March 4th, 2005
JFE Engineering Corporation

Feasibility Studies on Climate Change Mitigation Projects for CDM and JI

Summery of "Feasibility Study for Biomass High-Efficiency Power Generation Project"

(1)Basic Information about the Project

■ **Project outline and background**

This project concerns biomass power generation using palm empty fruit bunches (hereinafter referred to as EFB) as fuel which is performed at a palm oil mill of Kulim (Malaysia) Berhad Co., Ltd. of State of Johor, Malaysia, and sale of it to Tenaga National Berhad (hereinafter referred to as TNB), an electric power company in the Malaysia Peninsula, under the Small Renewable Energy Power Programme (hereinafter referred to as SREP) of the Malaysian Government.

Use of the "high-efficiency biomass gasification technology" which was developed by JFE Engineering Corporation is listed as one of the key points of this project. In the method using the conventionally common technology to generate power in a steam turbine by directly combusting biomass, enough economic efficiency often could not been obtained through use of EFB in the quantity obtained from one to two palm oil mills, and transportation costs constituted a limiting factor in diffusion of biomass generation. This technology enables power generation through gasification of EFB in the "circulating fluidized bed furnace" followed by the tar removal process and feeding into a gas engine, by use of which high generating efficiency can be expected even with a relatively small quantity of EFB collectable from one to two palm oil mills.

Kulim is highly interested in utilizing waste (EFB, effluent, etc.) discharged in the process of palm oil production and putting it on the commercial base, which has been deepening consultations with us regarding use of biomass. When a concept of power generation operation by biomass gasification through use of a circulating fluidized bed furnace was proposed by our side, the company responded with great interest and it was agreed between parties to jointly implement a feasibility study.

■Information about Host Country

Malaysia is located in both the Malay Peninsula and the Borneo Island in the Southeast Asia, with the land size of about 330 thousand km^2 or about 0.9 times as large as Japan and with the population of 24,530 thousand (Statistics Bureau in 2002). It is a multiracial country consisting of Malay ancestry (65.1%), Chinese ancestry (26.0%), Indian ancestry (7.7%), and others (1.2%). In addition to the national language which is Malay, other languages such as Chinese, Tamil, and English are spoken.

The major industries of Malaysia include manufacturing (electric equipment), agriculture and forestry (natural rubber, palm oil, timber), and mining (tin, crude oil, LNG).

■ Policy for CDM/JI in the Host Country

Malaysia ratified the Kyoto Protocol on September 4, 2002 and has been actively working on diffusion of the CDM projects. Ministry of Natural Resources and the Environment (hereinafter referred to as NRE) is assigned as DNA. Regarding process of Host Country's Approval, first of all, a project participant submits the synopsis "Project Idea Note" to NRE. After the synopsis is examined by the authority concerned, the letter of conditional approval is issued. It is then subject to Validation by the Operational Entity and the official approval by the host country is granted .

■ Feasibility Study Scheme (Japan, Host Country and others)

With the aim of implementing this feasibility study (hereinafter referred to as the Study), on the assumption of actual implementation of he project, we asked for cooperation from Kansai Electric Power Co., Inc., the General Environmental Technos Co., Ltd. (renamed in October 2004 from Kansai General Environmental Center Co., Ltd.), Sojitz (Malaysia) Sdn. Bhd, and JFE Engineering (Malaysia) Sdn. Bhd. The main scope of each company is as follows;

(Japan)

JFE: Total coordination of the Study, Arrangement for the site corporation, Estimation of project cost, Assessment of project's economic efficiency, Coordination with CDM related Authorities

Kansai Electric Power Co., Inc. : Investigation of feasibility of electric power selling to TNB

The General Environmental Technos Co., Ltd. : Preparation of PDD draft

(Maysia)
Kulim (Malaysia) Berhad: Supply of necessary data for Project

Sojitz (Malaysia) Sdn. Bhd.: Preparation of financial plans

JFE Engineering (M) Sdn. Bhd.: Estimation of site work costs

(2)Project Planning

■ Project Outline

This project concerns a small-scale renewable energy power generation by using the power generating unit (capacity: 3.8 MW) consisting of the latest model of a circulating fluidized bed gasification furnace combined with a gas engine for which EFB discharged in the process of production of palm oil liquid concentrate from Oil Palm Fruit at the Kulim's palm oil mill in State of Johor, Malaysia are used as biomass fuel. This project intends to obtain operating income by selling electricity generated with biomass fuel (annual 25.7 GWh) to TNB, a Malaysia's electric power company, and, at the same time, to realize greenhouse gas emission

reduction by replacing grid electricity of Peninsular Malaysia where fossil fuel such as natural gas is used as the main fuel. In this way, while contributing to sustainable development of the host country, it also aims to acquire the Certified Emission Reduction (CER) credit under the CDM mechanism of the Kyoto Protocol.

