Implementing the Clean Development Mechanism: Lessons from U.S. Private-Sector Participation in Activities Implemented Jointly

Ronald Lile, Mark Powell, and Michael Toman

Discussion Paper 99-08

November 1998

This paper is a revision of Discussion Paper 97-38 and replaces that paper which is no longer available.

1616 P Street, NW
Washington, DC 20036
Telephone 202-328-5000
Fax 202-939-3460
Internet: http://www.rff.org

Implementing the Clean Development Mechanism: Lessons from U.S. Private-Sector Participation in Activities Implemented Jointly

Ronald Lile, Mark Powell, and Michael Toman

Abstract

The "Clean Development Mechanism" (CDM) contained in the December 1997 Kyoto Protocol to the United Nations Framework Convention on Climate Change provides, for the first time, the capacity for industrialized countries to claim credits for greenhouse gas (GHG) emissions reductions or offsets undertaken in cooperation with host developing countries. However, the Protocol provides no guidance on how these cooperative activities for GHG reduction and sustainable development would be undertaken in practice, including the particularly important issue of the relationship of the private sector vis-à-vis government institutions in designing, financing, and securing approval for jointly implemented GHG abatement projects. The pilot program for "Activities Implemented Jointly" under the Framework Convention provides an opportunity to better understand the practical constraints and opportunities for successful private sector participation in the CDM.

This paper highlights some of the lessons for establishing a successful CDM by examining a small number of cases from the United States Initiative on Joint Implementation (USIJI). We first review the objectives, proposal review and evaluation criteria of this program, and provide some overall information on project proposals by project type and stage of development. We then develop case studies of two energy-related USIJI projects from the earlier phase of the program. These cases illustrate several potential problems that can arise in establishing CDM transactions. Further investigation of more recent cases sheds some light on the extent to which these problems change over time.

To be successful, the CDM must be based on a solid institutional footing, with clear incentives for all parties involved. The cases we examine illustrate how transactions can become entangled in the same kinds of problems that bedevil other transactions in developing and transitional economies. In both early cases, "transaction costs" were substantial. The latter projects indicated that while the nature of transactions costs changed over time, they still remained somewhat substantial. Project proponents regarded gaining USIJI acceptance as one of the principal impediments to JI project development. The cases also illustrate the need for clear and widely understood goals and procedures for investor country approval. In addition, the analysis underscores how attitudes of different project proponents regarding the value of GHG credits can affect their perspective on the transaction. Finally, the study underscores that financing remains the ultimate hurdle to project implementation, and that the expectation of a clear financial return on investment is a prerequisite to a successful project.

Key Words: climate change, joint implementation

JEL Classification Numbers: Q28, F21

Table of Contents

IMPLEMENTING THE CLEAN DEVELOPMENT MECHANISM: LESSONS FROM U.S. PRIVATE-SECTOR PARTICIPATION IN ACTIVITIES IMPLEMENTED JOINTLY

Ronald Lile, Mark Powell, and Michael Toman*

A. INTRODUCTION

The "Clean Development Mechanism" (CDM) contained in the December 1997 Kyoto Protocol to the United Nations Framework Convention on Climate Change provides, for the first time, the capacity for industrialized countries to claim credits for greenhouse gas (GHG) emissions reductions or offsets undertaken in cooperation with host developing countries.[1] However, the Protocol provides no guidance on how these cooperative activities for GHG reduction and sustainable development would be undertaken in practice, including the particularly important issue of the relationship of the private sector vis-à-vis government institutions in designing, financing, and securing approval for jointly implemented GHG abatement projects. The pilot program for "Activities Implemented Jointly" under the Framework Convention provides an opportunity to better understand the practical constraints and opportunities for successful private sector participation in the CDM.

This paper highlights some of the lessons for establishing a successful CDM by examining a small number of cases from the United States Initiative on Joint Implementation (USIJI). We first review the objectives, proposal review and evaluation criteria of this program, and provide some overall information on project proposals by project type and stage of development. We then develop case studies of two energy-related USIJI projects from the earlier phase of the program. These cases illustrate several potential problems that can arise in establishing CDM transactions. Further investigation of more recent cases sheds some light on the extent to which these problems change over time. Because we are considering only a small subset of total experience under this program, the paper should not be treated as a comprehensive review of USIJI operations or results. Instead, the analysis should be read as

---

* The authors' current affiliations are, respectively, University of Maryland, U.S. Department of Agriculture, and Resources for the Future. All three of the authors were affiliated with RFF when the paper was originally prepared. The authors wish to express their deepest gratitude to the leadership and staff of the US Initiative on Joint Implementation for their advice and assistance in carrying out the analysis reported in the paper; to the participants in the cases about which we report for their assistance in compiling the case information; and to several USDOE officials and staff for helpful comments on an earlier draft of the paper. This assessment was undertaken in tandem with an international project approved by the Asia Pacific Economic Cooperation-Human Resources Development-Business Management Network (APEC-HRD-BMN). The University of Hawaii's APEC Studies Center provided support for RFF's participation in the international conference which launched that initiative. Responsibility for the content of the paper is the authors' alone.

[1] For an introduction to the CDM see Toman, Kopp and Cazorla (1998).

underscoring broader issues of importance in developing a successful CDM. While we cannot claim that our findings from a few cases are robust, they do generally accord with theoretical intuition about the challenges to the design of effective institutions for CDM transactions which can successfully engage private sector participation.

We first provide some general background on the economic rationale for promoting CDM transactions, and a conceptual overview of some problems that can be anticipated in successfully organizing and completing such transactions. We then review the objectives, proposal review and evaluation criteria of the USIJI program, and provide some overall information on project proposals by project type and stage of development. Next we develop case studies of two energy-related USIJI projects from the earlier phase of the program. These cases illustrate several potential problems that can arise in establishing JI or CDM transactions. Further investigation of more recent cases sheds some light on the extent to which these problems change over time and with experience. Based on both the conceptual discussion and the information from the specific cases, we conclude by highlighting important potential lessons for JI or CDM programs in general.

B. BACKGROUND

Policy analysts have long recognized that in order to achieve a specified environmental improvement goal at the least overall cost to society, it often is necessary to provide flexibility in the allocation of responsibility for emissions reductions so that those with lower costs of abatement carry out more abatement activity. The idea of "emissions trading" grows out of this realization. With emissions trading, those emitters having lower abatement costs have a built-in incentive to expand their abatement activity since they can sell extra emissions reductions (without any net increase in overall emissions) to other emitters who have higher abatement costs. In practice, of course, one must also consider how the system can be monitored and enforced and other important specifics related to the design of a trading program. Overall, however, both extensive analysis and a limited but growing body of actual experience in the US suggests that domestic emissions trading can provide substantial cost savings (see, e.g., Burtraw 1995).

There is no reason in principle why this approach cannot also be applied internationally for control of emissions that transcend national boundaries, such as carbon dioxide (CO_2) and other greenhouse gases (GHGs). International trading of CO_2 emissions could reduce the overall cost of compliance with any specified set of internationally accepted reductions in CO_2. Even if, as is currently the case, only a subset of countries have agreed to concrete targets for reducing CO_2 emissions, those countries might be able to reduce their own emissions reductions costs by trading either with other countries with established emissions reductions targets, or by engaging in joint ventures for emissions reductions with countries that do not currently have targets. The latter types of transactions have the potential to provide tangible investment and other economic benefits to the partner country while offering lower abatement costs to those paying for the investments. Modeling of international emissions trading, including joint ventures for emissions credits in countries without emission

caps, indicates that the potential cost savings are substantial (see, e.g., Manne and Richels 1996, Edmonds et al. 1997). To realize these savings, however, the development of some new international institutions and procedures is required (see, e.g., Stewart et al. 1996, Wiener 1998).

