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West African Gas Pipeline

A Partnership for Clean Economic Growth



The Chevron Companies
1401 Eye Street, N.W., Suite 1200
Washington, DC 20005

Judith A. Blanchard
Federal Relations Manager
Phone No. 202 408 5831
Fax No. 202 408 5845

October 18, 2000

Mr. Roger Ballantine
Deputy Assistant to the President and
Chairman of the White House Climate Change
Task Force
115 Old Executive Office Building
Washington, D.C. 20502

Dear Mr. Ballantine:

We very much appreciated being included in your recent briefing with regards to the status of the negotiations for the Kyoto Treaty. Our interest specifically is in the area of CDM, as we think this has quite a lot of potential for companies, such as Chevron, to invest in worthwhile, environmentally sound projects in developing countries.

Attached for your review are some materials related to our West African Gas Pipeline, which we are hopeful, would be covered for potential credits under the CDM provisions in the treaty. The pipeline is in the planning stages, but is an extremely exciting and an environmentally sound project to help reduce emissions. We have also attached for your review some of the potential concerns we have about the CDM provisions.

We appreciate your assistance. If you have any questions, please do not hesitate to call me at 202-408-5831.

Sincerely,

A handwritten signature in black ink, appearing to read "Judith A. Blanchard", written in a cursive style.

Attachments

cc: Janet Anderson

CDM – Priority Issues of Concern

- **Timing:** Tangible emissions reductions through projects should be admissible for CDM credits starting January 1, 2000 in accordance with Kyoto Protocol language. Project initiation should be defined only when the project is operational and when emission reduction can be demonstrably be measured – not defined by the planning stage since such reductions can not be measured and there are different implementation steps and definitions. Any restrictions on timing that is based on potential project plans or initiation of a project should also be excluded as they would have a negative incentive for CDM project participation.
- **Additionality:** Additionality must focus on environmental emission reductions (emissions additionality only). Other restrictions, e.g. the so-called “anyway” tons would be difficult to determine, detract from the environmental objectives, and provide disincentives for commercial investment and emissions reductions in developing countries.
- **Positive List/Prompt Start:** If there is a “positive” list, which hopefully there will not be, then such a list should include broad opportunities for energy efficiency and natural gas capture and utilization projects; if there is any such list it should be flexible and allow opportunities for future expansion. A proposed trial or “prompt start” should include any project that can tangibly reduce emissions to qualify for credits. Focus should be on environmental benefits, not on the types of technology used for reductions.
- **Maintain Incentives to Participate in Projects:** Unnecessary requirements and red-tape can reduce private market incentives to invest in CDM projects. Requirements for formal sectoral baseline setting; disclosure of confidential business information; lengthy approval processes; and unduly high “overhead” costs could diminish the incentive to invest in emissions reducing projects. It is important that the process be as flexible and streamlined as possible to encourage CDM projects.

AUGUST 29, 2000

KYOTO: CLEAN DEVELOPMENT MECHANISMS

Introduction

The Kyoto Protocol has not been ratified and come into force. However, this is the deadline year to work out the operational details of the greenhouse gas reduction strategy agreed in Kyoto. This November, negotiations will take place at the sixth Conference of the Parties (called COP 6) in The Hague, Netherlands. It is quite possible that some precedent-setting decisions will be made at that meeting regarding key provisions of the Kyoto text, the "Kyoto Mechanisms." The design and implementation of these mechanisms will have a significant impact on the way countries and companies respond to the global climate change issue. Thus, it is critical that any rules established for these mechanisms be equitable, reasonable and workable.

What Are the Kyoto Mechanisms ?

The Kyoto mechanisms recognize specific reductions in greenhouse gases and allow transfers of credit for the reductions. Countries with emission reduction commitments can buy and sell credits from each other through emissions trading. Joint Implementation allows credit from joint projects to be shared among developed countries. Clean Development Mechanism (CDM) allows credit for projects in developing countries to be shared. Under the Protocol, CDM projects may commence and begin accruing credit in 2000 (the other mechanisms don't commence until 2008). For that reason this paper focuses on the rules for CDM.

How Should CDM be structured

The Protocol merely sketched-out the framework for the mechanisms. Determining the rules necessary to actually implement them was left to the post-Kyoto negotiations. In fact, the process to determine the rules for using the mechanisms is actively proceeding despite the lack of a ratified Protocol. If the negotiators do seek to finalize the CDM rules at COP 6, several issues that are important to businesses need to be taken into account. The rules should be established such that the mechanisms remain efficient, market-based instruments that minimize costs and render environmental benefits.

Our views of several key issues that significantly affect the workability of the mechanisms are as follows:

- *Timing* – When should CDM start ? The startup of CDM should not be delayed. It could start with trial period if need be. Thus, entities could still get credit for actions they are undertaking today.
- *Eligible Projects* – What type of projects should be eligible for credit ? CDM should be open to private entities as well as countries. Projects that capture and utilize natural gas, promote energy efficiency, or offer carbon sinks should be eligible for credits under CDM. Commercial projects which use existing technologies should not be excluded. We oppose limiting credits to renewable projects only.
- *Additionality* – what tests will be applied to specific projects to ensure they are benefiting the environment in ways that would not have otherwise occurred ? Projects should be judged on their ability to provide real, measurable, verifiable and long-term reductions in the growth of emissions (so-call "environmental additionality"). We oppose applying financial, investment or technology criteria because they will make the mechanism far too complex and unworkable.

- *Supplementarity* – to what extent will a given country be allowed to rely upon credits derived from trading externally versus reductions/sequestration via domestic actions ? We do not support placing limits or caps on the ability any entity – be it a country, business sector or company -- to utilize the mechanisms. Such artificial restrictions will only drive up the cost of mitigation and limit the usefulness of the mechanisms.
- *Equity* – will credits be constrained or capped by tests of geographic or social equity? As with supplementarity, we do not support limits or caps on the use of CDM or the other mechanisms.
- *Transaction Fees* – should fees be charged when using the mechanism ? Every effort should be made to minimize all transaction costs to avoid the risk of discouraging a valuable source of foreign direct investment.

CDM Provides Several Benefits

Implementing a well-designed CDM can provide several benefits:

- Lowers the overall cost of controlling greenhouse gas emissions. By expanding the universe of choices for mitigating GHG emissions, CDM allows parties to seek out the lowest cost option. This could be particularly beneficial to regions experiencing high growth rates.
- Encourages technology transfer. CDM encourages the broader use of advanced technology in place of older, less-efficient, high-emissions infrastructure in developing regions. Brings worthwhile and environmentally sound investment to developing countries.
- Offers incentive for early action. Companies can receive credit for activities and projects they are undertaking today.
- Provides associated environmental and development benefits. CDM projects can reduce emissions of criteria air pollutants while creating additional jobs and infrastructure.

The success of efforts to reduce global greenhouse gases will hinge on the ability to integrate the Protocol with typical business decision-making processes. The CDM must be properly designed to facilitate this integration. Without an effective CDM the Protocol will likely fail as it risks becoming a public works program without sufficient funding.

**VanNess
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August 7, 2000

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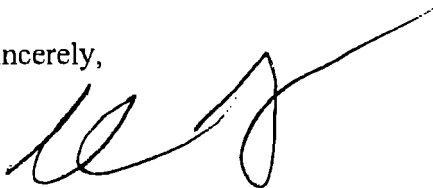
Dear Roger:

Attached is a paper that describes the USIJI project we discussed several weeks ago. CMS is currently meeting with those in the government with responsibility for these issues.

We will keep you abreast of our progress as the project moves through the certification process.

I look forward to talking with you soon.

Sincerely,



Richard Rosenzweig

Attachment

Event?

Janet -
where are
we on this?
pls give
an update.



An International Energy Company

ENVIRONMENTALLY RESPONSIBLE GAS PROCESSING IN EQUATORIAL GUINEA

I. Project Description

On May 31, 2000, the U.S. partners who own and operate the Alba gas field and the Atlantic Methanol Production Company (AMPCO) in Equatorial Guinea, submitted an application to the United States Initiative on Joint Implementation (USIJI). The AMPCO project represents a \$420 million investment that will achieve substantial environmental benefits and greatly contribute to sustainable development. The application is based on a major new project which exemplifies the principles of environmentally responsible gas processing. It will significantly reduce greenhouse gases and conforms to the criteria for USIJI certification. The project is divided into two phases as described below.

- **Downstream Phase**

AMPCO is constructing a methanol production plant adjacent to an existing gas processing facility on the northern coast of Bioko Island, the offshore portion of Equatorial Guinea. Approximately 100 million cubic feet per day of residue gas (dry methane) is currently being flared at the exit of the gas processing facility. This gas will be converted by the new plant into methanol which will be exported for sale on the international market. When the flare is extinguished early next year, this phase of the project will reduce emissions of carbon dioxide (CO₂) equivalent by 3.92 million tons per year.

- **Upstream Phase**

The total wet gas production of the Alba field is currently transported to the onshore processing facility which recovers the liquids producing condensate and LPG. The residue or dry gas exiting the processing plant is combusted in a ground flare, but will soon be utilized for the methanol production facility. Offshore production capability was recently expanded to ensure the reliability of production for the methanol facility. As a result of the expanded production, an additional 100 million standard cubic feet per day of gas will be produced beyond what is required for the onshore operation. Instead of flaring the additional gas, new equipment and systems have been installed to partially process the gas on the platform and then reinject it into the reservoir for greater efficiency, pressure maintenance and storage. During the project's initial 14 years of operation, 511 billion standard cubic feet of gas will be reinjected into the producing reservoir instead of being released into the atmosphere through flaring. This component of the project will reduce CO₂ emissions by 2.25 million metric tons per year.

A:\CMSIJI.WPD

July 26, 2000

Together, the two phases of the project will reduce CO₂ emissions by a total of 6.17 million metric tons per year. The world price for methanol has been volatile. There is also the potential that less methanol will be utilized due to the potential phase out of MTBE gasoline. Thus revenues derived from the project will likely be reduced. The credits resulting from USIJI certification could greatly enhance the project's economic viability due to the value of the credits.

II. Considerations for USIJI Certification of the Project

- **The Project Significantly Reduces Greenhouse Gas Emissions.**

The project will reduce emissions of Carbon Dioxide (CO₂) emissions by 6.17 million metric tons per year. The benefits from this project will have an extraordinary impact on local environmental conditions and the greenhouse gas reductions could be applied by the United States against a future emissions limitation obligation, should one ultimately be adopted.

- **The Project Encourages Much-Needed Investment to Africa and Serves as a Driver for Increasing Environmental Awareness.**

To date, only one African nation has participated in a USIJI project. Certification of this project will help to solidify a \$500 million investment and provide an impetus for the development of new projects on the continent. For example, a significant amount of gas flaring occurs in neighboring Nigeria. Certification of this effort would send a signal for gas producers there to reconsider the use of flaring. In addition, a direct result of examining the USIJI process in connection with this project, the Government of Equatorial Guinea decided to become a signatory to the United Nation Framework Convention on Climate Change (UNFCCC). As awareness spreads through the region and beyond of the environmental and other benefits from generating greenhouse gas reductions, neighboring nations will be similarly encouraged to expand their participation in the international climate change discussions.

- **Certification of a Baseload Energy Project Provides an Incentive for Developers to Consider Emissions Reductions in New Projects and Increases International Support for Flexible Mechanisms.**

Developers of commercial energy projects are not fully versed on the benefits of project-based mechanisms to reduce greenhouse gases. Nor do they understand the potential revenues that can accrue through emissions trading. Certification of the AMPCO project would send a powerful signal of how efforts to reduce greenhouse gasses can improve the economic viability of major infrastructure investments in developing countries. Certification would increase the understanding of and support for flexible mechanisms in the developing world and the corporate sector as effective tools to reduce emissions.

It would also provide valuable input to international climate change negotiators as they develop rules to govern such mechanisms based on real world experiences.

- **The Calculations to Determine the Greenhouse Gas Reductions Resulting From the Project Are Straightforward.**

Many greenhouse gas reduction projects require complex engineering analysis to determine the greenhouse gas reductions resulting from the project activity. Emissions reductions from this project are simple to quantify utilizing straightforward methodologies.

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September 21, 2000

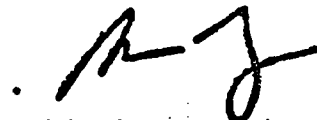
Roger Ballentine
Office of Environmental Initiatives
Old Executive Office Building
Room 115
Washington, DC 20502

Dear Roger:

We recently meet to discuss CMS Energies application for USIJI certification of its AMPCO/ALBA project in Equatorial Guinea. CMS has recently resubmitted its application answering additional questions of the USIJI staff. A decision on certification will be made at the end of this month.

We appreciated your time to brief you on this important project and look forward to project certification.

Sincerely,

A handwritten signature in black ink, appearing to be 'R. Rosenzweig', with a small dot to the left of the first letter.

Richard Rosenzweig

Attachment

Dated 09/08/00

Environmentally Responsible

Gas Processing

Bioko Island – Equatorial Guinea

ALBA Partners/AMPCO Project

**Application to the
United States Initiative on Joint Implementation**

September 8, 2000

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I. Participants in the Project

A. Domestic - Alba Fields and LPG Plant

1. CMS Oil and Gas ("CMS O&G")

- a. Responsible Officer: Bradley W. Fischer, President and Chief Executive Officer
- b. Contact Person: George A. Pickart, International Affairs Director, CMS Energy
- c. 1016 16th Street, NW
Fifth Floor
Washington, D.C. 20036
Phone: (202) 293-5794
Fax: (202) 223-6178
e-mail: gapickart@cmsenergy.com
- d. Category of Eligibility-U.S. Corporation

2. Samedan of North Africa, Incorporated ("Samedan")

- a. Responsible Officer: Rodney Cook, Manager of International Operations, Samedan Oil Company
- b. Contact Person: Rodney Cook
- c. 350 Glenborough
Suite 300
Houston, TX 77067
Phone: (281) 876-6200
Fax: (281) 876-6153
e-mail: rcook@samedan.com
- d. Category of Eligibility: U.S. Corporation

3. Globex International ("Globex")

- a. Responsible Officer: Gene Kornegay President
- b. Contact Person: Gene Kornegay
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Phone: (713) 463-7710
Fax: (713) 463-7722
e-mail: lgkornegay@aol.com
- d. Category of Eligibility: U.S. Owned Company

B. Domestic - Methanol Plant

1. CMS Gas Transmission ("CMSGT")

- a. Responsible Officer: James W. Cook, Senior Vice President, CMS Energy Corporation
- b. Contact Person: George A. Pickart, International Affairs Director, CMS Energy
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Fifth Floor
Washington, D.C. 20036
Phone: (202) 293-5794
Fax: (202) 223-6178
e-mail: gapickart@cmsenergy.com
- d. Category of Eligibility-U.S. Corporation

2. Samedan of North Africa, Incorporated ("Samedan")

- a. Responsible Officer: Rodney Cook, Manager of International Operations, Samedan Oil Company
- b. Contact Person: Rodney Cook
- c. 350 Glenborough
Suite 300
Houston, TX 77067
Phone: (281) 876-6200
Fax: (281) 876-6153
e-mail: rcook@samedan.com
- d. Category of Eligibility: U.S. Corporation

C. Foreign

1. Government of the Republic of Equatorial Guinea ("State")

- a. Responsible Officer:
- b. Contact Person: Ambassador Teodoro Biyogo Nsue
- c. Embassy of the Republic of Equatorial Guinea
2020 16th Street, NW
Washington, D.C. 20009
Phone: (202) 518-5700
Fax: (202) 518-5252
- d. Category of Eligibility: Government of the Republic of Equatorial Guinea, 10% Equity Investor in AMPCO project, 20% Equity Investor in LPG Project and 3% owner of Alba Field.

II. Project Information

A. Description and Milestones

1. Brief summary of project

Upstream of the Methanol Plant

In the mid-1980's, Gepisa, a joint venture between the State Oil Company of Spain and the Government of the Republic of Equatorial Guinea, discovered the Alba Field. However, it was eventually determined that the field was not commercially economical.

Walter International Equatorial Guinea, Inc ("WIEG") entered into a Production Sharing Contract ("PSC") with the Government of Equatorial Guinea dated 10 April 1990. The area of the PSC included the Alba Field. WIEG proved the field was commercial by drilling and testing the Alba #2 well in 1990. Production was commenced from the Alba Field in December 1991 using the Alba #2 well as the sole producing well. The Alba #3 well was drilled in May 1992 and commenced production in August 1992.

The Alba field is located offshore, 28km (18miles) northwest of Bioko Island, Equatorial Guinea. The field was developed with a minimum design "Tarpon" platform with two producing wells. The total production of the Field is transported approximately 18 miles from the platform to an onshore processing facility at Punta Europa on the northern tip of Bioko Island through a 10" pipeline. The natural gas is then processed with the condensate being stabilized in Plants #1 and #2. A liquid propane gas (LPG) Plant ("Plant #3") was designed and constructed in 1996 to further process the natural gas stream. This cryogenic plant produces a LPG product and the remaining stripped natural gas stream is combusted in a ground flare.

The Alba Field contains considerable natural gas. The current estimate of the Alba field, has a proven and probable reserve capacity of 1,700 billion cubic feet of dry natural gas. The Upstream facilities have processed and combusted over a nine year period 247 billion cubic feet of this gas leaving a remaining balance of 1,453 billion cubic feet. The estimated recovery factor for the remaining gas is 70%, which yields 1,017 billion cubic feet of gas available. Currently this gas is being flared at a rate of 30.67 billion cubic feet per year of gas.

The proposed methanol plant is being constructed to utilize the gas currently being flared and will consume 40.32 billion cubic feet per year of gas. The methanol plant being constructed is a standard 2,500 metric ton per day facility. Given a total available gas reserve of 1,017 billion cubic feet of gas, the proposed methanol plant would have an economic life of 25 years. However, the current infrastructure cannot deliver the total daily natural gas requirements of a standard methanol plant. To meet the demand for the methanol plant, eliminating the flare, an expansion of this infrastructure was necessary.

This expansion was accomplished by an accelerated well development program in the Alba Field to further delineate the field, increase recoverable reserves, increase production rates and to insure the production of sufficient dry residue gas for the life of the methanol plant. To assure that the well field expansion to support the methanol plant was economically viable, the gas production rate was increased (46 Bscf/yr) to an estimated total production rate of 77.92 billion standard cubic feet per year. This production rate ensures sufficient production of condensate to make the expansion project economical. The increased condensate production rate resulted in natural gas in excess (36.5 Bscf/yr) of the needs of the methanol plant. This excess natural gas will be re-injected into the formation to conserve the natural resource and minimize GHG emissions, as opposed to flaring.

Based on the proven and probable producible natural gas reserve capacity of 1,017 billion cubic feet and the production and re-injection/storage plan, it is estimated that all the natural gas reserves will be produced and processed (condensate removed) from the field in a 13-year period. The production volume used to calculate this time frame includes all of the natural gas produced (77.92 billion standard cubic feet per year). In the years 14 to 25 the injected stored natural gas will be utilized to produce methanol. Therefore, even though the reserve capacity will be completely processed in 13 years, the 13 years of re-injection has maintained the life of the natural gas reserves resulting in a 25-year gas supply to the methanol plant, eliminating the ground flaring of the gas.

The GHG reduction calculations take credit for all of the GHG reductions in the first 13 years of the plant life. Essentially it is assumed that at the time the natural gas is removed from the reservoir the GHG reductions occur. We have chosen to calculate the credits at the front end of the project, as this would have been the time the excess natural gas would have been flared if the methanol plant were not constructed.

The objectives of the upstream facilities are:

Offshore Facilities

- To separate hydrocarbon liquids from a portion of the natural gas stream
- To dehydrate a portion of the gas stream
- To re-inject a portion of the gas into the reservoir to aid in formation maintenance and store gas for future use by the methanol plant
- To transport the remaining gas and all hydrocarbon liquids to the shore

Onshore Facilities

- To separate hydrocarbon liquids from the natural gas
- To stabilize and store hydrocarbon liquids
- To recover LPG product from the natural gas and store the LPG
- To transport the residual natural gas to the methanol plant

Downstream (Methanol Plant)

Atlantic Methanol Production Company LLC (AMPCO) is constructing a methanol production plant adjacent to the existing Alba gas processing facility on the northern coast of the island of Bioko, Equatorial Guinea. The methanol plant has been developed to make use of the large quantities of residue natural gas currently being flared at the Alba gas processing facility and was considered to be the best and most environmentally preferred option for utilizing the residue gas. The project is being constructed with the backing of the Government of Equatorial Guinea.

The site of the methanol plant project covers a total area of approximately 172 acres. This site includes the main methanol plant, a 600-person camp, crude and product methanol storage areas, seawater intake area, engineered flare and other associated support facilities. Ancillary developments in support of the methanol plant include a construction jetty, construction haul route, product pipeline and an offshore pipeline-ending manifold (PLEM).

The methanol plant will utilize approximately 37.08 billion standard cubic feet per year of residue natural gas, of which a majority is currently being flared at the Alba gas processing facility. The methanol will then be exported and sold on the international market as chemical feedstock or fuels.

International world methanol demand estimates indicate that approximately 48% of methanol is used for chemical products; 29% of the methanol is used in MTBE production or fuels (given the current market trends and production costs the project has assumed that methanol produced by the AMPCO methanol plant will displace current market supplies and therefore will not add additional GHGs to the environment); the remaining 23% was specified as “other uses”.

The objectives of the methanol project are:

- To construct, operate and maintain a methanol plant in accordance with a range of specifications, standards and codes (ANSI, OSHA, World Bank),
- To operate with an on-stream time of 8,103 hours per day (92.5%, based on a non-shutdown year),
- To produce and market 2,500 metric tons per day of an enhanced IMPCA specification methanol representing a purity of not less than 99.85% methanol as set out in the emerging International Methanol Producers and Consumers Association purity standards.

Alba Participants

The Alba Participants are a consortium of independent international oil and gas exploration and production companies that are parties to the Alba Production Sharing Contract (“PSC”). Pursuant to the PSC, the Manufacturing and Marketing Agreement and the Gas Purchase and Sales Agreement the Alba Participants have the right and obligation to sell all of the natural gas produced, saved and not otherwise used in operations from the contract area.

The parties to the Alba PSC include CMS O&G, Samedan, Globex and the State represented by the Ministry of Mines and Energy. The interests of the parties in the Alba Field are as follows;

Alba Participants	Participating Interests	Cost Bearing Interests
CMS O&G	52.38000%	54.00000%
Samedan	33.74792%	34.79167%
Globex	10.87208%	11.20833%
STATE	3.00000%	0.00000%

CMS O&G is an indirect wholly owned subsidiary of CMS Energy Corporation. CMS O&G is an international company whose main business is the exploration and production of oil and natural gas. The company operates or owns interests in oil and gas producing properties in the United States, Equatorial Guinea, Congo, Tunisia, Ecuador, Venezuela and Colombia.

Samedan is a wholly owned subsidiary of Samedan Oil Corporation, which in turn is a subsidiary of Noble Affiliates, Inc. Samedan Oil Corporation has been engaged in the exploration, production and marketing of oil and gas since 1932, with current operations throughout the major basins in the United States, Argentina, China, Ecuador, Equatorial Guinea, the Mediterranean, the North Sea and the United Kingdom.

Globex

Globex is an international oil and gas exploration and production company headquartered in Houston, Texas. Globex has been engaged in the international exploration and production of oil and gas since 1990 and currently conducts operations in Equatorial Guinea, Cameroon, Australia, and the Philippines.

AMPCO

Atlantic Methanol Production Company LLC (“AMPCO”) is a company organized in the Cayman Islands. AMPCO is 90% owned by Atlantic Methanol Associates LLC that is owned fifty percent (50%) by a subsidiary of CMS Gas Transmission and Storage Company

(CMSGT) and fifty percent (50%) by a subsidiary of Samedan. The Government of Equatorial Guinea owns the remaining ten percent (10%) of AMPCO.

CMSGT is an indirect wholly owned subsidiary of CMS Energy Corporation. CMSGT is an international company and its principle business is the transportation, processing and storage of natural gas.

Samedan is a wholly owned subsidiary of Samedan Oil Corporation, which in turn is a subsidiary of Noble Affiliates, Inc. Samedan Oil Corporation has been engaged in the exploration, production and marketing of oil and gas since 1932, with current operations throughout the major basins in the United States, Argentina, China, Ecuador, Equatorial Guinea, the Mediterranean, the North Sea and the United Kingdom.

Key Project Considerations

Upstream of the Methanol Plant

- The submittal of this project for USIJI approval is an important element of an overall business strategy for the project.
- To accelerate recovery of hydrocarbon liquids while conserving gas reserves for future use by the methanol plant.
- To inject dry gas into the producing formation to improve the ultimate recovery of the hydrocarbon liquids from the reservoir.
- To improve safety and reduce the environmental impact of the accelerated development offshore, new manned platforms and facilities have been designed, constructed and installed.
- All offshore equipment has been designed, constructed and operated in accordance with US and international safety and environmental standards.

Downstream (Methanol Plant)

- The submittal of this project for USIJI approval is an important element of an overall business strategy for the project.
- The project executed a contract for Engineering, Procurement and Construction (EPC) with United Engineers International Inc. (UEII).
- The plant represents a significant improvement in non-renewable resource use through the recycling of large quantities of natural gas currently being flared.
- The plant has been designed, constructed and is required to be operated in accordance with international and United States industry standards.
- The methanol plant is located in a relatively isolated, sparsely populated area of minimal ecological and environmental sensitivity.
- Modeled air quality and noise levels associated with normal operating conditions at the plant are within environmental quality criteria limits.
- AMPCO has received all required Equatorial Guinea clearances to operate the proposed facility.
- AMPCO has a strong sponsor/shareholder team with experienced lead developers with respected local sponsors.

2. Project Location

Upstream of the Methanol Plant

The Alba Field is located offshore approximately 28km (18 miles) northwest of the Island of Bioko in water depths that range from 73 to 79 meters (240 to 260 feet). The entire contract area encompasses approximately 1400 km² or 300,000 acres with 3-D seismic coverage over the entire area. The Alba Field encompasses only approximately 6000 acres of the contract area. The liquids processing Plants 1, 2 & 3 are located on the Punta Europa headland on the northwest coast of Bioko Island, Equatorial Guinea. The estimated proven future reserves for

the Alba Field as of January 1, 1999 are 78.6 million barrels condensate, 1,700 billion cubic feet natural gas and 26.2 million barrels LPG product.

Downstream (Methanol Plant)

The methanol project site is located on the Punta Europa headland on the northwest coast of Bioko Island, Equatorial Guinea; a predominantly tropical, rural island situated off the coast of Cameroon, northwest of the Equatorial Guinean mainland.

The site is approximately six miles west from the capital city of Malabo and approximately two miles from Malabo Airport. The total project site is approximately 172 acres in size and lies on the coast, directly adjacent to the existing Alba gas processing facilities, in an approximate east-west orientation. The average site elevation, prior to site clearance and subsequent leveling was approximately 117 feet above mean sea level (AMSL) and was described as originally being rolling in character and densely forested.

3. Greenhouse Gas Sources and Sinks

The project consists of various sources of greenhouse gases. The following is a summary of these sources:

Baseline Case

The sources of greenhouse gas emissions in the baseline case are those related to the initial installation at the Alba processing facility (i.e. pre-methanol project). The onshore sources of GHG emissions currently include the production of electricity by a 250 kW diesel generator and two 750 kW natural gas generators and the offshore diesel electrical generation. These generators produce CO₂ as a greenhouse gas emission. These GHG emissions associated with these generators are not included in the baseline analysis because they remain unchanged in the modified case. The result is a zero net change in the emissions associated with energy needs.

The on site ground flare is used for combustion of the residue gas remaining after processing. The estimated average amount of flared natural gas is 30.67 billion standard cubic feet per year. The flare produces CO₂ and CH₄ as greenhouse gas emissions.

Modified Case

In addition to the electrical generation sources identified in the baseline case, the reference case contains those sources related to the expanded operation of the offshore platforms and the methanol plant.

The new offshore well platforms include two 500 kW gas generators for producing electricity and two 5000 hp compressors for injection of natural gas into the producing reservoir. The estimated natural gas consumption for energy production and compression is 730 million per year. The greenhouse gas emissions from these sources are predominantly CO₂

The ALBA processing facility's ground flare will cease operation and any flared gas will be through the installation of an engineered vertical flare. This flare will be used as a balancing flare to maintain a consistent operation of the upstream and downstream facilities and to safely handle the gas from the process in the event of an unexpected shutdown. The estimated natural gas combusted from this source is 3.24 billion cubic feet per year. The engineered flare emissions will produce predominantly CO₂.

Fugitive emissions from the methanol plant are considered minimal. Floating roof storage tanks are used to store the product and miscellaneous system vents are routed to the flare and accounted for in the 3.24 billion cubic feet per year estimated for that process. These combustion sources will produce predominantly CO₂.

The methanol plant will include multiple sources of greenhouse gases. These include gas turbines for electricity generation, auxiliary steam boilers, and a natural gas/steam reformer for the production of synthesis gas, an intermediate in the methanol process. It is estimated that the natural gas combusted in these processes is equal to 9.66 billion cubic feet per year. These combustion sources will produce predominantly CO₂.

There is no current plan for any sinks to be included in the project. However, given the location of the project on the island of Bioko the high natural growth rate of the vegetation on the island creates a sink for CO₂.

4. *Specific Measures to Reduce or Sequester Emissions*

Upstream of the Methanol Plant

The upstream portion of the project, which supports the operation of the downstream methanol plant, involves the construction and installation of two platforms, and the drilling and completion of producing and injection wells to facilitate the termination of on-shore flaring. The injection wells and the associated compressors will inject natural gas that will ensure the future operation of the downstream methanol plant. The facility will inject an estimated 36.5 billion cubic feet per year excess natural gas produced for the extraction of natural gas condensate. The GHG reductions are due to the re-injection of this gas to preserve the natural resource as opposed to flaring the excess gas, as is currently done.

Downstream (Methanol Plant)

The downstream portion of the project involves the installation of a methanol production facility, which will utilize natural gas that is currently being flared by the upstream onshore processing plants. The facility will utilize over 37.08 billion standard cubic feet per year of gas to produce on average 2,500 metric tons of liquid methanol per day, thus reducing the flare to an operational minimum flow and significantly reducing the production of greenhouse gas emissions.

5. *Dates of specific Commercial and Political Milestones*

Alba Field

- a. Dates when discussions regarding project were initiated:
 - An engineering study commenced about December 1997.
 - Submitted invitations to bid in November 1998.
 - A Plan for Accelerated Development of Alba Field prepared and presented to the EG Government in October 1998.
 - Three year budget of \$114,300,000 approved by EG Government in 1999.
 - Awarded contract to Global Marine in March 1999.
 - 'B' jacket departed Gulf Island in December 1999.
 - 'A' deck and jacket departed Gulf Island in December 1999.
 - Pipeline installation commenced in January 2000.
 - 'B' deck departed Gulf Island in February 2000.
 - Commenced installation of 'A' jacket in February 2000.
 - Commenced installation of 'B' jacket February 2000.
 - Installed the 'B' deck in March 2000.
 - Completed hookup work and commissioned 'B' deck in April 2000.

Methanol Plant

- Preliminary discussion by the Sponsors on best way to discontinue the use of the ALBA flare was carried out over several years
- Determination of best alternative for flared natural gas August 1997.
- Preliminary cost estimate study for Methanol plant performed by Raytheon Engineers and Constructors spring of 1997.

- Execution of the Heads of Agreement with the Government of Equatorial Guinea. October 1997
 - Execution on Manufacturing and Marketing (M&M) Agreement with the Government of Equatorial Guinea March 1998.
 - Engineering, Procurement and Construction Agreement executed with United Engineers International (UEI) with Notice to proceed May 1998.
 - Execution of Transportation Agreement March 1999.
 - File Environmental Impact Assessment for project with the Overseas Private Investment Corporation of the 60 day public comment period October 1999.
 - Schedule commercial operation May 2001.
- b. The following permits have been obtained and the following environmental information has been provided:

Alba Field All authorizations to proceed were obtained from the Ministry of Mines and Energy.

Methanol Plant

AMPCO in execution of the Manufacturing and Marketing Agreement received all required permits and licenses to build, own and operate the methanol plant.

EPC Contractor has been registered to do business in Equatorial Guinea and is working under the AMPCO permits.

- c. The following is a list of major events and anticipated schedule dates:

Upstream of the Methanol Plant

- Construction of offshore facilities commenced in April 1999.
- Installation of offshore facilities including two platforms, four pipelines and topside facilities completed in April 2000.

Downstream (Methanol Plant)

- | | |
|---|---------------|
| • Environmental Permits Issued | Part of M&M |
| • EPC Contract Signed | May 1998 |
| • Limited Notice to Proceed (EPC) | May 1998 |
| • Release Major Equipment Manufacturing | June 1998 |
| • EPC Contractor on-Site Mobilization | December 1998 |
| • File Environmental Impact Study | October 1999 |
| • Commercial Start-up | May 2001 |

- d. The commercial operation of both of the projects will begin in June 2001, it is anticipated that the project life will be a minimum of 25 years.

B. Sources of Funding for the Specific Measures to Reduce Greenhouse Gas Emissions

The Sponsors are currently funding the project from their specific sources of equity.

C. Assignment of Emissions Reductions

Negotiation is underway between: The Republic of Equatorial Guinea and the Lead Developers (AMPCO/ALBA) for sharing of the offsets (emissions reductions) generated by the total project. Formularization of allocation is expected shortly, and it is expected that each participant will be allocated share based on percentage of equity ownership in the project.

D. Additionality

From their earliest conceptual stages, both the upstream re-injection effort and the AMPCO methanol project have been driven out of concern for the environment and a desire to achieve the

reduction of greenhouse gas emissions. Significant quantities of natural gas produced at the Alba Field in Equatorial Guinea have been flared since condensate production began there in 1991. The AMPCO methanol project was envisioned essentially to utilize gas for which there previously was no market, to convert that gas to a transportable commodity for which there will be a variety of productive uses, and to realize in the process a substantial reduction in greenhouse gas emissions through the capping of the flare.

Similarly, the upstream re-injection effort, which arose out of the close synergies between the upstream and methanol projects, was designed in large measure to address environmental and safety concerns. To fully utilize the existing flare gas volumes, a methanol project sized at 2,500 metric tons per day would be required. However, a methanol plant at 2,500 metric tons per day would require some additional gas volume. Therefore, an expansion of the off shore production was required to provide both the supply of fuel as well as infrastructure to provide security to support the large investment. The off shore expansion in turn made additional liquids production making the investment in the offshore expansion economical. The need to secure a 25 year natural gas supply to support the methanol plant operation made the decision to re-inject straight forward even though the offshore expansion project's capital and operations cost would have been reduced by simply flaring the excess production.

