ＣＤＭ／ＪＩ事業調査及び温暖化対策クリーン開発メカニズム事業調査　概要版

A Study on Production of Anhydrous Fuel Ethanol in Lithuania

(1)Fundamental Factors concerning Project Implementation

■Outline of the proposed project and background of business planning

In this project, anhydrous ethanol is produced with feedstock of grains, mainly wheat produced in Lithuania. The raw material is procured, principally from within the range of 50 km around the site of the production plant. The necessary amount of the raw material is meant to be secured by contracting with growers or trades of grains for long-term supply. Because raw material can be stored in silo for a long time, ethanol production plant could be operated continuously throughout a year except for regular maintenance.

The production plant is set up in Kaunas City, the capital of Kaunas County, situated in the central southern part of Lithuania. The site is decided in consideration of convenience and economy of such factors as procurement of raw materials, ethanol production of ethanol, and delivery of product ethanol. Kaunas County boasts high production of wheat and other grains, and transportation infrastructure in Kunas City ascertains convenience of transporting feedstock biomass, produced ethanol and other goods.

Reduction of energy consumption in the production process is attempted by using membrane separation method for dehydrating fermentation liquid.

The major EU countries has already agreed on the introduction of bio-fuel as indicated in the EU directive, and because the host country also declares observance of the decision, the introduction of bio-fuel in Lithuania is regarded as certain and domestic demand for fuel bio-ethanol is expected. However, it is assumed that it exports to sought-after EU major powers because domestic demand is only about 10,000kl in 2006, and, therefore, the ethanol production capacity of the production plant is set to be 480kl/d.

Outline of the host country

Official Name of the Country：Republic of Lithuania

Area：65,200 km^2

Population：3.44 million（As of June 1, 2004）

Capital: Vilnius

Currency：Litus（LTL）

Exchange rate：　（1 Euro ＝3.4528 LTL）

Races：Lithuanian 81.8%、Russian 8.1%、Polish6.9%

Official language： Lithuanian

Political Situation,･Outlook： Republic system.

The president, the parliament, the government, and administration of justice maintain the highest power under the constitution. The president is a sovereign of the nation, it is elected usually directly by the election (secret vote system), and the term of office is five years. The president' rules over diplomacy, the decision of defense policy, and with the approval of the

assembly bears the duty of appointing the Prime Minister, other cabinet ministers, bureaucrat, and the judge in the constitutional court.

Prime Policy： Based on democracy and capitalism

Administrative body：

As a central administrative organization, there are the Ministry of Justice, the Ministry of Foreign Affairs, the Ministry of Economy, the Ministry of Finance, the Ministry of Defense, the Ministry of Environment, the Ministry of Transport, the Ministry of Culture, the Ministry of Internal Affairs, the Ministry of Health, the Ministry of Social Security & Labor, the Ministry of Agriculture, and the Ministry of Education & Science. The administrative division is divided into the 56 municipalities and the districts with ten counties.

Economic situation：

Ever since Lithuania became independent in 1991, Various reforms for the market-oriented economic have been promoted, and macroeconomic indicators have improved greatly through large-scale privatization etc. Lithuanian economy has been growing steadily thanks to the increase of the direct equity investment from the foreign countries and the expansion of importing and exporting.

■Policy and situation concerning CDM/JI like criteria of receipt of CDM/JI project in the host country, and installation situation of DNA, etc.

Lithuania's measures for controlling global warming are controlled by EU directives. The greenhouse gas emission reduction is requested from EU, and Lithuania responds to this.

The approach concerning JI is in a situation that you may say still at the starting stage. The criteria of approving JI projects are not yet fully established in Lithuania. The national registration and management system of the amount of the GHG emission reduction, that is required as the qualification as a host country of Kyoto mechanism with UNFCCC, is still insufficient. And the implementation or annual reporting to UNFCCC of GHG that is an obligation is also insufficient. Therefore, it is presumed that Lithuania is in a category of track 2 at the present stage.