Projects between industrialized countries with emission caps and developing countries without emission caps originally was referred to as "joint implementation" (or "JI") in the parlance of the Climate Change Convention (see Article 4 of the Convention). Under the Kyoto Protocol, however, JI now refers only to international projects for emission reduction involving more than one capped industrialized country (see Article 6 of the Protocol). The approach in the Protocol for including developing countries in such activities is the Clean Development Mechanism (see Article 12 of the Protocol). As with JI, the CDM is intended to generate both lower-cost emissions reductions for industrialized countries currently obliged to reduce emissions, and sustainable development benefits for host developing countries including shorter-term economic and environmental benefits and the transfer of lower-emissions technology.

Because of various technical and political concerns about how JI would work, the first Conference of Parties to the Convention in 1995 authorized a five-year pilot phase of "activities implemented jointly" (AIJ) to learn more about the operation of JI projects, to build confidence in the approach, and to more fully develop a framework for international implementation of JI. The US contribution to the pilot phase is the US Initiative on Joint Implementation, or USIJI. Under the pilot phase, countries whose emitters undertake AIJ can identify emissions reductions achieved but cannot claim pre-2000 emissions reductions through JI as credit against current obligations to reduce emissions. This means that in practice, incentives for private investment in JI are limited to "win-win" projects that create net economic benefits independent of greenhouse gas reductions, or projects where the investor is willing to speculate against the possibility that post-2000 emissions reductions might be creditable and thus gain market value. JI and AIJ projects must also be "additional" in the sense of not displacing any ongoing foreign assistance programs to recipient countries.

The CDM seeks to expand on the concept of JI in several respects, including the establishment of an international assistance fund for developing countries that are most vulnerable to climate change and procedures for project assessment and approval that would advance the interests of all participants. None of these aspects of the CDM is spelled out in the Kyoto Protocol, and future international negotiations will have to define them. At its heart, however, the CDM will involve activities that bring together in some fashion international investors interested in acquiring lower-cost GHG emission credits and host country actors interested in participating in projects that convey various benefits to the host country. Therefore, the experience of USIJI that we address in this paper remains relevant to the future of the CDM.

It is reasonable to expect that transaction costs[2] associated with a system for international GHG credits would be considerably higher than those in an emissions trading system confined to a single country. If these transaction costs are high enough, they could significantly reduce the global community's ability to gain from mutually advantageous potential trades in "credits" for GHG reductions. Transactions costs can arise from a number of sources. Some of these are inherent in the JI and CDM processes, such as the challenge of computing business-as-usual baseline emissions and verifying reductions. Other challenges could include lack of host country experience with market transactions, and cumbersome regulatory approval processes in host and investor countries for foreign investment. Such processes cause delay that almost inevitably reduces the realized return on investment, and they require disproportionate investments of scarce managerial resources by the investor in obtaining investment approval. Complex, nontransparent processes governing the approval and implementation of investment by both sides also can invite opportunistic rent-seeking by participants.

A key lesson to be learned from the AIJ pilots we consider is how various factors may encourage or hinder investor interests. The analysis does *not* attempt to provide an exhaustive review of the USIJI program or its projects; nor does it attempt to provide a comprehensive assessment of the specific cases considered. Instead, the more modest goal is to begin identifying potentially important transaction cost influences relevant to the future of the CDM by directly soliciting the views of actual or potential private sector partners involved with the USIJI program. Before delving into the case studies, we provide a brief overview of the USIJI program.

C. US INITIATIVE ON JOINT IMPLEMENTATION

The USIJI was established in 1993 as part of the Clinton Administration's Climate Change Action Plan. USIJI is a non-regulatory pilot program designed to contribute to the international knowledge base for considering approaches to joint implementation through projects demonstrating a range of alternatives to reducing, avoiding or sequestering greenhouse gas (GHG) emissions.

The main objectives of the USIJI pilot program (see USIJI 1997) are to:

- Encourage private-sector investment and innovation in the development and dissemination of technologies for reducing or sequestering GHG emissions.

- Encourage the rapid development and implementation of cooperative, mutually voluntary, cost-effective projects between US and foreign partners aimed at reducing or sequestering emissions of greenhouse gases, particularly projects promoting technology

[2] "Transaction costs" is the term used by economists to refer to the time, effort, and other resources needed to search out, negotiate, and consummate a deal.

- cooperation with and sustainable development in developing countries and economies in transition.

- Promote a broad range of projects to test and evaluate methodologies for measuring, tracking and verifying costs and benefits.

- Encourage participating countries to adopt more complete climate action programs, including national inventories, baselines, policies and measures, and appropriate specific commitments.

- Contribute to the formulation of international criteria for JI.

An interagency group chaired by the US State Department oversees USIJI. This interagency group is responsible for overall US policy development on joint implementation, decisions on amendments to program ground rules, and formulating the international strategy for promoting joint implementation. The USIJI Secretariat and the inter-agency USIJI Evaluation Panel are co-chaired by the Environmental Protection Agency (EPA) and the Department of Energy (DOE). Other USIJI participating agencies include the Agency for International Development (AID), Agriculture, Commerce, Interior and Treasury. The USIJI Secretariat is staffed by federal employees "on detail" (temporary assignment) from the participating agencies.

Proposal Review and Evaluation Criteria

Each proposal submitted to USIJI receives an initial review by Secretariat staff to determine its completeness and level of detail. The Secretariat advises the proposal's partners in writing if additional information is needed to continue proposal evaluation. If the proposal is complete and has the requisite level of detail, it begins a more comprehensive, formal technical review by a minimum of two independent parties experienced in both the technology (or technologies) and country/region involved. Proposal partners are encouraged to discuss their proposals with Secretariat staff before the formal evaluation and partners also are given the opportunity to submit additional information or to clarify issues identified during the technical review. Following submission, proposal development is frequently an iterative process among the proposal's partners, Secretariat staff, and technical reviewers. Some applicants withdraw proposals from consideration during this review process. The Secretariat presents proposals that clear the technical review process to the USIJI Evaluation Panel to determine if they can be accepted into the USIJI program. Proposal participants are then formally notified of the Panel's decision.

The USIJI Secretariat and Evaluation Panel are responsible for approving or rejecting USIJI proposals based on specific criteria. These criteria are intended to ensure that approved projects support the development goals of the host country while providing GHG benefits beyond those that would occur in the absence of JI. The Evaluation Panel must find that a project proposal:

1. Is acceptable to the government of the host country;

2. Involves specific measures to reduce or sequester greenhouse gas emissions initiated as the result of the US Initiative on Joint Implementation, or in reasonable anticipation thereof;

3. Provides data and methodological information sufficient to establish a baseline of current and future greenhouse gas emissions: (a) in the absence of the specific measures referred to in criteria 2 above (without the JI project); (b) as the result of the specific measures referred to criteria 2 above (with the JI project);

4. Will reduce or sequester greenhouse gas emissions beyond those referred to in criteria 3a above (without the JI project), and if federally funded, is or will be undertaken with funds in excess of those available for such activities in the applicable fiscal year;

5. Contains adequate provisions for tracking the greenhouse gas emissions reduced or sequestered resulting from the project, and on a periodic basis, for modifying such estimates and for comparing actual results with those originally projected;

6. Contains adequate provisions for external verification of the greenhouse gas emissions reduced or sequestered by the project;

7. Identifies any associated non-greenhouse gas environmental impacts/benefits;

8. Provides adequate assurance that greenhouse gas emissions reduced or sequestered over time will not be lost or reversed; and

9. Provides for annual reports to the Evaluation Panel on the emissions reduced or sequestered, and on the share of such emissions attributed to each of the participants, domestic and foreign, pursuant to the terms of voluntary agreements among project participants.

