intense research and debate, sparked by the publication of a paper by two American scientists in 1974 that hypothesized a link between CFC gases and ozone destruction—work which to earn the scientists the Nobel Prize for Chemistry in 1995.[4]

Political momentum was now building for a similar protocol to limit the emission of carbon dioxide and other greenhouse gases: negotiators were hoping to conclude a treaty by the end of 1997. Kevin knew, however, that climate change was a much more complex issue than ozone depletion. As he put it, "A handful of companies manufactured ozone-depleting chemicals, and there were a limited number of uses for them. Controlling carbon dioxide emissions would affect every aspect of life on earth." Any treaty to limit emission would certainly have a major impact on the ICCP's member companies, which included Dupont, British Petroleum, AT&T, Enron, 3M, Allied Signal, American Standard and Carrier Corporation. Kevin was considering how best to promote his members' interests, but he recognized that these companies represented a very diverse range of products and services; a mandatory reduction in emissions of greenhouse gases would present opportunities as well as threats.

Background

Ozone depletion and climate change are arguably two of the most important threats to the earth's ecosystem. Ozone depletion is caused mainly by a class of chemicals called chlorofluorocarbons (CFCs) while climate change is caused by the buildup of greenhouse gases, particularly carbon dioxide (CO_2), in the earth's atmosphere. The scientific evidence for both of these processes is strong but not totally conclusive. Both problems are examples of "global commons" issues: gases emitted into the atmosphere from any one country affect the whole world. Most countries in the world produce and emit these gases in amounts that, individually, would not have much impact on the global environment. Few countries would be willing to bear the costs of controlling emissions if others did not commit to doing likewise. Nevertheless, the sum of the global emissions could have potentially disastrous effects on the ecosystem.

Negotiating an agreement on climate change is a high-stakes game with uncertain odds. Many businesses that produced or relied on fossil-fuel energy expressed concern that premature action to curb emissions could impose huge economic costs. The costs of inaction, however, could also be massive. Global warming could lead to rising ocean levels, droughts and hurricanes, endangering coastal cities and disrupting the global food supply. Some environmentalists warned that waiting for more definitive proof of global warming could be disastrous, due to time lags in the climate system – as one Greenpeace member put it, we "should step on the bakes before we see the edge of the cliff."

A series of unusual events in 1994 and 1995 lead some to claim that global warming was already under way. In a series of articles in the British medical journal *The Lancet*, it was reported that disease-spreading mosquitoes were expanding their habits to areas previously considered too cold from them. A new orbiting radar gun detected a rise in sea level of three millimeters a year. Siberia was warmer than at any time since the Middle Ages, and the permafrost was retreating in the Canadian Artic. An in early 1995, a Rhode Island-sized chunk of the Larsen Ice Shelf in the Atlantic broke off into the South Atlantic, exposing rocks that had been buried for 20,000 years.[5]

The Scientific Basis for International Action

CFCs and Ozone Depletion

It was not until a few weeks after the signing of the Montreal Protocol in September 1987 that a NASA-sponsored scientific expedition to Antarctica produced almost definitive verification that CFCs in the stratosphere were causing a significant decline in stratospheric ozone levels.[6] In March 1988, more than 100 leading scientists in the Ozone Trends Panel (OTP) convened by UNEP issued a consensus report that backed up this argument and built momentum for a total phase-out of emissions.[7] The OTP estimated that even with a phase-out, atmospheric levels of chlorine – the destructive component of CFCs – would not return to normal untill the year 2060. By the early 1990s, scientists were detecting ozone-losses not just in the middle of winter in polar regions, but also in more temperate latitudes, and during spring and summer months. Ozone in the stratosphere – the region between 8 and 35 miles above the earth – absorbs ultraviolet radiation that can cause skin cancer in humans and could potentially have harmful effects on other animals and plant life on earth. CFCs take several years to make their way into the stratosphere and they remain there for hundreds of years, each CFC molecule acting as a catalyst to break down ozone.

Proving the extent and cause of ozone loss was not an easy task, however. Concentrations of ozone in the atmosphere do not usually exceed a few parts per million, and the task of measurement is compounded by the high altitudes at which the process occurs. Changes in ozone levels are also difficult to measure because of the seasonal and geographic variability in natural levels. Nevertheless, the accumulating evidence in the latter 1970s led many scientists to advocate cutting emissions as a precautionary approach. Scientists estimated that CFC emissions had to be reduced by 85% just to stabilize atmospheric levels of chlorine. The issue took on urgency, when in the spring of 1985, British scientists discovered a large hole in the Antarctic ozone layer.[8] The 40% ozone loss was so large that the scientist initially delayed publication of their findings, suspecting instrument error. A NASA satellite confirmed the ozone loss over a region as large as the United States. In January 1986, the WMO released a comprehensive international assessment of ozone science that predicted substantial ozone losses if CFC emissions went unchecked.[9]

Despite the consensus achieved by the scientists on the Ozone Trends Panel in 1988, a few scientist remain skeptical about the issue. S. Fred Singer, a scientist who worked on the satellite ozone monitor, complained that the CFC phaseout agreed to in the Montreal Protocol was "based mainly on panicky reactions to press releases…rather than on published work that has withstood the scrutiny of scientific peers."[10]

Greenhouse Gases and Climate Change

Scientists have known for decades that CO_2, methane, and other "greenhouse" gases warm the earth by allowing in and trapping the sun's heat. The first World Climate Conference in 1979 concluded that "there is serious concern that the continued expansion of man's activities may cause significant extended regional and even global changes of climate."[11] Nevertheless, there has been considerable debate about the extent to which human activity might change the climate. Fossil fuel combustion releases about 22 billion metric tons of CO_2 a year worldwide, and deforestation adds another 3-6 billion tons a year. Concentrations of methane – which has 20 times the heat trapping potential of CO_2

– have nearly doubled in the last 100 year, from sources such as livestock and rice-growing. (exhibit 6).

