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CLIMATE OF OPPORTUNITY:
Renewable Energy After Kyoto

by Christopher Flavin and Seth Dunn

International negotiations to protect the global climate could open huge markets for carbon-free energy. But U.S. renewable energy firms may miss out, unless they and their allies act now to shape American climate policy.

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A Message from the Staff of the Renewable Energy Policy Project

In the long term, protecting the global climate will require greater use of solar, wind, geothermal, biomass, and small hydropower, which emit no net greenhouse gases. Yet renewable energy firms in the U.S. must actively help shape climate policy to ensure that they benefit. If they do not, U.S. climate policy in the near term will exploit other, non-energy opportunities, and the European and Japanese firms will dominate the long-term global market for clean energy.

In the U.S., an active climate policy might not necessarily benefit renewables, at least in the next decade. To comply with commitments for the year 2012 made by the Clinton Administration in Kyoto, American polluters could rely largely — up to 85% — on deals to control emissions in other countries (for example, by planting trees in Central America) rather than controlling emissions at home. Proponents claim that a trading system could slash emissions more expeditiously after 2012. Opponents, especially in the European Union, retort that it would leave untouched the rich world's own polluting habits.

Yet the debate over how best to achieve the climate goals of the Kyoto Protocol assumes that the U.S. Congress will ratify the treaty. The Clinton Administration has proposed a $6.3-million Climate Change Technology Initiative which includes, among other elements, tax credits for purchasers of certain renewable technologies, and accelerated research and development. However, Congress has not only challenged the plan, it has attacked existing government renewable energy programs.

In short, a tangle of obstacles now confronts the U.S. renewable energy industry. A cluster of industries and labor unions perceive themselves threatened by a switch to low-carbon energy sources. Many politicians oppose the Administration's cautious climate proposals, due both to real concern for the economy and a desire for partisan advantage. This vocal alliance could sabotage even distant prospects for sustainable energy. Meanwhile, the Administration seeks to demonstrate that climate protection will cost very little and hurt not at all, raising the prospect of short-term climate action based on cheap emission credits gained elsewhere — at the expense of building a strong, market-based, zero-emission renewable energy industry. And, as American firms struggle merely to survive, the nation's commercial competitors in Europe and Asia work to ensure the dominance of their renewable energy industries.

A climate-driven market is not a done deal for the U.S. renewable energy industry. To succeed, renewable energy firms must present themselves as the industry of the future, and a potential economic force. They must explain to the Administration and to Congress the threat of losing another growth industry pioneered by American entrepreneurs. And they must explain to unions that more renewable energy means more family-wage jobs. Above all, they must participate in the policy process.

As the scientific consensus around the greenhouse effect solidifies, and atmospheric change enters household discussion, the world will act to protect the climate. Established companies will win the ensuing battle to supply clean energy, and weakened U.S. firms may not benefit. It is up to the industry to explain to America *now* that deferring the "tough medicine" means abandoning its economic benefits.

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July 8, 1998

Executive Summary

The Kyoto Protocol to the United Nations Framework Convention on Climate Change, agreed to in December 1997, marks an important turning point in efforts to promote the use of renewable energy worldwide. Since the original Framework Convention was signed at the Earth Summit in Rio de Janeiro in 1992, climate change has spurred many countries to step up their support of renewable energy. Even more ambitious efforts to promote renewables can be expected as a result of the Kyoto pact, which includes legally binding emissions limits for industrial countries and, for the first time, specifically identifies promotion of renewable energy as a key strategy for reducing greenhouse gas emissions.

This report examines the opportunities for renewable energy presented by the Kyoto Protocol and its subsequent implementation at both national and international levels. It suggests ways in which renewable energy business leaders and advocates can use the protocol as a means of accelerating the development of renewable energy policies and markets. We conclude that climate change will be increasingly central to the evolution of renewable energy technologies worldwide, and that it will accelerate the globalization of renewable energy markets that is already under way. Those who advocate or invest in renewable energy can no longer afford to ignore climate change.

The climate policy process is highly complex and fragmented, which means that efforts to monitor developments — let alone participate in them — must be carefully designed and judiciously managed. Stakeholders who follow the evolution of future climate policy most closely, and who respond efficiently and adeptly, will be best positioned to take advantage of the market opportunities that open up as the new century begins.

We believe that renewable energy advocates will find that the Kyoto climate conference and its accompanying global media coverage have created a favorable climate for renewable energy development. In the past year, multinational corporations such as British Petroleum, Royal Dutch Shell, and Tomen Corporation have announced major new investments in solar energy and wind power, which is likely to accelerate growth in these industries.

Implementation of the Kyoto Protocol faces many uncertainties in the years ahead, however. Wide disagreements among key governments were papered over in the protocol, and will have to be worked out before the U.S. Senate and other national legislative bodies will ratify it. Meanwhile, a backlash against the protocol has been felt from some U.S. industries and the Senate, forming sharp battlelines with the Clinton administration and its efforts to implement policy reforms in the United States. The protocol is to be further elaborated at the Fourth Conference of the Parties in Buenos Aires in November 1998, but the process of working out detailed issues of verification, enforcement, trading, and future developing-country commitments is likely to continue for several years, and will require careful monitoring.

On the financing front, the Global Environment Facility and the World Bank are working on new climate plans. In addition, a Clean Development Mechanism to channel funds into developing-country projects is authorized in the protocol, and will be set up in the coming years. These efforts could substantially increase financial support for renewable energy projects in developing countries as well as the Eastern bloc.

At the national level, the United States and several European governments have already proposed ambitious post-Kyoto renewable energy initiatives, some of which may go into force well before the protocol is ratified. This paper describes these proposed policies, and examines their political prospects and economic potential.

Much as the scientific uncertainties actually *strengthen* the case for stronger action on climate change, the uncertain political climate for renewables in the U.S. makes it all the more critical that its proponents be heard. This report identifies concrete ways in which U.S. renewable energy industries and advocates can take advantage of the Kyoto Protocol and influence the ongoing climate policy process by working with various business and nongovernmental organizations. The final section provides detailed recommendations for those who want to become more actively involved in the climate process or to make use of the national and international supports being developed. In addition, an Appendix provides a list of key contacts.

As powerful symbols of worldwide efforts to slow the inexorable buildup of carbon dioxide, renewable energy technologies are well positioned to benefit from the global effort to combat climate change that is now gathering force. Renewable energy promoters — companies, policymakers, and advocates — hoping to ride the approaching wave of post-Kyoto policies would do well to "Think **B-I-G**":

- **Be actively involved** in implementing and strengthening national programs aimed at accelerating "decarbonization" of the energy system; do not allow "sunset" industries, such as coal and oil, to set the terms of this debate.
- **Influence the design** of new international policies and institutions under the Framework Convention so as to enhance their effectiveness in promoting renewable energy.
- **Get ready** for potentially explosive growth of renewable energy markets in several regions in the next few years, including southern Europe, China, and Latin America.

CLIMATE OF OPPORTUNITY: Renewable Energy After Kyoto

by Christopher Flavin and Seth Dunn[1]

PART I: PRELUDE TO KYOTO

Well before the Third Conference of the Parties to the United Nations Framework Convention on Climate Change (UN FCCC) in Kyoto, Japan, in December 1997, concern over climate change had begun to shape renewable energy markets. During the 1970s and 1980s, energy security, air pollution, acid rain, and nuclear fears were the dominant catalysts for renewable energy development; during the 1990s, the need to reduce emissions of greenhouse gases has become an increasingly important impetus. With oil prices at their lowest levels in decades, climate change has become a key policy driver for renewable energy.

The connections between climate policies and renewable energy markets are best seen in Europe. With strong public backing, parliaments in several European countries responded — even before the signing of the climate treaty in Rio de Janeiro in 1992 — with a host of important new policy initiatives. In Germany, a generous "electricity feed law" passed in 1991 allowed renewable electricity generators to receive 17 pfennigs (10¢) for each kilowatt-hour generated. A similar law was passed in Denmark, bolstered by strong and consistent tax incentives. In Spain, an electricity feed law and other new incentives were introduced in the mid-1990s.[2]

In response to these policy changes, Germany's wind power installations went from less than 100 megawatts in 1990 to nearly 2,100 megawatts in 1997, making it the world's leading wind power user.[3] Wind installations in Denmark grew from 400 megawatts in 1990 to 1,100 megawatts in 1997, providing 7% of the nation's electricity and making wind turbines its second largest export.[4] Spain tripled its wind power capacity in 1996–97.[5] Biomass energy development has also benefited from the new pro-renewable energy policies in Europe, particularly in the form of electric power and district heat systems fueled by agricultural and forestry wastes.

The Japanese government, driven by a push for dominance of the solar industry as well as by concern about climate change, quickly built up its solar photovoltaic (PV) market in the 1990s. The government's focus is on its solar home program, which includes a strong net-metering law as well as a generous government subsidy (although that is now being gradually reduced). PV systems were installed on 9,400 homes in 1997, and the program's goal is 70,000 homes by 2000.[6]

In the United States, Canada, and Australia, governments have been less responsive to climate change issues, and have done less to open new renewable energy business opportunities in the 1990s. Modest policies such as the U.S. renewable electricity generation tax incentive of 1992 have been negated by the early stages of electric industry restructuring and the associated financial confusion and defensive postures adopted by many utility companies. The U.S. domestic market now represents less than 10% of the global market in solar power and less than 5% of the worldwide wind energy market, though it does hold almost a third of the world's installed geothermal electricity capacity.[7]

In developing countries such as China and India, renewable energy markets have also begun to stir, though they are motivated more by a search for economical alternatives to fossil fuels than by a desire to reduce pollution. These efforts have been assisted, however, by climate-motivated international financing mechanisms such as the Global Environment Facility (GEF), which is providing limited but essential funds for innovative renewable energy projects in developing countries.

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[2] Andreas Wagner, *Feed-In Tariffs for Renewable Energies in Europe — An Overview* (Bonn: European Association for Solar Energy, September 1997).

[3] Andreas Wagner, Bundesverband WindEnergie e.V., Bonn, Germany, letter to author (Flavin), 21 January 1998.

[4] Preben Maegaard, Folkcenter for Renewable Energy, Hurup Thy, Denmark, discussion with Flavin, Tokyo, 3 November 1997.

[5] Worldwatch estimate based on Birger Madsen, BTM Consult, Ringkobing, Denmark, letter to author (Flavin), 10 February 1998.

[6] "Government Boosts Incentives for Solar Power," *COMLINE Daily News Tokyo Financial Wire*, 20 November 1997.

[7] Worldwatch estimate based on Paul Maycock, *PV News*, various issues, and on Madsen, op. cit. note 5. Geothermal estimate based on U.S. DOE, Office of Geothermal Technologies, *Strategic Plan for the Geothermal Energy Program*, June 1998, Of approximately 8,000 MWe installed worldwide, 2,800 MWe are located in the U.S. Visit <http://www.eren.doe.gov/geothermal/> or call 202-586-5340 for more information.