Evaluation criterion #1 is intended to ensure compliance with the FCCC agreement that AIJ activities support the national environment and development priorities of recipient countries. Evaluation criteria 2, 3 and 4 are associated with the FCCC concept of "additionality." The stated goal of incorporating these criteria is to ensure that AIJ projects do not displace ongoing official development assistance (ODA) provided by investor countries to developing countries or countries with economies in transition from central planning to markets. (In other words, AIJ is not supposed to result in reprogramming or repackaging of foreign assistance.) Note, however, that USIJI criterion #4 may not satisfy some interpretations of additionality in light of flat or declining aggregate ODA levels. According to WRI (1996), under US Joint Implementation review procedures, beyond demonstrating public sector additionality, project developers must also make a satisfactory case that private investments are "additional." It is unclear, however, whether

private sector additionality is an explicit or implicit requirement since the USIJI Project Proposal Guidelines do not address the issue.[3]

The Evaluation Panel also considers: the potential for the project to lead to changes in greenhouse gas emissions elsewhere; the potential positive and negative effects of the project in addition to its effect on greenhouse gas emissions reduced or sequestered; whether the US participants are emitters of greenhouse gases within the United States and, if so, whether they are taking measures to reduce or sequester such emissions; and whether efforts are underway within the host country to ratify or accede to the United Nations Framework Convention on Climate Change, to develop a national inventory and/or baseline of greenhouse gas emissions by sources and removals by sinks, and whether the host country is taking measures to reduce its emissions and enhance its sinks and reservoirs of greenhouse gases.

Nature of USIJI Project Proposals

As of July 1998, through 7 rounds of proposals reviews, the USIJI Evaluation Panel has approved approximately 30 of the 110 proposals submitted.[4] Table A summarizes these projects. These projects are classified by project type: energy end use (i.e., efficiency), energy production (i.e., "climate friendly" energy generation), and land use (i.e., carbon sequestration). Projects not accepted by USIJI fall into several categories, including withdrawn as well as rejected proposals and proposals still under development.[5] The 110 projects submitted in the 7 rounds can be categorized as follows: 49 carbon sequestration, 40 energy end use and 16 energy production. The slightly higher prevalence of carbon sequestration projects is not surprising given the relatively lower capital intensity of "green" projects versus energy projects. However, the significant number of energy projects may reflect interest in the export potential associated with these technologies. Of the 80 proposals rejected or withdrawn, 38 have been energy-end use projects, 30 land use, and 12 energy production. Finally, somewhat less than one-half of the proposals accepted as USIJI projects (13 out of 30) have been fully financed. This underscores the fact that notwithstanding the process for JI proposal development and acceptance, financing remains the ultimate hurdle to project implementation.

---

[3] The Guidelines state only that for projects receiving multilateral funding, leveraging of additional private investment is a consideration. It may be that, informally, demonstrating private sector additionality contributes the necessary weight of evidence (regarding criterion #2) for project acceptance by the US interagency Evaluation Panel. In contrast, according to WRI (1996), the Canadian Joint Implementation Initiative criteria excludes only projects that are financed entirely by the Canadian International Development Agency.

[4] USIJI is currently in its 8th round of project evaluations. The results of these evaluations will be announced in October 1998.

[5] There are also a number of JI-like projects in which the partners have elected not to go through the official USIJI process. (For example, Honeywell has conducted a number of AID-DOE sponsored district heating projects in Eastern Europe that are not USIJI projects.)

Table A. USIJI Accepted Projects

Project Name	Country	Project Type	Round Submitted	Round Accepted	Proposal Financed
Fuel Switching for District Heating System	Czech Republic	**Energy End Use**	1	1	Yes
District Heating in Zelenograd	Russia	**Energy End Use**	1	3	No
Rusagas Fugitive Gas Capture	Russia	**Energy End Use**	2	2	Yes
District Heating Renovation in Lytkarino	Russia	**Energy End Use**	5	6	Yes
District Heating Renovation in Metallurguichesky District of Chellabinsk	Russia	**Energy End Use**	5	6	Yes
Energy Efficient Homes Izindlu Ezigcinayo Ubushushu	South Africa	**Energy End Use**	5	5	No
Plantas Eolicas S.A. Wind Facility	Costa Rica	**Energy Production**	1	1	Yes
Enersol Rural Solar Electrification	Honduras	**Energy Production**	1	1	No
El Hoyo-Monte Galan Geothermal Project	Nicaragua	**Energy Production**	2	2	No
Bio-Gen Biomass Power Generation Project	Honduras	**Energy Production**	2	2	No
Dona Julia Hydroelectric Project	Costa Rica	**Energy Production**	2	2	No
Aeroenergia Wind Facility	Costa Rica	**Energy Production**	2	2	Yes
Tierras Morenas Windfarm Project	Costa Rica	**Energy Production**	2	2	Yes
The Bel/Maya Biomass Power Generation Project	Belize	**Energy Production**	3	3	No
The Bio-Gen Biomass Power Generation Project Phase II, Sava Site	Honduras	**Energy Production**	3	3	No
CSDA/GPUI - Rural Solar Electrification Project	Bolivia	**Energy Production**	5	5	Yes
SELCO - Rural PV Electricfication	Sri Lanka	**Energy Production**	5	5	Yes
APS/CFE Renewable Energy Mini-Grid Project	Mexico	**Energy Production**	5	6	Yes
Forest Conservation - Bilsa Reserve	Ecuador	**Land Use**	1	3	No
RUSAFOR Saratov Afforestation Project	Russia	**Land Use**	1	1	Yes
Rio Bravo Conservation and Forest Management	Belize	**Land Use**	1	1	Yes
ECOLAND: Esquinas National Park	Costa Rica	**Land Use**	1	1	Yes
Klinki Forestry Project	Costa Rica	**Land Use**	2	2	No
Community Silviculture in Siera Norte, Oaxaca	Mexico	**Land Use**	2	6	No
Scolel Té--Sustainable Land Management and Carbon Sequestration	Mexico	**Land Use**	2	3	Yes
Reforestation in Vologda	Russia	**Land Use**	3	3	No
Project Salicornia: Carbon Sequestration and Halophyte-based Industries in Sonora	Mexico	**Land Use**	3	3	No
The Noel Kempff M. Climate Action Project	Bolivia	**Land Use**	3	3	Yes
Reforestation of Chiriqui Province	Panama	**Land Use**	3	3	No
Reduced Impact Logging	Indonesia	**Land Use**	3	3	No
Consolidation of National Parks & Biological Reserves as Carbon Deposit*	Costa Rica	**Land Use**	4	4	Yes

* This project incorporated two USIJI projects in Costa Rica from the first two proposal rounds: Project CARFIX: Stabilize Existing and Expand Forest Cover (submitted and accepted in Round 1) and Biodiversifix: Forest Restoration Project (submitted and accepted in Round 2). These projects should no longer be reported as separate projects.

