**Joint Implementation:**

**Biodiversity and Greenhouse Gas Offsets**

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**ABSTRACT**

One of the most pressing environmental issues today is the possibility that projected increases in global emissions of greenhouse gases from increased deforestation, development, and fossil-fuel combustion could significantly alter global climate patterns. Under the terms of the United Nations Framework Convention on Climate Change, signed in Rio de Janeiro during the June 1992 Earth Summit, the United States and other industrialized countries committed to balancing greenhouse gas emissions at 1990 levels in the year 2000. Included in the treaty is a provision titled "Joint Implementation," whereby industrialized countries assist developing countries in jointly modifying long-term emission trends, either through emission reductions or by protecting and enhancing greenhouse gas sinks (carbon sequestration). The US Climate Action Plan, signed by President Clinton in 1993, calls for voluntary climate change mitigation measures by various sectors, and the action plan included a new program, the US Initiative on Joint Implementation. Wisconsin Electric decided to invest in a JI project because its concept encourages creative, cost-effective solutions to environmental problems through partnering, international cooperation, and innovation. The project chosen, a forest preservation and management effort in Belize, will sequester more than five million tons of carbon dioxide over a 40-year period, will become economically self-sustaining after ten years, and will have substantial biodiversity benefits.

Change—it’s a word that has become prominent in my vocabulary in recent years. Global climate change, electric utility downsizing and restructuring changes brought on by competition and mergers, biodiversity changes, narrow command-and-control regulatory approaches to environmental issues changing to more flexible, innovative market-based initiatives—although quite diverse, all are topics involving change that are intertwined in a project in Belize, Central America.

Humanity is losing its richest, most diverse, and most valuable biotic resource in the extensive and devastating destruction of tropical forests. The economic, aesthetic, and cultural losses to future generations are difficult to calculate. At the same time, greenhouse gases, which include carbon dioxide (CO2), methane, chlorofluorocarbons, and nitrous oxides, are increasing dramatically in the atmosphere. In the United States, at least 85% of greenhouse gas emissions take the form of CO2, most of which is the result of fossil fuel combustion. In less developed, humid tropical countries like Belize, biotic emissions of CO2 from deforestation, forest degradation, and other land-use changes dominate.

Despite the many uncertainties over how increasing CO2 may influence our climate and how society will ultimately address the global climate change issue, countries are making commitments to reduce carbon emissions. In the face of monumental changes (i.e., downsizing, restructuring, competition) occurring within the US electric utility industry, some forward-looking utilities have taken innovative steps to play a constructive role in this matter by investing in tropical forestry opportunities that sequester carbon and positively impact biodiversity. Companies also are investing in domestic forestry efforts.

**Joint Implementation**

The concept of joint implementation (JI) was introduced early in the negotiations leading up to the 1992 Earth Summit and was formally adopted into the text of the United Nations Framework Convention on Climate Change (FCCC). Over 100 countries since have signed and ratified the convention. Many of these signatories have committed to reducing their greenhouse gas emissions. One article of the FCCC states that parties may implement policies and measures, which limit their anthropogenic emissions of greenhouse gases, jointly with other parties. The term JI has been used subsequently to describe a wide range of international cooperative development projects where private industry, government entities, or nongovernmental organizati-
tions in one country jointly seek to avoid, reduce, or sequester greenhouse gases, particularly CO\textsubscript{2}, with another country having similar interests. JI represents a market-based option to help countries meet the objective of the FCCC, while offering project participants a unique opportunity to promote reductions in global emissions of greenhouse gases in a potentially cost-effective, mutually beneficial manner.

During the spring 1995 FCCC Conference in Berlin, the parties failed to arrive at overall criteria for JI, although there were decisions regarding greenhouse gas credits and length of the pilot phase. The parties also agreed to change the name and refer to “activities implemented jointly (AIJ)” rather than JI. Although JI still is used extensively, AIJ is used hereafter in this paper. The parties established a set of four basic criteria for pilot phase projects. These included:

- Host and home country acceptance—AIJ project proposals must be submitted to, and accepted by, home and host countries through their respective evaluation processes;
- Local priorities—projects must be compatible with and supportive of national environmental and development priorities and strategies of the host country;
- Offset additionality—All AIJ activities should bring about real, measurable, and long-term environmental benefits related to the mitigation of climate change that would not have occurred in the absence of such activities; and
- Financial additionality—Financing of AIJ activities shall be additional to the financial obligations of industrialized parties within the framework of the financial mechanism of the FCCC, as well as to the financing of any current development assistance.