These developments have made wind power the world's fastest-growing energy source — expanding at an annual rate of 25.7% between 1990 and 1997.[8] (See Table 1.) The vast majority of that growth has occurred in Europe. Solar power, meanwhile, has grown at 16.8% a year this decade.[9] This explosive, environmentally motivated growth in the wind and solar industries has not been replicated in biomass and geothermal energy — at least so far. Biomass heating and electricity generation are growing rapidly in several Nordic countries, but they have stagnated elsewhere. Geothermal energy growth since the 1973 oil shock has been impressive, growing from 1000 MWp in 1973 to 8000 MWp in 1997. However, growth did slow in the early 1990s, as the least-expensive, most easily exploited geothermal resources are found in countries that have not yet taken climate change seriously, although there are significant exceptions.[10]

Table 1: Global Trends in Energy Use by Source, 1990–97

Energy Source	Annual Rate of Growth
Wind power	25.7
Solar power	16.8
Geothermal power*	3.0
Natural gas	2.1
Hydroelectric power*	1.6
Oil	1.4
Coal	1.2
Nuclear power	0.6

*Data available through 1996 only.
Source: Worldwatch Institute.

Renewable energy markets have begun to attract the interest of large energy companies in the last couple of years, at least some of it motivated by growing awareness of the climate issue. Enron Corp — which in 1996 acquired the leading U.S. wind power company, Zond — announced in 1997 its purchase of the German company Tacke, a wind turbine manufacturer.[11] The Japanese trading corporation Tomen, meanwhile, unveiled plans to invest $1.2 billion in wind projects.[12] Also in 1997, British Petroleum announced its intention to increase sales of solar products tenfold over the next decade, while Royal Dutch Shell made a $500-million, five-year commitment to renewables.[13] These recent announcements virtually guarantee that the next few years will be a dynamic period for international renewable energy markets. But the rate of growth is likely to be affected by a number of uncertainties, including the pace of implementation of the Kyoto Protocol. And numerous important issues regarding key components of the protocol remain to be resolved, some of which will get addressed at the Fourth Conference of the Parties, in Buenos Aires in November 1998.

PART II: THE KYOTO PROTOCOL IN BRIEF

Delegates from more than 160 nations met for 12 days at the Third Conference of the Parties to the U.N. Framework Convention on Climate Change.[14] In total, an estimated 10,000 government, nongovernmental, industry, and media representatives attended the December 1997 meeting, the aim of which was to begin reversing the overall upward trend in global greenhouse gas emissions.

[8] Worldwatch estimate based on Madsen, op. cit. note 5, and on BTM Consult, *International Wind Energy Development: World Market Update 1996* (Ringkobing, Denmark: March 1997).

[9] Worldwatch estimate based on Maycock, op. cit. note 7.

[10] Abundant geothermal resources exist along the Pacific Rim and in Eastern Europe, in addition to other regions. While many nations have not developed their capacity, there are notable exceptions, including the El Hoyo-Galan Geothermal Project in Nicaragua. This project is a part of the U.S. Initiative on Joint Implementation and is expected to reduce almost 20 million tons of carbon dioxide emissions in its lifetime. See Table 6.

[11] Ros Davidson and Sara Knight, "American Giant Moves into European Market," *Windpower Monthly*, November 1997.

[12] Kent Dahl, "Japanese Firm Makes Solid Commitment," *Windpower Monthly*, June 1997.

[13] John Browne, "Creating a Sustainable Company," presentation to the Andersen Consulting World Forum on Change, 6 June 1997, as posted at <http://www.bp.com/>, viewed 10 November 1997; "Government Urged to Boost UK Solar Energy Industry," *ENDS Report 274*, November 1997.

[14] "Report of the Third Conference of the Parties to the United Nations Framework Convention on Climate Change: 1–11 December 1997," *Earth Negotiations Bulletin*, 13 December 1997.

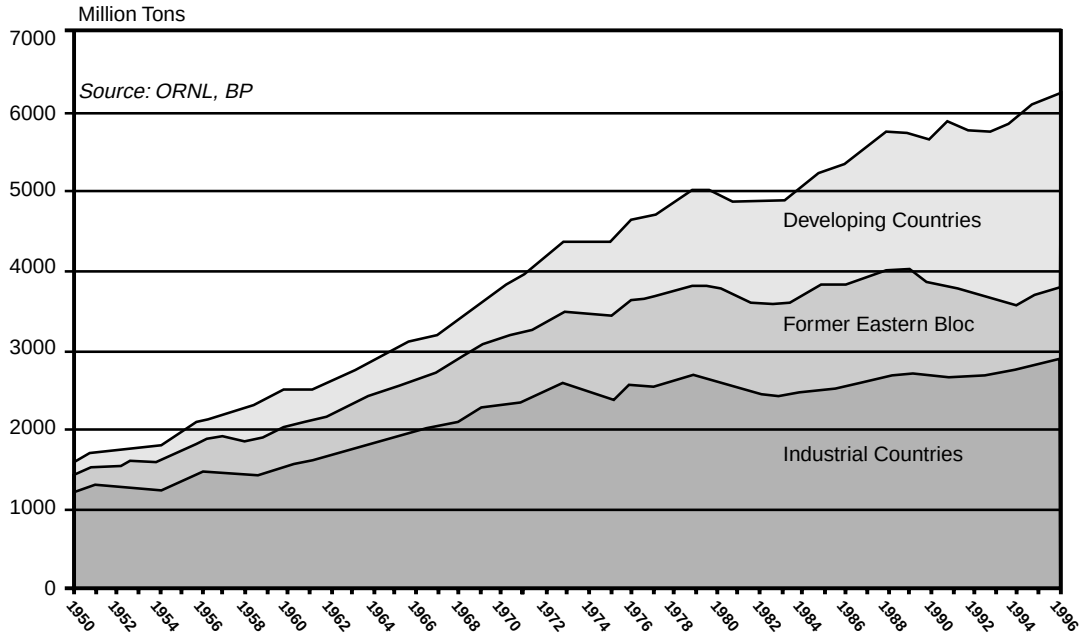
The diplomatic deliberations in Kyoto were guided by the work of the Intergovernmental Panel on Climate Change (IPCC), a U.N.-appointed panel of 2,500 of the world's leading scientists. The IPCC concluded in 1995 that "the balance of evidence … suggests a discernible human influence on global climate."[15] This landmark finding has shifted the scientific debate beyond discussion of whether the Earth is warming and toward greater understanding of the effects and of actions to slow climate change. Since 1995, global average temperatures have continued to set records — making the 1990s the hottest decade in 600 years, according to a 1998 study.[16]

The IPCC has concluded that a 60–80% cut in greenhouse gas emissions will ultimately be needed to stabilize atmospheric concentrations of the gases and avert serious climate disruptions.[17] This is a long-term goal, made more daunting by the fact that today less than half the world's population enjoys the benefits of a fossil fuel economy. This implies what IPCC Chairman Robert Watson has termed an accelerated "decarbonization" of the world's energy system over the next century — a dramatic reversal of the nearly fourfold expansion in carbon emissions since 1950.[18] (See Figure 1.)

The purpose of the Kyoto negotiations was to establish a near-term goal for more modest emission cuts in the next decade or so — going beyond the voluntary target agreed to in Rio in 1992 of holding industrial-country emissions to their 1990 levels in 2000. The European Union (EU) has come close to meeting that goal, while the United States, Japan, Canada, and Australia are on course to miss the Rio target by 10% or more.[19]

After much diplomatic maneuvering and compromising, the Kyoto Protocol was agreed to on December 10, 1997. Once ratified and legally in force, it will commit what is known as Annex I industrial countries (which includes former Eastern bloc nations) to cut their collective greenhouse gas emissions

Figure 1: Carbon Emissions from Fossil Fuel Burning by Economic Region, 1950-96



[15] J.T. Houghton et al., eds., *Climate Change 1995: The Science of Climate Change*, Contribution of Working Group I to the Second Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge, U.K.: Cambridge University Press, 1996).

[16] Michael E. Mann, Raymond S. Bradley, and Malcolm K. Hughes, "Global-scale temperature patterns and climate forcing over the past six centuries," *Nature*, 23 April 1998.

[17] Houghton et al., op. cit. note 15.

[18] Worldwatch estimate based on G. Marland et al., Oak Ridge National Laboratory, "Global, Regional, and National CO_2 Emission Estimates from Fossil Fuel Burning, Cement Production, and Gas Flaring: 1975-1995 (revised January 1998)," as viewed at <http://cdiac.esd.ornl.gov> 21 January 1998, and British Petroleum (BP), *BP Statistical Review of World Energy 1997* (London: Group Media & Publications, 1997).

[19] Worldwatch estimate based on Marland et al., op. cit. note 18 and BP, op. cit. note 18.

to at least 5.2% below 1990 levels during the 2008–12 "budget period."[20] This will slow the rate of climate change only slightly, but if implemented and continuously strengthened, it could precipitate important changes in energy policies, accelerate the commercial development of key technologies, and set the stage for more drastic emissions cuts in later decades. Under the Kyoto agreement, developing countries — whose emissions are typically less than one-fifth the per capita levels of industrial countries — are not assigned emissions limits, though under the original framework treaty they are required to submit regular reports on trends, and they are expected to be covered by limits established in a later amendment to the protocol.

In the Kyoto Protocol, individual industrial countries were assigned a range of different commitments that were politically negotiated among the parties.[21] (See Table 2.) The United States agreed to a 7% cutback from 1990 levels. This is a bigger cut than it appears at first glance: by 1997, U.S. carbon emissions were already 10% above that level, and under a business-as-usual scenario they could be more than 25% over that level by 2010. Meeting the Kyoto target would appear to require a sharp shift in direction for the U.S. energy economy.

Table 2: The Kyoto Protocol: Emissions Commitments for Selected Annex I Countries

Country	Change from 1990 levels by 2008–12 (percent)
Australia	+8
Canada	-6
European Community	-8
Japan	-6
Poland	-6
Russian Federation	0
Ukraine	0
United Kingdom	-8
United States	-7

Source: See footnote 20.

Other countries successfully lobbied for looser restrictions: Australia, for instance, is permitted to *increase* its emissions by 8%.[22] And Russia, Ukraine, and other former Soviet bloc countries are allowed to return their emissions to 1990 levels — which actually translates into more than a 30% increase from the depressed levels they had reached in 1997. As a result of recent economic trends in these countries in transition, 1997 emissions from Annex I nations as a whole are already 2.3% below 1990 levels, which means that achieving the Kyoto target would leave industrial-country emissions only 2.9% below 1997 levels.[23]

Governments are free to choose how to reduce their emissions, though the protocol provides an optional menu of eight groups of national policies and measures that might be implemented. Of most interest to the renewables industry is Article 2, subparagraph iv: "Promotion, research, development and increased use of new and renewable forms of energy, of carbon dioxide sequestration technologies and of advanced innovative environmentally sound technologies."[24] Other listed measures to reduce the greenhouse burden include enhancing energy efficiency, tax and subsidy reform, encouraging reforms in transportation policy, and capturing methane.

The IPCC has pointed to a large role for renewable energy in meeting the eventual goal of virtually replacing fossil fuels, noting that "in the longer term, renewable energy sources could meet a major part of the world's demand for energy."[25] This would, in turn, bring about sharp cuts in carbon emissions — under one of the IPCC scenarios, to below 2 billion tons by 2100. In the short term, however, most analysts agree that renewable energy sources will play a smaller role in reducing emissions compared with such low-cost options as improving automobile efficiency, replacing coal with natural gas, and switching to cogeneration. Still, the European Commission climate plan issued two months before Kyoto suggested that one-quarter of the emissions reductions it plans by 2010 could be achieved by deploying renewables.[26]

[20] United Nations Framework Convention on Climate Change (UN FCCC), "Kyoto Protocol to the United Nations Framework Convention on Climate Change," FCCC/CP/L.7/Add.1, 10 December 1997.

[21] Ibid.

[22] Ibid.

[23] Worldwatch estimate based on Marland et al., op. cit. note 18 and BP, op. cit. note 18.