D. CASE STUDIES: SELECTION CRITERIA AND REVIEW PROCESS

Two case studies initially were selected using the following criteria. First, we decided to select one energy end use project and one energy production project in order to focus the study on one sector of JI activities and to complement other case studies of carbon sequestration projects.[6] Second, under the hypothesis that different factors would be viewed as constraining or promoting the progress of potential JI projects at different stages of project development, we selected one case that had gained approval and financing and another proposal that had remained in development for an extended period. The proposals for both the Coal Bed Methane Recovery Project in Poland and the Fuel Switching/Cogeneration Project in the Czech Republic were originally entered in the first round of USIJI submissions in 1994. Coincidentally, both projects are located in the "Black Triangle" region of Central Europe (the region around the borders of the Czech Republic, Poland and the former East Germany), so called for its severe air pollution resulting from coal, steel, and other heavy industries. The USIJI Evaluation Panel approved the project in the Czech Republic during its first review (announced in February 1995). The project subsequently secured full financing.

For each case study selected, a key private sector partner was identified for a telephone interview. For the coal bed methane recovery project in Poland, John Tait of Aquatech Services, Inc., Fair Oaks, CA was interviewed. Aquatech is an environmental technology development firm. For the fuel switching/cogeneration project in the Czech Republic, Mary Bittle Koenick of the Center for Clean Air Policy, Washington, DC was interviewed.[7] The Center is a not-for-profit, nongovernmental organization that supports JI process development and, in effect, acted as a broker for three US utilities involved in the Czech project.

The interviews consisted of three parts. The first line of inquiry addressed the motivations of the private sector organizations to participate in the JI project. The second set of questions asked respondents to identify the factors that impeded or facilitated progress in each phase of project development. The first two parts of the interview began with open-ended questions followed by structured probing questions and were conducted "for the record." The final part of the interview was not for attribution. Here, we asked for the respondent's personal judgments regarding the greatest bottleneck in project development and their recommendations to encourage greater private sector participation in JI activities. In addition to the interviews, the two case studies elaborated below also draw on nonconfidential information made available by the USIJI Secretariat and other available literature.

---

[6] During a meeting convened by USIJI to help coordinate the activities of a number of domestic groups working on various aspects of JI program evaluation, a representative from the Center for International Environmental Law reported that the Center intended to conduct case studies of carbon sequestration projects. Our interest in energy projects also is motivated by ongoing collaborative work with Chinese experts on the potential for improved transfer of climate-friendly energy technology to that country.

[7] We had hoped to supplement Koenick's interview by speaking directly with the participating utilities. However, the utilities did not respond to either our or Koenick's attempts to contact them.

Because both of these cases come from the earlier phase of the USIJI program, there is a danger of reaching an erroneous conclusion in that some of the problems and challenges that arise early in any program are reduced over time with experience. Some of the problems associated with both host country and USIJI approval may have ebbed in the interim. This problem is particularly important in addressing both the investor country review process administered by USIJI, and the process of host country review and approval. Indeed, USIJI staff report that at the request of the FCCC Secretariat, countries have been requested to formally nominate contacts for host country approval, and almost all countries have done so. This may have reduced operational problems with host country acceptance. USIJI staff also point to lessons learned from past experience such as the continuing difficulty in developing baseline scenarios, developing provisions for monitoring and verification, how to set appropriate spatial and temporal boundaries for assessing leakage (see USIJI 1998 for details). As noted above, the number of accepted and financed projects have grown considerably, though the latter still remains a minority of accepted projects.

Table B. Additional USIJI Project Case Studies

Project Name	Country	Project Type	Round Submitted	Round Accepted	Proposal Financed
Energy Efficient Street Lighting, Cagayan de Oro	Philippines	**Energy End Use**	5	No	NA
Yu Wei Qing Coal Slurry Pipeline	China	**Energy End Use**	5	No	NA
District Heating Renovation in Lytkarino	Russia	**Energy End Use**	5	6	Yes
District Heating Renovation in Metallurguichesky District of Chellabinsk	Russia	**Energy End Use**	5	6	Yes
Bio-Gen Biomass Power Generation Project	Honduras	**Energy Production**	2	2	No
The Bel/Maya Biomass Power Generation Project	Belize	**Energy Production**	3	3	No
The Bio-Gen Biomass Power Generation Project Phase II, Sava Site	Honduras	**Energy Production**	3	3	No
SELCO - Rural PV Electricfication	Sri Lanka	**Energy Production**	5	5	Yes

To investigate the extent to which the barriers to project approval and financing may have changed over time, we conducted a shorter survey of the private sector participants in a number of more recent USIJI submissions enumerated in Table B, above (see also Appendix A). We specifically asked these project proponents about their goals in proposing the project, their experiences with USIJI review, and their experience with host country approval. The additional

projects were selected according to the following criteria.[8] First, we continued to concentrate on energy end use project and energy production projects in order to focus the study on one sector of JI activities and to complement other case studies of carbon sequestration projects (see note 6). Secondly, under the hypothesis that both USIJI and project submitters would learn by experience, we selected projects from rounds 2 through 5. We also felt that is was necessary to chose similar projects in different host countries to capture any country differences. Finally, since we wanted to ascertain how the USIJI process has evolved from the first round, we selected some projects where the private sector participants have had experience with the USIJI process for many rounds.

E. CASE STUDIES: FINDINGS

Coal Bed Methane Recovery in Poland

Overview

Originally, this proposal was to build, own, operate, and transfer a wastewater treatment plant for the Morcinek Mine, located in Kaczyce, Upper Silesia (in southern Poland). Currently, brine from the mine is discharged directly into surface waters. The treatment facility consists of evaporators and a reverse osmosis plant, which combine to remove salts from the mining effluent, and is powered by methane gas recovered from a coal bed. Coal bed gas is a significant mining safety hazard, but it may not be present in sufficient quality or quantity to financially justify collection and off-site distribution via pipeline. Currently, methane removed from Polish coal mines is simply vented to the atmosphere. However, methane is also a potent greenhouse gas; each pound of methane emitted from coal mining is about 20 times more effective at trapping radiation in the atmosphere than a pound of carbon dioxide (OTA 1991). Coal bed methane recovery technologies therefore provide opportunities to convert a waste product with significant global warming potential to productive use, either on-site or locally. Like coal gasification and clean coal technology, however, coal bed methane recovery is an alternative technology that still receives US Department of Energy subsidies for research, development, demonstration, and commercial application projects (e.g., under Sec. 1306 of the 1992 Energy Policy Act (EPAct)).

Aquatech Services, Inc. of Fair Oaks, CA developed the methane recovery/brine treatment technology and is the USIJI project proponent. Small-scale field tests of the desalinization technology were initiated at the Morcinek Mine in October 1994 using methane generated at the mine's demethanization station. The demonstration was supported by grants from the US Department of Energy and Environmental Protection Agency ($625,000) and the Polish public sector (Debt for Environment Swap (ECOFUND)/National Fund for Environmental Protection and Water Management (NFOSiGW) - $500,000). The Polish private sector partner for the USIJI

[8] The case study selection process is intended to be coordinated with other participants in the APEC project to obtain a series of cases varying by investor country, project type, and stage of development.

project proposal is Exbud-Metan Ltd., which has a $37,200 investment. MIMET, S.A., a Polish industrial construction firm, provided in-country labor to support the demonstration project (Center for Clean Air Policy 1996). The estimated cost of the demonstration project was $1.7 million.[9] Aquatech budgeted a commercial-scale treatment plant for the Morcinek Mine at $7.5 million. Over its projected 25-year lifespan, Aquatech estimated that the project would reduce net GHG emissions by the equivalent of more than 450 thousand tons of CO_2.[10]

Motivation

According to John Tait, Aquatech's motivations for the proposed project are entry into new markets for its technology and job creation in California.[11] In other words, Aquatech's motivation was the promotion of profitable technology transfer, not the accumulation of potential carbon offset credits (which were seen as too speculative to motivate investment), or the provision of host country benefits. This appears to put Aquatech's motivations somewhat at cross purposes with the primary objectives of the USIJI program as described above. This variance of purposes in turn seems likely to have colored Aquatech's perception of the effectiveness of the program. Aquatech entered into the USIJI process at the urging of Department of Energy staff who believed that conducting the transaction as an AIJ project would help secure approval from Polish authorities.[12] Initially, Aquatech solicited funding from USIJI for the demonstration phase of the project, mistakenly thinking that USIJI was a potential source of financing.

