



## International Conference on the Great Lakes Region

### **Regional Programme of Action for Economic Development and Regional Integration**

Project No. 3.3.9

Methane Gas Project (Kivu Regional Pipeline Project)  
Feasibility Study

October 2005  
As Amended August 2006  
Original Version: English

## **METHANE GAS PROJECT (KIVU REGIONAL GAS PIPELINE PROJECT)**

### **Preamble**

In their Dar-es-Salaam Declaration adopted in the United Republic of Tanzania on 20 November 2004, the Heads of States and Governments recognized the effect of continued instability in the Great Lakes Region (GLR), on the unsustainable use of area's natural resources. In order to promote peace and prosperity, and also ensure sustainable use of these resources, the Heads of States recognized the over-riding need to protect and conserve the environment and eco-systems in the GLR. This can only be achieved through cooperation and adoption of common policies and strategies, in the management, development and use of the region's resources. The proposed Methane Gas Project demands that the countries around and close to Lake Kivu cooperate in order to develop and encourage the use of methane gas as cheaper source of energy. Use of gas as an alternative cheap source of energy would ease current pressure on natural resources. This is reflected by the intensive and unsustainable use of biomass as the principal source of energy for the bulk of the people in the region. This reliant on single source of energy has resulted in environmental degradation including deforestation. The project therefore responds to the Declaration's call for search and use of natural resources in a sustainable manner.

### **Executive Summary**

Currently the region depends for its gas requirements, on its importation, which has to be transported mainly by road from all the way through the port of Mombasa. This makes the imported gas expensive, and unaffordable to the larger part of the population. As a result, many people have to rely on other sources of energy like biomass. The rate at which the latter is being used is not only unsustainable but it is also detrimental to the environment.

The discovery of methane gas under Lake Kivu therefore opens up a whole possibility of tapping an alternative cheaper source form of energy, and offers a break from this traditional over-dependence on biomass as the main source of energy by the majority of the people of the GLR. The estimated total volume of methane gas available is 50 billion cubic metres (m<sup>3</sup>), which awaits to be tapped for use. To date, only Rwanda which is planning to tap the gas and use it for electricity generation.

Recognizing the significance of the resource, the countries of the region have now proposed to tap this gas and distribute it within the region by pipeline. This would be the first time gas distribution by pipeline has been tried in the region. As such, a feasibility study has been proposed to look into details the various issues including the technical options and implications, economic, financial and social issues, which need to be addressed while undertaking such a project.

It is expected that a firm of consultants would be engaged to undertake the study, which is estimated to take approximately 4 months to complete. The estimated cost for the consultant's work is US\$ 828,550. SOCIGAZ, a company formed to foresee the

development and use of the Lake Kivu gas, would be directly responsible for the supervision of the consultant carrying out the study. A Steering Committee with representatives from the countries of DRC, Rwanda, Burundi, Uganda and Tanzania would oversee the overall implementation of the study and the project.

## **1. Introduction**

After many years of exploration and prospecting, methane gas was finally first discovered under Lake Kivu in the nineties. Feasibilities studies carried out have now estimated that the total gas available for exploitation is approximated 50 billion cubic meters ( $m^3$ ). This discovery could not have come at a better time considering the ever-rising cost of petroleum products including gas and fuel. Taking into account the long distances gas and the rest of petroleum products have to be transported to get to the countries of the Great Lakes Region (GLR), exploitation of the gas under Lake Kivu would offer a much cheaper source of energy. Rwanda is already preparing to use some of this gas to produce electricity. Recognizing the opportunity, the countries of the GLR have agreed to exploit the methane gas resources and distribute the same to their people. While studies on the availability and the possibility of use of the same for electricity generation in Rwanda have been carried out, a study has still to be carried out to establish the viability of the proposed gas production and distribution system, the theme of the proposed project. This project document describes the recommended feasibility study that should be carried out to assess and recommend the viability of gas production and distribution to the countries of the region of the Great Lakes.

## **2. Background/Situational Analysis**

Presently, the countries of the Great Lakes Region depend for the supply of their gas requirements from distant supplies, the bulk of which passes through the Port of Mombasa. This is normally hauled in tankers either by railway for some of the way and by road. The long distances involved in its transportation makes the gas expensive, and generally unaffordable to the majority of people living in the region. As a consequence, biomass is widely used as the main source of energy for the majority of the people in the region and especially by the poor. Experience from GLR countries and those in other regions, has shown that such reliance on biomass for energy source comes with a very high price on the environment. Therefore, the proposition to tap the methane gas under Lake Kivu makes an attractive proposition, and should prove to be cheaper than the current supply arrangements.