[24] UN FCCC, op. cit. note 20.

[25] Robert T. Watson, Marufu C. Zinyowera, and Richard H. Moss, eds., *Climate Change 1995: Impacts, Adaptation, and Mitigation of Climate Change: Scientific-Technical Analyses* (Cambridge, U.K.: Cambridge University Press, 1996).

[26] European Commission, "Climate Change —The EU Approach for Kyoto," Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions (Brussels, 1 October 1997).

One thing that has become clear in the climate negotiations is that renewable energy has decisively replaced nuclear power as the energy source that governments are most counting on to replace fossil fuels. Although the nuclear lobby has aggressively lobbied for consideration of this energy source as a climate-friendly option, most governments that take the climate issue seriously are not planning on additional nuclear capacity. This reflects a strong shift in public opinion, which has made nuclear power unacceptable among a large majority of Europeans since Chernobyl. In the United States as well, nuclear power has lost ground with the public and the power industry. The exception is Japan, where nuclear power is also unpopular, but where the pro-nuclear Ministry of International Trade and Industry (MITI) included the construction of 20 nuclear plants in its pre-Kyoto climate plan.[27] Most Japanese observers believe that this is politically unrealistic due to strong, locally based opposition to additional nuclear plants, and will never be carried out.

The Kyoto Protocol also includes the option of counting carbon absorption from forests, bogs, and other "sinks" as an offset against emissions. Some countries argued that there is not yet enough scientific understanding of natural carbon cycling to establish full accounting and verification procedures for carbon sinks. Under the agreement, carbon flow resulting from both additions to and subtractions from sinks is to be included in national inventories, so long as it reflects "verifiable changes in stocks in each commitment period."[28] At present, the activities to be accounted for in calculating sinks are limited to "afforestation, deforestation, and reforestation," and it remains unclear how these terms will be defined and what other activities will also be included in sink calculations.

According to the State Department, which negotiated the protocol, including other greenhouse gases (such as methane) and carbon sinks in the calculation of reductions will allow the United States to avoid cutting its carbon emissions to 7% below their 1990 level (as called for in the protocol). The U.S. government expects its annual absorption from qualifying sinks to equal 2–3% of 1990 carbon emissions, and other gases may add another percentage point or two.[29]

The Kyoto Protocol also embraces international emissions trading — a provision that allows individual governments to buy and sell emissions credits or allowances to meet their commitments, which is intended to encourage emissions cuts in countries where the most economical reductions are possible. The emissions trading concept has been promoted most heavily by the U.S. government, which has considerable experience with this strategy from dealing with a range of local and regional air pollutants.

The Clinton administration believes that it will be able to purchase emission allowances from former Soviet bloc countries for far less than emissions can be reduced domestically. In March 1998, Council of Economic Advisers Chair Janet Yellen said that the U.S. administration is relying on such trading to make its Kyoto commitments affordable.[30] According to an assessment by Resources For the Future, the administration may be counting on trading to meet as much as 85% of its Kyoto commitment — which, together with other "flexibility" measures, would allow the United States to increase its carbon emissions to well above not only the 1990 level but current levels as well.[31] (See Figure 2 on Page 7.)

Considerable debate still revolves around the generous emissions allowances given Russia and Ukraine in the protocol; they are permitted to return to their 1990 emission levels by 2010 even though they are currently 33% and 56% below them. These nations have per capita emissions above the European average, declining populations, and outdated, inefficient equipment likely to be shut down soon. Even a booming economic recovery is unlikely to push their emissions close to 1990 levels in 2010.[32] This would leave the Russians and Ukrainians with a windfall of emission allowances that could be sold on the open market — something that has been labeled "hot air trading" since it would trade past emission reductions rather than reduce future emissions. European governments believe that such trading would weaken the targets agreed to in the protocol, and diminish pressure for domestic policy reforms. For renewable energy, the biggest danger of this approach may be that a glutted market of relatively low-cost emission allowances could

[27] "MITI Plans Tightened Outlook For Energy Supply and Demand," *International Environment Reporter*, 28 February 1998.

[28] UN FCCC, op. cit. note 20.

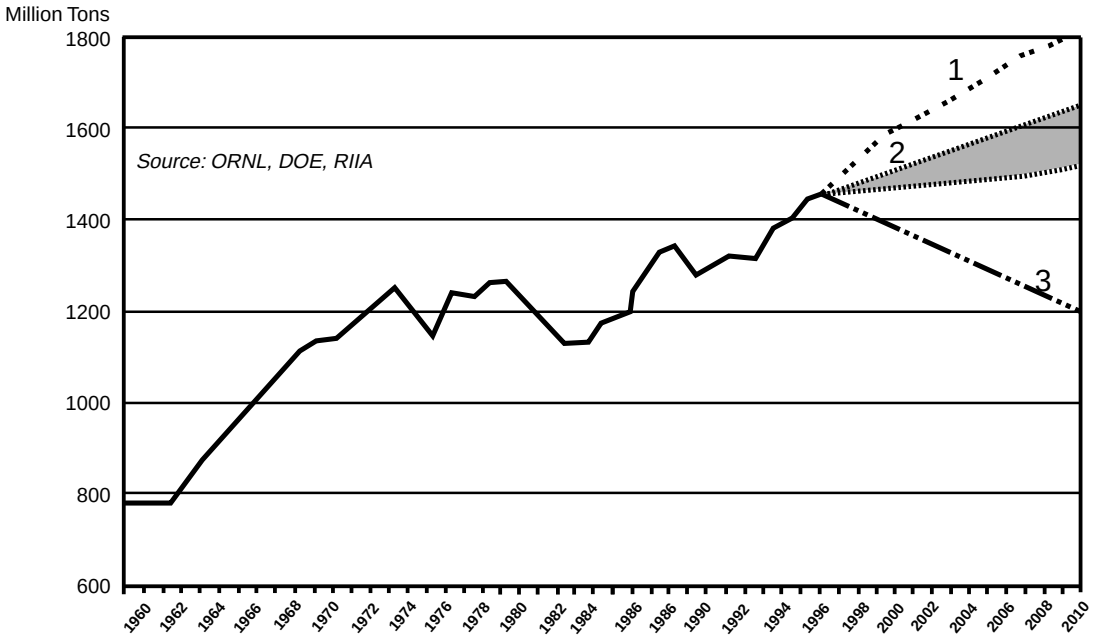
[29] Michael Grubb and Christiaan Vrolijk, "The Kyoto Protocol: Specific Commitments and Flexibility Mechanisms," Climate Change Briefing Paper No. 11, Royal Institute for International Affairs, April 1998.

[30] Joby Warrick, "White House Predicts Low Cost for Pact on Warming," *Washington Post*, 4 March 1998.

[31] Raymond J. Kopp and J.W. Anderson, "Estimating the Costs of Kyoto: How Plausible Are the Clinton Administration's Figures?" *RFF Weathervane*, 12 March 1998.

[32] Greenpeace International, "The Kyoto Protocol: Key Issues," Greenpeace Briefing Paper, Third Conference of the Parties to the U.N. Framework Convention on Climate Change, 10 December 1997.

Figure 2: U.S. Carbon Emissions, 1960-97 with Projections to 2010



"Flexibility" mechanisms could mean less renewable energy development

1 – The climbing top curve represents the Department of Energy's projection of U.S. carbon emissions under a "business-as-usual" scenario—that is, without new policies to cut emissions.

2 – The milder but still rising middle two curves describe the range of carbon the U.S. could emit and still meet its Kyoto target—providing that it could exploit "flexibility" mechanisms such as international emissions trading, expansion of carbon sinks, and use of the basket approach to include reductions from all six greenhouse gases.

3 – The severe bottom curve is a straight line between current carbon emissions and a 7 percent cut in emissions in the year 2010—essentially the path the nation would have to follow if it were required to cut carbon emissions domestically without the flexibility mechanisms described above.

reduce the incentive to develop domestic renewables or to engage in project-based emissions trading, which would directly channel funds to renewables.

A closely related "flexibility measure" endorsed in the agreement is joint implementation (JI, also known as activities implemented jointly, or AIJ), which has been under pilot testing for several years. Under these programs, the United States, Netherlands, Norway, and other industrial-country governments, together with private-sector partners, have pursued carbon offset and sequestration projects in transitional-economy and developing countries — mostly in Eastern Europe and Central America. As of April 1997, there were 101 such pilot projects under way worldwide; 36 of these involved renewable energy, while most of the rest focused on energy efficiency and tree planting.[33]

Article 6 of the Kyoto Protocol officially authorizes joint implementation between Annex I countries, and allows parties investing in such projects to receive transferable credits. It lets these nations "transfer to, or acquire from, any other such Party emission reduction units resulting from projects aimed at reducing anthropogenic emissions."[34] Such bilateral trading is intended primarily to allow western nations to invest in projects to upgrade the woefully inefficient power plants, factories, and district heating plants in Eastern Europe. But renewable energy projects also qualify for such reduction units, and could prove popular in cases where they are relatively low-cost. It remains to be seen how popular such projects will be, however, given the availability of other forms of emissions trading in the protocol.

[33] "Planned and Ongoing AIJ Pilot Projects," *Joint Implementation Quarterly*, December 1997.

[34] UN FCCC, op. cit. note 20.

Another vehicle for generating tradable credits under the protocol is the Clean Development Mechanism (CDM). Potentially one of the protocol's most crucial developments for renewables, the CDM is a multilateral financial mechanism intended to yield "project activities resulting in certified emission reductions [in developing countries]."[35] Originally proposed by Brazil as a penalty fund paid into by industrial countries that fail to meet emissions targets, the mechanism attracted the interest of the Clinton administration as a means of responding to Senate pressure to stimulate greater developing-country participation in the protocol.

Bridging the two concepts, the CDM evolved in Kyoto into a means of financing emissions reductions or offsets in developing countries while stimulating economic development and yielding emissions credits that industrial — and eventually developing — countries can apply against their emissions obligations. The final version of the CDM may be particularly useful to renewables developers since, unlike other forms of trading, the CDM "may involve private and/or public entities."[36] Large-scale purchase of such credits would likely be contingent, however, on a decision by the U.S. government to impose tradable domestic emission limits, a concept now being widely discussed in Washington but not yet formally proposed. Under such a system, Enron, for example, might build a wind farm in China, generating emissions credits that could be sold to a U.S. oil refiner that is over its domestic emissions limit. Moreover, the protocol indicates that such projects can begin as early as 2000.

Despite this ambitious timetable, the protocol contains only the outlines of the CDM, and discussions since Kyoto indicate a range of opinions on how it will function. Generally, developing countries view the CDM as a quasi-public mutual fund while U.S. interests envision it as the certification body of a purely private trading system. The structure and function of the CDM are among the most crucial issues to be addressed at the Fourth Conference of the Parties to the climate treaty in November 1998, though decisions on these issues may well take longer.[37] In addition, it appears likely that domestic legislation will be needed in order to encourage widespread private-sector participation in any kind of international emissions trading.

As of mid-June 1998, 40 countries — accounting for 39% of Annex I countries' carbon emissions in 1990 — had signed the Kyoto Protocol.[38] The signatures are little more than formalities. The more crucial test is ratification, which brings the protocol legally into force on the ninetieth day after the date on which at least 55 Annex I countries, representing at least 55% of this group's carbon emissions in 1990, have ratified it.[39] Ratification in the United States faces a rocky road. With 36% of the 1990 Annex I emissions, the United States technically cannot block other industrial countries from putting the protocol into force, but Europe and Japan may well refrain from ratifying it themselves if the world's largest emitter — and their strongest economic competitor — appears unlikely to do so.[40] Some of these issues may be worked out at the November meeting in Buenos Aires, but full implementation of the protocol is likely to take considerably longer. Even so, renewable energy developers and advocates may see some effects of the Kyoto Protocol almost immediately.