■ Project Boundary, Baseline, · Additionality

As the baseline of this CDM project, the "weighted average emission of current generation mix" is selected among the simplified baselines applicable to the small-scale CDM type I.D. In other words, the weighted average emission of generation mix which is the latest as of start of the operation (value obtained when the power sold under this project is multiplied by the weighted average emission coefficient of the grid power source) is taken as the baseline.

Also, "Investment Additionality" exists in the Project.

When an ordinary operation (without income through CER acquisition) which is not a CDM project is assumed, the internal profit rate of the said operation is estimated at 2.55% (rate for 21 years), which is far below the criterion of business profitability (usually, at the lowest, IRR10% or above) as an important index in investment decision-making involving business risks. (Kulim has set the investment criterion of IRR 15% or above.) Therefore, Investment Additionality exists in the Project.

■ GHG Reduction and Leakage

According to the estimated data on emission unit requirement (estimation by PTM) of the power supply grid in Peninsular Malaysia, it is estimated that the weighted average emission (average emission unit requirement of all power sources) of the current generation mix is 0.595 kg CO2/kWh. Accordingly, when the power amount (25,664,000 kWh per annum) equivalent to that to be sold under this project to the Peninsular Malaysia power supply grid is supplied by use of a power source having the above average emission unit requirement of all power sources (0.595 kg CO2/kWh), the greenhouse gas emission can directly correspond to the baseline emission. The following result is obtained:

Annual baseline emission = 25,664,000 kWh/year × 0.595 kgCO2/kWh = 15,270,080 kg CO2/year

There is almost no greenhouse gas emission source to be recorded within the project area concerning this project activities, where the project emission is regarded as zero.

Greenhouse gas emission reduction by this project = 15,270 t CO2/year - 0 t CO2/year = 15,270 t CO2/year

Therefore, Greenhouse gas emission reduction by this project for the total credit period (21 years) is estimated as stated below;

= 15,270 t CO2/year x 21 yrs =320,670 t CO2)

Leakage shall not be expected in the Project.

■ Monitoring Plan

With regard to the monitoring methodology and plan of the small-scale CDM project Type I.D in which this project falls, a simplified specified procedures are useable as in the case of the baseline methodology. The items subject to monitoring under this project only includes power amount sold to TNB which is, in other words, only power supply amount to the electric power grid of Peninsular Malaysia. The amount transmitted from this project site and the amount received on the TNB side (Peninsular Malaysia power grid) are each monitored by a watt-meter mounted on each side and by means of the fiscal statement.

■ Environmental Impact

Whenever an operation falls into any of the 19 areas stipulated under the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 1984 based on the Environmental Quality Act 1974, the Environmental Impact Assessment (EIA) report needs to be prepared , submitted to the Director of Division of Environment, and approved in the specified procedure. This project is considered to fall into the "power generation/transmission" among the 19 areas. Although there is no item which specifically provides biomass generation, the regulations regarding thermal power plants using fossil fuel should be applicable as the closest in terms of the conditions concerned. In that case, the conditions applicable to the operation subject to EIA are the following:

"Construction of a thermal power plant which burns fossil fuel, having power generation capacity of 10 MW or more"
This project, whose power generation capacity is less than 10 MW, does not fall into an operation subject to the Environment Impact Assessment. Therefore, we understand EIA is not necessary for the Project.

■ Stakeholders' Comment

There are no residents around the Ladang Tereh Palm Oil Mill expect for those who are employed by the mill. Therefore, we received the feedback from Kulim and NRE, we received supportive comment for this project.

(3)For the materialization of the Project

■ Project Scheme (Japan, Host country, Others)

A special purpose company is expected to be established through investment by Kulim (Malaysia) Berhad Co., Ltd. as the site corporation and a Japanese company with the aim of acquiring emission credit. JFE Engineering Corporation and JFEM shall be in charge of Engineering, Procurement and Construction Work jointly.

■Financial Plan for the Project

As for the fund plan, it is assumed that 40% will be covered by SPC's own funds consisting of investment of Kulim and Japanese investors, and 60% covered by loan

■ Project Profitability

(Where income of US $10/t CO2 is assumed)
Pay Back Period: 11.0 years, IRR: 5.45%
(Where income of US $5/t CO2 is assumed)
Pay Back Period: 13.3years, IRR: 4.13%
(Where no credit is assumed)
Pay Back Period: 16.5 years, IRR: 2.55%

■ Action Plan for the Project materialization

- The Project is to be executed under SREP, the application to Energy Commission and negotiation with TNB for Power Purchase Agreement are needed.
- This project concerns a power generation project using EFB as fuel, for which stable supply becomes most important. Especially in this project, because enough amount of EFB cannot be secured from the palm oil mill close to the Project site alone, supplies from neighboring plants are expected, whose fuel supply system should require attention from reliability point of view, It is very important to discuss with Kulim about various factors including the supply of EFB.
- Even though the income of US$ 10 /tCO2 is assumed, the pay back period shall be more than 10 years, the possibility of the project materialization is still not so high. The activity for cost reduction is necessary.

(4)Validation/ Determination

■Outline

Not Applicable

■Process of contact with OE

Not Applicable