Factors Influencing Project Development

The coal bed methane recovery project proposal was submitted to USIJI in 1994. After being placed "in development" and remaining there for a while, Aquatech has withdrawn the project. Tait reports that Aquatech's private investors have questioned the project outlays and that

---

[9] Estimated demonstration project cost based on information provided in Center for Clean Air Policy (1996) and by John Tait of Aquatech Services.

[10] `http://www.wbcsd.climatechange.com/tasdform/226e.html`

[11] Poland ranked #7 among the world's coal producing countries as of 1992 (Humphreys 1994), and the country's European Community (EC) neighbors on the Baltic may seek to make Poland's entry into the EC contingent on taking steps to reduce industrial pollution--such as mining effluent--that is transported to the sea. As of early 1994, only one coal mine in Poland was equipped to desalinate mining water, according to Bates et al. (1994).

[12] Although the monopolistic Hard Coal Corporation was abolished in 1990, the Polish coal sector is dominated by state owned enterprises and overseen by the State Hard Coal Agency (Bates et al. 1994). After elimination of industry subsidies, many mines incurred heavy losses, and the government later restructured the industry by closing some mines and combining the rest into 6 coal companies and 1 holding company (several individual mines continue to operate independently). Despite these measures, the industry as a whole remains unprofitable in the absence of aggressive cost-reduction measures. Privatization is scheduled to begin in earnest in 1999 with the sale of the country's two most efficient mines, Budryk and Bogdanka (TRADEX 1997; `http://www.jurock.com/tradex/ poland.html`).

the firm is considering exploring other emerging markets for its technology. According to Tait, the primary impediments to project development have been the acquisition of host country approval for the JI project and concerns about the security of rights for Aquatech's proprietary technology.

According to Aquatech, the Polish mining authorities as well as the Polish Ministry of the Environment have endorsed the proposal.[13] Under USIJI procedures, however, formal host country approval requires acceptance by the host country's Foreign Affairs Ministry or a body with authority delegated by the Ministry to review and approve proposed AIJ activities. The Polish Government has agreed on criteria for JI projects and opened a JI Secretariat to review project for approval (USIJI 1996a). Aquatech has been unsuccessful in securing the endorsement of the Polish Ministry of Industry and Trade, which shares responsibility for reviewing JI project proposals with the Ministry of Environment. According to Evans (1995), the Polish Government also has not been very open in developing its joint implementation policy, which has led some Polish environmental groups to criticize the process.

Aquatech was also concerned about preserving its proprietary rights over the treatment technology. Tait's anxiety grew when the Polish government sold the Morcinek Mine where the technology was tested to a Czech concern. Polish officials told Aquatech that they wanted the technology installed at two or three other mines. Due to site-specific geological differences, however, this would require testing and calibrating the technology at the new mines. Consequently, Aquatech would need to bear more up-front development costs.

According to Tait, uncertainty about the future value (if any) of credits for GHG emission reductions is a major impediment to securing project funding. Strikes by Polish miners also have dampened the interest of Western investors in the Polish coal mining industry, says Tait. (In 1992, Polish miners struck *en masse* to demand higher wages and to protest a government plan to close unprofitable mines.) While the value of GHG credits is a factor unique to joint implementation activities, the influence of labor unrest and insecure intellectual property rights are generic to business transactions in many countries. Tait also expressed the view that USIJI involvement has not facilitated securing host country approval for the project because of lack of experience in international commerce.

Estimated Development and Transaction Costs

According to Tait, Aquatech has invested approximately $500 thousand in demonstration project development and transaction costs.[14]

---

[13] Polish mining authorities may be motivated to endorse the project because mines discharging brine are subject to pollution taxes--known as fines and fees (http://www.wbcsd.climatechange.com/tasdform/226e.html). According to Bates et al. (1994), pollution taxes had little effect on Polish state owned enterprises with soft budget constraints, but the enterprises are becoming more sensitive to the fines and fees as commercialization proceeds.

[14] The information provided in Center for Clean Air Policy (1996) states that Aquatech's contribution to the demonstration project was approximately $200 thousand; however, the source of one-third of the estimated total demonstration project costs were not identified at that time by Aquatech. Based on the information provided by

Fuel Switching/Cogeneration in the Czech Republic

Overview

This project, commissioned in September 1996, will implement fuel-switching, cogeneration, and efficiency improvements to upgrade the Bynov District Heating Plant, located in the City of Decin, Czech Republic. Decin is a heavily industrialized city in northern Bohemia with a population of approximately 55,000. The project will convert the Bynov Plant from burning soft coal (lignite) to burning natural gas. (Natural gas contains approximately 50 percent less carbon per unit energy than hard or bituminous coal (OTA 1991), as well as releasing far less conventional pollution than lignite.) A cogeneration facility will use heat otherwise wasted to produce steam and electricity, and improvements in the distribution network will make the system more energy efficient.

US participants in the USIJI project include three electric utilities that provided a $600,000 zero-interest loan to finance the fuel-switching component of the project and the Center for Clean Air Policy. The utilities are the Wisconsin Electric Power Company, Commonwealth Edison Company, and NIPSCO Development Company, Inc., an affiliate of Northern Indiana Public Service Company. As indicated above, the Center for Clean Air Policy brokered the transaction for the utilities. The City of Decin is the host country participant in the USIJI project. USIJI estimates that over the 25-year lifespan of the project, GHG emissions will be reduced by the equivalent of more than 600 thousand tons of CO_2 as a result of the fuel-switching and new cogeneration facility (USIJI 1996b).

Motivation

According to Mary Bittle Koenick of the Center for Clean Air Policy, the primary factor motivating the three US utilities to participate in the USIJI process was the desire to publicly demonstrate that they were proactive in the climate change debate and to show that flexible, market-based alternatives are workable means to meet GHG emissions control requirements. Koenick reports that another motivating factor for the utilities was the prospect of overseas investment. (As discussed below, however, an initial stock purchase agreement was derailed when the scope of the project expanded.)

Factors Influencing Project Development

According to Koenick, the major impediment during the pre-proposal stage was securing host country acceptance. Originally, the three US utilities only had a letter of agreement signed by the Mayor of Decin. Watt and Sathaye (1995, citing Janet Gille of the Center for Clean Air Policy) report that the agreement with the Mayor of Decin stated that the utilities would get 40 percent of the carbon reduction credits from the fuel-switching and that

Tait, it appears that Aquatech scaled-back somewhat on the demonstration project (originally estimated at $2 million) and made an additional $300 thousand investment.

the credits would last for 20 years. (The term of the credits affects their potential future value as offsets in meeting GHG emission control objectives.)

