CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

[Initial comments by SenterNovem and VROM *in Italics in yellow*]

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

Mtwara Energy Project
Version 01
28th December 2007

A.2. Description of the small-scale project activity:

The Mtwara Energy Project (MEP) is an integrated gas-to-power project that will provide reliable, accessible and affordable electricity to end users in the Mtwara and Lindi regions in southern Tanzania, an area covering 24,000 square kilometres and home to approximately two million inhabitants.
First electricity was generated at the Artumas Gas & Power limited generation facility in Mtwara on December 24, 2006. AG&P Power received its Generation License from the Energy and Water Utilities Regulatory Authority (EWURA) in Tanzania on February 26, 2007, and the Commissioning phase for the project was completed on March 5, 2007. Artumas owns 80% of the Mtwara Energy Project.
(Projects which have already started operations are still eligible under CDM, but CERs can only be claimed as of the day of EB registration. It is possible that the EB develops and sets new rules to avoid projects which started many years ago to still qualify under CDM; projects of which the starting date – which may be the date of start of construction – was more than 2 years before the date of registration may then not be eligible anymore, unless there are very strong arguments about the role of CDM in project development. One of the arguments could be that this project acts as a pilot for a larger project in the near future?)

The project involves:

- Development of an existing natural gas field located at Mnazi Bay. Artumas has drilled Mnazi Bay (MB) #1 and MB #2. They are currently in the process of drilling MB #3, exploration well
- Geological & Geophysical Programs
- Gas Processing Facilities
- Construction, operation and maintenance of a 27 kilometre pipeline both off-shore and on-shore;
- Installation, operation and maintenance of a 18 MW power plant; and
- Upgrade, operation and maintenance of approximately 205 kilometres of electrical transmission and 400 kilometres of electrical distribution.
- Off take Compressed Natural Gas Initiative

(This project description is confusing and may raise questions. The project either consists of
a) the power project including the development and exploration of a gas field, which should then all be included in the project boundary as specified under chapter B3, or
b) should only refer to the production and distribution of electrical power.
In case the project is limited to the production and distribution of electrical power it must be clear that there are sufficient off-takers for the natural gas anyhow and that in the baseline continuation with power production using oil would have been the most likely alternative).

Another concern is the capacity which is indicated to be 18MW. As such this makes the project qualify under Small Scale. However if in future the project – which is implemented modular? – would be expanded, thereby surpassing the SSC benchmark of 60 kt CO2 reductions annually, the project would no

longer qualify as SSC. It is quite likely that the EB will then effectively refuse to issue any further CERs from this project.

Finally, the description of the power project itself is not clear. The applicable technology, being open cycle gas turbines – as well as the change compared to the existing situation - should be described in more detail.)

The project will help the Host Country fulfill its goals of promoting sustainable development.

Specifically, the project:

- Will reduce atmospheric emissions of pollutants and improves the air quality of the region;
- Will bring about social-economic development in the region by availing electricity to more people
- Will create new employment for the installation and operation of the equipment
- Acts as a cleaner technology demonstration project which could be replicated across East Africa;

The Project Activity is an important capacity building activity, demonstrating the use of a new mechanism for funding environmentally friendly technologies, which reduces emissions of greenhouse gases.*[Clarify what this new mechanism is. Is this the CDM? Or is this a combination of finding sources and mechanisms as FMO engineered? Elaborate here or in Annex. Is not mandatory to do it in very much detail]*

Biomass is the main source of energy in the Lindi and Mtwara Regions, as it is for the rest of the country. A Household Budget Survey carried out in 2001 by the National Bureau of Statistics shows that only 5% of the population in the two regions has electricity connections. The main source of energy for cooking is firewood, while kerosene is mainly used in lighting. All district headquarters and a number of small townships in the two regions are served with electricity. Charcoal is increasingly becoming a source of fuel for cooking in the urban areas. Population growth and an increase in demand for fuel in the form of firewood will put a stress on the environment as more trees are felled.

A.3. Project participants:

Name of Party(ies) involved. (*) indicates a host party	Public/Private entities	Kindly indicate whether the party wishes to be considered a project participant Yes/No
Government of Tanzania*	Public	No
Artumas Group inc.	Private	Yes
VROM/SenterNovem	Public	Yes
Camco International	Private	No

(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time requesting registration, the approval by the Party(ies) involved is required.

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

The project is located in Mtwara, Southern Tanzania

A.4.1.1. Host Party(ies):

Government of Tanzania

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

Mtwara

A.4.1.3. City/Town/Community etc:

Mtwara

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

The project area generally covers the administrative regions of Lindi and Mtwara located in the southeast corner of Tanzania, bordering the Indian Ocean to the east. Lindi Region borders the regions of the coast to the north, Mtwara to the south and Morogoro and Ruvuma to the west. Mtwara Region borders the Ruvuma River and Mozambique to the south, and the regions of Ruvuma to the west and Lindi to the north.
According to the 2002 Population and Housing Census, the population of the Mtwara and Lindi Regions is 1,919,829 growing at a rate of 1.6% per annum. About 70% of the people live in rural and 30% in urban areas.