Due to Equatorial Guinea's increasing acceptance of competition and free market principles, coupled with the realization that a CO₂ commodity trading market is emerging worldwide, the generation of greenhouse gas emission credits (CO₂ offsets) has emerged as a significant consideration in the planning, deliberations, and decision-making processes of the AMPCO and Alba project's partners. While there is a stand-alone requirement for a minimum degree of economic viability for projects of this size and scale, the credits are considered by the partners to have a high probability of ensuring the sustainability and commercial health of both efforts.

This is particularly relevant in view of the high degree of uncertainty in the long-term trends in methanol supply, demand and pricing. Methanol demonstrates the typical properties of a petrochemical commodity. Since large methanol producers tend to service all of the major world markets, and since the commodity can be easily transported across long distances, regional pricing gravitates towards a world price, which is set by the domestic gas price paid by the older, high cost plants on the U.S. Gulf Coast. As a result, there is a high degree of price volatility based on U.S. gas prices and the degree of plant utilization worldwide. During the past 15 years, methanol prices have fluctuated from lows of \$70 - \$80 per metric ton to a high of more than \$500 per metric ton.

During the mid-1990's, unusually high methanol prices encouraged a significant number of new methanol producers to enter the market, as well as projects to extend the life of older, less efficient plants. Approximately 3 million metric ton per year of new capacity was added in 1997, and an additional 4.2 million metric tons had been added by the end of 1999. With total world demand at less than 30 million tons per year, an oversupply situation has developed and in conjunction with low U.S. gas prices, the world price of methanol fell to under \$90 per tonne, in the first half of 1999. The over capacity is expected to continue over the short term; and only the recent sharp rise in U.S. gas prices has reversed the downward trend of world price of methanol.

The United States is the world's largest consumer of methanol, and the Gulf Coast region accounts for the largest amount of consumption. The methanol market is closely linked to the broader economic cycle, since the commodity or its derivatives are used in the housing, construction, automotive, energy, gasoline, steel, food and durable goods markets. One of the major derivative products for methanol over the last decade is MTBE, which is consumed as a gasoline additive to achieve air quality improvements. However, due to ground water contamination issues, the State of California has already taken steps to ban the use of MTBE, and the U.S. Environmental Protection Agency has recently indicated its support for a national ban.

The global trends and the potential implementation of new policies and laws in the United States introduce a significant, previously unaccounted for element of risk to producers of methanol worldwide, and to the long term economic prospects for the AMPCO project. In fact, due to the potential impact of losing the U.S. market for MTBE, the AMPCO partners urgently reviewed the viability of the project in the spring of 1999. The opportunity to generate emission credits as a possible additional economic benefit has been a much needed bit of positive news to contrast with the bleak outlook of a depressed methanol market for an extended period. The partners have concluded that the financial benefits from CO₂ offsets that eventually would accrue through USIJI certification will play a large part in mitigating that risk, and have substantially strengthened their resolve to pursue the project and bring it to fruition.

The domestic partners have also encouraged USIJI certification as an effective mechanism to raise Equatorial Guinea's profile in U.S. policymaking circles, to add substance to and promote US-Equato-Guinean ties, and thereby fundamentally reduce the level of political risk. As an equity partner, the government of Equatorial Guinea has an incentive to ensure that the project is well run and protected from political manipulation and interference. Certification under the USIJI program raises that incentive to a higher level by drawing the project into the bilateral US-Equatorial Guinea relationship.

Until now, Equatorial Guinea did not place a priority on joining the international global climate change regime. As a direct consequence of the partners' efforts to obtain certification, however, Equatorial Guinea has taken the extraordinary step of acceding to the UN Framework Convention on Climate Change (UNFCCC) (see official copy of the instrument of accession to the UNFCCC sign by President Obiang Nguema Mbasogo attached in Appendix D), an agreement that the government had previously declined to join. Accession to the UNFCCC as a result of a desire to see this project certified is further testament that the government views the project as an integral part of its emerging efforts to bolster its environmental policies and practices. The partners believe that the shifting posture of the government of Equatorial Guinea, spurred by its emerging efforts to engage the United States in a dialogue on international environmental issues, offers additional protections against political risk.

The partners have taken steps to inform the project's political risk insurers and lenders of the potential benefits of USIJI certification and the financial impact of realizing CO₂ offsets. The future value of the sale of these credits falls within a broad spectrum, however, and according to the partners' research it is difficult to quantify with absolute certainty. Accordingly, lenders at this point are aware of but do not include the revenue from CO₂ offsets in their analysis of the creditworthiness of the project.

There is nothing in the laws, policies or regulatory framework of Equatorial Guinea to require the partners to extinguish the Punta Europa flare or pursue the upstream re-injection effort. Indeed, under Article 5.3 of their Production Sharing Contract, the Alba joint venturers are explicitly authorized to flare all natural gas not used, sold to third parties, or provided to the State. In other words, the partners are undertaking efforts that are completely additional to the legal, policy and regulatory requirements of Equatorial Guinea.

In pursuit of these efforts, the partners are introducing techniques, management practices, and training that have not been previously deployed in Equatorial Guinea. Until now, no methanol has been produced in Equatorial Guinea, so the AMPCO project will introduce a new commodity to Equatorial Guinea's export capabilities. While the technology itself is not new, an onshore facility of this complexity has not previously been utilized in Equatorial Guinea and therefore will involve a robust level of technology transfer, employment and training opportunities, and the ultimate development of in-country managerial expertise and professional skills through an extensive training program to upgrade local work skills.

Similarly, re-injection in and of itself will not involve new technology but will introduce processes and practices that are particular to this project and therefore new to Equatorial Guinea. These

include the construction of multiple pipelines to ensure redundancy, and establishment of an ability to dehydrate and process the gas both on and offshore. The project will also require the use of new personnel, including additional new offshore foremen, operators and mechanics, and an entirely new, full time management structure on Bioko, including a Vice President for West Africa, a finance and administration manager, a Health, Safety and Environment manager, and an Information Technology Manager. These will result in the substantial transfer of knowledge and ability to Equatorial Guinea.

Based on the above, the project partners firmly believe that their efforts involve substantial levels of project, environmental and financial additionality, which amply demonstrate that they are implementing policies and technologies to reduce and sequester greenhouse gas emissions above and beyond what would otherwise reasonably occur.

E. Acceptance by the National or Federal Government of the Host Country

A letter-dated June 19, 2000 from the President Obiang to Secretary of State Albright is enclosed in Appendix C of the Application.

F. Technical Assistance

The project Sponsors are not requesting technical assistance from the USIJI at this time. If the Sponsors believe they will require technical assistance in the future they will notify the USIJI with the estimated level of assistance and the required level of funding.

III. Greenhouse Gas Emissions and Sequestrations

A. Baseline Estimate of Emissions and or Sequestration of Greenhouse Gases Without Measures

Description of Baseline Process

Upstream of the Methanol Plant – Offshore

Wet natural gas is produced from offshore wells and is transported by pipeline to the processing plants located on Bioko Island. The offshore systems include a production platform, which requires electric generation to sustain its operations. Emissions associated with the offshore energy needs were not included in the baseline analysis because they remain unchanged in the modified case, that results in a zero net change in the emissions associated with energy needs for offshore processing.

Upstream of the Methanol Plant- Onshore

Wet natural gas produced is transported from the offshore wells, where the condensate is separated and stabilized in Alba Plants 1 and 2. The residue gas from Alba Plants 1 & 2 is then sent to Alba Plant 3 where it is run through a scrubber and metered prior to being dehydrated. The high-pressure dry inlet gas then flows to a cryogenic liquid propane gas (LPG) recovery unit where it is cooled through an exchanger. As this gas is cooled, liquid hydrocarbons are condensed and collected. These condensed fluids are then distilled to minimize the light hydrocarbon component and also separate additional stabilized condensate. The remaining LPG is then treated to remove sulfur compounds. Treated LPG product is transferred from Plant 3 under pressure at ambient temperature to a refrigeration area. The resulting residue gas from both Alba Plants 1 and 3 is then commingled and sent to the ground flare located on the site. These on shore plant require electric generation to sustain its operations. Emissions associated with the onshore energy needs were not included in the baseline analysis because they remain unchanged in the modified case, that results in a zero net change in the emissions associated with energy needs for onshore processing.

The baseline emission estimate is based on the volume of flared natural gas in the year 1999, of 30.89 billion cubic feet. This volume represents an online availability factor of the Alba well field and processing facility of 98.2%. As a conservative assumption, an availability factor of 97.5%

was used to determine the baseline emission estimate. This availability factor is equivalent to 30.67 billion standard cubic feet per year. The volume flared remains relatively constant year to year and fluctuates only when the well is shutdown for both forced and planned maintenance outages. The project will provide data as to the actual amounts flared during the verification process.

The natural gas is combusted in a ground flare that is assumed to be approximately 85% efficient. This means that 85% of the natural gas is converted to carbon dioxide (CO₂) and 15% remains as natural gas, which is assumed to be 100% methane (CH₄).

The results of this estimate yields 3.40 million metric tons of CO₂ equivalents produced yearly. The calculations and a schematic are presented in Appendix A of this application.

B. Estimate of Emissions and Sequestration of Greenhouse Gases With Measures

Description of Modified Process

Upstream of the Methanol Plant-Offshore

In order to meet the natural gas requirements of the methanol plant, expansion of the ALBA Field was required. This expansion included the drilling of additional wells (both production and re-injection), installation of two offshore platforms (one with a crude liquids separation equipment), and the installation of re-injection compressors and a new pipeline to transport the wet natural gas to the onshore processing plants and then on to the methanol plant.

The additional energy production to support the needs of the expanded offshore facilities and the compression for re-injection of the natural gas, is estimated to consume .73 billion standard cubic feet per year. Fugitive emissions from the wellhead are very difficult to estimate and quantify.

Fugitive emissions of equal value are present in both the base case and the modified case and result in no net reductions or increases.

Downstream (Methanol Plant)

Methanol production is a reliable, established chemical process technology available through a number of experienced licensors. The Atlantic Methanol production facility will produce 2,500 metric tons per day.

Construction of the methanol plant occurs over a 3-year period. During the construction fuel is used to construct and start the facility. The project has estimated that the construction will consume approximately 1.3 million gallons of diesel fuel, 250,000 gallons of LPG and 72,500 mmscf of natural gas. The emissions from the combustion of these fuels, in mobile construction equipment electric generation for construction and fuel for start-up that will not produce methanol. The estimated total emissions for the construction period is estimated to be ___ tons and is insignificant as compared to the emissions reductions realized by the project.

The production of methanol via steam/hydrocarbon reforming includes the following steps:

- Desulfurization of feedstock
- Reforming
- Synthesis gas compression
- Methanol synthesis
- Methanol purification (distillation)

The modified case emission estimate is based on the use of the currently flared natural gas in a methanol production facility and the re-injection of excess produced natural gas.

The methanol plant will require 40.3 billion cubic feet of natural gas per year. The difference between the volume of the gas currently flared (30.67 billion cubic feet) and that required (40.3

billion cubic feet) by the methanol plant will be made up through increases in production of the wet gas wells installed by offshore expansion (9.65 billion cubic feet).

Of the 40.3 billion cubic feet per year of natural gas required to support the methanol production, 27.4 billion cubic feet per year is used directly in the production of methanol, 9.66 billion cubic feet per year is used for energy needs and 3.24 billion cubic feet (8% of the total required for methanol production) is considered miscellaneous combustion related emissions. The 3.24 billion cubic feet is flared in an engineered flare to balance the plant fuel load.

GHG emissions directly from the methanol are not considered as approximately 66% of the chemical grade methanol is bound up in products or chemical feedstock. The other 34% (27% MTBE, 2.3% fuels and 4.1% solvents) is used to meet market demands and offset other less economical supplies of MTBE, fuels or solvents.

The emissions associated with the methanol production include those from energy production, fugitive emissions and emissions associated with construction of the facility (although these emissions are considered to occur only once in time). Fugitive emissions from the process and storage are considered insignificant. The chemical grade methanol is stored in 3 large floating roof tanks intended to prevent the loss of product via evaporation. The floating roof design consists of a deck, fittings and a rim seal system that allows the roof to float on the top of the methanol liquid preventing the formation of gases and preventing evaporative losses. The crude methanol is stored in two fixed roof storage tanks that are vented. These vents are fixed with scrubbers that will clean the vented gas returning the scrubbed methanol to the process. Fugitive emissions are controlled by natural gas detectors located in and around the process for employee safety.

The emissions associated with the loading of the transport tankers and during transportation are very difficult to quantify, however based on the experience of consultants to the project, have estimated that there will be minimal emissions associated with the loading of the tankers. A small portion of the previous loading will remain in the tankers compartment wells. This amount of methanol emissions is estimated to be 300-400 liters total (approximately half ton) per loading. This is equivalent to about 10 tons per year based on the current planned production rate and tanker capacity. Given that the methanol is loaded at a temperature that is equal to or slightly higher than the ambient temperature for both the air and water temperature in Equatorial Guinea, the methanol as it is transported will cool. As it cools it will contract, which will minimize any methanol vapors emissions to the atmosphere.

Given that the methanol produced by this project will be replacing and/or offsetting production of methanol at a similar facility, the emissions associated with the methanol production (i.e. energy, fugitive, storage, and transportation) are assumed to be consistent or less than the facility that this plant is offsetting. Therefore, these emissions were not considered as part of the calculation.

Emission Reduction Summary

The following table summarizes the calculation of the sequestered greenhouse gas emissions.

	Without Measures (Mtonnes CO ₂ E/yr)	With Measures (Mtonnes CO ₂ E/yr)	Total Reductions (Mtonnes CO ₂ E/yr)
Upstream of Methanol Plant			
Re-injected natural gas for storage.	0	-4.05	4.05
Offshore Energy Needs for the production and re-injection of the natural gas	0	.044	-0.44
Flaring Onshore	3.40	0	3.40

Downstream			
Misc Flaring	0	.192	-.192
Total Reductions			7.23

The total amount of GHG emissions per year sequestered by the upstream and downstream projects is calculated to be 7.23 million metric tons of CO₂ equivalent.

C. *Monitoring Greenhouse Gas Emissions and Updating Emissions Estimates and External Verification*

The Monitoring and Verification Program (MVP) will contain AMPCO policies to assure that greenhouse gas reductions are an important component of environmental compliance. These policy statements will underscore commitment to the program, quality assurance requirements, verifiable measures and management of change. The program will be administered by the AMPCO plant environmental engineer and verified annually by an independent third party.

The Monitoring and Verification Program will be developed and implemented prior to the methanol plant start-up. The Program will be a comprehensive plan that spells out specific monitoring parameters and procedures for capturing the information that will be required for documenting actual GHG emission reductions from the project. The MVP will identify the specific calculations or algorithms that will be used to quantify the GHG emission reductions. The MVP will also identify the metering and measurement devices necessary to assure that all natural gas used as feedstock, combusted or re-injected is accurately measured and recorded.

The MVP will specify the methodology and procedures for the following major tasks:

- Monitoring of key information parameters and collection of data to facilitate the calculation of GHG emission reductions.
- Documentation of baseline case assumptions.
- Data retention procedures.
- Verification of plant configuration to assure that emissions sources changes are accounted for in the quantification of GHG emissions.
- Periodic reporting of emission reductions to ensure the integrity and trace ability of the GHG emissions.
- Verification and certification of reduction by an independent third party.

The project believes that implementing a verifiable MVP will assure that the GHG benefits will not be lost or reversed over time.

There are presently no rules or guidelines in place for the certification of GHG emission reduction credits under the Clean Development Mechanism or other internationally recognized standards. It will therefore be necessary to develop a set of criteria in the MVP and a process for incorporating or addressing such standards as they emerge.

The project has tentatively committed with ERT to provide consulting services to annually independently verify the emissions credits sought and to register them on GHG Registry®. ERT along with the project team will develop a comprehensive program, as described above, to ensure that GHG emission reductions are accurately measured, transparently calculated and correctly reported prior to the methanol plant start-up. The project will finalize its commitment with ERT prior to or upon the final decision of the USIJI Review Committee. A copy of ERT's draft MVP is attached in Appendix F to this application. The AMPCO and ALBA partners wish to affirm that the proposal does not constitute a contractual arrangement, but is representative of the type of MVP that they intend to conclude upon certification. The partners pledge to keep USIJI staff

informed of progress as the effort proceeds to ensure that the MVP fully meets USIJI's requirements and expectations.

IV. Other Considerations

A. Non-greenhouse Gas Environmental Impacts of the Projects

1. AMPCO as part of its initial development is creating new environmental (or health and safety) policies or procedures. These are to be based on the current environmental, health and safety policies the two majority partners (CMSGT and SAMEDAN) have in place as individual companies and will be implemented through the Operational and Maintenance Manual for the plant once construction has been completed. These policies and procedures will reflect recognized environmental, health and safety standards and industrial codes of good practice as specified and agreed to in the Manufacturing and Marketing Agreement with Equatorial Guinea.

The Turnkey Agreement for the methanol plant project sets out contract and requirement for the design, construction and test operation of the plant. It outlines, a minimum compliance with the following standards and specifications:

- OSHA (Occupational Safety and Health Association, US Department of Labor),
 - NFPA (US National Fire Protection Association); and
 - World Bank environmental guidelines
2. The procedures specifically developed for environmental protection on construction sites include hazardous waste management, pollution prevention, spill prevention, control and countermeasure (SPCC); spill response; storm water management; used oil management; recycling; and waste management. AMPCO's contractor, requires that all of their sub-contractors operate within the construction, environmental, health and safety policies and procedures unless the company operates under a more stringent system.
 3. Daily site walkovers are undertaken by the Environmental, Health & Safety (EH&S) Officer to monitor the implementation of general safety procedures throughout the project site and to ensure that good "housekeeping" is generally maintained. Weekly meetings attend by all on-site company representatives are held where, in addition to progress assessment, environmental and health and safety issues are discussed.
 4. Currently setting up procedures, work practices and standards for application at managerial and working levels on site - including plant modifications/design safety procedures, site safety procedures; environmental procedures and health and hygiene. The environmental procedures will address, for example, the control and disposal of wastes, effluent discharges and emission to air, protection of sensitive areas, spill prevention and response, soil protection, storage and disposal, environmental monitoring and assessment, noise surveys.
 5. Project medical facilities will contribute to local medical infrastructure.
 6. The Project has provided to the USIJI a copy of the Environmental Impact Assessment (EIA) that was developed to support the project. The EIA has posted on the Overseas Private Investment Corporation's web page for the required 60-day period in which no third party comments were received. A copy of the EIA has been provided to the USIJI Technical Review Committee under separate cover.
 7. In terms of localized air quality the methanol plant is predicted not to represent a significant adverse effect on the adjacent area, due to the predicted pollutant concentrations being well within air quality criteria, the isolation of the site, the sparse population present and prevailing wind direction. Dust generation will be minimal once construction has ceased. In addition,

the large reduction of GHG associated with the extinguishing of the existing ground flare will yield a substantial positive global impact.

8. With regard to water quality, there will remain a risk of some form of surface water and marine water contamination through unexpected events such as failure of water treatment units, containment measures, and emergency situations. However, methanol has low acute toxicity to aquatic organisms. Application of good environmental management practices, maintenance of equipment and protective structures and training should help minimize the occurrence and significance of risk. A full time environmental engineer will be employed to implement best management practices and follow plant environmental procedures aimed at protecting the environment.
9. The consequences of accidental release of methanol to the ground are considered insignificant. Biodegradation is the major route of removal of methanol from soil. Several species of methylobacterium and methylomonas are capable of utilizing methanol as a sole carbon source.
10. Increased shipping will be expected to have a moderate overall net adverse effect in terms of risk of impacts associated with spills of substances such as oil, methanol and discharges of ballast/bilge water. Minor or major methanol spills are expected to have limited short term and long terms adverse environmental effects on account of the chemical properties of methanol which facilitate rapid dilution and biodegradation. The ships utilized in transportation.
11. It is predicted that there would be no adverse noise impact at Mongola village or at the property boundary. A minor adverse impact is likely to remain within the site from plant activity, in particular at the nearest accommodation blocks (these are expected to be moth-balled until the maintenance/shut down periods) and administration office to the methanol plant, after accounting for additional mitigation measures.
12. Due to the potential negative health effects of methanol exposure, all employees will be given awareness training.
13. Disposal of solid waste will be at approved facilities by qualified contractors or carriers, both during construction and throughout the operating life of the plant.
14. Small amounts of hazardous materials may be generated. They will be disposed of through licensed disposal services.

Based on the information contained in the EIA and the Operating and Maintenance procedures, the project is confident that the environmental impacts are negligible compared to the positive impacts of GHG emission reductions.

B. Development Impacts of the Project (see Appendix E for additional discussion)

1. Economic development: This project will positively impact economic development of the region. This project will provide resources for new materials, boosting the country's economy.
2. Both temporary and permanent jobs will be created during the construction and operation of the plant.
3. Technology Transfer - Capacity Building: This project will add momentum to developing clean independent plants in Equatorial Guinea.

C. *Efforts to Reduce Domestic Greenhouse Gas Emissions by U.S. Participants*

CMS

1. CMS Energy is involved in the following domestic utility projects that significantly decrease carbon emissions.
 - An older coal fired power plant at the Rouge Steel complex which is located in an urban area, has been replaced with a natural gas fired combined cycle facility. (Dearborn Industrial Generation)
 - Oil burners at a 1276 MW plant were replaced with low NO_x dual-fuel burners to allow combustion of up to 65% natural gas and provide reductions in nitrogen oxide emissions. (Consumers Energy's Karn 3&4 Plant)
 - Consumers Energy is a participant in the Natural Gas Star Program that implements technologies and practices to reduce methane emissions from natural gas operations.
 - The re-licensing of Consumers Energy hydro-electric generation facilities and the extension of the Palisades nuclear license provides the potential to displace fossil fueled generation.
2. CMS Energy has ownership interest in the following domestic power plants that have low carbon emissions.
 - Filer City, a 60 MW power plant that annually obtains approximately 5-10% of its heat input from wood versus coal.
 - MCV is the largest natural gas-fired combined-cycle facility in the U.S. at 1370 MW.
 - Various biomass-fueled plants in the U.S. that provide 155 MW.
 - Wind turbines that provide 102 MW.

Samedan

Samedan is involved in domestic exploration and production of oil and gas reserves both onshore and off shore, as such they take efforts in minimizing GHG emissions in the development of these properties. This includes the use of the following:

- Conversion of diesel fired engines to natural gas
- Installing Photovoltaic solar power in place of standard electric generation

Globex

Globex has no domestic projects or interests and therefore has no domestic GHG emissions.

D. *Other Information You May Wish the Panel to Consider*

- In 1980, Michigan enacted one of the toughest SO₂ emission limitation rules in the nation. As a result of this rule Consumers Energy facilities met or exceeded SO₂ emission limits prescribed in the Acid Rain requirements of the 1990 Clean Air Act Amendments 10 years before they were issued.
- Since 1980, SO₂ emissions have decreased by 72%.
- As a result of an increased reliance on low-sulfur Western coal, initiated by that 1980 State rule and enhanced by additional air initiatives, Consumers Energy's mercury emissions have also decreased with the mercury emissions rate currently at a level that is 66% less than pre-1980 emission rates.
- Consumers Energy has been an active participant in the State of Michigan's voluntary mercury pollution prevention initiative. As part of that program, focusing on reducing the use and consumption of elemental mercury, we have reduced our mercury inventory by 22% (648

pounds), from the 1996 inventory (2933 pounds). As a direct result of educational aspects of this program we have had zero spills of mercury,

- As a result of the Acid Rain provisions of the 1990 Clean Air Act Amendments, we have achieved a more than 40% reduction in our NOx emission rates to the atmosphere from a 1990 baseline. Plans are currently underway to further reduce emissions to a value that is about 65% of the 1990 levels.
- Consumers Energy has been an active participant in numerous air quality program initiatives. These include the popular and successful Ozone Action Days programs in Southeastern and Western Michigan as well as the ground-breaking the Lake Michigan Ozone Study and the Southeast Michigan Ozone Study.
- Three CMS Energy sites in Michigan have received the Governor's Clean Corporate Citizen Award: JR Whiting Plant, Filer City, and Parnall Complex.
- CMS began voluntary recycling in 1993, the company has saved about 150,000 cubic yards of landfill space.

Items recycled by CMS from 1993 through 1998:

<i>Antifreeze</i>	<i>136,000 gallons</i>
<i>Used Oil</i>	<i>1,400,000 gallons</i>
<i>Fuel (gas/diesel)</i>	<i>78,000 gallons</i>
<i>Batteries</i>	<i>165,000 pounds</i>
<i>Lighting (lamps)</i>	<i>165,000 pounds</i>
<i>Metals</i>	<i>9,500 tons</i>
<i>Office Paper</i>	<i>84,000 cubic yards</i>
<i>Cardboard</i>	<i>3,000 cubic yards</i>
<i>Wood products</i>	<i>33,000 + tons</i>

- Sixteen CMS electric generating sites have wildlife habitat program certified by the Wildlife Habitat Council (WHC). A special release program helped re-establish the threatened trumpeter swan to its native Michigan.
- Consumers Energy pioneered mass reforestation and fish stocking projects in Michigan
- CMS is committed to providing habitat for wildlife such as the American kestrel.
- CMS maintains strict standards for clean air, water and land. They help flowers such as the orange columbine and bluish-purple fringe gentian thrive in Michigan.
- CMS Energy is leading the way in waste reduction and pollution prevention among independent power producers. CMS operates wood-waste fueled plants in North Carolina and Michigan and is part owner of a facility in California.
- CMS Energy operates the largest independent power plant in Africa at El Jadida, Morocco, and Casablanca. Jorf Lasfar won two special environmental awards given to facilities that go beyond compliance to develop and implement a proactive environmental ethic at the plant.
- CMS uncovered and protected more than 20,000 relic artifacts along the Gas Atacama pipeline route in Argentina.

In addition to the documents and citations listed above, the applicants believe that the USIJI members should factor some important political considerations into their review process. Equatorial Guinea has never been featured prominently in the panoply of US foreign policy objectives in Africa. Consequently, there has never existed a robust and productive dialogue between the United States and Equatorial Guinea on global environmental issues, the international climate change regime, or the potential benefits of early action and joint efforts on greenhouse gas emissions reduction. As the domestic partners deliberated on the potential value and benefits of USIJI certification, and initiated discussions with US government agencies on the potential for certification of the project, it inspired the government to begin to consider these issues.

As a direct result of discussions with the partners and other stakeholders, and with the strong and effective encouragement of the US Ambassador to Equatorial Guinea, the government took the extraordinary and speedy decision to become a signatory to the UN Framework Convention on Climate Change (UNFCCC). That decision represents a significant milestone in the US government's foreign and environmental policy objectives, and stands as an important example of

the results that can be achieved when US government and industry work cooperatively to advance the national interest.

Certification of the project not only will encourage the government of Equatorial Guinea to conclude that there is value added to its decision to join the UNFCCC, it will also serve as model to encourage other nations in Africa to consider and pursue environmentally sound infrastructure projects and to participate in mechanisms such as USIJI and the CDM. A review of the USIJI's September 1999 report to the Secretariat of the UNFCCC reveals that outside of two projects in South Africa, no other projects have been certified in Africa as of that timeframe. Certification of the project could help to create an important synergy between the U.S. government's Africa initiative – which seeks to promote US trade and investment in the region – and its global environmental policy, and thereby generate similar interest and activity in other countries in the region.

V. General Provisions

A. Confidential Business Information

Please indicate if any of the project information is proprietary or confidential.

B. Monitoring and Verification

Please see Section III. C., and appendix F.

C. Withdrawal From USIJI

The parties understand the USIJI requirements in this area and will abide by them if withdrawal becomes necessary.

D. Annual Reports

Will be submitted in accordance with USIJI requirements.

E. Promotional Cooperation

The parties understand they may use the USIJI logo in their advertising and public relation activities. In turn, the parties agree to cooperate in efforts to publicize and promote the USIJI program.

VI. Required Certification

The following certification, signed by all responsible participants named in Section I, must appear as part of your proposal to the USIJI Evaluation Panel:

“We the undersigned have each reviewed this proposal as submitted and to the best of our knowledge and belief certify that all information provided therein is accurate and complete. Further, the undersigned acknowledge that they have read and understand the General Provisions of the Guidelines for a USIJI Project Proposal and agree to comply herewith.”

_____ Date

VII. Appendix A – Base Case Emission Estimates

Methodology

Examination of the schematic in this *Appendix A* (basecase installation is highlighted by crosshatching) shows the base case layout including the existing well field installation and the modified layout. The emission calculations will be performed in several separate calculations and then the net greenhouse gas emissions will be totaled.

Greenhouse gas emissions are predominantly from the combustion of natural gas used in the production of electricity and the flaring of the natural gas.

The calculation of emissions using the Ideal Gas Law; $PV=nRT$

Where: P = standard pressure in atmospheres
 V = volume of gas in cubic feet
 n = moles of the gas (Mass/molecular weight)
 R= Ideal Gas Constant (0.7302 ft³-atm/lb mole-°R)
 T=standard temperature in Rankin (491.67 °R)
 M=(mass in lbs.)
 E= Combustion Efficiency

Rearranging the formula to obtain the mass of the gas combustion products, we see:

$$M_{CO_2} = (PV * MW / RT) * E$$

Upstream of Methanol Plant - Offshore

Energy Production

Emissions associated with the offshore energy production were not included in this calculation because they remain unchanged in the modified case, that results in a zero net change in the emissions associated with energy needs for onshore processing.

Upstream of the Methanol Plant- Onshore

Energy Production

Emissions associated with the onshore energy production were not included in this calculation because they remain unchanged in the modified case, that results in a zero net change in the emissions associated with energy needs for onshore processing.

Ground Flare Emissions

A calculation of the mass of CO₂ equivalents is performed based on the combustion of natural gas in an 85% efficient ground flare. The ideal gas law is used to calculate the mass of the combustion products based on the volume of gas combusted and the flare efficiency.

Assumptions

- It is assumed that the natural gas is 100% methane. The actual chemical composition shows that the natural gas is 86% methane, 7% hydrocarbons and 7% CO₂. We assume that all of the hydrocarbons will be broken down into methane in the combustion process and that the CO₂ will remain unchanged.
- Based on the premise of mass balance, the mass of the gas combusted is equal to the mass of the products of combustion.
- The flare efficiency used is considered a best estimate value. Several expert sources were contacted for efficiency data including the Michigan Department of Environmental Quality - Air Quality Division and Geological Division. In addition a search of EPA's publications was made. No information was found.

- E= Flare Combustion Efficiency (85%)

$$M_{CO_2} = (PV * MW / RT) * E$$

$$= ((1 \text{ atm} * 30.67 \text{ billion ft}^3 * 44 \text{ lb CO}_2/\text{lb mole}) / (0.7302 \text{ ft}^3\text{-atm/lb mole-}^\circ\text{R} * 491.7^\circ\text{R})) * 0.85$$

$$= 3.2 \text{ billion lbs CO}_2/\text{year}$$

$$= 1.45 \text{ million metric tons CO}_2/\text{year}$$

$$M_{CH_4} = (PV * MW / RT) * E$$

$$= ((1 \text{ atm} * 30.67 \text{ billion ft}^3 * 16 \text{ lb CH}_4/\text{lb mole}) / (0.7302 \text{ ft}^3\text{-atm/lb mole-}^\circ\text{R} * 491.7^\circ\text{R})) * 0.15$$

$$= 0.21 \text{ billion lbs CH}_4/\text{year}$$

$$= 0.093 \text{ million metric tons CH}_4/\text{year}$$

Emissions

$$M_{CO_2 \text{ Equiv}} = M_{CO_2} + (M_{CH_4} * GWP)$$

$$= 1.45 \text{ Mt CO}_2 + (0.093 \text{ Mt CH}_4 * 21 \text{ GWP})$$

$$= 3.40 \text{ million metric tons CO}_2 \text{ equivalents/year}$$

Variations in Emissions

Because the downstream gas production and flaring process is a continuous steady-state process, the variation in greenhouse gas emissions over any 1-year period is considered minimal.

Uncertainties

Uncertainties in the calculation center around the value used for the flare efficiency. A reduction in the flare efficiency (75%-80%) would result in an increase in GHG emissions for the base case and a net increase in GHG reductions. A higher flare efficiency (90%), would result in a more conservative GHG calculation, as the GHG reductions would be lower, although an efficiency this high is considered very unlikely given the combustion conditions. The ground flare is no more than an 8" diameter pipe discharging into a pit. The ignition source is not continuous (ignited rag soaked in oil) and the oxygen concentration is most likely substandard given the pit situation. The efficiency value of 85% is considered conservative best estimate.

VIII. Appendix B – Modified Case Emission Estimate

Methodology

Examination of the schematic in *Appendix A* shows the modified case layout including the expanded wet gas well, associated energy and compression needs and the methanol plant. The emission calculations will be performed in several separate calculations and then the net greenhouse gas emissions will be totaled.

Greenhouse gas emissions are predominantly from the combustion of natural gas used in the process equipment for methanol production including a gas compressor turbine, gas turbine generators, reformer and auxiliary boilers. GHG emissions reductions are taken for the re-injection of the natural gas as opposed to flaring the excess produced.

The calculation of emissions using the Ideal Gas Law; $PV=nRT$

Where:

- P = standard pressure in atmospheres
- V = volume of gas in cubic feet
- n = moles of the gas (Mass/molecular weight)
- R= Ideal Gas Constant (0.7302 ft³-atm/lb mole-°R)
- T=standard temperature in Rankin (491.67 °R)
- M=(mass in lbs.)
- E= Combustion Efficiency

Rearranging the formula to obtain the mass of the gas combustion products, we see:

$$M_{CO_2} = (PV * MW / RT) * E$$

Upstream of the Methanol Plant - Offshore

Energy Production for the existing offshore facilities

These emissions associated with the offshore energy production are the same as the baseline case and therefore were not included in this calculation

Upstream of Methanol Plant - Onshore

Energy Production

These emissions associated with the onshore energy production are the same as the baseline case and therefore were not included in this calculation

Downstream (Methanol Plant)

Energy Production for Methanol

Based on the assumption that this methanol plant will offset methanol production currently in operation and the emissions associated with the methanol production would be the same. The emissions related to energy production were not included in this calculation.

Flare and Miscellaneous Equipment

However, given the lack of in-country natural gas infrastructure that other existing methanol plants may have. A new engineered flare will be used as a balancing system to maximize the process plant and methanol plant on-line availability. It was assumed that the total amount of gas flared that would not occur at an existing methanol plant would average 8% of the volume consumed by the methanol facility.

Assumptions

- It is assumed that the natural gas is 100% methane. The actual chemical composition shows that the natural gas is 86% methane, 7% hydrocarbons and 7% CO₂. We assume that all of the hydrocarbons will be broken down into methane in the combustion process and that the CO₂ will remain unchanged.