The level of carbon dioxide in the atmosphere has risen from about 285 parts per million (ppm) 100 years ago to 350 ppm in 1995, and the rate of increase continues to grow. During this period, global mean temperatures have increased by 0.3 degrees to 0.6 degrees Celsius.[12] The oceans are becoming warmer, polar ice caps are shrinking, and sea levels have risen about 4 to 6 inches in the last 100 years. The Intergovernmental Panel on Climate Change (IPCC), a group of scientists convened by the UN and the World Meteorological Organization, projected that if greenhouse gases continue to grow unchecked, mean global temperatures would increase by 0.8 degrees to 3.5 degrees Celsius by the 2100, and sea levels would rise a further 4 to 30 inches (exhibit 7).

While these numbers may sound quite modest, they "indicate changes more rapid than any experienced in the last 10,000 years."[13] The IPCC report predicted that some ecosystems would not be able to cope with this rate of change, leading to species loss. The changes would be more pronounced outside the tropics, and more extreme local weather patterns, such as floods, droughts and hurricanes, are predicted. The projected temperature changes can be put into perspective by comparing them to the ice-ages, when average global temperatures were about 3 degrees to 4 degrees cooler than today, and ice-sheets covered much of North America and Europe.

The wide range of forecasts of temperature changes is due to the complexity of the global climate system, and the natural variability in weather patterns. Scientists have attempted to stimulate the climate using "general circulation models" that divide the earth's atmosphere and oceans into 3-dimensional grids and solve hundreds of equations for each cell in the grid. These highly complex computer models are still on only coarse approximations and do not account well for changing cloud cover and ocean currents. Until the early 1990s, most circulation models predicted temperature increases nearly twice as great as those observed. Only recently have these models included the effect of aerosols – small particles emitted from burning fossil fuels – that act to cool the earth by reflecting some sunlight back out to space. Current models have predicted very well the amount of cooling that resulted from the eruption of the Mount Pinatubo volcano in 1991. James Hansen, Director of NASA's Goddard Institute for Space Studies, argues that these models can now reproduce quite accurately climate changes of the distant past as well as the global warming of this century.[14]

There considerable debate about the direction and size of climatic feedback mechanisms; for example, increased CO_2 and higher temperatures could lead to faster rates of forest growth, which would absorb more of the carbon being put into the air. Cloud cover could increase due to greater evaporation of water at higher temperatures, blocking more of the sun's solar light. On the other hand, some think that higher temperatures could accelerate the emission of CO_2 and methane from decomposing organic matter, and that the retreat of polar ice caps will lead to more absorption of solar energy.

The level of complexity and uncertainty of climate change has led some to characterize it as a "chaotic" system, meaning a complex, dynamic, non-linear system in which small changes can cause large, sudden, and potentially irreversible consequences.[15] Researchers from the Woods Hole Oceanographic Institution, who have studied ocean sediments and ice core samples, recently reported that the earth's climate appeared to snap suddenly into and out of ice ages in a matter of decades. According to researches Scott Lehman, "Our results suggest that the present climate system is very delicately

poised. Shifts could happen very rapidly if conditions are right, and we cannot predict when that will occur."[16] One scenario is that Artic snowmelts could dilute the salinity of the Atlantic Ocean causing the Gulf Stream to flow in a more southerly direction, giving England a Siberian climate.

Due to the buffering effect of the oceans and other time lags, the full effect of today's CO_2 levels will not be felt for decades; just to stabilize the current level of greenhouse gases in the atmosphere, emissions would have to be reduced by about 50% from 1990 levels. As in the case of ozone depletion, however, global warming also has its skeptics. Astrophysicist Sallie Baliunas, at the Harvard-Smithsonian center for Astrophysics, has claimed that "There is not observed change in global…mean temperature that is outside the bounds of natural variability…There is no scientific basis for a catastrophic global warming produced by the buildup of greenhouse gases from fossil-fuel burning."[17] Although this view is shared by only a few reputable scientists, they tend to be vociferous in their views and receive considerable attention in the media and in Congress. Some have pointed out that these enviro-skeptics receive significant sums from the coal and oil industries; for example, Fred Singer, who has moved on from ozone to the climate change issue, has received consulting fees from Exxon, Shell, Unocal, ARCO, and Sun Oil.[18]

Country Positions in International Negotiations

In their efforts to reach international agreements that would address global environmental problems, different countries brought a wide range of interests and concerns to the negotiating table, depending on their economic structure, sensitivity to public opinion, and geography. The richer, industrialized countries tended to see ozone depletion, climate change, marine pollution, and biodiversity as the most critical issues facing the earth, while developing countries were more interested in clean water, desertification, and securing resources to ensure economic growth.

Ozone Depletion

On the initiative of the U.S., Canada, and several Scandinavian countries, UNEP convened a conference in 1977 on ozone depletion, with experts from 32 countries. It was not until 1986, however, that negotiations began on a binding protocol to limit emissions. The U.S. and Canada pushed for an immediate freeze, followed by a 95% phaseout over 14 years. The European Union counted with a proposal to cap production worldwide at levels that would actually allow EU producers to increase output by 30% over 1985 levels.[19]

To some extent, the positions reflected the interest of CFC producers in each country. The U.S. had already taken unilateral action to regulate CFCs in aerosols, and American producers hoped that an international agreement would forestall more stringent domestic controls (exhibit 3). In comparison to the U.S. producers, who were largely dependent on their home market, the European producers enjoyed a buoyant export market for one-third of their output. The Europeans were also concerned that Dupont held an advantage in substitutes.

The 1987 Montreal Protocol, which mandated 50% cuts in production in industrialized countries by the year 1988, represented a compromise on all sides. The European Union was under pressure internally from Germany, which was breading ranks with the EU by advocating strong controls, and externally from the United States, which had threatened

the EU with sanctions on exports of CFCs. Japan agreed to sign on when it was agreed to treat substances as a combined "basket" rather than individually, which gave countries some flexibility in deciding how to meet the targeted reductions. Japan had earlier opposed including CFC 113, a solvent widely used in the electronics industry, in the agreement.

Some developing countries agreed to sign on after they were offered exemptions for up to 10 years and financial assistance to acquire new technologes. The larger developing countries, such as India and China, did not initially ratify the agreement, however. Although the large LDCs produced only 5% of the world's CFCs, their output was rising by 7-10% annually, and Indian producers had plans to export half their CFC production to Asia and the Middle East.