The economy of the two regions is predominantly agricultural and the main cash crops are cashew nuts, groundnuts and sunflowers, while cassava, millet, rice, maize and peas are grown for food. The Mtwara and Lindi Regions account for about 75% of the country's total cashew nut crop production, with 8 out of the country's 12 cashew nut processing factories. In the 1980s the powdery mildew disease, which kills the cashew nut flower, affected cashew nut production in the country. During the same period raw cashew nut exports increased, leading to closure of the local factories for lack of raw nuts and other operational problems. Since then, most of these factories have remained closed and they are now listed for privatization. The government is looking into policies which will promote processing of raw nuts locally instead of exporting them.
Currently there are small-scale industrial activities related to oil seed extraction, metal works and woodwork. The project area, and in particular Lindi, is very rich in forest products. Poor means of communication and unreliable power supply have hampered the development of the timber industry in the area. There are gemstone deposits in the Ruangwa, Newala, Masasi and Tandahimba districts but mining is on a small scale at present. Gypsum deposits are found in Mandawa, Lindi region. Mtwara has a natural deep harbour with the potential to serve as an outlet to the southern part of Tanzania and the land-locked states of Malawi and Zambia.

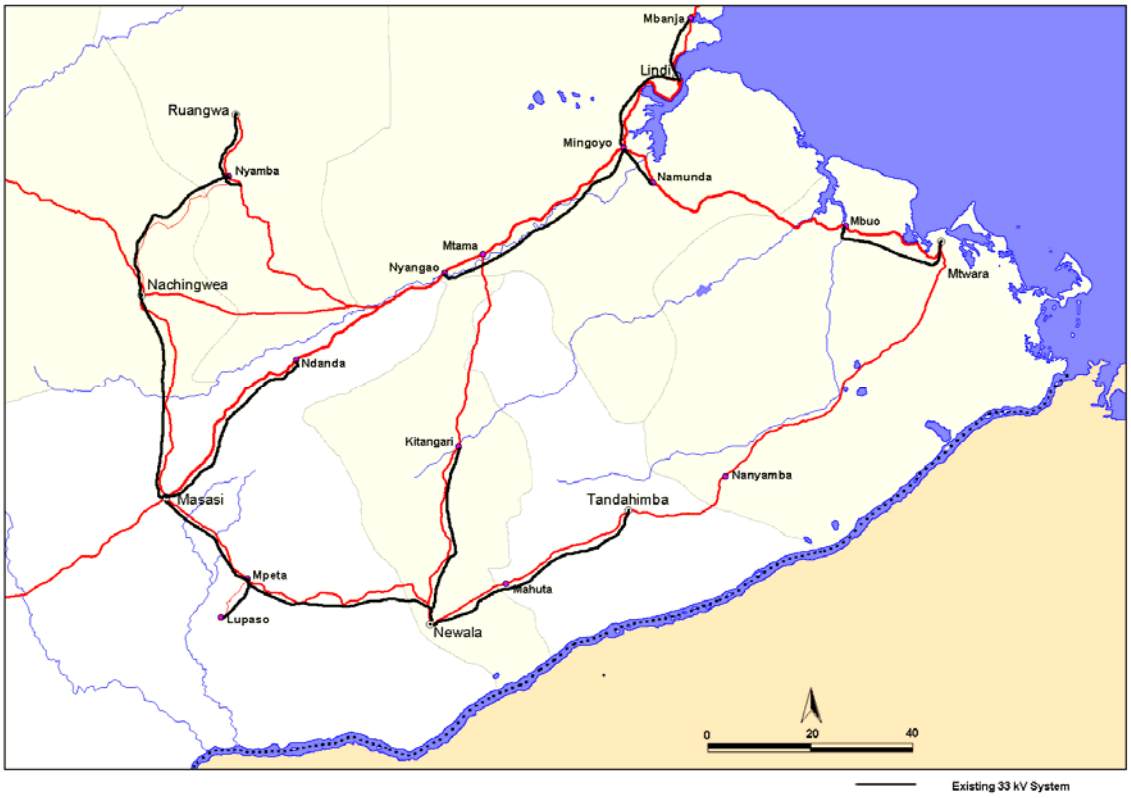
Though smaller than Mtwara port, Lindi port also has a potential to serve as export/import hub for the region. The government has taken initiatives to stimulate economic development in the project area

through the establishment of the Mtwara Development Corridor. Several projects are envisaged under the plan and the goal is to improve the standard of living for the inhabitants of the area identified under the corridor. Mtwara has been licensed as one of the Export Processing Zones in the country, a move expected to attract investment into the area.
Parts of Lindi Region are within the boundaries of the Selous Game Reserve, while the Msanjesi and Lumesule Game Reserves in Mtwara provide an animal migration route between Selous and Northern Mozambique. With the improvement in access, there is a potential for growth in tourism industry, as already identified under the Mtwara Development Corridor initiative. Transport between the two regions and Dar es Salaam is improving with the completion of a permanent bridge over the Rufiji River. Trading opportunities will open with other parts of the country and the two regions' proximity to the ocean makes them potential traders in such items as fish products and salt.

[both two pieces of text should stress more the expanding economic activities due to the "new"grid. It is now somewhere mentioned in the text but is not really stressed]

Map of Tanzania showing the Mtwara region in the South

[please remove the black line in the figure]



Detailed map of the South of Tanzania, showing the project area. [if the black lines represent the three "old" isolated small grids then explain this. If so, why not also the new grid in the figure?]

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

According to Appendix B of Simplified modalities and procedures for small scale CDM projects version 6, of 30 September 2005, the project activity is type AMS-III.B.