The United States has taken the initiative in promoting AIJ in regional and international forums and has set up a US Initiative for Joint Implementation (USIJI) Secretariat. This interagency pilot program was the first national program to have a formal set of acceptance criteria guidelines, which are quite rigorous, and an established evaluation process. The purpose of the USIJI pilot program is to:

- Encourage the rapid development and implementation of cooperative, mutually voluntary, cost-effective projects between US and foreign partners aimed at avoiding, reducing, or sequestering emissions of greenhouse gases, particularly projects promoting technology cooperation with and sustainable development in developing countries and countries with economies in transition to market economies;
- Promote a broad range of projects to test and evaluate methodologies for measuring, tracking, and verifying costs and benefits;
- Establish an empirical basis to contribute to the formation of international criteria for AIJ;
- Encourage private-sector investment and innovation in the development and dissemination of technologies for reducing or sequestering emissions of greenhouse gases; and
- Encourage participating countries to adopt more complete climate action programs.

The first seven successful USIJI projects were announced in February 1995 and another eight projects were accepted in December 1995. Any project that avoids, reduces, or sequesters global greenhouse gases beyond the reference baseline (the level and rate of emissions without the offset project) may be considered an AIJ project if the source of emissions being offset and the site of the emission abatement are located in two different countries. There are two main types of AIJ projects:

- Land use—These projects include both carbon sequestration through practices that measurably increase the carbon-fixing ability of a certain area of land and preservation of natural carbon stocks threatened with imminent destruction. Sequestration refers to the natural process by which the carbon in gaseous compounds, such as CO\textsubscript{2}, is incorporated into plant biomass. For example, the carbon atom in CO\textsubscript{2} is absorbed ("fixed") by plants ("sinks") through photosynthesis with oxygen released into the atmosphere. Examples of land-use projects include forest preservation, reforestation, and sustainable forest management projects.

- Energy—These projects include fuel switching or application of renewable energy that reduces the use of carbon-based fuels and energy efficiency increases resulting from changes in either energy production or user demand through programs such as demand-side management.

“Climate Challenge” Program

The “US Climate Action Plan,” signed by President Clinton in 1993, firmly commits the United States to the goal of balancing domestic greenhouse gas emissions at 1990 levels in the year 2000. The United States is seeking to achieve this objective through cost-effective, market-based greenhouse gas mitigation strategies. A broad menu of totally voluntary climate-change initiatives are being implemented by several federal agencies.
These initiatives are targeted principally to the electric utility, transportation, agricultural, and forestry sectors. One of the many initiatives jointly developed by the electric utility industry and the Department of Energy (DOE) is the Climate Challenge, which encourages electric utilities to limit greenhouse gas emissions voluntarily.

Wisconsin Electric Power Company (WE) signed a Climate Challenge Participation Accord with the DOE in February 1995. By the year 2000, WE has committed to reducing its emissions of CO₂ by at least 16% while also facing an almost 17% increase in estimated system electrical load requirements over the same period. Emissions of CO₂ will be reduced through many programs including provision of demand-side management programs to assist customers in using energy more efficiently, improving energy efficiency at power plants, developing or supporting waste-to-energy projects, maximizing utilization of fly ash, providing assistance in the conversion of motor vehicles from using gasoline to using compressed natural gas, reducing transmission and distribution line losses, and, of course, through participation in foreign USIJI projects.

A Pilot Project Partnership

WE and The Nature Conservancy (TNC) began discussing a market-based AIJ program in 1994. After the USIJI Secretariat held its first workshop in September on proposal development, the two parties began a proposal development effort. The project was designed for the specific purpose of examining the potential for using carbon sinks as a credible, accountable climate change response strategy and as a source of conservation financing. The outcome will help guide TNC decisions about future responses to the climate change issue. For WE and the other equal financial participants, which include Detroit Edison Company, Cinergy Corporation, PacifiCorp, and UtiliTee Carbon Company, the project will reveal whether or not voluntary private international projects can be used effectively to help achieve the greenhouse gas mitigation goals of the FCCC. If the project proves to be a viable means of promoting conservation and achieving credible carbon mitigation, it will pave the way for future joint efforts.

