CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

Reduction of Flaring and Use of Recovered Gas for Methanol Production
Version 2
01/12/06

A.2. Description of the project activity:

The Atlantic Methanol Production Company (AMPCO) has constructed a methanol plant adjacent to an existing gas processing facility on the northern coast of Bioko Island in Equatorial Guinea. The gas and other hydrocarbon products come from the off-shore Alba field, which is processed on shore. The extra gas has been flared at the exit of the gas processing facility. This methanol plant is now taking this previously-flared gas and generating a useful product that can be exported to the international market. Methanol is used in a variety of industries including housing, construction, automotive, energy, gasoline and steel industries. Without this project, the gas that is used to produce the methanol would be flared, thus emitting greenhouse gas emissions.

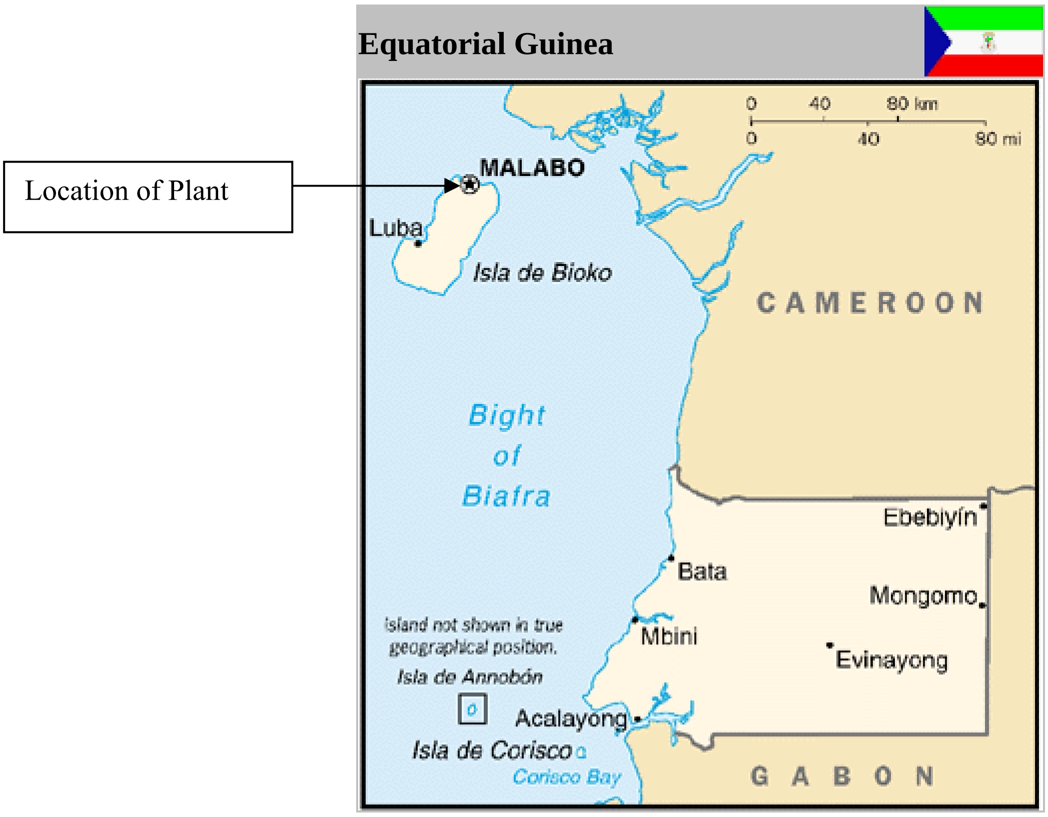
A.3. Project participants:

Name of Party Involved	Private or Public Entities	Indicate if the Party wishes to be considered a project participant (Yes/No)
Government of Equatorial Guinea (Host)	☑ Atlantic Methanol Production Company (AMPCO) ☑ MDL Ambiente	No
Government of Great Britain and Northern Ireland		No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

The AMPCO project site is located on the northwest coast of Bioko Island. It is a predominantly tropical, rural island situated off the coast of Cameroon, northwest of the Equatorial Guinea mainland. The site is approximately six miles west of the capital city of Malabo.



A.4.1.1. Host Party(ies):

Government of Equatorial Guinea

A.4.1.2. Region/State/Province etc.:

Bioko Island

A.4.1.3. City/Town/Community etc:

Six miles west of Malabo, the capital of the country.

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

The AMPCO project site is located on the Punta Europa headland of Bioko Island, as shown in the pictures above. The site is about 172 acres and lies on the coast, directly adjacent to the existing gas processing facilities for the off-shore fields. The Alba oil field is located off-shore, about 18 miles

northwest of Bioko Island. The products from the field are transported from the off-shore platform to an onshore processing facility at Punta Europa.

A.4.2. Category(ies) of project activity:

Sectoral Scope 10: Reduction of Fugitive Emissions

A.4.3. Technology to be employed by the project activity:

Methanol production is a reliable, established chemical process technology available through a number of experienced licensors. The production of methanol via stream/hydrocarbon reforming includes the following steps:

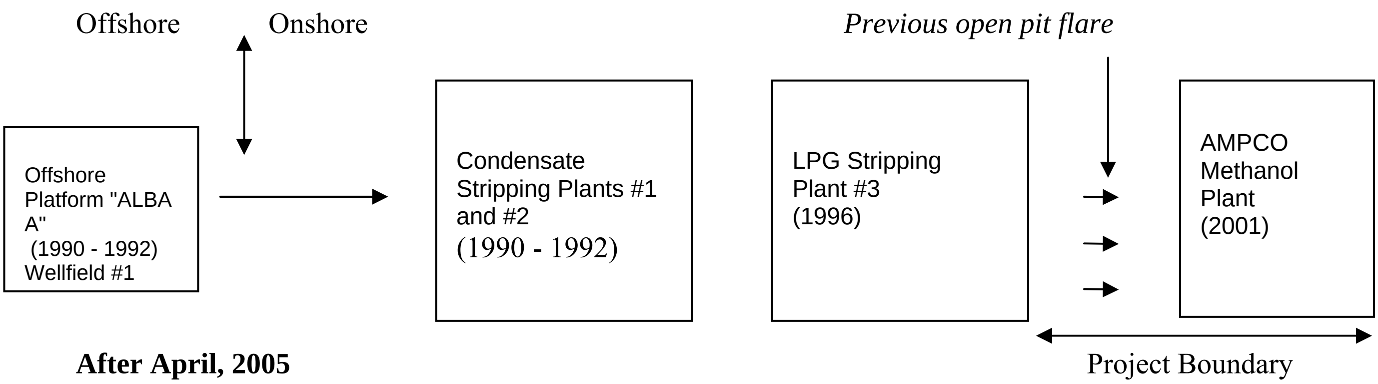
- Desulfurization of the feedstock (the recovered gas)
- Reforming
- Synthesis gas compression
- Methanol synthesis
- Methanol purification (distillation)

This technology was not previously available in Equatorial Guinea, and thus the project has resulted in a transfer of new technology to the host party.

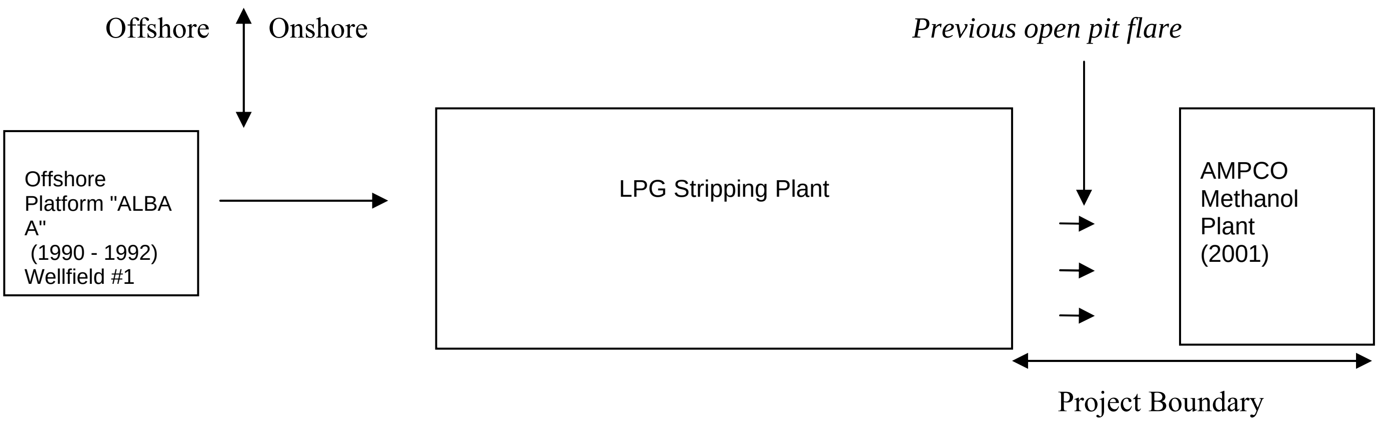
The methanol plant is supplied by natural gas that is recovered from the Alba oil and gas fields. Of this amount, about 68% is used for the direct production of methanol, about 32% is used for the energy needs of the facility.

As mentioned above, when the project began operation, the products from the Alba field were brought onshore and processed at two condensate stripping plants and an LPG stripping plant. In April, 2005, the original LPG plant was replaced by a new one, and the facility now gets feedstock from a new LPG plant. Both illustrations are provided below:

Before April, 2005



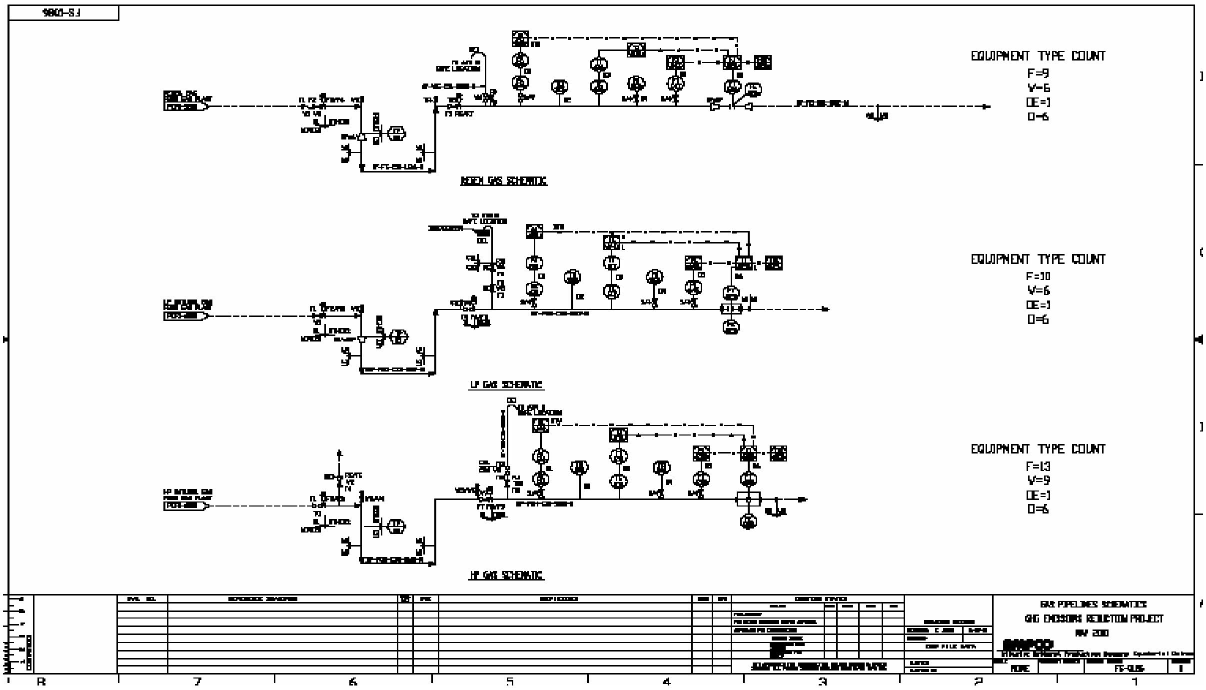
After April, 2005



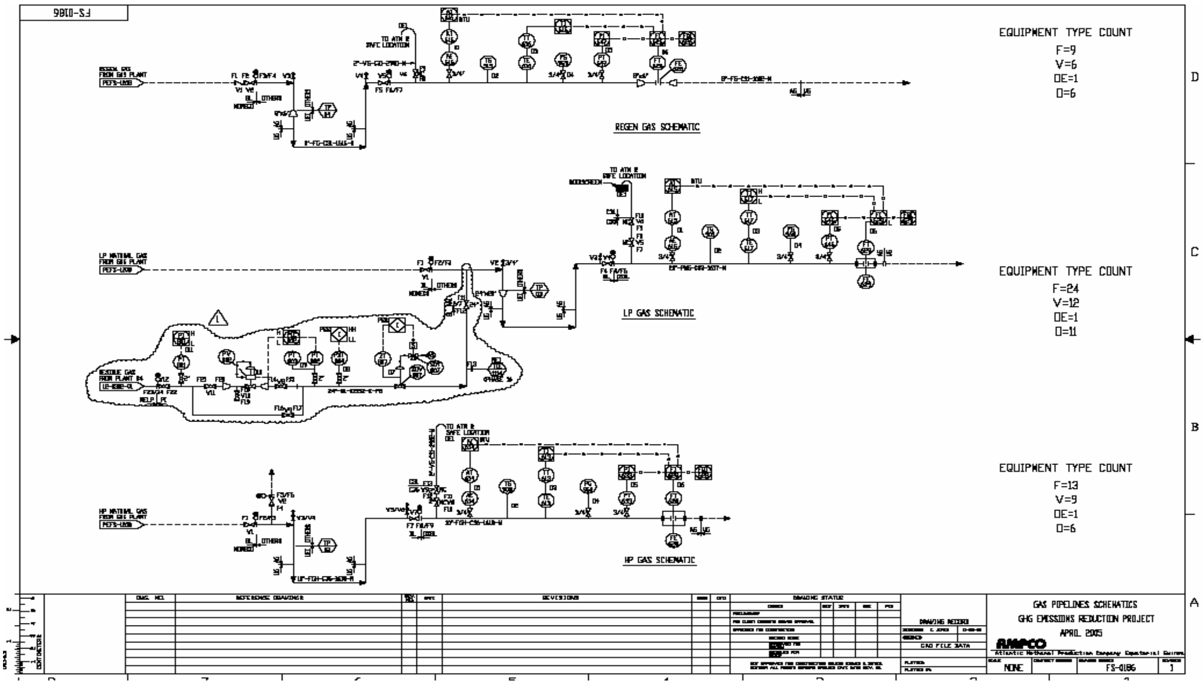
The project comprises of the three pipelines from the LPG plant to the methanol facility as well as the methanol plant itself. In the baseline scenario, all three pipes went to the flare and in the project case, all three pipes lead to the methanol plant. The pipelines include the following:

- the low-pressure pipeline (transporting the tail gas),
- the high-pressure pipeline (transporting the gas containing also liquids and condensate in case of a failure and shutdown at the LPG plant), and
- the “REGEN” pipeline (transporting reformed gas i.e. another waste gas from the LPG plant which otherwise would be flared.

Pipeline Schematic Before April 2005



Pipeline Schematic After April 2005



A.4.4 Estimated amount of emission reductions over the chosen crediting period:

Please indicate the chosen crediting period and provide the total estimation of emission reductions as well as annual estimates for the chosen crediting period. Information on the emission reductions shall be in indicated using the following tabular format.

Year	Annual estimation of emission reductions in tonnes of CO_2e
2001	1,296,333
2002	1,883,329
2003	2,209,688
2004	2,564,270
2005	2,678,300
2006	1,999,945
2007	2,499,945
2008	2,499,945
2009	2,499,945
2010	2,499,945
Total estimated reductions (tonnes of CO_2e)	22,631,645
Total number of crediting years	Up to 10 years
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	2,263,165

A.4.5. Public funding of the project activity:

No public funding was used for this activity.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

Version 1 of AM0037 "Flare reduction and gas utilization at oil and gas processing facilities" and Version 2 of the Tool for the demonstration and assessment of additionality.

B.2 Justification of the choice of the methodology and why it is applicable to the project activity:

This methodology is applicable because the project activity is reducing the level of flared gas in a gas processing facility. This methodology applies because all of the criteria in the approved methodology fit, including:

• Tail gas from an oil or natural gas processing facility, used by the project activity, was flared (not vented) for the last 3 years, prior to the start of the project, or as long as the processing facility has been in operation. *This is the case with the AMPCO facility.*

• Previously-flared tail gas from an oil or natural gas processing plant is used to produce useful energy or a useful product (e.g. methanol, ethylene, or ammonia). The surplus tail gas substitutes the same type of fuels/feedstock or fuel/feedstock with a higher CO2 equivalent emissions impact. *This plant produces methanol which always uses natural gas as a feedstock. Thus, the surplus tail gas substitutes for a feedstock that would otherwise have the same CO2 equivalent impact. However, it should be noted that the feedstock is transformed into methanol and thus not emitted (as opposed to a situation in which the surplus gas is a fuel and thus is emitted).*

• If the tail gas is used as a feedstock in a new facility, the production of the useful products (e.g. methanol, ethylene, etc.) by the project activity does not lead to displacement of production in a new plant that would be built in the absence of the project activity in an Annex I country; and would emit more than 1% of the emissions due to flaring of the tail gas in the baseline situation. The project participants can use market studies of the useful product, interviews with appropriate experts, analysis from research institutes with expertise the market for that useful product, etc. to demonstrate that such a displacement of production in Annex I country is highly unlikely to occur. *The production of methanol at this facility is highly unlikely to lead to displacement of methanol production at an existing facility or new plant. The project participants have a letter from the Methanol Institute supporting up this assertion, which is provided in Annex 5. The project participants have also provided information to the validator demonstrating that the project activity is the only methanol plant in the region.*

The proposed CDM facility produces about 900,000 tons of methanol per year, while the annual market is more than 30 million tons per year – about 3%. Since this project began, global demand for methanol has been rising at about 3% per year. Data also shows that the reason why methanol plants that have been shutting down are in Europe and the U.S. is because of the rising cost of natural gas as a feedstock. When gas that was originally used as a feedstock for a now-closed methanol plant in the U.S. or Europe becomes available, it is used for other purposes, since natural gas is a valuable and useful commodity. Because larger market forces unrelated to this particular project are causing the shut down of some methanol plants and because global demand has been rising by at least three percent since 2001, this type of project will not cause production to stop somewhere else and flaring to start. It is possible that additional methanol production facilities will be constructed to meet increasing global demand and to replace retiring capacity as occurs in all industries. The Methanol Institute, the largest single repository of information on the global methanol industry, confirmed the assertions described above.

• The use of the tail gas by the project activity will not lead to an increase in fuel consumption outside of the project boundary. *There is no evidence that the project activity will lead to an increase in fuel consumption outside the project boundary, because no other fuel use occurs outside the boundary as a result of this project.*

• Energy requirements for the project activity are primarily met using the previously-flared tail gas. If additional fossil fuel is required for the project activity, these emissions should be counted as project emissions. *This is the case for the AMPCO plant.*

• Accurate data on the quantity and carbon content on the tail gas are available. *This is available for the AMPCO plant.*

B.3. Description of the sources and gases included in the project boundary

As shown in the figure in Section A.4.3, the project boundary includes the infrastructure from the open pit flare to the methanol facility. More specifically, the project boundary includes:

- Pipelines from the gas processing plant to the flare
- Open pit flare
- The three pipelines from the gas processing plant to the methanol plant, which is utilizing the tail gas, and
- The methanol plant itself.

Table 1: Summary of gases and sources included in the project boundary, and justification / explanation where gases and sources are not included.

	Source	Gas	Included?	Justification/Explanation
Baseline	*Flaring*	CO_2	*Yes*	*Main source of emissions in the baseline*
		CH_4	*No*	*It is assumed that flaring results in complete oxidation of carbon in tail gas, resulting in a more conservative baseline.*
		N_20	*No*	*Assumed Negligible*
	Fuel Consumption for tail gas transport	CO_2	*No*	*No fuel is consumed in transport of tail gas to the flare.*
		CH_4	*No*	*No emissions*
		N_20	*No*	*No emissions*
	Fugitives resulting from tail gas transport	CO_2	*No*	*No emissions*
		CH_4	*No*	*No fugitive emissions are calculated for the baseline case for simplicity and conservativeness.*
		N_20	*No*	*No emissions*
Project Activity	*Fuel Consumption for tail gas transport*	CO_2	*No*	*No fuel is consumed in transport of tail gas to the methanol plant.*
		CH_4	*No*	*No emissions*
		N_20	*No*	*No emissions*
	Fugitives resulting from tail gas transport	CO_2	*No*	*Fugitive emissions assumed to be 100% methane for simplicity and conservativeness*
		CH_4	*Yes*	*Fugitive* CH_4 *emissions may occur if tail gas is transported to the end use facility in the project scenario.*
		N_20		*Assumed negligible*
	Fugitive emissions from accidents	CO_2	*No*	*Assumed negligible*
		CH_4	*Yes*	*Fugitive* CH_4 *emissions may occur if there is an equipment failure in equipment transporting tail gas to the methanol plant.*
		N_20	*No*	*Assumed negligible*
	Additional energy used by feedstock facility	CO_2	*Yes*	*Emissions result from the combustion of diesel fuel for energy at the methanol plant*
		CH_4	*No*	*Assumed negligible*
		N_20	*No*	*Assumed negligible*

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

This methodology is applied in the following manner. First, the baseline scenario is selected using the following steps:

- Step 1: Identify all realistic and credible alternative scenarios to the proposed CDM project activity and eliminate all alternatives that do not comply with legal or regulatory requirements;

- Step 2: Assess the alternative scenarios to the proposed CDM activity and eliminate alternatives that face prohibitive barriers; and

- Step 3: Determine the most likely alternative (baseline scenario). Where more than one credible and plausible alternative remains after Steps 1 and 2, the alternative that result in the lowest baseline emission shall be the baseline scenario. The methodology is applicable if the baseline scenario is (a) flaring of the tail gas; and (b) if a new facility is built for the use of tail gas., the baseline is no facility would have been built in absence of the project activity, else, for an existing facility the baseline is continuation of the present situation in absence of the project.

Step 1: Identify all realistic and credible alternative scenarios to the proposed project activity and eliminate alternatives that do not comply with legal or regulatory requirements. Below is a list of plausible alternative baseline scenarios for use of the tail gas:

1. Continuation of the flaring.
2. On-site consumption of the tail gas for energy.
3. Injection into the oil reservoir.
4. Recovery, transportation, processing and distribution of tail gas to end-users.
5. Tail gas is used as a fuel and/or feedstock at offsite facility.
6. Another source of feedstock, other than the tail gas, is used at the end use facility where the tail gas is used in the project activity. The scenario should clearly list the possible feedstock and their source. In case of a new end use facility, all possible feedstock should be evaluated.
7. The proposed project activity not being registered as a CDM activity.

Each of these alternatives is in compliance with local law in Equatorial Guinea.

