



TOGETHER
for a sustainable future

OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.



TOGETHER
for a sustainable future

DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

FAIR USE POLICY

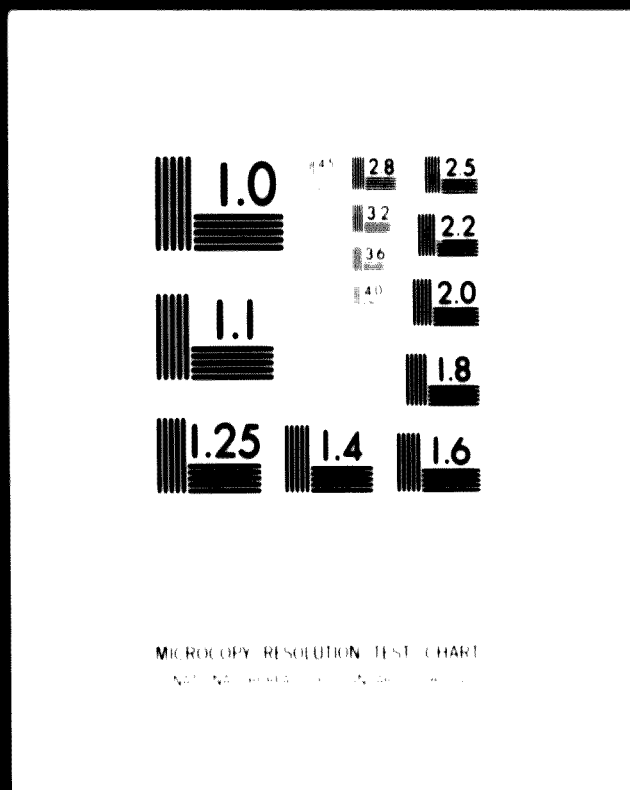
Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

1 OF 1
00994



24x
C



00994



United Nations Industrial Development Organization

PROJECT INFORMATION
SHEET

RWA-05-70+

THIRD AFRICAN MEETING TO PROMOTE INDUSTRIAL PROJECTS ^{1/}

ABIDJAN, IVORY COAST, 24 NOVEMBER - 1 DECEMBER 1971

METHANE GAS

COUNTRY: Rwanda

PROJECT: Methane gas extraction
Capacity: 30 million m³ per year
Investment: US\$900,000

FOREIGN CONTRIBUTION REQUIRED: Equity participation
Know-how
Management
Marketing



^{1/} Sponsored by: The African Development Bank (ADB)
The Economic Commission for Africa (ECA)
The United Nations Industrial Development Organization (UNIDO)

+ Project submitted in 1970, revised and supplemented.

id.71-7569

187

IMPORTANT NOTICE

The basic purpose of this meeting is to provide an Exchange or Market Place for the initiation of contacts on specific industrial projects between their proponents from the African countries and potential suppliers of capital, finance, equipment or know-how, as the case may be, from the industrialized countries.

This Project Information Sheet has been prepared as a basis for such contacts. Its purpose is not to present detailed information about the project but to provide the recipient with an outline sufficient to determine tentative interest in principle. Any further available information on the project will be furnished on request to interested parties at the Meeting.

Experience has shown that industrialists frequently prefer to carry out their own further investigations in detail into projects in which they are interested, but assistance from UNIDO in these matters can be rendered to the African country concerned on request.

This Information Sheet contains only the information supplied to UNIDO by the proponent of the Project. UNIDO can therefore take no responsibility for its accuracy.

METHANE GAS

I. THE PROJECT

The depths of Lake Kivu contain large quantities - about 57 billion m³ - of methane gas which is kept in solution in the water by the prevailing hydrostatic pressure. As the petroleum prospecting situation stands at present, this deposit of methane gas constitutes the only natural resource of this nature known to exist in this part of central Africa. It is therefore proposed to set up a methane gas extraction plant at Gisenyi, near the pilot natural gas tapping station, or at any other suitable point on the shore of Lake Kivu.

The execution of the project will make it possible to develop the use of methane gas in industries connected with the exploitation of the gas deposit.

II. ECONOMIC ASPECTS OF THE PROJECT

1. Importance of the project with respect to State priorities and planning objectives

The project is one of the priority projects of the national plan, and its objective is to permit the utilization of methane gas:

- As a source of heat, that is to say, as a substitute for other power sources which cost a great deal of foreign exchange;
- As a raw material, the two component elements of methane being the basis for most synthesis industries.

2. Economic grounds for the project

The exploitation and utilization of methane gas for the industrial development of the area round Lake Kivu would represent a considerable saving of foreign exchange and a most valuable contribution to many industries.