According to Annex A of the Kyoto protocol, this project falls under sectoral category 1: Energy industries (renewable/non-renewable)

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

Year	Emission reductions Tons
2008	24,877
2009	26,204
2010	27,721
2011	29,298
2012	30,286
2013	31,248
2014	32,156
Total	**201,789**

Crediting period (Years)	7
Annual average emission reductions	28,827

A.4.4. Public funding of the small-scale project activity:

There is no public funding of the project activity that could constitute diversion of ODA

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

A proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

1. With the same project participants;
2. In the same project category and technology/measure;
3. Registered within the previous 2 years; and
4. Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

There is no other project activity with the same project participants, in the same project category and technology/measure, registered within the previous 2 years and whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point. Therefore this small-scale project activity is not a debundled component of a large project 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 small-scale project activity:

Simplified methodology "AMS.III-B – Switching fossil fuels, Version 10, scope 1, December 23, 2006.

B.2 Justification of the choice of the project category:

Project category is III.B.

Category III.B comprises fossil fuel switching in existing industrial, residential, commercial, institutional or electricity generation applications. This project activity is a fossil fuel switch (from diesel to natural gas) in an existing generation application.

Fuel switching may change efficiency as well. If the project activity primarily aims at reducing emissions through fuel switching, it falls into this category. If fuel switching is part of a project activity focused primarily on energy efficiency, the project activity falls in category II.D or II.E. This project activity does not aim at energy efficiency and is not part of a project activity focused on energy efficiency.

Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO2 equivalent annually. The project activity reduces emissions by less than 60kt annually as estimated in A.4.3

B.3. Description of the project boundary:

The project boundary is the generation facility located at Mtwara port, the three isolated grids at Mtwara, Lindi and Masasi regions and the surrounding areas, which will be interconnected to the new grid.

[What is the new grid? Was it explained before? Is not clear. Refer to that subchapter and paragraphs or explain it again briefly]

B.4. Description of baseline and its development:

Identification of plausible baseline scenarios:

(In the scenarios mentioned hereunder it is not entirely clear which fuel is assumed: oil or gas?)

1. Continued generation from three isolated diesel plants at Lindi, Mtwara and Masasi without significant capacity addition: It is possible that TANESCO would have continued to operate the three isolated grids without any significant capacity additions due to capital constraints. TANESCO has been in financial constraints in the recent past, since at least year 2000[1] and has not been able to finance any significant new investment in capacity increase since. These three grids had an average combined generation of 32,661,888 units and a capacity of 6,944KW of maximum demand from the years 1999 to 2005.[2]
2. Continued generation from the three plants with historical average capacity addition: The Tanesco [be consistent: TANESCO or Tanesco] growth in the years 1999 to 22005 [TYPO] is as below[3]:

[1] See http://www.imf.org/external/np/loi/2001/tza/01/index.htm

[2] See 'Review of demand studies for Artumas group', by PA consulting, March 2006.

[3] See 'Review of demand studies for Artumas group', by PA consulting, March 2006

Table 1					
Load Factor - Observed					
	Maximum Demand (kW)	Units Generated (kWh)	System Load Factor		
Lindi					
1999	1200	4,735,310	0.4505		
2000	1203	5,173,030	0.4909		
2001	1203	5,537,730	0.5255		
2002	1329	6,286,014	0.4504		
2003	1894	8,008,253	0.4827		
2004	1735	8,736,099	0.5748		
2005	1628	7,698,859	0.5400		
Mtwara region (incl Masasi)					
1999	4,878	22,445,738	0.5253		
2000	5,185	26,299,222	0.5790		
2001	5,393	25,785,410	0.5459		
2002	5,800	23,394,029	0.4604		
2003	5,252	26,979,005	0.5864		
2004	5,508	27,633,427	0.5727		
2005	6,400	29,921,092	0.5337		
Combined					
1999	6,078	27,181,048	0.5105		
2000	6,388	31,472,252	0.5624		
2001	6,596	31,323,140	0.5421		average
2002	7,129	29,680,043	0.4753		0.5368
2003	7,146	34,987,258	0.5589		
2004	7,243	36,369,526	0.5732		
2005	8,028	37,619,951	0.5350		
source: TANESCO annual reports					

[please in redo tables in next version: should be all in Word table format ; no image please and all the same font]

From this we work out the average growth for the combined region:

Year	KWh	Growth
1999	27,141,048	
2000	31,472,252	0.15958131
2001	31,323,140	-0.004737888
2002	29,680,043	-0.052456331

2003	34,987,258	0.178814262
2004	36,369,526	0.039507755
2005	37,619,951	0.034381119
Average		0.059181705

Hence the growth in those five years averaged 5.92%. This would have been a likely growth for the region in the absence of the project activity. It is also consistent with the forecast national demand growth, which is predicted by the East African Power Supply master plan study to be 5.11% and 6.39% for the low and high growth scenarios respectively[4]

3. Continued generation from TANESCO from the three isolated grids, with demand driven capacity additions. If TANESCO ceases to experience financial constraints, it is possible that the capacity and requisite transmission and distribution infrastructure would be increased in response to customer demand. There is considerable suppressed demand in the region due to the following factors:
    a. Unavailability of power due to the slow expansion programme;
    b. Significant connection fee, currently estimated at USD 400 in areas where distribution infrastructure is available[5]

    In the absence of these barriers, it has been shown to be possible to have demand increase dramatically. For instance, in the case where a 'soft' connection option is offered by ORET, a Dutch funding programme, where consumers pay only about $60, there will be an additional 30,765 small customers by the fourth year of operations, over the 5,800 base new customers projected by the PA Consulting Study. *[so what is the conclusion?]*