- Based on the premise of mass balance, the mass of the gas combusted is equal to the mass of the products of combustion.
- The flare efficiency used is considered a best estimate value. Several expert sources were contacted for efficiency data including the Michigan Department of Environmental Quality - Air Quality Division and Geological Division. In addition a search of EPA's publications was made. No information was found.
- E= Flare Combustion Efficiency (99%)

$$M_{CO_2} = (PV * MW / RT) * E$$

$$= ((1 \text{ atm} * 3.24 \text{ billion ft}^3 * 44 \text{ lb CO}_2/\text{lb mole}) / (0.7302 \text{ ft}^3\text{-atm/lb mole-}^\circ\text{R} * 491.7^\circ\text{R})) * 0.99$$

$$= .39 \text{ billion lbs CO}_2/\text{year}$$

$$= .179 \text{ million metric tons CO}_2/\text{year}$$

$$M_{CH_4} = (PV * MW / RT) * E$$

$$= ((1 \text{ atm} * 3.24 \text{ billion ft}^3 * 16 \text{ lb CH}_4/\text{lb mole}) / (0.7302 \text{ ft}^3\text{-atm/lb mole-}^\circ\text{R} * 491.7^\circ\text{R})) * 0.01$$

$$= 0.144 \text{ billion lbs CH}_4/\text{year}$$

$$= 656 \text{ metric tons CH}_4/\text{year}$$

Emissions

$$M_{CO_2 \text{ Equiv}} = M_{CO_2} + (M_{CH_4} * GWP)$$

$$= 0.179 \text{ million t CO}_2 + (656 \text{ t CH}_4 * 21 \text{ GWP})$$

$$= 0.193 \text{ million t CO}_2 \text{ equivalents/year}$$

Methanol Production

The methanol produced by the methanol facility will be sold as chemical feedstock, solvents, fuel additives and for building materials. The methanol produced by the facility is expected to replace methanol produced at less economic methanol production facilities, therefore there will be no net increase in greenhouse gas emissions from this process.

Miscellaneous emissions source from the methanol process including refining columns, storage tanks and venting systems will controlled using scrubbing systems, intermittent flaring, closed -vent systems and floating roofs. Any emissions that would occur would be similar to emissions produced by the methanol plant this plant will replace.

Re-injected Gas

The basic assumption is that the re-injected gas will be stored and consumed by the methanol plant in the future, in lieu of flaring gas at the time of production. The calculation of the mass of CO₂ equivalents is performed based on the combustion of natural gas in an 85% efficient ground flare. The ideal gas law is used to calculate the mass of the combustion products based on the volume of gas combusted and the flare efficiency.

Assumptions

- It is assumed that the natural gas is 100% methane. The actual chemical composition shows that the natural gas is 86% methane, 7% hydrocarbons and 7% CO₂. We assume that all of the hydrocarbons will be broken down into methane in the combustion process and that the CO₂ will remain unchanged.
- Based on the premise of mass balance, the mass of the gas combusted is equal to the mass of the products of combustion.

- The flare efficiency used is considered a best estimate value. Several expert sources were contacted for efficiency data including the Michigan Department of Environmental Quality - Air Quality Division and Geological Division. In addition a search of EPA's publications was made. No information was found.
- E= Flare Combustion Efficiency (85%)

$$M_{CO_2} = (PV * MW / RT) * E$$

$$= ((1 \text{ atm} * 36.5 \text{ billion ft}^3 * 44 \text{ lb CO}_2/\text{lb mole}) / (0.7302 \text{ ft}^3\text{-atm/lb mole-}^\circ\text{R} * 491.7^\circ\text{R})) * 0.85$$

$$= -3.8 \text{ billion lbs CO}_2/\text{year}$$

$$= -1.72 \text{ million metric tons CO}_2/\text{year}$$

$$M_{CH_4} = (PV * MW / RT) * E$$

$$= ((1 \text{ atm} * 36.5 \text{ billion ft}^3 * 16 \text{ lb CH}_4/\text{lb mole}) / (0.7302 \text{ ft}^3\text{-atm/lb mole-}^\circ\text{R} * 491.7^\circ\text{R})) * 0.15$$

$$= 0.24 \text{ billion lbs CH}_4/\text{year}$$

$$= -0.11 \text{ million metric tons CH}_4/\text{year}$$

Emissions

$$M_{CO_2 \text{ Equiv}} = M_{CO_2} + (M_{CH_4} * GWP)$$

$$= 1.72 \text{ Mt CO}_2 + (0.11 \text{ Mt CH}_4 * 21 \text{ GWP})$$

$$= 4.05 \text{ million metric tons CO}_2 \text{ equivalents/year}$$

Energy Production and Compression for the expansion of the offshore facilities

A calculation of the mass of CO₂ equivalents related to the production of energy and compression of natural gas is performed based on the combustion of natural gas used in gas turbine electrical generators and compressor engines. The ideal gas law is used to calculate the mass of the combustion products based on the volume of gas combusted.

Assumptions

- It is assumed that the natural gas is 100% methane. The actual chemical composition shows that the natural gas is 86% methane, 7% hydrocarbons and 7% CO₂.
- AP-42, Compilation of Air Pollution Emission Factors demonstrates that natural gas combustion efficiency is 99% complete.
- E= Flare Combustion Efficiency (99%)

$$M_{CO_2} = (PV * MW / RT) * E$$

$$= ((1 \text{ atm} * 730 \text{ million ft}^3 * 44 \text{ lb CO}_2/\text{lb mole}) / (0.7302 \text{ ft}^3\text{-atm/lb mole-}^\circ\text{R} * 491.7^\circ\text{R})) * .99$$

$$= 88.5 \text{ million lbs CO}_2/\text{year}$$

$$= 40,257 \text{ metric tons CO}_2/\text{year}$$

$$M_{CH_4} = (PV * MW / RT) * E$$

$$= ((1 \text{ atm} * 730 \text{ million ft}^3 * 16 \text{ lb CH}_4/\text{lb mole}) / (0.7302 \text{ ft}^3\text{-atm/lb mole-}^\circ\text{R} * 491.7^\circ\text{R})) * 0.01$$

$$= .325 \text{ million lbs CH}_4/\text{year}$$

$$= 147.9 \text{ metric tons CH}_4/\text{year}$$

$$M_{\text{CO}_2 \text{ Equiv}} = M_{\text{CO}_2} + (M_{\text{CH}_4} * \text{GWP})$$

$$= 40,257 \text{ t CO}_2 + (147.9 \text{ t CH}_4 * 21 \text{ GWP})$$

$$= .0433 \text{ million metric tons CO}_2 \text{ equivalents/year}$$

Variations in emissions

Because the downstream gas production and flaring process is a continuous steady-state process, the variation in greenhouse gas emissions over any 1-year period is considered minimal. Energy production and compression needs are expected to remain steady. Flare use for plant balancing is also expected to remain steady. Flare use for emergency situations will occur and is not represented in these emission estimates. Emergency flare use will be quantified using flow measurement devices on an annual basis to assure GHG reductions are properly credited.

Uncertainties

Uncertainties in the calculation center around the value used for the flare efficiency. A reduction in the flare efficiency (75%-80%) would result in an increase in GHG emissions for the base case and a net increase in GHG reductions. A higher flare efficiency (90%), would result in a more conservative GHG calculation, as the GHG reductions would be lower, although an efficiency this high is considered very unlikely given the combustion conditions. The ground flare is no more than an 8" diameter pipe discharging into a pit. The ignition source is not continuous (ignited rag soaked in oil) and the oxygen concentration is most likely substandard given the pit situation. The efficiency value of 85% is considered conservative best estimate.

IX. Appendix C - Acceptance Letter from the Host Country

X. Appendix D – Documents Related to Equatorial Guinea’s Accession to UNFCCC

XI. APPENDIX E – ADDITIONAL DISCUSSION OF DEVELOPMENT IMPACTS

XII. APPENDIX F – DRAFT MONITORING AND VERIFICATION PROPOSAL

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HOW MUCH SUSTAINABLE DEVELOPMENT CAN WE EXPECT FROM THE CLEAN DEVELOPMENT MECHANISM?

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Note: The opinions expressed herein are those of the authors,
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ADVANCING SUSTAINABLE DEVELOPMENT GOALS THROUGH THE CDM

The Clean Development Mechanism (CDM) has two goals. It is designed to lower the overall cost of reducing greenhouse gas (GHG) emissions released to the atmosphere, while also supporting sustainable development initiatives within developing countries. These twin objectives reflect the need to coordinate action between differently positioned developed and developing countries, which nevertheless share a common aim of reducing the buildup of GHGs.

The basic principle of the CDM is simple. It allows developed countries to invest in low-cost abatement opportunities in developing countries and receive credit for the resulting emissions reductions. Developed countries can then apply this credit against their 2008–2012 targets, reducing the cutbacks that would have to be made within their borders. Because many abatement opportunities are less expensive in developing countries, this increases the economic efficiency of achieving initial GHG emissions reductions. Because GHG emissions contribute equally to climate change irrespective of where they occur, the impact on the global environment is the same.

While this abatement mechanism is cheaper for developed countries, developing countries benefit too, not just from the increased investment flows, but also from the requirement that investments both offset GHG emissions and advance sustainable development goals. Thus, the CDM allows developing countries to participate at a time when other development priorities limit funding for GHG reduction activities and encourages them to do so by promising that these development priorities are addressed as part of the solution. More generally, the CDM's objective of advancing development initiatives in developing countries recognizes that only through long-term development will all countries be able to play a role in climate protection.



CDM Design and Operation Policy Issues
Initial Draft
January 12, 1998

General

- What is the scope of the Clean Development Mechanism?
 - Individual projects only
 - Pooled projects
 - Targets for selected sectors
 - Project-specific reductions driven by policies and measures
- What activities should be included in the CDM?
 - Comprehensive: all project categories (reduction and sequestration) and all gases
 - Comprehensive, however, LUCF activities adhere to definitions in Article 3 of Kyoto Protocol
 - Determination of inclusion of project categories by host country
 - Staged approach to project inclusion (e.g., begin with categories of greatest certainty)
 - Are there any activities that should not be included in the CDM?
- Is there a linkage between certified emission reductions resulting from CDM and reductions subject to early-crediting?
 - Early crediting only for domestic actions
 - Early crediting can be for either domestic and international actions (with provisions to ensure that double counting of credits does not occur)
 - No linkage between CDM and early crediting
- Should there be any requirements to participate in CDM?
 - Submit national communications
 - Require national plan for total emission reductions
 - Schedule for adopting a target

Baselines

- How should "baselines" be established to determine additionality and certified emission reductions?
 - Bottom-up project baseline (e.g., project-by-project)
 - Top-down baseline (e.g., benchmark, performance standard, whole-sector, technology standard)
 - Allow different options for different sectors and situations

- How should top-down baselines be designed?
 - > Based on historical data or projections?
 - > Based on total existing capacity or new capacity additions (marginal capacity)?
 - > Sector or sub-sector?
 - > Country regional or global?
- What are the key characteristics of any baseline?
 - > Static or dynamic?
 - > Straight line or declining slope?
 - > Rate-based or absolute?

Additionality ?

- What forms of additionality should be included in the CDM?
 - > Programmatic
 - > Financial
 - > Emissions

Accounting

- How should certified emission reductions (CERs) be measured and credited?
 - > Absolute amount of GHG emission reductions (in "tonnes of CO₂ equivalent" bundled to appropriate project size - calculate using GWPs)
 - > Rate-based approach (e.g., C/kWh)
 - > Full credit for all CERs from all project activities
 - > Discounted credits for CERs for certain activities (e.g., address leakage, baseline uncertainty, externalities)
 - > Units fungible with emissions trading and JI units
- How should the share of proceeds and use of adaptation funds be determined?
 - > Market value of the emissions reductions achieved
 - > What percentage share is acceptable?
 - > How should use of adaptation funds be determined?
 - > How should "particularly vulnerable" countries be identified, and with what criteria?
 - > Who should disburse administer adaptation funds?

Process

- Should the CDM have a "pre-certification" or "registration" stage?
 - > Pre-certification of project activity to ensure project is voluntary, meets sustainable goals, additionality, but actual emissions reductions certified only after they occur
 - > Pre-certification of claimed certified emission reductions

- No pre-certification stage
- What should be the relationship between projects under AJJ and CDM?
 - AJJ projects grandfathered into CDM as is
 - AJJ projects grandfathered into CDM with new baseline assessment
 - AJJ projects not incorporated into CDM
- What should the sequence be for certification and verification?
 - Operational entity certifies the CERs and then a "body" verifies these reductions
 - Operational entity verifies CERs then UNFCCC (or other body) certifies reductions

Compliance

- How should compliance issues be addressed in relation to CDM?
 - Institutionally built into the operation/design at the domestic and international levels
 - Compliance with broader obligations under the Protocol or Convention
 - Compliance with terms of Article 12 of the Protocol (addressed by Executive Board, UNFCCC)
 - Private sector compliance liability (e.g., contracts between private sector investors)
- How should "part of" be defined in the CDM?
 - Qualitative but no numerical "cap" ("part of" totality of Annex I Party reductions from the flexibility mechanisms and domestic actions)
 - Numerical "cap" for offsets achieved through all three mechanisms
 - Numerical cap only for CDM
 - No qualitative or quantitative caps imposed on the CDM

Sustainability and Equity:

- How should sustainable development component of project activities be determined?
 - By host country
 - Formulaic approach
 - Internationally agreed upon standards
- What policy mechanisms are available to address equity concerns under the CDM?
 - Adjusted baselines
 - Discounting credits
 - Special fund to ensure geographical distribution of projects
 - Project Bundling, Regional Projects, Clearing house function
 - No consideration for equity - CDM operates as a market-based mechanism

Whole Sector CDM

Concept

The Clean Development Mechanism (CDM) of the Kyoto Protocol allows for emission reduction credits for projects in non-Annex B countries. While CDM credits are expected to be project-based, the term 'project' is not defined. Under "whole sector" CDM, credits would be generated from GHG emissions reductions for an entire sector (e.g., the electricity sector) relative to a preestablished baseline. Individual projects within this sector would not be credited.

Qualifying Under the CDM

Credits to whole-sector emission reductions would have to meet the same conditions as all other CDM projects:

- Participation would be voluntary;
- The credited actions must assist the non-Annex I Party in achieving sustainable development objectives;
- The credited actions must result in reductions or removals that are real, measurable and long-term;
- The credited actions must result in emission reductions or removals that are additional to any that would occur in the absence of the certified project activity; and
- A share of the proceeds from the sectoral (based on reductions) would be used to cover administrative and adaptation expenses.

Process

Setting the Baseline:

An emissions baseline would have to be established for the identified sector for some future period.

- The first step would be to estimate the projected emissions for the sector in a business as usual scenario.
- The BAU projections could be based on absolute net emissions from a given sector over a period of time or a generic measure of emissions intensity (e.g., tonnes of carbon per megawatt hours of electricity generated) over a period of time.
- The baseline could be
 - the BAU projection itself (where any emissions below BAU would be credited),
 - or a designated amount under the BAU projection (where credits would be attainable only for reductions that are a given percent below what would have happened anyway).
- The baseline could be set for each budget period or for other designated periods.
- This baseline might be determined by an internationally agreed upon formula or by a country-specific negotiating process.

Awarding Credits:

Credits could be awarded to the host country government, ministry, or designated entity within the host country (e.g., an association or conglomeration). Credits would be awarded if emissions reductions for a whole sector were below a pre-established baseline for a given period.

Credits would be certified only after the emissions reductions had been achieved and verified. Individual projects within a whole-sector baseline would be ineligible for additional credits through other CDM processes. If emissions exceed the pre-established sectoral baseline, the participating country would not be penalized.

Implications Assessment

Benefits of whole-sector credits over credits to individual projects:

- Allows for the inclusion of amorphous emission reductions such as those resulting from domestic policies otherwise be difficult to quantify and reward.
- Total reduction potential could be greater since the entire sector is being addressed as opposed to attempting to affect total sector emissions through crediting individual projects.
- Sectoral crediting could reduce some of the additionality concerns associated with crediting individual projects.
- Could eliminate some types of leakage problems associated with individual projects (e.g., forestry projects where logging on one plot is displaced to another).
- Whole-sector CDM would be a largely risk-free way for a country to obtain many of the benefits of full participation in emissions trading, without the risks associated with accepting a binding emissions target.
- Whole-sector reductions may better advance "meaningful participation" from developing countries beyond project-by-project reductions.
- Could have lower transaction costs since only one baseline needs to be established and only one 'project' emissions needs to be calculated, certified, and verified. No need to verify and certify individual projects.

Drawbacks of whole-sector credits over credits to individual projects:

- No market until whole-sector emissions have been measured and verified. The time periods of measurement and verification would depend on the level of effort needed to measure emissions for a whole sector and the available data. Longer intervals between credit awards could make capital recovery for efficiency investments more difficult.
- Could substantially reduce the incentive to accept a binding target, especially if the sector baselines were comparable to (or higher than) the levels that would be considered acceptable binding targets.
- Most projections are extremely uncertain, often dependent on factors that are difficult to predict (e.g. economic conditions) and are therefore more likely to be influenced by political posturing.

- Can create distortions by shifting activities from a capped sector (e.g., electricity) to an uncapped one (e.g., industry self generation).
- Total incentive for private investment may be diluted because credits would not be directly allocated to individual projects, and individual private investors would have little or no control over whether the country meets its whole-sector target.
- All developing countries may not have the data and capacity to develop these targets so some may be advantaged over others.
- Developing countries may perceive this as a back-door target.

Ivan

338-9028

Example: Whole-Sector Baseline for Electricity Generation in China

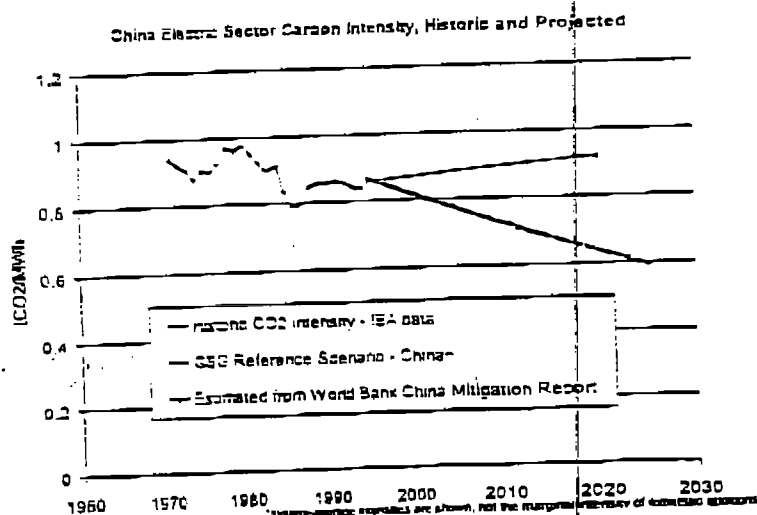
The following is a step-by-step description of how whole sector CDM would generate credits. The example sector used is the electricity sector in China.

Step 1: Choose relevant sector (Host country and body designated by the Executive Board)

China and a body designated by the Executive Board will approve a sector for Whole-sector CDM. Not every sector will be conducive to this approach, so the approved body would evaluate the proposal based on available data to create a baseline, capacity to gather data for measurement within project years, and the benefits of this approach over other approaches for this sector.

Step 2: Develop a baseline (Host country and body designated by the Executive Board)

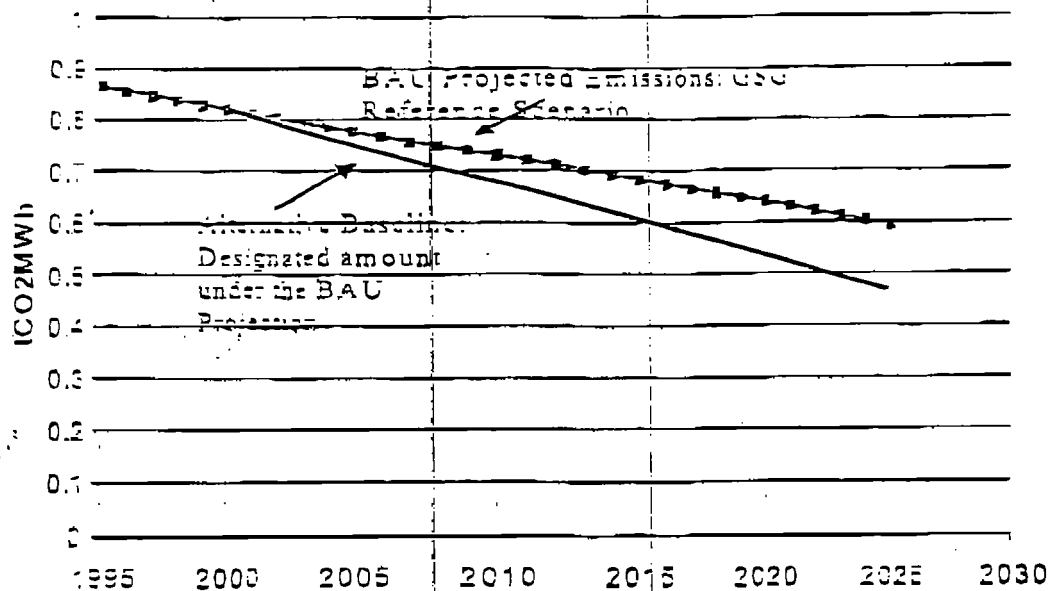
The first step in developing a baseline for the whole sector is to estimate projected emissions (either absolute or an emissions rate) for the given sector in a BAU scenario. Projections can often vary widely as shown in the example below of the projected efficiency rates (CO₂/MWh) for the Chinese electricity sector.



In this example, the Global Scenario Group (GSG) Reference scenario (based largely on IPCC 92a with some added technical detail) shows the Chinese electricity sector becoming more efficient and the World Bank Mitigation Report estimates that the Chinese electricity sector will become less efficient.

The baseline would either be the BAU projection itself, or a designated amount under the projection (see figure below). The baseline would be either developed through a set formula for that sector or through a negotiating process between the China and designated body. The baseline would need to be set prior to the period for which credits would be considered. In this example, the BAU projection and the baseline are rate based, however they could be based on absolute emissions.

In the example below, the baseline is based upon the BAU Projections from the GSG Reference Scenario for the Chinese electricity sector. The BAU projection is the upper line, however the baseline to which reductions would be compared could be either line. Actual baselines would need to be revisited and updated periodically.



Step 3: Determine method for calculating actual emissions from the whole sector.

Many developing countries may never have estimated emissions from an entire sector. Methodologies can be standardized across all developing countries or may be based upon IPCC guidelines for developed countries. The methodology would determine the boundary of the sector, the required data (including the source), coefficients and factors, time period and other information relevant to creating a sector emissions estimate. This methodology would need to be agreed upon before the first eligible year. A methodology for the Chinese electricity sector could be:

Boundary: On-Grid Electricity Production (no industrial or residential production)
 Time Period: First budget period
 Required Data: Fuel input by fuel type (coal must be designated by type of coal)
 Factors: IPCC carbon factors for each type of fuel
 Equation: $\text{Total Emissions} = (\text{Fuel Input}_1 * \text{C factor}_1) + (\text{Fuel Input}_2 * \text{C factor}_2) + (\text{Fuel Input}_3 * \text{C factor}_3)$

Step 4: Begin Emission Reduction Policies and Projects (Host country and Private Sector)

China would be responsible for creating incentives for emissions reductions. Incentives could be country-wide policies, incentives for regional policies, incentives for private investment etc. The policies themselves, GHG reduction projects or other measures taken to reduce emissions within the given sector would not be individually evaluated.

Step 5: Emission Monitoring and Reporting (Host country)

Monitoring refers to the measurement of GHG reductions/sequestration and other related socio-economic and environmental effects of the sector. Monitoring does not involve the actual calculation or certification of GHG reductions nor does it involve comparisons with baseline measurements.

The Chinese government or designated ministry would monitor the electricity sector performance in accordance with guidelines set forth in step 3. Monitoring methods for GHG emissions for the China electricity sector could include engineering methods, statistical sampling (including multivariate statistical models), end-use metering, short-term monitoring and integrative methods.

The Chinese government or designated ministry would monitor socioeconomic and sustainability performance of the projects within the sector in accordance with guidelines set forth by the COP/MOP but based on objectives designated by China.

Step 6: Emissions Reporting (Host country)

At the end of the time interval set in Step 3, China will compare the actual emissions for the sector for the given period to the whole-sector baseline set forth at the beginning of the project. China will incorporate this information onto a standard reporting format that includes the environmental, social and economic status of the sector. There are two options for emissions reporting:

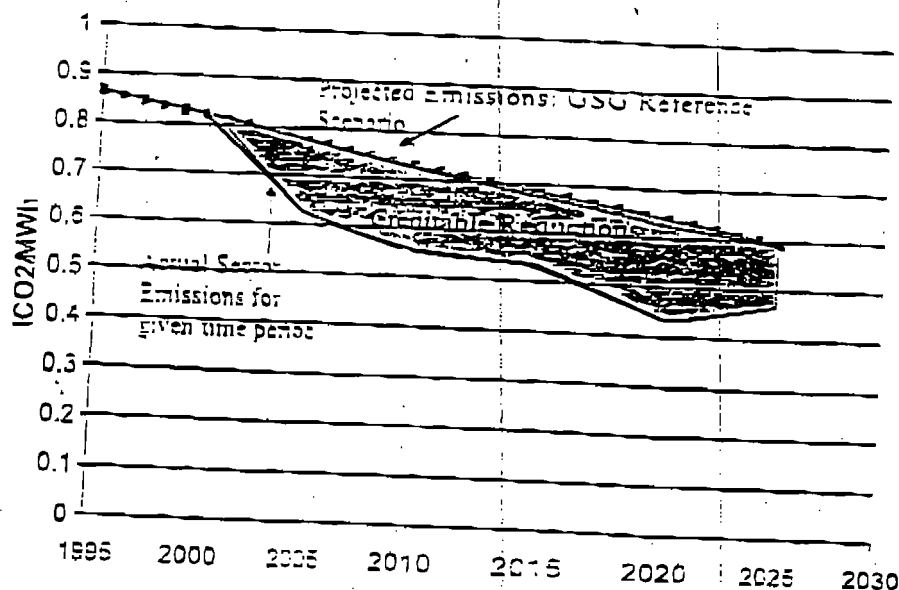
- (1) The Chinese government or designated ministry will report actual emissions to the [CDM, Operational Entity, third party verification] in accordance to the standard methodologies set forth in step 3. The benefit of this approach is that it incurs small transaction costs; however, confidence in the report may decrease since the operators have an incentive to inflate emission reduction estimates.
- (2) A third party [auditor] is hired by the Chinese government to check the operators monitoring data and to complete the report to the [CDM, Operational Entity, etc.]. The benefit of this approach is that gaming is less likely to occur, however, transaction costs increase as you include a third party.

Step 7: Certification (Operational Entity)

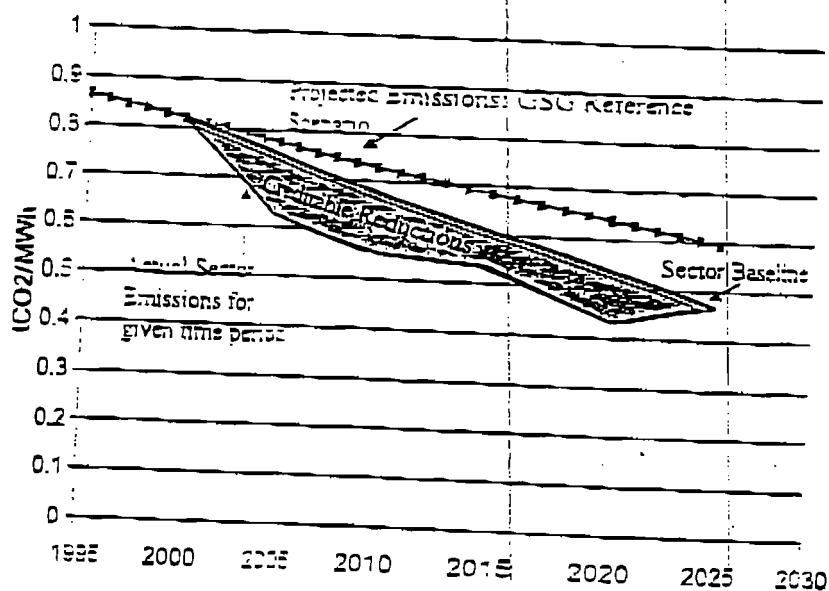
The calculation of project GHG reductions is conducted at this stage and would include GHG reductions, non-GHG impacts, determination of proper project performance baselines against the stated reference scenario, estimation of project leakage, etc.

The Operational Entity would review the reports submitted by the project operator/developer (which state the results of measuring, monitoring, and evaluating the project) and compare the actual emissions to the baseline. Actual credits would be awarded to reductions that fall under the baseline. As illustrated below, the baseline could be either the BAU projection itself, or a given level under the BAU projections.

Option 1: Provide Credits to Any Reductions Under BAU Projection



Option 2: Set Sector Baseline Under Projected Emissions



Step 8: Audit and Verify Emission Reductions (Third Party Auditor)

Verification of whole sector emissions would occur in a similar fashion to other CDM systems. A third party auditor would review the Chinese electricity data for the whole sector and verify that the sector emissions are the same as are reported in Step 6. An operational entity would report the verified emissions to the COP/MOP.

Draft: Do not Cite or Quote**ATTACHMENT:****Issues Associated with Creating Effective Benchmarks for the CDM****February 10, 1999*****Background***

Project-level greenhouse gas (GHG) emissions reductions have historically been evaluated using project-by-project baselines. Under this approach, the project developer evaluates what would have happened without the project and then estimates resulting emissions from this project. The difference between these two numbers is the net GHG reductions or removal from the project. Experience with US IJI has indicated that this process is extremely time intensive and can be quite subjective. It is difficult to estimate what would have happened in the absence of the project and assumptions made can be manipulated by the parties involved. Establishing a more straightforward method to determining additionality would lower transaction costs and streamline the crediting process.

Benchmark Concept:

Benchmarks can be used to determine certified emission reductions resulting from projects within the Clean Development Mechanism (CDM). The purpose of benchmarks, rather than project specific counter-factual baselines is to lower transaction costs and reduce subjectivity. Any project that is more efficient than the benchmark will be considered additional. Certified emission reductions (CERs) can be determined based on the difference between the benchmark and the project performance.

Benchmark Development:

Once guidelines are established, developing the benchmark could be quite straightforward. Agreeing upon the guidelines, however, may be a difficult process. There are few clear answers and most decisions will entail a trade-off between competing goals. EPA has evaluated the options theoretically and by using real data for selected developing countries. This analysis can help frame the trade-offs and the implications of different choices. Additional analysis is needed to choose the appropriate method that will help the U.S. meet its environmental and economic priorities within the CDM.

The main characteristics of an effective CDM benchmark will be:

- High Environmental Integrity. A benchmark will have high environmental integrity if it allows minimal non-additional credits.
- Low Transaction Costs. Creating a benchmark will incur some costs that can be added to the overall transaction costs of the CDM. The fewer permutations needed, the lower the cost of the benchmark system. In the following graphs, 'high' means that the option ranks well for low transaction costs (i.e., has relatively low transaction costs).
- High Participation. High participation in CDM will allow more tradeable credits and therefore reduce the overall cost of compliance with the Kyoto protocol.
- High Investor Certainty. Theoretically, CDM credits will provide incentives to reduce emissions. Prior to making an investment, the investor will want to increase his or her certainty of the amount of credits that will eventually be awarded.
- Incorporates New Technologies and Trends. New technologies and trends may change our estimate of what would have occurred in the absence of CDM credits.

The following paper outlines some of the choices and the associated trade-offs among the above goals.

Draft: Do not Cite or Quote***Issues and Trade-offs*****Global versus Regional Benchmark**

More regionally-specific benchmarks may lead to higher accuracy, but also higher transaction costs. Resources and situations vary by country and thus one benchmark may not fit all countries. Equity issues between countries may also be a consideration.

Choices:

- *Global benchmarks:* Lower transaction costs and perhaps the appearance of greater equity among countries. Lower accuracy of benchmark for most countries.
- *Regional/national/local benchmarks:* higher transaction costs, but higher accuracy. May appear inequitable for some sectors.
- *Vary by sector:* Adjust the regional specificity according to the individual sector's situation. Regional disaggregation should be balanced between the transaction costs and the level of accuracy. (Equity?)

	Global Benchmarks	Country-specific Benchmarks
Environmental Integrity	Low	High
High Participation	No Impact	No Impact
Low cost to create benchmark	High	Low
Investor Certainty	No Impact	No Impact
Incorporating New Technologies or Trends	No Impact	No Impact

Average versus better-than-average benchmark

A historical 'average' benchmark would allow any project that has better than average carbon intensity to qualify for CDM credits. By definition, this would allow half of the existing production in any given sector to qualify as additional. A better-than-average benchmark risks being so stringent that few projects can qualify.

Choices:

- *Average:* A benchmark based on an average of the activity data, by definition, will credit half of the capacity within that sector without any changes in behavior. This choice is likely to allow a significant amount of non-additional credits to be awarded.
- *Better-than-average:* A better-than-average benchmark sets a higher standard and limits the amount of non-additional credits that are awarded. It does run the risk of not allowing some valid reductions from being credited. Better-than-average choices include:
 - Top 25 percentile of new or existing capacity.
 - Top 10 percentile of new or existing capacity.
 - Most efficient new capacity addition
 - Best Available Technology/Practice (the most carbon efficient alternative available to that situation regardless of price)

The magnitude of trade-offs between these choices will depend on how each sector is aggregated. For example, in the United States electricity sector, if all types of generation are included, the lowest 25th percentile of GHG emissions is zero. On the other hand, if you use a fossil-only benchmark, veering into lower percentiles is likely to yield a more appropriate benchmark.

THE CLEAN DEVELOPMENT MECHANISM

At Kyoto, industrialized and developing nations came together to formulate an innovative, market-based approach to promoting sustainable development and providing cost-effective reductions of greenhouse gas emissions. The Clean Development Mechanism (CDM) is a win-win proposition in which industrialized countries or their companies could earn emissions credits while developing countries acquire technology and capital and earn emission credits that could be banked or sold.

How CDM Could Work

The CDM might work as follows: a company from an industrialized country could help build a highly efficient plant in a developing country rather than a less efficient plant previously planned. This would result in emissions reductions below what would have been the case without the project investment. Those reductions would be certified as credits and the developing nation and investing company would then determine how to share the credits. The developing country could acquire technology and capital investment as well as a share of credits it could sell or bank. The company could acquire a share of credits it could use to meet its emissions reduction commitments at home.