In landlocked Rwanda, which is some 2,000 km from the sea and has a population density of over 125 inhabitants to the square kilometre, industrial development is one of the essential conditions for the utilization of the manpower available in this already over-populated country.

The problem arises especially in connexion with food crops. Increasing the yield of such crops by using intensive cultivation methods and fertilizers must be considered not just as an essential condition for industrial development, but as one of the essential conditions for the very survival of the population of Rwanda.

Methane gas, which is the cheapest raw material for the synthesis of ammonia and nitrogenous fertilizers, can help to solve this difficult problem.

The sale price of the gas will make it easily competitive in the entire landlocked area round Rwanda. The foreign exchange savings which would result from the exploitation of the gas may be estimated at US\$14 million on the basis of the Mombasa price or US\$60 million on the basis of the Kigali price.

3. Advantages which the project will enjoy

The project will be able to enjoy the following advantages:

- Exemption from customs duties on the importation of capital equipment;
- Exemption from or reduction of duties on exports of methane gas.

III. COMMERCIAL ASPECTS OF THE PROJECT

1. The local market

In 1962, a pilot tapping station was set up at Cape Rubona, 4 km from Gisenyi. This station supplies the boilers of the "Bralirwa" brewery and the 180 hp dual-fuel diesel engine of the pumping station.

The production capacity of the station is about 270 m³/h of gas (78% methane, 22% carbonic anhydride and other components) with a calorific value of 4.5-5 therms per m³. This corresponds to a capacity of 1,350 therms per hour, 200 therms of which are used for operating the tapping station (washing and compression), while the remainder is used in the brewery boilers.

The aim of the project is to proceed to larger-scale operations so as to make about 30 million m³ per year of natural gas available to a number of enterprises. In other words, the project remains linked, for the immediate future, to the many industrial or household applications within Rwanda. Apart from utilization for the synthesis of ammonia and nitrogenous fertilizers (see project RWA-04-70+) these are:

2. Raw materials

The deposit of methane, which is of organic origin, is kept in solution in the depths of the lake by the effect of hydrostatic pressure. In normal atmospheric conditions (25°C and 640 mm pressure) the reserves are estimated to contain:

57 billion m³ of CH₄
190 billion m³ of CO₂
4 billion m³ of N₂

It is therefore estimated that the Lake Kivu deposit contains about 57 billion m³ of methane with a calorific value equivalent to 36 million tonnes of fuel oil.

The banks of the lake slope down steeply, and at several points on the Rwandan side it is possible to reach a depth of 300 metres about 50 metres from the shore.

It is planned to separate the methane gas from the water at a depth of less than 20 metres so as to collect a gas which is rich in methane and to leave most of the CO₂ in the water.

3. Available infrastructure

Electricity

At Gisenyi, the plant will be able to obtain 220/380 volt alternating current at 50 cycles per second.

High tension current is supplied under a two-part tariff:

- Fixed charge: US\$3.75 per kW of installed capacity per month, up to 80 kW;
US\$3.00 per kW of installed capacity per month, over 80 kW.
- Variable charge (by blocks of 125 kWh per kW of subscribed capacity):
 - 2.5 US cents per kWh for the first block;
 - 2.0 US cents per kWh for the second block;
 - 1.5 US cents per kWh over 250 kWh.

Water

Cost of water: 12 US cents per m^3 , or free if water from Lake Kivu is used.

The lack of engineers and higher-level technicians makes it necessary to use expatriate staff. Otherwise, the necessary labour is available in the area under consideration.

Transport of methane and available communications

Three methods are normally used for transporting methane gas:

- Transport through pipelines under pressure. This method is of interest for transporting gas over short distances, or for transporting large amounts of gas over long distances;
- Compression of the methane for transport. This method is particularly popular in Italy and France for the utilization of methane as motor vehicle fuel;
- Liquefaction of methane by cooling to a low temperature (-160°C) at ambient pressure. The reduction of volume thus achieved (about 600 m^3 of gas at atmospheric pressure is reduced to 1 m^3 of liquid) makes possible the storage of large quantities of liquefied methane gas and its transport in tank trucks.

The existing road system is such as to permit the transport of methane to all corners of the country and even to neighbouring countries.

V. FINANCIAL ASPECTS OF THE PROJECT

1. Investment costs

A production unit with a capacity of 30 million m^3 per year would represent a total investment of US\$600,000 for the tapping, purification and transport of gas over a distance of up to 50 km.

If the minimum storage requirements are estimated at 10 per cent of daily production ($100,000\text{ m}^3$ per day), i.e., $10,000\text{ m}^3$, the investment costs in respect of storage facilities at the tapping station would be US\$200,000.

The total investment would thus amount to:

- tapping	US\$600,000
- storage	US\$200,000
- working capital	US\$100,000
Total:	<u>US\$900,000</u>

2. Expected turnover

Expected turnover is 30 million m^3 x \$0.01 per m^3 = US\$300,000.