PART III: IMPLICATIONS FOR THE U.S. RENEWABLES MARKET

The Kyoto Protocol has already created a more favorable climate for renewables in the U.S. business community, though it has also deepened differences between the Clinton administration and Congress over support for these technologies. The administration moved quickly to strengthen support for renewables through several modest initiatives in early 1998. The fiscal year (FY) 1999 budget proposal includes a Climate Change Technology Initiative of $6.3 billion over five years.[41] As proposed, the program puts $2.7 billion into increased research, development, and deployment of clean energy technologies, and an additional $3.6 billion into tax incentives for energy efficiency, renewable energy, and carbon reduction technologies. As of June 1998, however, congressional appropriations committees were scaling back the budget requests and increasing the climate change technology budget from $114 million to just $139 million rather than the $230 million requested by the administration.[42] Efforts had begun to restore part of the funding through amendments, but the results were unclear.

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[35] Ibid.

[36] Ibid.

[37] "Report," op. cit. note 14.

[38] "Report of the Meetings of the FCCC Subsidiary Bodies: 2-12 June 1998," *Earth Negotiations Bulletin*, 15 June 1998.

[39] UN FCCC, op. cit. note 20.

[40] U.S. share of Annex I emissions is a Worldwatch estimate based on Marland et al., op. cit. note 18, and on BP, op. cit. note 18.

[41] White House, "Climate Change Technology Initiative," 1999 Briefing Materials, 2 February 1998.

[42] "Senate Version of VA/HUD Spending Bill Cuts Climate Change, Clean Water, CERCLA," Bureau of National Affairs, Air Pollution and Climate Change website, as viewed at <http://www.bna.com>, 10 June 1998.

Table 3: Renewables-Related Activities in the U.S. Climate Change Technology Initiative

Million Solar Roofs Program

$12 million in 1999 budget to launch at least 25 R&D and deployment partnerships with state and local governments, energy service providers, the solar industry, developers, and builders

$120 million over five years for new tax credit for purchasers of rooftop PV and solar water heating systems, covering 15 percent of qualified investments (with a maximum of $1,000 for solar water heaters and $2,000 for solar PVs)

Renewable Energy

$389 million ($117 million increase) in 1999 budget for R&D and deployment

$13.3 million increase (to $78.8 million) for solar shingle and other PV system efficiency improvements

Five-year extension of tax credit for electricity produced from wind and biomass

$10.5 million increase (to $43.5 million) for wind energy system improvements

$39.1 million increase in research on conversion of wood and crop wastes and energy crops to fuels and electricity

Source: See footnote 41.

Renewable energy programs are slated for a 25% increase under the administration's proposals, from $346 million in FY98 to $437 million in FY99. Congress has not reacted well to these proposals either, however, as both House and Senate committees moved to hold the budgets roughly even with the previous year's figures — which represent significant reductions from the renewable energy budgets of the mid-1990s.[43] Ironically, just as Congress was making these cuts on the rationale that the proposals were tied to an unratified treaty, the Congressional General Accounting Office released a report sharply criticizing Clinton's climate initiative for *not* being explicitly tied to the target, and for lacking an overall goal and plan for meeting the Kyoto requirement.[44]

The most high-profile element of the administration's climate proposal is the Million Solar Roofs Program, originally announced by President Clinton in June 1997 at the United Nations Special Session commemorating the fifth anniversary of the Earth Summit. The program, which is modeled after similar European and Japanese programs, aims to install 1 million rooftop PV systems by 2010.[45] Unlike its counterparts elsewhere, however, the U.S. government is not planning on large subsidies to get the program going. The 20% budget addition targeted for solar PVs in the FY99 budget includes a meager $6.4 million to establish 25 partnerships with utilities, builders, government agencies, cities, and financial institutions to carry out the rooftop program.[46] In addition, a five-year tax credit worth $120 million has been proposed to cover 15% of the cost of installing a rooftop solar system — up to $1,000 for water heating systems and up to $2,000 for PV panels. The credit would apply to systems put in service between 1999 and 2003 for solar water heaters and until 2005 for PV systems.[47] (See Table 3.) To date, federal agencies have made commitments to install 20,000 roof systems, while states, communities, and utilities have made proposals for more than 350,000 roofs.[48]

Wind and biomass energy are also beneficiaries of the administration's climate initiative. Wind R&D is slated for a 34% increase, with a new goal of lowering the cost of wind power from 4¢ to 2.5¢ per kilowatt-hour at sites where the wind averages 15 miles per hour. Biomass energy R&D is to

[43] President's Committee of Advisors on Science and Technology (PCAST), Report of the Energy Research and Development Panel, *Federal Energy Research and Development for the Challenges of the Twenty-First Century* (Washington, DC: November 1997).

[44] "Senate Republicans Call For Kyoto Vote Before Funding Climate Change Programs," Bureau of National Affairs, Air Pollution and Climate Change website, as viewed at <http://www.bna.com>, 9 June 1998.

[45] Brenda Biondo, "Pushing Solar Energy Through The Roof," *Solar Industry Journal*, Second Quarter 1997.

[46] U.S. Department of Energy (US DOE), *Science, Technology and Energy for the Future*, FY1999 Congressional Budget Request, Budget Highlights and Performance Plan, Office of the Chief Financial Officer (Washington, DC, February 1998).

[47] White House, "Vice President Gore Announces $2,000 Solar Tax Credit," Washington, DC, 30 January 1998.

[48] Linda Ladas, "States Respond to the Million Solar Roofs," *Solar Industry Journal*, Fourth Quarter 1997.

be increased $39 million, with a focus on improving the conversion of wood and crop wastes to fuels and electricity. In addition, President Clinton has proposed a five-year extension of the existing 1.5¢-per-kilowatt-hour tax credit for wind- and biomass-based power generation.[49]

The administration requested $33 million for geothermal energy R&D in FY99, a 12% increase from FY98. $29.5 million was intended for geothermal electric power. The remaining $3.5 million was budgeted for geothermal heat pumps, which move heat from the ground into buildings during the winter, and pump heat into the ground during the summer. While the Senate originally proposed $18 million for FY99 geothermal R&D, it now appears that funding will be closer to the administration's request. The funding increase will allow DOE to expand, among other activities, geothermal heating applications in colder regions.

To encourage renewable energy — and reduce carbon emissions — the administration recommended a Renewable Portfolio Standard (RPS) requiring that 5.5% of the nation's electricity be generated by renewables (not including hydropower) by 2010, allowing electric companies that fall short of this target to purchase renewable energy credits from companies that exceed the minimum standard. The package proposes a $3-billion matching Public Benefits Fund for renewables support, funded through a fee on electricity of $0.001 per kilowatt-hour. The proposal also includes right-to-know provisions requiring electricity suppliers to disclose the source of their generation as well as their emissions.[50] In addition, all consumers would be eligible for net metering programs, which allow them to sell small amounts of electricity back to the supplier at the same price they pay for power — a policy already adopted by 20 states and pending in another five.[51]

The eventual shape of the U.S. power industry will ultimately be decided by Congress as well as the legislatures of the 50 states. Renewables have fared well in some of the restructuring bills proposed so far, including three introduced in the U.S. Congress in 1997 that include some form of Renewable Portfolio Standard, ranging from 2% to 5%.[52]

Public system benefits charges — small fees paid by all consumers — are another approach to promoting renewables included in some restructuring proposals. At the federal level, Senate Bill 687 (Jeffords) includes a public benefits charge that the Department of Energy (DOE) estimates would increase average monthly electricity bills by no more than $2.[53] Public benefit funds at the state level, meanwhile, totaled $6 billion in 1996.[54] California, which considered but decided against an RPS, set up a $540-million public benefits fund to support renewables, efficiency, and low-income programs over four years. The fund only went into effect in early 1998, so its impact remains to be seen. Rhode Island, Illinois, and Massachusetts have also adopted public system benefits charges.[55] (See Table 4 on Page 11.)

Other strategies for promoting renewables in a more competitive environment are premised on public support for new energy sources. Green power pricing and marketing offer consumers the chance to purchase renewable electricity, a concept that may benefit from increased public awareness of the climate issue. The idea has taken the industry by storm in the past couple of years, and already 32 utilities have set up green pricing programs that offer consumers the option of paying a small premium for renewable electricity.[56] From Michigan to Colorado, several of these programs have been oversubscribed, attracting the interest of small businesses as well as residential customers.[57]

The prospect of a competitive power market in which customers can choose their electricity supplier has meanwhile led to the proliferation of "green power marketers" that offer various packages of renewable electricity. The first serious test of the concept began in California in April 1998, when an estimated 13 million households were able to choose their electricity supplier for the first time. To prevent false claims

[49] US DOE, op. cit. note 46.

[50] US DOE, "Administration's Plan Will Bring Competition to Electricity, Savings to Consumers," Washington, DC, 25 March 1998.

[51] US DOE, op. cit. note 46; Thomas Starrs, "Summary of State Net Metering Programs," as viewed <http://www.spratley.com/ncp>, 6 April 1998; see also Thomas Starrs, *Net Metering: New Opportunities for Home Power*, REPP Issue Brief, September 1996.

[52] Scott Young, "State Restructuring Bills Compared," *LEAP Letter*, November/December 1998, as viewed at <http://www.spratley.com/leap>, 30 March 1998; National Consumer Project, "New Massachusetts Law Grows Renewable Energy as Retail Market Opens," *Renewables and Restructuring Update*, December 1997, as viewed at <http:www/spratley.com/ncp/>, 30 March 1998.

[53] US DOE, Energy Information Administration, *Annual Energy Outlook 1998* (Washington, DC: December 1997).

[54] US DOE, *Comprehensive Electricity Competition Plan* (Washington, DC: March 1998).

[55] US DOE, "State Restructuring Policies for Renewables," as viewed at <http:www.eren.doe.gov/greenpower/>, 13 April 1998.

[56] Barbara C. Farhar, "Energy and the Environment: The Public View," REPP Issue Brief, October 1996; US DOE, "Summary of Green Pricing Programs," as viewed at <http://www.eren.doe.gov/greenpower/>, 16 March 1998.

[57] US DOE, op. cit. note 55; Ed Holt, "Green Power for Business: Good News from Traverse City," REPP Research Report, July 1997.