Benefits of the CDM

- ***Promotes Sustainable Development.*** The CDM will assist in achieving sustainable development by providing an incentive for investments in developing countries, helping those countries get on a path toward cleaner energy and economic growth.
- ***Encourages Meeting Environmental Goals.*** The CDM, in combination with emissions trading and joint implementation, will allow developed countries to secure the most cost-effective emissions reductions wherever they may be found.
- ***Spurs Technology Investment.*** The CDM promotes the diffusion of climate-friendly technologies and creates a worldwide market for them.
- ***Helps Meet the Costs of Adaptation.*** Finally, the CDM will aid those countries that are most vulnerable to climate change since, under the Protocol, a "share of the proceeds" from qualifying projects is to be used to assist those countries in meeting the costs of adaptation.

Next Steps

The U.S. is committed to working with the international community to develop operational rules as quickly as possible, especially in view of the Protocol provisions allowing CDM activities to begin as early as 2000. The Parties need to work through a number of issues relating to how the CDM will function, including determining rules for baselines, verification, institutional structures and allocation of project proceeds. Work on these issues will begin at Buenos Aires and should be guided by the following key principles:

- The CDM should assist developing countries in achieving sustainable development;
- The CDM should be a flexible, market-based mechanism that ensures cost-effective reductions through public and private sector investment in clean energy and carbon sequestration projects;
- The CDM should help ensure compliance with targets and be based on principles of efficiency, transparency and accountability; and
- Wherever possible, the CDM should use existing institutions to streamline the process.

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The Děčín Project: Czech Republic

8 pss.

The Děčín Project

CZECH REPUBLIC

A COOPERATIVE

INVESTMENT IN

THE GLOBAL

ENVIRONMENT



Department of Energy
Washington, DC 20585

February 9, 1999

TO: DISTRIBUTION

FROM: Mark Mazur

SUBJECT: CDM Papers for Wednesday, February 10 Meeting

Attached you will find a redraft of DOE's example paper that will be discussed at David Sandilow's meeting on Wednesday, February 10.



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DOE DRAFT – Do Not Cite or Quote 02/09/99

Example of Step-by-step Process for CDM Power Plan Project in China

This paper provides an example of how a project would go forward under CDM using one benchmarking approach to calculate certified emissions reductions (CERs) generated from a project. We provide only the CDM-related issues as this is the only variable in a potential CDM project. Appendix I contains a list of issues that have been identified for further consideration. Appendix II contains an example of calculations to establish the range of baselines that might be chosen as benchmarks, which would then lead to different values for emissions additionality.

Step I: Company Develops Project

- **Description of a potentially real Project:**
A 800 megawatt IGCC coal-fired power plant is being planned in Shandong Province in China. It will be partially financed by a U.S. company, say Southern Company, and owned and operated by the Shandong International Power Company (SIPC), which is the local planning commission that plans to use the electricity generated from the project for Shandong's electric grid. Approval for the project must come from China's State Power Corporation (who oversees power plants and grids for China) and China's State Development Planning Commission (who approves projects in excess of \$30 million). Southern Company and SIPC expect that the carbon emissions from this plant per megawatt hour (MWh) will be lower than the carbon emissions associated with the approved benchmark for power-plant projects in China.
- **Provide Calculations of Project's Projected Emissions:**
The project developers (Southern Company and SIPC) estimate emissions based upon the plant design, expected operating parameters, and analysis of the carbon content of the intended fuel source to be 417 pounds (lbs) of carbon per MWh of output. The plant's life expectancy is 40 years. Given that the developers expect the plant to be baseload with a 90 percent availability factor, annual generation from the plant is projected to be:

$$800 \text{ MW} (8760 \text{ Hr/Yr}) (0.90) = 6.3 \text{ million MWh}$$

$$\text{Annual carbon emissions: } 417 \text{ lbs} \times 6.3 \text{ million MWh} = 2627 \text{ million lbs or } 1.1941 \text{ million metric tons of carbon (MMT) per year}$$
- **Determine "Emissions Additionality"**
The CERs generated from a project will vary considerably depending upon the exact specifications of the baseline used to determine the benchmark (i.e., average or better than average of last 5 units, last 5 years, coal-fired plants only, all plants in last 5 years). Thus, benchmarks could vary significantly depending on country/regional circumstances. See Appendix 2.

The project developers collect information from the China's State Power Corporation to estimate the range of possible benchmarks. Based upon Executive Board guidelines for power plants of this project's type and size range, the rate of emissions from all power plants built in the past 5 years will be used to establish baseline conditions.

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The appropriate benchmark would be 504 lbs of carbon per MWh of output. The expected number of CERs generated, therefore, would be:

$[(504 \text{ lbs/MWh}) - (417 \text{ lbs/MWh})] \times 6.3 \text{ million MWh} = 548 \text{ million lbs or } 0.249 \text{ million tons of carbon per year.}$

Assuming a market price of \$20/CER, the value of the expected CERs generated per year is estimated to be worth \$5.48 million.

- Southern Company negotiates with Shandong International Power Corporation to determine division of CERs. In this case, Shandong agrees to keep 25 percent of the CERs generated after 2 % is collected for "proceeds." Regal Power will keep 75 percent of the CERs generated after payment of "proceeds."

Step II: Submit to Host Government for Approval

- The project developers submit the project for approval to China's designated approving authority, the State Development Planning Commission (SDPC). The SDPC has established a set of guidelines that must be met before it grants its approval, including consideration of how this project meets China's sustainable needs and objectives.
- The Chinese Government approves the project. Such approval implies that the project is consistent with China's sustainable development needs and objectives.

Step III: Submit to Operational Entity for Registration:

- The project developers provide a letter from China's SDPC to the Operational Entity that indicates China's approval of the project. China's approval implies "voluntary participation by both Parties," a requirement of Article 12.5a of the Kyoto Protocol
- The project developers provide calculations from Step I to demonstrate that the project provides "real, measurable, and long-term benefits" and that the savings in emissions are "additional."

Step IV: Emissions Monitoring, and Reporting:

- The project developers use monitors to ascertain CO2 flows from the project on a real-time basis, consistent with guidelines set forth by the COP/MOP.
- The project developers report on emissions and emissions saved annually to the Operational Entity based on the approved benchmark. For year Y, the project developers report that the plant actually operated at an 80 percent availability factor, and reported the following:

$800 \text{ MW} (8760 \text{ Hr/Yr})(0.80) = 5.6 \text{ million MWh}$

Actual emissions: $5.6 \text{ million MWh} \times 417 \text{ lbs} = 2335.2 \text{ million lbs or } 1.06 \text{ MMT}$

Saved emissions for year Y are:

$[(504 \text{ lbs/MWh}) - (417 \text{ lbs/MWh})] \times 5.6 \text{ million MWh} = 487.2 \text{ million lbs or } .22 \text{ MMT}$

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Step V: Verification

- The project is subject to random, independent audit. Auditor X has been certified by the Executive Board to do random, third-party audits for Chinese CDM projects to verify information contained in annual reports. In this case, the project developers' Year Y report was audited by Auditor X, which verified the emissions generated and saved as reported by Southern Company and SIPC. Auditor X communicates its conclusions to the Operational Entity.

Step VI: Certification

- Operational Entity "checks" submitted report to ensure that the project developers have completed correctly the standard format approved by the Executive Board. An additional "check" for this project has occurred in the form of a random audit by Auditor X.
- Once the Operational Entity approves the report, thereby certifying the results, it transfers the CERs, minus the 2% deducted for "proceeds," to SIPC. SIPC, in meeting its contract with Southern Company, then transfers 75 percent of the remaining CERs to Southern Company.
- The Operational Entity reports all CERs to the Executive Board.
- Southern Company reports its CERs [$.75 \times .98 \times .22 \text{ MMT} = .16 \text{ MMT}$] to the U.S. National Registry for adjustment of its holding of CERs. Shandong International Power Corporation reports its CERs [$.25 \times .98 \times .22 \text{ MMT} = .05 \text{ MMT}$] to China's National Registry (assuming there is one).

Step VII: Appeal Process (if necessary):

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Appendix I

Issues that Arise for further consideration

Step I: Company Develops Project

- Some of the benchmarking issues: Who determines benchmark? For historical information about Chinese power plants, who provides information? If Chinese government is charged with responsibility, what happens if it doesn't cooperate or work fast enough? How prove accuracy? Who is responsible for proving accuracy? Should historical information create a baseline for sector (i.e., electric power generation) or sub-sector (coal-fired electricity)? For industrial projects, level of aggregation will be even bigger problem? Should benchmarks be determined by province, country or region? What is process for case-by-case determination of a project's baseline?
- In determining additionality, should baseline calculations be based on the average or marginal plant?
- Regarding division of CERs, should this be between project developers in both countries, between U.S. partner and Chinese government, or should be left to host government to decide?
- Is calculation of proceeds for developers' use only or should it be required in submission to operational entity?

Step II: Submit to Host Government for Approval

- Is host government required to have CDM point of contact with decision-making authority?
- Should there be a deadline for host government approval process?

Step III: Submit to Operational Entity for Registration

- Who should provide proof of host government approval?
- What is the nature of verification? Is it pro-forma or is there an evaluation? Does operational entity do verification or authorize third party verification? Or are project developers required to submit verification plan?
- Should there be a requirement for a submission on other environmental implications, such as transboundary effects?
- Regarding "voluntary participation approved by each Party involved" (section 12.5a of KP), how is this proved? Is host government certification enough or must each government provide such a certification (this could involve more than 2 if a multinational company wanted to divide CERs among more than one Annex B Party)? Does this language imply that only Parties to the Kyoto Protocol can engage in CDM projects? [Need State/Legal to evaluate]

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Step IV: Emissions Monitoring and Reporting.

- Must every CER be entered into a national registry (to ensure double entry accounting and verification) or could developers sell CERs without notifying national authority? Who reports CERs to national registry?

Step V: Verification

- Does verification occur before or after certification?
- Which independent entities will be allowed verify emissions reductions?
- Will each project be subject to a verification process, or will projects be verified selectively?

Step VI: Certification

- Is certification of CERs by operational entities automatic (unless an audit determines inappropriate calculation) or should an affirmative decision to certify be required by the operational entity each year? Should the IRS random audit model be used?
- Does operational entity have a formal auditing process? If so, does Executive Board write the rules for this or does the COP/MOP? If there is an auditing process, who does audits? Third-Parties or Operating Entity?
- Should Operational Entity report CERs to Executive Board or the UNFCCC to allow third parties to verify that CERs were indeed certified?

Step VII: Appeal Process (if necessary):

- What type of audit can overturn certification of CERs?
- Should there be a review process established that allows Executive Board to overturn CERs?
- What type of appeal process should be established?
- Would a project developer or its government represent its interests in an appeal?
- If appeal process imposed, should there be a deadline for resolution of appeal?
- Is revocation of CERs the worst consequence? Is Executive Board the final authority?

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Appendix II

Hypothetical Alternatives for Calculating CERs Using Benchmarks

[note: numbers in calculations are hypothetical because detailed information was not available]

Historical information used to develop benchmark

- Hypothetical average and marginal emissions per unit of output:
 From coal-fired facilities of 200 MW built [commissioned] in the last five years: 660 lbs/MWh
 From the last ten coal-fired facilities of 200 MW or more: 620 lbs/MWh
 From all coal-fired facilities in the past year: 620 lbs/MWh
 From the last five coal-fired facilities of 200 MW or more: 600 lbs/MWh
 From all units (coal, nuclear, oil, gas-fired, hydro, wind) of 200 MW or more built in the last five years: 504 lbs/MWh [*Benchmark used in example*]
 From last (marginal) coal-fired unit built: 417 lbs/MWh

Range of "Emissions Saved" (or CERs generated) based on benchmark chosen [based on above values]

Based upon coal-fired units built (commissioned) during last five years:
 $(660 \text{ lbs/MWh}) - (417 \text{ lbs/MWh}) \times 6.3 \text{ million MWh} = 1531 \text{ million lbs or } .70 \text{ MMT}$
 or ~~70,000~~ CERs
~~100,000~~

Based upon last ten coal-fired units:
 $(620 \text{ lbs/MWh}) - (417 \text{ lbs/MWh}) \times 6.3 \text{ million MWh} = 1279 \text{ million lbs or } .58 \text{ MMT}$
 or 580,000 CERs

Based upon all coal-fired units built during past year:
 $(620 \text{ lbs/MWh}) - (417 \text{ lbs/MWh}) \times 6.3 \text{ million MWh} = 1279 \text{ million lbs or } .58 \text{ MMT}$
 or 580,000 CERs

Based upon last five coal-fired units:
 $(600 \text{ lbs/MWh}) - (417 \text{ lbs/MWh}) \times 6.3 \text{ million MWh} = 1153 \text{ million lbs or } .52 \text{ MMT}$
 or 520,000 CERs

Based upon all units (including nuclear, gas, oil, etc.) built during last five years:
 $(504 \text{ lbs/MWh}) - (417 \text{ lbs/MWh}) \times 6.3 \text{ million MWh} = 548 \text{ million lbs or } .25 \text{ MMT}$
 or 250,000 CERs [*Benchmark used in example*]

Based upon last coal-fired unit built:
 $(417 \text{ lbs/MWh}) - (417 \text{ lbs/MWh}) \times 6.3 \text{ million MWh} = 0 \text{ lbs or } 0 \text{ MMT}$

FAX COVER SHEET

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***From:* David Gardiner
Assistant Administrator
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401 M Street, S.W. MC 2111
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Voice Number: (202) 260-4332
Fax Number: (202) 260-0275**

COMMENTS:

Attached is a copy of the draft *CDM Design and Operation Recommendations Paper* for next Wednesday's meeting. The paper on benchmarks will follow under separate fax cover.

David

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Clean Development Mechanism Design and Operation Recommendations Paper

The “flexibility mechanisms” included in the Kyoto Protocol (international emissions trading, the Clean Development Mechanism, and Joint Implementation) are key to meeting the emissions targets in the Protocol at a modest cost. The Clean Development Mechanism (CDM) offers the opportunity to generate greenhouse gas emissions credit beginning in the year 2000, adding to the global stock of emissions credits required by developed countries to meet their targets under the Kyoto Protocol. This paper is intended to help policymakers decide on key issues involved in devising rules for an operational CDM.

A major difference between the CDM and emissions trading is the motivations of agents involved in the transaction. Participants in an emissions trading transaction have opposing motivations – one wishes to purchase tons and one wishes to sell; in entering into this transaction, each will provide a check on the other. In a CDM transaction, however, both parties involved in the project may have a similar motivation to overstate the Certified Emission Reductions (CERs) generated from a project. Thus, in determining the framework for the CDM, it is important to strike a balance between the pursuit of a sufficient number of cost-effective projects and procedures that result in protection of the environment. We need to make policy choices somewhere on this spectrum of distinct objectives. Identifying this position will also help inform the discussion about the extent to which the U.S. should lead internationally on CDM issues versus allowing the agenda to be developed primarily by other Parties.

The following sections outline key CDM design and operation issues by topic area. The policy recommendations stress the core objectives of establishing the CDM on a timely basis; achieving real and verifiable GHG reductions; maintaining low transaction costs; and engaging developing countries.

1. Institutional Structures

The institutional structure of the CDM should support sustainable development in non-Annex 1 countries and provide a means for industrialized countries to reduce the costs of meeting their targets under the Kyoto Protocol. The recommendations below provide specific guidance on key institutional aspects of the CDM.

(1a) Executive Board Structure – The U.S. favors a relatively small Executive Board (e.g., 12-14 members); the UNFCCC should provide administrative support for the Board.

The Executive Committee of the Secretariat of the Multilateral Fund for the Implementation of the Montreal Protocol may serve as an example. In this case, the Executive Board should be comprised of seven members each from Annex I and non-Annex I Parties, each member serving two-year terms with the ability to serve consecutive terms. The chair and vice-chair of the Board alternate each year between the two groups. Nomination of Annex I members is limited to Annex I Parties; nomination of non-Annex I members is limited to non-Annex I Parties. Decisions are made by consensus of the Board.

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(1b) Executive Board Functions -- The U.S. position is that the Conference of Parties would set overall guidance for the CDM; the Executive Board should implement this guidance and elaborate on methodological, operational and technical issues.

As mandated by the Kyoto Protocol, the Executive Board supervises the CDM and implements guidance provided by the Conference of Parties through the Subsidiary Bodies to ensure transparency, efficiency and accountability. In some cases, the Executive Board may rely on outside experts or technical panels to develop methodological or technical guidance. Decisions of the Executive Board should represent the interests of both developed and developing countries.

(1c) Operational Entity Selection -- The U.S. supports a decentralized network of specialized private sector or non-profit institutions to serve as operational entities.

Standardized criteria should be used by the entities for evaluating all projects and certifying CERs. Operational entities will be selected to ensure broad coverage of all regions and qualified to ensure that CERs are credible. Strict measures should be taken to avoid conflict of interest among participating institutions. These guidelines should clearly restrict any operational entity from involvement in CDM project development, promotion, financing or implementation.

(1d) Operational Entity Functions -- Operational entities should be responsible for registration of projects and the certification of emission reductions in accordance with standard and transparent methodologies to evaluate and certify projects.

The Executive Board should develop these guidelines and ensure that they are followed through periodic evaluation of operational entities.

2. Transparency and Review

The central challenge within the CDM is to ensure the environmental integrity of the mechanism without creating an overly burdensome and costly structure. U.S. policy should support clear guidelines for ensuring transparency and review of transactions under the CDM that will help to achieve both of these objectives.

(2a) Transparency and Accountability -- The U.S. supports clear and standardized rules/guidelines for all elements and institutions operating within the CDM.

Consistent rules/guidelines will promote equitable treatment of participants.

(2b) Third Party Verification -- The U.S. supports third-party verification as a key element under the CDM.

The Executive Board should provide guidance to determine what institutions may request third-party verification, how verification is undertaken, and identify repercussions for project developers, hosts and operational entities if CERs are found invalid through the verification process. A time limitation for both requesting audits and appealing decisions as well as an efficient and equitable system for appealing decisions should be established.

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The most desirable form of this verification still needs to be worked out. Options will be identified in an interagency process with recommendations forwarded by late March 1999.

(2c) Project compliance under the CDM – The U.S. supports the development of a transparent and standardized set of rules and guidelines to ensure project compliance under the CDM.

These requirements should include rules/guidelines for: the registration of projects and accrual of CERs; the oversight of activities of operational entities; and the consequences for violations by Parties or private entities participating in the CDM.

(2d) Compliance by Parties – The U.S. may want to seek parallel consequences for similar violations under any of the flexibility mechanisms, including CDM.

Consequences beyond restriction/suspension of the right to participate in a flexibility mechanism have not been resolved in the negotiations. Options will be identified in an interagency process with recommendations forwarded by late March 1999.

3. Operational Issues

The U.S. seeks the resolution of many operational issues related to the CDM by COP5. The following are policy recommendations on key operational issues.

(3a) Project Registration – The U.S. supports a project registration phase prior to project development.

Projects should register with an authorized operational entity to confirm that the project is voluntary, meets sustainability goals of the host country, and that emission reductions are additional. Project registration should identify the baseline or benchmark to be used for the ex-post calculation of credits. Actual emissions reductions would be certified by operational entities only after they occur (e.g., after the end of the year, project performance will be compared to the baseline and emissions reductions calculated accordingly). This step removes most elements of uncertainty for the investor other than actual project performance.

(3b) Comprehensive Inclusion – The U.S. supports comprehensive inclusion of project categories (reduction and sequestration) and all gases, unless one or more is shown to be ineligible (e.g., because of high potential for leakage from individual projects).

All categories should be eligible from the start of the CDM using project-by-project baselines, but benchmarks may be applied to sectors at different stages in the development of the mechanism. Although the U.S. has supported the inclusion of sinks as allowable CDM projects (a controversial position in the international negotiations), a final position on this issue should work in parallel with IPCC technical discussions on developing sound methodologies for assessing sinks.

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(3c) Eligibility Requirements – The U.S. does not support additional CDM eligibility requirements of non-Annex I Parties other than the existing requirement of a first National Communication to participate in the CDM.

(3d) Sustainable Development Criteria – The U.S. does not support standardized methodologies to determine sustainable development criteria for projects.

Determination of sustainable development should be the sole responsibility of the host country of a project activity. It may be prudent not to explicitly state a position on this issue since it may serve as a point of leverage in negotiations with developing countries.

(3e) Transaction Relationships – All transactional relationships should be allowed under the CDM (e.g. bilateral, multilateral, or national governments).

Both public and private institutions should be able to participate in project development or CER transactions. Non-Annex I Parties and private entities should be able to generate CERs without an Annex I partner.

(3f) Definition of “part of” under the CDM – The U.S. does not support limiting the amount of CDM credits that can be used to meet Annex B targets.

“Part of” should mean anything less than 100% of the abatement required to achieve compliance with Parties’ quantified emission limitation and reduction commitments under the Protocol.

(3g) Prompt-start for CDM – The U.S. favors a prompt-start for the CDM.

Complete methodologies need not be established for all sectors before the CDM can become operational. The CDM may initially move forward in sectors with greenhouse gas quantification experience, while other sectors may not have established benchmarks, baselines, or methodologies for calculating reductions. Methodological or technical problems in any single project category should not restrain other project categories from CDM activity. In addition, the U.S. should seek opportunities to promote capacity building in those countries interested in hosting projects.

(3h) AII and the CDM – AII projects should be eligible for inclusion under the CDM, however, they must meet all established CDM criteria.

4. Equity Concerns

As a market-based mechanism, the CDM will provide low-cost opportunities for GHG reductions while simultaneously promoting the flow of private capital toward GHG reduction projects in less developed nations. Because the vast majority of financing for CDM projects will be from the private sector, the market will largely determine the distribution of projects. At the same time, some developing countries are concerned that the majority of projects will be developed only in countries where investment is already going, or where abatement costs are very low. In order to address this equity concern, the structure of the CDM should ensure broad participation of developing countries without market distortions.

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(4a) Measures to Ensure Broad Participation – The U.S. supports non-market-distorting measures to ensure broad inclusion of CDM projects in a wide range of host countries.

Several non-market distorting policy measures could be used to achieve this objective. These measures include: a CDM clearinghouse function to match hosts with potential investors; the inclusion of a comprehensive range of project types in the CDM; and the provision of U.S. financial and technical assistance to support capacity building in countries interested in hosting projects.

(4b) Measures to Assist Financing – The U.S. supports project bundling for smaller countries or the creation of CDM “mutual funds” led by private sector institutions to provide opportunities to facilitate financing of projects in countries where they may otherwise not occur.

(4c) Projects Initiated by Developing Countries – The U.S. believes that non-Annex I countries may unilaterally develop CDM projects in their country or in another non-Annex I country.

Standardized registration criteria as well as monitoring, verification and certification protocols should be used for assessing these projects. Unilaterally generated projects would be subject to the CDM administrative and adaptation fees just like projects bilaterally.

(4d) Other Incentives -- The U.S. does not support using other financial incentives to ensure regional dispersion of CDM projects such as quotas, differentiated baselines, CER bonuses, and valuing CERs from select countries at a higher rate.

These incentives may raise costs, promote activities where abatement costs are not low, and distort the market functioning of the CDM.

(4e) Use of ODA and/or Public Funds – The U.S. does not support the use of Official Development Assistance (ODA) for the purchase of CERs, directly or indirectly through a “laundering” process under the CDM.

ODA or other public funds may play a role in supporting capacity development or technical assistance that supports host countries in participating in the CDM. This issue is particularly important since Japan strongly supports the use of ODA for developing CDM projects, while the EU opposes its use. Developing countries are also particularly sensitive about reprogramming limited ODA away from traditional uses.

The context and circumstances under which these funds are used will be identified with interagency recommendations by the beginning of March 1999. In addition, the Japanese will be engaged bilaterally to assess their thinking on this matter.

(4f) Earning CERs through Policies or Measures – The U.S. has not yet developed a position on the inclusion of government policies in the CDM.

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Two options exist: (1) CERs are earned only through project level reductions and not through policies or measures. Policies and measures can be difficult to monitor and verify, allow leakage and gaming, and create disincentives for countries to take on a target; (2) allow CERs to be earned under policies and measures but with specific parameters for assessing and crediting reductions. This option would provide more opportunities for developing countries to participate in the CDM.

An interagency group will analyze this issue and report back by the end of March 1999.

5. Division of CERs and Share of Proceeds

As a commodity with market value, CERs may be sold or banked for future use by both Annex I and non-Annex I Parties. The U.S. does not support pre-determined rules on how credits should be divided between involved parties. After a percentage of CERs is taken to cover CDM administrative costs and the fund for adaptation, the remainder shall be apportioned between the project host and developer based on private contractual arrangements. Operational entities will be responsible for the certification of these credits and will report total CERs issued for each project to the Executive Board.

(5a) Unit of Measure for Certified Emission Reductions – CERs shall be measured in tonnes of carbon dioxide equivalent and be calculated using the appropriate GWP for all gases included in Annex A of the Kyoto Protocol. CERs should be fungible with other tradable units at their full value. CERs should be serialized to some degree for identification and tracking, depending on how CERs are brought into the market and whether CERs can be “de-certified.”

(5b) Share of Proceeds – The U.S. position is that between 1-3 percent share of CERs generated by project activities should be allocated for administrative costs of the Executive Board and toward the adaptation fund to support activities in the most vulnerable countries

The majority of this share should go towards the adaptation fund since administrative costs of the Executive Board are expected to be low. A sliding scale, depending on project size, may also be considered for determining the CER share charged to projects.

(5c) Use of Adaptation Funds – Adaptation funds should only be used to assist developing country Parties that are particularly vulnerable to the adverse effects of climate change.

The Executive Board should develop an objective process for the selection of particularly vulnerable countries based on standardized criteria. The disbursement of these adaptation funds should be conducted through appropriate international institutions.

(5d) Role of Private Entity – The CER share awarded to the investor and the host should be determined by private contract between participants. These CERs shall be the property of each private party and may be held for future use, traded, or sold.

DRAFT – Do Not Cite or Quote – 2/11/99**6. Baselines and Benchmarking**

In general, the U.S. supports standardized methodologies for generating emissions baselines to determine CERs under the CDM. Top-down baselines (e.g., benchmark, performance standard, whole-sector, technology standard) should be considered. For sectors where top-down baselines are not possible or have not yet been constructed, project specific baselines should be used. Project baselines will be established during the registration of the project. This baseline should be fixed for the lifetime of the project.

(6a) Choosing a Baseline or Benchmark – The U.S. supports flexibility to project developers for bottom-up baseline development. However, if an appropriate top-down baseline has been established, a project developer/host should be required to use that baseline for their calculations.

(6b) Additionality – The U.S. believes that only emissions additionality should be assessed in the CDM.

Programmatic and financial additionality should not be assessed for projects relying on private capital. Experience with USJI has shown both of these categories of additionality to be subjective, and too complicated to determine.

(6c) Other Technical Elements – While there is strong agreement on the desirability of baselines and benchmarks, other technical elements of baselines are currently being addressed in an inter-agency process. The interagency technical group will make recommendations by May 1999 in advance of the June SBSTA/SBI sessions. The USG should have a position on key issues by COP5 so that top-down baselines can begin to be developed by January 2000. The interagency group will address issues such:

- **Level of Aggregation** - Project-specific methodologies and top-down baselines should be set at the highest level of aggregation that still provides reasonable accuracy. In this context, greater definition of “sector” and “sub-sector” is needed as well as identification of sectors where country, regional or global baselines are most appropriate and/or feasible.
- **Period for Earning CERs** - The time frame for accruing CERs against the initial baseline will vary depending on project type. Timeframe options being considered include criteria based on: capital lifetime (estimated or actual); budget periods within the protocol; average time for capital recovery; and other factors.
- **Choice of Data** (applies to top-down only) - Top-down baselines should be based on historic data. This data could be for projected installed capacity during the last year, all existing capacity, or a rolling average of selected years.
- **Updates** (applies to top-down only) - Top-down baselines will need to be updated periodically to incorporate new trends and technologies (applied to new projects only). The appropriate update cycle will depend on the cost of benchmark construction and the expected rates of change in a given sector.

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- **Average versus Better-than-average** (applies to top-down only) - Better-than-average benchmarks provide more assurance that emission reductions/sequestration are truly additional, while average benchmarks would include more projects. A balance must be sought based on U.S. government objective for the CDM.
- **Who Establishes Baselines?** - Project-specific baselines should be developed by the project developer and approved by an operational entity. Top-down baselines should be developed with cooperation from, but not solely by, the host country. Other involved parties could be: the Executive Board; a body designated by the Executive Board; or operational entities.

Notes on China Power Plant Idea -- Chayes Article
December 28, 1998

- Basic idea would be U.S. - China bilateral agreement for the development of cleaner power plants. Chayes conceives this occurring under the CDM and dubs it the U.S.-China Clean Development Program. He limits his focus on the building of new, large, central station generating plants. Recognizing that other countries, like Japan, France and Canada, have already begun to invest in China's power industry, he assumes that a U.S.-China bilateral agreement might involve up to 20% of new plants to be built in China.
- The premise is that clean coal technologies, such as pulverized coal combustion, atmospheric fluidized bed combustion, or integrated gasification combined cycle would operate a good deal more efficiently than the conventional technology China is employing now. If, for example, significant numbers of new large power plants were built at 40-45% efficiencies rather than 30-35% efficiencies, sizable ghg reductions could be achieved.
- The clean coal technologies are considerably more expensive than conventional technologies. Chayes assumes a capital cost *increment* in the order of \$200-250 million per plant. A major question is how that increment is financed. China, presumably, won't want to pay for it -- though perhaps would pay some part of it, given the immediately measurable improvement in air pollution.

If Kyoto were ratified and we had put in place a domestic trading system, the CDM credits from these projects might be enough to coax U.S. companies to accept a lower-than-usual rate of return from the Chinese, since the CDM credits would be rather directly convertible into cash. Since we don't know when Kyoto will be ratified, and there presumably won't be a true domestic trading system for some period after that, we would need to look at other incentives for companies to accept a lower rate of return than they would ordinarily require. In theory, as Chayes points out, this could be accomplished through measures such as tax incentives or preferential financing.

- Chayes also points out the need for the Chinese, on their side, to greatly simplify the approval process for large-scale projects like this, since the current confusing and opaque process greatly increases transaction costs and leads potential investors to shy away.
- Initial questions that must be answered on our side:
 - What efficiency savings (e.g., 45% vs. 32%) are plausible using clean coal technology vs. conventional Chinese technology?
 - What percentage of Chinese power sector might be involved in a U.S.-China agreement; how many and what size power plants are we talking about?

-- What overall ghg savings (as compared to current Chinese baseline) are plausible in a U.S.-China program?

-- How much more does it cost per plant to use clean coal vs. conventional coal technology?

-- How would that increment be paid for? Would Chinese be prepared to pay for some part of it? If we intend to use tax and/or financing incentives to interest U.S. companies in Chinese power projects, how much would this cost the U.S. government? Would such cost be tenable?

-- Chayes assumes that this program all works as a set of CDM projects. But CDM rules won't be agreed to before end of 2000 at earliest, and ratification by U.S. won't occur before 2001 at earliest. So while we would need to put CDM-like processes in place at bilateral level -- e.g., criteria for eligible projects, means of measuring additional ghg benefits over baseline performance, etc. -- we don't want to hitch this idea to a working CDM under a ratified Protocol. Note that additionality could be made important even in a non-CDM world, since presumably tax credits could be conditioned on certification by appropriate party (e.g., EPA) of additional ghg benefits.

-- Would there be a way for non-CDM credit incentives (i.e., tax and/or financing incentives) to be written so as to phase out at such time as CDM was up and running, CDM credits were available and Kyoto Protocol were ratified? Or if not phased out, at least written so as to prevent double counting (i.e., use of a tax credit and a CDM credit)? Do we care?



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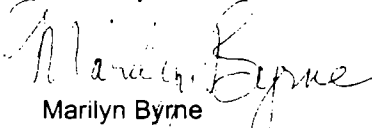
Todd Stern
Assistant to the President for Special Projects
The White House
Ground Floor, West Wing
Washington, DC 20502

December 18, 1998

Dear Mr. Stern,

I am attaching the article that you discussed with Professor Abram Chayes on Thursday, December 17. Professor Chayes also wanted me to tell you that the numbers are just illustrative.

Sincerely,


Marilyn Byrne
(617) 495-9710

A SUGGESTED MODEL FOR IMPLEMENTING THE
CLEAN DEVELOPMENT MECHANISM

Abram Chayes, Felix Frankfurter Professor of Law (emeritus)
Harvard Law School

(Assisted by Amanda Cohen, Karen Filipovich and Alastair Iles)

(DRAFT: DO NOT QUOTE OR CITE WITHOUT PERMISSION)

This paper presents a proposal for a major collaborative effort by the United States and China to reduce CO₂ emissions in the Chinese electric power sector within the framework of the recent Kyoto Protocol (KP) to the United Nations Framework Convention on Climate Change (FCCC). The proposal is conceived as a possible approach to implementing the Clean Development Mechanism (CDM) established by Article 12 of the Protocol. The CDM is a new and untested mechanism for encouraging cooperative multinational efforts to reduce atmospheric levels of greenhouse gases. To prompt further discussion and refinement of the CDM, and to encourage the United States and other developed countries to begin investment in clean development projects, this paper proposes a model for initial implementation of the CDM. The proposed implementation strategy is designed to produce:

- large emission reductions in the relatively near term;
- significant transfers of technology and financial resources from developed to developing countries; and
- increased understanding of the CDM's potential benefits and possible problems.

We use a notional U.S.-China project to illustrate the practical steps necessary for successful operation of the CDM. The proposal focuses on the Chinese electric power sector because it is growing rapidly and affords ample opportunities for technological improvements that would reduce greenhouse gas emissions. At the same time, measuring CO₂ emissions from central station power generation facilities is comparatively straightforward, so monitoring and verification problems are minimized.

I. BACKGROUND

It is now widely recognized that climate change attributable to greenhouse gas (GHG) emissions resulting from human activities is a serious global problem with potentially catastrophic consequences.¹ The harmful effects of GHGs do not depend on the location of emissions, because in contrast to many other pollutants, GHGs are uniformly mixed. That is, regardless of where they are emitted on the earth's surface, GHGs diffuse throughout the atmosphere.

Developed countries are currently the largest emitters of GHGs, and the United States alone accounts for almost a quarter of the world's total annual emissions. These countries will continue for a long time to have the highest emission rates *per capita*, but early in the next century several industrializing countries are likely to overtake developed countries in total quantity of emissions. Forecasts suggest, for example, that by the year 2015, China will be the largest GHG emitter in the world, exceeding the United States in aggregate emissions, though *per capita* emissions will still be far lower in China than in the U.S.² It is therefore important that developed countries cooperate with China and other developing countries in the effort to reduce GHG emissions while simultaneously fostering these countries' rapid pace of economic development.