It is not clear how Lithuania's relatively aggressive posture on introducing the renewable energy is reflected in the materialization of the JI project. At present several projects regarded as pilot projects among Baltic nations are being planned or under examination on the possibility. The Ministry of Environment intends to establish a domestic system through these implementation of the pilot projects, in addition to investigating foregoing JI projects in other Eastern European nations.

Because Lithuania's indigenous energy resource is not abundant, substitution of fossil fuel with regenerative fuel is one of the most important policies, and the introduction of anhydrous bio-ethanol is one of the measures that attract attention these days.

As for Lithuania's organization to cope with Kyoto mechanism, the contact on the matter concerning Kyoto mechanism is the Ministry of Environment. In approving specific proposal JI project, a steering committee composed with the Ministry of Environment, the Ministry of Economy and the Ministry of Finance is formed and appraise the proposed projects. The committee can seek for opinions from other Ministries as necessity arises.

There are no concrete criteria in Lithuania concerning approval of JI projects However priorities in category are set as bellow.

-Renewable energy Development （Wind, Biomass, Solar energy, etc.）

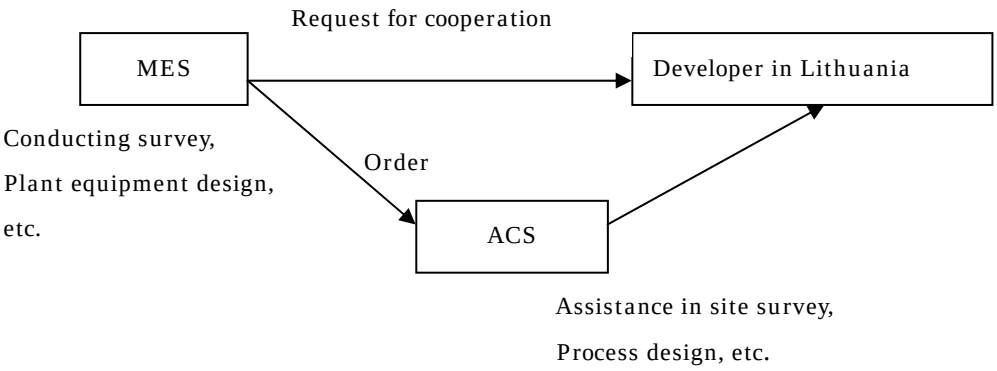
-Fuel Switching（especially for renewable energy.）

-Energy saving by improving efficiency

-Reduction of methane emission in agriculture

-Afforestation

■System investigation system



(2)Project description

■Outline of the Project

In this project, anhydrous biomass ethanol is produced mainly from wheat as raw material with relatively low energy consumption. In the process agricultural product waste is also utilized. The product ethanol is to be distributed to the domestic market as well as the EU market as the fuel for gasoline mixture. A company for ethanol production and sales is newly established in Kaunas City. A bio-ethanol production plant is constructed in the City. In the production process, reduction of energy consumption is attempted by combining efficient ethanol fermentation technology and membrane dehydration. The supply of raw material grains for this project is secured by contacting for a long-term basis with suppliers.

Raw materials: Principally grains procured at peripheral area of the ethanol production plant are supplied as the raw materials.

Raw material feed rate: 1,320 tons/day

(The amount is guaranteed by concluding long-term buying contract with Lithuanian Chamber of Agriculture.)