4. Project activity implemented but not as a CDM project: Whereas the intention of the project was always to apply for CDM registration[6], the scenario under which the project is implemented without CDM funding is analyzed here. It will be shown that the non-CDM project will face significant financial constraints and may not be feasible to complete the project in its entirety without CDM funding;
5. Power generation using an other technology, to name the Combined cycle gas turbines. The present chosen technology is open cycle gas turbines. This is preferred in the project due to its low investment cost to enhance affordability under the current tariff regime.
6. Power generation using gas in three isolated grids: In this scenario, gas would be transported to the three isolated generation plants and the transmission lines to connect the isolated grids would not be built: This scenario would mean saving the investment cost of the high voltage transmission lines that interlink the three grids, but building of a gas transport infrastructure. The latter is a considerably more expensive undertaking;
7. The three isolated grids interconnected and connected to the main national grid. At the moment the grid is 400km away from the region where the project activity is taking place. The investment cost is considerably high to bring the grid to Mtwara, at more than USD 150,000,000[7].

[4] See East African Power Master Plan Study, Final phase 1 report, September 2004 by BKS ACRES

[5] Mtwara-Lindi-Masasi Regional Electricity Franchise Inception report, September 2007

[6] The initial PIN was written in August 2002 and is appended to this PDD

[7] Information obtained from Artumas internal estimates

From the foregoing, scenario 1 is untenable because it would be unacceptable for the region to experience zero growth when the rest of the country is experiencing growth rates above 5%. Whereas Tanesco did have financial constraints, there are good signs that this is easing, with the recent facility being availed to the company. Hence this scenario is an unlikely baseline. Scenario 3 would not happen without the project activity, as the source of the subsidy, ORET, is also part financing the project activity. *(this is not very clear; what is meant here?)*
Scenario 4 would deny the project a critical revenue stream that would make the project difficult to implement as envisaged. Scenario 5 has a significant additional investment cost that was not considered prudent to incur at this stage by the project developer. Scenario 6 would incur very high gas transportation costs, and hence is ruled out since these costs would be much higher than the cost of wheeling electricity. Similarly, scenario 7 has prohibitive initial costs that no one would be willing to incur.

Hence the most likely scenario is scenario number XX which, would be a moderate growth scenario, using diesel oil as a fuel, that is consistent with both historical growth rates and national growth projections for the future.

Date of baseline completion: 27/12/2007.

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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 small-scale CDM project activity:

Emission reductions will be achieved through using natural gas, a fuel with lower carbon emission factor than the previously used fuel, diesel. Natural gas is the least GHG intensive fuel from among all fossil fuels. The emissions reductions for the Mtwara Energy project rely on this fact.

In the absence of the CDM incentives the project activity would be difficult to implement and the emissions would be greater than that of the project scenario, because fuel oil would be used instead of natural gas.

There are no national and/or sectoral policies and circumstances that influence the decisions or impose obligations to the proposed project activity. *[any reference? To the latest version of a policy paper]* The use of fuel oil and natural gas are not restricted nor demanded by any local legislation. Also, there are no sectoral policies giving incentives for the use of natural gas or disincentives for the use of fuel oil. Therefore, no sectoral policies and circumstances would make the project activity preferred, rather than the baseline scenario. *[maybe confirmed by Ministry of Energy? Possibly in writing, so it can be referred to?]* The only national circumstance that foments the new technology is the participation of Tanzania in the Kyoto Protocol, which allows the project to benefit from the CDM incentives.

Additionality is assessed below as indicated in Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

Preliminary screening based on the starting date of the project activity

Project participants wish to have the crediting period starting prior to the registration of the project activity. For this reasons it is provided below:
(This is impossible since the date for retroactive crediting has expired long ago. The only possibility is to claim credits as of the day of registration of the project. It is however relevant to demonstrate that CDM was seriously taken into account when starting (start construction, implementation or real action, whatever is first) the project. For that sake the information hereunder may still be relevant. Please also note the remark on a possible new EB policy as explained under chapter A2)

(a) Evidence that the starting date of the CDM project activity falls between 1 January 2000 and the date of the registration of a first CDM project activity

On August 25th, 2003 Artumas signed an Agreement of Intent with the Government of Tanzania and the Tanzania Petroleum Development Corporation. Generation started in March 2007. Adequate evidence is available at the project site *(More relevant here is the date on which construction or adjustment to enable the fuel switch started)*

(b) Evidence that the incentive from the CDM was seriously considered in the decision to proceed with the project activity.

(a) Artumas commissioned the development of a business plan by its subsidiary, Mtwara Transmission and Distribution Company to look at the feasibility of the project. In 2005, the business plan was ready, and identified revenues from carbon credits as a critical resource,

which would then be used for capacity building in the area.[8]

(b) The first PIN was written in 2006 as the 'Carbon Finance Document'[9]

According to *Attachment A* to *Appendix B* of the simplified modalities and procedures for CDM small scale project activities, evidence as to why the proposed project is additional can be shown by conducting an analysis of any of the following: (a) investment barriers, (b) technological barriers, (c) prevailing practice and (d) other barriers.