A. The Framework Convention on Climate Change

In 1992, the Framework Convention on Climate Change (FCCC) created an international institutional system for dealing with climate change. The Convention was opened for signature in June 1992, and as of January 28, 1998, 174 countries, including China and the United States, have ratified the treaty.

Parties to the FCCC undertook different obligations, depending largely on their relative development status. Industrialized countries, which are listed in Annex I of the Convention (Annex I countries), pledged to adopt policies and measures "with the aim of"

¹ IPCC, *Policy Implications of Global Warming*, National Academy Press, 1992.

² World Bank

reducing GHG emissions to 1990 levels by the year 2000.³ It now seems clear that most of the Annex I countries will not meet these goals.⁴ By contrast, developing countries made no GHG abatement commitment under the FCCC. Like the developed countries, though, they undertook to prepare national emission inventories and to report to the FCCC on their domestic policies and activities for reducing atmospheric GHG levels. The Convention provided for early review of the “adequacy” of these commitments, and the first meeting of the Conference of the Parties (COP) held at Berlin in 1995 decided that the commitments of Annex I countries – even if met – were not adequate to meet the goals of the Convention. The COP mandated negotiation of a protocol to establish quantitative targets and timetables for reductions of GHG emissions of Annex I countries, to be ready for signature within two years.

B. The Kyoto Protocol, Cooperative Abatement Efforts and the Clean Development Mechanism

The Berlin Mandate initiated a two-year process of negotiation culminating in the adoption of the Kyoto Protocol (KP) to the Framework Convention on Climate Change at the third meeting of the COP in December, 1997. The Protocol establishes binding commitments for the Annex I countries to reduce GHG emissions by an average of almost 6% below 1990 levels during the period 2008-2012.⁵ Although the Protocol does not introduce new GHG reduction commitments for non-Annex I countries, it does reaffirm all countries’ existing FCCC obligation to compile national emission inventories. Finally, the KP contains a number of new mechanisms that permit all Parties to the Convention to implement GHG reduction policies cooperatively with other Parties.⁶

³ Annex I countries must also provide inventories of GHG emissions and report their domestic policies and their progress in reducing greenhouse gases to the FCCC Secretariat. The OECD countries (Annex II countries) assent in addition to contribute to a fund to defray the agreed incremental costs of GHG abatement activities undertaken by developing countries. The fund is administered by the Global Environment Facility, an institution established for this and other purposes.

⁴ Currently, only two Annex I countries are likely to meet this target: Britain and Germany.

⁵ Specific commitments for each country are defined in KP, Annexes A and B.

⁶ As of February 1998, the Kyoto Protocol has not yet been ratified. For the purposes of this paper, we assume that Annex I countries will accept the emission reduction obligations set out in the Protocol, and that both Annex I and developing countries will accept the Protocol’s timetables and emission crediting regime.

One of the most important of these new features is the Clean Development Mechanism established by KP Article 12 to provide a schematic framework for cooperative GHG abatement efforts between Annex I and developing countries. The CDM is intended to help developing countries achieve sustainable development, decrease local pollution and reduce GHG emission levels, and to assist Annex I countries in complying with their emission reduction commitments. To forward these goals, Article 12 states that “certified” emission reductions resulting from a clean development project in a developing country may be used by Annex I countries “to contribute to compliance with part of their . . . reduction commitments.” Both private and public entities are eligible to participate in the CDM and to benefit from resulting emission reductions. Together, these provisions provide economic incentives for Annex I countries to encourage private firms to invest in GHG reduction efforts in developing countries. This private investment, in turn, should result in large-scale transfers of technology, expertise and private capital to developing countries, while simultaneously reducing the costs of GHG abatement worldwide.

Article 12 states that to be eligible under the CDM, projects must meet the following requirements:

- voluntary participation in the project;
- approval of the project by all involved Parties;
- real, measurable and long-term benefits related to mitigation of climate change;
- real emission reductions additional to any that would occur in the absence of the project activity; and
- substantial transfers of capital, technology and expertise to developing country participants.

The CDM is to be supervised by an Executive Board (Article 12 (4)), and the COP must certify any emission reductions resulting from project operation (Article 12 (5)). A share of project proceeds are to be used to cover administrative costs and to assist particularly vulnerable developing countries in adapting to future adverse effects of climate change.

Properly implemented, these requirements will help to ensure both that cooperative projects result in real and significant transfers of financial, intellectual and technological resources to developing countries and that these projects effect real reductions in GHG levels. It is therefore vital to the success of the CDM that both the activities of the Executive Board and the emission certification process be widely perceived as equitable and well-administered. Successful global implementation of the Clean Development Mechanism will require considerable field experience. We hope the successes and problems of the U.S.-China effort proposed here will provide valuable information for further refinement of the CDM.

II. COMPARATIVE COSTS AND AVAILABLE TECHNOLOGIES

Reduction of GHG emissions often entails significant economic costs. The motive force for cooperative, multinational GHG reduction efforts in the CDM is the variance in the cost of comparable emissions reductions in different places. Cost estimates for GHG reductions range widely depending on the specific location, level of economic and technological development, economic sector and method for measuring emissions. Reducing GHG emissions is cost-effective in some circumstances but prohibitively expensive in others. Cost estimates in industrialized nations, for example, range from tens to hundreds of U.S. dollars per ton of carbon saved. Consequently, U.S. adoption of the Kyoto Protocol's GHG abatement obligations will create a strong incentive to seek the least costly emission reduction opportunities.

Many opportunities for low cost emission abatement are located in developing countries, so industrialized states may be able to obtain GHG abatement at lower cost by investing abroad, depending on the relative cost of greenhouse gas abatement in the specific developed and developing countries in question. Before describing the institutional framework and mechanics of the proposed U.S.-China cooperative emission reduction project, therefore, we examine the potential cost differentials -- and resulting investment incentives -- in the specific case of the United States and China.

Studies of the Chinese energy sector emphasize the large opportunities for emissions savings in other aspects of Chinese energy production, transmission and consumption.

These include limiting transmission losses, demand side savings, fuel switching possibilities, and regulation of small boilers and local and provincial generating plants. The potential gains in some or all of these areas may be greater than those in the state-owned central station power sector. But these other areas present severe difficulties for systematic cooperative effort under the CDM, at least until additional experience has been accumulated. We therefore limit our proposal to large central station generating plants because they seem to us to represent the simplest opportunity for making a prompt start on a large and effective CDM program.

1. Chinese perspective

China is expected to increase its overall capacity for energy production between 12 and 17 GW per year, for at least the next ten years.⁷ Currently, China generates some 70% of its power from coal and has the largest coal reserves in the world. In addition, China is concerned about energy security and fearful of relying excessively on imported fuels. Although China plans to exploit its hydroelectric generating potential and the limited near term natural gas availability, all these factors mean that China will meet the great bulk of its increasing energy demand by building additional coal-fired plants.

The likelihood that China will build many new coal-fired plants in the next decades creates an opportunity for a cooperative U.S.-China effort to minimize greenhouse gas emissions from those plants. In addition, three other Chinese government policies may foster such a joint effort. First, China is attempting nationwide to increase its energy production efficiency in order to produce more energy at lower cost. Second, China is striving to develop more effective methods of combating its major urban air pollution problem, predominantly from SO₂. And third, China would like to increase foreign investment in the energy sector by as much as 25% to facilitate new plant growth.

2. U.S. perspective

The Kyoto Protocol requires the U.S. to reduce its annual GHG emissions to 1,276 Mt C, 7% below the 1990 level of 1,372 Mt C, between 2008-2012. To meet this commitment,

⁷ Energy Efficiency Improvements in China: policy measures, innovative finance and technology development: 7. Paris: OECD/IEA; Washington, D.C.: OECD Washington Center [distributor] 1997.

the U.S. government must induce private actors – individuals and firms – to reduce emissions of CO₂ and other GHGs. Estimates of the costs of achieving this reduction domestically range widely, from \$US 20 to \$US 150 per ton of carbon saved⁸. Under the KP, however, the United States can use emission reductions achieved in CDM projects to assist in achieving compliance with its emission abatement commitment, though the details of this system have yet to be worked out. Together, high cost of meeting its full KP reduction commitment domestically and the possibilities opened up by the CDM should encourage the United States actively to seek lower cost opportunities to reduce GHG emissions in countries like China. This in turn implies that the United States will need to develop an incentive system to encourage U.S.-based investors to fund activities abroad that directly reduce GHG levels. Possible investment incentives are discussed in section III (C) (1), below.

3.) Opportunities and barriers within China's electric generation sector

Several considerations make the Chinese electric sector – particularly the likely new coal-based plants – an ideal arena in which to test U.S.-China cooperation within the CDM. First, China's electric sector is clearly expanding. There are also straightforward options for improving existing Chinese power-generation technologies. In addition, measurement of GHG emissions should, in theory, be easier to accomplish in the state-owned electric power sector than in many other areas (e.g. personal coke-fired stoves). Finally, China's concern with the human health and environmental effects of local pollution and the U.S. need for low cost emissions reductions create clear opportunities for synergy.

The cooperative venture proposed here will not be feasible, however, unless the costs of GHG reductions in China are less than the costs of those reductions in the United States (or in other countries). How to calculate these costs, and, in turn, how to determine the resulting emissions reductions, are matters of some debate. Before presenting the range of projected figures, however, it is important first to identify the factors that need to be

⁸ Jaccard, Mark and Montgomery, W. David, "Costs of Reducing CO₂ in the Us and Canada," *Energy Policy* 24(10-11) 889-898. It should be noted the range of US \$20-150 are based on a carbon tax that would yield a result of CO₂ reduction down to 1990 levels by 2010.

considered in arriving at reliable estimates of costs and emission reductions. These factors include:

- the range of costs of CO₂ emission reductions in the United States,
- projected increases in China's energy-generating capacity in the next 8-12 years;
- projected increases in carbon emissions resulting from this growth in capacity, assuming China will for the most part use available, conventional domestic technologies;
- feasible technological alternatives for increasing Chinese capacity,
- probable savings in CO₂ emissions resulting from using an alternate technology;
- predicted costs of alternative technologies;
- fuel costs and trends, both in China and in the United States; and
- probable transaction costs.

Some of these issues are especially troubling. China still heavily subsidizes coal. If reforms remove or reduce this subsidy, plants with higher fuel efficiencies will become increasingly cost-effective and presumably more attractive to investors. The outcome of this matter is purely at the discretion of the Chinese government but will significantly impact the operating costs of various types of coal-fired plants. Transaction costs, especially in China, are also a potentially formidable barrier. The CDM framework proposed here (as discussed in Section III) is largely aimed at minimizing the program's transaction costs.

4.) Costs of carbon reduction with different technologies and coal quality

Given the high levels of uncertainty surrounding each of the above-mentioned factors, the estimates presented below provide only a ballpark approximation of the GHG emission reductions and associated costs to evaluate the feasibility in principle of a US China cooperative investment program in China's coal-fired electric generation sector.

Carbon dioxide emissions from coal-based plants depend on two things: the efficiency of the plant and the carbon content of the coal. As a base-case, we use a conventional

domestic Chinese technology: a 300MW or larger sub-critical steam plant with an electrostatic precipitator (ESP).⁹ China has used a comparable technology in a number of recent large power plants and will probably continue to use it in the near future (with marginal improvements), in the absence of more efficient alternatives available at competitive capital costs. With this base case we compare four alternative coal-based technologies, currently available in developed countries, though not yet in China. These technologies, listed in order of increasing fuel efficiency (and cost) are:

- pulverized coal combustion, 300MW or above, with an ESP
- pulverized coal combustion, 300MW or above, with an ESP and a scrubber
- atmospheric fluidized bed combustion
- integrated gasification combined cycle

For each of these technologies, we calculate the CO₂ emission savings per GW of capacity (savings per year x estimated 20 year useful life of plant) using three different fuel qualities: low sulfur coal (Lcoal), high sulfur coal (Hcoal) and washed coal (Wcoal). We make separate calculations for operation at 74 per cent capacity and 80 per cent capacity.¹⁰

On the cost side, our analysis is limited to capital costs, leaving out operation, maintenance and fuel costs. There are two reasons for this limitation. First, reduced fuel costs due to increased efficiency will offset some or all of the likely increased operation and maintenance costs of the new technology. The parties to any project of course may take account of these costs in their contractual arrangements, in which case they will have to calculate the costs in detail for the particular plant and technology involved. Second, China is currently reforming fuel prices. If subsidies are removed, higher prices will make more efficient plants more attractive, but we don't know where or how these prices will shift over the estimated 20 year lifetime of a plant.

⁹ The ESP and additional mechanisms to control local pollutants may be added as China attacks the problem of urban air pollution. End of the pipe pollution reduction methods add expense and reduce efficiency of the plant as a whole.

¹⁰ Operation at 80% capacity is a standard assumption for evaluating power plant efficiency; the 74% figure was chosen based on calculations made by Professor Rogers in his study.

To find the projected cost of one ton of CO₂ emission reductions for each technology/fuel/capacity combination, we divide the projected incremental capital cost of the more expensive technologies by the tons of carbon saved. The results are summarized in the accompanying tables and graphs. They suggest that many of these combinations may produce reductions of CO₂ emissions at less than \$US 30 or even less than \$US 10 per ton. At that rate, the reductions would likely be less costly than all but the cheapest U.S. domestic reduction possibilities. If these projections are reasonably accurate, therefore, the possibility for a successful U.S.-China CDM program should exist.

III. THE STRUCTURE AND OPERATION OF THE CLEAN DEVELOPMENT MECHANISM

Three major institutional components must be considered in implementing the proposed U.S.-China Clean Development Program. First is the relationship of the program to the FCCC and its organs. Second is the form of agreement between the participating states. Third is the national actions that have to be taken within each participating country to make the program work.

A. The Role of International Institutions

The CDM is only vaguely sketched in KP Article 12. Nevertheless, it is clear that the Mechanism will require clear guidelines for project implementation and strict oversight of project operation, to ensure both that developing countries benefit from the transfer of technology, capital and expertise, and that developed countries and participating private investors receive accurate emission credits for GHG abatements achieved. The role of the Parties to the Kyoto Protocol in defining, approving and monitoring CDM projects is therefore pivotal. The following section discusses that role in general terms, relevant both to the U.S.-China program suggested here and to subsequent applications of the CDM.

1. The COP's Role

The COP's authority to define and implement projects under the CDM derives largely from Articles 12 and 13 of the Kyoto Protocol (KP). Article 13 states that the Conference of the Parties shall serve as the meeting of the Parties to the Protocol and further that the COP shall "facilitate, at the request of two or more Parties, the coordination of measures

**CARBON DIOXIDE EMISSION REDUCTION & COST PER TON/ GW, OVER 20 YEAR PLANT LIFETIME
COMPARED TO 300MW OR LARGER DOMESTIC STEAM WITH ESP**

80% Capacity Case

Technology	Capital Cost Increment (millions of dollars)	Emissions Reductions/ over 20 yrs/ GW (000s of tons)			Cost per ton of CO2 reduction		
		Hcoal	Lcoal	Wcoal	Hcoal	Lcoal	Wcoal
Imported Pulverized coal combustion 300MW and above with ESP	200	11583	14403	10626	\$ 20.72	\$ 16.66	\$ 22.59
Imported Pulverized coal combustion 300MW and above with ESP and Scrubber	350	7943	9876	5461	\$ 52.88	\$ 42.53	\$ 76.91
Imported atmospheric fluidized bed	250	15027	18685	10626	\$ 19.96	\$ 16.06	\$ 28.23
Imported integrated gasification combined cycle	250	32326	40195	36575	\$ 9.28	\$ 7.46	\$ 8.20

* Initial Numbers, with exception of capacity, courtesy Dr. Peter Rogers, Harvard University

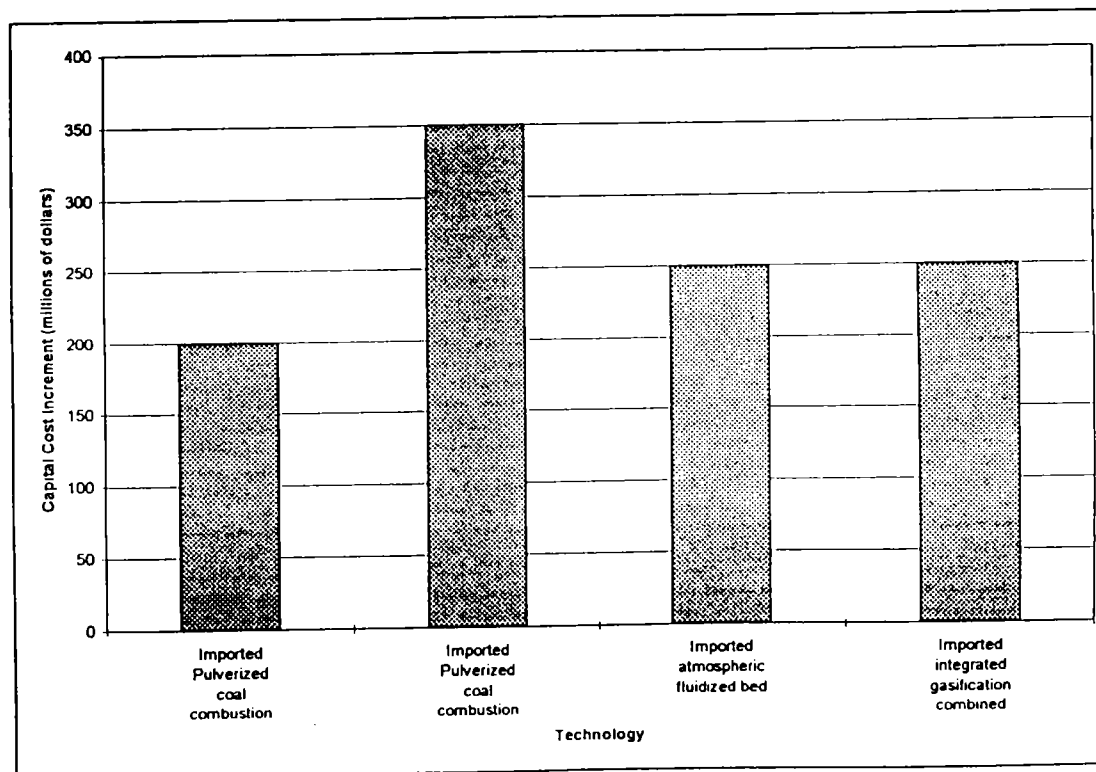
**CARBON DIOXIDE EMISSION REDUCTION & COST PER TON/ GW, OVER 20 YEAR PLANT LIFETIME
COMPARED TO 300MW OR LARGER DOMESTIC STEAM WITH ESP**

74% Capacity Case

Technology	Capital Cost Increment (millions of dollars)	Emissions Reductions over 20 yrs/ GW (000s of tons)			CO2 Reduction, cost per ton		
		Hcoal	Lcoal	Wcoal	Hcoal	Lcoal	Wcoal
Imported Pulverized coal combustion 300MW and above with ESP	200	10744	13359	9856	\$ 32.43	\$ 26.08	\$ 35.35
Imported Pulverized coal combustion 300MW and above with ESP and Scrubber	350	7367	9161	5065	\$ 82.76	\$ 66.56	\$ 120.38
Imported atmospheric fluidized bed	250	13938	17331	9856	\$ 31.25	\$ 25.13	\$ 44.19
Imported integrated gasification combined cycle	250	29983	37281	33923	\$ 14.53	\$ 11.68	\$ 12.84

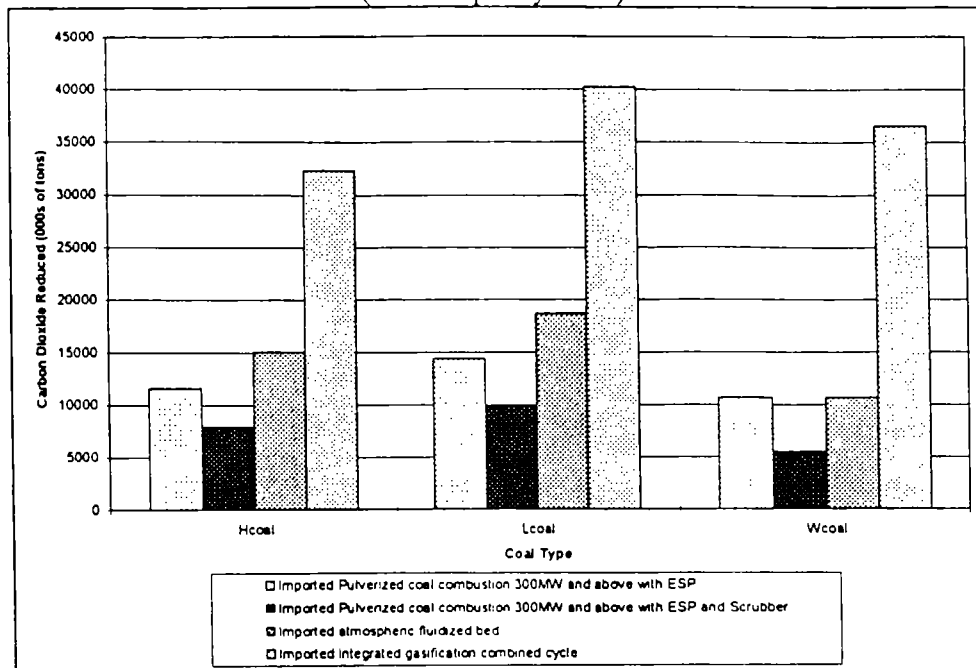
* Initial Numbers Courtesy of Dr. Peter Rogers, Harvard University

CAPITAL COST INCREMENT
COMPARED TO 300MW OR LARGER DOMESTIC STEAM WITH ESP



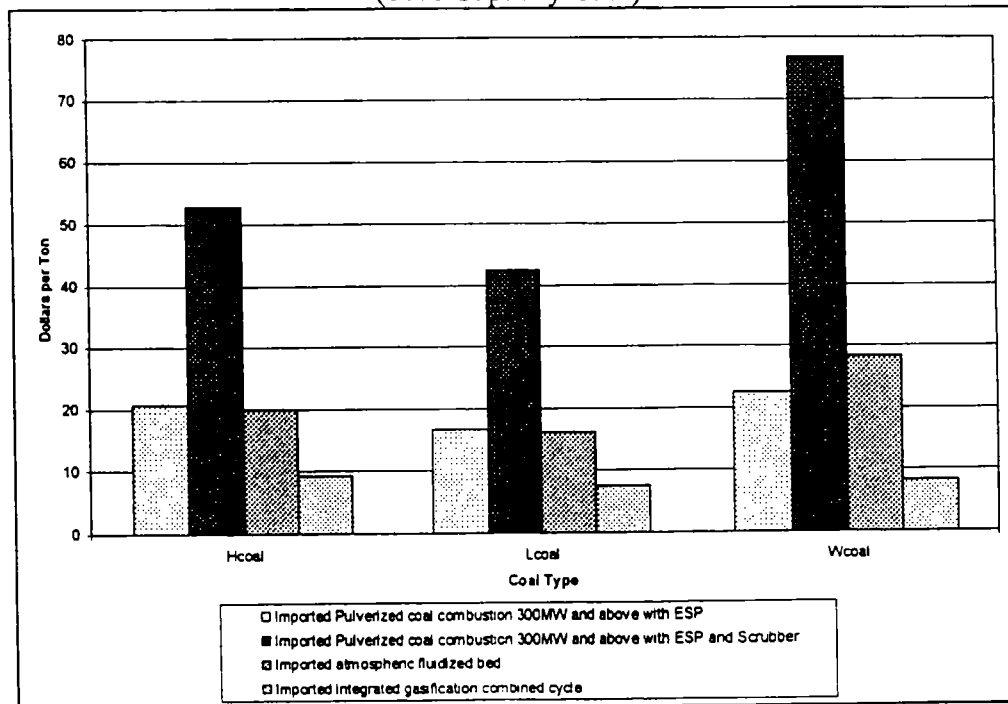
CARBON DIOXIDE EMISSION REDUCTION/ GW, OVER 20 YEAR PLANT LIFETIME
COMPARED TO 300MW OR LARGER DOMESTIC STEAM WITH ESP

(80% Capacity Case)



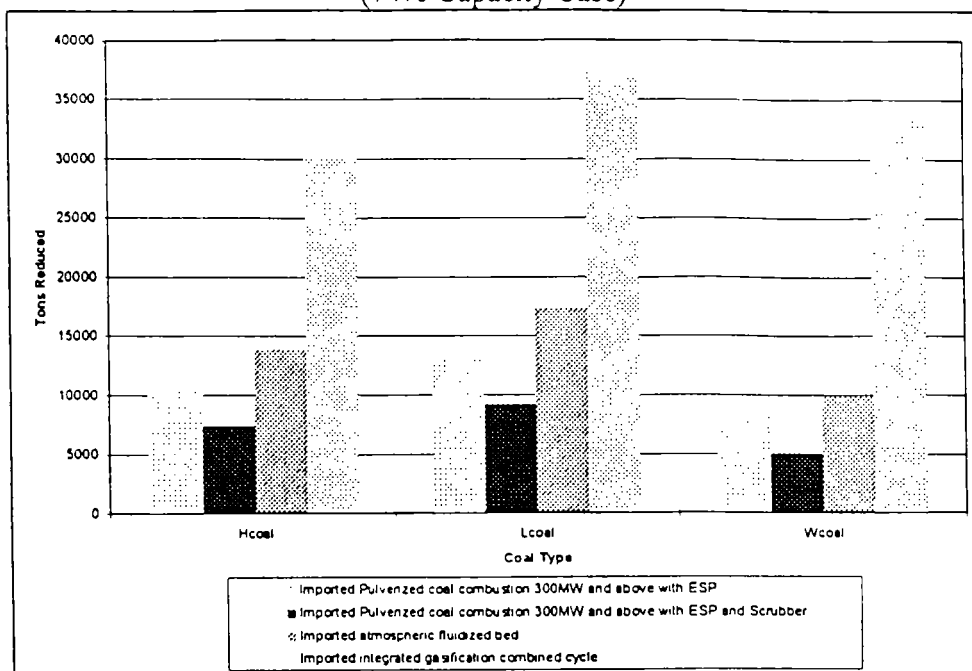
COST PER TON OF CARBON DIOXIDE REDUCED
COMPARED TO 300MW OR LARGER DOMESTIC STEAM WITH ESP

(80% Capacity Case)



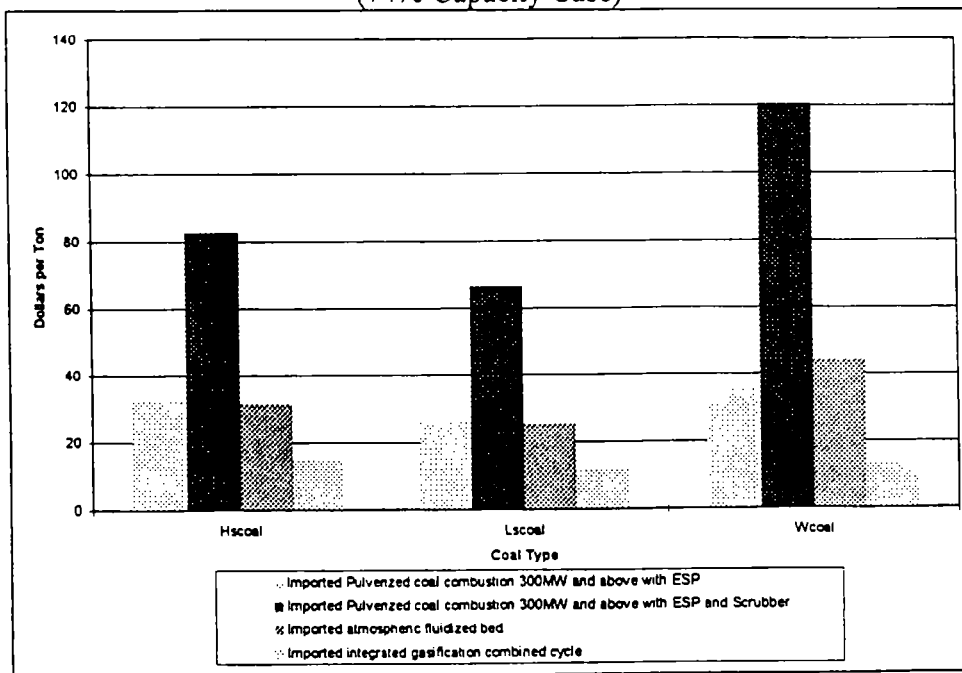
CARBON DIOXIDE EMISSION REDUCTION/ GW, OVER 20 YEAR PLANT LIFETIME
COMPARED TO 300MW OR LARGER DOMESTIC STEAM WITH ESP

(74% Capacity Case)



COST PER TON OF CARBON DIOXIDE REDUCED
COMPARED TO 300MW OR LARGER DOMESTIC STEAM WITH ESP

(74% Capacity Case)



adopted by them to address climate change and its effects.” (Article 13 (4) (d)). With respect to the CDM in particular, Article 12 requires that the CDM be “subject to the authority and guidance” of the COP (Article 12 (4)) and be supervised by an Executive Board established by the COP. Further, Article 12 requires the COP to “elaborate modalities and procedures [for the CDM] with the objective of ensuring transparency, efficiency and accountability through independent auditing and verification of project activities.” (Article 12 (7)).

2. The Executive Board

Though Article 12 mentions an Executive Board, the KP gives no hint of the composition or procedures of this Board. These matters are to be decided by the COP under authority of KP Articles 12 (4) and 13 (4) (h). It is therefore not possible to say at this juncture just how the Executive Board will operate. However, it is likely that the COP will follow the models of the Executive Committee of the multinational fund under the Montreal Protocol and the Council of the Global Environmental Facility, which perform roughly similar functions. These boards consist of a small number of members chosen by the Parties, 20 in the Executive Committee of the Montreal Protocol and 32 in the GEF. They are chosen to provide broad geographical representation and divided roughly equally between developed and developing country members. Decisions of these boards are generally made by consensus, but if a vote is required, concurrent majorities of both developed and developing country components are necessary for approval. Provision must also be made for the relationship of the Executive Board to the standing subsidiary organs established under the KP.

3. Possible CDM project criteria

The first challenge facing the COP in setting up a successful CDM program is to define criteria to guide the development and approval of CDM proposals. To be approved, a CDM project proposal should demonstrate that it meets each of the criteria established by the COP. Some of these are already established in general terms by Article 12 of the Protocol. The list below includes those mentioned in the KP as well as others that seem

desirable to ensure a workable system for developing effective CDM projects and certifying GHG abatement credits

- The governments of both host nations and other participating nations must approve and voluntarily accept project proposals;
- A proposed project must complement and support the host nation's environmental and developmental priorities;
- Sources of funding for proposed projects must be additional to investing countries' existing obligations to support transfers of financial and technological resources to the host country; and finally
- Any proposed project must be likely to result in significant, identifiable financial and technological transfers from the investing countries to the host country.
- A CDM project must be is likely to result in long-term reductions in atmospheric GHG levels;
- These reductions must be additional to any that would occur in the absence of the project; and
- GHG abatement due to project operation should be measurable through use of an accurate and reliable GHG emission baseline with which the project's performance can later be compared.

The COP will also have to establish modalities to ensure that a share of the proceeds of each project is set aside for administrative costs of the CDM and for assistance to the most vulnerable developing countries, as provided in Article 12 (6) and (8).

3. The CDM project approval process

At least initially, the COP itself ought to grant final approval of a proposed project, after analysis and recommendation by the Executive Board. The Board should be charged with determining in the first instance (1) whether a proposed project meets the established project criteria and (2) in particular whether the proposed GHG abatement baseline and measurement techniques are workable. The Executive Board should consult the

Subsidiary Body for Scientific and Technological Advice (SBSTA; see Article 15 of the KP) on these issues of baseline definition and measurement techniques. The SBSTA might also be asked to specify "good practice" for the proposed project, to ensure that participating parties do not receive credits for illusory GHG abatement, resulting, for instance, from temporary suspension of project operation or operation at reduced capacity.

Projects approved by the Executive Board should subsequently be reviewed by the full COP at its annual meeting. It would also be desirable to allow an appeal to the COP for projects disapproved by the Board, if a stated number of Parties to the Protocol agree.

4. Evaluation of project performance and certification of credits

COP involvement in Clean Development projects cannot end with approval. Continuous oversight is required to ensure that a project is implemented and operated as detailed in its proposal. The COP ought not, however, be directly involved in performance verification. Instead, parties financing and operating the project should submit reports to the Executive Board, annually (or if necessary more frequently) detailing project activities and claimed GHG abatement.

These reports could be audited by an approved third party, such as a private international auditing entity, which would compare the project's performance with the approved project baseline to determine the number of GHG abatement credits owed. Project reports should be made publicly available for comment by interested governmental, international and non-governmental organizations, and the auditing body should receive and address these comments in its own report. The auditor should report its determination to the Executive Board, where parties would have the opportunity to challenge the findings of the auditors. When its review is completed, the Executive Board would forward the project report, auditor's report and its own recommendations to the COP for final action. Funding for the audit process would be a project expense.

5. Granting of GHG abatement credits

Based on the project report, the auditor's report and the Executive Board recommendations, the COP would certify the emissions reductions eligible for use by the investing Annex I country in accordance with Article 12. There would be no need to allocate credits among private investors within the investor countries. This distribution process would instead be handled individually by participating countries through a domestic emissions trading system or other incentive devices as discussed in section C(1) below. In order to attract private investors to back clean development projects, however, it is clearly necessary that participating countries have functioning domestic incentive systems based on the value of the credits the country has received from the CDM project.

B. The Umbrella Agreement

We conceive that the U.S.-China Clean Development Program and other future CDM efforts would be initiated by an umbrella agreement, concluded by the participating countries at the highest levels and outlining the scope, objectives and basic principles and practices of the program. These agreements would streamline the identification, planning and approval process for potential CDM projects, significantly reducing transaction costs and lowering bureaucratic hurdles. For the U.S.-China program proposed here, the umbrella agreement would state that the object of the program is to promote U.S. private investment in China's power industry, on mutually agreeable and beneficial terms, in order to reduce the industry's GHG emissions below those projected on the basis of existing Chinese technology.

An initial question to be determined by the umbrella agreement is the scope of the program. In our view, as an experimental, initial implementation of the CDM, this U.S.-China program should be narrowly focused – limited to new construction of large, state-owned central station power installations. Such a limitation would minimize the difficulties of determining, monitoring and verifying GHG reductions and would reduce the transaction costs of dealing with provincial and local governments. Obviously, U.S. investors should not and could not practically finance all of the new state-owned, coal-fired electricity generation plants that are likely to be built in China during the next 15 to 20 years. Moreover, other developed countries, notably Japan, Canada and France, have

already begun to invest in China's power industry and will continue to do so. An umbrella agreement between China and the United States, however, might well involve up to 20% of the new plants to be built – still a very large proportion. If this initial program is successful, the arrangements described here could later be expanded, or adapted to other economic sectors.