Later, the Czech Environmental Ministry also provided an endorsement. However, this "official" letter of host country acceptance did not include a GHG crediting agreement. Since the City of Decin was one of the project participants, the crediting agreement with the Mayor of Decin was essentially an agreement between the project parties. There was no bilateral GHG crediting agreement between the US and the Czech Republic (Watt and Sathaye 1995).

There was also uncertainty within the Czech government, according to Koenick, about whether the Environmental Ministry had the authority to provide host country acceptance for JI projects. During project implementation, the Czech government created an interagency AIJ commission, and the Foreign Affairs Ministry delegated project approval authority to that body. According to Evans (1995), the Environmental Ministry would like to control the JI project approval process to ensure that the Czech Republic meets its obligations under the FCCC. In addition, fuel-switching projects such as the Bynov heating plant conversion also help to ameliorate conventional forms of local and regional air pollution (i.e., the switch from coal to natural gas reduces particulate matter and sulfur oxide emissions). Other Ministries, however, have different concerns. For example, converting a large number of power plants from coal to gas may have fiscal implications for the Czech government because it could significantly increase the state subsidies allocated for natural gas (Evans 1995). Furthermore, plans to convert plants from coal to gas threaten flagging, but still influential coal mining interests in the Czech Republic.[15]

The creation of the Czech AIJ commission effectively meant that the USIJI project had lost host country approval. In December 1996, the USIJI Evaluation Panel moved the status of the project back to the "in development" category, approximately two years after the Panel initially approved the project, and after the project had already been commissioned. The US partners had to go back the new Czech AIJ commission for re-approval. Contributing to the confusion was a "chicken and egg" problem. The Czech JI project criteria require acceptance from the government of the proposers' country of origin. The USIJI procedures require the same from host countries for acceptance (unclassified cable from the State Department in Wash., DC to the US Embassy in Prague, dated December 18, 1996).

The highest hurdle in securing project approval, according to Koenick, continued to be securing host country acceptance. Satisfying the USIJI requirement to establish the baseline GHG emissions and the reductions resulting from the project was an additional formidable task. It was particularly challenging since the project was considered for approval during the first round when the USIJI technical protocols were being developed and test-run. Koenick states that the lack of transparency in the USIJI project review process in use then resulted in added

[15] Czechoslovakia ranked #9 among the world's coal producing countries as of 1992 (Humphreys 1994). Nevertheless, some Czech enterprises are now importing coal from Poland because it is cheaper than Czech coal. At the same time, Czech mines are closing down (OECD 1996).

development costs. Koenick believes that the efforts of the US Government were helpful in obtaining host country acceptance for the project, though they did not contribute greatly to project development.

The primary factor facilitating project development during the financing stage was having the three US utilities on board from the outset, according to Koenick. A change in design and expansion of the scope of the project, however, presented an additional hurdle. The origins of the project can be traced to 1994, when the Czech Privatization Ministry began efforts to privatize the Decin District Heating Enterprise and turn it into a joint stock company, to be called Termo, which would own and manage the Bynov district heating system and plant. Originally, the total investment of $600,000 supplied by the US utilities was intended to provide the capital necessary to finance the $1.5 million fuel-switch. The hard currency investment, however, attracted other investors, giving the City of Decin leverage to increase the scope of the project to include the cogeneration facility and efficiency improvements. Ultimately, the total estimated project cost grew to $8 million (USIJI 1996b). At this point, says Koenick, there was concern among all of the parties about financing the project. The city, however, finally secured additional funding from local banks, the Czech State Environment Fund, and the Government of Denmark, which matched the US utility investment. Since the City was the recipient of the financing, it was required to maintain ownership of the Bynov plant instead of transferring the assets to the Termo Company. This precluded a stock purchase agreement originally negotiated with the US utilities to acquire equity in Termo (USIJI 1996b).

Koenick reports that the expanded number of players involved in the project and the need to rework the language of the agreement between the utilities and the City of Decin were the major impediments during implementation of the project. According to USIJI (1996b), the utilities ultimately provided a no-interest loan to the City in return for 100% of the GHG reductions resulting from the fuel-switching. (The Center for Clean Air Policy (n.d.) reports that this represents the equivalent of 5,991 tons of CO_2 emissions reductions achieved annually by the plant. The national Czech electric utility, CEZ, reportedly retains more than 20,000 tons of CO_2 reductions achieved annually by the cogeneration facility.) Koenick notes that the negotiations required numerous iterations among the parties' lawyers to ensure that the investors could recover their principal and to cover contingencies, should the Czech government change its mind about apportioning the GHG credits. There was some concern about the utilities incurring a financial loss; the project could not get underwriters' insurance because the GHG credits were not an asset. The level of exposure was minimal, however, considering that it was spread across the three US utilities.

This discussion indicates how the entire process of project design, acceptance, and implementation was complicated by the privatization process in the Czech Republic.[16]

[16] For its speed, scope, and openness, the Czech mass privatization program is considered the model for economies struggling with public-sector reforms. The privatization of Czech State enterprises, however, has

Market reforms in countries with economies in transition affect all foreign investment, however, and are not unique to JI transactions.

Estimated Transaction Costs

Koenick estimates the total transaction costs incurred by the US partners involved in the Decin project at $600,000--equivalent to their total direct project financing.

Findings from the Additional Cases

Motivations

According to our interviews, the majority of the participants in the projects listed in Table B entered the JI process to speculate on the future value of GHG credits and to help influence the evolution of JI criteria. However, there were a number of other motivations. These other factors included establishing new country contacts, entry into new markets, and public recognition. In fact, one participant indicated that the primary reason for participating was to establish contacts. Their business interests include substantial consulting work. Thus, by going through the JI process they were educating themselves with JI while strengthening their future client base. Another participant indicated that going through the pilot phase of USIJI was analogous to getting a "union card" in that they hoped early participation would afford them special treatment for future projects. One other participant indicated that they entered, like Aquatech, into the USIJI process at the urging of Department of Energy staff. However, in this case DOE indicated that the project participants would receive DOE funding if the project was accepted as a JI project. Considering that they had a feasible project but had been unsuccessful at obtaining the requisite funding this was quite attractive for them. It appears that, as in Aquatech's case, some of the cases are at cross purposes with the primary objectives of the USIJI program as described above.

Factors Influencing Project Development

The participants unanimously reported that the major impediment for their projects was the substance of the JI review process itself. Specifically, determining "additionality" and baselines appear to be difficult issues. The USIJI program identifies three types of additionality – emissions, financing, and programmatic. For the majority of the projects, the determination of emission additionality was the more time consuming and elusive. As noted above, in one case financial additionality loomed large. One of the unapproved projects was in development prior to applying to USIJI and thus didn't meet the requirements of the programmatic additionality clause. In contrast to additionality issues, questions involving emissions "leakage" and monitoring and verification seemed to be more minor issues.

---

resulted in a pattern of ownership in the Czech economy that is heavily concentrated in the hands of a few large, formerly state-owned financial institutions (Desai 1996).

The project proponents gave the USIJI staff high marks when it came to assisting in pre-feasibility and feasibility studies and identifying technical experts. Some proponents indicated that USIJI also helped with locating funding, while others indicated that they wished USIJI would have helped more in this arena. In evaluating this concern, it is important to keep in mind that the USIJI itself sees financing as outside their mission. Although many project proponents thought that the review process resulted in "high quality" results, they believed it was too time consuming and costly. It was also noted, by those with more USIJI experience, that there has been a change in the review process. They have seen an increase in informational requirements and reporting standards, specifically with respect to engineering and economic aspects of projects. While proponents see this additional information as being relevant to the eventual success or failure of projects, and potentially useful for future GHG trading under the Kyoto Protocol, they question its immediate relevance to project certification. They also believed that previously approved projects could not get through the current process.