The break-even point is reached at about 16 million m^3 of gas per year, i.e., 1,600 hours of production at 10,000 m^3 per hour.

VI. CONTRIBUTION REQUIRED

It is proposed to set up a mixed company with possible participation by the Rwanda Development Bank. The foreign partner will be invited to participate in the equity, to provide technical know-how and to participate in management. He should also give assistance in marketing the gas.

VII. OTHER INFORMATION

Project submitted by:

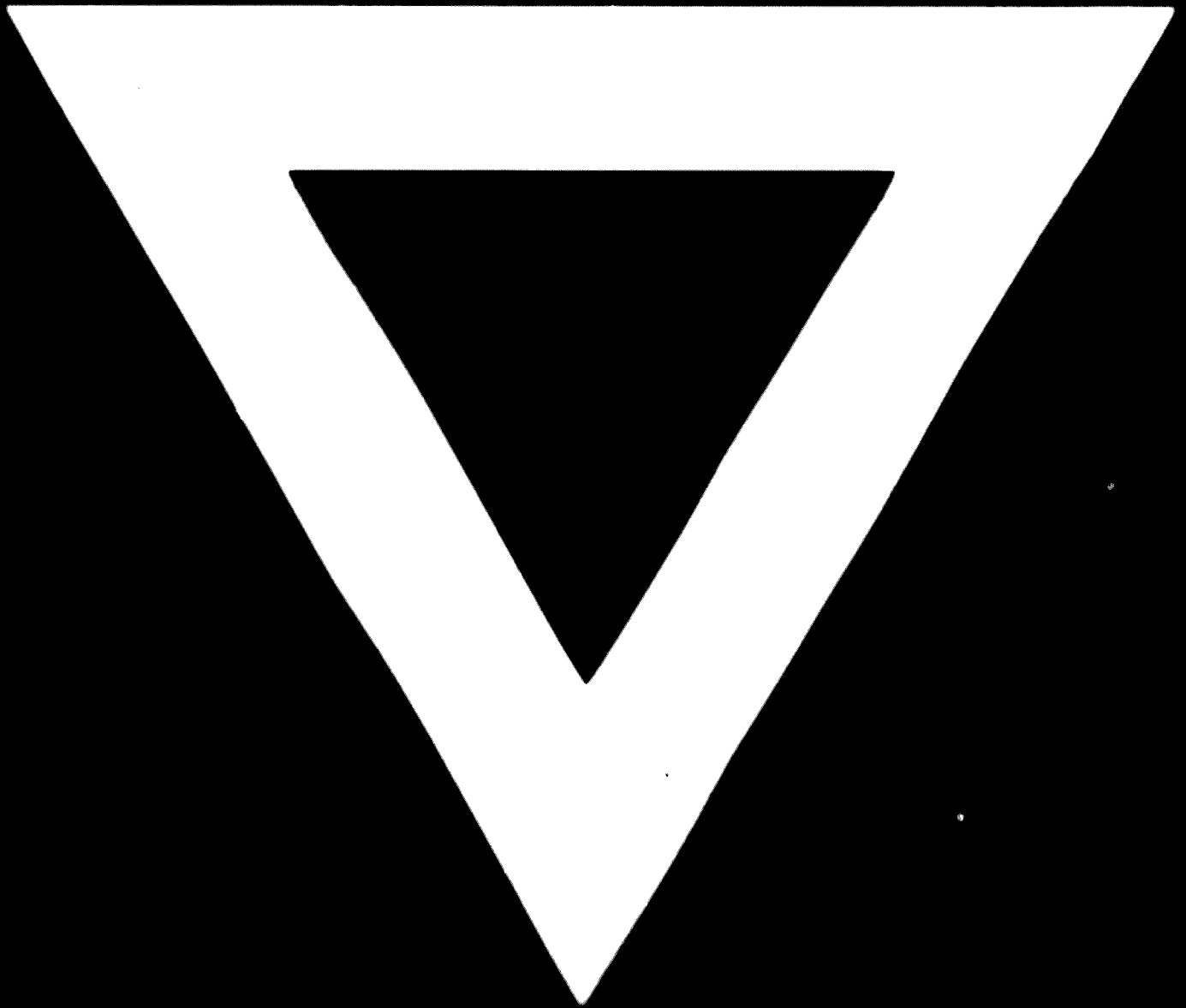
Department of the Secretary of State
for the National Development Plan,
B.P. 46,
Kigali, Rwanda.

Available documentation:

- Preliminary reports and surveys;
- Studies of the methane deposit;
- Studies on the exploitation of the methane deposit.



B - 348



80.11.21