In addition to addressing the scope of the proposed program, the umbrella agreement should also provide a broad framework to govern specific projects and to guide the continuing evolution of the U.S.-China Clean Development Program. Some of the most important elements to be elaborated in the agreement would be:

- A Joint Commission, consisting of a senior official on each side to exercise broad supervisory jurisdiction over CDM projects and make overall policy decisions. The Commission would periodically review and evaluate program results and would make adjustments and adaptations to deal with major problems as they arise. The Commission member from each country would manage and expedite that country's national procedures and actions in support of the CDM program.
- A generalized system for establishing baselines for projects and for computing and allocating credits for emissions reductions generated by a project.
- "Fast track" project approval processes for use in China and the U.S.
- Procedures governing the transfer of expertise, operating methods and technology related to program activities. These procedures could include transfer of knowledge and equipment related to monitoring and evaluating the air pollution effects of new power plants; and
- A dispute resolution process covering not only disagreements between the United States and China but also possible disputes between private investors and either government.

Each of these elements warrants further elaboration.

1. The Joint Commission

In our view, the U.S.-China program cannot succeed without continuous, high level attention from the participating governments. Ideally, each government would designate a senior official whose exclusive responsibility would be the supervision and management of CDM programs. This official would act to energize and stimulate national activities pursuant to the program, break bureaucratic gridlock and bring major policy issues before the head of government for decision. In addition, this commissioner would maintain continuous liaison with the commissioner of the other participating country to ensure smooth coordination and to sort out problems as they arise. The Joint Commission would meet periodically, at intervals that would be determined by the size of the CDM program.

2. Baselines for calculating emission reductions

Under the joint U.S.-China CDM framework proposed here there is no need to compute a national emission baseline for China.¹¹ Instead, an individual baseline would be computed for each power plant in the program based on a projection assuming conventional technologies were used. It might be possible to agree on a "standard" baseline for a "standard" power plant, but efficiencies vary among plants, even within a given technology. In addition, even without foreign investment, China would likely alter its technology-of-choice over time. Thus it would be desirable to make separate baseline

¹¹ As noted above, the KP contains no quantitative commitments as to emissions limitation for non-Annex I countries, like China. The emission limitations for Annex I countries are set at a fixed percentage of a historical emission level, i.e. emissions as of 1990. This approach may be reasonable for industrialized countries, like the United States, which are comparatively rich, have a stable developed industrial base, and face relatively small changes in industrial development during the next few decades. For developing countries, however, any emissions ceiling based on historical performance would imply a cap on economic development and would therefore be unacceptable. An alternative approach to calculating emission reductions in developing countries would be to measure reductions against the projected growth in GHG emissions in the absence of any treaty based limitation effort. This type of baseline would allow for continuing development while simultaneously generating pressure for energy efficient development. There are obvious problems with this method, however, including inadequacies in data and methodology (Edward A. Parson and Karen Fisher-Vanden, "joint Implementation and its Alternatives: Choosing Systems to Distribute Global Emission Abatements and Finance," Environment and Natural Resources Program Paper, April 1997) and incentives to exaggerate economic growth projections and thus projected growth in GHG emissions under business-as-usual. For these reasons, and because it would be impossible to trace the impact of reductions from particular power plants in national aggregates, we rejected the idea of using a national baseline in the U.S.-China Clean Development Program in favor of the individual plant baselines described in the text.

calculations for each project, taking account of the particular circumstances surrounding that plant. Then, emission reductions could be calculated by comparing actual plant performance with that plant's projected emissions baseline.

One of the advantages of confining initial implementation of the CDM to central-station power plants is that China's extensive historical experience with the relevant technology should permit relatively simple and accurate forecasts of the necessary numbers. More accurate projections might be generated over time by an iterative process that could be carried out jointly by the U.S. and Chinese authorities, taking account of dynamically changing technological, economic and climatic conditions. In this paper, a simple approach based on historic performance of the technology is used to calculate baselines for Chinese power plants

3. Fast-track approval

Under the umbrella agreement, a CDM project would require the approval of authorities from both participating countries. It would be desirable for each country to centralize responsibility for expediting this approval process in its member of the Joint Commission. Even if this were done, however, a complex interagency process would be involved on both sides in reviewing and approving investment applications.

Investor and host countries are likely to weigh the various considerations differently in deciding whether to approve project proposals. For example, for this U.S.-China program, the United States would need to satisfy itself that a project is likely to produce real and measurable abatements of GHG emissions that would not occur in the absence of the project. The question whether the project will be cost-effective compared to domestic alternatives would presumably be a decision for the investor. Thus, a simple approval process is feasible. In contrast, China would need to ensure that a project is compatible with national development priorities; transfers significant and desirable financial and technological resources, as well as expertise; and meets or beats applicable environmental standards. Approvals from development, environment and CDM-related authorities at multiple levels of government may be required, often in a context in which the institutional and political relationships among the authorities are unclear to investors.

Previous experience demonstrates that the project approval process – in both the U.S. and China – generates significant transaction costs that can make the difference between success and failure for foreign investment activities. The umbrella agreement for the U.S.-China program should therefore commit both countries to drastic simplifications of domestic approval processes. These simplifications will require far-reaching actions at the national level, discussed in section C below.

4. Technology transfer

In addition to the financial transfers involved in U.S. investment in Chinese power stations, access to expertise and new technologies is an important incentive for the central Chinese government and other actors to participate in the U.S.-China Clean Development Program. The umbrella agreement's guidelines should therefore make clear that an expected element of any project is the transfer both of sophisticated clean coal technology and of the knowledge and skills needed to maximize returns from this technology. Within these guidelines, individual investors would make arrangements with the approving agencies in China for each individual project. These arrangements would be included in the final project proposal and would be a significant factor on which approval of a project proposal would depend.

In terms of environmental gains, reduction of acid rain and air pollution is likely to be of much greater interest to Chinese authorities than is greenhouse gas reduction. Clean coal technology can result in significant improvements in local and regional emissions of air pollutants like SO₂ and NO_x. The present Chinese air pollution monitoring network has many gaps, however, so it is difficult to determine whether technological changes actually improve atmospheric conditions. The U.S. government (through such agencies as the EPA) and investors could increase the salience of these improvements – thereby increasing awareness of the link between air pollution and climate change issues – by providing technical support, equipment and expertise in evaluating and monitoring air pollution and human health effects in the vicinity of new power plants.

5. Dispute settlement

Disputes between the two parties to the umbrella agreement should be settled by consultation and, failing that, perhaps by reference to the appropriate procedures and organs of the KP. Disputes between the investors and the Chinese central, provincial or local authorities are another matter. It is a question for careful further consideration whether the umbrella agreement should contain a commitment to third party mediation and/or arbitration for such disputes.

C. Required Actions by National Governments

Before Kyoto, Parties to the FCCC tried several approaches to cooperative GHG emission reductions. The most important reason for the failure of these prior efforts was the absence of concrete incentives for investor participation. Given the political risks and economic uncertainties, private investors in the Chinese power industry typically have demanded an internal rate of return (IRR) of 17 to 20%. Yet it is difficult to achieve an IRR of that level in the Chinese power industry, due to artificially low electricity tariffs for industrial and residential consumers and the apparent reluctance of the Chinese authorities to allow investments in infrastructure that exceed an IRR of 15%. Thus to have a chance of significant success, the U.S.-China program must provide concrete investment incentives in the form of direct financial rewards and reduced transaction costs, both for initial approval and for subsequent relations with the host country. The first must come from the U.S. government's shaping of domestic environmental policies and GHG abatement regulations. The second must be provided primarily by the Chinese authorities' streamlining of project search and approval processes.

1. Restructuring U.S. investment incentives¹²

The incentive for the United States government to undertake a joint emission reduction program with China is that the U.S. can gain credit for low cost emission reductions against its KP- mandated ceiling on emissions. It is not usually noted in discussions of the subject that these credits at the governmental level do not automatically translate into

¹² Although the U.S. approval process is a good deal simpler than the Chinese, there is considerable room for improvement. A description of the current practice with recommendations for a Clean Development process is found in Appendix C.

financial incentives for private investors. Thus, an essential element of the Clean Development Program must be U.S. national legislation to convert the emissions credits earned by the government into concrete financial incentives for the investor. In effect, these incentives would bridge the gap between the 20 percent plus IRR demanded by U.S. investors and the lower rates available on foreign investment in China

If the U.S. establishes a domestic emissions trading program, as seems presently to be projected, the solution is simple. The government would issue emissions permits to the investor in the amount of the approved emission reductions credited as a result of the project in China. The investor could then either use the permits to cover its own excess U.S. emissions or trade the permits on the market.¹³

In the absence of a domestic emissions trading system, the government would have to provide one (or several) of the more familiar investment incentives to induce investors to favor projects in the U.S.-China program over other direct investment projects. Among the incentives that might be employed are:

- Relief from regulatory obligation to abate these emissions inside the investor country;
- Relief from taxes on carbon or GHG emissions if and when they are imposed;
- Relief from taxes, charges and regulations not connected with controlling GHG emissions (such as ordinary corporate taxes or other environmental regulations);
- Preferential loans, guarantees, governmental purchasing or other advantages in government and capital markets; or
- Direct subsidies.

The choice of instrument depends on considerations of administrative feasibility and political acceptability. President Clinton's budget for FY 199⁹ contains \$6 billion for

¹³ At this moment, rumor has it that the projected U.S. emission trading program will have a built-in price ceiling. If so, the issue of emissions permits to U.S. investors in respect of their Chinese investments may have to be supplemented by other incentives.

incentive to encourage domestic GHG emissions reductions. Any such program could readily be adapted for use with the CDM.

The provision by a country of incentives and subsidies in international trade and investment transactions is regulated by OECD guidelines and to a degree by the World Trade Organization. But it may be argued, however, that the measures discussed above are not strictly speaking subsidies within the meaning of these regulations, but instead constitute payment for services, measured by the value to the U.S. of the carbon saved through CDM projects.

2. Streamlining China's project approval process

The Chinese process for approving cooperative GHG reduction projects and other foreign investments is complex, confusing and opaque. It poses a daunting prospect for anyone contemplating major investment in the Chinese economy. The political and economic changes occurring in China also make it hard to predict the institutional and economic arrangements a future investor will face.

At present, the function of approving cooperative GHG abatement projects is distributed across a number of government agencies and departments, with regard to technical, economic, environmental and political factors. There is no single inter-agency body to bring together all the interested governmental parties. Nor are there published standards which the Chinese authorities are required to consider in approving cooperative, multinational projects. The decision-making stages of the approval process are not easily distinguished, because projects must be referred to various central government agencies and also to provincial and municipal or local governments for approval. It is unclear where the approval process begins and ends.

Currently, potential foreign investors in China's electric power sector must submit an application to the Chinese State Planning Commission (SPC), which is the most important economic and development agency in the central Chinese government. This submission is required for any power sector project involving foreign investment, although in theory, the SPC is only required to consider power plant projects that exceed a certain investment threshold. Applications are then likely to be referred to other central government

agencies, such as the Ministry for Electric Power (which regulates the electric power generation and transmission sector), the Ministry of Foreign Economic Relations and Trade (which oversees joint-venture power projects), or the National Environment Protection Agency (which has become increasingly powerful in policy making since the later 1980s, and which is responsible for overseeing environmental regulations).

At present, the interactions among these bodies are largely unclear to U.S. investors and the U.S. government. In addition, many extraneous considerations may affect the approval process. There was a period during the mid-1990s, for example, when the SPC was reluctant to grant approvals for foreign investment projects with an IRR that exceeded 12 percent. Many projects were therefore held up indefinitely. From mid-1996, however the central Chinese government is no longer officially capping the IRR of projects funded by foreign investment, although there may be a lingering reluctance to allow higher rates. Further, China has doubled the amount of foreign investment that is allowed.

In recent years, the regulatory and institutional landscapes have undergone significant changes, at least at the central government level:

- A new State Power Corporation was formed in January 1997 to take over all the ownership functions of the Ministry of Electric Power. In turn, as a holding company, it owns about 30 provincial and regional power companies, which own local and municipal power companies. Many local, municipal and provincial governments also own power generation facilities, adding to the confusion of the Chinese power sector. Each of the power groups and provincial companies now carry out their own planning and decision-making. They are legal enterprises in their own right and are often the bodies that decide to build a new power plant, and to enter into joint ventures with foreign investors, rather than the State Power Corporation.
- A new State Power Investment Corporation (SPIC), based in Hong Kong, was created in June 1996. To date, the SPIC has been assigned ownership of at least six power generation plants and has begun to broker deals with foreign investors.

- The Ministry of Electric Power is now largely responsible for regulating the power sector and is not supposed to make decisions concerning the approval and construction of new power plants. As a result, the Ministry of Electric Power no longer plans a proprietary role, since its former regulatory, investment and ownership functions have been separated as part of an ongoing corporatization process. There are reports that the Ministry of Electric Power may be abolished during 1998, and its regulatory functions given to other central government agencies.
- A new Electricity Law, enacted in April 1996, created a stronger system for control of pricing to replace part of the previous system in which power tariffs were set arbitrarily by local government bureaus. This law also protected the rights of foreign investors in power generation plants and transmission grids by giving them the right to request local and provincial governments to take up their output into power transmission grids.
- The SPC has drafted regulations to allow new forms of direct foreign investment. In particular, foreign investors can now be majority shareholders in power sector projects, or even own projects outright. Foreign investors can also engage in Build-Operate-Transfer (BOT) projects, in which they build a power plant, operate it for some period of years, and then transfer the operating rights to the owner (usually the provincial or municipal power company). The first BOT project was approved during 1996.

As a result of these recent reforms, the approval process for direct foreign investment has been improved somewhat, but it remains labyrinthine, since many of the approvals must come from the provincial and local or municipal governments. These bodies often still own their own power companies, together with the companies ultimately owned by the SPC and the SPIC. As a result, these bodies often choose to build their own small plants to serve smaller cities and localities.

Investors also need to obtain approvals of both the environmental and developmental aspects of any proposed project. The situation is complicated because central government

agencies no longer necessarily play a driving role in development and economic decision-making. It is the provincial and local governments that now make many of the key development decisions and seek out potential investment opportunities for foreign investors. The local power bureaus participate in the approval process as well as the central agencies. Formerly, provincial and local governments themselves provided the capital for investment, but increasingly, private companies have independent resources. Thus, local development and power bureaus do not necessarily know everything about the projects being planned in their jurisdictions.

Moreover, because environmental laws and policies are largely enforced and implemented at the local level in China, foreign investors may need to negotiate with the local environment protection bureaus (EPBs) to ensure that project proposals undergo environmental impact assessments and are seen to meet environmental standards. The position of EPBs is equivocal, because they are both part of the national system (reporting to the National Environment Protection Agency) and part of the local government system. Typically, EPBs are less able to impose rigorous environmental standards on larger projects, especially if powerful and politically well-connected interests are involved.

Ultimately, the State Planning Commission finalizes approval of any cooperative power industry ventures. (See attached diagram, Appendix A).

Because of the opaque and complicated nature of the Chinese decision making process, high approval and search costs are likely to be incurred, and potential U.S. investors may be deterred from considering cooperative GHG abatement efforts in China. It is clear that significant decreases in these transaction costs will be needed if the U.S.-China program is to make significant headway.

IV. CONCLUSION

Current cooperative GHG abatement efforts, primarily under the aegis of the Activities Implemented Jointly (AIJ) pilot phase, are small-scale and involve minimal investment. None of the major developing countries have participated strongly in these projects. If these countries are to join whole-heartedly in cooperative clean development efforts, they must be assured of massive transfers of technological expertise and financial resources.

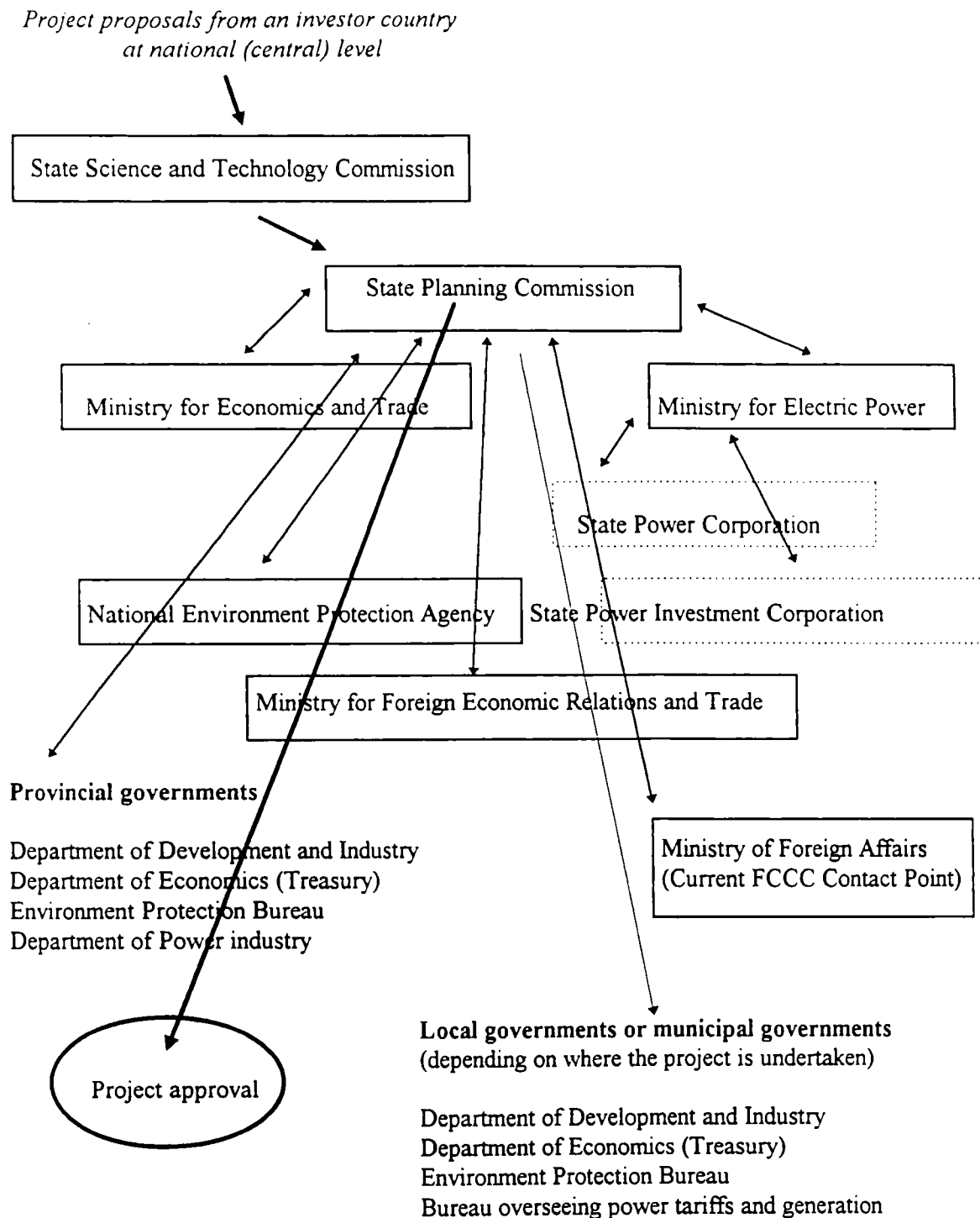
Further, to encourage an influx of private capital, developed countries must create incentives for firms to invest in cooperative projects. The Clean Development Mechanism outlined in the Article 12 of the Kyoto Protocol offers a possible means to meet both goals, but there is not yet a clear, detailed, workable framework for implementing the Mechanism. A number of different approaches to Article 12 have been discussed in general terms. These approaches are by no means mutually inconsistent, and multiple approaches could be followed simultaneously, assuming each meets the requirements of the Article.

As a step toward defining one such approach, this paper proposes a Clean Development Program between the United States and China directed at China's state-owned, coal-fired electricity generation plants. For the purposes of this paper, we assume that both the United States and China will ratify the Kyoto Protocol, and further that the COP will take prompt action at its fourth meeting in Buenos Aires in late 1998 to implement the CMD in accordance with Article 12 of the Protocol. In addition, the program proposed here has the following elements:

- A bilateral umbrella agreement between the U.S. and China;
- Creation of a Joint Commission to oversee the evolution of the U.S.-China investment relationship;
- Creation of economic incentives in the United States to encourage preferential investment in clean development projects; and
- Streamlining of search and approval processes in both China and the United States.

There is a clear need for cooperative, multinational projects aimed at reducing GHG emissions by transferring energy efficient technology to developing countries, especially as the major developing countries are projected to surpass industrialized nations in aggregate annual emissions early in the next century. The U.S.-China program discussed here provides a possible framework for implementing the Clean Development Mechanism quickly and cost-effectively, to foster increased involvement in GHG abatement efforts by both developed and developing nations.

APPENDIX A
THE CHINESE APPROVAL PROCESS FOR AIJ PROJECTS IN THE POWER GENERATION SECTOR



Clean Development Mechanism Design and Operation Options Paper

The Clean Development Mechanism offers the opportunity to generate greenhouse gas emissions credit in 2000. This paper is intended as the initial effort to define the CDM and to help policymakers take decisions on the issues involved in establishing an operational CDM system.

A major difference between the CDM and emissions trading involves the motivations of agents involved in the transaction. Participants in an emissions trading transaction have opposite motivations – one wishes to purchase tons and one wishes to sell; in registering this transaction, each will provide a check on the other. In a CDM transaction, however, both agents in the project have a similar motivation to overstate the CERs generated from a project. Thus, in establishing the mechanisms and procedures that underpin the CDM, it is important to balance incentives – pursuit of cost-effective projects and procedures that result in protection of the environment.

The following sections outline key CDM design and operation issues by topic area. The policy recommendations stress the core objectives of: establishing the CDM on a timely basis; achieving real and verifiable GHG reductions; maintaining low transaction costs; and engaging developing countries. The design and operation of the CDM will determine how the above objectives are met, and greatly influence the environmental effectiveness and equity of this flexibility mechanism. Since the greatest challenge of the CDM is to balance the need for an environmentally credible mechanism with the objective of low transaction costs and bureaucracy, the institutional structure and functions of the CDM will prove critical. For each following topic area, an additional section is included which identifies those policy issues requiring further analysis and discussion to ensure that appropriate policies are developed.

Institutional Structures

The functions of the CDM are to support sustainable development in developing countries and to provide a means for Annex B Parties to reduce the costs of meeting their targets under the Kyoto Protocol. The CDM is subject to the authority and guidance of the Conference of Parties serving as the Meeting of Parties to the Protocol. An Executive Board supervises the CDM and implements guidance provided by the Conference of Parties through the Subsidiary Bodies to ensure transparency, efficiency and accountability by overseeing activities of participating Parties, operational entities, and public/private entities. Operational entities will also play a critical role in the functioning of the CDM, but little consensus has been achieved in terms of who may serve as an operational entity, how they will be approved, and in what order they will carry out their functions. The recommendations below provide some guidance on this matter, however, further discussion is needed to identify and stress the linkages of institutional issues to other methodological and technical aspects of the CDM.

Policy Recommendations:

- **Executive Board Functions:** The Conference of Parties would set overall guidance for the CDM; the Executive Board would implement this guidance and elaborate on methodological, operational and technical issues. In some cases, the Executive Board may need to rely on outside experts or technical panels to develop methodological or technical guidance.

Decisions of the Board would represent the interests of both developed and developing countries. The Board would function as a separate standing body of the COP/MOP and report to the SBI.

- **Executive Board Structure:** A relatively small board would be preferable (e.g., 12-14 members). The CDM Executive Board could draw upon the model of the Executive Committee of the Secretariat of the Multilateral Fund for the Implementation of the Montreal Protocol as an example. In this case, the Executive Board would be comprised of seven members each from Annex I and non-Annex I Parties, each serving two-year terms with the ability to serve consecutive terms. The chair and vice-chair of the Board would alternate each year between the two groups. Nominations of Annex I members would be limited to Annex I Parties; nomination of non-Annex I members would be limited to non-Annex I Parties. Decisions would be made by consensus of the Board. The UNFCCC Secretariat would provide administrative support to the Executive Board.

Policy Issues Needing More Discussion:

- **Operational Entity Functions:** Under the Protocol, operational entities will be responsible for the certification of emission reductions resulting from project activities under the CDM. In order to ensure environmental legitimacy, while maintaining low transaction costs, it may be useful for operational entities to be independent and decentralized but required to use standard, consistent and transparent methodologies in evaluating and certifying projects. Although it would be appropriate for the Executive Board to certify operational entities, it needs to be determined who would develop this criteria for certification and the guidelines used by the operational entities in carrying out their duties. In order to avoid conflict of interest, operational entities which certify project activities, should not be involved in project development, promotion, financing or implementation.
- **Operational Entity Selection:** Operational entities should be qualified to ensure that certified emission reductions (CERs) are credible and selected to ensure broad coverage of all regions. Although efforts should be made to avoid creating new entities, a number of existing institutions may potentially serve as operational entities, including: private sector institutions (e.g., international accounting firms); international financial institutions; other multilateral organizations; or a combination of these (see Annex A). More discussion is needed to determine what institutions may best carry out the functions outlined above, but particular institutions may be ruled out due to opposition from particular Parties. For example, the role of multilateral banks or UN agencies such as UNDP or UNEP should most likely not be considered due to developing country opposition.

Operation of the CDM

The central challenge in developing the CDM is ensuring the environmental integrity of the mechanism without creating an overly burdensome and costly structure. The assessment of emissions additionality will play a key role in resolving this dilemma, since the rigor of the emissions additionality assessment can potentially lead to a failure of the CDM either through standards which are too strict to attract investment or too weak to ensure environmental

credibility. As a result, each stage in the design and operation of the CDM should employ standardized procedures and methodologies to approve and assess projects even if the actual functioning of the CDM is carried out in a relatively decentralized fashion.

Policy Recommendations:

- **Comprehensive Inclusion** - All project categories (reduction and sequestration) and all gases, unless one or more is shown to be ineligible (e.g., because of high potential for leakage from individual projects), should be included. Opinions on inclusion of sinks activities in CDM are divided at this time, and it is unclear if substantial progress will be made by COP6. The USG needs to decide the importance of this policy issue. Policy makers should ensure that the development of positions on sinks works in parallel with the IPCC process on this issue. As for AIJ projects, they should be eligible for CDM certification, however, they must meet the CDM criteria that are eventually established, including additionality criteria.
- **Participation of Parties** - Eligibility to participate in CDM by Annex I Parties should be no less strict than to participate in Annex I trading. There is a need to explore means by which non-Annex I Parties would have eligibility requirements (e.g., compliance with all reporting requirements, submission of National Communication that meets guidelines, establishment of a national inventory in sector proposed for the project).
- **Transaction Relationships** – All transactional relationships should be allowed under the CDM (e.g. bilateral, multilateral, or national governments). In addition, both public and private institutions should be able to participate in project development or CER transactions and non-Annex I Parties and companies should be able to generate CERs without an Annex I partner.
- **Unit of Measure for Certified Emission Reductions** - CERs shall be measured in tonnes of carbon equivalent and be calculated using the appropriate GWP for all gases included in Annex A of the Kyoto Protocol. CERs should be fungible with other tradeable units at their full value. Depending on how CERs are brought into the market and whether CERs can be “decertified”, CERs will need to be serialized to some degree for identification and tracking.
- **Definition of “part of” under the CDM** - “Part of” should mean anything less than 100% of the abatement required by Annex I Parties in order to achieve compliance with Parties’ quantified emission limitation and reduction commitments under Article 3 of the Protocol.
- **Sustainable Development Criteria** – Determination of sustainable development criteria should be the sole responsibility of the host country of a project activity. In order to address any transboundary environmental or socioeconomic effects of a project, a facilitative mechanism could be established. At the same time, it may be prudent not to explicitly state a position on this issue since it may serve as a point of leverage in negotiations.
- **Prompt-Start Approach to the CDM** – It is likely that the CDM may initially move forward in those sectors where experience has already been gained, while other sectors may

not have established baselines or methodologies for calculating reductions. In these cases, methodological or technical problems in any single project category should not hold up inclusion of other project categories for CDM activity. In other words, methodologies do not need to be established for all sectors before the CDM can become operational.

Policy Issues Needing More Discussion:

- **Eligibility Requirements** -- We may need to explore whether it is advantageous to require additional eligibility requirements of non Annex I Parties, who currently have only one requirement – a first National Communication under the FCCC. Some options: should developing countries be Parties to the Kyoto Protocol to participate in CDM or to receive “proceeds?” Should they be required to do regular inventories? The CDM may be the only hook to get developing countries to do more.
- **Project compliance under the CDM** - Further work is needed on project compliance under the CDM. For example, a CDM compliance system may require more than procedures and mechanisms to respond to non-compliance. This may include the development of rules/guidelines for: the certification of projects and certified emission reductions; the activities of the operational entities; reporting; procedures for audit/review of activities of operational entities (including occasional project audits); and the consequences for violations by Parties. These issues will need to be assessed in greater detail.
- **Compliance with Protocol** - With respect to Protocol compliance, the primary concern is parallelism - that is parallel consequences for similar violations, be they under trading, JI, CDM or the bubble. In compliance discussions to date, the question of whether violation of the rules of the flexibility mechanisms should result in any consequences other than restriction/suspension of the right to participate in the mechanism have not been resolved. This issue will need further discussion and evaluation.
- **Policies as Projects** - Policies that lead to project level reductions could also be allowed under the CDM, however, CERs would only accrue from actual project activities that resulted from the policy. Baselines for this type of CDM project may be difficult to develop and verify, may create disincentives for countries to move toward a trading regime, and should be examined in greater detail.
- **Article 12.5a** - Under Article 12.5 of the Protocol, the need for “voluntary participation approved by each Party involved” is noted. The use of “Party” raises the question of whether a country could participate in the CDM before ratifying the Protocol. This would apply to Annex I and non-Annex I countries and should be further addressed due to its legal and political implications, including options for an interim approach for participation in the mechanism. It should be noted that the USG would not need to approve projects developed by private entities. Credits should not accrue to Party, from private entity, until ratification and application of assigned amount.
- **Use of ODA and/or Public Funds** – Although there is a general consensus that ODA should not be used for purchasing credits, a policy position should be made on whether ODA/Public Funds can be used for CDM projects. Although the bulk of CDM financing will mostly

likely come from private sources, these funds may be used in various ways to finance or provide support to CDM project development. A decision should be made regarding the extent to which these types of funds may be used in the context of the CDM and under what circumstances. This issue is particularly important since Japan strongly supports the use of ODA, while the EU (France in particular) opposes its use. Developing countries are particularly sensitive about reprogramming ODA away from traditional uses.

- **Verification of Reductions** – Verification is a critical step within the stages of a CDM project since it ensures the environmental legitimacy of the flexibility mechanism. A number of issues should be addressed at this point, including: who should serve as a third party verifier; what criteria should be used; what kind of an appeal process should be established; when, how, and at what frequency should verification occur; and should CERs be invalidated if project emissions are not verified.

Baselines and Benchmarking

Methodologies for calculating emission reductions will be critical to the CDM. Standardized methodologies for generating baselines (including the use of benchmarks) may provide a streamlined approach for assessing reductions from project activities. Baselines used in calculating these reductions can be developed on a project-by-project basis (bottom-up) or through a more standardized benchmarking approach (top-down). In the interest of minimizing transaction costs, top-down baselines (e.g., benchmark, performance standard, whole-sector, technology standard) should be included as an option for project assessment. In the initial stages of project development, the appropriate baseline for the project will be established during the registration of the project. Once a project is registered, its baseline becomes fixed for the lifetime of that project.

Policy Recommendations:

- **Project Registration** – In advance of actual project initiation, projects will be registered with an authorized operational entity to confirm that the project is voluntary, meets sustainability goals of the host country, and is additional. At the same time, project registration would identify the baseline or benchmark to be used for the ex-post calculation of credits. Actual emissions reductions would be certified by operational entities only after they accrue. This step removes most elements of uncertainty for the investor other than actual project performance.
- **Choosing a Baseline or Benchmark** – Flexibility should be provided to project developers in developing a bottom-up baseline for determining additionality and calculating emission reductions. At the same time, if a top-down baseline based on benchmarks has been established, a project developer/host should be required to use that baseline for their calculations.
- **Additionality** – Unlike criteria established under the USIJI program, programmatic and financial additionality should not be included in CDM project criteria for projects relying on private capital. This recommendation is supported by experience in the USIJI, which

indicated that both of these categories of additionality are subjective, or are too complicated to determine. Therefore, only emissions additionality should be assessed in the registration phase of the project development.

- **Rate-Based Calculations** – In some cases, baselines established during the registration phase of a project activity may be set as a rate, with the absolute quantity of CERs calculated after the reductions have accrued as the rate times the quantity of activity. For example, a project may need a rate-based calculation if it is unsure of the total production expected under actual project activity.

Policy Issues Needing More Discussion:

- **Level of Aggregation** - In order to minimize the costs and difficulties, top-down baselines should be set at the highest level of aggregation that still provides reasonable accuracy. In this context, greater definition of “sector” and “sub-sector” is needed as well as greater analysis to see in what sectors country, regional or global baselines may be feasible. The question of who develops the level of aggregation and the data one uses to assess a sector will also be critical to ensuring the quality and legitimacy of the baselines.
- **Period for Earning CERs** – More analysis is needed to determine what the appropriate period for earning CERs may be for a given project. Although CERs can be accrued against the agreed baseline for a given amount of time, this time frame is likely to vary depending on project type. Timeframe options could be based on the following criteria: capital lifetime (estimated or actual); budget periods within the protocol; average time for capital recovery; or other factors. It may also be useful to consider the accuracy of a benchmark over time in the given sector, when evaluating the period for earning credits.
- **Key Characteristics of a Top-Down Baseline** – Further discussion is needed to determine what the key characteristics of a top-down baseline should be. For example, the baseline for project types or sectors should mostly likely be updated for new projects, perhaps with periodic (e.g., 3-5 year) recalculations or as a rolling average of a given interval (e.g., rolling 5-year averages) recalculated annually. Under this recalculation, baselines (both bottom-up and top-down) will tend to decline at some rate, based on projections of improvement. However, there may be important exceptions to this trend that should be accounted for in particular sectors or countries.
- **Marginal versus Average** - The data used to create a benchmark is a major determinant of the credits allowed under the benchmark. Two key choices are between (1) marginal and total capacity and (2) average and ‘better-than-average’ choices. Marginal capacity is more likely to be representative of current trends than total capacity. Better-than-average benchmarks (e.g. top 10%, expected new technology) are likely to create a more solid incentive and allow less free riders than an average baseline which, by definition, would allow half of the existing projects to qualify for credits. The decision of which choices to employ will significantly impact the functioning of the CDM and should be analyzed in greater detail.