Table 4: Pre-Kyoto State-level Renewables Restructuring Policies

State	Mechanism(s)*	Disclosure Requirement
Arizona	RPS—0.5% from PV or solar thermal in 1999, increasing to 1% in 2002	No
California	SBC—$540 million over four years to fund incentives, project financing support, customer rebates	Yes
Illinois	SBC—5.0¢/month surcharge on residential customers for 10 years	Yes
Maine	RPS—3% of retail sales Voluntary fund for R&D	Yes
Massachusetts	RPS—1% in 2003, rising 0.5% per year through 2009, increasing 1% annually thereafter SBC—0.075¢/kWh from all customers, increasing to 0.1¢/kWH in 1999 and 0.125¢/kWh in 2000. Decreasing to 0.1¢/kWh in 2001, 0.075¢/kWh in 2002, and 0.05¢/kWh thereafter	Yes
Montana	SBC—2.4% of 1995 utility revenues for energy conservation, renewables, and low-income energy assistance	Yes
Nevada	RPS—0.2% of total consumption, rising to 1% by 2010, from in-state renewables (at least half solar)	Yes
New Hampshire	None	No
Oklahoma	None	No
Pennsylvania	None	Yes
Rhode Island	SBC—0.23¢/kWh for 5+ years to fund renewables and demand-side management programs	Yes

*RPS = renewables portfolio standard; SBC = system benefits charge
Source: See footnote 55.

and confusion, the private, non-profit Center for Resource Solutions has established a "Green-e" certification brand. To be certified, the electricity supplied must be at least 50% based on renewables (excluding large hydropower), while the other half must be no more polluting than the current average California electricity mix — which includes only 16% coal and 32% natural gas, with hydropower 27% and other renewables 9%.[58]

As the California electricity market opened, seven retail electricity "products" from five companies and one utility had been certified to use the Green-e label.[59] Its potential will not be clear for some time, however, and will only be realized with effective government regulation of key factors such as access to transmission lines. One particularly important issue for renewable power marketers is whether customers will be informed of the energy sources being used, and the emissions produced, in generating the power they receive. Eight of the 11 state restructuring laws with environmental provisions have disclosure requirements, as do all three congressional proposals.[60] But as of June 1998, prospects for federal electricity restructuring legislation were clouded by divisions in the power industry, including the opposition of many utilities. Most of the focus is at the state level, where restructuring is proceeding at a rapid pace, posing both risks and opportunities for renewables.

[58] Karl Rábago, Ryan Wiser, and Jan Hamrin, "The Green-e Program: An Opportunity for Customers," *The Electricity Journal*, January/February 1998.

[59] Center for Resource Solutions, "Green-e Renewable Electricity Branding Program, Certified Products," as viewed at <http://www.igc.apc.org/crs/green-e/>, 3 March 1998; Ryan Wiser, "California Retail Green Power Products," prepared for Lawrence Berkeley Laboratory, 27 March 1998.

[60] US DOE, op. cit. note 50; US DOE, op. cit. note 53.

Table 5: European Commission White Paper for a Community Strategy and Action Plan on Renewable Energy

Strategic Objective
- 12% penetration of renewables in the EU by 2010 (current share is 6%)

Action Plan
- Fair access for renewables to the electricity market
- Fiscal and finance measures (taxes and tax incentives)
- New bioenergy initiative for transport, heat, and electricity
- Improving building regulations, direct reversible metering

Implementation
- 1 million photovoltaic systems (500,000 PV roof and façade for domestic market; 500,000 PV village export initiative)
- Incentives for PV investments
- 10,000 MW of large wind farms
- Guaranteed fair grid access
- 10,000 MW of biomass installations
- Support for decentralized use
- Integration of renewable energies in 100 communities
- Selection of pilot locations aiming at 100 percent power supply from renewables

Source: See footnote 62.

Some U.S. policymakers are meanwhile beginning to focus on broader efforts to control the nation's carbon emissions. One way to implement the limits required by the Kyoto Protocol after 2008 would be to adopt a national "emissions cap and trade" program similar to the sulfur dioxide program in the 1990 Clean Air Act. This would likely include only large emitters such as big factories and power plants, requiring that they either reduce their own emissions or purchase permits from other companies that go below their reduction requirements.

Although such a program is still hypothetical, and would require congressional action to be implemented, some analysts are already proposing schemes for giving companies credit for emissions reductions made in the decade prior to 2008 — schemes that could give a boost to renewable energy markets in the near future. As an initial testing of the waters, the U.S.-based utility Niagara Mohawk began a greenhouse gas emissions trading program with the Canadian utility Suncor Energy in March 1998. Suncor purchased 100,000 tons of "carbon emission reduction credits" and acquired an option to buy a total of 10 million tons over the next decade from Niagara Mohawk, which is selling credits because its emissions are currently about 50% below their 1990 levels.[61]

PART IV: IMPLICATIONS FOR INTERNATIONAL RENEWABLES MARKETS

The Kyoto Protocol is also prompting other industrial countries to expand their renewable energy markets, which could provide new opportunities for U.S. companies. In anticipation of the protocol, the European Union adopted an official plan for sharply cutting emissions, which included a major role for renewables. The European Commission's White Paper on renewable energy, published in November 1997, has an overall goal of doubling the renewable energy share of the EU energy supply from the current 6% (including hydropower) to 12% by 2010.[62] (See Table 5.) It foresees 40 gigawatts of wind power, 3 gigawatts of PVs, and 153 million tons of oil equivalent of biomass energy by 2010 — creating between 500,000 and 900,000 jobs in the process.

Taking a more strategic approach than the U.S. initiative, the EU White Paper argues: "Without a coherent and transparent strategy and an ambitious overall objective for renewables penetration, these sources of energy will not make major inroads into the Community energy balance."[63] The report aims to position the European Union as a strong com-

[61] "U.S., Canadian Utilities Make CO_2 Trade, Hope to Stimulate Market, Officials Say," *International Environment Reporter*, 18 March 1998.

[62] European Commission, "Energy For The Future: Renewable Sources of Energy," White Paper for a Community Strategy and Action Plan, January 1998.

[63] Ibid.

Table 6: U.S. Initiative on Joint Implementation Renewable Energy Projects

Title (country)	Lifetime in Years	Tons of Carbon Reduced
APS, CFE Renewable Energy (Mexico)	n/a	n/a
Aeroenergia S.A. Wind Facility (Costa Rica)	20	36,194
Bio-Gen Biomass Power Generation, phases I and II (Honduras)	21	2,373,940
Dona Julia Hydroelectric Project (Costa Rica)	15	210,566
El Hoyo-Monte Galan Geothermal Project (Nicaragua)	40	19,765,628
Plantas Eolicas S.A. Wind Facility (Costa Rica)	21	222,538
Rural Solar Electrification (Bolivia)	n/a	n/a
SELCO Rural Electrification (Sri Lanka)	n/a	n/a
Solar-Based Rural Electrification (Honduras)	24	17,192
Tierras Morenas Windfarm Project (Costa Rica)	13	118,611

Source: See footnote 67.

petitor in international renewable energy markets, with the hope of creating exports and jobs. Recognizing that the European renewable energy industry will require a strong home market to maintain worldwide leadership, it sets forth ambitious goals, including building 1 million PV systems — 500,000 on domestic roofs and façades and 500,000 village systems outside of Europe. It also calls for assisting 100 communities to become 100% reliant on renewables. According to the plan, wind power is already so economical that simply providing fair access to the electricity grid may allow it to reach 30,000 megawatts by 2010.

Leaders of Europe's renewables industries applaud the White Paper's aims but are concerned that they are not backed by sufficiently detailed implementation policies — which are largely left to national discretion. Unless the EU proceeds rapidly to make energy policy at the international level, or accelerates national policy reforms — particularly in laggards such as France and Italy — the ambitious European renewables goals will be hard to achieve. These goals may also be complicated by simultaneous moves to "liberalize" European electricity markets, which will likely reduce subsidies for coal and nuclear power but could also interfere with pro-renewables policies, as it has in the United States.

Japan, meanwhile, is falling behind the pace of change in Europe. In January 1998, the Environment Agency submitted a framework bill for implementing the Kyoto Protocol that makes few specific policy recommendations.[64] The Ministry of International Trade and Industry is expected to submit legislation in late 1998 to amend Japan's 1979 energy conservation law, but it is unclear how much support will be given to renewables, which are largely excluded from the market by the country's monopoly power suppliers. Although the government has included promotion of carbon-free energy as one of nine policies and measures to be followed in implementing the Kyoto agreement, nuclear power is the government's preferred carbon-free option — as noted earlier, 20 new plants have been planned. In addition, MITI has proposed that 3.7% of the country's reduction be achieved through a liberal interpretation of the language on carbon sinks, and has indicated a strong interest in purchasing emissions allowances from Russia and other countries.[65] As of June 1998, the government was finalizing its latest global warming plan, but no information on support for renewables was available.

[64] "Environment Agency's Climate Change Bill Indicates Step Back from Kyoto Commitment," *International Environment Reporter*, 4 February 1998.

[65] "Japanese, Russian Firms Set Stage For Emission Trading Under Cooperative Pact," *International Environment Reporter*, 18 March 1998; "Japan Exploring Greenhouse Gas Trades With Russia to Meet Kyoto Pact Reductions," *International Environment Reporter*, 18 February 1998.

The Kyoto Protocol has also stimulated efforts to expand renewable energy use in developing countries. The Clinton administration requested a tripling of the interagency pilot Initiative on Joint Implementation, from $4 million to $12 million, which as of April 1998 had approved 32 projects in 12 countries.[66] Eleven of these are renewables projects — covering wind, biomass, small hydropower, geothermal, and solar energy — and 9 are located in Latin America, the region most eager thus far to attract U.S. projects.[67] (See Table 6.) Most of the funding for these projects comes from the private sector, including a number of U.S. power companies, though a small grants program is available for project development. Although such pilot projects have to date been limited by the fact that no credits are available, the Clean Development Mechanism described earlier could give such efforts more momentum once uncertainties over procedures are worked out.

The provisions in the Kyoto Protocol for credit for joint implementation projects between Annex I countries could stimulate renewables projects in the countries of the Eastern bloc — where 67 of the 101 JI projects are located. Of these, 27 involve renewables: 26 are Swedish projects to convert boilers in the Baltic countries from coal to biomass fuel, and the other is a German wind power facility in Latvia.[68] Promising opportunities also exist for other renewables, including plentiful geothermal energy. Overall, such opportunities may widen as energy growth resumes in these nations in the next decade.

Kyoto is also spurring governments to add climate-related initiatives to their bilateral aid programs. At the United Nations in June 1997, President Clinton announced a $1-billion, 5-year Climate Action Plan to assist developing countries in charting less carbon-intensive development paths. Administered by the U.S. Agency for International Development (AID), this includes direct aid of $150 million a year over five years for forestry and energy projects, and is to leverage an additional $250 million through $25 million of bilateral credit financing.[69] Renewable energy is a major element of the program.

In a related multiagency effort involving DOE and AID, the U.S. government has launched technology cooperation agreements in Brazil, China, India, Indonesia, Kazakhstan, Mexico, and the Philippines aimed at stimulating government and private investment in sustainable energy technologies.[70] The program will engage the private sector in both host and donor countries, with the coordination of the Business Council for Sustainable Energy, which is providing advice on how to expand these markets. Broader, more detailed agreements are planned by the time of Fourth Conference of the Parties, with the goal of identifying potential CDM projects. However, representatives of some renewable industry trade associations view these initiatives as a creative repackaging of existing programs that may do little to stimulate international renewables markets.

Japan, the world's largest bilateral aid donor, seems to be more serious about expanding renewables markets in developing countries. It announced a Kyoto Initiative at the December 1997 meeting, aimed at providing low-interest loans for climate change projects in developing countries, including renewable energy.[71] In April 1998, the government launched a solar energy aid program, consisting of grants, loans, and training to assist in electrifying rural villages.[72]

Renewable energy financing by the Global Environment Facility may also increase in the post-Kyoto era. Established in 1991 by the World Bank, United Nations Development Programme, and United Nations Environment Programme, GEF provides support for projects designed to help developing countries meet the "incremental" or additional cost of projects that address several global environmental problems, including climate change. Under the 1992 climate treaty, GEF is an officially authorized, though interim, funding mechanism for developing countries. Frequently, GEF grants for energy efficiency and renewable energy are attached to larger World Bank energy loans, providing leverage for the limited funds and introducing Bank personnel to the new technologies.

