

Feasibility study on a wood fired power plant,
including
energy forestation planning
for
sustainable fuel wood supply,
in
southern Vietnam.

Summary of Report

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Chapter 1. The Study

More than half of the land of Long An Province, which is located in the southern part of Vietnam, is covered with acid sulphate soil.

The acidity of the soil drops to pH2.0 level during dry season so that only limited adaptable plants can survive in the area.

Melaleuca (*Melaleuca sp.*), wood plant, was grown in acid sulphate soil land as its habitat before post war and provided people live in the area with medicine, construction material, fuel wood, feed for beekeeper and so on, but due to bombing attacks during the war and illegal cutting after the war extinguish Melaleuca forest completely.

From the early 90's, the Vietnamese government started promoting Melaleuca reforestation of the area in order to give farmers chances to participate in economic activities by selling Melaleuca wood for construction material, and forested area in Long An province was recorded as 64,000ha in 2003.

The rapid economic development in Vietnam from the end of 90's changes various things including construction material. Steel bars have become the replacement of Melaleuca wood and that leads to the depreciation of Melaleuca wood price in the market and therefore farmers have been losing passion for plantation.

The project will use Melaleuca as fuel and generate electricity.

The project will contribute to sustainable development with aspects mentioned below.

Provide farmers with the stable Melaleuca wood market.

Contribute to improvement in power shortage.

Maintain existing forest and improve forest management.

This feasibility study aims to clarify required conditions for setting up the project as a CDM project.

Sojitz Research Institute Ltd. made the study in collaboration with;

Tsukishima Kikai Co., Ltd., Japan (for power plant technology)

Oji Paper Co., Ltd., Japan (for forestation technology)

Mitsubishi Research Institute, Inc. (for remote sensing technology)

People's Committee of Long An Province

Forest Science Sub-Institute of South Vietnam

Research Centre for Energy and Environment, Vietnam

Chapter 2. Long An Province

GDP (2002)	7,293,213 million Vietnam dong
GDP per Capita	338 US dollars
Location	Next to HCMC and the Gate of Mekong Delta
Climate	Aw

Chapter 3 The Project

3.1 Wood Fired Power Plant

The project will adopt gasification technology.

The plant will be operated 24hrs/day, 330days/yr.

The plant, using 88ton (dry) of biomass per day, generates 5.5MW electricity consisting of 0.5MW for self consumption and 5.0MW for grid.

The specific gravity of Melaleuca wood is 0.85 and it contains 58.7% moisture, so that 251m³ Melaleuca wood is required per day.

3.2 Energy Plantation

We have studied the following conditions to be fulfilled when energy plantation is planned in developed countries.

- i. Subsidies for biomass producer to cover a price gap between fuel wood and other products (wood chip for pulp or others)
- ii. Subsidies for biomass user to cover a cost gap between fuel wood and coal, gas, oil or others.
- iii. Good soil condition
- iv. Efficient planting and harvesting system
- v. Fast growing plant species

3.2.1 Current situation (2003) of forest in Long An

More than 20year effort with big capital expenditure, an irrigation system has been established and now;

72% of the land is used for agriculture, mainly for paddy.

12% of the land is covered by forest.

3.2.2 Plantation

Each farmer has 1-5ha of forestation area planted by themselves.

Harvesting work is made by companies under contracts with farmers.

3.2.3 Cost and Market Price

Plantation	USD380 – 640 / ha for the first year
Harvesting	USD200 – 300 / ha
Delivery	USD1.27 – 2.23 / FT to the collecting place
Price	USD0 – 1 / piece (length 4.5m)

3.2.4 Cost Analysis for fuel

The piece of marketable grade Melaleuca is not proper for use as fuel from the economical point of view.

The power plant should use unmarketable grades.

3.2.5 Biodiversity

The basic rules on A/R CDM were decided at COP9.

In the decision, a host country evaluates risks of potential invaders and genetically modified species.

Vietnam recognizes importance of biodiversity and the concept of restration of natural forest is included in the "5million ha reforestation program" promoted by the government.

This project contains reforestation of Melaleuca. *M. cajupti* is a native species so that no big problem is seen on the matter.

It is said that biodiversity consists of 4 concepts i.e. genetic level, species, eco-system and landscape.

A wide use, easy, low cost method / logical tool are required.

3.3 CDM

Vietnam ratified UNFCCC in 1994 and signed Kyoto protocol in 1998 then September 2002, Vietnam ratified Kyoto Protocol.Ministry of National Resource and Environment has been registered as DNA.

The national approval has been given to 4 projects.

Chapter 4. Project Planning

4.1 Power Plant

The project site is decided at Thuan Nghia Hoa industrial estate in Than Hoa District from the consideration mentioned below;

- i. The place is convenient to receive fuel wood delivered by vessel.
- ii. Connectable grid exists around the site
- iii. Potential user of heat exists / will be exist near the site.