(a) Investment barriers: Whereas the figures for investments that Tanesco would have done to maintain the growth identified in the baseline scenario are not available, evidence indicates that natural gas generators are significantly more expensive than diesel generators. Besides, unlike in the baseline scenario, Artumas will have to invest in production and transporting facilities for the gas. Moreover, the combining of the isolated grids into one southern grid requires substantial investment in transmission capacity. Hence, the investments that Artumas have to do in the region, which amount to more that USD 1,400,000 per annum for the next 25 years[10] is far more than Tanesco would have done to achieve 5.9% growth. Taking the diesel generator cost at USD 750 per KW (which is on the higher side), Tanesco would have invested an average of USD 432,000 annually for the next 7 years, compared to Artumas' USD 1,400,000. This is a significant barrier. *(It is somewhat strange to refer to investment figures here only; a better comparison should then be based on calculated IRRs for the baseline situation and for the project situation. Another message here could be – if it is intended to say so - that there is a barrier in access to financing. However this seems to be conflicting with the fact that the project is up and running)*

(b) Technological barrier: The project activity involves gas exploration, gas production, gas transport, power generation from natural gas (on a smaller scale than the only other gas plant in Tanzania, Songas which produces 182MW), transmission and distribution of power. This is quite a combination of many technologies and the project in its entirety is unique in East Africa. There is little local knowledge of technology to facilitate design, manufacture, installation, operation and maintenance of all the components of the system. Neither is such knowledge provided anywhere within the East Africa region, or even plans to introduce it due to the low level of technological development f the region. Hence there will always be need to hire international experts to assist in design, installation, operation and maintenance of such equipment, and to train local staff to eventually take over the operation of the plants. *(if it is intended to say the project is first of its kind, say so here)*

(c) Barrier due to prevailing practice: The standard practice in Tanzania is to use diesel generation for isolated grids, and to a lesser extent on the national grid. Besides the project area of Lindi, Masasi and Mtwara, other areas of Tanzania with diesel generation for isolated grids include Liwale, Mafia Island, Njombe, Songea, Tunduru, Ikwiriri, Kigoma, Mpanda and Kilwa-Masoko. Hence the prevailing practice is to use diesel, and this project is a first for isolated grids. *(if it is intended to say the project is first of its kind, say so here)*

(d) Other Barriers:

I. Asset transfer: There are assets that belong to tanesco that have to be transferred or leased out to Artumas. These include transmission, distribution and metering equipment. The modalities of this transfer have been hindered by difficulties in valuation. This is likely to challenge the assumptions Artumas had made regarding the value of the assets they were inheriting form

[8] Mtwara Transmission and Distribution Company, Rapid Rural Electrification Business plan, draft version, June 9th 2005

[9] See file VROM PIN Artimus rev1.doc

[10] See Artumas Exel file Mnazi Bay total project v24.xls

Tanesco *(This seems very complex. Is it possible to validate this by a DOE? If not, or very difficult, then remove this argument)*

II. Institutional: Two new institutions have recently been formed in Tanzania: The Electricity and Water Utilities Regulatory Authority (EWURA) and the Rural Electrification Authority (REA). EWURA will be responsible for approving Power Purchase Agreements and with no experience in that area, there is a serious risk that the PPA will be delayed or be unfavourable to Artumas. REA will also have to define its operations and try to stamp its authority on the rural electrification scenario in Tanzania, which might interfere with Artumas's own expansion plans.

These barriers are considerably significant, hence the project can be said to be additional.
[barrier arguments are ok but might be presented more convincingly. Maybe some references if possible. In addition, "all by all, this project is the first of its kind"

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Baseline Emissions:
According to the methodology AMSIII.B, the emission baseline is the current emissions of the facility expressed as emissions per unit of output (e.g., kg CO2e/kWh). Emission coefficients for the fuel used by the generating unit before and after the fuel switch are also needed. Further, IPCC default values for emission coefficients may be used.
Hence, the baseline emissions are calculated as follows:

$$BE_y = EG_y * EF_{CO_2D}$$

Where:

BE_y	Baseline Emissions in Tons of CO_2 in year y
EGy	The electricity generated in year y in Mwh
EF_{co2D}	The Emission factor for diesel in Tons of CO_2 per Mwh

$$EF_{CO_2D} = [COEFF * 3.6] / EFF$$

Where:

COEFF	Fuel Emission coefficient of diesel in Tons per GJ
3.6	Conversion factor for GJ to Mwh
EFF	Efficiency of the diesel generation, = 33%

Project emissions:
The methodology states that project activity emissions consist of those emissions related with the use of fossil fuel after the fuel switch. It also allows that IPCC default values for emission coefficients may be used.

Hence:

$$PE_y = Q_{NG,y} * EF_{NG}$$

Where:

PE_y Project emissions in year y in tons of CO_2
$Q_{NG,y}$ Quantity of Natural gas used in year y in Million cubic feet (mcf)
EF_{NG} Emission factor of Natural gas in Tons per mcf

The methodology does not require leakage calculations to be done. Hence the emission reductions are:

$$ER_y = BE_y - PE_y$$

Where:
ER_y Emission reductions in year y in tons of CO_2

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

(Copy this table for each data and parameter)

Data / Parameter:	**EGy**
Data unit:	Kwh
Description:	Electricity generated. The figure used is the electricity generated in year 2005. In subsequent years, the projected growth rate of 5.9% is applied
Source of data used:	Tanesco Historical data
Value applied:	37,619,951
Justification of the choice of data or description of measurement methods and procedures actually applied:	
Any comment:	

Data / Parameter:	**COEFF**
Data unit:	tCO_2e/GJ
Description:	Fuel emission coefficient for diesel
Source of data used:	IPCC 2006
Value applied:	0.0741
Justification of the choice of data or description of measurement methods and procedures actually applied :	Methodology allows IPCC default values to be used in the absence of actual data from the fuel.
Any comment:	