- **Design of Top-Down Baselines** – The design of top-down baselines will require greater analysis and discussion. One option for discussion would be deriving these baselines from recent historical data (e.g., the last 5 years), but aiming to approximate what the “next” unit of investment would be (e.g., the project on the margin). Projections may also be useful in checking the validity of baselines established using recent historical data.
- **Who Establishes Baselines** – Although the development of baselines should be based on standardized and transparent methodologies, there is the question of who develops and establishes the benchmark or baseline, and whether a decision on a particular baseline can be appealed by either the investor, host or a third party. This issue will need to be resolved both for project-by-project baselines and top-down baselines. In both cases, an independent review process may be necessary to ensure that baselines are methodologically sound, credible, and verifiable.

Equity Concerns

As a market based mechanism, the CDM will provide low cost opportunities for GHG reductions while simultaneously promoting the flow of private capital toward CDM projects in less developed nations. Since the vast majority of finance for CDM projects will be private, the distribution of projects will be determined in large part by the market. At the same time, there is a fear among many developing countries that virtually all projects will be developed in countries where investment is already going, or where abatement costs are very low (e.g. China). In order to address this equity concern, CDM policies may need to be developed to ensure broad participation of developing countries under this flexibility mechanism.

Policy Recommendations:

- **Measures to Ensure Broad Participation** –To promote broad inclusion of CDM projects and host countries, non-market distorting measures can be taken such as: creation of a clearinghouse function under the CDM to match hosts with potential investors; inclusion of a comprehensive range of project types; and provision of technical assistance to host countries interested in hosting projects. Many related issues arise for each option, for example if a clearinghouse function is envisioned, who should perform this role?
- **Measures to Assist Financing** - Project bundling for smaller countries or the creation of CDM “mutual funds” led by private sector institutions may provide unique opportunities to facilitate financing of projects in countries where they may otherwise not occur.
- **Projects Initiated by Developing Countries**– In addition to hosting CDM projects using financing from project developers, non-Annex I countries may unilaterally develop CDM projects in their country or in another non-Annex I country. CERs generated from this project activity may be either traded or banked for use against future commitments. Standardized registration criteria as well as monitoring, verification and certification protocols would be used for assessing these projects. In addition, unilaterally generated projects would be subject to the CDM administrative and adaptation fees.

Policy Issues Needing More Discussion:

- **Other Incentives:** In addition to the above options, other financial incentives may also be used to ensure regional dispersion of CDM projects. Quotas, differentiated baselines, and CER bonuses for projects in particular regions may encourage project development in countries where CDM investment would otherwise not occur. The advantage of these incentives are that they send a clear message to developing countries that there is a genuine commitment to regional equity under the CDM, and would most likely achieve the desired result of broad geographic dispersion of projects. At the same time, these policies may raise costs, promote activities where abatement costs are not low, and distort the market functioning of the CDM.

Division of CERs and Share of Proceeds

Certified Emission Reductions (CERs) will be generated by each project. As a commodity with market value, CERs may be traded, sold or banked for future use by both Annex I and non-Annex I Parties. CERs should be issued after the reductions have accrued and been verified by independent auditors on an annual basis. After a percentage of CERs is taken to cover CDM administrative costs and the fund for adaptation, the remainder shall be apportioned between the project host and developer based on private arrangements. Operational entities will be responsible for the certification of these credits and report total CERs issued to the Executive Board for each project.

Policy Recommendations:

- **Share of Proceeds** – A 1-3 percent share of CERs generated by project activities will be allocated for administrative costs of the Executive Board and toward the adaptation funds to support activities in the most vulnerable countries. The majority of this share should go towards the adaptation fund since administrative costs of the Executive Board are expected to be minimal. This allocation will be based on the percentage of total CERs generated by a particular project in a given year, not on their market value or on the estimated value of the project itself. A sliding scale, depending on project size, may also be considered for determining the CER share charged to projects. For any system, a decision will need to be made on who distributes these funds.
- **Use of Adaptation Funds** – This share of proceeds will be used to assist developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation. The selection of particularly vulnerable countries will be based on standardized criteria to be agreed upon by the Executive Board. The disbursement of these funds may be conducted through appropriate international institutions.
- **Role of Private Entity** – The CER share awarded to the investor and the host shall be determined by private contract between the investor and the host country Party. These CERs shall be the property of each private party and may be held for future use, traded, or sold.

U.S. Environmental Protection Agency
Office of Policy
401 M Street, SW (MC 2175)
Washington, DC 20460

facsimile transmittal

To: Assistant Secretary Climate Group Fax:

From: David Gardiner Date: 02/09/99

Re: Revised Draft of CDM Options Paper Pages: 10
for Discussion at Wednesday Meeting

CC: [Click here and type name]

☐ Urgent ☒ For Review ☒ Please Comment ☐ Please Reply ☐ Please Recycle

Attached please find two documents for your review:

- Revised draft of the CDM options paper. In order to focus discussion, the paper only addresses those issues covered in the last meeting (institutional issues) and other key issues which need to be addressed in Wednesday's meeting. These include Equity Concerns (paragraph 2), Use of ODA (paragraph 2g), and CDM as Lever for Developing Country Engagement (paragraph 3). The last page includes a final recommendation that the remainder of issues be delegated to a staff level interagency group for further analysis. It is also proposed that this group establish a timetable for producing clear recommendations on each of these issues.
- A redraft of the benchmark paper. This paper outlines implications of key policy decisions related to benchmarking. This paper is not intended to drive decisions for each issue, but to provide a framework to define priorities for benchmarking outcomes.

Annex I?
Annex B?

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Clean Development Mechanism Design and Operation Options Paper

The Clean Development Mechanism (CDM) offers the opportunity to generate greenhouse gas emissions credit beginning in the year 2000. This paper is intended as an initial effort to define the CDM and to help policymakers take decisions on key issues involved in establishing an operational CDM.

A major difference between the CDM and emissions trading involves the motivations of agents involved in the transaction. Participants in an emissions trading transaction have complementary motivations – one wishes to purchase tons and one wishes to sell; in registering this transaction, each will provide a check on the other. In a CDM transaction, however, both agents in the project may have a similar motivation to overstate the Certified Emission Reductions (CERs) generated from a project. Thus, in establishing the mechanisms and procedures that underpin the CDM, it is important to balance incentives – pursuit of a sufficient number of cost-effective projects and procedures that result in protection of the environment. Policy choices made will impact where on the spectrum our position falls relative to these two distinct, though not necessarily mutually exclusive, objectives. Identifying this position will also influence to what extent the U.S. should lead internationally on CDM issues versus allowing the agenda to be developed by other Parties.

The following sections outline key CDM design and operation issues by topic area. The policy recommendations stress the core objectives of establishing the CDM on a timely basis; achieving real and verifiable GHG reductions; maintaining low transaction costs; and engaging developing countries.

1. Institutional Structures

The institutional structure of the CDM should support sustainable development in developing countries and provide a means for Annex B Parties to reduce the costs of meeting their targets under the Kyoto Protocol. An Executive Board supervises the CDM and implements guidance provided by the Conference of Parties through the Subsidiary Bodies to ensure transparency, efficiency and accountability by overseeing activities of participating Parties, operational entities, and public/private entities. The recommendations below provide specific guidance on key institutional aspects of the CDM.

Policy Recommendations:

(1a) Executive Board Functions: The Conference of Parties would set overall guidance for the CDM; the Executive Board would implement this guidance and elaborate on methodological, operational and technical issues. In some cases, the Executive Board may need to rely on outside experts or technical panels to develop methodological or technical guidance. Decisions of the Board would represent the interests of both developed and developing countries.

(1b) Executive Board Structure: A relatively small board would be preferable (e.g., 12-14 members). The CDM Executive Board could draw upon the model of the Executive Committee of the Secretariat of the Multilateral Fund for the Implementation of the Montreal Protocol as an

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example. In this case, the Executive Board would be comprised of seven members each from Annex I and non-Annex I Parties, each serving two-year terms with the ability to serve consecutive terms. The chair and vice-chair of the Board would alternate each year between the two groups. Nominations of Annex I members would be limited to Annex I Parties and nomination of non-Annex I members would be limited to non-Annex I Parties. Decisions would be made by consensus of the Board. The UNFCCC Secretariat would provide administrative support to the Executive Board.

(1c) Operational Entity Functions: Under the Protocol, operational entities will be responsible for the certification of emission reductions resulting from project activities under the CDM. In order to ensure environmental legitimacy while maintaining low transaction costs operational entities would use standard and transparent methodologies in evaluating and certifying projects. The Executive Board would develop these guidelines and ensure that they were being followed through periodic evaluation of these entities.

(1d) Operational Entity Selection: Operational entities should be qualified to ensure that CERs are credible and selected to ensure broad coverage of all regions. A decentralized network of specialized private sector institutions may best serve these needs, but all efforts would be made to ensure that standardized criteria is used by the entities for evaluating all projects and certifying CERs. Strict measures would be taken to ensure no conflict of interest among participating institutions. These guidelines would clearly restrict any operational entity from involvement in CDM project development, promotion, financing or implementation.

2. Equity Concerns

As a market-based mechanism, the CDM will provide low-cost opportunities for GHG reductions while simultaneously promoting the flow of private capital toward CDM projects in less developed nations. Because the vast majority of financing for CDM projects will be private, the distribution of projects will be determined in large part by the market. At the same time, there is a fear among many developing countries that virtually all projects will be developed in countries where investment is already going, or where abatement costs are very low. In order to address this equity concern, the structure of the CDM and related policies can be developed to ensure broad participation of developing countries in this flexibility mechanism.

Policy Recommendations:

(2a) Comprehensive Inclusion – Comprehensive inclusion of project categories (reduction and sequestration) and all gases, unless one or more is shown to be ineligible (e.g., because of high potential for leakage from individual projects), will promote broader participation in the CDM. Although the U.S. has supported the inclusion of sinks (a controversial position), the development of a position on sinks should work in parallel with the IPCC process on this issue. All projects should be eligible for CDM certification, however, they must meet established CDM criteria.

(2b) Measures to Ensure Broad Participation - Broad inclusion of CDM projects in a range of host countries may be achieved through non-market distorting policy measures. These measures include: the creation of a CDM clearinghouse function to match hosts with potential investors;

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the inclusion of a comprehensive range of project types; and the provision of technical assistance to host countries interested in hosting projects.

(2c) Measures to Assist Financing - Project bundling for smaller countries or the creation of CDM “mutual funds” led by private sector institutions may provide unique opportunities to facilitate financing of projects in countries where they may otherwise not occur. Valuing CERs from select countries at a higher rate may improve investment flows as well.

(2d) Projects Initiated by Developing Countries– In addition to hosting CDM projects using financing from project developers, non-Annex I countries may unilaterally develop CDM projects in their country or in another non-Annex I country. CERs generated from this project activity may be either traded or banked for use against future commitments. Standardized registration criteria as well as monitoring, verification and certification protocols would be used for assessing these projects. In addition, unilaterally generated projects would be subject to the CDM administrative and adaptation fees.

Policy Issues Needing More Discussion:

(2e) Other Incentives: In addition to the above options, other financial incentives could be used to ensure regional dispersion of CDM projects such as quotas, differentiated baselines, and CER bonuses. Although useful, these policies may raise costs, promote activities where abatement costs are not low, and distort the market functioning of the CDM. A decision should be made on whether incentives should be considered despite their effects on the functioning of the market.

(2f) Policies as Projects - Policies that lead to project-level reductions could also be allowed under the CDM, however, CERs would only accrue from actual project activities that resulted from the policy. Baselines for this type of CDM project may be difficult to develop and verify, and create disincentives for countries to move toward a trading regime. A decision should be made on under what specific circumstances policies may be included under the CDM, and the requirements needed to transparently assess resulting additional reductions.

(2g) Use of ODA and/or Public Funds - Although the bulk of CDM financing will come from private sources, these funds may be used in various ways to finance or provide support to CDM project development. The context and circumstances under which these funds are used need to be identified. This issue is particularly important since Japan strongly supports the use of ODA, while the EU opposes its use. Developing countries are also particularly sensitive about reprogramming limited ODA away from traditional uses.

3. CDM as Lever for Developing Country Engagement

The CDM is unique in that it engages both Annex I and non-Annex I Parties in project activities. Although it is the U.S. position that Annex I Parties must necessarily be in compliance with Article 5 and 7 of the Protocol to use flexibility mechanisms, there is no policy position on requirements for CDM participation of non-Annex I countries. Additionally, the Kyoto Protocol does not clearly state eligibility requirements/compliance measures for non-Annex I Parties.

DRAFT – Do Not Cite or Quote – 2/9/99**Policy Recommendations:**

(3a) Eligibility Requirements - Additional CDM eligibility requirements of non-Annex I Parties should be explored as a means to ensure that the CDM helps to move developing countries to further commitments and toward participation in a trading regime. Currently only the requirement of a first National Communication under the FCCC exists. Other options include: developing countries be Parties to the Kyoto Protocol to participate in CDM or to receive proceeds; or, the requirement to do regular inventories in those sectors where CDM projects are taking place.

4. Issues Recommended for Review under an Interagency Process at the Staff Level

A large number of outstanding issues related to the CDM still need to be reviewed at the staff level. It is proposed that the following list of issues not be raised to the Assistant Secretary level at this time, but delegated to an interagency staff working group for discussion and technical analysis. This group should also establish a timetable for producing a set of recommendations on each of these issues.

CDM Eligibility and Compliance Issues

- Participation of Parties
- Independent Auditing and Verification
- Transaction Relationships
- Definition of “part of” under the CDM
- Sustainable Development Criteria
- Project compliance under the CDM
- Compliance with Protocol

Baselines and Benchmarking

- Project Registration
- Choosing a Baseline or Benchmark
- Additionality
- Prompt-Start Approach to the CDM
- Level of Aggregation
- Period for Earning CERs
- Key Characteristics of a Top-Down Baseline
- Marginal versus Average
- Design of Top-Down Baselines
- Who Establishes Baselines

Division of CERs and Share of Proceeds

- Unit of Measure for Certified Emission Reductions
- Share of Proceeds
- Use of Adaptation Funds
- Role of Private Entity

Issues Associated with Creating Effective Benchmarks for the CDM

February 10, 1999

Background

Project-level greenhouse gas (GHG) emissions reductions have historically been evaluated using project-by-project baselines. Under this approach, the project developer evaluates what would have happened without the project and then estimates resulting emissions from this project. The difference between these two numbers is the net GHG reductions or removal from the project. Experience with US LJ has indicated that this process is extremely time intensive and can be quite subjective. It is difficult to estimate what would have happened in the absence of the project and assumptions made can be manipulated by the parties involved. Establishing a more straightforward method to determining additionality would lower transaction costs and streamline the crediting process.

Benchmark Concept:

Benchmarks can be used to determine certified emission reductions resulting from projects within the Clean Development Mechanism (CDM). The purpose of benchmarks, rather than project specific counter-factual baselines is to lower transaction costs and reduce subjectivity. Any project that is more efficient than the benchmark will be considered additional. Certified emission reductions (CERs) can be determined based on the difference between the benchmark and the project performance.

Benchmark Development:

Once guidelines are established, developing the benchmark could be quite straightforward. Agreeing upon the guidelines, however, may be a difficult process. There are few clear answers and most decisions will entail a trade-off between competing goals. EPA has evaluated the options theoretically and by using real data for selected developing countries. This analysis can help frame the trade-offs and the implications of different choices. Additional analysis is needed to choose the appropriate method that will help the U.S. meet its environmental and economic priorities within the CDM.

The main characteristics of an effective CDM benchmark will be:

- High Environmental Integrity. A benchmark will have high environmental integrity if it allows minimal non-additional credits.
- Low Transaction Costs. Creating a benchmark will incur some costs that can be added to the overall transaction costs of the CDM. The fewer permutations needed, the lower the cost of the benchmark system. In the following graphs, 'high' means that the option ranks well for low transaction costs (i.e., has relatively low transaction costs).
- High Participation. High participation in CDM will allow more tradeable credits and therefore reduce the overall cost of compliance with the Kyoto protocol.
- High Investor Certainty. Theoretically, CDM credits will provide incentives to reduce emissions. Prior to making an investment, the investor will want to increase his or her certainty of the amount of credits that will eventually be awarded.
- Incorporates New Technologies and Trends. New technologies and trends may change our estimate of what would have occurred in the absence of CDM credits.

The following paper outlines some of the choices and the associated trade-offs among the above goals.

Issues and Trade-offs

Global versus Regional Benchmark

More regionally-specific benchmarks may lead to higher accuracy, but also higher transaction costs. Equity issues between countries may also be a consideration.

	Global Benchmarks	Country-specific Benchmarks
Environmental Integrity	Low	High
High Participation	No Impact	No Impact
Low cost to create benchmark	High	Low
Investor Certainty	No Impact	No Impact
Incorporating New Technologies or Trends	No Impact	No Impact

Average versus Better-than-average data

A benchmark can be set at either an average or a better than average level. The associated trade-off is between environmental integrity and high participation.

	Average	Better-than-average
Environmental Integrity	Low	High
High Participation	High	Low
Low cost to create benchmark	No Impact	No Impact
Investor Certainty	No Impact	No Impact
Incorporating New Technologies or Trends	No Impact	No Impact

The benchmark could be set at a range of better-than-average benchmarks. For example: the best 25th percentile, the best 10th percentile, the last most efficient unit, the best available technology/practice. As you move toward more strict benchmarks, you risk less participation. The magnitude of trade-offs among these choices will also depend on how each sector is aggregated. For example, in the U.S. electricity sector, the best 25th percentile is zero emissions (due to the high portion of hydro and nuclear). This problem would be less severe if you used a fossil only benchmark.

Frequency of Benchmark Updates

Benchmarks will need to be periodically updated to account for new technologies and trends. The frequency of these updates depends on the relative value of higher costs as opposed to the accuracy of benchmarks. More frequent updates will increase the cost of benchmarks. Infrequent updates will not account for new technologies and trends. Note that this is not necessarily a matter of environmental stringency since carbon efficiencies within a sector do not necessarily go down over time.

	Every 10 years	Every year
Environmental Integrity	Low	High
High Participation	No Impact	No Impact
Low cost to create benchmark	High	Low

Investor Certainty	High	Low
Incorporating New Technologies or Trends	Low	High

Note: Incorporating New Technologies is ranked low because projects may take a while before they begin operation. Longer periods between updates may allow a project to apply under the benchmark that exists during the initial stages of project development (prior to benchmark lock-in)

Length of Time that A Given Benchmark Applies to a Project

Benchmarks will be revised periodically. The benchmark will apply to the project for a given amount of time. The length of time that a project is measured against its initial benchmark will affect the level of investor certainty about how many credits the project may yield. Allowing benchmarks to apply to the lifetime of the project may continue to credit obsolete equipment that should be retired. Applying each new update to a given project lowers the investor certainty of the number of credits.

	Actual Lifetime of Project	Until New Update
Environmental Integrity	Low	High
High Participation	High	Low
Low cost to create benchmark	No Impact	No Impact
Investor Certainty	High	Low
Incorporating New Technologies or Trends	Low	High

Additional choices may provide a good compromise between allowing

- *Benchmark applies to estimated capital recovery of project.* This would provide the incentive to upgrade technologies once the investment is paid off, however, it is unlikely that the promise of new credits will prompt capital turnover prior to some profit yield.
- *Benchmark applies to estimated lifetime of project.* Each project and technology has an estimated lifetime. The estimated lifetime could be determined at the pre-certification phase.

Level of Sectoral Disaggregation

The appropriate level of sectoral disaggregation will vary by sector. Higher sectoral aggregation will lower the cost to develop the benchmark, however, highly aggregated sectors may not create the correct incentive. For example, China's electricity is largely coal and hydro. Establishing a benchmark for all fossil fuel will create one line for a bi-modal distribution. This would credit all hydro (whether additional or not) and create a benchmark that is too stringent for the cleanest coal to qualify.

	Aggregate	Disaggregate
Environmental Integrity	Low	High
High Participation	Undetermined	Undetermined
Low cost to create benchmark	No Impact	No Impact
Investor Certainty	High	Low
Incorporating New Technologies or Trends	Low	High

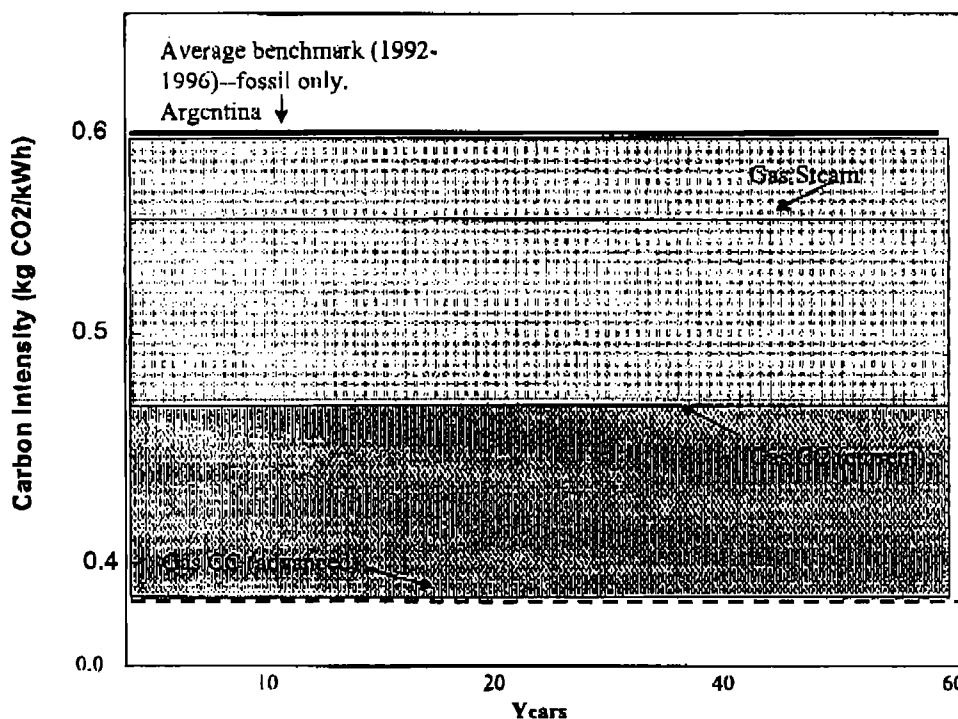
EXAMPLES

The following are two examples of benchmarks in the electricity sector and a brief discussion of the related trade-offs.

Benchmark #1:

- By country (example: Argentina)
- Average of last 5 years of capacity additions
- For fossil only
- Updated every 10 years
- Benchmark lasts for the lifetime of the project

Benchmark Example #1: Argentina



In this example, the number of credits allowed for a current technology combined cycle are illustrated by the checked box. Argentina's new capacity is likely to be gas combined cycle regardless of CDM. This would mean that most of the awarded credits for this project are not really additional. Using a fossil only benchmark increases the overall benchmark above many new natural gas technologies since Argentina's historic mix for the 5 year period includes oil. Also, allowing the credits to be awarded for the lifetime of the project exacerbates the number of non-additional credits. If capital recovery occurs at 20 years, then these credits may be sustaining an inefficient plant (in comparison to modern technologies) for an additional 30 - 40 years.

The darker box illustrates the additional credits that may be gained by moving from a typical natural gas combined cycle to an advanced model. A combined cycle natural gas plant would accrue the additional credits, plus all the non-additional credits in the above box. Although some of these credits are additional for the time the capacity was built, the plant may not be carbon efficient compared to future electricity generation options. Extending the life of the benchmark to the full life of the plant

may help keep an obsolete plant in operation.

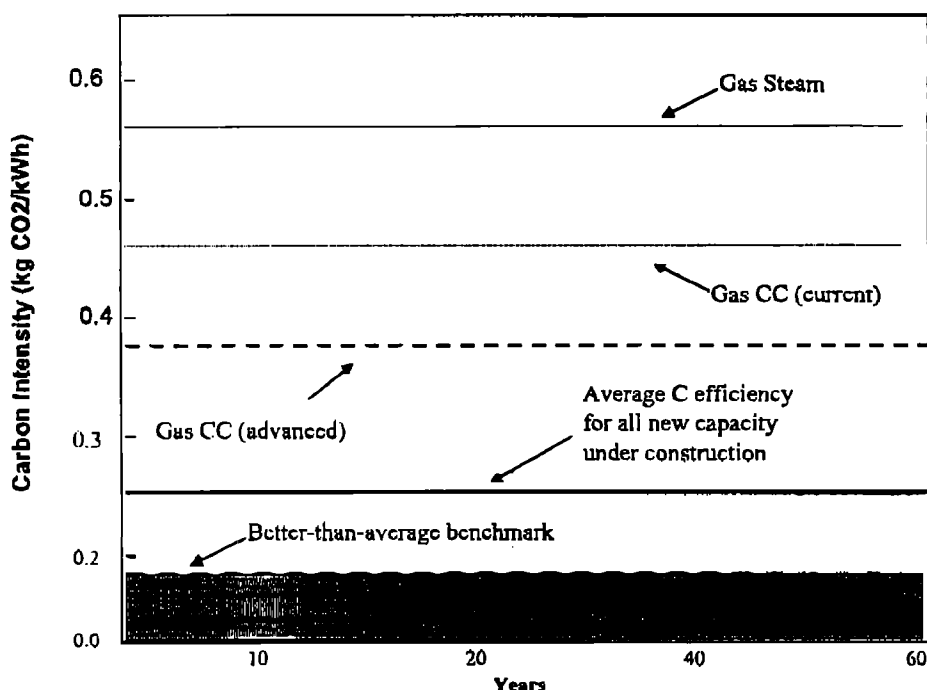
Since this benchmark is fossil only, large-scale hydro and nuclear don't apply and therefore the amount of non-additional credits is limited to the upper box.

If the benchmark is updated every 10 years, then the number of non-additional credits will continue to flood the market. While additional credits lower the overall cost of compliance for Annex B countries, they also lower the environmental effectiveness of the Kyoto Protocol.

Benchmark #2:

- By country (example: Argentina)
- Better than average of new capacity additions under construction
- For all generation (all types of fossil, all zero-carbon)
- Updated every year
- Benchmark lasts until capital recovery

Benchmark Example #2: Argentina



Benchmark #2 is so environmentally stringent that even the most advanced and carbon efficient fossil technology does not get credit. Under this benchmark, only zero-carbon technologies are credited. It is unclear whether these technologies are additional or not since Argentina already has significant portions of hydro and nuclear. In this case, even if the benchmark is set at the average carbon efficiency for all new capacity under construction, it would still be lower than most carbon-efficient fossil technology. In this case, the driving factor is the mix of zero-carbon technologies in an average electricity benchmark.

The benchmark is updated every year which will increase the cost of creating a benchmark to which very few projects will qualify.

Since the benchmark for each project is only applicable until the point of capital recovery, any non-additional emissions from hydro or nuclear will be limited.

BASELINES:
The Potential for Using Benchmarks to Determine Additionality
in the Clean Development Mechanism

Background

Project-level greenhouse gas (GHG) emissions reductions have historically been evaluated using project-by-project baselines. Under this approach, the project developer evaluates what would have happened without the project and then estimates resulting emissions from this project. The difference between these two numbers is the net GHG reductions or removal from the project. Experience with US IJI has indicated that this process is extremely time intensive and can be quite subjective. It is difficult to estimate what would have happened in the absence of the project and assumptions needed can be manipulated by the parties involved. Establishing a more straightforward method to determining additionality would lower transaction costs and streamline the crediting process.

Benchmark Concept:

Benchmarks can be used to determine certified emission reductions resulting from projects within the Clean Development Mechanism (CDM). The purpose of benchmarks, rather than project specific counter-factual baselines is to lower transaction costs and reduce subjectivity. Benchmarks would create a rate-based baseline for an entire sector. Any project that is more efficient than the benchmark would be considered additional. Certified emission reductions (CERs) can be determined based on the difference between the benchmark and the project performance.

Policy Issues and Options:

General (applies to all sectors):

- Should the benchmark be based on total past emissions or new capacity? Some countries have remained consistent over time, however new capacity in other countries is completely different than past trends. For example, historically, Argentina's electricity generation was largely oil based. However, recent trends are toward natural gas and large-scale hydro. Since the additionality criteria applies to what would have happened next, current trends (e.g., new capacity additions) are more applicable.
- Should the benchmark be based on historical average, projections, or normative values? Normative values (e.g., percentile approach, BAT, etc.) are likely to create the most effective benchmark. A historical 'average' benchmark would allow any project that has better than average carbon intensity to qualify for CDM credits. By definition, this would allow half of the existing production in any given sector to qualify as additional. Projections, while correct in intent, rely on many factors that are difficult to predict. Projections can vary not only in magnitude, but directionally as well.
- Updating the benchmark. The benchmark established for any given year will provide the baseline for the lifetime of a project that qualifies for the CDM in that year. Updated benchmarks for future projects, however, will be needed to account for new trends and technologies. The intervals in which benchmarks are updated will depend largely on the level of effort needed to create the benchmarks. If the cost is high, then the intervals between updates will be longer. It is possible to tighten the benchmarks using an automatic deflator to account for technology improvements. However, the trends in developing countries have not suggested that efficiencies historically improve over time. Decreasing the benchmark between updates, however could create the correct incentive for efficiency improvements.

Sector Specific:

- Which sectors are most conducive to Benchmarks? Sectors that are most conducive to benchmarks have a homogenous output, quantifiable reductions, and available data. It is also important that these sectors attract enough CDM projects to warrant the cost of creating a benchmark. Electricity, some industrial demand sectors, energy supply (e.g., natural gas pipelines or coal mining methane recapture), residential appliance may qualify for benchmarks. Land use change and forestry are sectors that needs further investigation. See chart below for further explanation.
- Level of Aggregation for the sector. Benchmarks could be created at various levels of aggregation for a given sector. Disaggregation leads to more precision, but at a greater cost. The level of aggregation will vary among sectors, however, there is often too much dispersion within individual sectors to aggregate across an entire sector. For example, electricity generation in China is mostly coal and hydro. A fully aggregated benchmark would incorporate all the hydro (~25% of new capacity from 1992-1996), and therefore be below any possible efficiencies for coal-based production. In this case, two benchmarks may need to be developed in order to appropriately reflect efficiencies for both coal and hydro within the electricity power generation sector.
- Should the benchmark be global or regional? For the electricity sector, regional (e.g., country specific) benchmarks are likely to be more effective. Each country will have some electricity production, however, the available resources and existing infrastructure will vary among countries. If a global benchmark is created for historical marginal capacity, all electricity production from some countries would be considered additional. Global benchmarks for the electricity sector could be effective if the benchmark is technology-fuel based (e.g., coal benchmark). In this case, incentives for lower-carbon fuels could be provided by looser benchmarks or by discounting credits for high carbon intensive fuels.

Commodity-based sectors (e.g., iron and steel), although also varying greatly between countries, have more tradeable products. Therefore, it may make more sense to have global commodity benchmarks to encourage production in more energy-efficient countries. Global commodity benchmarks would also allow more disaggregation without higher costs.

The following table outlines how baselines may be formulated for potential CDM sectors. Our analysis has relied on existing data. Time constraints have precluded intense host country cooperation or capacity building. Data quality could improve with a clear incentive (CDM credits) and host country cooperation.

To date, EPA's work has focused primarily on the electricity sector, followed by energy supply and industrial demand. Recommendations on other sectors are preliminary. Additional analysis is necessary to allow for more concrete recommendations.

Sector	Sub-Sector (Level of Aggregation)	Type of Baseline	Regional or Global	Discussion
Electricity Generation (Data Quality: Good)	Fossil Fuel	Benchmark	<u>Regional</u> : If benchmark applies to total fossil fuel. <u>Global</u> : If specific for fossil fuel (e.g. coal benchmark, oil benchmark, natural gas benchmark).	Some countries (e.g., Argentina, Thailand) use different fossil fuels for electricity generation. In these cases, one benchmark may create an incentive for fuels with moderate carbon intensity, but low carbon fuels would automatically qualify (without really being additional). High carbon fuels would not be close enough to create an incentive to be more efficient. Therefore, global fuel-specific benchmarks may be more appropriate, however, they would not create any incentive for fuel switching. The key determinant in setting the benchmarks is the elasticity of substitution between different types of fossil fuels in most developing countries.
	Emerging Renewable	Benchmark	Global	One global benchmark for all emerging renewables would create an equal incentive for projects regardless of the location. In addition, one benchmark is less onerous to create.
	Large-scale Hydro and Nuclear	Project Specific	--	Large scale hydro and nuclear should not be completely excluded from CDM since each has significant potential to reduce GHG emissions. However, including them in a benchmark creates additionality problems since many countries already have significant portions of large-scale hydro and nuclear. For example, just under half of electricity projects under construction in 1996 in China are large-scale hydro. All of these would qualify under any benchmark since they result in zero emissions.

Sector	Sub-Sector	Type of Baseline	Regional or Global	Discussion
Fossil Fuel Supply (Data Quality: See Subsector)	Coal bed methane <u>Data Quality:</u> Good, but since there have not been many projects, it may not be a representative sample	Benchmark or Project Specific	Depends on method	Benchmarks could be either: (1) set at zero where all projects get credit. This would be a global benchmark. Given the low number of existing and planned projects, this is a viable possibility. (2) set at best practice. Global efficiencies are at about 25% and could be increased to about 30%. Could do global benchmark that varies depending on the gassiness of the mine, or regional benchmarks. The cost of the benchmark will need to be weighed against the number of estimated projects in this field.
	Natural gas production <u>Data Quality:</u> Poor	Project by project	--	It is unlikely that the reduction in transaction costs needed to justify benchmarks would be achieved in this sector because of the wide range of project options and the dominance of only one country (China)
	Natural gas distribution <u>Data Quality:</u> Poor	Project by project	—	Getting good data on natural gas transmission and distribution is very difficult because the source is spread out along the distance of the pipeline.
Industrial Energy Demand (Data Quality: Questionable)	Iron and Steel, Cement, Petroleum Refining (?)	Benchmark (possible)	Global	Benchmarks for industrial demand sectors should be global for two reasons: (1) to create an equal incentive for efficient projects among countries. Unlike electricity supply, commodity production is less regionally tied. It therefore makes sense to create an incentive in countries that can produce the commodity more efficiently (2) Each subsector would need to be disaggregated further in order to create an effective benchmark (e.g. type of steel) since carbon intensity varies by type of end-use product. Global benchmarks would significantly cut down the transaction costs.
	Pulp and Paper Chemicals	Benchmark or Project Specific*	Global	These subsectors may have so many different products (that are not fungible between each other) that benchmarks are not possible. Any decision would need more investigation.