A set of project screening criteria that meet USIJI, WE, and TNC demands was established. For example, the project had to be credible and modest in size. As a private international investment, host country political stability and secure land tenure laws also were important. After screening more than 20 potential projects being planned by TNC's Latin American and Caribbean partner organizations, five candidate projects were identified. From these excellent sites, WE and TNC agreed that the Rio Bravo in northwest Belize was the best candidate for the pilot project. Programme for Belize (PFB) owns the Rio Bravo Conservation and Management Area (RBCMA) in perpetual trust for the people of Belize. The land had been obtained by PFB through a series of donations and purchases since PFB was established in 1988. By 1994, PFB had researched RBCMA's flora and fauna and had developed a preliminary land-use plan, which included development of a sustainable forestry program on the eastern portion of the RBCMA. The western portion is to be protected for conservation, scientific, and educational purposes.

PFB, however, had not secured funding for implementing its sustainable forestry program. It also had an option to purchase a critical parcel of land that intersects the eastern portion of the RBCMA but was without funds to conclude the purchase. Based on well-documented local land conversion trends, it was apparent that deforestation and conversion to unsustainable agriculture would take place on the optioned parcel within five years.

As a result of these circumstances, it was clear that any sequestration benefits realized in the RBCMA would occur only as a result of the pilot project. Moreover, PFB had demonstrated a capability to provide the in-country institutional support for the project's design and implementation and has an excellent working relationship with the government of Belize and the local community.

Project Components

The Rio Bravo project has two components. Component A involves purchase of a parcel of forest land that intersects the eastern portion of the RBCMA and is under imminent threat of conversion to agricultural land. Component B involves a combination of sustainable forestry management, fire protection, and conservation.

Under component A, PFB would exercise its option to purchase 6014 ha of endangered forest land. Because of a lack of funds, PFB had decided that it would have to forego any further efforts to purchase the parcel. Until the USIJI project emerged, the area would have almost certainly been deforested and converted to agricultural use. In addition, a recent sustainable forestry prefeasibility study of the RBCMA indicated that acquisition of this parcel is necessary to have sufficient forest acreage to implement a viable sustainable forestry initiative within the 50,543-ha eastern portion of the RBCMA.

Component B involves developing and implementing a forest management program that is both economi-
cally sustainable and increases the level and rate of carbon sequestration. Although conservation of forest lands under threat of conversion to agricultural use is clearly one way of attaining a net viable strategy from an economic standpoint, the long-term preservation of forest land will ultimately depend on there being a real economic benefit. Otherwise Belizean land will naturally be converted to the “highest and best” economic use. In the case of Belize, the most directly profitable use of depleted forest lands is large-scale intensive agriculture. Six sustainable forestry measures will be initiated as part of component B:

- Primary broadleaf timber stocks and the area’s biomass will be allowed to recover to a higher maintenance level for carbon sequestration. Existing forests have been degraded through illegal felling of undersized trees and logging on sites unsuitable for timber extraction. Younger mahogany (*Swietenia macrophylla*) and Mexican cedar (*Cedrela mexicana*) will be allowed to grow to maturity before extraction.
- Practices that encourage regeneration of the primary timber species will be adopted. Regeneration is poor following traditional selective logging because the larger seed trees are removed and gaps are not large enough for regeneration.
- Low-impact logging will be employed. Logging techniques will be used that minimize damage to nontarget species, other vegetation, and soil. These include marking trees for extraction, directional felling, cutting of lianas, and use of preplanned skid trails that minimize destruction of the surrounding biomass and prevent soil erosion.
- Durable timber products will be marketed. Marketing of high-value timbers for durable wood products will continue to hold carbon in the long-term and also provides critically needed jobs.
- A forest fire prevention program and a fire management plan will be implemented to improve pine stocks through regeneration in the highly degraded pine savanna vegetation type. These open pine woodlands have been damaged by uncontrolled seasonal wildfires or fires set by poachers.
- Using implementation of successful sustainable forestry management on the RBCMA as a model, efforts will be made to extend the management practices to approximately 600,000 ha in the surrounding area.