As pointed out above, studies have estimated the total gas available under Kivu to be approximately 50 billion  $m^3$ . Compared to the current and estimated future demand for gas in the region, there appears to be plenty of it to supply the surrounding countries for many years to come. As indicated, feasibility studies have been undertaken by Rwanda to explore the possibility of using some of the gas to generate electricity. The proposal is to bring through some private sector participation arrangement. In addition, both Rwanda and the Democratic Republic of the Congo (DRC) established in 1990 through CEPGL (Community Economic des Pays de Grand Lakes), SOCIGAZ, a commercial and industrial entity formed to exploit the methane gas found under Lake Kivu. Unfortunately due to the outbreak of civil war in the region, SOCIGAZ suspended its operations in 1998. The countries in the region have now decided to tap this gas and distribute it by pipeline to the countries. However, this is the first time a project of this nature, i.e. distribution of gas by pipeline, is being considered in the region. A study is therefore required to highlight and address the various issues, which need to be taken

into account while proceeding with the project. A feasibility study is proposed to provide the information. Outline Terms of Reference (TOR) for the study are given in the following sections.

### **3. The Methane Gas Project Feasibility Study**

#### **3.1 Study Objective**

The objective of the proposed study is to provide adequate information on the technical, socio-economic and financial aspects of the proposed project, and explore the feasibility of the proposed production of gas under Lake Kivu, and its distribution by pipeline.

#### **3.2 Study Description**

A firm of consultants will undertake a study on the proposed production and distribution of methane gas among the countries of GLR by a system of pipelines. The study consultant will be responsible for collecting and analyzing all data relevant to and necessary for carrying out the tasks under the study. This will include data regarding the market for the gas, technical details including information required to decide on the parameters of the pipelines, social, environmental and economic analysis, project costing and assessment of risks involved and their mitigation.

The work of the recruited consultant will include but not be limited to the tasks described in the following sections.

- i) The consultant shall carry out an evaluation of the market for gas in the region of the Great Lakes including Uganda, Rwanda, Burundi, western and northwestern Tanzania and the DRC. Data will be collected on the present sources of gas and its consumption patterns, mode of delivery and storage facilities. This shall be followed by an analysis and market evaluation and forecasts for the next 15 to 20 years. Future market trend and demand will be estimated by projecting historical and current demands, taking into account the current and expected improvements in living standards of the target populations, as well as the impact on proposed project by other potential sources of gas in the region in future;
- ii) From the results of the market survey and in consultations with countries concerned, determine and establish the areas of influence of the project. Having established those areas which can economically be supplied with the gas from Kivu, and taking into account such factors as technological, operational, and other logistical issues, the consultant shall explore the different mode of transportation and distribution of gas to the identified main consumption centers. Transportation by pipeline, by road tankers or already packed in containers shall be explored;
- iii) When assessing gas transportation by pipeline, it will be necessary to undertake field reconnaissance surveys for the areas of supply in order to determine the most economical routes for the pipelines leading to the identified main areas of demand. Factors of topography, geological and

- climatic conditions, land availability, accessibility, and demand for supporting infrastructure including access roads and other utilities shall all also be taken into account. Pipelines of varying sizes shall be analysed in order to determine the optimum dimensions of pipes to different destinations. Locations and number of junctions and terminal points shall be determined. The selection of the pipe routes shall take cognizance the fact that the region is prone to seismic activities where risks of disruption from such phenomenon are high.
- iv) After establishing the size of the markets for the gas, the consultant shall prepare details for gas extraction, processing and packaging, taking into account similar ongoing activities. The consultant shall then prepare preliminary details of recommended facilities including layouts and cross sections of all ancillary works (utilities, operation and maintenance facilities, plant and equipment). The necessary phasing of these works shall be determined and the same clearly indicated;
  - v) Socio-environmental studies shall be carried out for the selected mode of gas distributions, in order to determine potential significant positive and negative social and environmental impacts by the proposed project. Some of the positive aspects, which will have to be assessed shall include impacts on the environment and other natural resources like forests, by promotion of gas utilization as an alternative source of energy. Conversely, gas leakages by accidents or by sabotage, possibility of ensuing fires, impacts during construction on agriculture and other land uses, wetlands and other areas of sensitive biodiversity, historical sites, and availability of land for the project sites, soil erosion, employment creation as well as impacts on other existing alternative methods of transportation of gas;
  - vi) At the socio-economic level, the consultant shall elaborate in details, the impacts the project will have on the most vulnerable members of societies within the countries to be covered by the project including the poor, the women and children. The implications of the availability of gas as an alternative source of energy shall be explored in depth, taking into account affordability and accessibility. Similarly, the consultant will pay special attention to the identification and analysis of projects impacts, and the risks it will pose both during and post construction phases, in aggravating the HIV/AIDS epidemic prevailing within GLR as well as the project zone of influence;
  - vii) Recommendations shall be made on the required actions and cost of mitigation of the significant adverse impacts. Such recommendations on the mitigation measures shall include clearly defined project components, their costs and implementation duration;
  - viii) Preparation of estimates of both capital and operation and maintenance costs shall be prepared for each gas transportation and distribution alternatives, clearly broken down into various components together with the supporting infrastructure and utilities, comparative costs of the various alternate forms and of energy shall be prepared;
  - ix) The consultant shall carry out an economic cost benefit analysis of the project by considering other alternative modes of transportation (e.g. roads and railways) of the oil products, as well as comparison with other sources of