Product: Anhydrous ethanol for fuel (99.8 Wt%)

Production capacity: Annual output 160,000 kℓ

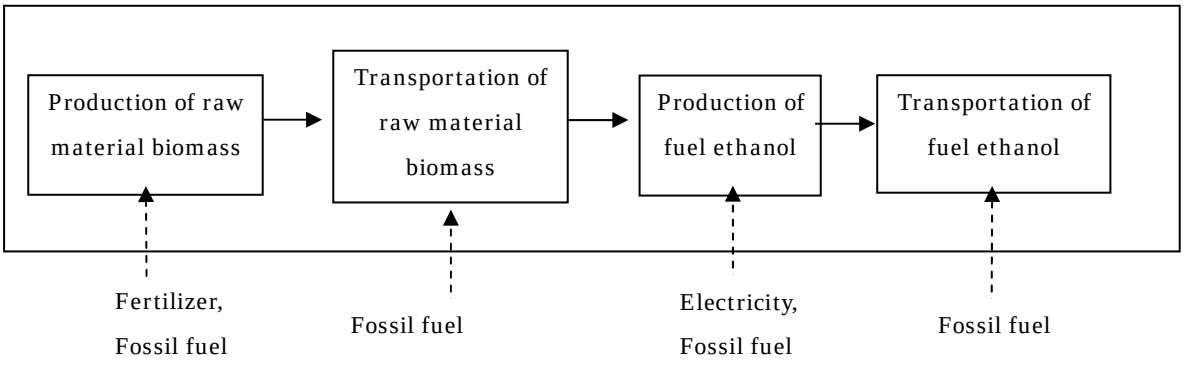
Plant availability: 335 days /.year

By-product: Fermentation residue is sold as fodder for animals. Gluten is sold as food or fodder additive.

■Project boundary・Setting of baseline・Proof of additionality

(1)Project boundary

With this project all process from transport stage to the plant of raw materials biomass to sale of the ethanol is the examination object and is project boundary. Because of that project boundary is set as follows.



The raw material is supplied to ethanol production plant from the existing storage etc. by tank truck. The produced ethanol for the domestic market is delivered to oil tank places, which are the existing gasoline circulation system relay points, by tank lorry or with the railroad. The product ethanol for other EU countries is transported to a port in Lithuania by truck, shipped to the port at the vicinity of the destination by chemical tanker, and is transported to oil tank place or the refinery at the destination. After that it is circulated through existing gasoline circulation system.

The main greenhouse effect gas the discharge quantity of which differs depending upon the presence of this project is carbon dioxide.

(2) Baseline setting

In presumption of baseline scenario, (b) approach in paragraph 48 of Modalities and Procedures for CDM was applied. Hypotheses made in setting the base line are as follows.

-Bio-fuel will be introduced in Lithuania in accordance with EU directive
-Bio-ethanol blended gasoline is introduced as a fuel of the automobile. The mixing ratio is set as indicated in the EU directive.
-The gasoline consumption in Lithuania will continue to increase at annual percentage rate 5%.
-Fuel ethanol production capacity in major EU countries is far less than demand scale.

Based on the hypotheses, out of plural scenario which are thought to be possible, the following scenario was selected as the most plausible:
Corresponding to the introduction of ethanol-blended gasoline into Lithuania's market in accordance with EU directive, demand for fuel ethanol increases in Lithuanian. However the new construction of a fuel ethanol production plant does not take place from the economic rational viewpoint. Instead conversion of the existing potable ethanol production facilities into fuel ethanol production by newly adding dehydration equipment to the existing ethanol production facilities is more likely to occur. Because the production capacities of these existing facilities is

relatively small, fuel ethanol production volume as a whole hardly increase. As a result, fuel ethanol production volume is far less than the demand volume. The situation is similar to those in other EU countries.

(3)Proof of additionality

With the project scenario a fuel ethanol production plant is newly founded in Lithuania. With the full operation of the plant, the amount of anhydrous ethanol to meet the expected demand when ethanol blended gasoline is introduced in Lithuania can be domestically supplied. With this scenario, plant investment cost is markedly large in comparison with the baseline scenario and therefore project IRR is much lower than the baseline scenario, indicating that the choice of constructing a new production plant cannot be economically attractive activity. Therefore it is not a BAU scenario. In addition, because all the anhydrous bio-ethanol produced by the production plant is assumed to be used as automobile fuel, the difference between the quantity of GHG emission that corresponds to the consumption of gasoline based on the baseline scenario and the quantity of actual GHG emitted through implementation of the project is the reduction quantity. Because the difference is supposed to be positive, the additionality is proved.