The acquisition and management components of the project will act together to sequester CO$_2$ by securing a parcel of forested land while increasing the amount of carbon the forest sequesters over time under a sustainable forestry regime. The project is expected to become self-supporting within ten years and will continue for a total of 40 years, which constitutes the harvesting cycle for mahogany. The 40-year estimated minimum carbon sequestration is 1,309,495 tonnes (more than 5 million tonnes of CO$_2$) representing a total cost of approximately US $2.6 million. Based on a conservative estimate, the total cost per unit of greenhouse gas sequestered is US $1.91 per tonne of carbon (52¢ per tonne of CO$_2$) over 40 years.

### Biodiversity

In addition to its greenhouse gas benefits, the project will have a number of other benefits (Table 1). Biodiver-

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<thead>
<tr>
<th>Benefit</th>
<th>Description</th>
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<tr>
<td>Greenhouse gas impacts</td>
<td>Significant carbon sequestration in vegetation and soils</td>
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<tr>
<td>Nongreenhouse gas impacts</td>
<td>Soil erosion will be reduced</td>
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<td></td>
<td>Pollution of surface waters will be reduced</td>
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<td></td>
<td>Some improvement in air quality may result</td>
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<tr>
<td>Human health</td>
<td>Positive benefits may be seen</td>
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<td>Biodiversity</td>
<td>Significant positive benefits through maintaining natural vegetation and wildlife habitats</td>
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<td>Sustainable economic development</td>
<td>Major long-term benefits expected through sustainable forest management</td>
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<tr>
<td>Regional employment</td>
<td>Harvesting forest products and converting them to final products provide labor-intensive jobs</td>
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<tr>
<td>Environmental education</td>
<td>Concepts of global climate change-carbon sequestration/sustainable economic development will be incorporated into educational curriculum at Rio Bravo Field Station</td>
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<tr>
<td>Community outreach</td>
<td>Sustainability concepts extended to mechanized farm community to promote importance of agricultural sustainability</td>
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<td>Land productivity</td>
<td>Maintained through retaining natural forest cover, sustainable forest management, and low-impact logging</td>
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<tr>
<td>Cultural heritage</td>
<td>Controlled access will protect archaeological Mayan sites</td>
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<tr>
<td>Technology transfer</td>
<td>Program can be used as a model for application to other private land holdings to demonstrate benefits of sustainable forest management</td>
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Earth does life’s diversity flourish more abundantly than in the tropics, where myriad species of plants and animals have developed intricate relationships over millions of years. Estimates of the total number of species vary from two to more than 30 million, and the great majority have yet to be scientifically named and described. Of the over 4000 species of plants in Belize, over 700 are tree species (Hamm 1995). On PFB’s 90,000+-ha Rio Bravo property, there are probably close to 300 tree species. Upland broadleaf forest and scrub swamp forest along with a transition forest, which is between these two types, dominate the land cover, but more than 12 distinct vegetation types are recognized (PFB 1991). Sampling of Rio Bravo tree plots shows that uncommon or rare tree species make up a high percentage of the species found in a given area (Brokaw and Mallory 1993).

Tropical life is increasingly threatened by human activity. Belize has a population of 205,000 in an area smaller than the state of Vermont, yet its population is expected to grow by 145,000 in the next 25 years. Forests are vanishing rapidly under intense pressure for development. This loss not only deprives us of critical knowledge but also threatens the global environment. Tropical ecosystems provide an invaluable storehouse of undiscovered medicines, food, and other resources, and their abundant life is a source of wonder and delight. While unlikely, it is possible that clearing even a small forest area could eliminate all or a large part of the population of some tree species in Rio Bravo. Although Rio Bravo forests cannot be termed primeval, virgin, or undisturbed, the majority of the individual, adult, canopy trees in the forest represent old-growth species. The forest has been selectively logged during the past 150 years and has experienced other disturbances such as hurricanes, but it is generally in excellent condition (PFB 1991).

Wildlife is abundant and diverse in the Rio Bravo area. Over 380 bird species have been recorded, and there are 12 endangered mammal species. All five Central American cat species occur: jaguar (*Felis onca*), puma (*F. concolor*), jaguarundi (*F. yagouaroundi*), ocelot (*F. pardalis*), and margay (*F. wiedii*). All seem to have healthy populations (PFB 1991). Hunting has been actively discouraged or eliminated in recent years; the area is remote and human habitation near Rio Bravo is quite low. Rio Bravo also adjoins the Maya Biosphere Reserve in Guatemala and the Calakmul Biosphere Reserve in Yucatan, creating the largest remaining block of forest in Central America.