- energy. Sensitivity analysis will be carried out based on demand variation scenarios. The consultant will use these results together with the outputs from the socio-environmental studies to recommend the least cost alternative. Finally, the consultant shall carry out financial as well as sensitivity analysis of the recommended alternative, assuming different market conditions (tariffs). Considering the investment requirement for the project and risks involved, carry out an assessment of alternative project financing modalities including, private sector financing, soft loans and public funding. The consultant shall assess the impacts of the project source of financing on the recommended institutional arrangements for implementation and thereafter the management of the facilities;
- x) Examine the various scenarios of project implementation and recommend the most appropriate strategy for its actualization. It is expected that the private sector will play a major role in the development of the Kivu gas. The consultant shall therefore explore this scenario in details including the future management of the gas distribution, and recommend the most appropriate modality of encouraging private sector participation in the project. An implementation schedule shall then be prepared with the duration of the major activities clearly shown as well as highlighting important milestones. Suitable institutional arrangements to oversee the execution of the project and to manage the operations once completed shall be described. There will also be a need to elaborate the requirements for evaluation and monitoring of the implementation process;
  - xi) An analysis of project risks and major issues to be addressed if a decision is made to proceed with the project implementation. In particular, risks associated with security, technological and operational issues, and impacts on the project by future discovery of other gas fields or sources in the region shall merit thorough analysis;
  - xii) Recommend the way forward, clearly highlighting critical issues that will need to be addressed, and prepare TOR for future services that will be required to implement the project.

### 3.3 Study Outputs

The following are the expected outputs from the feasibility study of the proposed Methane Gas Pipeline Project:

- i) Recommended most appropriate mode of transportation and distribution of gas from Lake Kivu to the demand areas within the Great Lakes Region;
- ii) Recommended financing mechanism for the project implementation as well as its post construction ownership and management;
- iii) Recommended most appropriate institutional arrangements for implementation and post construction management of the project facilities, including TOR for services required to implement the project;
- iv) Identified significant socio-environmental impacts requiring addressing during project implementation and operational phases of the project.

### 3.4 Study Cost Estimates

The estimated cost of the proposed feasibility study is USD 828,550. A more detailed cost break down is given in table 3.1 below.

**Table 3.1 Methane Gas Pipeline Project Feasibility Study - Cost Estimates Summary Breakdown (in US\$)**

No	DESIGNATION	NUMBER		Unit Price \$	Total Amount \$
		Field	Home Office		
1	HONORARIUM				
1.1	Key Consultant's Staff				
	Project Director (Consultant's Head office)	0.5 mm	1mm	10,500	15,750
	Study Manager (Gas Engineer)	3	1	10,500	42,000
	Gas Transmission Engineer	3	1	10,500	42,000
	Civil/Hydraulic Engineer	2	1	10,500	31,500
	Electro-Mechanical Engineer	2	1	10,500	31,500
	Surveyor	3	1	10,500	42,000
	Public Utilities Economist	2	1	10,500	31,500
	Finance Specialist	2	1	10,500	31,500
	Legal and Institutional Specialist	2	1	10,500	31,500
	Socio-Economist	3	1	10,500	42,000
	Environmentalist	3	1	10,500	42,000
1.2	Support Personnel				
	Secretary	4	-	1,500	6,000
	Assistant Surveyor	4		2,000	8,000
	Driver	4	-	1,200	4,800
	Messenger	4	-	1,000	4,000
	<b>SUB TOTAL HONORARIUM</b>				<b>406,050</b>
2	ACTIVITIES AND FIELD WORKS				
	Surveying and Mapping				50,000
	Miscellaneous				20,000
	<b>SUB TOTAL FIELD WORKS</b>				<b>70,000</b>
3	PER DIEM, LOGISTICS AND TRAVELS				
	Per Diem	780days	250 USD		195,000
	Air Transport	12 trips	2000 USD		24,000
	Surface Transport				30,000
	Computers and related office work	4 units	2000 USD		8,000
	Reproduction and Documentation				25,000