In June 1990, UNEP convened the annual meeting of the parties in London to amend the Montreal Protocol in light of new scientific evidence. The agreement was to phase out CFCs completely by 2000, and to include other chemicals not covered by the original agreement, such as carbon tetrachloride, and methyl chloroform. HCFCs were now included as well, but under U.S. pressure they would not be phased out until 2030. India and other developing countries agreed to sign on after the financial assistance fund for technology transfer was established totaling $160 million. The London amendment has now been ratified by all countries that use of produce ozone depleting chemicals in significant quantities.

Climate Change

International negotiations to limit emissions of greenhouse gases began in earnest at the first Conference of the Parties (COP I) in Berlin in Frebruary 1995. A Framework Convention had already been signed by 153 countries at the U.N. Conference on Environment and Development "Earth Summit" in Rio de Janeiro in June 1992. Despite the 1990 IPCC report indicating that emissions of greenhouse gases might have to be cut by up to 60% to prevent further climate change, the Rio agreement was little more than an expression of intent to stabilize emissions at 1990 levels by the year 2000. The U.N. forecast in 1995 that 9 of 18 major industrialized countries would miss event this target. The U.S., which had instituted a number of voluntary programs to encourage firms to cut emissions, blamed strong economic growth and low energy prices for its failure to meet the target.

A number of countries in Berlin supported a 20% cut below 1990 emissions' levels by the year 2005. The U.S., however, reversing its strong support for controls in the ozone case, played a key role in blocking any move toward a binding agreement. Environmental groups blamed the U.S. stance on industry pressure, and pointed out that the U.S. was the largest emitter of CO_2 in the world and had substantial reserves of oil and coal (exhibit 5). The U.S. delegation argued that, instead of rushing to adopt costly and arbitrary reductions goals, further economic and technical analysis was need to understand what steps were feasible. One American delegate remarked privately that "other countries are willing to make bold commitments without any idea of how to achieve them. Some of them are simply using the U.S. for cover--they don't want mandated reductions any more than we do."

Canada, a major exporter of energy, joined the U.S. in opposing specific emissions limits. Japan also joined in blocking a 20% reduction, though it was prepared to support a freeze at 1990 levels. Japan was planning to increase its use of nuclear power from 27% of

generating capacity in 1990 to more than 40% by 2010. Members of OPEC, led by Saudi Arabia and Kuwait, were among the most vociferous opponents of any restriction.

European governments were unable to present a united front. France and Germany both supported the 20% reduction, but for different reasons. France already obtained more than 60% of its electricity from nuclear plants, and was perhaps hoping that controls on fossil fuels might spur exports of its nuclear technology. Germany had a strong environmental lobby, and was also expecting substantial cuts in emissions from the closure of outdated and inefficient power plants and factories in the former East Germany. The U.K., which had led an attack on a proposed Eruopean carbon tax, had supprted the U.S. position since 1992. During 1995, the U.K. government changed course and endorsed some controls—this change occurred in the same year that the government announced its intention to shut down much of the British coal industry, which was inefficient and heavility subsidized. Four poorer members of the European Union, Spain, Portugal, Greece and Ireland, opposed specific restrictions on emissions and expressed fears that emissions controls would stifle economic growth.

Much of the developing world, which already accounted for an estimated 45% of total greenhouse gas emissions, was firmly opposed to any agreement. China, with one-third of the world's proven reserves of coal, relied on coal for around 80% of its energy needs, and was already the third largest emitter of CO_2. China planned to expand its coal production fivefold to 3 billion tons a year by 2020, which would increase global CO_2 emissions nearly 50%.[20] Brazil, Indonesia, and Malaysia are home to much of the world's tropical rain forest, whose destruction contributes a significant amount to CO_2 releases.

The strongest support for firm action came from a group of 32 countries known as the Association of Small Island States (AOSIS), which also included countries like Bangladesh with large populations in low-lying coastal areas. Despite their relatively weak bargaining position, these countries have been able to exert some moral suasion over the negotiations, due to the threat to their very existence.

Industries Affected and Business Response

Ozone Depletion

In the early 1980's, eighteen chemical companies accounted for most of the world's production of CFCs, the bulk of which was concentrated in the U.S., U.K., France, and Japan (exhibit 2). DuPont alone produced around one-quarter of world output and supplied about one-half of the U.S. market, though sales of CFCs were less than 3% of Dupont's total revenues. In the United States, which accounted for about 30% of world production, the total market value of CFCs produced in 1985 was about $750 million.[21] CFCs had four main industrial uses: as the cooling agend in refrigeration and air-conditioning, as a solvent to clean electroinics equipment, as a propellant in aerosol sprays, and as an expanding agent in insutlation and packaging materials (exhibit 3).

The CFC industry initially reacted to environmental concerns by expanding funding for a multi-year research program, which had begun in 1972 under the auspices of the Chemical Manufacturers Association. DuPont alone contributed some $4 million to this project and began research into substitutes for CFCs. During the mid-1970s, as concern about the effects of CFCs on the ozone layer grew, bills to regulate CFCs were introducted into twelve U.S. states, and congressional hearings were held to consider

banning the use of CFCs in aerosols. DuPont countered with a campaign to convince the public and Congress that further research was needed. Public pressure continued to mount, however. Facing a consumer boycott, Johnson Wax announced in 1975 that it would phase out the use of CFCs as aerosol propellants, and other large consumer products companies followed this example. By 1980, the EPA was proposing to extend federal regulations to other uses of CFCs, but these proposals were put on hold by the Reagan administration at a time when the scientific case against CFCs was being challenged. DuPont ceased its development work on substitutes.

The Alliance for Responsible CFC Policy was established in 1980 as an industry advocacy group. Under the leadershop of Kevin Fay, who was later to head the ICCP, the Alliance emphasized the scientific uncertainties around the ozone issue and the difficulty and cost of finding CFC subsitututes. The industry came under renewed pressure after the ozone hole discovery in 1985. In 1986, two Dupont scientists reviewing the evidence reached similar conclusions to those in the 1986 WMO report, which forecast serious ozone depletion in the absence of controls. The EPA called for an 85% reduction in CFC production. In September 1986, the Alliance surprised many observers by announcing that it would support international regulation of CFC production and emissions. Initially the alliance called for a cap on CFC output, but ultimately supported the 1987 Montreal Protocol's target of 50% reuction by 1998. After strong new scientific evidence emerged in late 1987 and 1988, Dupont moved quickly to announce a complete phaseout of CFCs.