In only one of the later projects considered did proponents indicate that host country acceptance caused considerable problems. This experience is quite different than in the two case studies reported above. The most influential positive factor reported by proponents was how a project fit with the host country's economic and political priorities. Nevertheless, concerns with host country acceptance and elevated transaction costs continue to arise. Some project proponents found it difficult to identify the proper authorities, while others had to deal with changing governments and thus changing priorities. These experiences highlight a continued lack of host country institutional capacity for JI, including an understanding of its purpose and requirements, especially at the local partner level. Experiences with such host country factors as contract enforcement, financial property rights, and the tax system were mixed – significant impediments in some cases, minor pluses in others. Still another difficulty experienced by some participants was determining existing or emerging business practices, especially in the transition economies. Macroeconomic stability continues to be a problem, especially for obtaining underwriters.

Estimated Transactions Costs

Most of the individuals we spoke with did not offer any financial estimates for the transactions costs. Two project proponents reported modest sums, on the order of $30K, usually for staff time to address successive rounds of USIJI staff questions. The review process appears to have made up the majority of the transactions costs in the other projects as well.

F. LESSONS LEARNED

In this final section we attempt both to summarize some of the key points derived from our review and to reinterpret these points as lessons for the ongoing development of the CDM.

The process of designing and implementing CDM projects can become entangled in the same difficulties that impede investments in developing and transitional economies generally. Continued broad reforms are needed.

As we noted in the Background section, a perusal of the broad literature on foreign investment reveals a number of general challenges that also apply to joint implementation. These include the possible lack of market experience in host countries, weak economic and other institutions, and complex investment approval processes that can create financial insecurity and may invite gaming. Continued progress in economic and legal reforms in developing and transitional is the best antidote to these problems.

Proponents in both of the cases we reviewed in detail regarded gaining host country approval as the principal impediment to project development. The host country Environmental Ministries responsible for matters relating to the Framework Convention endorsed both projects at least partly, no doubt, to obtain concomitant local environmental benefits. Resistance came from other Ministries and other centers of power. Due to the representation of multiple Ministries on JI evaluation panels, the host country project approval process became entangled in broader bureaucratic and political struggles over sectoral and macroeconomic reforms. This is an example of a general problem in many countries, the US included, when different levels and agencies of government often fail to "speak with one voice." However, the proponents of the later projects felt that host country acceptance was a much less serious issue, especially if the project is in line with host country priorities. In these cases the more crucial host country factors appear to have been broader economic and institutional issues such as contracts, financial property rights and the tax system problems.

A straightforward and transparent host country project review process will promote the success of CDM endeavors by lowering investor transaction costs, in particular by reducing opportunities for inconsistent or opportunistic behavior by host country decisionmakers. Expanded technical assistance for host countries in refining project approval procedures may be very useful.

As the Parties to the Framework Convention work to flesh out the operation of the CDM, continued and expanded support to host countries for developing project review capacity may be very important. A number of developing countries have expressed concerns about their lack of technical ability to review the technological or financial aspects of projects proposed by international investors, as well as about a lack of bargaining capacity for articulating their interests and negotiating deals. To some extent this problem will be ameliorated by progress toward ensuring that CDM credits have an economic value, since this will give private market intermediaries an incentive to enter the market on the side of host countries as well as international investors. Nevertheless, multilateral assistance for institutional development through national programs and development banks may be crucial for lowering developing country concerns and, in turn, promoting more fluid processes for launching projects.

While attention in the earlier cases focused on host country acceptance, attention in the later cases focused on the USIJI evaluation process itself as an important impediment to project development. In fairness, however, it should be understood that USIJI is a pilot initiative and is not solely or explicitly intended to be a vehicle for promoting US environmental technology exports. It now appears that the evaluation process has become more transparent and has resulted in better-prepared projects, as evidenced by later proponents' claims that the USIJI program results in "high quality" projects. However, it is also believed that this high quality comes at considerable cost, especially with respect to informational burdens.

A straightforward and transparent project review process in the US, other Annex B countries, and through the Framework Convention is important for providing clear guidance to prospective investors and limiting transaction costs, thereby encouraging international progress in GHG control and technology transfer. These institutions should seek as much as possible to promote the evolution of a market for GHG credits while also ensuring environmental integrity.

Ultimately, for the CDM to succeed it must be able to garner real interest among investors with a plethora of other options in globalized capital markets. To do this in turn requires clarity for investors about what constitutes "additional" emission reductions that can be turned into emissions credits, requirements for monitoring and allocation of liability for nonperformance, and so forth. As the CDM evolves, both national programs promoting emissions trading and the new international oversight institutions emerging from the Kyoto Protocol will need to figure out how to provide guidance on these issues in ways that keep transaction costs low while meeting reasonable standards for environmental performance. For example, methods of pre-approval for certain types of projects could greatly speed the process, while multi-layered and iterative reviews gum up the works. Meeting this challenge is another key to the success or failure of the CDM.

Project financing remains the ultimate challenge, even after projects are approved. Establishing a market value for greenhouse gas credits through internationally agreed-upon policies for the CDM will generate demand for the products and services of GHG-reducing technology vendors.

Project financing is another major challenge. In the case of the Decin project, the credits' lack of financial value only prevented the proponents from securing underwriters insurance on a relatively small exposure to financial risk. For a technology vendor such as Aquatech, however, establishing a value for the GHG credits would be viewed as a development that would help generate demand for the firm's stock in trade. This value is the key to taking the CDM from a small market primarily concerned with "win-win" prospects and reputation burnishing to a more flourishing market for real GHG emission reduction credits. The CDM has the potential to generate the necessary market signal, especially as it provides for investments in bankable early reduction credits as early as 2000. Whether or not this benefit is realized depends on the international community's success in devising sound CDM "rules of the road," on the extent to

which barriers to international investment continue to fall, and on the extent to which industrialized countries stand by the emission targets they pledged to meet in Kyoto.

APPENDIX A. FOLLOW-UP USIJI PROJECT DESCRIPTIONS[17]

Bel/Maya Biomass – Belize: The Bel/Maya Biomass Power Generation Project involves the installation of an 18 MW steam power plant adjacent to a sugar mill in the community of Orange Walk in northern Belize. This plant will displace diesel oil-fired power with fuel by sugarcane bagasse, orange processing wastes, and wood waste from sawmills and other nearby sources. As a result, this project is expected to lower utility carbon emissions by approximately 900,000 tons over its projected 30-year life.

Yu-Wei-Qing Pipeline – China: This project consists of the construction of a 9.7 million ton coal cleaning facility and a 7 million ton underground clean coal slurry pipeline to transport coal over 720 km. The project is expected to generate GHG emission benefits (a reduction of almost 900 million tons over 30 years) by reducing pollution-intensive transportation of coal by trains and trucks, producing clean coal that generates 10 percent fewer emissions when burned and using fly ash as a substitute for portland cement. The participants include: China Pipeline Holdings, International Utility Efficiency Partnerships, Materials Development Corporation and China Coal Construction & Development Corporation.