Data / Parameter:	**EFF**
Data unit:	%
Description:	Efficiency of the diesel generation
Source of data used:	Default efficiencies from manufacturers.
Value applied:	0.33
Justification of the	This is the conservative approach. Actual efficiencies were lower, especially

choice of data or description of measurement methods and procedures actually applied:	considering the poor maintenance by Tanesco. Lower efficiencies mean more diesel use, and hence lower higher emission reductions from natural gas use. Adopting this value means emission reductions are not exaggerated.
Any comment:	

Data / Parameter:	**Q_{NG}**	
Data unit:	mcf	
Description:	Quantity of natural gas	
Source of data used:	Artumas projections	
Value applied:	210,900 for 2008	
Justification of the choice of data or description of measurement methods and procedures actually applied:	Data obtained as part of rigorous feasibility study	
Any comment:	To be checked against actual value in 2008 as part of monitoring	

Data / Parameter:	**EF_{NG}**
Data unit:	Tons/TJ *[please, express the EF of both diesel and gas in the same units]*
Description:	Emission factor for natural gas
Source of data used:	IPCC default 2006
Value applied:	56.1
Justification of the choice of data or description of measurement methods and procedures actually applied:	Methodology requires that default IPCC values be used in the absence of actual fuel data.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions: ***[PLS redo the tables and formulas is Word format]***

As explained in B.6.1, the baseline emissions are calculated using the formula:

$$BE_y = EG_y * EF_{CO_2D}$$

Since the EF is a constant (calculated as 0.808 tons/Mwh), the baseline emissions are as follows:

Year	Electricity generated Mwh	Baseline Emissions T
2008	44,702	36,136
2009	47,348	38,274
2010	50,150	40,539
2011	53,118	42,939

2012	56,262	45,480
2013	59,591	48,171
2014	63,118	51,022

The project emissions are given by the formula:

$$PE_y = Q_{NG,y} * EF_{NG}$$

Again, the emission factor for natural gas is known (56.1 tons/TJ, leading to an EF of 0.0534 tons/mcf. Hence the project emissions are:

Year	Gas used mcf	Project Emissions T
2008	210,900	11,259
2009	226,100	12,071
2010	240,100	12,818
2011	255,500	13,640
2012	284,600	15,194
2013	317,000	16,923
2014	353,400	18,867

The emission reductions are the difference between the two emissions. Leakage calculation is not required as per the methodology.

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

Year	Baseline Emissions	Project emissions	Emission Reductions
2008	36,136	11,259	24,877
2009	38,274	12,071	26,204
2010	40,539	12,818	27,721
2011	42,939	13,640	29,298
2012	45,480	15,194	30,286
2013	48,171	16,923	31,248
2014	51,022	18,867	31,156
Total			**201,789**

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

B.7.1 Data and parameters monitored:
(Copy this table for each data and parameter)

Data / Parameter:	**EGy**
Data unit:	Kwh
Description:	Electricity generated. The figure used is the electricity generated in year 2005. In subsequent years, the projected growth rate of 5.9% is applied *(Why is reference made here to the projected growth rate? The monitoring requirements of AMS.III-B just require: "Monitoring fuel use and output after the fuel switch has been implemented - e.g. gas use and heat output by a district heating plant, gas use and electricity generated by a generating unit".)*
Source of data to be used:	From electronic meters to be installed at the site
Value of data	Actual values recorded by the meters for comparison with the projected figures.
Description of measurement methods and procedures to be applied:	Electronic meters
QA/QC procedures to be applied:	The consistency of metered net electricity generation should be crosschecked with receipts from electricity sales and the quantity of fuels fired (e.g. check whether the electricity generation divided by the quantity of fuels fired results in a reasonable efficiency that is comparable to previous years).
Any comment:	Data would be monitored continuously, 100% of data will be measured and would be kept electronically for 2 years after the end of the crediting period.

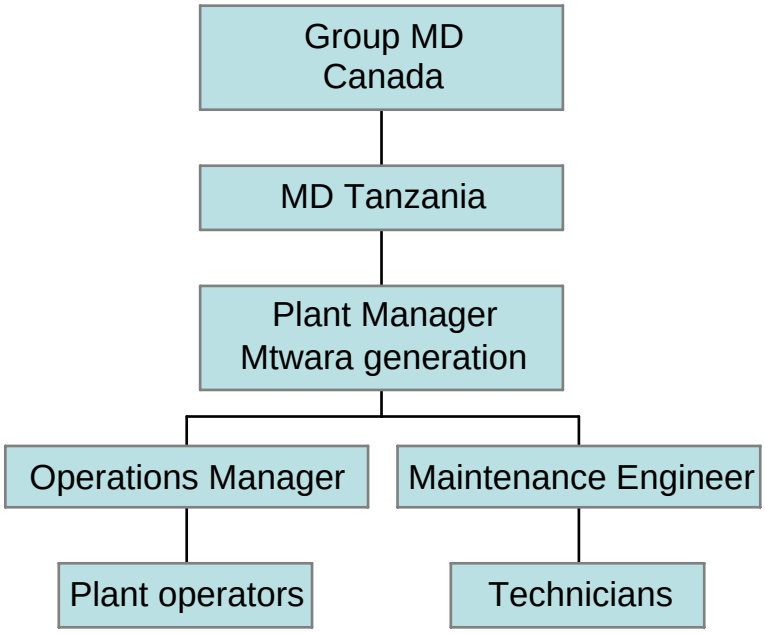
Data / Parameter:	**Q_{NG}**
Data unit:	mcf
Description:	Quantity of natural gas
Source of data to be used:	Artumas projections
Value of data	210,900 for 2008, the rest as indicated in B.6.3 *(what is the objective of the reference to B.6.3 here?)*
Description of measurement methods and procedures to be applied:	The gas consumption will be measured using flow meters installed at the inlet of the power plant. It will be reported monthly, and the values stored electronically and on paper.
QA/QC procedures to be applied:	There will be an invoicing procedure between AG&P gas and AG&P power, the gas producers and power generators respectively. This will require that each keep a record of the values recorded. A check meter will also be available to ensure the accuracy of the meters is maintained. They will be calibrated annually.
Any comment:	100% of the data will be monitored and stored electronically

[general question: is Artumas already monitoring data as required?? Do they have installed all equipment?? Do they record all data already as requested/ prescribed in the methodology??]