Industry analysts noted that the CFC business had been stagnant and barely profitable since the late 1970s. CFCs had become a low-margin, commodity business, but the substitute HFCs and HCFCs promised to be high-price, high-margin products with little competition. Moreover, strong unilateral U.S. controls on CFCs might have put U.S. producers at a disadvantage relative to European competitors.[22]

Industries that used CFCs were initially relectuant to switch to substitutes; they were more expnsive, and would entail significant investments in new production processes. The American Electronics Association testified to Congress in March 1987 that "The electronics industry has a keen interest both in the continued availability of this indispensable solvent and in its safe use…the issue has profound and troubling implications for the U.S. high-tech industry's international competitiveness and for international trade."[23] Nevertheless, the industry moved quickly to develop water-based cleaning techniques, and discovered that they were actually cheaper than using CFC solvents. Northern Telecom committed to phase out all ozone-depleting substances within three years, and estimated the switch would require an investment of $1 million and save the company $4 million over three years.

The automobile industry was much slower to respond to the phaseout of CFCs. The industry tended to require long lead times for product line changes, and had a history of trying to delay environmental regulations. Manufactures argued that using HFCs would require bigger, heavier, and more expensive air-conditioning designs, and that this would hurt fuel economy. They also argued that the cost of retrofitting 140 million cars by 1997 to use non-CFC-cooled air conditioning could range from $70 billion to $140 billion. Despite these dire predictions, Nissan introduced an air-conditioning unit based on a new parallel condenser technology that was the same size and weight as CFC-cooled units. Other companies quickly adopted similar technologes, and by 1995 almost all new cars were fitted with non-CFC units.[24]

Policy analysts attributed the relatively smooth phaseout of CFCs in the U.S. to the approach taken to implementing the treaty.[25] The EPA implemented a marketable permit system that allowed companies flexibility while cutting cost of reporting and record keeping. A stiff tax was also imposed on CFCs. These market instruments, combined with the firm phaseout date, sent a powerful message to CFC producers and users. To spur research on substitutes, the EPA acted as a catalyst in setting up a number of industry panels to study all the major uses of CFCs and investigate alternative technologies.

Greenhouse Gases

Companies that extract and process fossil fuels such as coal and oil would obviously suffer from any effort to limit their use. The largest emitters of CO_2 are the electric utilites and the transportation sector (exhibit 6). A much broader range of industries relies on energy inputs, and the more energy-intensive ones, such as steel, aluminum, cement, and chemicals would be particulary hard hit by higher energy prices. Yet another group of industries could potentially be affected by changes in climate; agriculture and forestry are sensitive to temperature and rainfall, and some in the insurance industry were beginning to express concern at the potentially enormous losses from flooding, drought, and hurricanes. Frank Nutter, the president of the Reinsurance Association of America, was quoted saying that climate change "could bankrupt the industry."[26]

U.S. power plants account for about 36% of U.S. emissions of CO_2, and the demand for this energy is split roughly equally among residential, commercial, and industrial uses (exhibit 8). Each kilowatt-hour (kWh) of coal-derived electricity put more than 2 pounds of CO_2 into the air; the corresponding figure for oil is 1.7 pounds, and 1.3 pounds for natural gas (exhibit 9).[27] U.S. demand for electricity is forecast to nearly double by 2025, and demand in less developed countries (LDCs) is expected to increase even faster; the average American consumes about 11,000 kWh, compared to 700 kWh in Asia and 400 kWh in China.

Given this rapid growth in demand for energy, the current United Nations goal of stabilizing CO_2 emissions at 1990 levels appears to be a daunting task. It would entail a substantial swith to gas, nuclear, or renewable sources of power such as solar or wind, and this is still the cheapest from of power. Nuclear power has become a very expensive alternative due to safety requirements, decommissioning costs, and the time required to liscence and construct a plant.

Renewable energy sources currently supply about 20% of the world's elecricty, mostly from hydropower. There is limted scope for expanding hydropower, partly due to environmental concerns about the impact of large dams. Wind power is now competitive in certain locations, at around 6 cents per KW, but photovoltaic cells, which convert the sun's energy directly into electricity, are still very expensive at about 30 cents per KWh—and that is when the sun is shining. Photovoltaics are finding applications in rural areas in developing countries, as they have low distribution costs and require relatively little maintenance. Solar thermal energy, which forces the sun's energy to boil a liquid and drive a turbine, is more competitive at around 10 cents per kWh, and several small plants have been installed in California. In recent years, utilities have found that conservation—termed "demand management" by the industry—is the cheapest and cleanest way to free capacity to meet demand; investing in insulation and energy efficient lighting, for example, saves electricity at an estimated cost of 3 cent per kWh.

With a few exceptions, the large coal, oil, and utility companies that dominate the energy industry have not invested very mush in renewable energy sources. Companies developing wind and solar power technologies tend to be small and undercapitalized. Luz International, the only commercial company supplying solar thermal plants, filed for bankruptcy in 1991. The U.S. government encouraged renewable energy with tax credits during the Carter administration, but under presidents Reagan and Bush the Department of energy have very low priority to renewables: the lion's share of federal resources has gone to fusion research, even though commercial application is not expect for 40 years or more.

The have been various proposals for a tax on fossil fuels to promote energy efficiency and a swith to renewable sources. Some economist have argued that a carbon-tax based on the CO_2 emitted per unit of energy would provide the lowest cost route to cutting emissions; the tax revenues could be used to fund research into alternative energy sources and to reduce income taxes. Estimates of the cost to the economy of curbing greenhouse gas emissions vary widely. According to *The Economist*, "One of the certainties about global warming is that the cost of severely curbing emission of greenhouse gases now would be huge."[28] By contrast, the U.S. Office of Technology Assessment has estimated that taxes and controls on greenhouse gases could yield a reduction of more than 20% in emissions by 2015, and that savings from conservation and new technooges would more than offset the cost.[29]

One economic study indicates that a carbon tax of $120 per ton would stabilize CO_2 emissions at 1990 levels, at a cost to the U.S. economy of $150 billion a year.[30] This cost represents about 2%of the U.S. GNP—but would not necessarily slow the economy's *rate* of growth. Other economists have pointed out that energy is already taxed in arbitrary ways; the implicit tax on oil ranges from $65 per tone of carbon in the U.S. to more than $300 in France and Italy, while coal is actually subsidized to the tune of $40 a ton of carbon in Germany and the U.K.[31]