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[66] White House, op. cit. note 41; U.S. Initiative on Joint Implementation, *International Partnerships Report*, Vol. 4, No. 1, March 1998; for an assessment of USIJI's market potential, see International Institute for Energy Conservation, *Opportunity Knocks: The Export Market for Energy Efficiency and Renewable Energy Products and Services* (Washington, DC: March 1997).

[67] U.S. Environmental Protection Agency, *Activities Implemented Jointly: Second Report to the Secretariat of the United Nations Framework Convention on Climate Change* (Washington, DC: January 1998); "Planned and Ongoing AIJ Pilot Projects," *Joint Implementation Quarterly*, April 1998; UN FCCC, "List of AIJ Projects," as viewed at <http://www.unfccc.de/fccc/ccinfo/>, 7 April 1998.

[68] UN FCCC, op. cit. note 67.

[69] U.S. Agency for International Development (USAID), *USAID Climate Action Plan* (Washington, DC: October 1997).

[70] US AID, "Technology Cooperation Agreements," Draft Concept Paper, Washington, DC, 12 January 1998.

[71] H.E. Mr. Ryutaro Hashimoto, Prime Minister of Japan, Opening Statement at the High-Level Segment of the Third Conference of the Parties to the Framework Convention on Climate Change, 8 December 1997.

[72] "Japan to Begin Solar Energy ODA Program In Small Developing Countries in April," *International Environment Reporter*, 18 February 1998.

Recently, the goal of stimulating "market transformation" for renewables has been adopted by GEF, a goal achieved via demonstration projects as well as policy advice. GEF's complex governance structure and narrowly defined mandate, combined with a lack of experience with such projects in many developing nations, have slowed implementation. Nonetheless, by the end of 1997 GEF had invested $700 million in climate change projects in 114 countries, including a number of successful renewable energy projects.[73] The World Bank has also proposed a new partnership with the GEF on renewable energy that would leverage, at a four-to-one ratio, an annual GEF increment of $150 million, with the GEF share dropping as projects become more competitive.

Following Kyoto, at a GEF Assembly in March 1998, donor countries agreed to a $2.75-billion replenishment of the fund, which should allow it to increase its support of renewables.[74] Among the projects likely to be given a boost are a $100–200 million commercial and concessional fund for renewable energy and energy efficiency, and a debt and equity financing program for small to medium-sized renewables enterprises. Renewable energy companies are already involved in GEF projects in Costa Rica (wind), Mauritania (wind), India (wind, hydropower, solar PV), Tunisia (solar hot water), and Indonesia (solar PV). GEF is considering the possibility of soliciting project proposals from the private sector — which could give it a more direct role in boosting renewables markets in the years ahead.[75]

Efforts are also under way to enlist the World Bank as a whole in the effort to slow climate change. Over the past several decades, the Bank has been one of the world's leading financiers of fossil fuel projects, and it continues to be heavily involved in coal projects in countries such as India and China. In response to mounting pressures for reform, World Bank staff have prepared a draft environmental strategy for the energy sector called *Fuel for Thought*, which was submitted to the Board of Directors in mid-1998. The new strategy aims to "bring environmentally-friendly technologies and practice into the mainstream of its operations… [and] undertake high-visibility projects involving renewable energy and energy efficiency to serve as models of best practice."[76] The World Bank's new goals are laudable, but experienced observers are skeptical; the Bank's lending priorities are heavily influenced by its country directors and by client nations, which have successfully resisted past energy reforms and in some cases have a large vested interest in coal. Unless the new policies include concrete lending goals, policy guidelines, and enforcement measures, they are unlikely to provoke timely change.

The World Bank — with funding from Norway and other governments — has in the meantime launched a new Global Carbon Initiative to explore market-based instruments for greenhouse gas reductions and to spur private financial flows and technology transfer.[77] By June 1998, it had $100 million of initial commitments from 12 companies and five governments (Finland, the Netherlands, Norway, Sweden, and Switzerland) for a prototype carbon fund. This would pool money from companies and governments seeking greenhouse gas emission reduction credits, and then find emissions-reducing projects in which to invest those funds. Bank staff describe it as a sort of greenhouse mutual fund that could be used to support renewable energy and other projects — as currently envisioned, approximately half of them in developing countries and half in those in transition. One use of the funds would be to add climate-friendly elements to Bank energy loans. It remains to be seen whether such a new role for the World Bank will be accepted internationally, particularly among developing countries, and what its relationship to the Clean Development Mechanism will be. Skeptics question whether this initiative is not just delaying reform of the Bank's core lending, while proponents welcome the prospect of another source of financing for renewable energy projects.

PART V: BUENOS AIRES AND BEYOND

The potential for the Kyoto Protocol to provide a major push for renewables will only be realized if some of the agreement's many uncertainties can be resolved and its embryonic institutions and processes effectively implemented. In the years ahead, national and international policies will likely evolve synergistically, driven by an intricate array of feedback loops. Though limited progress was made at some follow-up negotiations in June 1998 in Bonn, Germany, the Buenos Aires meeting in November will get more attention from high-level government officials and the media, and may yield more con-

[73] Christopher Flavin, "Banking Against the Greenhouse," *World Watch*, November/December 1997; World Bank, *DRAFT: Fuel for Thought: A New Environmental Strategy for the Energy Sector* (Washington, DC: World Bank, May 1998).

[74] "Report," op. cit. note 14; "Countries Pledge $2.75 Billion to Fund Global Environment Facility for 1990–2002," *International Environment Reporter*, 1 April 1998.

[75] Global Environment Facility, "Private Sector Information Kiosk," as viewed at <http://www.gefweb.org/PRIVATE/>, 2 April 1998.

[76] World Bank, *Fuel for Thought: A New Environmental Strategy For The Energy Sector*, draft, Washington, DC, 29 May 1998.

[77] World Bank, *The Global Carbon Initiative of the World Bank*, distributed at Kyoto, Japan, December 1997.

crete decisions. Renewable energy advocates and developers who wish to be a step ahead of the market will need to understand and closely follow this international process which is often characterized by lulls and spurts.

The most immediate challenge is to overcome strong disagreements between the United States and Europe over trading of the "hot air" credits that Russia appears to have been allocated in the protocol. Europe insists that limits be placed on trading — equal to 50% of the total reduction commitment undertaken by the Parties to the Convention — while the United States and several allies want unlimited opportunity to use trading to meet Kyoto targets.[78] Until these issues are resolved, the stringency of the commitments made in Kyoto will be unclear, and domestic policy implementation will be delayed. During the June 1998 meetings in Bonn, these fissures only deepened; herculean diplomatic efforts may be needed to close them this year.

Developing countries have insisted on keeping the issue of their future protocol commitments off the formal agenda in Buenos Aires. Yet there may be agreement on a "Buenos Aires mandate" that would begin talks toward setting emissions goals for developing countries under a later amendment — much as the 1995 Berlin mandate set in motion the discussions that resulted in the Kyoto Protocol. And the issue of developing countries will be addressed implicitly in Buenos Aires as attention turns to the institutional nature and functioning of the Clean Development Mechanism. As discussed earlier, the CDM has the potential to have a major influence on the extent to which developing countries advance renewables, and whether companies in industrial countries use such investments as a way to meet their commitments under the protocol. And since the CDM is authorized to begin granting credits as early as 2000, its effects could be felt soon.

Facing legislative pressure to ensure "meaningful participation" of key developing countries, the Clinton administration hopes that the Clean Development Mechanism will serve as a "carrot" for developing countries to assume new commitments — without which they would not be able to use the credits accumulated by taking part in CDM projects. For their part, developing countries' willingness to discuss new commitments may be influenced by whether the CDM turns out to be an effective mechanism for obtaining the money and technologies that allow them to take stronger action on climate change. But it will also depend on the extent to which industrial countries begin to demonstrate good-faith efforts to honor their own Kyoto commitments.

Following Buenos Aires, the Fifth Conference of the Parties in 1999 will review the adequacy of the commitments made in Kyoto. Although there is not yet a specific timeline for amending that agreement, the 1999 review and the anticipation of the IPCC's Third Assessment Report in 2000 could provide the economic and scientific momentum to strengthen the protocol and its targets and timetables. Whether the political will to do so will have crystallized that soon is far less certain.

The year 2000 will also mark the end of the pilot phase of joint implementation projects and the beginning of credit generation for climate change mitigation projects in developing countries under the CDM. As the absence of credits has been cited as the main hindrance to wider private-sector involvement in joint implementation projects, the number of such projects may increase rapidly in the next few years. Because of their cost competitiveness in many parts of the developing world, their local environmental benefits, and their ability to demonstrate "additional" reductions that otherwise would not have occurred, renewable energy projects could become an attractive investment option for those seeking carbon offsets.

The role of the Global Environment Facility in the climate change process will also need to be sorted out in the next few years. The creation of the CDM may undermine efforts by GEF officials to attract greater private-sector support for climate change projects that are already cost-competitive or nearly so. Still, GEF is likely to continue playing a catalytic role in the near term by opening new markets for renewables in areas where barriers to their commercialization remain, where an "incremental cost" of their application can be identified, and where the availability of financing can stimulate private development as well as governmental policy changes. The biggest problem for GEF is the fact that the U.S. Congress has fallen behind in its funding commitments to the facility. Unless these commitments are met, GEF's already modest financing capability may have to be slashed.

[78] "EU Leaning Toward 50% Trading Cap," *ENDS Daily*, 2 April 1998.

For some countries, the climate policy landscape has changed as much at the national level as it has internationally. In Europe, a broad societal consensus over the need to reduce emissions seems to have formed; serious discussions about raising taxes on energy and carbon emissions resumed under the leadership of the United Kingdom, which chaired the European Union in early1998. The EU's pro-renewables consensus also seems to have been strengthened by the Kyoto agreement, bolstered by the fact that policy reforms have already provided European nations with a strategically important lead in the international marketplace. There is a good chance that the strong "electricity-feed" laws of Denmark, Germany, and Spain will be replicated by other countries, if not by the EU as a whole.

In the United States, the climate policy playing field has also changed since Kyoto. A range of industry voices on the issues has emerged. Both British Petroleum and Royal Dutch Shell have defected from the Global Climate Coalition, which has received increasingly skeptical treatment in the press.[79] At the same time, other companies — including American Standard, Enron, Ballard Generation Systems, Honeywell, and United Solar Systems — have joined the Business Council for Sustainable Energy, an industry group representing companies in energy efficiency, natural gas, cogeneration, and renewable energy that are committed to the new high-growth, low-emissions energy technologies. And in April 1998, a new industry group, the Pew Center for Climate Change, was launched; it represents blue-chip companies such as Boeing, Toyota, Monsanto, Sun Oil, and American Electric Power. Headed by former U.S. chief climate negotiator Eileen Claussen, the group has begun a $5-million ad campaign to persuade the public that there are economical solutions to the climate problem.[80]

Still, the current impasse between the administration and Congress is slowing domestic policy initiatives as well as tying the administration's hands abroad as it attempts to reach new accommodations with Europe and the developing world. Whether the isolationist stance of the Republican-run Congress will change is one of the most important uncertainties in the years immediately ahead.

In sum, the post-Kyoto climate landscape is marked by unprecedented variety, complexity, and contention. It remains to be seen whether this will spur innovation and commercial development of renewables — or instead mire policy discussions and markets in an angry debate.