Step 2: Assess the alternatives to the proposed project activity and eliminate alternatives that face prohibitive barriers:

- Alternative #1: Continuation of the flaring. *This is the current scenario and thus the proposed baseline. The project participants are not aware of any regulation or legislation, which forbids flaring in Equatorial Guinea.*

- Alternative #2: On-site consumption of tail gas for energy. *Part of the recovered gas is being used for on-site consumption, but the energy needs on-site are not high enough to utilize a significant portion of the previously-flared gas. Thus, something has to be done with the surplus gas and further on-site consumption to meet energy needs is not possible. All of the energy needs on-site are already being met using only a small portion of the recovered gas. Detailed analysis on current rates of utilization and energy demand on site will be provided to the DOE upon project validation.*

- Alternative #3: Injection into the oil reservoir: *Part of the gas from the production site is re-injected into the reservoir at the Alba fields. However, re-injection into the reservoir of the tail gas from the LPG stripping plant is impractical. Thus, re-injection of the gas that is delivered to the methanol plant is not an option.*

- Alternative #4: Recovery, transportation, processing and distribution of tail gas to end-users. The gas that is being flared can be sold to other end-users in the market – in the industrial, commercial or residential sectors – thus displacing other fossil fuels. *As evidenced by the fact that gas has been flared on this site for years, it is clear that no market exists for distributing gas to end-users on the island, due to low demand and the costs of the infrastructure needed to bring the gas into the nearby towns. If this were not the case, such a project would have been implemented a long time ago because it would have brought extra revenue to the owners of the LPG and condensate plants. The residents of Bioko Island are quite poor and demand for energy is quite low. It would not have been economic to extend a gas line and set up the administrative infrastructure needed to sell gas to end-users, collect bills, etc.*

- Alternative #5: Tail gas is used as a fuel and/or feedstock at offsite facility. *There is no other industrial or other large facility at Bioko Island which can use the surplus tail gas, either as a fuel or as a feedstock.*

- Alternative #6: Another source of feedstock, other than the tail gas, is used at the end use facility where the tail gas is used in the project activity. The scenario should clearly list the possible feedstock and their source. In case of a new end use facility, all possible feedstock should be evaluated. *There is natural gas available from the Alba field, but it is contractually obligated for other uses. Therefore, no other possible source of feedstock is available for the methanol plant.*

- Alternative #7: The proposed project activity not being registered as a CDM activity. *The proposed project activity faced barriers as further elaborated in Section B.3.*

<u>Step 3:</u> Determine the most likely alternative (baseline scenario). Where more than one credible and plausible alternative remains after Steps 1 and 2, the alternative that result in the lowest baseline emission shall be the baseline scenario. The methodology is applicable if the baseline scenario is (a) flaring of the tail gas; and (b) if a new facility is built for the use of tail gas, the baseline is that no facility would have been built in absence of the project activity. For an existing facility, the baseline is continuation of the present situation in absence of the project.

As demonstrated in Steps 1 and 2, the only plausible baseline scenario is Alternative 1: Continuation of the flaring. The gas processing plant has installed gas flaring equipment for environmental and safety reasons, as well as for the flaring of un-utilized gas. This approach is also in compliance with local regulations, as the host country does not prohibit the flaring of the tail gas

Next the "<u>Tool for the demonstration and assessment of additionality</u>" is used to show the project is additional. Once the baseline scenario is established and the additionality of the project is confirmed, the project participants apply the baseline emission formulas, the project emissions formulas to determine emission reductions. All of these steps are described in the sections below.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

In accordance with the methodology, an additionality assessment using Version 2 of the "*Tool for the demonstration and assessment of additionality.*" is provided below.

Step 0. Preliminary screening based on the starting date of the project activity

First, however, since the real project activity commenced in May of 2001, the developers should show that the motivation to generate CO2 credits was part of the initial plan and indeed applied for certification under the U.S. Initiative on Joint Implementation – a program which recognized greenhouse reduction projects and applied strict criteria on baselines, monitoring and additionality requirements.

I. The IJI Process: According to the application for the USIJI program – submitted in September of 2000 – from the earliest stages, the AMPCO project was driven out of a desire to achieve the reduction of greenhouse gas emissions.

This project was accepted into the IJI program and moreover, the project partners signed a contract in 2001 allocating any potential revenues from the emission reductions that might be generated. This contract can be made available to a Validator and shows that from the earliest stages, the generation of emission credits was a significant motivation for undertaking the project activity. As it became clear that a worldwide market for GHG emission trading was emerging, the goal of generating potential offsets emerged as a significant consideration in the planning, deliberations and decision-making processes of the AMPCO project developers. While the project did meet a stand-alone requirement for minimal economic viability, the credits were considered by the partners to have a high probability of ensuring the sustainability and commercial health of the methanol plant. Again, this is demonstrated by the fact that the project participants went through the extensive application process for the USIJI program (which required, among other things, strict monitoring protocols which would not have been necessary if there was no goal in generating credits – these monitoring reports were drafted by an independent organization, paid for by AMPCO). In addition, the fact that in 2001 the parties carefully negotiated how much each party would get from sales of any future emission credits indicates this early-on planning for GHG trading. The project participants have provided to the validator evidence demonstrating that this project was being pursued as a CDM project activity in 2001 – and that the Government of Equatorial Guinea supported this effort.

Another consideration was the volatility in the methanol market, which added considerable risk to the venture. Large methanol producers tend to service all the major world markets, and since methanol can be easily transported by ship across long distances, regional pricing tends to gravitate 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. The project participants have provided documentation to the validator that based on U.S. prices, methanol prices can fluctuate significantly, and during the last 15 years, prices have reached a low of $70 per metric ton to more than $500/ton.

Two factors raised significant concern as the project was being considered, which would be mitigated by the extra revenues brought by selling CERs:

- *Oversupply:* In the mid-1990s, unusually high methanol prices encouraged a significant number of new producers into the market, with an additional 4.2 million metric tons capacity coming on-line by the end of 1999. Because the world demand is only 30 million tons/year, the result was an oversupply – and coupled with lower U.S. gas prices as the time – the price of methanol fell to under $90/ton in 1999.

- *Developments in the U.S. Market:* The U.S. is the world's largest consumer of methanol, and one of the largest uses is in gasoline. Specifically, a major derivative of methanol products is MTBE, which is added to gasoline in order to reduce air pollution. However, due to ground water contamination issues, the State of California has already taken steps to ban the use of MTBE, and it is possible there will be a national ban as well. If this occurred, demand for methanol would decline significantly.

Due to these developments, specifically the potential of losing the MTBE market in the U.S., the AMPCO partners urgently reviewed the viability of the project during the construction period and actively considered cancellation of the project altogether. During the review, AMPCO partners determined that the potential to generate additional revenues through emission credits could help the project overcome these barriers. Memoranda provided in Annex 6 demonstrate that in May 2000, the partners concluded that the potential financial benefits from generating emission credits, which could accrue through USIJI certification and ultimately CDM registration, could play a large role in mitigating these risks and that the CDM was a factor in their decision to proceed with the project.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a. Define alternatives to the project activity:

The following options have been identified:

- Alternative #1: Continuation of the flaring.
- Alternative #2: On-site consumption of tail gas for energy.
- Alternative #3: Injection into the oil reservoir.
- Alternative #4: Recovery, transportation, processing and distribution of tail gas to end-users. The gas that is being flared can be sold to other end-users in the market – in the industrial, commercial or residential sectors – thus displacing other fossil fuels.
- Alternative #5: Tail gas is used as a fuel and/or feedstock at offsite facility.
- Alternative #6: Another source of feedstock, other than the tail gas, is used at the end use facility where the tail gas is used in the project activity. The scenario should clearly list the possible feedstock and their source. In case of a new end use facility, all possible feedstock should be evaluated.
- Alternative #7: The proposed project activity not being registered as a CDM activity.

Sub-step 1b. Enforcement of applicable laws and regulations:

Each of these alternatives is in compliance with local law in Equatorial Guinea.

Step 2. Investment analysis: This step is not selected

Step 3: Barriers analysis

Sub-step 3a. Identify barriers that would prevent the implementation of type of the proposed project activity:

This project faced many substantial barriers, which as discussed in Step 1, were helped to be overcome by the potential for carbon credits.

- Physical Infrastructure: In order to construct the methanol plant, the project participants had to build a significant amount of infrastructure, including the construction of a shipping port and a number of paved roads capable of handling heavy equipment.

- Technically-Qualified Staff: Before this project, the technical expertise to produce methanol Equatorial Guinea did not exist. The country lacked trained personnel with the skills needed to construct and maintain the equipment in the methanol production process. This project activity resulted in transfer of technology – and training of local staff to operate the technology – that simply did not exist before this project.

- Not a Core Business: AMPCO is a partnership of three different companies in the oil and oil-related industries. When the decision was taken to move ahead with the project, none of these entities had ever built or operated a methanol plant.

Finally, Equatorial Guinea is considered to be a very high risk environment, given it is located in one of the poorest parts of the world. The business climate is very risky and this presented another barrier to implementation of large-scale investment projects involving value-added post extraction processes such as methanol production.

Evidence to these barriers, and the impact of potential carbon credits on overcoming these barriers, have been presented to the DOE upon project validation. These documents include:

- Analysis of the methanol market in 2000 and the potential risks and concerns associated with potentially falling methanol prices.

- USIJI application and all associated documentation, including the approval by US EPA and documents showing inclusion into the program.

- Letter dated May 10, 2000 from James Cook, Senior Vice President of Technology and Development at CMS Energy to another partner in the project, Rodney Cook of Samedan Oil Corporation. The letter outlines how emission credits were discussed as a strategy to mitigate the risk from this project.

- Memorandum to the Environment and Corporate Responsibility Committee of the CMS Board of Directors, dated September 20, 2000, entitled, "Environmentally Responsible Gas Processing in Equatorial Guinea: Creating Value Thru GHG Emission Reduction.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

The alternative is the continued operation of the flare, which faced no barrier as it was already in place and operational.

Step 4: Common Practice

No similar project has taken place in Equatorial Guinea or any other country in the region. Data to show that this is the only such project in the West African region can be presented to the DOE upon project validation.

Step 5: Impact of CDM Registration

The impact of CER revenue was an influencing factor in the decision to implement the project activity. The plant may not have been completed in the absence of the revenue from carbon credits. Furthermore, the impact of CDM registration, allows for:

- Attracting new foreign investment and new technology: There was no local company with the technical capacity to undertake this project.
- Reducing Risk: The generation of carbon credits reduced the risks associated with this project, particularly the price volatility in the methanol market, thus the return on investment that can be expected.
- Country Risk: Equatorial Guinea has very high country investment risk. The potential for carbon revenues helps reduce the risk associated with operating in such a high-risk environment.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

BASELINE EMISSIONS: In calculating baseline emissions, it is assumed that the recovered gas would be flared in the absence of the project. It is also assumed that all carbon in the tail gas (i.e. in methane and other gases including other hydrocarbons, CO, and CO_2) is completely oxidized to carbon dioxide. It should be noted, in accordance with AM0037, fugitive CH_4 emissions and emissions from the transportation of the tail gas will be ignored.[1] Baseline emissions are calculated as follows in the equation below:

$$BE_y = \left(V_y \times w_{carbon,y} \times 44/12\right) + \left(FCT_{flare,x} \times V_y \times EFFCT_{flare,x}\right) + FE_x$$

Where:

BE_y = Baseline emissions during the year y (t CO_2e/yr)
V_y = The volume of tail gas utilized in year y at intake point to end use facility (m^3)
$w_{carbon,y}$ = The carbon content of tail gas flared in year y (t C/m^3)

[1] AM0037, page 7, states: "if transport of the tail gas to the end use facility only requires an extension of the pipeline to the flare in the baseline scenario, then baseline emissions along the pipeline can be ignored and project emissions only need to be estimated for the pipeline extension". Please see: http://cdm.unfccc.int/UserManagement/FileStorage/CDMWF_AM_SBWT9S0RALV9LGCP8JPN86XMVOMDHY

$FCT_{flare,x}$ = Energy or fuel consumed for transportation (e.g., for pipeline compressor) to flare per unit volume of tail gas in year x (e.g. m^3/ m^3, liters/m^3, kJ/ m^3, kWh/m^3). Not used in this project.
$EFFCT_{flare,x}$ = Emissions factor for fuel or energy used for transportation of tail gas to flare in year x. Not used in this project
(e.g., t CO_2/ m^3, t CO_2/liter, t CO_2/kJ, t CO_2/kWh)
FE_x = Fugitive CH_4 emissions along the transportation path to the point of flaring (t CO_2e/yr). Not used in this project
x = Baseline year (i.e., the year before the flare was stopped and the project activity was started). Not used in this project
y = Project year

Fugitive CH4 emissions along the transportation path to the point of flaring

Fugitive CH4 emissions occurring during the transport of tail gas may be small, but they should be estimated to be conservative. Emission factors may be taken from the IPCC Good Practice Guidance and/or from the 1995 Protocol for Equipment Leak Emission Estimates, published by U.S. EPA. Emissions should be determined for all relevant activities and all equipment (such as valves, pump seals, connectors, flanges, open-ended lines, etc.). The U.S. EPA approach is based on average emission factors for total organic compounds (TOC). In the equation below, methane emissions are calculated by multiplying the methane concentration in the in the tail gas with the appropriate emission factor from Table 1 and then summing across all pieces of equipment.

$$FE_x = GWP_{CH4} \times \frac{1}{1000} \times \sum_{equipment} \left[w_{CH4,pipeline} \times EF_{pipeline} \times t_{equipment} \right]$$

Where:
GWP_{CH4} = The approved Global Warming Potential for methane
$w_{CH4,pipeline}$ = The mass fraction of methane in the pipeline tail gas (kg CH_4/kg)
$EF_{pipeline}$ = The appropriate emission factor from Table 2 or the IPCC Good Practice Guidance (kg CH_4/hour/equipment)
$t_{equipment}$ = The operation time of the equipment in hours (in absence of further information, the monitoring period could be considered as a conservative approach)

All data for gas volumes in all equations should be converted to common standard temperature and pressure values. For example, an often-used default density of methane at 0 degree Celsius and 1 atm is 0.0007168 t CH_4/m^3. For the purpose of the calculation in the equation above, the project participants will group the equipment according to the different types listed below.