With the experience of the ban on CFCs fresh in their minds, a number of industry groups began to organize to protect their member's interests. A proposal in 1991 for a combination energy/carbon tax in the European Union, which would have increased electricity prices by about 20%, was defeated after strong lobbying by European industry associations representing utilities, oil companies, chemicals, and industrial energy users.[32] A modest fuel tax proposed by the Clinton administration in 1992 was quickly dropped in the face of pressure from the automobile and oil industries. The American Petroleum Institute paid $1.8 million in 1993 alone to the public relations frim of Burson-Marsteller, partly to help defeat the Clinton fuel tax. An association of U.S. utilites ran a series of advertisements in 1992 debunking global warming theory, but touting its benefits if it did occur: "Winter nights are warming and summer days appear to be cooling, promoting greater crop yields and more robust forests. CO_2 fertilization of the atmosphere helps produce more food for people and wildlife. Wildlife can flourish in more abundant habitat."

The Global Climate Coalition, which represented more than 50 companies and trade associations in the oil and coal, utility, chemicals, and auto industries, was the largest industry group working on this issue and was active at the international treaty negotiations in Berlin in February 1995. It spent nearly $1 million a year to convince policymakers that proposals to limit CO_2 emissions "are premature and are not justified by the state of scientific knowledge or the economic risks they create."[33] Don Pearlman's

Climate Council, which worked closely with oil exporting countries such as Kuwait and Saudi Arabia as well as with some oil and coal companies, was also active in trying to forestall any international treaty with mandatory reductions in CO_2 emissions.

The Business Council for a Sustainable Energy Future repsresented businesses active in natural gas, electric power, energy effieicney, and renewable energy—sectors that stood to benefit from ctonrals on carbon emissions. Although the BCSEF was much smaller than GCC, it claimed success in demonstrating at Berlin that business was not united against an emissions treaty. The BCSEF supported proposals to curb CO_2 emisson, especially measures that would offer financial incentives for low-carbon alternatives and for the transfer of new technologies to LDCs. Trade associations representing U.S. gas, solar, and energy services industries have estimated that more than 200,000 jobs could be created if energy taxes and subsidies are used to promote growth in these sectors.[34]

Other industries potenailly affected by climate change have adopted a wait-and-see attitude. The insurance industry, concerned at payouts for natural disasters that have jumped from an average of $3 billion a year in the 1980's to $10 billion a year in the 1990's, has begun to monitor the issue closely, but has not yet been active in international negotiations.[35] Agriculture and forestry in some areas could be hurt by changing temperature and rainfall—some models predict that the U.S. Great Plains could be hit by severe droughts. Higher CO_2 levels and greater rainfall in other regions could enhance crop and tree growth. Companies in these industries have been studying the drought tolerance of various seeds, but have not yet entered the policy debates. Cynthia Rosenzweig, a Columbia University agronomist and co-author of a major study, concluded that "the overall outlook for climate change is not catastrophic."[36] Consumer prices for food would rise somewhat, and income in the agricutltural sector n the U.S. could actually rise 1-2% due to higher prices and inelastic demand. The outlook of the rest of the world, where people spend more of their incomes on food and are more dependent on local crops, was less optimistic.

The ICCP was formed by a group of industrial companies which had been involved in the CFC issue, and were now concerned that HFCs, some of which werw potent greenhouse gases, would also be regulated in a climate change treaty. These companies soon discovered, however, that they had a broad range of interests that could potentially be affected by efforts to limited greenhouse gas emissions. Some companies manufactured insulation and could benefit from increased incentive for energy efficiency. AT&T was promoting "tele-commuting" as an approach to reducing emissions from transportation. Enron had substantial interests in conventional power generation, but had recently invested in a joint venture with Amoco to produce photovoltaic panels. General Electric's gas turbine business could benefit from a switch away from coal, but its appliance and aircraft divisions could be hurt by emissions controls.

The ICCP stressed the need for more voluntary programs that would encourage companies to identify profitable opportunities to reduce emissions. If voluntary measures proved inadequate, the ICCP expressed a preference for market-based measures rather than command and control mandates. The ICCP wanted to ensure that any treaty to reduce emissions would be based on a detailed analysis of technological and economic feasibility, and would have a long timetable; this would give industry the time to design new products and processes, and prevent premature obsolescence of capital.

The Role of Environmental Groups

By the early 1980s, it was estimate that about 13,000 environmental non-governmental organizations (NGOs) existed in industrialized countries, and another 2,000 or so in LDCs. Most were only national in scope with a narrow focus, but a growing number were taking an interest in international issues. Among these were activist organizations such as Greenpeace, and others that focused more on research, such as the Worldwatch Institute. The World Wildlife Fund had 23 national organizations with 3 million members in 1990, while Greenpeace, a loose global confederation, had more than 3 million members in 20 countries. The European Environmental Bureau was a confederation of 120 national environmental organizations with a combined membership of 20 million. Despite these impressive membership numbers, environmental groups did not appear to have much political influence. Only in Germany were environmentalists formally organized into political parties with significant strength. The green vote, comprising between eight and fourteen percent of the electorate, sometimes played a crucial swing role in the country's regional politics.

In the U.S., environmental NGOs had been especially successful at increasing consumer awareness of the dangers of CFCs. The British group, Friends of the Earth, also undertook a large public relations campaign against aerosols. It was largely pressure from cosumer and enviornmetnal groups that lead Johnson Wax and other companies to phase out their CFC use in aerosol sprays and foam packaging.

To work on the climate change issue, envionrmental NGOs from 22 countries formed a coalition called the Climate Action Network (CAN). This umbrella organization had a strong presence at the Berlin conference, holding press conferences and publishing a daily newsletter. CAN was quite well organized despite a relative lack of resources, and engendered respect among the UNEP staff for its independence. As Chris Flavin of the Worldwatch Institute put it, "the NGOs ran circles around the Global Climate Coalition." Influencing the national delegations was another matter, however. Environmental groups had not been very successful at galvanizing public opinion around this issue, and in the U.S. people seemed to be more focused on the domestic issues such as the deficit. One environmentalist at Berlin complained that "the U.S. delegation is free to stall these negotiations without any worry about domestic repercussions."