PART VI: MAKING THE MOST OF KYOTO

For supporters of renewable energy, the Kyoto Protocol presents an important opportunity to accelerate policy reforms and spur the development of new markets. It has generated great enthusiasm in both public and private sectors for expanding the use of renewable energy technologies. Indeed, the climate policy process has already contributed to the buildup of a sizable market for renewable energy in Europe and Japan, nurturing industries now poised to capture export opportunities in the "emerging markets" of the developing world. But many U.S. renewable energy promoters have failed to anticipate or exploit the growth of these markets. It is time for U.S. companies to participate in the climate policy process more actively, informing the administration, Congress, and the international community of the enormous economic opportunities that may result — opportunities that will be grabbed by foreign competitors if the United States stays on the sidelines of the renewable energy revolution.

The Kyoto Protocol can be expected to hasten the globalization of renewable energy markets; any company that fails to understand this new dynamic may again lose out in the marketplace. In the years ahead, the renewables markets of various countries and continents will be increasingly integrated, driven not only by the broader dynamics of a global economy but also by the fact that most of these markets are now being shaped to some degree by the climate policy process. U.S. renewable energy advocates and industrialists are more preoccupied with domestic policy issues and markets than many of their counterparts elsewhere, and will have to broaden their horizons if the United States is again to be a leader in renewable energy. Much as climate change is expected to exacerbate existing environmental stresses, renewable energy supporters should view the climate policy process as a valuable new impetus — supplementing concerns over energy security, air pollution, acid rain, and nuclear radiation — in accelerating the use of renewables.

Although the Kyoto agreement is full of legal and political complexities and uncertainties — and is likely to undergo a series of "refinements," if not major surgery, for years — companies, policymakers, and advocates should not wait for full clarity or legal ratification to act. Rather, they would do well to focus on the immediate opportunities being opened at the

[79] Martha M. Hamilton, "Shell Leaves Coalition That Opposes Global Warming Treaty," *Washington Post*, 22 April 1998.

[80] Colin Macilwain, "Climate Change Centre Signs Up Big Firms," *Nature*, 14 May 1998.

international, national, and local levels by the "Kyoto spirit." It is particularly important to use the climate issue as a means of building grassroots public support for renewables — which has been one of the keys to Europe's success since 1990. Renewable energy systems can serve as a powerful, even a populist, symbol of the worldwide effort to combat climate change — something the Clinton administration is trying to build on through the Million Solar Roofs Program.

It is essential that those who see market opportunities in climate policy be actively engaged in its formation — in part to counter the strong negative messages still emanating from many U.S. industry sectors. But it is impractical for most companies to follow such a complex process closely on their own; the best vehicle for involvement and action in the field is the Business Council for Sustainable Energy. (The senior author is a member of the Council's Board of Directors.) Based in Washington, the Business Council has been a regular presence at recent climate negotiations, including the Kyoto conference, and works closely with renewable energy trade associations, such as the U.S. Export Council for Renewable Energy and the European Business Council for Sustainable Energy.

The Business Council is also a good starting point for companies wishing to become more involved with specific institutions and processes. It works closely with the administration and Congress on pressing domestic issues such as R&D and electricity restructuring, and also with international bodies such as the Climate Change Secretariat, GEF, and the World Bank. It is crucial that companies and advocates that support these programs and institutions weigh in strongly and soon with key members of Congress, since many of their budgets are in jeopardy. Since Kyoto, the Business Council has arranged a series of seminars to help business leaders and policymakers think about such issues as the Clean Development Mechanism, joint implementation, and credits for early action.

Another group that is knee-deep in the climate policymaking process is the U.S. Climate Action Network (US CAN), a Washington-based network of more than 50 nongovernmental organizations, including the Environmental Defense Fund, the Sierra Club, and the Union of Concerned Scientists. As the U.S. "node" of the global Climate Action Network, US CAN serves as a clearinghouse for information about raising public awareness on climate change and as a focal point for tracking and clarifying the environmental community's positions on the domestic and international policy agenda. US CAN's members have launched a public education effort to mobilize a grassroots constituency for progressively stronger action by the administration and Congress.

There are many ways to get involved in the policy process directly. (See Appendix for a list of U.S. and international contacts.) Here, too, networks can be helpful: the Sustainable Energy Coalition, for example, has contact information on members of the House and Senate Renewable Energy Caucuses. Many climate decisionmakers are eager to hear directly from concerned citizens and the private sector — particularly from those who take a constructive approach to the issue. Diplomacy is important, however. As the U.S. government's role in the climate process is viewed with skepticism in many countries, it is important to explain views clearly and carefully — and to listen carefully to the views of those from other countries.

Regarding support for particular renewable energy projects, most of the international institutions described in this report are not able to consider proposals from private companies — though this may begin to change in the future. In the meantime, it is important to learn the procedures used by the funding agencies and, where appropriate, to develop project proposals in conjunction with government agencies wherever the opportunities lie.

To capitalize on Kyoto, renewable energy promoters will need to "Think **B-I-G**":

■ **Be actively involved** in implementing and strengthening national climate programs aimed at accelerating decarbonization of the energy system; do not allow "sunset" industries, such as coal or oil, to set the terms of this debate.

- Support quantified limits on emissions trading to ensure adequate measures are taken to increase domestic renewables use.
- Support efforts to expand the domestic renewables market by pressing for full congressional funding of the administration's climate change initiative as well as the specific elements of its renewable energy budget.
- Work with state and federal policymakers to enact electricity restructuring legislation that includes strong support for renewables as well as energy source and emissions disclosure requirements.
- Encourage states that do not yet have net metering programs or Million Solar Roofs plans to get moving.
- Anticipate a state-led energy revolution. Take advantage of existing green pricing and marketing, net metering, Million Solar Roof programs, and other utility and state renewables policies.

■ **Influence** the design of new international policies and institutions under the Framework Convention on Climate Change so as to enhance their effectiveness in promoting renewable energy.

- Participate actively in the climate policy process, including monitoring the leadup to the Buenos Aires meeting and prepare to react as key provisions of the protocol are agreed to.
- Work with business and environmental umbrella groups following the negotiations, and offer sustained support for the protocol's ratification well before formal Senate debate begins.
- Provide input on how the Clean Development Mechanism should be structured to encourage the spread of renewable energy projects.
- Work with groups such as the U.S. Business Council for Sustainable Energy in shaping GEF and joint implementation programs and the development of the World Bank's Carbon Investment Fund. Encourage Congress to provide full funding for them.

■ **Get ready** for potentially explosive growth of renewable energy markets in several regions in the next few years, including southern Europe, China, and Latin America.

- Single-market strategies are risky. Monitor the development of national policies carefully so as to take advantage of those "emerging renewables markets" that may open suddenly in the future.
- Explore opportunities to expand the overseas market through U.S. bilateral assistance programs, such as the new AID Climate Change Initiative.
- Consider ways to team up with investment banks and with large oil and power companies that are looking for opportunities in renewable energy.

Few issues are as contentious or complex as climate change. And from the point of view of renewable energy supporters, none are as important. Aggressively engaging that process is not just a nice opportunity; it may turn out to be essential to the future of many renewable energy companies. Understanding and following the climate policy process will require significant investments — but will yield far greater rewards in the decades ahead.

Appendix: Contacts for Further Information

(Activities in Parentheses and Italics)

International Institutions

Global Environment Facility (GEF)

GEF Secretariat
1818 H Street, NW
Washington, DC 20433
Web: <http://www.gefweb.org>
Phone: 202-473-0508
Fax: 202-522-3240/3245

Dilip Ahuja *(GEF)*
Director
Climate Change Operational Program
Phone: 202-473-9469

Alan Miller *(GEF, CDM)*
Senior Environmental Specialist for
Climate Change
Phone: 202-473-8324

Organisation for Economic
Co-operation and Development
(Technology transfer, policy coordination)

2, Rue Andre-Pascal
75775 Paris CEDEX 15
FRANCE

Jan Corfee-*Morlot*
(CDM, International mechanisms)
Administrator
Climate Change Directorate
Phone: (33-1) 4524-1966
Fax: (33-1) 4524-7876
Email: jan.corfee-morlot@oecd.org

United Nations
Development Programme
(Developing country programs)

1 U.N. Plaza
New York, NY 10017

Annie Roncerel
Senior Programme Officer
Energy & Atmosphere Programme
Sustainable Energy and Environment
Division, BDP
Phone: 212-906-6616
Fax: 212-906-5148
Email: aroncere@undp.org

U.N. Framework Convention on
Climate Change (UN FCCC)
(Kyoto Protocol, AIJ)

UN FCCC Secretariat
P.O. Box 260124
D-53153 Bonn
Germany
Web: http://www.unfccc.de
Phone: 49-228-815-1000
Fax: 49-228-815-1999

Janos Pazstor *(UN FCCC implementation)*
Coordinator
Intergovernmental and
Information Support
Email: jpazstor@unfccc.de

World Bank
(Energy and Environment Strategy,
Global Carbon Initiative)

1818 H Street, NW
Washington, DC 20433
Web: http://www-esd.worldbank.org/cc/
Phone: 202-477-1234
Fax: 202-522-3256

Charles Feinstein
(Energy and Environment Strategy)
Director
Global Climate Change Unit
Global Environment Division
Environment Department
Phone: 202-473-2986

Odil Tunali
(Energy and Environment Strategy)
Consultant
Global Climate Change Unit
Global Environment Division
Environment Department
Phone: 202-473-6774

Eivind Tandberg *(Carbon Investment Fund)*
Program Manager
Global Carbon Initiative
Phone: 202-473-9476
Email: etandberg@worldbank.org

U.S. Federal Government

Agency for International Development

Ronald Reagan Building
1300 Pennsylvania Avenue, NW
Washington, DC 20523
Web: http://www.info.usaid.gov/

David Hales *(CDM, JI, technology transfer)*
Director
Global Environment Center
Phone: 202-712-1750

Jefferson Seabright
(Technology cooperation agreements)
Director
Office of Energy, Environment,
and Technology
Phone: 202-712-4370

Council on Environmental Quality

722 Jackson Place, NW
Washington, DC 20503
Phone: 202-395-5750
Fax: 202-456-2710
Web: http:www.whitehouse.gov/CEQ/

Kathleen McGinty *(Negotiations)*
Chair
Phone: 202-395-5750

David Sandalow *(CDM, trading, JI)*
Associate Director for International Trade
Phone: 202-456-6224

Department of Commerce

14th Street and Constitution Avenue, NW
Washington, DC 20230
Phone: 202-482-1212

Jeffrey Hunker *(Economic/trade issues)*
Deputy Assistant to the Secretary
Phone: 202-482-6055

Department of Energy

Forrestal Building, 1000
Independence Avenue, SW
Washington, DC 20585
Phone: 202-586-6210
Web: http://www.doe.gov

Abe Haspel *(CDM, trading, JI)*
Associate Deputy Under Secretary
Phone: 202-586-5316

Joe Romm *(Technologies and policies)*
Principal Deputy Assistant Secretary
Phone: 202-586-9220

Environmental Protection Agency

Waterside Mall
401 M Street, SW
Washington, DC 20460
Web: http://www.epa.gov

David Doniger *(CDM, trading)*
Counsel
Phone: 202-260-2865

Maurice LeFranc (CDM)
Policy Specialist
Phone: 202-260-2090

Department of State

2201 C Street, NW
Washington, DC 20520
Web: http://www.state.gov/index.html
Phone: 202-647-4000 *(Office of Global Change)*

Melinda Kimble
(Second lead climate negotiator)
Acting Assistant Secretary
Phone: 202-647-3004