Table 2: Oil and natural gas production average emission factors

Equipment Type	Service	Emission Factor (kg/hour/equipment item) for TOC
Valves	Gas	4.5E-03
Pump seals	Gas	2.4E-03
Others*	Gas	8.8E-03
Connectors	Gas	2.0E-04
Flanges	Gas	3.9E-04
Open-ended lines	Gas	2.0E-03

TOC: Total organic compounds

Source: US EPA-453/R-95-017 Table 2.4, page 2-15

*"Other" equipment type was derived from compressors, diaphragms, drains, dump arms, hatches, instruments, meters, pressure relief valves, polished rods, relief valves and vents. This "other" equipment type should be applied for any equipment type other than connectors, flanges, open-ended lines, pumps or valves.

Where the IPCC Good Practice Guidance (2000) is used to estimate fugitive CH_4 emissions, the appropriate refined Tier 1 emission factors in Table 2.16 of the IPCC Good Practice Guidance should be applied.

PROJECT EMISSIONS: Project emissions would occur if fossil fuel were consumed in the process of transporting the gas to its new end use and any resulting fugitive emissions from its transport. Project emissions can be calculated as follows in the following equation. It should be noted that no energy is needed to transport the gas, so FCTy will be zero):

$$PE_y = (FCT_y \times EFFCT_y x V_y) + (FE_y) + (EFA_y) + (FFU_y)$$

Where:
PE_y = Project emissions in year y
FCT_y = Energy or fuel consumed for transportation (e.g., for pipeline compressor) to end use facility per unit volume of tail gas in year y (e.g., m^3/m^3, liters/m^3, joules/m^3, kWh/m^3). Not used for this project.
$EFFCT_y$ = Emissions factor for fuel or energy used for transportation of tail gas to end use facility in year y (e.g., t CO_2/m^3, t CO_2/liter, t CO_2kJ, t CO_2/kWh) Not used for this project.
V_y = The volume of tail gas utilized in year y at intake point to end use facility (m^3)
FE_y = Fugitive CH_4 emissions along the transportation path to the point of flaring (t CO_2e/yr)
EFA_y = Fugitive emissions of CH_4 from accidents
FFU_y = Additional energy may be used by the end use facility that utilizes the tail gas (e.g., grid electricity or other fossil fuels besides tail gas) (t CO_2e)

Fugitive CH_4 emissions along transport pipeline (FE_y)

Fugitive CH_4 emissions along the pipelines to the methanol plant are included in the calculations for project emissions. For simplicity of the calculations and conservativeness, fugitive CH_4 emissions from the pipelines to the flare have been excluded from the baseline emission calculations. The pipelines used by the project activity are an extension of the pipelines used in the baseline scenario for transportation of the gas to the flare.

The fugitive emissions will be estimated using the procedure defined in the baseline emissions section.

All data for gas volumes in all equations should be converted to common standard temperature and pressure values (e.g. the default density of methane at 0 degree Celsius and 1 atm is 0.0007168 t CH_4/m^3.)

CH_4 emissions from transport of tail gas in pipelines when accidental event occurs (EFA_y)
When an accident causes gas leakage from the pipeline, the gas volume is calculated as the sum of (1) the total amount of gas flow from the time the accident occurred until gas flow was shut off, and (2) the total amount of gas remaining in the pipeline at time of shut off. Accidental release of methane from the pipeline should be calculated as:

$$EFA_y = GWP_{CH4} \times \frac{1}{1000}\left(V_{accident} + V_{remain,accident}\right) \times w_{CH4,pipeline,accident}$$

with:

$$V_{accident} = t_{accident} \times F = (t_2 - t_1) \times F$$

$$V_{remain,accident} = d^2 \times \pi \times L \times \frac{P_p}{P_s} \times \frac{T_s}{T_p} \times \frac{V_{d,accident}}{\sum_i V_{Xi,d,accident}}$$

Where:

EFA_y = Methane emissions from the transport pipeline due to an accidental event (t CO_2e)
$V_{accident}$ = The volume of tail gas supplied to the pipeline from the oil and natural gas processing plant from the time the gas leakage started until the shutdown valves were closed (m^3)
$V_{remain,accident}$ = The volume of tail gas remaining in the pipeline after the shutdown valves have been closed (m^3)
$w_{CH4, pipeline, accident}$ = The fraction of methane in the tail gas on a mass basis (kg CH_4/ m^3)
t_1 = The time the gas leakage caused by the accident occurred (sec)
t_2 = The time that the shutdown valves closed both the upstream and downstream pipeline (sec)
F = The flow rate of tail gas supplied from the off-shore oil platform to the gas processing plant and methanol facility. (m^3/sec)
d = The radius of the pipeline (meters)
π = The ratio of the circumference of a circle to its diameter (unit-less)
L = The length of the pipeline (meters)
P_p = The pressure in the pipeline when the shutdown valves close both the upstream and downstream of the pipeline (atm)
P_s = Standard pressure (atm)
T_p = The temperature in the pipeline when the shutdown valves close both the upstream and downstream of the pipeline (ºC)
T_s = Standard temperature (ºK)
$V_{d,accident}$ = The volume of tail gas supplied to the pipeline from the oil and natural gas processing plant before the accident occurs during the period (m^3)
$V_{xi,d,accident}$ = The volume of gas supplied to the pipeline from other sources if any before the accident occurs during the period (m^3)

Additional energy used by end-use facility (FFU_y)

$$FFU_y = QF_y * EF_{facility,y}$$

Where:
QF_y = Energy or fuel consumed by end use facility (e.g., for processing tail gas as a feedstock material) in year y (e.g., m^3, liters, kJ, kWh)
$EF_{facility,y}$ Emissions factor for fuel or energy used by end use facility in year y (e.g., t CO_2/ m^3, t CO_2/liter, t CO_2/kJ, t CO_2/kWh

LEAKAGE: According to the AM0037, leakage is expected to be negligible unless fugitive methane for tail gas transportation emissions is outside the control of the project participants. In the case of this project, all of the sources of fugitive methane are under the control of the project participants. All of the emissions from tail gas transportation, therefore, are incorporated as project emissions. No leakage calculations are required.

EMISSION REDUCTIONS: Emission reductions are calculated as the difference between baseline and project emissions, taking into account any adjustments for leakage:

ERy = BLy – PEy - L

Baseline emissions will be calculated ex-post using metered data on delivered gas (that would have otherwise been flared) each project year of the crediting period. Since the gas is used as a feedstock, ex ante emissions will be estimated based upon project-activity production levels and the energy consumption/fuel combustion associated with that activity.

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	Type and Number of valves, pump seals, connectors flanges, open-ended lines, etc
Data unit:	Number
Description:	Type and Number of valves, pump seals, connectors flanges, open-ended lines, etc
Source of data used:	Pipeline Schematics
Value applied:	Equipment Count May 2001 - April 2005 HP Pipe / LP Pipe / RG Pipe Valves 9 / 6 / 6 Flanges 13 / 10 / 9 Open Ended Lines 1 / 1 / 1 Others 6 / 6 / 6 Equipment Count May 2001 - April 2005 HP Pipe / LP Pipe / RG Pipe Valves 9 / 12 / 6 Flanges 13 / 26 / 9

	Open Ended Lines Others	1 6	1 11	1 6
Justification of the choice of data or description of measurement methods and procedures actually applied :	Required to determine default emissions that might normally occur in weak points of the pipeline. Because this is the pipeline that connects to the end-use facility, any emissions from these pieces of equipment must be counted as project emissions. The pertinent sections of pipelines are shown on the pipeline schematic included in this document. The number and type of the likely locations of leaks as outlined by EPA and used for similar purposes in AM0009 are indicated. Data will be archived for two years following the end of the crediting period.			
Any comment:				

Data / Parameter:	d
Data unit:	meters
Description:	Radius of the pipeline
Source of data used:	Pipeline schematics
Value applied:	Regen Gas D = 0.203 m LP Gas D = 0.508 m HP Gas D = 0.254 m
Justification of the choice of data or description of measurement methods and procedures actually applied :	Required to determine volume of gas emitted during accidents.
Any comment:	No accidents have been reported to date, thus not calculated in Section B.6.3.

Data / Parameter:	L
Data unit:	Meters
Description:	Length the pipeline
Source of data used:	Pipeline schematics
Value applied:	Regen Gas – L = 662.63 m LP Gas – L = 667.21 m HP Gas – L = 665.99 m
Justification of the choice of data or description of measurement methods and procedures actually	Used to determine volume of gas emitted during an accident

applied :	
Any comment:	No accidents have been reported to date, thus not calculated in Section B.6.3.

Data / Parameter:	P_s
Data unit:	Atm
Description:	Standard pressure of the pipeline
Source of data used:	N/A
Value applied:	1 atmosphere
Justification of the choice of data or description of measurement methods and procedures actually applied :	Used to determine volume of gas emitted during an accident
Any comment:	No accidents have been reported to date, thus not calculated in Section B.6.3.

Data / Parameter:	T_s
Data unit:	º Kelvin
Description:	Standard temperature of the pipeline
Source of data used:	N/A
Value applied:	273 degrees Kelvin
Justification of the choice of data or description of measurement methods and procedures actually applied :	Used to determine volume of gas emitted during an accident
Any comment:	No accidents have been reported to date, thus not calculated in Section B.6.3.

Data / Parameter:	$EF_{facilty, y}$
Data unit:	$kgCO_2/kg$
Description:	Emissions factor for fuel used by end use facility
Source of data used:	2006 IPCC default values
Value applied:	IPCC default of 3.1863 $kgCO_2/kg$ of diesel
Justification of the choice of data or description of measurement methods and procedures actually applied:	Used to determine carbon content of fuel
Any comment:	Most recent IPCC data is used. Data will be archived for two years following end of the crediting period.

B.6.3 Ex-ante calculation of emission reductions:

The ex-ante calculations provided below contain assumed values used for estimating the reductions for 2006 and beyond:

PROJECT EMISSIONS

$$PE_y = (FCT_y \times EFFCT_y x V_y) + (FE_y) + (EFA_y) + (FFU_y)$$

FFU_y: The energy requirements for the methanol plant are met using the associated gas from the LPG stripping plant. In the absence of the methanol plant, the gas would be flared. These emissions are not considered project emissions.

Diesel: There is a small amount of diesel that is used for start up operations and auxiliary boilers, as well as for vehicles. The amount of diesel used in the past few years is listed below. In order to determine the carbon intensity of the diesel, the project participants used the IPCC default of 3.1863 $kgCO_2$/kg of diesel fuel. Because AMPCO measures diesel by volume, it is necessary to obtain a density figure to convert to $kgCO_2$/liter of diesel. For density calculations, the project participants use 0.88 kg of diesel/liter of diesel.[2]

Year	Diesel Fuel Usage (liters)
2001	559,592
2002	763,000
2003	208,000
2004	276,000
2005	252,000
2006	400,000
2007	400,000
2008	400,000
2009	400,000
2010	400,000

Actual calculations can be found in the spreadsheet provided to the validator.
*Example from 2006, which assumes diesel use of 400,000 liters: 400,000 * .88 * 3.1863 / 1000 = 1,121* tCO_2

[2] The project participants used the following sources for the density calculation: http://cdm.unfccc.int/Projects/DB/DNV-CUK1140180495.84/Monitoring/DNV-CUK1154125336.66/report and http://www.iges.or.jp/en/cdm/pdf/philippines/03/08.pdf. Note that these figures are very conservative, as they are quite high compared to other sources of data. The higher the density, the more carbon from the diesel and thus, the higher the project emissions will be.