After Berlin

The Berlin talks concluded with an agreement to negotiatie a climate change protocol by 1997, though there was still great uncertainty concerning targets and timetables, and it was not clear how binding any protocol might be. The final deal in Berlin was "just enough to keep the climate treaty process from collapsing", according to the Climate Action Network.[37] Chris Flavin of the Worldwatch Institute, on a more optimistic note, thought that the agreement to negotiate a protocol by 1997 future was "about the best that could be realistically expected at this time."

Despite the lack of agreement on specifics, a number of options had been explored in Berlin that could prove useful in moving the negotiations forward. One approach would involve granting CO_2 emission permits to each country, which in turn would assign permits to major CO_2 emitters such as coal-powered power plants. These permits would then be tradeable, encouraging companies to seek efficient ways to cut back on emissions.[38] Another idea that aroused considerable interest in Berlin is termed "joint

implementation". This would allow companies (and countries) to continue activities performed in other countries toward their goal of emissions reductions: for example, an American utility would be able to claim credit for a reforestation project, or for selling technology for more efficient electricity generation to a developing country.

Kevin Fay, director of the ICCP, need to formunate a response to the IPCC scientific report that had just been released. In the past, business groups had tended to downplay any eveidence of global warming and had empahsiszed the need for more research before any action was taken. Kevin, along with most other business groups, still thought that the 1997 target for a treaty would not allow sufficient time for conducting detailed technical and economic assessments on a sector by sector basis. He feared that the imposition of severe curbs on emissions without having alternatives in place could lead to market chaos and significant disruption to the ICCP's members' businesses.

Kevin also knew that if business continued to drag its feet, it risked being sidelined in the treaty process. He wondered whether it might be time to change course; acknowledging that climate change was indeed a potential problem might give his group more credibility and influence in the negotiating process. The next round of talks was to be held in Geneva in the summer of 1996, and he knew tht political momentum for a treaty was mounting. It would not be easy, however, to find common ground among the ICCP's diverse member companies. It would be even harder to present a unified front with the other industry groups, such as GCC and the BCSEF. While these divisions might weaken the influence of business at the negotiations, Kevin thought it important that the negotitors would see his group as the moderate voice of industry, with the resources and expertise to help find solutions to the greenhouse problem. He needed to make sure that the ICCP had a "seat at the table" in the process.

Exhibit 1

Timeline of Key Events

Ozone Depletion:

1972 Chemical Manufacturers Association begins research into effects of CFC gases.
1974 Molina and Rowland publish paper linking CFC gases to ozone depletion.
1975 Johnson Wax announces it will stop using CFCs as a propellant in aerosols.
1977 U.S. bans CFCs in aerosols except for "essential" uses.
UNEP convenes conference on ozone depletion.
1980 Negotiations begin on a framework convention.
Alliance for Responsible CFC Policy is founded.
1985 March - Vienna Convention on Protection of the Ozone Layer is signed. It requires further research and cooperation but no mandatory reductions in CFC emissions.
June - British scientists publish their discovery of a large hole in the ozone layer.
1986 Jan. - WMO releases report predicting substantial ozone losses.
1986 Sept. - The Alliance announces support for international regulation of CFCs.
1987 Sept. - Montreal Protocol on Substances that Deplete the Ozone Layer is signed. It mandates 50% reduction in production of CFCs.
Oct. - NASA expedition establishes causal link between CFCs and ozone depletion.
1988 March - UNEP's Ozone Trends Panel recommends total phaseout of CFCs. Dupont endorses call for total phaseout.
1990 London conference amends and strengthens Montreal protocol.
1995 Molina and Rowland win Nobel prize in chemistry.

Climate Change:

1977 National Academy of Sciences report discusses CO_2 and the "climate problem".
1979 WMO and UNEP sponsor the first World Climate Conference.
1988 Toronto conference calls for a 20% cut in emissions by 2005.
U.S. EPA issues a report identifying the need for a broad range of regulatory and fiscal measures to stabilize/reduce emissions.
1990 Second World Climate Conference.
IPCC releases first scientific assessment report.
1991 Negotiations begin on a climate convention.
1992 June - Framework Convention on Climate Change signed at Earth Summit in Rio. No mandatory limits on emissions, but parties agree to negotiate a protocol.
1995 Feb. - First Conference of the Parties (COP 1) held in Berlin.
1995 Dec. - IPCC releases second assessment report, which concludes that some global warming is already under way.
1996 Jan. - *New York Times* reports that 1995 was warmest year on record. *Newsweek* runs cover story linking east coast blizzard to global warming.
1996 July - Second Conference of the Parties scheduled to meet in Geneva.
1997 Target for Third Conference of the Parties and adoption of a protocol with "targets and timetables" for emissions reductions.

Exhibit 2.
Global CFC Use by Category, 1985

Use	Share of Total
Aerosols	25%
Refrigerants	20%
Insulation	19%
Solvents	19%
Flexible foam	7%
Other	10%