B.7.2 Description of the monitoring plan:

1) Internal Organization

Organization for monitoring MEP



[What is MD in the organogram and text hereunder please explain]

The plant manager for the Generation plant at Mtwara will be in charge of the monitoring program. The plant operators will be responsible for reading the meters, both gas and electricity, and entering the records in the computer. The Operations manager will keep paper copies of the readings, and send electronic copies for safe keeping to the Tanzanian MD based in Dar es Salaam.
The maintenance engineer and his/her technicians will ensure the meters are maintained and calibrated annually. They will keep the maintenance and calibration records.

2) General Description of monitoring

Monitoring for the CDM project activity includes the monitoring of electricity generation and natural gas consumption, in the equipment included in the project boundary. The organization for carrying out this monitoring is shown above. This team is responsible for optimizing operations, and for ensuring quality of monitoring procedures and data.

The operations department is responsible for collecting and recording all monitoring data. All data will be stored both in electronic and paper formats.

CDM – Executive Board

3) Data Collection

Fuel consumption

During the last hours of the last day of each month, an operator will read the gas meters. The data collected will be recorded in a paper sheet. During the morning of the next day, all data collected will be transferred to the electronic system. During this transfer the data will be checked by a second operator. If mistakes or discrepancies are detected, a new measurement will be done, if necessary, as soon as possible. After all data in the electronic system has been entered correctly, it will be validated by the operations manager and then it is sent to the plant manager for analysis. Daily measurements are made as an internal control procedure. Data discrepancies can be detected by a simple comparison with measurements made during the previous days.

4) Reporting data

The operations manager prepares the monthly reading and any reports of discrepancy. In addition, he reconciles the monthly reading and the daily readings for the month. He then prepares a report, which is sent to the plant manager. The plant manager is will also have received the invoice from AG&P gas, and he will compare their reading (which is taken at their end of the gas pipeline) with his. If there is no material discrepancy, he approves the reading and sends an electronic copy to the MD Dar es Salaam. This is the official record for monitoring purposes and will be kept until at least two years after the end of the crediting period.

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

Date of completion of baseline and monitoring methodology: **27th December 2007**

Name of responsible person: **James Wakaba**

Contact e-mail: **james.wakaba@esda.co.ke**

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:

01 January 2008 (this can only be the date of registration of the project)

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:

01 January 2008 *(this should be date of registration of the project)*

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable

C.2.2.2. Length:

Not applicable

SECTION D. Environmental impacts

D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

The host party, the Government of Tanzania, requires an Environmental Impact Assessment to be done for this kind of project. According to the guidelines[11], appendix A lists production and distribution of electricity, gas steam and hot water as a category of projects that must undertake an EIA. Accordingly, Artumas commissioned an EIA in 2005, whose report is available[12]. Artumas was later issued with a licence by the National Environmental Management Commission of Tanzania. Whereas the detailed report contains an analysis of the possible environmental impacts for the overall project, including gas exploration, mining, transport as well as power generation and distribution, a few impacts relevant to the project activity are given below.

Parameter	Impact
Land use	People will be displaced to give way for transmission and distribution lines, interfering with their source of livelihood
Noise	The generators will produce noise beyond what is acceptable to the human ear
Stack emissions	The generators will produce stack emissions. However,

[11] Republic of Tanzania, Vice President's Office, Draft Environmental Impact Assessments Guidelines and Procedure

[12] A copy of the report is available at www.artumas.com/pdf/environment_s4/mtwara_EIS_Oct_05.pdf

	these emissions are less than what is already being generated by diesel gensets, since natural gas is a cleaner fuel
Air quality	Similarly, air quality will improve due to shutting down of the diesel generators
GHG emissions	The project will result in reduction of GHG emissions
Accidents	Possibilities of accidents during the were identified
Electric and Magnetic fields	The 132KV transmission lines could generate unacceptably high levels of electromagnetic fields that would be hazardous to public health
Construction impacts	Some hazards during construction include: • Accidents • Noise • Disruption of movement • Interference with vegetation • Interference with soil formations

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 only significant impacts were the dislocation of people from land and noise. The former will be addressed by a comprehensive compensation and resettlement programme, while the latter will be resolved by the use of acoustic enclosures for the generators.

All relevant precautionary measures will also be taken during the construction phase to minimize the identified hazards.

It should also be noted that the project was assessed and found to conform to World Bank guidelines on Power plants.

All this is well documented in the EIA report referenced above.

SECTION E. Stakeholders' comments

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

Artumas' complied fully with NEMC and World Bank requirements regarding public consultation and disclosure as the project planning and implementation for the Project has progressed, and to use the results of this consultation to inform the project design. The NEMC Guidelines call for public consultation and specify the timing and process for notification of the public at key steps in the EIA process. Public consultation is called for at the EIA Scoping Stage and following completion of the impact analyses. The Project sponsor is also required to notify the public upon commencement of the scoping activities, and on submission of the Draft Environmental Impact Study to NEMC.