Year	CO_2 Equivalent (tonnes)
2001	1,569
2002	2,139
2003	583
2004	774
2005	707
2006	1,122
2007	1,122
2008	1,122
2009	1,122
2010	1,122

FE_y, Fugitive Emissions from Pipeline: Project emissions from the potential leakage in the pipeline extensions between the point of flaring and the methanol plant should be accounted for.

FEy =

$$GWP_{CH4} \times \frac{1}{1000} \times \sum_{equipment} \left[w_{CH4,pipeline} \times EF_{pipeline} \times t_{equipment} \right]$$

A schematic of the pipeline between the LPG plant and AMPCO facility is included in Section A.4.3. The schematic identifies the quantity and type of components along the length of the pipe. In April, 2005, the original LPG plant was replaced by a new one, and the facility now gets feedstock from a new LPG plant. The schematic and component count for the new system is shown Section A.4.3.

.

A. Between May 2001 and April 2005 the component count and fugitive emissions in kg / hr were as shown in the table below:

	Equipment Count May 2001 - April 2005					
	HP	**LP**	**RG**	**Total**	**EF* kg/hr/item**	**Fug Emissions** kg/hr**
Equipment Type						
Valves	9	6	6	21	0.0045	0.0945
Flanges	13	10	9	32	0.00039	0.01248
Open-ended lines	1	1	1	3	0.002	0.006
Other	6	6	6	18	0.0088	0.1584
Total						**0.27138**

* EF is taken from Table 2 of AM0037

** EF x # of equipment pieces.

B. Between April 2005 and December 2005, the component count and fugitive emissions in kg / hr were as shown in the table below:

Equipment Type	Equipment Count April 2005				EF* kg/hr/item	Fug Emissions** kg/hr
	HP	LP	RG	Total		
Valves	9	12	6	27	0.0045	0.1215
Flanges	13	26	9	48	0.00039	0.01872
Open-ended lines	1	1	1	3	0.002	0.006
Uther	6	11	6	23	0.0088	0.2024
Total						**0.34862**

* EF is taken from Table 2 of AM0037

** EF x # of equipment pieces.

Note: The total is an estimated figure for 2006 and beyond.

For simplicity of calculation and conservativeness the time of operation is assumed to be 24 hours a day continuous. Annual fugitive emissions are as follows:

Year	Hours of Operation	Emissions per hour	CO_2 Equivalent (tonnes)
2001	5880	0.27138	33.510
2002	8760	0.27138	49.923
2003	8760	0.27138	49.923
2004	8784	0.27138	50.060
2005	8760	0.32957	60.629
2006	8760	0.34862	64.132
2007	8760	0.34862	64.132
2008	8784	0.34862	64.308
2009	8760	0.34862	64.132
2010	8760	0.34862	64.132

Illustrated calculation of 2006 Project Emissions (estimated):

$FCT_y = 0$

$EFFCT_y = 0$

$V_y =$ HP = 9.04; LP = 921.51; RG = 15.8; TOTAL: 946.35 (million m^3)

$FE_y = 64.13$ tCO_2

FEy = 21 * 1/1000 * (1 * 0.34862 * 8760)

$EFA_y = 0$ (no accidents have occurred)

$FFU_y = 1,122$ tCO_2

PE_{2006} = 0 + 64.13 + 0 + 1122 = 1186.13 tCO_2 in 2006 (est.)

Estimated leakage: Zero

Overall Project Emissions

Year	CO_2 Equivalent (tonnes)
2001	1,603
2002	2,189
2003	633
2004	824
2005	767
2006	1,186
2007	1,186
2008	1,186
2009	1,186
2010	1,186

BASELINE EMISSIONS: Estimated anthropogenic emissions by sources of greenhouse gases of the baseline

$$BE_y = \left(V_y \times w_{carbon,y} \times 44/12\right) + \left(FCT_{flare,x} \times V_y \times EFFCT_{flare,x}\right) + FE_x$$

	Natural Gas Delivered to AMPCO (MMm3 = million cubic meters)											
	HP				LP				Regen			
Year	V_y Qty (MMm^3)	% C	% CH_4	W_{carbon} (t C/m^3)	V_y Qty (MMm^3)	% C	% CH_4	W_{carbon} (t C/m^3)	V_y Qty (MMm^3)	% C	% CH_4	W_{carbon} (t C/m^3)
2001	29.05	68.11	73.67	0.00058	584.10	68.10	73.67	0.00058	1.30	68.10	73.67	0.00058
2002	5.46	67.68	73.82	0.00057	892.49	67.68	73.82	0.00057	1.63	67.68	73.82	0.00057
2003	65.91	68.94	67.72	0.00062	980.09	67.36	72.49	0.00057	0.05	67.36	72.49	0.00057
2004	158.73	68.50	63.87	0.00063	1028.89	66.79	69.29	0.00058	0	66.79	69.29	0.00058
2005	20.52	68.44	66.19	0.00062	1241.67	66.93	71.12	0.00058	4.17	66.93	71.12	0.00058
2006	9.04	68.44	66.19	0.00062	921.51	66.93	71.12	0.00058	15.8	66.93	71.12	0.00058
2007	0.00	68.44	66.19	0.00062	1183.63	66.93	71.12	0.00058	0.00	66.93	71.12	0.00058
2008	0.00	68.44	66.19	0.00062	1183.63	66.93	71.12	0.00058	0.00	66.93	71.12	0.00058
2009	0.00	68.44	66.19	0.00062	1183.63	66.93	71.12	0.00058	0.00	66.93	71.12	0.00058
2010	0.00	68.44	66.19	0.00062	1183.63	66.93	71.12	0.00058	0.00	66.93	71.12	0.00058

Ilustrated calculation of 2006 Baseline Emissions (estimated):

BE = ($V_{y, HP}$ x $W_{carbon, HP}$ + $V_{y, LP}$ x $W_{carbon, LP}$ + $V_{y, RG}$ x $W_{carbon, RG}$) x 44/12 x 1,000,000
Tonne CO_2eq

V_y = HP = 9.04; LP = 921.51; RG = 15.8; TOTAL: 946.35 (million m^3)
$W_{carbon,y}$ = HP = 0.00062; LP = 0.00058; RG = 0.00058 (tC/ m^3)
$FCT_{flare,x}$ = 0 (no fuel required for transport of gas, so this variable is not calculated)
$EFFCT_{flare,x}$ = 0 (no fuel required for transport of gas)
FE_x = 0 (because the pipeline is simply an extension of the previous pipe, this variable is not used in this project)

BE_{2006} = [(9.04 * .00062 * 44/12) + (921.51 * .00058 * 44/12) + (15.8 * .00058 * 44/12) + 0 + 0] * 1,000,000
***BE_{2006}* = 2,001,131 tCO_2**

Overall Baseline Emissions

Year	CO_2 Equivalent (tonnes)
2001	1,297,936
2002	1,885,518
2003	2,210,321
2004	2,565,094
2005	2,679,067
2006	2,001,131
2007	2,501,131
2008	2,501,131
2009	2,501,131
2010	2,501,131

The calculations above describe the first part of the formula. The transport of the tail gas to the end use facility requires an extension of the pipeline to the flare in the baseline scenario; therefore, fugitive CH_4 emissions and emissions from transportation of the tail gas have been ignored

B.6.4 Summary of the ex-ante estimation of emission reductions:

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions (tonnes of CO_2e)
2001	1,603	1,297,936	0	1,296,333
2002	2,189	1,885,518	0	1,883,329
2003	633	2,210,321	0	2,209,688
2004	824	2,565,094	0	2,564,270
2005	767	2,679,067	0	2,678,300
2006	1,186	2,001,131	0	1,999,945
2007	1,186	2,501,131	0	2,499,945
2008	1,186	2,501,131	0	2,499,945
2009	1,186	2,501,131	0	2,499,945
2010	1,186	2,501,131	0	2,499,945
Total (tonnes of CO_2e)	11,946	22,643,591	0	22,631,645

B.7 Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

PROJECT EMISSIONS

(Copy this table for each data and parameter)	
Data / Parameter:	FCT_y
Data unit:	N/A
Description:	Quantity of fossil fuel(s) Used to move gas to project facility
Source of data to be used:	N/A
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	N/A
QA/QC procedures to be applied:	N/A
Any comment:	Not used in this project. No energy required to transport gas. Gas has sufficient pressure at source for transport to the Methanol plant.

Data / Parameter:	$EFFCT_y$
Data unit:	N/A
Description:	CO_2 per unit of fossil fuel(s) used for transportation of tail gas to end use facility in year y.

Source of data to be used:	N/A
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	N/A
QA/QC procedures to be applied:	N/A
Any comment:	Not used in this project

Data / Parameter:	$t_{equipment}$
Data unit:	Time (hours of operation)
Description:	Time of use for each of the equipment pieces listed in section B.6.2
Source of data to be used:	AMPCO
Value of data applied for the purpose of calculating expected emission reductions in section B.5	8760
Description of measurement methods and procedures to be applied:	For simplicity of calculation and conservativeness, the equipment is assumed to be in service continuously for the entire year.
QA/QC procedures to be applied:	To be conservative, it will be assumed that operation is every hour of the year – thus raising the level of project emissions and reducing emission reductions. No QA/QC procedures are therefore required.
Any comment:	This parameter is required for calculating fugitive emissions.

Data / Parameter:	$W_{CH4, pipeline}$
Data unit:	kg CH_4/kg
Description:	Average methane weight fraction in the pipeline
Source of data to be used:	Analysis of the gas utilized
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1
Description of measurement methods and procedures to be	For the Fugitive emissions calculations all streams are considered to be 100% CH4 for simplicity and conservativeness

applied:	
QA/QC procedures to be applied:	To be conservative, it will be assumed that the gas is 100% methane – thus raising the level of project emissions and reducing emission reductions. Gas composition varies little, but analysis of the gas is taken at least weekly when in service.
Any comment:	For the Fugitive emissions calculations all streams are considered to be 100% CH4 for simplicity and conservativeness

Data / Parameter:	QF_y
Data unit:	liters of diesel
Description:	Amount of fossil fuel consumed at the end-use site for on-site power generation or other thermal needs
Source of data to be used:	Purchasing records from AMPCO
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Estimate for 2006 and beyond: 400,000 liters/year
Description of measurement methods and procedures to be applied:	Number of liters will be provided from purchase records
QA/QC procedures to be applied:	Can be reliably calculated from records of diesel purchases
Any comment:	Diesel is consumed for back up power for emergency equipment, black start for power generators and fuel for vehicles. All diesel consumed is accounted for as project emissions. Data will be archived for two years following the end of the crediting period.

Data / Parameter:	EFA_y
Data unit:	Emissions of CH4 that occur from accidents
Description:	KG of CH4. Required for project emissions since emissions from accidents resulting from operation of the pipeline to the methanol facility may occur.
Source of data to be used:	AMPCO (plant records)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	Calculated as the sum of the total amount of gas flow from the time the accident occurred until shut-off, and the total amount of gas remaining in the pipeline at shut-off.
QA/QC procedures to be applied:	Emissions from accidents will require strong data collection from AMPCO. This will include length of time of accidents, etc. The monitoring plan should spell

	out who is responsible and what procedures are in place to deal with accidents and reliably measure the emissions from accidents.
Any comment:	No accidents have been reported to date, thus not calculated in Section B.6.3.

Data / Parameter:	$W_{CH4, pipeline, accident}$
Data unit:	kg CH_4/m^3
Description:	Fraction of methane in tail gas at time of accident. Required for project emissions since it is necessary to know the content of methane in the gas, to determine the overall GHG impact of emissions to the atmosphere.
Source of data to be used:	Analysis of gas utilized
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	Gas composition varies little. Analysis of the gas is taken at least weekly when in service.
QA/QC procedures to be applied:	Gas composition varies little. Analysis of the gas is taken at least weekly when in service.
Any comment:	No accidents have been reported to date, thus not calculated in Section B.6.3.