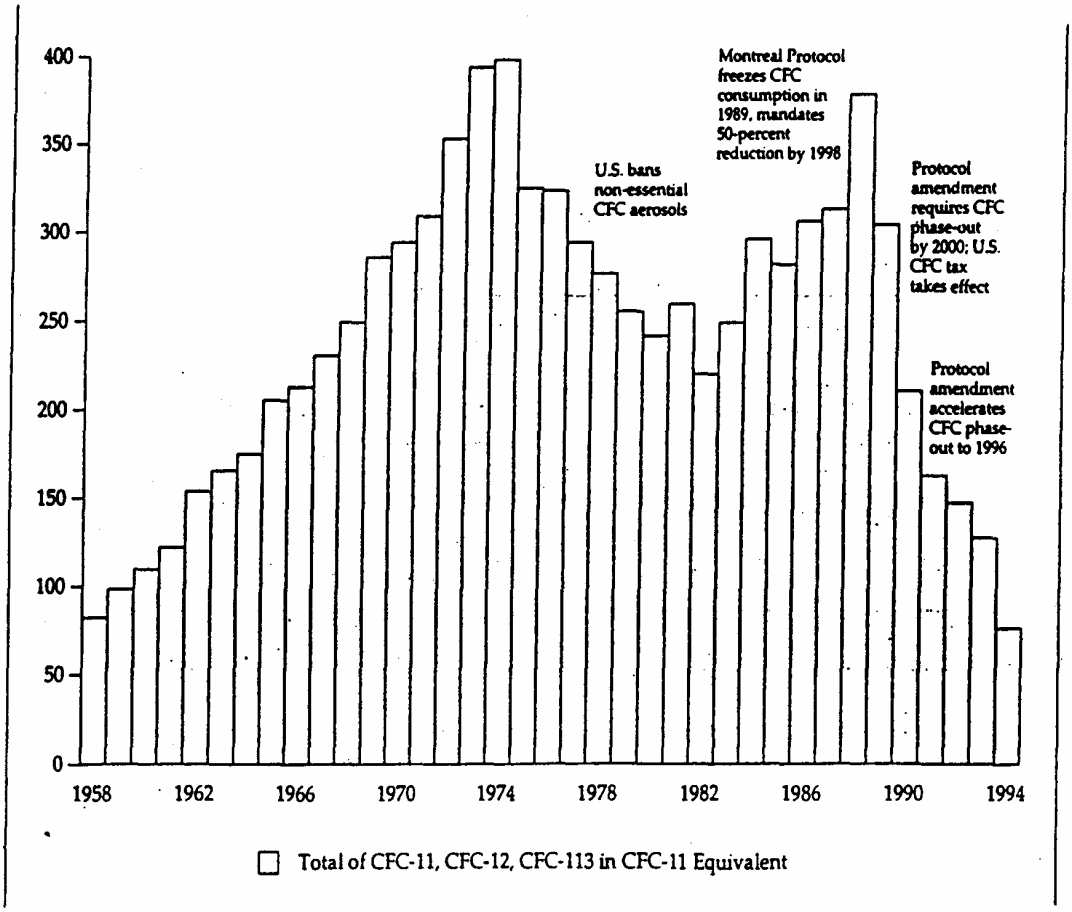
Source: adapted from Koeler et al. (1987) *Projections of Consumption of Products Using CFCs* (Santa Monica, CA: Rand Corp.)

Exhibit 3.
World Market Share in CFCs of Major Producing Countries

Country	1974	1986
EC	40%	44
U.S.	50%	30
Japan	N/A	12
Soviet Un.	N/A	9

Source: adapted from R. Benedick (1991) "Protecting the Ozone Layer", in J.T. Matthews (ed.) *Preserving the Global Environment* (New York: Norton)

Exhibit 4. U.S. Production of Major CFCs and Policy Developments (thousand metric tons)



Source: Elizabeth Cook "Marking a Milestone in Ozone Protection: Learning from the CFC Phaseout", *WRI Issues and Ideas*, Jan. 1996 (Washington DC: World Resources Institute)

Exhibit 5.

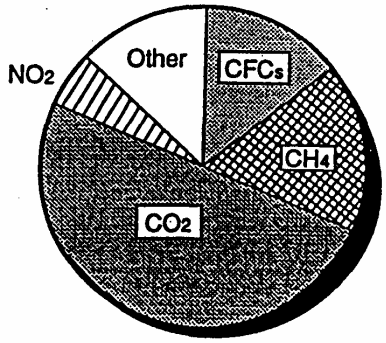
Carbon Emissions from Fossil Fuel Burning
Selected Countries, 1994

Country	Total Emissions (million tons)	Emissions per person (tons)	Emissions per $ GNP (tons/m.$)	Emissions Growth 1990-94 (percent)
United States	1,371	5.26	210	4.4
China	835	0.71	330	13.0
Russia	455	3.08	590	-24.1
Japan	299	2.39	110	0.1
Germany	234	2.89	140	-9.9
India	222	0.24	160	23.5
U.K.	153	2.62	150	-0.3
France	90	1.56	80	-3.2
Poland	89	2.31	460	-4.5
S. Korea	88	1.98	200	43.7
Mexico	88	0.96	140	7.1
S. Africa	85	2.07	680	9.1

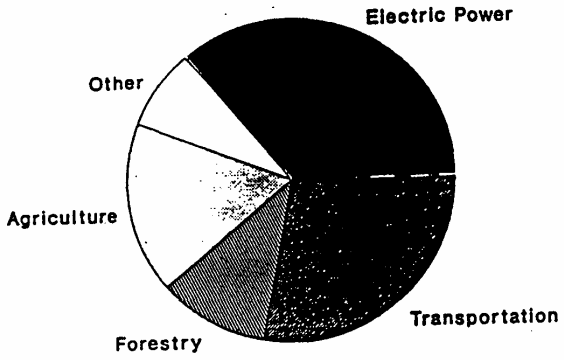
Source: adapted from Lester Brown et al. (1996) *State of the World 1996*, p. 30 (Norton/Worldwatch Institute)