	Office accommodation				10,000
	Communications				7,500
	<b>SUB TOTAL ITEM 3</b>				<b>299,500</b>
4	Consultations with Stakeholders				30,000
5	Coordination and Management (Study Coordination Unit and Steering Committee)				15,000
	Miscellaneous				8,000
	<b>TOTAL COST (1+2+3+4+5)</b>				<b>828,550</b>

### 3.5 Study and Project Financing

Gas distribution is an industry best suited for the private sector. It is therefore expected that whatever mode of distribution will be recommended by the study, it will still be able to attract a lot of interest and possibly participation in both the project implementation and post construction operation. As indicated in the brief TOR given above, the best way to engage the private sector to fund and manage the gas distribution operations shall be elaborated by the study consultant. But the private sector will only be interested in profitable business. As such, the study shall therefore have to be carried out to establish the economic viability of gas distribution to the countries neighbouring Lake Kivu. The financing of the study shall be either with public and/or donor funding.

## 4 Study Implementation

### 4.1 Implementation Schedule

A firm of consultants shall be recruited to carry out the study. It is estimated that the consultant will require four months to finalise the feasibility study. The consultant shall closely involve all the stakeholders including local communities in order to bring them on board, generate sense of ownership to ensure their full participation especially by women during its implementation. Stakeholders' workshops shall be conducted one in each of the project countries, to enable the consultant to take into account, the consumers views and preferences when firming up the study recommendations. The following are key milestones of the study

Table 4.1 – Feasibility Study - Implementation Schedule – Key Milestones

	<b>Activity or Event</b>	<b>Responsible Party (ies)</b>	<b>Target Date</b>
1.	Approval of the TOR for the Feasibility Study	DRC, Rwanda, Burundi, Uganda, Tanzania, NEPAD	May 2007
2.	Project Sponsors/Donors	DRC, Rwanda, Burundi, Uganda, and	July 2007

	Meeting	Tanzania, NEPAD and Donors	
3.	Fund raising for the Study	SOCIGAZ/NEPAD/Donors/Concerned Countries	October 2007
4.	Recruitment of the Consultant	SOCIGAZ	January 2008
5.	Commencement of Study	Consultant	March 2008
6.	Stakeholders Workshops	Consultant & Stakeholders	May 2008
7.	Completion of Study	Consultant	June 2008

#### 4.2 Institutional Arrangements

SOCIGAZ, an institution created to be responsible for the development of the gas in Lake Kivu already exists. SOCIGAZ will therefore be responsible for the implementation of the study and will take the leadership in the procurement of the services and supervision of the consultant. SOCIGAZ will ensure that the study is carried out on time, and in accordance with the agreed upon TOR. In order to ensure feedback from all the countries concerned, a Steering Committee to which SOCIGAZ will be reporting, shall be constituted with representation from each of the countries. This committee shall provide guidance and direction during study period and also facilitate addressing the various issues especially those of regional cooperation and coordination. However, due to the manpower constraints within SOCIGAZ and also within ECCAS, it is proposed that NEPAD provide adequate support during the implementation of the study.

### 5 **Study Justification**

Undertaking the proposed study is important in order to address the various issues highlighted in the above sections of this report. In particular, it is necessary to establish and ensure that there is adequate market for gas within the region and assess how this compares with other local sources of energy, including potential sources of gas within the GLR. The project would be a good candidate for private sector participation and hence the need to establish its economic and financial viability. It is most likely that the issue of security is crucial since by its very nature, a gas pipeline would be an easy target of sabotage during times of unrest.

The ease of access and availability of cheaper gas to the people in the region, would in itself lead to cost savings for the ordinary people who use gas, in comparison with the current supply of gas that has to be hauled for long distances from its source. Availability and common use of gas that is produced locally would provide an alternative and sustainable form of energy. This would ease the pressure on the current widespread use of biomass, with its subsequent destruction of the environment including the forests.