Data / Parameter:	t_1
Data unit:	Time
Description:	Time the gas leakage caused by the accident occurred. Required for project emissions because it is necessary to know the amount of time that has elapsed during accidental emissions from pipeline incidents.
Source of data to be used:	AMPCO (plant records)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	N/A
QA/QC procedures to be applied:	N/A
Any comment:	No accidents have been reported to date, thus not calculated in Section B.6.3.

Data / Parameter:	t_2
Data unit:	Time
Description:	Time the shutdown valves closed both the upstream and downstream pipeline.

	Required for project emissions because it is necessary to know the amount of time that has elapsed during accidental emissions from pipeline incidents.
Source of data to be used:	AMPCO (plant records)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	N/A
QA/QC procedures to be applied:	N/A
Any comment:	No accidents have been reported to date, thus not calculated in Section B.6.3.

Data / Parameter:	F
Data unit:	m^3/sec
Description:	Flow rate of gas supplied from to the gas processing and methanol plants. Note: For this project, to be conservative, F will include all of the gas supplied from the off-shore oil field to the on-shore gas processing plant and methanol plant.
Source of data to be used:	Flow meter FI629 – LP FI628 – HP FI626 – RG
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	Data continuously measured at the flow meter that records all gas delivered to Bioko Island from the offshore production operations. Data must be archived for two years following the end of the crediting period.
QA/QC procedures to be applied:	Volume of gas should be completely metered with regular calibration of metering equipment, similar to what is called for in other approved methodologies.
Any comment:	No accidents have been reported to date, thus not calculated in Section B.6.3. Note: Including gas from these other points is conservative since emissions from these pipelines will increase project emissions and thus reduce emission reductions.

Data / Parameter:	T_p
Data unit:	ºC
Description:	The temperature in the pipeline when the shutdown valves close both the upstream and downstream of the pipeline
Source of data to be	Temperature Indication

used:	TI617 – LP TI613 – HP TI616 – RG
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	Reading of meter by operational staff and recording into log and database.
QA/QC procedures to be applied:	Consistency checks of measurement with operation data – same as AM0009
Any comment:	When an accident causes gas leakage from a pipeline, the gas leakage volume is less than the sum of (1) the total amount of gas that flowed during the time the accident occurred until the gas flow is shut and (2) the total amount of gas remaining in the pipeline. Therefore, the temperature of the gas in the pipeline needs to be measured only when the valve is shut. No accidents have been reported to date, thus not calculated in Section B.6.3.

Data / Parameter:	P_p
Data unit:	Atm
Description:	Pp is the pressure in the pipeline when the shutdown valves close both the upstream and downstream of the pipeline in atmospheres (atm).
Source of data to be used:	Pressure Indication PI646 – LP PI633 – HP PI647 – RG
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Used to determine volume of gas emitted during an accident
Description of measurement methods and procedures to be applied:	Reading of meter by operational staff and recording into log and database.
QA/QC procedures to be applied:	Consistency checks of measurement with operation data – same as AM0009
Any comment:	No accidents have been reported to date, thus not calculated in Section B.6.3.

Data / Parameter:	V_d, accident
Data unit:	m^3
Description:	The volume of tail gas supplied to the pipeline from the oil and natural gas processing plant before the accident occurs during the period day. Used to

	determine volume of gas emitted during an accident.
Source of data to be used:	AMPCO
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	Reading of meter by operational staff and recording into log and database.
QA/QC procedures to be applied:	Consistency checks of measurement with commercial data – same as AM0009
Any comment:	No accidents have been reported to date, thus not calculated in Section B.6.3.

Data / Parameter:	$V_{xi,d\ accident}$
Data unit:	m^3
Description:	The volume of gas supplied to the pipeline from other sources if any before the accident occurs during the period day
Source of data to be used:	AMPCO
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	Reading of meter by operational staff and recording into log and database.
QA/QC procedures to be applied:	Consistency checks of measurement with commercial data – same as AM0009
Any comment:	No accidents have been reported to date, thus not calculated in Section B.6.3.

BASELINE EMISSIONS

Data / Parameter:	V_y
Data unit:	Cubic meters
Description:	Volume of gas that would have been flared, measured at the metered receipt point
Source of data to be used:	Flow meter FI629 – LP FI628 – HP FI626 – RG
Value of data applied for the purpose of calculating expected	For 2006, HP = 9.04; LP = 921.51; RG = 15.8; TOTAL: 946.35 (million m3)

emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Measured with a flow meter
QA/QC procedures to be applied:	Volume of gas will be completely metered with regular calibration of metering equipment, similar to what is called for in other approved methodologies. Meter calibration takes place once per month.
Any comment:	Data will be archived for two years following the end of the crediting period.

Data / Parameter:	W_{carbon}
Data unit:	Tonnes-C/m^3
Description:	Carbon content of recovered gas
Source of data to be used:	Analysis of the gas utilized
Value of data applied for the purpose of calculating expected emission reductions in section B.5	For 2006 and estimates beyond (**tC/m^3**): LP: 0.00062 HP: 0.00058 RG: 0.00058
Description of measurement methods and procedures to be applied:	See below
QA/QC procedures to be applied:	Carbon content of gas can be crossed checked with previous months' data as well as checking with the owners of upstream facilities and the recovery process.
Any comment:	Data will be archived for two years following the end of the crediting period.

Data / Parameter:	$FCT_{flare,x}$
Data unit:	
Description:	Quantity of fossil Fuel(s) Used to move gas to flaring point, if any
Source of data to be used:	N/A
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	N/A
QA/QC procedures to be applied:	N/A
Any comment:	Not used in this project. No energy required to transport gas. Gas has sufficient pressure at source for transport to the flare. Thus, this variable is not calculated

	in Section B.6.3.

Data / Parameter:	$EFFCT_{flare,x}$
Data unit:	
Description:	CO2 per unit of fossil fuel(s) used
Source of data to be used:	N/A
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	N/A
QA/QC procedures to be applied:	N/A
Any comment:	Not used in this project. No energy required to transport gas. Gas has sufficient pressure at source for transport to the flare. Thus, this variable is not calculated in Section B.6.3.

Data / Parameter:	Type and Number of valves, pump seals, connectors flanges, open-ended lines, etc
Data unit:	N/A
Description:	N/A
Source of data to be used:	N/A
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	N/A
QA/QC procedures to be applied:	N/A
Any comment:	For conservativeness and simplicity no fugitive emissions are included in the baseline case. Thus, this variable is not calculated in Section B.6.3.

Data / Parameter:	Time of use for each of the pieces mentioned above
Data unit:	N/A
Description:	N/A
Source of data to be used:	N/A

Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	N/A
QA/QC procedures to be applied:	N/A
Any comment:	Not used in this project

B.7.2 Description of the monitoring plan:

The information necessary to calculate or estimate the GHG emission reductions associated with the AMPCO project will be monitored and collected as indicated in the monitoring plan provided in this section. All the information will be available electronically and in hard copy format and will be handled by AMPCO personnel.

Furthermore, AMPCO personnel will:

- Ensure the metering of the gas delivered to the plant is accurate and in accordance with the QA/QC procedures outlined in the monitoring methodology.
- Ensure that the pipeline connections between the methanol plant and the LPG plant are well maintained and any fugitive emissions from accidents are accurately accounted for.
- Maintain records on purchase of diesel fuel for use at the facility.

The procedures described below have been implemented to ensure proper monitoring, collection and recording of information required for the calculation of achieved emission reductions:

- *Amount of natural gas received:*
  Information on the amount of natural gas received by AMPCO will be recorded and archived through the plant's control room via the distributed control system (DCS). The gas measurements will be performed using calibrated instrumentation devices. The DCS automatically prints out a report each midnight stating totals for the day. The shift supervisor enters these quantities into a production database which serves as the data source for the annual flow quantities used for emission reduction calculations. In addition, the daily report is reviewed by AMPCO operations management and distributed to all concerned parties including the partners.

- *Flow meters:*
  Fuel flow to the AMPCO facility and major fuel burning components at AMPCO are monitored using either standard Orifice Plate ΔP or Vortex Shedding (Rosemont Model 8800) measurement instruments. The flow meters will be maintained and calibrated by the maintenance department. The maintenance department will generate monthly records on all the calibrations performed. All calibrations will be undertaken by trained instrument technicians. Records of the training and

qualifications will be kept on file by the maintenance department. The LPG plant will be notified prior to the monthly calibration checks and invited to witness the calibrations.

Given the nature of the instrumentation, the frequency of calibration, and the manufacturer's specified relative accuracy of the measurement devices, all flow measurements are believed to be ±2% accurate.

- *Gas composition analysis:*
  Gas chromatographs are used for the undertaking of gas analyses[3]. These analyses are performed on a weekly basis and recorded electronically in the laboratory computer. The result values are entered manually by the laboratory technicians into the lab database which is accessible to the operations and technical services groups. The database serves as the source for the annual gas composition information required for the emission reduction calculations.

- *Amount of diesel used by the facility:*
  As highlighted in Section B, project emissions result mostly from the use of diesel by the methanol plant. Diesel is used intermittently for start-up purposes, emergency back-up, and maintenance activities. Some diesel is also used by vehicle and heavy equipment at the site. All diesel consumed by the facility is purchased locally; consumption is monitored by keeping invoices from the local diesel supplier and cross-checking it with the records from the diesel supplier itself.

The monitoring records handling is performed by the AMPCO Technical Services Department. The Technical Services Department (TSD) maintains an Excel spreadsheet for all emission calculations and source data. The data is reviewed annually by the TSD Manager and the project partners.

Note: In case of emergencies and accidents, the plant is designed with automatic remote operated isolation valves to contain and minimize gas releases in the event of emergencies. The Punta Europa Fire Department has developed a written Emergency Response Plan to respond to and contain all types of accidental releases.

As part of the annual reporting process, the achieved emission reductions will be verified through audits carried out on an annual basis. These audits will ensure the operation of the facility is in accordance with the Emissions Reporting Guidelines previously developed for AMPCO. It will also ensure plant processes, procedures, operating records and data monitoring is undertaken as proposed in the CDM monitoring methodology.

More information on the annual reporting audits and on the calibration of the meters is contained in Annex 4.

B.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

25/09/2006
Seth Baruch, QualityTonnes (Not a project participant)
818 Aspen Street, NW

[3] The gas chromatographs for these analyses are checked weekly for proper calibration by analysing known standard gases.

Washington, DC 20012 USA
202-236-5253
sbaruch@qualitytonnes.com

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

03/05/2001

C.1.2. Expected operational lifetime of the project activity:

25 years

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

Option Not Selected

C.2.1.2. Length of the first crediting period:

Option Not Selected

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

03/05/2001

C.2.2.2. Length:

10 years

SECTION D. Environmental impacts

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

An Environmental Impact Assessment (EIA) was developed to support the project. Some of the key environmental issues identified during this assessment are as follows:

Air Quality: In terms of localized air quality the methanol plant has not represented 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 was minimal once construction was completed. In addition, the large reduction of GHG associated with the extinguishing of the ground flare has yielded a substantial positive local and global impact.

Water Quality: With regard to water quality, there has been 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 has helped minimize the occurrence of a release and the significance of the consequences. A full time HSE (Health, Safety and Environmental) Manager is employed to implement best management practices and follow plant environmental procedures aimed at protecting the environment.

Other Issues: 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.

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.

There has also been no adverse noise impact at Mongola village or at the property boundary. Due to the potential negative health effects of methanol exposure, some precautions have been taken. For example, if in contact with methanol without sufficient cleaning, skin irritation can occur. If methanol vapors are inhaled, nausea can occur. AMPCO has trained all employees on appropriate cleaning, and the nearby rotation residences are only used during down time of the methanol plant. Because the location of the plant is uninhabited, no local communities are affected by these issues – only plant personnel. Disposal of solid waste is at approved facilities by qualified contractors or carriers. Finally, small amounts of hazardous materials have been generated and are disposed of through licensed disposal services.

This same EIA was presented to the USIJI office and was posted on the Overseas Private Investment Corporation's web page for the required 60-day period, in which no third party comments were received.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

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.

Site walkovers are undertaken by the HSE Officer to monitor the implementation of general safety procedures throughout the project site and to ensure that good “housekeeping” is generally maintained. Weekly meetings are attended by all on-site company representatives are held where, in addition to progress assessment, environmental and health and safety issued are discussed.