Exhibit 6. Sources of Greenhouse Warming, by Gas and Economic Activity

Relative Contribution to Global Warming, by Gas



Relative Contribution to Global Warming by Economic Activity

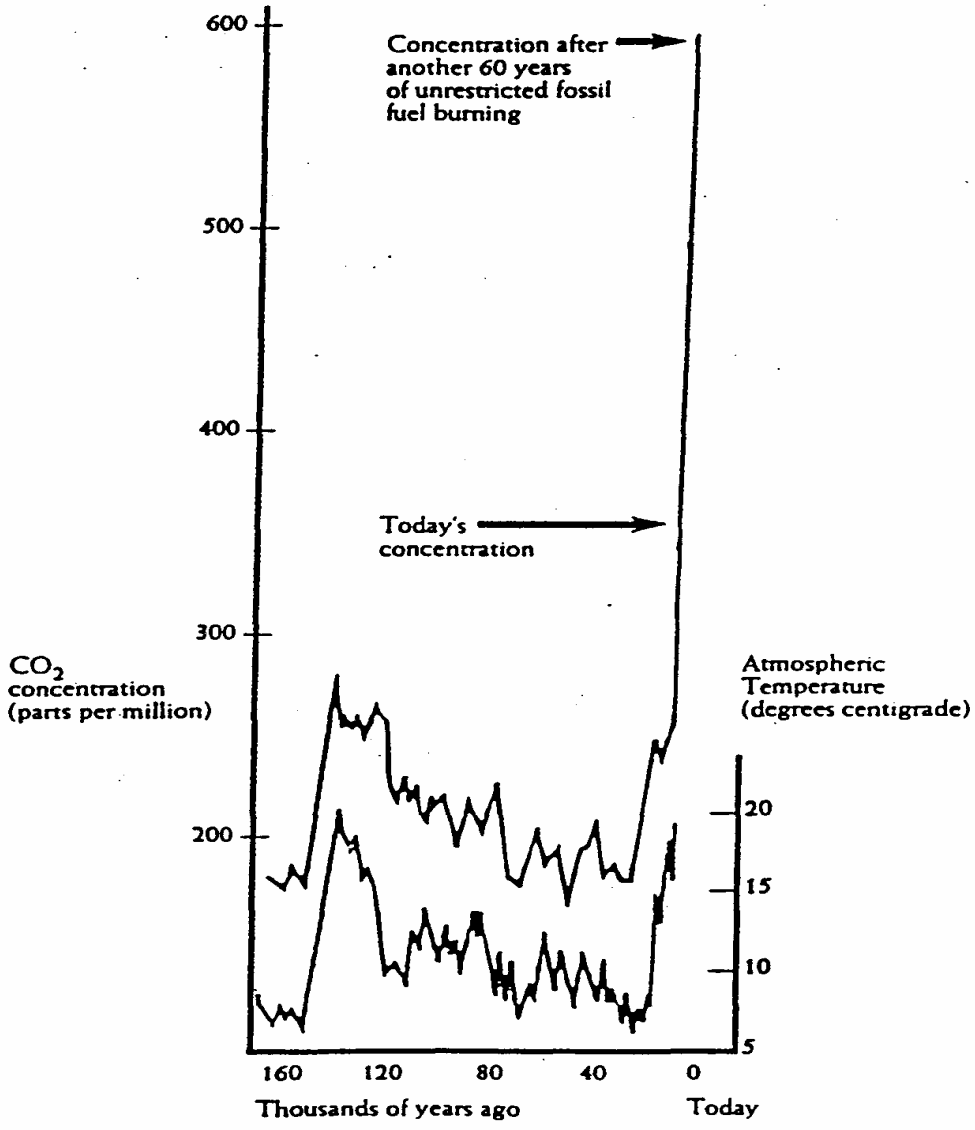


Carbon Dioxide ($C0_2$): from burning fossil fuels and deforestation
Chlorofluorocarbons (CFCs): used as coolant, solvent, aerating agent, propellant
Methane (CH_4): from cattle, rice paddies, decomposing organic matter
Nitrous Oxide (NO_2): from coal burning and breakdown of chemical fertilizers

Relative global warming potential reflects both the amount of each gas emitted and its heat-trapping potential. For example, CFCs have a relatively large contribution to global warming despite low emission levels because they trap thousands of times more heat than $C0_2$ and remain in the atmosphere much longer.

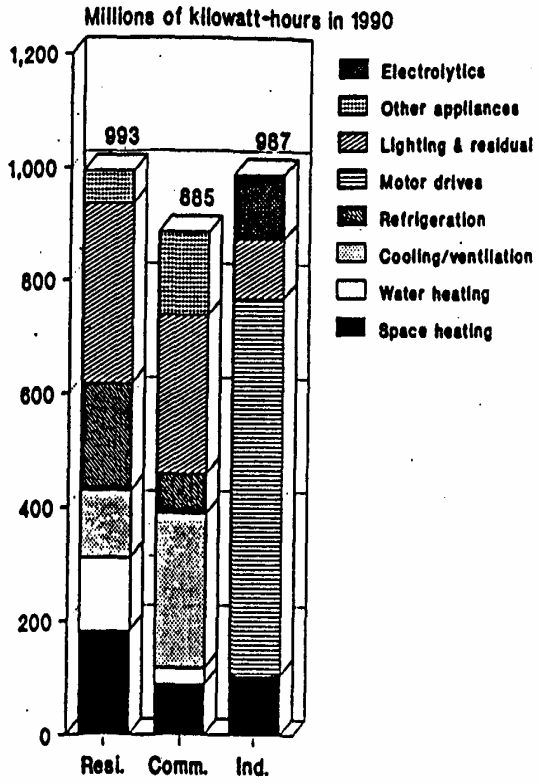
Source: adapted from World Resources 1994-95 and other sources.

Exhibit 7. Global Average Temperature and Carbon Dioxide Concentration 158,000 B.C. - 1994 A.D.



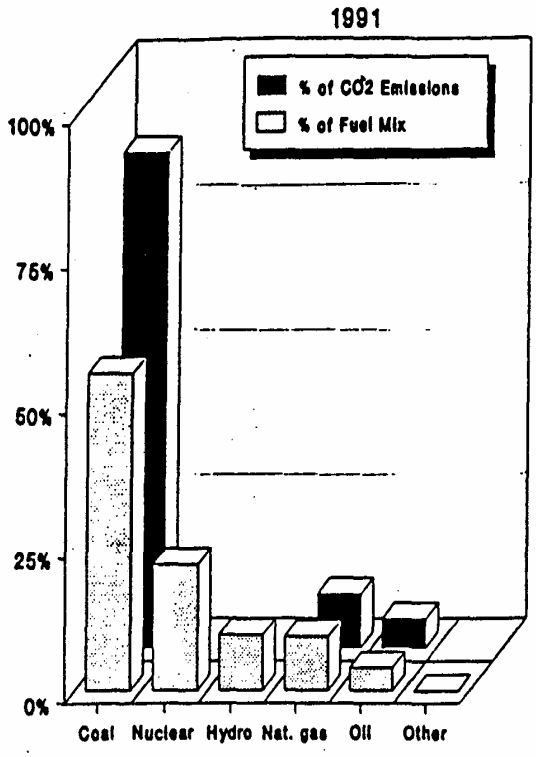
Source: Christopher Flavin, "Storm Warnings", *World Watch* Nov/Dec. 1994

Exhibit 8. Demand For Electricity by End Use



SOURCE: Electric Power Research Institute, 1991.

Exhibit 9. U.S. Electricity Fuel Mix and Related CO_2 Emissions



SOURCE: U.S. Department of Energy and Investor Responsibility Research Cente

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