Investing in AIJ and Carbon Offsets

The motivation for a company to invest in an AIJ project such as Rio Bravo varies widely. In general, there seems to be no shortage of promising, innovative projects or lack of technical expertise, but lack of funding by industry and other sectors that emit greenhouse gases is a problem. Wisconsin Electric CEO Richard Abdoo (1995) notes several important benefits:

- It demonstrates that voluntary programs effectively reduce emissions and that the private sector can make significant progress without the creation of a mandatory command-and-control approach.
- It leads to new, innovative, and cost-effective approaches to emissions reduction that encourage and support the development of market-based approaches to environmental issues.
- It represents the right thing to do with respect to the environmental and social benefits.
- It creates and strengthens strategic alliances with partners, allowing achievement of multiple goals.
- It recognizes USIJI efforts under the DOE Climate Challenge Program and credit under section 1605 of the Energy Policy Act.
- It allows a reduction of a significantly greater volume of CO2 per dollar invested than many domestic projects would achieve.
- It is important for the company to go beyond endorsing concepts to conducting real on-the-ground projects.
- It meets the company’s desire to lead by example and, it is hoped, show a new path for environmental solutions.

Emissions Trading

Despite the many uncertainties regarding the global climate change issue and how CO2 emissions should be addressed, emissions reduction policies are being discussed at many governmental levels. Trexler and McFall (1993) point out that while command-and-control approaches to addressing CO2 emissions could be pursued, market approaches seem to be gaining favor for pollution control purposes. These approaches for limiting CO2 emissions include carbon taxes, emissions trading, externality adders, and carbon offsets.

The US 1990 Clean Air Act amendments generated the Acid Rain Allowance Trading Program that institutes trading of sulfur dioxide emission allowances. This provides an excellent basis for the formulation of a carbon trading mechanism, especially given the cost and difficulty associated with successfully limiting CO2 emissions at the combustion source. Because global
CO₂ budgets are the real issue, benefits are realized from carbon offset projects implemented anywhere as long as the net flux of carbon to the atmosphere is zero. Implementation of an effective program to address CO₂ emissions, with all of the many sources and sinks for carbon, however, is much more complicated than that associated with sulfur dioxide.

At the present time, carbon offsets have no monetary value. However, the United States has established a mechanism to document the greenhouse gas mitigation achieved. This helps create the institutional conditions necessary for the formation of a carbon offset trading market and helps provide some incentive for facilities emitting greenhouse gas to invest in emission reduction projects and carbon sink land-use projects.

Unilateral or sector-only caps and trading would not be successful in substantially managing greenhouse gases, while at the same time, they would be economically burdensome. In addition, establishing a system to address allowable emissions, monitoring, reporting, and verification is a tremendous challenge, and, for many nations, insufficient technical and economic resources are barriers to setting up the necessary systems.

It also is possible that a debt-for-carbon mechanism, similar to the debt-for-nature swap, could emerge in the future (Shand 1995). Such swaps could have substantial economic, environmental, and social benefits.

Conclusions

While the USIJI approach is new, and uncertainties rule in the global climate arena, there is much that is positive and opportune in the efforts by select electric utilities to reduce CO₂ and other greenhouse gases. Implementing successful pilot projects like Rio Bravo is imperative. The experiences of those involved in these projects must demonstrate that win-win transactions are possible. If voluntary, flexible approaches that include carbon emissions trading are to evolve into successful strategies, confidence must be built among many parties and interests that the cost of greenhouse gas mitigation can be reduced while still supporting sustainable development objectives.

The complex threats to biological diversity call for a wide range of responses from both private and public sectors, and the mix of these responses must be adjusted to suit local conditions. The best way to protect species is to protect habitats. Protected habitats will succeed in realizing their conservation of biodiversity objectives only to the extent that the areas themselves are managed effectively. Implementing such management typically involves making protected areas parts of larger, regional schemes designed to conserve natural resources; inducing sustainable human use of the resource base; ensuring that benefits of the habitat protection reach the rural population; and, finally, involving the rural population in policy decisions related to the protected areas. The Rio Bravo Project appears to involve an innovative funding strategy that can be used to effectively manage forest lands in Belize to conserve biodiversity. This represents an extremely important secondary benefit of the successful implementation of AIJ land-use projects.

Literature Cited