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.

SECTION E. Stakeholders’ comments

E.1. Brief description how comments by local stakeholders have been invited and compiled:

Because this facility is located in an uninhabited area, the relevant stakeholder is the Government of Equatorial Guinea. Government stakeholders have been fully involved in the process, and the project participants have given evidence to the validator demonstrating the governments support and approval of the project.

The country is not home to many environmental or community organizations or other NGOs. The development impacts of the project separate from the environmental benefits have been well documented and has led to more community involvement. For example, the partners have supported and will continue to support international non-governmental and other organizations that promote democratic ideals and principles through education and support for democratic systems in Equatorial Guinea. One of the project partners provided a $10,000 grant to the International Federation for Electoral Systems (IFES) to support the establishment and operations of an Elections Observer Mission for one of Equatorial Guinea’s recent elections. That partner similarly provided $7,500 to the Institute for Democratic Strategies (IDS) in support of a multifaceted democratization program in Equatorial Guinea.

These projects are illustrative of the fact that the partners undertake a commitment to social responsibility in the community they serve. The partners exercise and encourage responsible and ethical business practices in all of dealings with customers, local partners, vendors, and suppliers. The partners continually seek to observe certain fundamental values in their interaction with local and national leaders, opinion-makers, and government officials, including adherence to the rule of law, tolerance, and respect. The partners also promote the establishment of greater transparency in business transactions, the development of sound and open regulatory regimes and practices, and the adoption of policies and laws that encourage free market principles.

Other Comments from AMPCO’s IJI Application: The project will help to build developmental capacity and have a substantial positive effect on Equatorial Guinea’s economic growth and social progress. The partners, for instance, have worked effectively to establish a new and productive dialogue between the Overseas Private Investment Corporation, the US State Department, and the Government of Equatorial Guinea to lay the groundwork for substantial progress in the areas of labor and workers rights. This

dialogue has already produced both verbal and written commitments by the President of Equatorial Guinea to senior State Department officials that the government will institute new programs and policies to shore up labor and workers rights protections. These commitments are a direct result of the partners' efforts and will be implemented, monitored and sustained through the life of the AMPCO project.

In addition, the advent of the AMPCO methanol project, the first large onshore facility in the country, brought expansive new opportunities to Equatorial Guinea for local employment. The project emerged as a foundation for new and progressive government policies and practices on local employment, which the partners have supported and embraced.

The plant employs approximately 240 people total, of which roughly 140 are skilled, professional staff. These skilled workers will in turn be available for other US and foreign investors, and as additional investment accrues their ranks will grow. Overall, the project is improving the skills of the local labor pool. In addition to these benefits, the project partners have done the following:

- Developed, constructed and begun operation of a 10-MW power plant on Bioko Island to meet all power requirements for the island, at a cost of more than $12 million. The partners conduct ongoing meetings with the Ministry of Mines and the local power company to assist with electrical power for Malabo. The partners also have undertaken a program to clear and maintain all power transmission lines from the hydroelectric plant in Riaba, at a current cost of $20,000 per month;

- Contributed $200,000 to construct a temporary bridge on the road between the airport and Malabo that was washed out by a flood, and contributed $750,000 for the construction of a permanent bridge. The partners have also agreed to participate in the reconstruction of the entire road;

- Purchased two vehicles at $36,000 and provided two drivers and chemicals to conduct a malaria spraying program in Malabo five or more nights per week;

- Provided $45,000 in equipment and in-kind assistance to construct facilities and provide street lighting and electricity in advance of an international conference;

- Initiated discussions with US universities for extension programs to supplement the company's training and vocational education effort;

- Provided books and supplies for local schoolchildren.

E.2. Summary of the comments received:

N/A

E.3. Report on how due account was taken of any comments received:

N/A

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Atlantic Methanol Production Company (AMPCO)	MDL Ambiente
Street/P.O.Box:	AMPCO Plant	21 Wilson Street
Building:	Administration	
City:	Punta Europa	
State/Region:	N/A	London
Postfix/ZIP:	N/A	EC2M 2TD
Country:	Equatorial Guinea	United Kingdom
Telephone:	713-328-1390	+44 207 731 3562
FAX:	713-328-1301	+44 207 731 3562
E-Mail:	kkeag@AtlanticMethanol.com	mdl_ambiente@dsl.pipex.com
URL:	N/A	
Represented by:		Ben Richardson
Title:	Chairman	Mr
Salutation:	Mr.	
Last Name:	Keag	Richardson
Middle Name:		
First Name:	Ken	Benjamin
Department:	Administration	
Mobile:		+44 7736 435 774
Direct FAX:	713-328-1301	+44 207 731 3562
Direct tel:	281-872-2835	+44 207 731 3562
Personal E-Mail:	kkeag@AtlanticMethanol.com	benrichardson@dsl.pipex.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding was used for this project

Annex 3

BASELINE INFORMATION

Gas Delivered to AMPCO Plant that would have otherwise been flared (MMm^3):

Year	Natural Gas Delivered to Ampco (MMm3 = million cubic meters)											
	HP				LP				Regen			
	V_y Qty (MMm^3)	% C	% CH_4	W_{carbon} (t C/m^3)	V_y Qty (MMm^3)	% C	% CH_4	W_{carbon} (t C/m^3)	V_y Qty (MMm^3)	% C	% CH_4	W_{carbon} (t C/m^3)
2001	29.05	68.11	73.67	0.00058	584.10	68.10	73.67	0.00058	1.30	68.10	73.67	0.00058
2002	5.46	67.68	73.82	0.00057	892.49	67.68	73.82	0.00057	1.63	67.68	73.82	0.00057
2003	65.91	68.94	67.72	0.00062	980.09	67.36	72.49	0.00057	0.05	67.36	72.49	0.00057
2004	158.73	68.50	63.87	0.00063	1028.89	66.79	69.29	0.00058	0	66.79	69.29	0.00058
2005	20.52	68.44	66.19	0.00062	1241.67	66.93	71.12	0.00058	4.17	66.93	71.12	0.00058
2006	9.04	68.44	66.19	0.00062	921.51	66.93	71.12	0.00058	15.8	66.93	71.12	0.00058
2007	0.00	68.44	66.19	0.00062	1183.63	66.93	71.12	0.00058	0.00	66.93	71.12	0.00058
2008	0.00	68.44	66.19	0.00062	1183.63	66.93	71.12	0.00058	0.00	66.93	71.12	0.00058
2009	0.00	68.44	66.19	0.00062	1183.63	66.93	71.12	0.00058	0.00	66.93	71.12	0.00058
2010	0.00	68.44	66.19	0.00062	1183.63	66.93	71.12	0.00058	0.00	66.93	71.12	0.00058

Overall Baseline Emissions

Year	CO_2 Equivalent (tonnes)
2001	1,297,936
2002	1,885,518
2003	2,210,321
2004	2,565,094
2005	2,679,067
2006	2,001,131
2007	2,501,131
2008	2,501,131
2009	2,501,131
2010	2,501,131

Annex 4

MONITORING PLAN

Annual Reporting

The annual verification of emission reductions are accomplished by performing audits of the facility on an annual basis. These audits will do the following:

1. Verification that the AMPCO facilities continue to operate in a configuration that is consistent with that described in an Emissions Reporting Guideline developed for AMPCO.
2. Site visit and inspection of the physical facilities. Emphasis will be placed on the configuration and characteristics of the gas plant flare, gas field re-injection, and fate of gas that would otherwise be used by AMPCO in the production of methanol.
3. Interviews by AMPCO staff with appropriate plant management, operational, and environmental personnel. Emphasis will be placed on ensuring that plant processes, procedures, data monitoring and acquisition, operating records are consistent with the proposed CDM monitoring methodology.
4. Inspection of the gas plant ground flare. If the gas plant flare is ever altered, replaced, or otherwise retired in favor of another process for the disposal of excess gas (other than the proposed CDM project activity), information on the replacement process will be obtained for use in future emissions calculations.
5. Inspection of data monitoring and recording instrumentation. All such instrumentation will be viewed and their operation and calibration will be discussed with plant personnel responsible for that equipment.
6. Review of year-end data reports to verify accuracy of entry into an Emission Calculation Workbook and consistency of data derivation with the methods described herein.

Accuracy and calibration of metering

Fuel flow to the AMPCO facility and major fuel burning components at AMPCO are monitored by using either standard Orifice Plate ΔP or Vortex Shedding (Rosemont Model 8800) measurement instruments. A summary of the instrumentation used and the expected relative accuracy provided by the manufacturers is as follows:

Parameter Measured	Flowmeter Type	Relative Accuracy
HP/LP/Regen gas from CMS	Orifice Plate	±2%

- Plant instrumentation staff routinely calibrates all meters every month. Given the nature of the instrumentation, the frequency of calibration, and the manufacturer's specified relative accuracy of the measurement devices, all flow measurements are believed to be accurate to within the specified accuracy of ±2%." - - - -

Annex 5

Methanol Institute Letter

Methanol Institute

Telephone: 703.248.3636
Fax: 703.248.3997

August 2, 2006

Ms. Susanne Haefeli-Hestvik
Det Norske Veritas
International Climate Change Services
NO-1322 Høvik, Norway

Dear Ms. Haefeli-Hestvik:

The Methanol Institute (MI) and its research arm, the Methanol Foundation, represent the global methanol industry. The Methanol Institute is a non-profit industry association that maintains comprehensive data on methanol technology, end-uses, production and commodity market and trends. The AMPCO project owners asked the MI to provide its opinion on two issues related to the impact of the AMPCO project on methanol production at other facilities around the globe.

We restate the issues and provide our opinion below.

Issue 1: Does the AMPCO facility lead to the displacement of production at other methanol facilities and if so, emissions and/or emissions reductions result from displaced production at other facilities?

It is not possible to determine if the AMPCO facility has any direct impact on production levels or greenhouse gas emissions that may be emitted at any other methanol production facilities operating around the world. The global methanol market has been growing at an average of 3% per year and therefore the capacity generated by the AMPCO facility would not necessarily lead to displacement of production, but rather be absorbed into this increasing demand. However, methanol plants that have been retired in the past decade were located in the US and Europe as a consequence of their production efficiency and the higher feedstock prices due to competing demand for the feedstock (natural gas-methane). With respect to emissions, when these plants are retired, the gas previously used as feedstock is used for other competing purposes and does not end up being flared. To our knowledge, retirement of a methanol plant has never resulted in the flaring of the gas previously used as its feedstock and the AMPCO plant is one of only two plants worldwide that use previously flared methane as a feedstock[1]. Because the AMPCO facility uses previously flared methane as a feedstock, it thereby eliminates this source of emissions from the flared gas resulting in a significant reduction in greenhouse gas emissions.

[1] The other plant, located in the North Sea, was required to stop flaring as a consequence of regulations governing operations in the jurisdiction in which the flare was operated. In the North Sea case, the methanol plant was built because the operator was required under regulation to stop flaring the gas.

Issue 2: If the AMPCO facility did not exist, where would the methanol from this facility be produced?

It is not possible to determine where this productive capacity would be located if AMPCO were not constructed or if or when such capacity would be installed. Decisions to construct methanol facilities are based upon a variety of factors including environmental pressures, technology advancement, cost of production, cost and reliability of feedstock supplies, expectations of future market conditions, demand levels and retirement of obsolete or uneconomic capacity. Given the multiplicity of factors that are considered when deciding to undertake a capital intensive project of this magnitude, it isn't possible to determine if and when a new plant will be developed (or an existing plant expanded) and to isolate a single deciding factor—the absence of the AMPCO facility—as the cause of the decision for a plant to be constructed.

We trust that this information will be of use clarifying the issues raised.

Sincerely,

John Lynn
President & CEO

Annex 6

AMPCO Memoranda

MAY.10.2000 5:29PM CMS ENERGY NO.839 P.1
TO:WASHINGTON GA

CMS ENERGY
FACSIMILE TRANSMISSION

Date: May 10, 2000

To: Rodney Cook, Samedan

CC: Brad Fischer, Houston
George Pickart, Washington, DC
William Spence, AMPCO

From: JAMES W. COOK
Company: CMS Energy
Telephone No.: (313) 436-9242
Fax No.: (313) 436-9258

* * * * * * * *

COVER SHEET AND 3 PAGES TO FOLLOW. QUESTIONS ABOUT THIS DOCUMENT SHOULD BE DIRECTED TO (313) 436-9241.