Bio-Gen Phase I and Phase II - Honduras: Phase I of the Bio-Gen project is a 15 MW biomass waste-to-energy plant to be located near a large forest products processing region around Guaimaca, Honduras. Phase II will locate a 15 MW biomass-fueled steam power plant 15 kilometers west/northwest of the city of Sava, Honduras. Both plants will be owned and operated by a Honduran company, Biomasa-Generacion, for the purposes of generating electrical power for sale to Empresa Nacional de Energia Electrica (ENEE). Both plants will displace diesel-fired power generation with biomass fuel obtained from wood wastes (Phase I) or waste from the forest products and palm oil industries (Phase II).

The proposed projects will reduce the emissions of greenhouse gases, help reduce the power supply deficit in Honduras, balance the regional Honduran electrical load, increase the economic efficiency of one of the country's principal export industries, and utilize wood wastes which are often incinerated in open piles, disposed of in nearby rivers, or dumped in low-lying areas. Specifically Phase I of the Bio-Gen project is expected to reduce GHG emissions by over 2 million tons over the 20 year expected life of the project. Phase II participants estimate it will reduce carbon emissions by approximately 600,000 tons over its projected 20-year life.

[17] Project descriptions were obtained from various sources including USIJI (1998) and DOE press releases.

District Heating Renovation in Lytkarino - Russian Federation: This project includes energy efficiency improvements to the boiler house and central heating points, to municipal and public service buildings, and to the housing stock which in turn will rehabilitate and modernize the central heating system of Lytkarino. U.S. Partners are Battelle Memorial Institute/Pacific Northwest National Laboratory of Washington, D.C. Non-U.S. Partners include Administration of the City of Lytkarino (the municipal government)and the Center for Energy Efficiency in Moscow.

Improving District Heating Efficiency in the Metallurguichesky District of Cheliabinsk - Russian Federation: This project includes energy efficiency upgrades to the heat distribution system, public buildings, residential housing stock, and boiler houses which in turn will rehabilitate and modernize the central heating system of the Metallurguichesky District of Cheliabinsk. U.S. Partners are Battelle Memorial Institute/Pacific Northwest National Laboratory of Washington, D.C. Non-U.S. Partners include Administration of Oblast and Metallurguichesky District Of Cheliabinsk (the municipal government); the Center for Energy Efficiency in Moscow.

Energy Efficient Street Lighting – Philippines: This 25 year project involves converting over 4500 mercury vapor streetlights in the city of Cagayan de Oro to high pressure sodium lamps. This conversion lowers electricity by 40 to 50% per lamp. It is estimated that over 44 million kW-hrs of electricity will be saved over the life of the project, thus lowering GHG emissions by over 35,000 tons. The US partner is the International Institute for Energy Conservation. The domestic partner is the Cagayan Electric Power and Light Company.

Rural Photovoltaic Electrification – Sri Lanka: This project involves marketing and installation of solar home systems (SHS) as an alternative to the use of kerosene lamps for lighting and the use of diesel electric charging of lead-acid batteries for powering small home appliances. The systems provide electricity for lighting, radio and television services. The scope of the project involves over I t is expected that 812,000 SHS will be installed over a 10 year period and each SHS will generate GHG benefits for 20 years. It is estimated that there will be a cumulative savings of over 6 million short tons of CO2. US partners include Solar Electric Light Company (SELCO) and Trexler and Associates, Inc.

REFERENCES

Bates, R., S. Gupta, and B. Fiedor. 1994. *Economywide Policies and the Environment: A Case Study of Poland*. Environment Working Paper No. 63, The World Bank Environment Department, January.

Burtraw, D. 1995. *Cost Savings Sans Allowance Trades? Evaluating the SO2 Emission Trading Program to Date*, Discussion Paper 95-30, Resources for the Future, Washington, D.C.

Center for Clean Air Policy. 1996. *Joint Implementation Projects in Central & Eastern Europe. Description of ongoing & new projects* (Prague, Czech Republic: Center for Clean Air Policy).

Center for Clean Air Policy. No date. The Decin Project, Czech Republic. A Cooperative Investment in the Global Environment.

Desai, R. 1996. *Large-Bank Finance and the Limits of Mass Privatization in Eastern Europe: The Case of the Czech Republic*, Working Paper 96-2, Center for International Affairs, Harvard University, Cambridge, Mass.

Edmonds, Jae, et al. 1997. *Return to the 1990s: The Cost of Mitigating United States Carbon Emissions in the Post-2000 Period*. Draft Manuscript, Pacific Northwest Laboratory, Washington, D.C.

Evans, M. 1995. *Joint Implementation in Countries in Transition: An Analysis of the Potential and the Barriers*, Pacific Northwest Laboratory report prepared for the Climate Change Division of the US Environmental Protection Agency, March. Available at: `http://w3.pnl.gov: 2080/aisu/jiforweb.htm`

Humphreys, D. 1994. "Experimenting with Supranational Policies in Europe," in R. G. Eggert, ed., *Mining and the Environment: International Perspectives on Public Policy* (Washington, D.C.: Resources for the Future).

Manne, A. S. and R. Richels. 1996. "The Berlin Mandate: The Cost of Meeting Post-2000 Targets and Timetables," *Energy Policy*, vol. 24, no. 3, pp. 205-210.

Organisation for Economic Co-operation and Development (OECD). 1996. *Regional Problems and Policies in the Czech Republic and the Slovak Republic* (The Center for Co-Operation with Economies in Transition). Available at: `http://www.oecd.org/sge/ccet/cpcs1106/ present.htm`

Stewart, R. B., J. B. Wiener, and P. Sands. 1996. *Legal Issues Presented by a Pilot International Greenhouse Gas Trading System*. UNCTAD (UN Conference on Trade and Development).

Toman, M., R. Kopp, and M. Cazorla. 1998. *International Emissions Trading and the Clean Development Mechanism.* Resources for the Future Climate Issues Brief No. 13, October. Available at: `http://www.weathervane.rff.org`

U.S. Congress, Office of Technology Assessment (OTA). 1991. *Changing by Degrees: Steps to Reduce Greenhouse Gases*, OTA-O-482 (Washington, D.C.: US Government Printing Office).

U.S. Initiative on Joint Implementation (USIJI). 1996a. *The USIJI International Partnerships Report*, Vol. 2, No. 3 (June). Available at: http://www.ji.org/usijiipr.shtml#3

U.S. Initiative on Joint Implementation (USIJI). 1996b. *Activities Implemented Jointly: First Report to the Secretariat of the United Nations Framework Convention on Climate Change*, DOE/PO-0048, July.

U.S. Initiative on Joint Implementation (USIJI). 1997. *Resource Document on Project & Proposal development under the US Initiative on Joint Implementation (USIJI)*. Version 1.1, June.

U.S. Initiative on Joint Implementation (USIJI). 1998. *Activities Implemented Jointly: Second Report to the Secretariat of the United Nations Framework Convention on Climate Change: Accomplishments and Descriptions of Projects Accepted Under the U.S. Initiative on Joint Implementation*, Volume 1 (January).

Watt, E. and J. Sathaye [in collaboration with O. de Buen et al.]. 1995. *The Institutional Needs of Joint Implementation Projects*, Lawrence Berkeley National Laboratory Report (LBL-36453) prepared under contract to the US Environmental Protection Agency Climate Change Division through the US Department of Energy (Contract DE-AC03-76SF00098), October.

Wiener, Jonathan. 1998. "Global Environmental Regulation: Instrument Choice in Legal Context," *Yale Law Journal*, vol. 108, no. 3 (December).

World Resources Institute (WRI). 1996. *Private Financing for Global Environmental Initiatives: Can the Climate Convention's "Joint Implementation" Pave the Way?* (Washington, D.C: WRI).