The power plant will be operated by 38staffs (4team / 3shifts)

Fuel wood will be procured from 3,850ha area.

Marketable grade fuel wood in the area will be sold to the construction material market and unmarkeble grade will be collected from other area.

4.2 Forestation

CDM forestation on unused land has been promoted from the cashflow of the power plant.

Potential forestation area will be confirmed by Landsat/ETM data and ASTER data.

The power plant will provide subsidies to farmers who obtain land tenure from the local government.

4.3 CDM

4.3.1 Biomass Power Generation

i Baseline

The project is categorized as I.D.-Renewable electricity generation for a grid in Appendix B of the simplified M&P for small-scale CDM project activities.

Additionality: From the economical point of view, any other similar type of projects will not be established without CDM framework. A gas fired power plant is most likely to replace the absence of the project.

Boundary: The plant site and off-site transportation.

ii Duration of the project activity / Crediting period

23years / 7years (Renewable crediting period)

iii Monitoring

Actual electricity generation will be measured on the grid side.

The emissions from diesel oil (for start-up) will be deducted at the time of the GHG calculation.

iv. Estimation of GHG emissions

Approximate Operating Margin: 0.9159 kg-CO₂/kWh = *K1*

Build Margin: 0.7891 kg-CO₂/kWh = *K2*

Average of *K1* and *K2*; 0.8525 kg-CO₂/kWh = Emission Coefficient of the baseline

Estimation of the baseline GHG emissions: 33,759 ton-CO₂/year

After deduction of the emissions from diesel oil; 33,216 ton-CO₂/year = the emission reduction due to the project activity

v. Environmental Impacts

The project activity emissions (air, water, waste) will not exceed the current standards in Vietnam.

4.3.2 A/R CDM

i Eligibility

By Landsat/TM data, it was confirmed that the potential forestation area was not covered by forest in January 1989 (December31 data was not available).

ii Baseline

No methodology for A/R CDM has been approved by the Methodology Panel.

Consideration of additionality.

As explained above, the demand for Melaleuca wood has been decreasing and farmers have lost interest in planting Melaleuca. Afforestation with Melaleuca requires much more capital than that with other tree species as Melaleuca requires huge earth up at the time of planting.

Without CDM framework, a Melaleuca fired power plant will not be materialized, therefore new demand for Melaleuca will not be grown.

It is probably that abandoned land will remain unchanged.

iii Duration of the project / Crediting period

30years / 30 years (Fixed crediting period)

iv Approach to non-permanence

ICER will be selected.

v Monitoring

The monitoring will be made in combination with an analysis with remote sensing technology and physical survey on biomass accumulation.

vi Actual net GHG removals

Carbon pools: aboveground and underground biomass.
The carbon composition of each part will be used for calculation of GHG removals.

vii Environmental impacts

Environmental impacts on biodiversity, eco-system and other impacts on the outside of the project boundary will be analysed after project site is decided.
If negative impacts are anticipated, Environmental Impact Assessment required by Vietnamese regulation should be implemented.

viii Socio-economic Impacts

Impacts on community, indigenous people, right of land-use, employment, food production, culture, etc should be analysed.

4.4 Risks

i Cost over run

EPC contractor will issue a completion guarantee to the project company.

ii Plant performance

EPC contractor will issue a performance guarantee to the project company.

iii Fuel procurement

To conclude agreement with each of farmers is not realistic.
People's Committee will establish SPC for fuel supply to the project company.
Long term charter contracts will be concluded for vessel in order to minimize the cost of fuel delivery.

iv Power purchase agreement (PPA)

Bankable PPA will be concluded with EVN.

v. Credit transfer risk

No big problem is foreseen.

vi Operation risk

Supervisors will be dispatched from Japan for start-up of the plant and staff training. The project company will hire skilled operators for management.

Chapter 5 Result of the Study

Project IRR with 20 years for the power plant has been calculated.

5.1 Result

i Base -5.05%

ii Variable: Power selling price per kWh.

Yen	¥4	¥4.5	¥5	¥6	¥7	¥8
IRR	-7.22	-5.05	-3.12	0.21	1.43	4.12

iii Variable: Fuel wood

Yen	¥2,000	¥1,500	¥1,000	¥500	¥0
IRR	-	-17.07	-5.05	-9.76	-1.36

iv Variable: GHG Credit price

Yen	¥0	¥500	¥1,000	¥1,500	¥2,000
IRR	-6.85	-5.05	-3.41	-1.91	-0.53

v Variable: Percentage of subsidy on equipment

%	0%	33%	50%	66%	100%
IRR	-5.05	-0.55	2.99	8.02	50.39

5.2 Consideration

Since most severe figures are used for basic assumption, IRR of base case is calculated to be -5.05%.

The realistic way is to make efforts toward slight improvement on each factor, therefore we are optimistic that the room for improvement in project IRR is quite big and we keep making efforts to proceed this project.