■GHG emission reduction and leakage in project implementation

The GHG emission quantity for both baseline scenario and project scenario were calculated. The result shows that annual emission reduction of approximately 130,000 tons of CO2 equivalent would be achievable with the execution of this project. As for leakage, because it is presumable in this case that there would be no significant difference in the quantity of greenhouse effect gas discharge outside the project boundary, the leakage due to this project was made zero.

■Monitoring plan

Principal measurement items are as follows.

○Keeping records of the quantity of raw materials, secondary raw materials etc., which are accepted at the bio ethanol factory, stored in the facility and used in operation, by computer or by writing.

○Keeping records of the production volume of produced anhydrous bio-ethanol by computer or writing.

○Keeping records of the sales volume of produced bio-ethanol by computer or writing.（because anhydrous bio-ethanol is denaturalized in order not to be able to make the beverage, it is not used other than automobile fuel.）

○Keeping records of the quantity of the fossil fuel used on the occasion of abnormal stop, startup and shutdown of the plant.

■Environmental impact / Other indirect impact

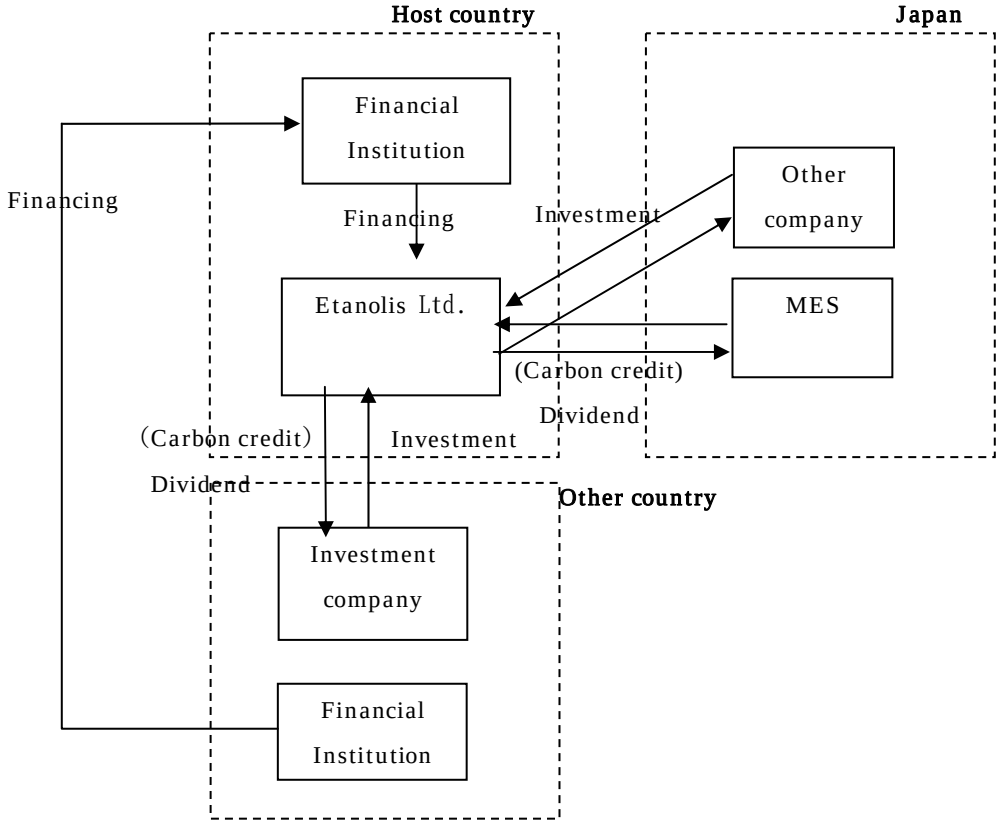
It is stipulated with law concerning the implementation of environmental impact assessment. According to the law, it is not the case that all projects become the object, it has meant to be executed only concerning those which are judged that environmental impact is large.