[dates, references, agendas and documents that can support the arguments you are presenting, for this whole subchapter E1, so evidence should be provided]

Essential World Bank requirements regarding public consultation and disclosure include:

- At least one round of public consultation at each of the "scoping", EIA review, and construction/operation stages of the project, to be conducted in culturally appropriate ways;
- Careful documentation of all public consultation activities and issues;
- Public disclosure of EIA documentation both at the World Bank Infoshop and in the country where the project is proposed for specified periods of time;
- Circulation of local language summaries of EIA results; and
- Demonstrated responsiveness by project sponsor to issues raised during consultation.

The following steps were used in getting stakeholder input:

Advertising/Public Notices:

- Newspaper advertisements were used to provide official notification at key stages in the project as required by the NEMC Guidelines;
- Newspaper and radio advertisements, and postings on village notice boards, were used to inform potentially interested parties with information about the project and invite attendance at public meetings; and
- Advertisements and notices were provided in both English and Kiswahili.

Formal Public Meetings:

- Formal public meetings were held to provide information to potentially affected persons, and to collect their comments and questions; and
- Formal Public Meetings consisted of a presentation followed by a question and answer period.

Informal Meetings with Elected Officials and Agency Representatives:

- Informal meetings with elected officials and agency representatives were used to provide information on the status of the project, to collect relevant existing information, and to identify issues of concern;
- Informal meetings were typically held at Government/Agency Offices during normal working hours; and
- Active consultation with staff and management of Mnazi Bay/Ruvuma Estuary National Marine Park.

Formal Agency Meetings

- Formal meetings with elected officials and government functionaries were held to provide information about the project to agency representatives, and to solicit their comments and questions. The meetings consisted of a short formal presentation followed by a question and answer period.

Disclosure

- Artumas provided public access to the EIS report, as well as other relevant project documentation, such as the Resettlement Action Plan;
- The full documentation was made available in hard copy at local libraries, project offices, and selected government offices. Electronic copies was availed on the Company's internet site; and
- Summary information was made available in Villages located throughout the project area.

During phase 1 (scoping), meetings were held with the following:

- Marine Parks Unit, Ministry of Tourism and Natural Resources;
- Ministry of Health;
- Mnazi Bay Ruvuma Estuary National Marine Park;
- Mtwara Port Master and Tanzania Harbours Authority.
- National Environmental Management Council;
- National Development Corporation;
- Regional and District Level Government Functionaries (e.g., Regional Commissioner, District Lands Officers, District Engineer);
- TANESCO;
- TANROADS; and
- Tanzania Petroleum and Development Corporation (TPDC).

During phase two, meetings were held in, among other areas:

- Mtwara Town: November 15 *[year? For all these items]*, 2:00 pm;
- Msimbati November 16, 2:00 pm;
- Mnazi Moja November 17, 2:00 pm;
- Nyangao November 18, 2:00 pm;
- Ndanda November 19, 2:30 pm; and
- Masasi November 20, 1:00 pm.

E.2. Summary of the comments received:

In general, there was strong support for the project expressed by elected officials, agency staff, and the general public. For the most part, the support appears to be related to the acceptance amongst stakeholders that the project will improve the reliability and accessibility of electrical power in Mtwara and Lindi Regions, and that utilization of the natural gas from Mnazi Bay will provide direct and indirect economic benefits.

The key concerns that were identified related primarily to:

- Protection of the long-term ecological and tourism values of the Msimbati Peninsula and Mnazi Bay;
- Compensation for those whose land is affected;
- Opportunities for local employment during construction and operations; and
- Affordability and accessibility of electricity.

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

The responses to the main issues are summarized below *[evidence, reference?]*:

Issue	Solution
Protection of the long-term ecological and tourism values of the Msimbati Peninsula and Mnazi Bay	Pledge of adherence to the Environmental and social Management plan, relocation of jetty to the satisfaction of marine park staff
Compensation for those whose land is affected	Comprehensive compensation and resettlement programme

Opportunities for local employment during construction and operations	Allocation of opportunity quotas to all the villages in a fair manner
Affordability and accessibility of electricity	Discussions with the Rural Electrification authority on subsidizing cost of connections; Pledge of reduced tariffs after 3-4 years of operation.

The most significant project change that was driven by consultation involved the transmission system plan. At the time of the meetings the project plan for the transmission system was based on development of a 132 kV Transmission system between Mtwara and Masasi as follows:

- Immediate construction of 132-kV transmission line between Mtwara and Mingoyo (78km), with a step down substation at Mingoyo;
- Immediate construction of a transmission line between Nyangao and Ndanda (38 km). This line would be built to a 132 kV standard but operated initially at 33 kV; and
- Based on the load growth, future construction of the balance of the 132 kV system between Mingoyo and Masasi, which would involve constructing 132 kV lines between Mingoyo to Nyangao and between Ndanda to Masasi, as well a new substation in Masasi.

Based on representations that Artumas should consider distributing power to Nanyamba and Tandahimba, and based on input from villagers on the need to minimize connection changes, the system plan was adjusted to the current plan as described in Section 4.2.8.1 of the Environmental Impact Study. The revised system plan will ensure more people have opportunities to be connected to electrical power and, by minimizing the initial cost of the system, will ensure the connection charges and consumption tariffs are minimized.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Represented by:	
Title:	
Salutation:	
Last Name:	
Middle Name:	
First Name:	

Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Annex 3

BASELINE INFORMATION

Annex 4

MONITORING INFORMATION

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