Jonathan Pershing *(Trading, JI, strategy)*
Deputy Director
Office of Global Change
Phone: 202-647-4069

Rafe Pomerance *(Diplomatic strategy)*
Deputy Assistant Secretary
Office of Global Change
Phone: 202-647-2232

Daniel Reifsnyder *(CDM, trading, JI)*
Director
Office of Global Change
Phone: 202-647-4069

Department of Treasury

1500 Pennsylvania Avenue, NW
Washington, DC 20220
Web: http://www.ustreas.gov

Jonathan Gruber *(JI, trading, CDM)*
Deputy Assistant Secretary
for Economic Policy
Phone: 202-622-0563

John Karl Scholz *(Tax incentive package)*
Deputy Assistant Secretary for Tax Analysis
Phone: 202-622-1782

U.S. Initiative on Joint Implementation (USIJI)

USIJI Secretariat
PO-6
1000 Independence Avenue, SW
Washington, DC 20585
Phone: 202-586-3288
Web: http://www.ji.org
Information Line: 202-586-3467
Fax: 202-586-3485/3486
Fax-on-Demand: 202-260-8677

White House Climate Change Task Force

722 Jackson Place, NW
Washington, DC 20503
Phone: 202-343-1060
Fax: 202-343-1162
Web: http://www.whitehouse.gov
initiative/climate

Todd Stern
(Lead Administration climate representative)
Assistant to the President
for Special Projects
Phone: 202-456-2702

Dirk Forrister *(Domestic public outreach strategy, CDM, trading)*
Chairman
Phone: 202-343-1060

Steve Seidel *(Industry outreach)*
Industry Outreach
Phone: 202-343-1092

U.S. Congress

Senate

Senate Appropriations Committee
S-128 Capitol Building
Washington, DC 20510-6025
Phone: 202-224-3471
Web: http://www.senate/gov/committee/appropriations.html
Chairman: Ted Stevens (AL)

Budget allocations

Energy and Water Development Subcommittee
SD-127 Dirksen Senate Office Building
Washington, DC 20510-6030
Phone: 202-224-7260
Chairman: Pete V. Domenici *(R-New Mexico)*
DOE renewables R&D, tax incentive budgets

Foreign Operations Subcommittee
SD-142 Dirksen Senate Office Building
Washington, DC 20501-6031
Phone: 202-224-2104
Chairman: Mitch McConnell *(R-KY)*
AID, World Bank funding and policy

Interior and Related Agencies Subcommittee
SD-131 Dirksen Senate Office Building
Washington, DC 20510-6033
202-224-7233
Chairman: Slade Gorton *(R-Washington)*
DOE renewables R&D budgets

VA, HUD, and Independent Agencies Subcommittee
SD-127 Dirksen Senate Office Building
Washington, DC 20510-6032
Phone: 202-224-7211
Chairman: Christopher Bond *(R-MO)*
EPA budget for Climate Change Technology Initiative

Senate Committee on Energy and Natural Resources
SD-364 Dirksen Senate Office Building
Washington, DC 20510-6150
Phone: 202-224-4971
Fax: 202-224-6163
Web: http://www.senate.gov/committee/energy.html or http://www.senate/gov/~energy
Email: webmaster@energy.senate.gov
Chairman: Frank Murkowski *(R-Alaska)*
Energy and climate policy, R&D

Energy Research, Development, Production and Regulation Subcommittee
SD-308 Dirksen Senate Office Building
Washington, DC 20510-6152
Phone: 202-224-6567
Fax: 202-228-0302
Chairman: Don Nickels *(R-OK)*
Energy and climate R&D

Senate Committee on Small Business
SR-428A Russell Senate Office Building
Washington, DC 20510-6350
Phone: 202-224-5175
Fax: 202-224-5175
Web: http://www.senate.gov/~sbc/
Email: committee@small-bus.senate.gov
Chairman: Kit Bond *(R-MO)*
Protocol impacts on small businesses

Senate Foreign Relations Committee
Sd-450 Dirksen Senate Office Building
Washington, DC 20510-6225
Phone: 202-224-4651
Hearings Schedule: 202-224-8380
Web: http://www.senate.gov/committee/foreign.html
Chairman: Jesse Helms *(R-NC)*
Foreign policy

International Economic Policy, Export and Trade Promotion Subcommittee
Chairman: Chuck Hagel *(R-NE)*
Foreign economic, trade, and aid policy, including protection of the environment

House

House Appropriations Committee
H-218 Capitol Building
Washington, DC 20515-6015
Phone: 202-225-2771
Web: http://www.house.gov/appropriations
Chairman: Bob Livingston *(R-LA)*

Budget allocations

Energy and Water Development Subcommittee
2362 Rayburn Office Building
Washington, DC 20515-6020
Phone: 202-225-3421
Chairman: Joseph M. McDade *(R-PA)*
DOE renewables R&D, tax incentive budgets

Foreign Operations, Export Financing, and Related Programs Subcommittee
H-150 Capitol Building
Washington, DC 20515-6021
Phone: 202-225-2041
Chairman: Sonny Callahan *(R-AL)*
AID, World Bank, GEF funding and policy

Interior and Related Agencies Subcommittee
B-308 Rayburn House Office Building
Washington, DC 20515-6023
Phone: 202-225-3081
Chairman: Ralph Regula *(R-OH)*
DOE renewables R&D budget

VA, HUD, and Independent Agencies Subcommittee
H-143 Capitol Building
Washington, DC 20515-6022
Phone: 202-225-3241
Chairman: Jerry Lewis *(R-CA)*
EPA budget for Climate Change Technology Initiative

House Committee on Small Business
2361 Rayburn House Office Building
Washington, DC 20515-6315
Phone: 202-225-5821
Fax: 202-225-3587
Web: http://www.house.gov/smbiz/
Email: smbizcom@hr.house.gov
Chairman: James Talent *(R-MO)*
Protocol impacts on small businesses

House Commerce Committee
2125 Rayburn House Office Building
Washington, DC 20515-6115
Phone: 202-225-2927
Fax: 202-225-1919
Hearings Schedule: 202-225-0654
Web: http://www.house.gov/commerce/ or http://www.house.govcommerce_democrats/
Email: commerce@hr.house.gov
Chairman: Tom Bliley *(R-VA)*
Energy policy, R&D

Energy and Power Subcommittee
Chairman: Dan Schaefer *(R-CO)*
Energy policy, R&D

House Government Reform and Oversight Committee
2157 Rayburn House Office Building
Washington, DC 20515-6143
Phone: 202-225-5074
Fax: 202-225-3974
Web: http://www.house.gov/reform/
Chairman: Dan Burton *(R-IN)*
Overall government operations and activities

National Economic Growth, Natural Resources, and Regulatory Affairs Subcommittee
B-377 Rayburn House Office Building
Washington, DC 20515
Phone: 202-225-4407
Fax: 202-225-2441
Chairman: David McIntosh *(R-IN)*
Emissions trading, Clean Development Mechanism; developing country participation

Nongovernmental Organizations

American Wind Energy Association *(Trade association)*

122 C Street, NW, Fourth Floor
Washington, DC 20001
Phone: 202-383-2500
Fax: 202-383-2505
Email: windmail@awea.org

Contact: Randall Swisher
Email: randy_swisher@awea.org

Business Council for Sustainable Energy *(Policy advocacy coalition)*

1200 18th Street, NW, Ninth Floor
Washington, DC 20036
Phone: 202-785-0507
Fax: 202-785-0514

Contact: Lisa Jacobson, Director, International Programs
Email: ljacobson@ase.org

Center for Resource Solutions *(Green-e labeling program)*

P.O. Box 29512
Presidio Bldng. 49
San Francisco, CA 94129
Phone: 415-561-2100
Fax: 415-561-2105

Contact: Kirk Brown
Email: kirkbrown@igc.org

Geothermal Energy Association *(Trade association)*

122 C Street, NW, Suite 400
Washington, DC 20001
Phone: 202-383-2676
Fax: 202-383-2678
Email: geo@geotherm.org

Contact: Karl Gawell

International Institute for Energy Conservation *(Export opportunities)*

750 First Street, NE, Suite 940
Washington, DC 20002

Contact: Griffin Thompson, Director, Climate Program
Phone: 202-842-3388

Solar Century *(Insurance-renewable business investment partnerships)*

32 St. Bernards Road
Oxford OX 2 6EH
United Kingdom
Phone: 44-0-1865-513-534
Fax: 44-0-1865-316-127

Contact: Dr. Jeremy Leggett, Executive Director
Email: jl@solarcentury.co.uk

Solar Energy Industries Association *(Trade association)*

122 C Street, NW, Fourth Floor
Washington, DC 20001-2109
Phone: 202-383-2600
Fax: 202-383-2670

Contact: James Beck
Email: jbeck@seia.org

SUN DAY Campaign/Sustainable Energy Coalition *(Energy advocacy network, Congressional caucuses)*

Suite #2
315 Circle Avenue
Takoma Park, MD 20912-4836
Phone: 301-270-2258
Fax: 301-891-2866

Contact: Ken Bossong
Email: kbossong@cais.com

U.S. Climate Action Network *(Environmental organization focal point)*

1200 New York Avenue, NW, Suite 400
Washington, DC 20005
Phone: 202-289-4201
Fax: 202-289-1060
Email: uscan@igc.apc.org
Web: http://www.climatenetwork.org/USCAN/

Contact: Chad Livingston,
Email: Clivingston@nrdc.org

U.S. Export Council for Renewable Energy *(Trade association network)*

Fourth Floor
122 C Street, NW
Washington, DC 20001
Phone: 202-383-2550
Fax: 202-383-2555
Web: http://solstice.crest.org/renewables/usecre/index.html

Contact: Manny Ocasio, Outreach
Email: mannyo@usecre.org

Worldwatch Institute *(International environmental policy research)*

1776 Massachusetts Avenue, NW,
Suite 800
Washington, DC 20036
Phone: 202-452-1999
Fax: 202-296-7365
Web: http://worldwatch.org
Email: worldwatch@worldwatch.org

Contact:

Christopher Flavin
Email: cflavin@worldwatch.org

Seth Dunn
Email: sdunn@worldwatch.org

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Whole Buildings and a Whole Building Policy, by the Passive Solar Industries Council and Donald Aitken: This paper explains why energy-conscious builders and architects need to consider "whole buildings," and suggests that whole buildings ought to form the basis of federal buildings policy, as well.

Project Siting: Comparative Case Studies and Lessons Learned, by Bob Kahn and John Grattan. This paper reviews case studies of renewable energy project siting, and provides recommendations to make renewable energy projects beneficial to both their end-users and to local communities hosting the project.

Past Price Projections: Renewables as a Success Story, by Dallas Burtraw. This paper reviews past price projections for renewables, evaluates the fulfillment of those projections, and assesses the viability of meeting future price reductions and the importance of other factors, such as fossil fuel prices, on market growth for renewables.

Making Technology Happen: Case Studies of the Government's Role in Innovation, by Adam Serchuk and Bernard Moore. This paper explores the role of the Federal government in promoting diverse consumer technologies, including the fax machine and energy-efficient lighting, to supply background for a discussion of an appropriate Federal role in developing renewable energy technologies.

Upcoming Issue Briefs*

Government Procurement, by Virinder Singh: This paper explores the power of government purchasing to open markets for renewable energy technology, offering case studies of current renewable energy procurement efforts and of recycled paper.

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Readers who wish to comment on this paper or to propose a project should contact Dr. Adam Serchuk, Research Director, at aserchuk@aol.com or (202) 293-0542.

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