■Stakeholders' comment

Opinions of the Lithuanian Chamber of Agriculture, Mayor of Kaunas and the staff of the city were requested in regard to implementing this project and all of the opinions were affirmative. However comments of the residents in the vicinity of the expected plant site are yet to request.

(3)Toward implementation

■Project implementation system:



■Financial plan for project implementation

Fund raising plan：	Investment	40,825,000 EUR
	Financing	81,650,000 EUR
	Equity	8,165,000 EUR
	Grant（EU）	32,660,000 EUR

■Cost effectiveness

The result of business profitability calculation conducted under the below-mentioned

conditions shows that the project IRR at 10th year after starting of the business was 7.1%

Conditions：

Loan　81,659,000 EUR　（Interest:6.5%, Other cost:0.5%, Repayment period:10years）

Tariff： 15%

Depreciation： 0.25/year （no salvage value, 10 year fix reduction rate method）

Annual operation cost： 55,572,000 EUR

Ethanol selling price： 0.40 EUR /ℓ

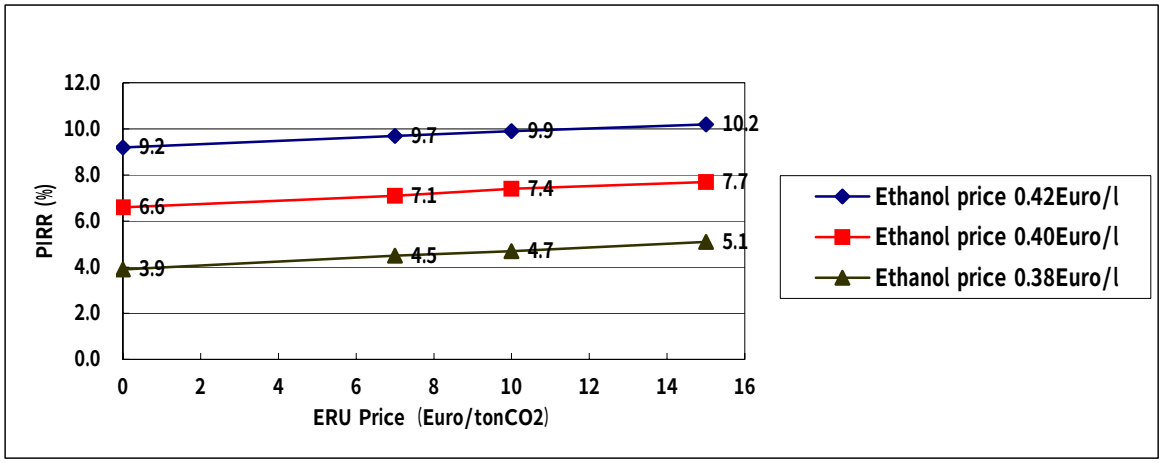
Government subsidy： 0.05 EUR /ℓ

Project period： 25 years

Credit period： 14 years（ERU will be sold in the next year of acquisition）

ERU price： 7 EUR / ton CO_2

IRR when carbon credit price and ethanol selling price are changed are as shown below. Contribution of carbon credit earnings is small.



■Outlook for project realization

Because introduction of fuel ethanol is a worldwide trend, demand for it is expected to increase. However business profitability is the largest obstacle for the project to be actualized. Price of ethanol and government incentives for ethanol producers are important factors for the project feasibility, and it is necessary for these to be set favorably for the enterprise. Also it is necessary to involve suppliers of the raw material in the fuel ethanol business from the point of view of securing sustainable supply at relatively low cost.

Even if the Assuming that the above-mentioned condition was satisfied, there is still a problem that initial investment is too large in comparison with expected ERU earnings. For project actualization it is required to reduce the initial investment and for that reconsideration of the plant site.

(4)Validation/Determination

N.A