Sector	Sub-Sector	Type of Baseline	Regional or Global	Discussion
Transportation <i>(Data quality: ?)</i>	Policies	Whole-Sector	—	Transportation policies to lower GHG emissions such as fuel taxes, reformulated gasoline, etc. could lower GHG emissions, but would be difficult to quantify. Whole-sector CDM would be the only way to estimate these emissions. However, creating a baseline for a whole sector would exclude any other projects within that sector from qualifying for CDM.
	Infrastructure	Project Specific	--	Projects such as HOV lanes, public transportation, etc. have the potential to lower GHG emissions, but would be difficult to benchmark
	Fleets	Benchmarks or Project Specific	Regional	It could be possible to benchmark fleet performance, but the cost of creating the benchmark may be high since the benchmarks would need to be regional. The benefit of a benchmark approach would hinge on the cost versus the number of potential projects.
Residential and commercial energy use	Appliances and Equipment	Benchmarks	Global	Global benchmarks based on the best available technologies could be created for residential and commercial appliances and equipment. Further work needs to be done to determine the regional dispersion of such equipment to determine if benchmarks are applicable.
Building	Energy efficient buildings	Project Specific	—	
Forestry and Land use ** Additional work needs to be done to assess the potential for forestry benchmarks	Conservation	Project Specific	--	Benchmarks are difficult for conservation projects because determining additionality is based upon too many site specific factors.
	Management practices	Benchmarks (??)	Global	Management practices such as sustained yield and high crop rotation may be considered for benchmarks. The actual carbon benefits, however, may be difficult to assess in aggregate since each forest is different.

*Either a benchmark or a project specific baseline would apply. The project would not have the opportunity to choose.

** Assumes forestry projects are eligible in the CDM

Example of Step-by-step Process for CDM Power Plan Project in China

This paper provides an example of how a project would go forward under CDM using a benchmarking approach to ascertain additionality. We provide only the CDM-related issues as this is the only variable in a potential CDM project. Appendix I contains a list of issues that have been identified for further consideration. Appendix II contains an example of calculations to determine emissions additionality.

In a future paper, we will provide an example of a project that would develop its own baseline either because its unique properties do not allow for a benchmark approach or because no benchmark is available for such a project.

Step I: Company Develops Project

- **Description of Project:**
A 500 megawatt IGCC coal-fired power plant is being planned for the province of _____ in China. Project developers expect that the carbon emissions from this plant per unit of electricity output will be lower than the carbon emissions associated with the benchmark for power-plant projects in China.
- **Provide Calculations of Project's Projected Emissions:**
Estimate emissions using standard methodologies from the plant. Since plant emissions will be a function of actual plant performance, projected emissions need to be cast in the form of an operational variable such as units of carbon per kWh.
- **Determine "Emissions Additionality"**
The "additional" CERs generated from a project will vary considerably depending upon the exact specifications of the baseline used to determine the benchmark (i.e., average or better than average of last 5 units, last 5 years, coal-fired plants only, all plants in last 5 years). Thus, benchmarks could vary significantly depending on country/regional circumstances.
- Project developers negotiate with appropriate entity in China to determine division of CERs
- Project developers calculate estimate of annual "proceeds" for own use

Step II: Submit to Host Government for Approval

- Project developers submit for project approval to Chinese Government under its self-defined guidelines.
- Chinese Government would approve the project. Such approval would, by implication, indicate that the project is consistent with China's sustainable development needs and objectives.

Step III: Submit to Operational Entity for Registration:

- Project developers provide host government certification [implies “voluntary participation by both Parties”]
- Project developers prove "real, measurable, and long-term benefits"
 - baseline and projected emissions will demonstrate this
- Project developers demonstrate how project meets “additionality” requirements
 - saved emissions should satisfy “additionality” test

Step IV: Emissions Monitoring, and Reporting:

- Project developers monitor project on a regular basis, using guidelines set forth by the COP/MOP
- Project developers reports on emissions and emissions saved annually to Operational Entity

Step V: Verification

- Independent auditor verifies the project emissions reported in Step IV.

Step VI: Certification

- Operational Entity “checks” report
- Operational Entity reports all CERs to [UNFCCC]
- CERs are considered certified
- Project Developer reports CERs to National Registry(ies) for adjustment of its holding of CERs

Step VII: Appeal Process (if necessary):

Appendix I

Issues that Arise for further consideration

Step I: Company Develops Project

- Some of the benchmarking issues: Who determines benchmark? For historical information about Chinese power plants, who provides information? If Chinese government is charged with responsibility, what happens if it doesn't cooperate or work fast enough? How prove accuracy? Who is responsible for proving accuracy? Should historical information create a baseline for sector (i.e., electric power generation) or sub-sector (coal-fired electricity)? For industrial projects, level of aggregation will be even bigger problem? Should benchmarks be determined by province, country or region? What is process for case-by-case determination of a project's baseline?
- In determining additionality, should baseline calculations be based on the average or marginal plant?
- Regarding division of CERs, should this be between project developers in both countries, between U.S. partner and Chinese government, or should be left to host government to decide?
- Is calculation of proceeds for developers' use only or should it be required in submission to operational entity?

Step II: Submit to Host Government for Approval

- Is host government required to have CDM point of contact with decision-making authority?
- Should there be a deadline for host government approval process?

Step III: Submit to Operational Entity for Registration

- Who should provide proof of host government approval?
- What is the nature of verification? Is it pro-forma or is there an evaluation? Does operational entity do verification or authorize third party verification? Or are project developers required to submit verification plan?
- Should there be a requirement for a submission on other environmental implications, such as transboundary effects?
- Regarding "voluntary participation approved by each Party involved" (section 12.5a of KP), how is this proved? Is host government certification enough or must each government provide such a certification (this could involve more than 2 if a multinational company wanted to divide CERs among more than one Annex B Party)? Does this language imply that only Parties to the Kyoto Protocol can engage in CDM projects? [Need State/Legal to evaluate]

Step IV: Emissions Monitoring and Reporting.

- Must every CER be entered into a national registry (to ensure double entry accounting and verification) or could developers sell CERs without notifying national authority? Who reports CERs to national registry?

Step V: Verification

- Does verification occur before or after certification?
- Which independent entities will be allowed verify emissions reductions?
- Will each project be subject to a verification process, or will projects be verified selectively?

Step VI: Certification

- Is certification of CERs by operational entities automatic (unless an audit determines inappropriate calculation) or should an affirmative decision to certify be required by the operational entity each year? Should the IRS random audit model be used?
- Does operational entity have a formal auditing process? If so, does Executive Board write the rules for this or does the COP/MOP? If there is an auditing process, who does audits? Third-Parties or Operating Entity?

Step VII: Appeal Process (if necessary):

- What type of audit can overturn certification of CERs?
- Should there be a review process established that allows Executive Board to overturn CERs?
- What type of appeal process should be established?
- Would a project developer or its government represent its interests in an appeal?
- If appeal process imposed, should there be a deadline for resolution of appeal?
- Is revocation of CERs the worst consequence? Is Executive Board the final authority?

Appendix II

Example of Calculation of “Additionality”

[note: numbers in calculations are contrived]

Assumptions:

- Based upon the plant design, expected operating parameters, and analysis of the carbon content of the intended fuel source, the developers project emissions to be 50 units per kWh.
- Given that the developers expect the plant to be baseload with a 90 percent availability factor, annual generation from the plant is projected to be:
500 MW (8760 Hr/Yr) (0.90) (1000kW/MW) = 3,942 million kWh
Annual carbon emissions being: 3,942 (50 units/kWh) = 197,100 million units

Historical information used to develop benchmark

- Hypothetical average and marginal emissions per unit of output:
From the last five coal-fired facilities of 200 MW or more: 70 units/kWh.
From the last ten coal-fired facilities of 200 MW or more: 80 units/kWh
From coal-fired facilities of 200 MW built [commissioned] in the last five years: 90 units/kWh
From all coal-fired facilities in the past year: 75 units/kWh
From all units (coal, nuclear, oil, gas-fired, hydro, wind) of 200 MW or more built in the last five years: 60 units/kWh
From last (marginal) coal-fired unit built: 55 units/kWh

Range of “Emissions Saved” based on benchmark chosen [based on above values]

Calculating the emissions saved could be based on the average or on a better than average benchmark for the above choices. Better than average choices include a given percentage below the benchmark or the BAT. For simplicity, the following example uses the average.

Based upon last five coal-fired units:

$$(70 \text{ units/kWh}) - (50 \text{ units/kWh}) \times 3,942 \text{ million kWh} = 78,840 \text{ million units}$$

Based upon last ten coal-fired units:

$$(80 \text{ units/kWh}) - (50 \text{ units/kWh}) \times 3,942 \text{ million kWh} = 118,260 \text{ million units}$$

Based upon coal-fired units built (commissioned) during last five years:

$$(90 \text{ units/kWh}) - (50 \text{ units/kWh}) \times 3,942 \text{ million kWh} = 157,680 \text{ million units}$$

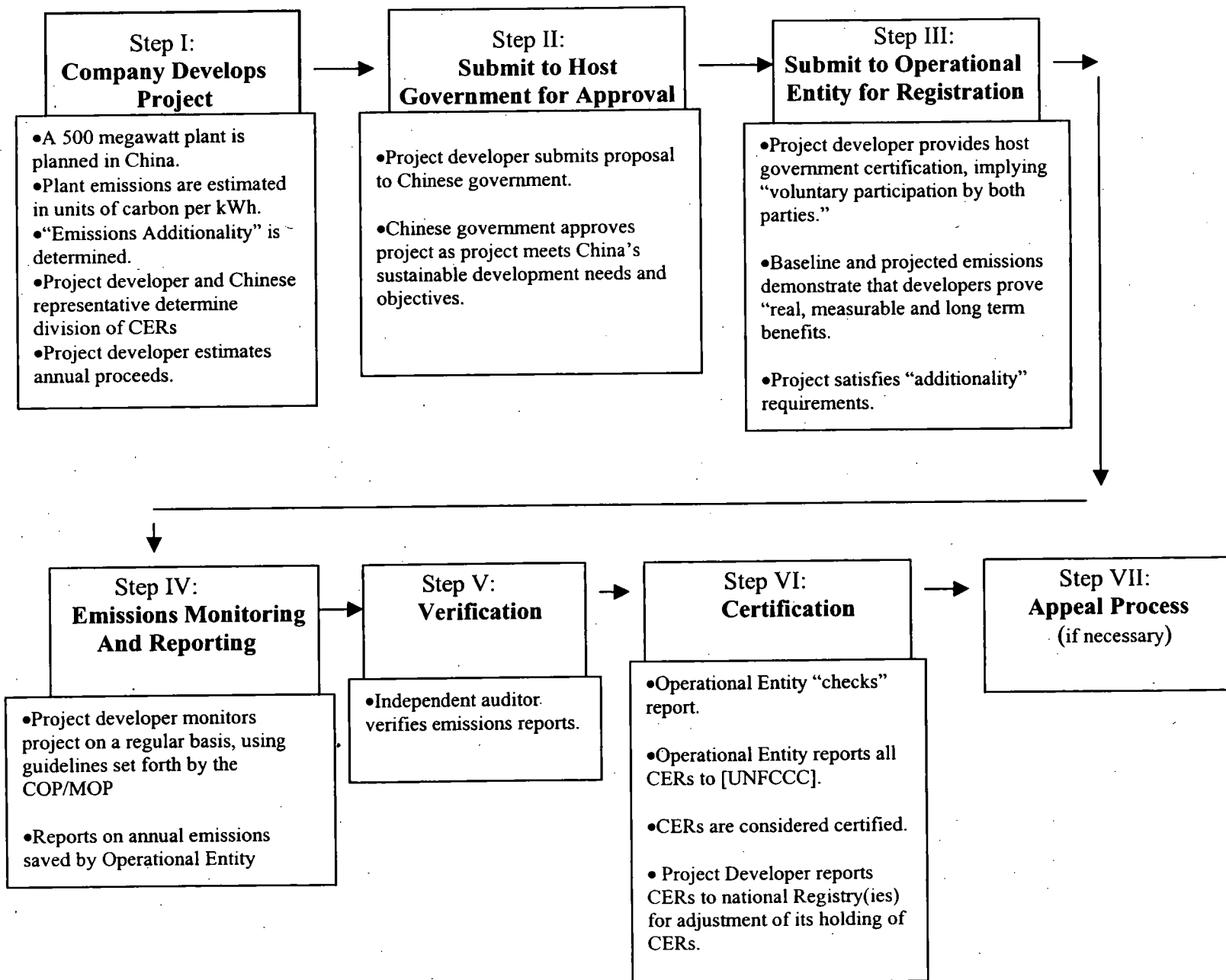
Based upon all coal-fired units built during past year:

$$(75 \text{ units/kWh}) - (50 \text{ units/kWh}) \times 3,942 \text{ million kWh} = 98,550 \text{ million units}$$

Based upon all units (including nuclear, gas, oil, etc.) built during last five years:
(60 units/kWh) - (50 units/kWh) x 3,942 million kWh = 39,420 million units

Based upon last coal-fired unit built:
(55 units/kWh) - (50 units/kWh) x 3,942 million kWh = 19,710 million units

CDM Step by Step



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Growth Targets for GHG Emissions from Developing Countries:

Introduction and Summary of Findings

The United States has advocated emissions growth targets for non-Annex I countries. As these countries consider the possibility of adopting such targets, several have solicited assistance from the United States. The tasks of providing technical assistance to these countries and working with the international community to develop an understanding of what constitutes "appropriate non-Annex I targets" require a further refinement of the US position on developing country growth targets. This paper presents some basic principles for growth targets and discusses several proposals.

Principles Recognizing the interests of developing countries, the United States interest, and the economic and environmental impacts of emissions targets, there are three basic guiding principles for emissions growth targets:

- **Targets should result in environmental benefits;**
- **Targets should be consistent with continued economic development; and**
- **Targets should be of a form that allows developing countries to participate in international emissions trading, to reduce the economic costs of attaining given targets.**

Findings While there is a general consensus on these basic principles, a further elaboration on some of the key issues involving these principles can help facilitate the effort toward a position on the form, magnitude, and timing of a developing country growth target. In reviewing existing data, ongoing research, and in conducting our own analyses, we have found that:

- **Growth targets even as high as BAU can yield significant reductions in global emissions by forestalling the leakage that would otherwise occur.**
- **Targets can result in economic gains from trade for all sides, if they are not too stringent.**
- **A "fair" allocation to expect of potential new participants might be a target that fits the apparent pattern among Annex B countries. This approach turns out to imply some degree of "progressivity" -- with richer countries asked to make bigger sacrifices than poor ones.**
- **Given uncertainty about the future, to fix the precise quantitative target now would create great risks regarding the ultimate stringency of the target; it would raise concerns that a target unintentionally constrains economic development, on the one hand, or that the target could result in hot air, on the other hand. These risks would be reduced by indexation approaches.**
- **Approaches to index targets to income growth between now and the commitment period have some advantages over carbon efficiency target approaches.**
- **CO₂ is the dominant greenhouse gas in developing countries (from fossil fuels and land-use). Measurement of other gases might be too difficult to justify their inclusion.**

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Guide to Contents

(I) Benefits of Targets-and-Trade A scheme in which non-Annex I countries are invited to adopt binding emission targets in the general vicinity of their BAU paths, and then to trade emission permits internationally, is a scheme that has real potential economic and environmental benefits, not just for Annex I countries, but for the developing countries as well. This gives them a genuine incentive to join, which would otherwise be lacking.

(II) What Should Determine Desired Targets? Non-Annex I countries could be asked to take on targets that make some small reductions relative to BAU, and still benefit. But large cuts would render them worse off, and therefore unlikely to agree to participate. Conversely, large increases relative to BAU are unlikely to be acceptable to the Annex I countries. We explore the range of targets that the developing countries could be expected to take on. A reasonable upper bound is their BAU paths.

Even a target as generous as this would result in global environmental benefits, by forestalling leakage, as shown in **Memo II.1: *Emissions leakage from Annex I to non-Annex I countries***.

A reasonable lower bound is the "indifference target" which entails cuts large enough that participation no longer brings them economic benefits, because the gains from selling permits are fully offset by the losses from a stringent target. (See **Memo II.2: *The Trade-off between target stringency and gains from trade***).

An alternative approach to formulating a "fair" target for developing countries is to estimate statistically what pattern holds among targets already accepted by Annex I countries, and then to extrapolate to developing countries. This statistical approach is explained in **Memo II.3: *Progressivity of existing targets, as a guideline for developing-country targets***. This approach turns out to imply some degree of "progressivity" -- with richer countries asked to make bigger sacrifices than poor ones -- without going nearly so far as the redistribution of wealth that some poor-country representatives seem to be asking for. As an example, when the pattern is extended to China, the implied target is a 5 percent cut relative to BAU. This happens to lie inside the range spelled out in Memo II.2.

(III) Uncertainty of Measurement and Forecasting complicates the analysis further. Because BAU forecasts are uncertain, a given numerical target could turn out to be unintentionally stringent (inflicting economic costs on the country) or unintentionally lax (creating "tropical hot air"). **Memo III.1, *Uncertainty about Target Stringency, and proposed solutions***, explores this problem and approaches to deal with it by indexation.

Another difficulty of extending targets to developing countries is measurement of emissions. **Memo III.2, *What greenhouse gases are necessary to include?***, suggests simple CO2 targets might be good enough for these countries.

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I. Benefits of Targets-and-trade

It would be useful to get developing countries to agree to binding limits, even if they involved only small (or no) cuts below Business as Usual (BAU) in the first budget period. Such targets, with trading, imply gains for their economies, gains for ours, and gains for the environment.

Reasons:

- We want to forestall increases over BAU, that would occur in response to Annex I cuts if others do not take on targets. (This is leakage, as explained in Memo II.1 below.)
- The ability for Annex I countries to buy reductions from LDCs would greatly reduce the costs of meeting our targets (as CEA testimony showed). In particular, it is estimated that trading with developing countries would lower U.S. costs more than 80 percent relative to the costs of achieving the Kyoto targets solely through reductions in domestic emissions. (This is as compared to 57 percent savings from trading among Annex I countries alone).
- With targets close to BAU, the developing countries would benefit from the ability to sell emission permits achieved at costs below the world price. This actually gives them a genuine economic incentive to join, which is otherwise lacking. Illustrative calculations by CEA suggest that China would stand to gain \$3.6 billion/year by joining Annex I, and India to gain \$1.6 billion/year. (See Table 2. The United States would save a preliminary-estimate \$11.6 billion if China joined, or \$2.5 billion if India joined.)
- Further, when permits are sold, reductions in carbon dioxide emissions generate ancillary air quality benefits in the developing countries through lower particulate matter, sulfur dioxide, and nitrogen oxides emissions.
- Establishing developing country targets now would meet the requirements of the Byrd-Hagel resolution. Agreement on modest targets in the nearer term is the first step to drawing LDCs into the system, where larger cuts relative to BAU might be possible in the longer term (in some proportion to the cuts made by richer countries that have gone before them).

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II.1 Emissions leakage from Annex I to non-Annex I countries

Even if developing-country targets did no more than to hold developing countries at BAU emission levels, this would be a major environmental benefit. Several economic analyses indicate that for every 3 to 5 tons of carbon abated in Annex I countries, emissions in non-Annex I countries will increase by 1 ton. Often referred to as "leakage," this shifting in emissions reflects two economic impacts of abating emissions in Annex I:

- **World Oil Market Price Effects.** Abating carbon dioxide in Annex I countries reduces the demand for oil, thereby lowering the price of oil. With lower oil prices, some non-Annex I countries will consume more oil and increase their emissions relative to what they would have without the Annex I abatement policies.
- **Energy-Intensive Industry Migration.** Annex I abatement policies that increase the price of energy may provide an incentive for energy-intensive firms to relocate to non-Annex I countries.

Leakage is positively correlated with permit prices: higher Annex I permit prices (and higher energy price effects) will likely result in higher rates of leakage.¹ Several modeling teams participating in the Stanford Energy Modeling Forum (EMF-16) have estimated the extent of leakage associated with an Annex I trading regime. These analyses assume that Annex I countries participate in international emissions trading while non-Annex I countries neither adopt targets nor participate through the CDM. While these results represent a wide range, they all reflect significant increases in emissions above BAU for non-Annex I countries. Thus, even if non-Annex I countries' emissions were only capped at business-as-usual levels, without reductions, that would yield significant environmental benefits in that it would forestall leakage.

Table 1. Increase in Non-Annex I Emissions Under Annex I Trading

MERGE (Manne and Richels)	MRT (Charles River Assoc.s)	G ³ (Shackleton et al)
325 MMTCE	115 MMTCE	55 MMTCE

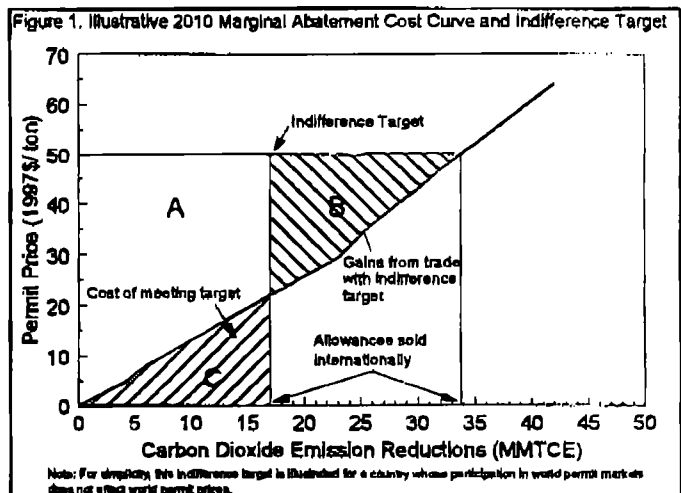
II.2 The trade-off between target stringency and gains from trade

¹ However, international emissions trading can eliminate leakage among all trading participants. An effective trading market that results in equal marginal costs of abatement across all participating countries also results in equal energy price effects in all participating countries. Thus, there is no economic incentive for energy intensive firms to relocate to another country participating in trading. A full global trading system would then eliminate leakage completely. Some economic analysis indicates that while the CDM would lower costs some to Annex I countries, the project-by-project approach does not equalize energy price effects across all participating countries, and would not eliminate leakage to developing countries.

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The Administration has stated in bilateral and multilateral meetings, Congressional testimonies, and other public fora that if developing countries adopt emissions growth targets and participate in international emissions trading, they can enjoy economic gains from trade. Among other issues, this conclusion is sensitive to the stringency of the emissions growth target. The environmental gains from emissions reductions below BAU come at the price of economic costs incurred by a developing country that adopts the below-BAU target. In addition, in the cases of large non-Annex I countries, more stringent targets could have economic costs for buyers in international emissions trading. More stringent developing country targets could raise U.S. costs by restricting the supply of permits in world markets and so raising the price of permits relative to less stringent targets.

To assess the magnitude of this effect consider the target which just leaves a country no better off than no target at all. This "indifference" target is where the costs of meeting the target through domestic action just equal the net gains from selling permits in world markets.² Figure 1 illustrates gains from trade for a small country. The upward-sloping curve shows the rising marginal cost of increasingly stringent reductions. For small reductions from BAU, the cost is far less than the price they fetch on the world market. For a target that is equivalent to a reduction of 17 MMTC, net gains from foreign exports are B, and the cost of meeting the target is C. Since $B = C$ in this example, the net costs from participation are nil.³



As a numerical example of the effects of increasing the stringency of an emissions growth target, we present results from some modeling scenarios of Annex I trading with China. These analyses assume that no other non-Annex I countries participate in international emissions trading or the CDM. If

² This analysis presumes that non-Annex I countries abate their emissions cost-effectively, e.g., through a tradable permit system or a carbon tax.

³ This hypothetical example assumes that the country in question does not consider participation in the Clean Development Mechanism (CDM). If this country were to participate in CDM if it did not adopt a target, then its indifference target would not be at the level where net gains from trade are zero, but where expected net gains from trade would equal expected net gains from the CDM. The CDM option implies that the indifference target would be less stringent. However, including the ancillary air quality benefits associated with abating carbon dioxide, especially in countries with significant local air pollution problems, could imply that the indifference targets should be *more* stringent.

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other non-Annex I countries did participate in either flexibility mechanism, the world trading price could be lower, resulting in lower gains from trade and a less stringent indifference target for China.

Table 2 provides an illustration of the effects of emissions targets more stringent than BAU on China with Annex I plus China trading. A small reduction below BAU has no real effect on the Annex I trading price, and thus no economic effects on the U.S. However, as the target becomes more stringent the trading price increases, resulting in higher total costs of compliance for the U.S.

Table 2. Effects of Various Chinese Emissions Targets with Annex I Trading

Emissions Target ¹	Permit Price (1997\$/ton)	Chinese Emissions Reductions (MMTC)	Chinese Emissions Sales (MMTC) ²	Chinese Gains from Trade (1997\$)	Increase in Total U.S. Cost Relative to China BAU Target
BAU	\$26/ton	276	276	\$3.6 billion	not applicable
BAU - 1%	\$26/ton	276	262	\$3.2 billion	~\$0
BAU - 5%	\$29/ton	304	235	\$2.4 billion	\$1.3 billion
Indifference	\$36/ton	343	172	\$0 billion	\$4.2 billion

¹ We employ the SGM BAU for China for the purposes of these calculations.

² Reductions in Chinese emissions less Chinese emissions sales yields net global reductions.

Imposing this "indifference" target on China, given that its participation lowers world permit prices, leads to the following conclusions.⁴

- An indifference target for China results in it foregoing \$3.6 billion relative to the gains it would obtain if it were to take a BAU target.
- An indifference target for China increases annual U.S. costs by \$4.2 billion or about 33% relative to a BAU target for China.

II.3 Progressivity of existing targets, as a guideline for developing-country targets

It appears reasonable on grounds of fairness that wealthier countries should undertake greater efforts to address climate change than less-wealthy countries. While the emission targets in the Kyoto Protocol reflect the outcome of political negotiations, it is possible to discern systematic economic

⁴ The reason that Chinese participation lowers world permit prices is because BAU or near BAU targets result in more permits available on the world market.

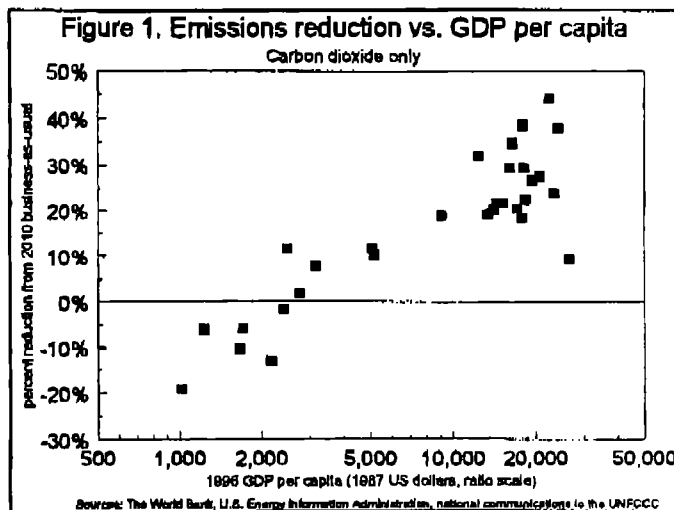
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patterns in them. A fair target for developing countries might one that fits whatever pattern seems to hold among existing targets. In particular, this approach would allow some degree of progressivity, with richer countries making larger reductions than poor ones -- without going nearly so far as the redistribution of wealth that some poor-country representatives seem to ask for.

The Annex B targets (including the EU bubble allocation), when presented in terms of reductions below 2010 BAU, follow a pattern of progressivity (see figure 1). Note that this pattern holds for CO₂ as well as for all greenhouse gas emissions (although data on some non-CO₂ GHG emissions are not available for some Annex I countries; see memo III.2). For the 30 Annex I countries presented in this figure, the average reduction from BAU is 16.1%. For the lower half of Annex I countries by per capita income, the average reduction is 5.2% below BAU.

We conducted statistical analyses to better understand the progressivity of the Annex B targets. We used data on Annex B countries' per capita income, emissions growth projected between 1990 and 2010, coal as a share of total energy consumption, and whether a country is a transition economy, to explain the trend in emissions targets in terms of deviations from BAU. The statistical analyses illustrate a pattern of progressivity among the existing targets: each 1% increase in per capita income implies a 0.11 to 0.17% greater sacrifice, expressed as emissions reductions from BAU. Levels of statistical significance are relatively high, suggesting that the results are meaningful. In absolute terms, an increase in income is associated with an increase in the level of the emission target. But the increase in income also implies an increase in the BAU level. The increase in BAU is *greater* than the increase in the target, implying that richer countries are making greater sacrifices. As an example, when the pattern is extrapolated to China the implied target is a 5 percent cut relative to BAU. This happens to lie inside the range spelled out in Table 2 of Memo II.2: both China and the rest of the world gain.

This statistical approach certainly has limitations, and the results reported here are preliminary. They are sensitive to decisions about the data used. Per capita income data can change depending on the year and exchange rate used to compare countries. Estimates of BAU emissions can vary too.



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III.1 Uncertainty about target stringency and proposed solutions

Some developing countries have claimed that the uncertainty regarding projected economic performance is so great that they cannot risk adopting a binding emissions target for the first commitment period at this time. A natural response to this concern is that international agreements on these countries' targets should be structured to reduce the risk of inadvertent stringency and in particular to reduce the possibility of a target so stringent as to cause large economic losses to the developing countries. In addition to the concern expressed by some developing countries that adopting a binding target now for 2008 risks it being inadvertently stringent and constraining economic development, some have also expressed concern the symmetric concern on the other side, that a target may be too lax, creating "tropical hot air" and thus failing to result in environmental benefits in terms of actual emissions reductions. Thus, it is desirable both to mitigate the risk of inadvertent stringency and also mitigate the risk of inadvertently laxity. The idea is to reduce the variability of the effective stringency of the target without loosening or tightening the intended target, i.e., to reduce the variance without changing the expected value.

To attempt to address this uncertainty issue, a number of ideas have been forwarded. CEA has called its proposal an indexation or formula approach; EPA has referred to its proposal as efficiency standards. They are all versions of the general notion of agreeing today on a contract under which the numerical emission target is to depend in a specified way on future variables whose values are as yet undetermined. (The analogy is with a cost-of-living adjustment clause in a labor contract, that specifies a given increase in the wage for every cent increase in the Consumer Price Index -- thus reducing uncertainty over *real* wages.) In what follows, we assume that a country's aggregate emissions are indexed to future income alone. (We are thus omitting from past CEA proposals the possibility of including in the formula other variables like population; and are omitting from past EPA proposals the possibility of separate "efficiency standards" for individual sectors within an economy.)

It is useful to distinguish four proposals that appear in earlier memos.

- (1) CEA approach (Special-case): **For every percentage point that GDP in 2007 turns out to be higher (or lower) than forecast, the emissions target is raised (or lowered) by 1%.**
- (2) CEA approach (General): **For every percentage point that GDP in 2007 turns out to be higher (or lower) than forecast, the emissions target is raised (or lowered) by X%, where X is a number less than 1.** An advantage relative to proposal (1) is that countries that do well over the coming decade are asked to contribute a bit more than those that do not, while not being penalized unduly.
- (3) EPA approach (Special-case): **For every percentage point that GDP in the years 2008-2012 turns out to be higher (or lower) than forecast, the emissions target is raised (or lowered) by 1%. (EPA phrases this as setting a number for the ratio of emissions to GDP; but that is the same thing.)** The advantage relative to the CEA approach is it allows even more uncertainty-

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protection, with respect to fluctuations in income in the years after 2007. The disadvantage is that the country does not know how many tons it is entitled to until the end of the budget period, which could make trading difficult.

(4) EPA approach (General). **The target ratio of emissions/GDP that is set for the budget period (2008-2012) does not depend only on the country's own past emissions level (such as 1997 or 1990 plus K%, or BAU minus X%) but also on a common standard established for all countries. It seems to CEA that this approach has two serious drawbacks:**

(I) Because emissions/GDP varies widely across countries, a request that countries agree to a common standard would imply far greater sacrifice for some than for others (relative to their current positions, or to BAU). We wouldn't hear of this approach in setting the US target at Kyoto, and neither will many others who would be disadvantaged.

(ii) A comparison of GDPs across countries can easily vary by 100% or more, depending on whether a PPP basis is used or market exchange rates, what year is chosen, and how PPP or the exchange rate is measured; the implied large year-to-year swings in targets (tons of GHG emissions) would be unworkable. Note that approaches (1)-(3) do not have this problem, because measurement problems in yearly growth rates for a given country amount to a couple of percentage points at most.

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III.2 What greenhouse gases are necessary to include?

In the Kyoto Protocol, Annex B countries have targets specified in terms of a basket of six types of greenhouse gases. These targets include both emissions sources and sinks. While this comprehensive approach provides more environmental benefits, it does increase the required effort and cost of inventorying greenhouse gas emissions. Many developing countries lack the monitoring infrastructure to assess emissions of all six types of greenhouse gases. Must developing country growth targets include all greenhouse gases, or is a subset of the Annex A list of gases sufficient?

In evaluating this question, it may be useful to consider several issues.

- **Greater Climate Benefits.** A developing country growth target set below what emissions would be otherwise for only one greenhouse gas (e.g., CO₂) would generate greater environmental benefits relative to a scenario where that country does not adopt a target.
- **Leakage Across Gases Unlikely.** There appears to be little opportunity in most economies for intergas leakage. For example, most efforts to abate fossil fuel-related carbon emissions would result in efficiency improvements, switching to leaner fossil fuels (e.g., natural gas) and to carbon-free sources of energy (e.g., hydropower, nuclear, wind), none of which have emissions of other types of greenhouse gases. Moreover, efforts to abate carbon dioxide in fossil fuel combustion may have ancillary reductions of energy-related methane.
- **CO₂ is Significant Majority of Greenhouse Gas Emissions.** In the United States, carbon dioxide comprises 85% of all greenhouse gas emissions (weighted by carbon equivalence). Across Annex I, carbon dioxide is, on average, 80% of each country's emissions. This trend appears to hold for some non-Annex I countries as well. In 1990, carbon dioxide comprised 88% of Korea's emissions, 85% of Mexico's emissions, and 85% of Kazakstan's emissions. In Argentina, carbon dioxide comprised 63% of 1990 emissions, with methane comprising most of the rest. It appears that carbon dioxide dominates most countries' emissions, with methane a distant second (depending on the extent and nature of agriculture). Non-Annex I countries have not reported their emissions of the synthetic gases in their national communications to date. It is not clear how revisions to the N₂O emissions estimation methodology could affect estimates of non-Annex I countries' emissions.
- **Land Use Change Could be Significant.** Carbon dioxide emissions from land use change in non-Annex I countries appear to be quite significant. Some estimate that by including land use change emissions, non-Annex I emissions exceeded Annex I emissions in 1994 (Panayotou and Sachs 1998). Emissions from land use change in non-Annex I countries in 1994 were more than one-fifth of global carbon dioxide emissions. Some statistical analysis indicates that countries' land use change activities do not become net sinks, ceteris paribus, until per capita income exceeds \$3,600.