### 6. **Risks and Mitigation**

One of the major risks that would be faced by the study and particularly by the project is the failure by all the effected countries to fully participate in the implementation of the study and the project. It is therefore necessary that the four countries of Uganda, Rwanda, Burundi and DRC and Tanzania demonstrate commitment right from the beginning in order for the project to succeed. The risk of upsurge of insecurity in the region cannot be overlooked. Close collaboration and coordination is therefore necessary to ensure that the study is carried out and the resultant project is implemented and sustained.

There are also the technical risks posed to any pipeline project in an earthquake prone region. The study recommendations shall have to factor in such conditions and build safeguards in case of such eventualities. Equally, in future, Lake Kivu could be one of the several sources of gas in the region as exploration for petroleum continues. Competition with gas from other regional sources will also have to be considered during the study. However, this is not likely to be a problem, since such other sources could contribute to the expansion of gas distribution in the area and therefore have more people benefiting.

METHANE GAS PROJECT (KIVU REGIONAL PIPELINE PROJECT) - FEASIBILITY STUDY MATRIX

<b>Narrative Summary (NS)</b>	<b>Verifiable Indicators (OVI)</b>	<b>Means of Verification (MOV)</b>	<b>Important Assumptions</b>
<p>Project Sector Goal:</p> <ol style="list-style-type: none"> <li>To contribute to economic development and regional integration by providing an easy and cheaper source of energy to the people of the countries of the Great Lakes Region.</li> </ol>	<ol style="list-style-type: none"> <li>Affordable and accessible gas from the Lake Kivu, available to the people of the region;</li> <li>The gas adopted and used as the main form of energy in the GLR.</li> </ol>	<ol style="list-style-type: none"> <li>Statistics from the Government of the Great Lakes Region</li> </ol>	<p>(Goal to Supergoal)</p>
<p>Study Objectives:</p> <ol style="list-style-type: none"> <li>The objective of the proposed study is to provide adequate information on the technical, socio-economic and financial aspects of the proposed project, and explore the feasibility of the proposed production of gas under Lake Kivu, and its distribution by pipeline.</li> </ol>	<ol style="list-style-type: none"> <li>1.1 Recommendations of the study adopted and preliminary designs prepared for the pipeline;</li> </ol>	<ol style="list-style-type: none"> <li>Study Progress Reports</li> <li>Supervision and audit reports</li> </ol>	<p>(Project Objective to Goal)</p> <ol style="list-style-type: none"> <li>Adequate commitments by the concerned governments and demonstration of strong political will;</li> <li>Strong commitment for public and private funding for the project;</li> <li>Peace prevails in the GLR;</li> </ol>

<p>Outputs:</p> <ol style="list-style-type: none"> <li>1. Recommended most appropriate mode of transportation and distribution of KIVU gas to the region of the Great Lakes;</li> <li>2. Recommended financing mechanism and implementation modalities of the project;</li> <li>3. Recommended most appropriate institutional arrangements for implementation and post construction management of project facilities;</li> <li>4. Recommended significant socio-environmental issues requiring addressing during implementation and operational phases of the project.</li> </ol>	<ol style="list-style-type: none"> <li>1.1 Feasibility study report accepted and recommendations adopted.</li> <li>2.1 The recommendations accepted and adopted, and project funding secured;</li> <li>3.1 Agreed institutional arrangement set up and functioning</li> <li>2.1 The Socio-environmental analysis report accepted after consultation with stakeholders;</li> </ol>	<ol style="list-style-type: none"> <li>1. Study progress reports</li> <li>2. National statistical reports</li> <li>3. Audit reports</li> </ol>	<p>(Output to Project Obj.)</p> <ol style="list-style-type: none"> <li>1. Timely adoption of the study recommendations ;</li> <li>2. Keen participation in the stakeholders' seminars and adequate consultations during study duration;</li> <li>3. Private sector willing to participate in the project;</li> </ol>
<p>Activities:</p> <ol style="list-style-type: none"> <li>1. Sourcing of Funding for the study.</li> <li>2. Recruitment of a Consulting Firm.</li> <li>3. Execution of the study;</li> <li>4. Stakeholders seminars and consultations;</li> <li>5. Donors/Financiers conference on</li> </ol>	<p>Inputs:</p> <p>Total study costs: US\$ 0.828 million</p> <p>Resources: TBD</p> <p>Financing Plan: TBD</p>		<p>(Activity to Output):</p> <ol style="list-style-type: none"> <li>1. Timely sourcing of funding and commencement of the study.</li> <li>2. All countries are agreeable to the</li> </ol>

project financing and implementation.			project and to implementation of the study;
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## METHANE GAS PIPELINE (KIVU) PROJECT