SPECIAL INSTRUCTIONS OR COMMENTS:

FAIRLANE PLAZA SOUTH
330 TOWN CENTER DRIVE, SUITE 1100
DEARBORN, MICHIGAN 48126
FAX (313) 436-9258

MAY 10 '00 17:39 313 436 9258 PAGE.01

MAY.10.2000 5:29PM CMS ENERGY

CMS ENERGY

An International Energy Company

James W. Cook
Senior Vice President
Technology and Development

VIA FACSIMILE

May 10, 2000

Mr. Rodney Cook
Manager of International Operations
Samedan Oil Corporation
350 Glenborough
Suite 300
Houston, TX 77067

Dear Rodney:

As we have discussed on several occasions, CMS Energy has been exploring the possibility of obtaining certification of the AMPCO methanol project under the U.S. Initiative for Joint Implementation (USIJI), a program administered by the U. S. Energy Department in conjunction with other government agencies. As you know, when the Punta Europa flare is extinguished, the reduction of CO_2 emissions will be immediate, measurable, and of significant quantity.

Certification of the project under the USIJI program will enable AMPCO to generate credits for the greenhouse gas emissions reduction that can be traded in an emerging worldwide market. These credits will provide the project with a new and increasing revenue stream that will mitigate a portion of the risk from the volatile global market price of methanol. This is particularly important in view of the emerging proposals for banning the use of MTBE in the United States. CMS Energy believes that over time these emission credits will help to sustain the AMPCO project's viability and thereby offer an improved economic justification for bringing the project to fruition. Similarly, the proposed upstream reinjection program represents an important reduction of CO_2 emissions and can produce certifiable credits that enhance the financial and environmental benefits of the project. Accordingly we intend to account for those reductions in our application to USIJI.

Fairlane Plaza South • 330 Town Center Drive • Suite 1100 • Dearborn, MI 48126-2712 • Tel: 313 436 9242 • Fax: 313 436 9258

The process for obtaining certification is a complicated one; and unfortunately, there is a May 31, 2000 deadline for the next round of applications, and this is the only window available to our project. In the last few weeks CMS held a series of discussions with experts in the U.S. government and private sector; and we have determined that while the timeframe is short, it will be possible to submit a detailed application prior to the deadline. In order to do so, we will require Samedan's support for the effort, and the AMPCO partners will need to engage in a dialogue on some of the associated issues.

Certification under the USIJI program also requires approval from the government of Equatorial Guinea. We have had the opportunity to raise the prospect of this certification program in a recent meeting with President Obiang and with other Equato-Guinean officials, and their reaction thus far has been favorable. Unfortunately, in the process of conducting our discussions, we have determined that Equatorial Guinea is not a signatory to the United Nations Framework Convention on Climate Change (UNFCCC), which is a prerequisite for participating in the USIJI program. In follow-up conversations, we have requested that Equatorial Guinea become a participant in the UNFCCC, and there appears to be actual progress in that regard. If the Government of Equatorial Guinea signs the Convention by May 31, 2000, we will then be clear to submit our application to USIJI. If the government does not sign, we still may be able to submit an application contingent upon a firm indication of the government's willingness to sign the convention within a defined period of time.

In addition to providing its approval, the government of Equatorial Guinea as an equity partner in AMPCO will be entitled to a share of the credits as well. Accordingly, the AMPCO partners will need to continue holding discussions in order to arrive at a mutually agreeable understanding about the equitable apportionment and assignment of the credits. I am sure you will agree that we will need to be thoughtful regarding the distribution of the credits, their tax treatment, and their transferability.

In order to complete the application, CMS, Samedan and the Alba partners will need to coordinate on assembling the requisite data and information. Under separate cover, I will provide you with a copy of the guidelines for submitting an application and a first draft of our application. We are in particular need of information of efforts by Samedan to reduce domestic greenhouse gas emissions, which is information that the USIJI requires in the application. You will see from our first draft the description of what CMS Energy has been doing; and I would suggest, if appropriate, that you consider designating a representative to the application team and that you model your own submission on ours. I have asked Bob Avery to coordinate the preparation of the application, including preparation of the specific CMS information. Please feel free to seek Bob's assistance as needed.

As the process moves forward there will be other issues that we will need to address. These include the tax implications, if any, of the credits, the potential beneficial impact of certification on the project's political risk profile, and the possible need to establish independent monitoring and verification of the reduction of CO_2 emissions.

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As a final note, I wanted you to be aware of the market research we have undertaken regarding these credits. CMS Energy has contacted on a preliminary basis some of the leading authorities on the emerging market for emissions reduction credits, specifically experts from the brokerage firms of Cantor Fitzgerald and Natsource. Those discussions indicate that credits are currently being traded at a significant discount to their future value, which will be greater if a global climate change regime such as the Kyoto Protocol is put into practice. For the time being, however, the experts affirm that "investment grade" credits do exist and are traded. Marketable credits are from projects such as those certified under the USIJI program, that involve well known and established corporate participants, and that are located in politically attractive regions such as Africa – all criteria by which the AMPCO project measures up very well. We have received informal predictions that the credits generated by AMPCO could be worth as much as $1.50 per ton of CO_2 now and that they are expected to gradually increase in value until 2008. Since 2008 is considered something of a threshold year in climate change negotiations, the value of the credits after that could rise considerably, to the magnitude of between $5 to $10 per ton or more. I think you will agree that these potential revenues will do a great deal to strengthen our resolve to go forward with the project, to mitigate the uncertainty in the global methanol market, and to sustain AMPCO's viability over the long term.

I look forward to discussing these matters with you in greater detail.

Regards,

James W. Cook

CC: Bradley W. Fischer, Houston
George A. Pickart, Washington, DC
Robert A. Avery, Dearborn
William C. Spence, AMPCO

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Environmentally Responsible Gas Processing in Equatorial Guinea: Creating Value Thru GHG Emissions Reduction

CMS Energy Board of Directors
Environmental and Corporate Responsibility Committee

September 20, 2000

BACKGROUND

1990-91 - E&P independent operator, Joe Walter, and his partners sign a production sharing contract with the Government of Equatorial Guinea. Walter drills two successful off-shore gas wells, constructs a small on-shore gas processing facility to make liquids and flares the dry exit gas.

1995 - CMS Oil and Gas buys Walter International and becomes operator of the EG concession.

1996 - CMS management sets dual goals to productively utilize the gas and stop the flaring.

1997 - After numerous studies, CMS and its EG partner, Samedan Oil, decide to develop a petrochemical project to use the flared gas to make methanol.

1998 - Definitive agreement signed with the EG Government to enable the methanol project to proceed.

1998 - Turnkey construction contract signed with Raytheon Engineers and Constructors to build the methanol plant.

PROJECT STATUS - SEPTEMBER 2000

- Joint Venture Companies - the Atlantic Methanol Project Companies (AMPCO) - have been formed and are staffed and working in Houston and EG.
- Plant construction is in the precommissioning stage.
- Commercial methanol production is expected late in the first quarter of 2001.
- Methanol market price is currently robust due to high U. S. gas prices. As a result, the project's initial commercial prospects look good. Longer term market is uncertain due to MTBE phase out.
- Two time chartered tankers to transport AMPCO's methanol to market will be delivered in the first half of 2001.
- Partial recourse financing for AMPCO has been approved by the OPIC Board. Detailed terms are currently being negotiated, and closing is expected in the first quarter of 2001.
- An application is pending to certify the project for USIJI emissions reduction credits.

PROJECT CERTIFICATION UNDER USIJI

- After signing the United Nations Framework Convention on Climate Change (unveiled at the Earth Summit in Rio de Janeiro in 1992), the United States government established the U.S. Initiative on Joint Implementation (USIJI) in 1993, as part of a broader US Climate Change Action Program

- USIJI supports the development and implementation of voluntary projects between US and foreign partners that reduce, avoid or sequester greenhouse gas (GHG) emissions.

- The USIJI is a pilot phase program intended to recognize, and thereby give credit for, early action on greenhouse gas mitigation efforts in advance of obligations that will apply if and when the Kyoto Protocol enters into force.

- USIJI projects are certified based on a rigorous set of criteria. Projects must demonstrate that they are accepted by the host country, will reduce or sequester net GHG emissions, were developed or realized in part because of the USIJI program, provide sufficient data to establish emissions baselines with and without the project, provide for verification of emissions reductions, identify associated environmental and developmental impacts, and provide assurances that benefits gained will not be lost over time.

- Projects are certified by an inter-agency panel, in which the key players are the US EPA, Department of Energy, Department of State, and Agency for International Development. The process involves three stages: technical screening, technical review, and final evaluation.

CMS APPLICATION FOR EG PROJECT CERTIFICATION

- CMS, on behalf of our partners, filed an application in May to the USIJI covering all EG operations both upstream and downstream. The application was based on:
  - Extinguishing the on-shore flare as a result of the methanol plant, and
  - Reinjecting the excess off-shore gas production developed to support the gas supply requirements for the methanol project.

  The total credits requested in the application are 7.2 million tons per year of CO_2 equivalent reductions over 14 years.

- In support of the application, the Government of Equatorial Guinea wrote strong supporting letters, joined the United Nations Framework Convention for Climate Control and has indicated its intention to ratify the Koyoto protocol.

- The initial feedback from the USIJI technical review of the application has been very encouraging. It appears that, at least, the on-shore portion of the requested credits will be recommended for certification. This will mean recognition of roughly 3.4 million tons per year of CO_2 equivalent reductions.

MARKET FOR EMISSIONS REDUCTION CREDITS

- A market currently exists for these credits and is expected to expand dramatically once the Koyoto Protocol is fully defined. The market is mainly individual brokered transactions.
- Market purchasers are mainly corporate emitters hedging future risks, proprietary traders and environmentally conscious firms. Both USIJI certified credits and pre-certified credits are traded in addition to GHG credits from other sources.
- Current sellers include utilities, industrials and transportation operators who have switched fuels or made energy efficiency improvements, coal mines and landfills (methane capture), waste to energy facilities, renewable energy sources, demand side management projects and sequestration/forestry projects.
- Trading Activity To Date:
  - Approximately 100 transactions
  - Approximately 40 million tons of CO_2 equivalent
- Current Market Pricing:
  - International Emissions Trading (IET)

    Outright Sales 2000 - 2007 = US $0.60 to $1.50

    Option structures for 2008 - 2012 (Koyoto First Compliance Period)

    Premium = US $0.40 - $0.75
    Strike Price = US $1.25 to $2.50
  - Clean Development Mechanism (CDM)

    Sales 2000 Onward = US $1.50 to $3.00
- Future Market Pricing Projections:

  5-10 times current prices (assuming Koyoto Protocol Compliance is enacted in U.S.)

CRITICAL MARKET ISSUES

- The most critical issue for valuing the EG emissions reduction credits is whether USIJI certification will be fully "grandfathered" or at least transferable in some form under the final Koyoto Clean Development Mechanism (CDM).
- Other important market valuation issues include:
  - Clear ownership and transferability
  - Host government support and participation
  - Project monitoring and verification
  - Precise quantification of credits
  - Support by seller

ACTIONS TO ENSURE VALUE OF CMS CREDITS

Action Plan:

- Complete USIJI certification
- Setup project monitoring and verification program and register credits
- Negotiate credit allocation and ownership agreement with EG government and other partners. This will be based on current project ownership.
- Work to ensure full transferability of USIJI certification to CDM program and provisions for emission trading in final Koyoto negotiations
- Work with Broker to test current market for CMS credits in two time periods:
  - Pre-Koyoto implementation negotiations (November 2000), and
  - After CDM rules defined
- Look for other CMS project applications

Potential Future Value of Credits to CMS:

- Partial certification and current market prices:

  $(3.4 \times 10^6)(0.45)(\$2.0) = \$3.0$ million per year
- Full certification and future market projections:

  $(7.4 \times 10^6)(0.49)(\$10) = \$36.3$ million per year

Note: Does not reflect Broker fees, terms of final allocation agreement, or difference between USIJI and final CDM requirements.