添付資料１.

プロジェクト設計書（PDD）

三菱証券

Small-scale CDM PDD

for

Angkor Bio Cogen
Rice Husk Power Project

February 2005

Mitsubishi Securities
Clean Energy Finance Committee

ABBREVIATIONS

ABC	Angkor Bio Cogen
AIT	Asian Institute of Technology
CDM	Clean Development Mechanism
DNA	Designated National Authority
EAC	Electricity Authority of Cambodia
FOD	First Order Decay
GHG	Greenhouse gas
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
MIME	Ministry of Industry Mines and Energy
MS	Mitsubishi Securities
PDD	Project Design Document

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A. General description of project activity

A.1 Title of the project activity:

Angkor Bio Cogen Rice Husk Power Project (the Project or Project Activity)

A.2 Description of the project activity:

A.2.1 Purpose of the Project Activity

The Project is designed to use for electricity generation rice husk that would otherwise be left to decay.

It involves the construction and operation of a 1.5 MWe new rice husk power generation plant adjacent to Angkor Kasekam Roongroeung Rice Mill (Angkor Rice Mill) in Kandal province in Cambodia. The project owner, Angkor Bio Cogen (ABC), will sell the electricity to the rice mill. The rice mill is currently using diesel oil to generate electricity for the rice mill operation.

At present, the rice mill operation requires 380 kw electricity input. In 2005, however, the rice mill will increase its rice production from 10 tons/hour to 30 tons/hour of rice paddy input. This will result in an increase in electricity requirements from 380 kw to 1,080 kw.

The Project will displace the use of diesel oil for power generation at the rice mill. The Project will also avoid methane emissions that would be produced from rice husk left to decay in the absence of the Project.

ABC will sell the electricity to Angkor Rice Mill in bulk under a power purchasing agreement. There is a possibility that Angkor Rice Mill sell a small amount of surplus electricity to neighbouring factories and community. The factories are also using diesel oil to generate electricity for their own operations. The Project covers ABC's electricity sales to Angkor Rice Mill and possible Angkor Rice Mill's electricity sales to the factories. However, a decision of Angkor Rice Mill to sell the surplus electricity to the community is positioned outside of the project boundary (See B.4 and D.3).

The Project will become the first renewable energy project to utilize biomass in Cambodia.

A.2.2 Contribution to the sustainable development of the host country

Cambodian Designated National Authority (DNA) presents a document regarding sustainable development criteria for proposed CDM activities.[1] The instruction in the document indicates that the PDD must outline how the project meets Cambodia's sustainable development objectives. The following illustrates how the Project meets the four criteria outlined in the instruction.

The Project contributes to environmental protection and improvement in Cambodia and therefore meets the first criteria. The Project's contribution on reduction in air pollution and sustainable use of land resources are particularly significant. The Project reduces greenhouse gas (GHG) emissions by utilizing renewable energy sources that would have been abandoned.

[1] The document is titled Sustainable Development Criteria for Proposed Clean Development Mechanism (CDM) Projects and available from the DNA.

As described in Section E, the Project does not cause negative environmental impacts.

The Project brings social benefits to the neighbouring community and meets the second criteria. Angkor Rice Mill and ABC are jointly exploring a possibility of providing a small volume of electricity to a neighbouring village with a relatively small charge (See A. 2.3.2). As described in Section G, ABC invited the members of the neighbouring community to a public consultation meeting on September 18th 2004. All the members expressed their support to the Project.

The Project leads to technology transfer as well as know-how transfer to Cambodia and meets the third criteria. The technology for the Project will be procured either from Europe or Japan. Although it is a proven technology in some Southeast Asian countries, the Project will become the first case in Cambodia to utilize the technology (See A. 4.2.2). In regards to know-how transfer, the Project establishes a training program for local engineers so that they can operate the plant on their own in the long run (See A. 4.2.3).

The economic benefits that will be brought by the Project are significant and the Project meets the fourth criteria. The Project displaces the use of diesel oil and contributes greatly to decreasing dependency on fossil fuel and imported oil. It is noteworthy that Cambodia's renewable energy strategy and plan released by the government recognizes that biomass is a promising renewable energy in Cambodia and urges to explore the potential urgently. [2] The Project's plan is consistent with the objectives of the country's renewable strategy and plan.

A.2.3 Project plans

A. 2.3.1 Electricity sales

The produced electricity will be sold in bulk to the rice mill under a power purchasing agreement. A sales licence is required for any electricity sales in Cambodia. Before the Project implementation, ABC will obtain the license from Electricity Authority of Cambodia (EAC). Angkor Rice Mill will sell excess electricity to the factories in the vicinity. It is expected that the power plant will internally consume about 15% of the electricity it produces. The total quantity of electricity sales will be 10,098 MWh/year:

1.5 MW x 7,920 hours/year	=	11,880 MWh/year[3]
11,880 MWh/year x (1-0.15)=		10,098 MWh/year

A. 2.3.2 Electricity to a neighbouring village

Angkor Rice Mill and ABC are jointly exploring a possibility of providing a small volume of electricity to Ang Snoul Village with a relatively small charge. Ang Snoul Village is situated in the vicinity of the project site. Access to the electricity distribution system is currently unavailable at the village with the result that kerosene lamps are used for lighting and wood scraps for cooking. The supply of excess electricity will contribute to an improvement of the standard of living for people in the community.

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[2] Strategy for Renewable Energy-based Rural Electrification in Cambodia, The Royal Government of Cambodia, Phnom Penh, May 2003. This document as well as other documents relating to Cambodia's renewable energy are available at http://www.recambodia.org.

[3] It is expected that the plant will be under operation for 330 days a year. The rest (35 days) is allotted for regular maintenance and other stoppages.

A. 2.3.3 Rice husk availability

As indicated in A.4.2.4, the Project will utilize 26,136 tons/year rice husk for power generation. When the production capacity increases in 2005, the total quantity of rice husk produced from the rice mill operation becomes 47,520 tons/year. There will be no shortage in rice husk as fuel.

The following chart illustrates rice husk availability and utilization for power generation.

Rice husk availability				
	Rice paddy production per hour	Rice husk production per hour[4]	Operating hours per year	Rice husk production per year
Before 2004	10 tons	2 tons	7,920 hours	15,840 tons
After 2005	30 tons	6 tons	7,920 hours	47,520 tons
Rice husk utilization for power generation				
		Rice husk utilization per hour	Operating hours per year	Rice husk utilization per year
After 2006		3.3 tons	7,920 hours	26,136 tons

A. 2.3.4 Financial plans

The initial investment cost of the Project is estimated at US$ 3.5 million. This includes the cost of an EPC contract as well as the cost of land, project development fees and contingencies.

ABC intends to finance 50% of the costs through equity investment and the remaining 50 % through loans. Angkor Kasekam Roongroeung (Angkor Rice Mill) as well as Chieu family who is the major shareholder of the Angkor Rice Mill plans to provide about half of the common equity. ABC hopes that the Project's designation as a CDM project will attract the interest of potential investors for the remaining half of the common equity.

The debt financing will be sourced from local banks under the terms of 3 to 5 years in maturity and a 9-13 % interest rate per annum. In addition, ABC is in contact with Thai banks based in Cambodia to explore another opportunity of financing. The company also intends to pursue a possibility of obtaining a supplier's credit from the equipment supplier.

A.3 Project participants:

Angkor Bio Cogen Co., Ltd (ABC) was established in August 2004 as a special purpose company for the rice husk power project. The company has a separate and independent shareholding structure from the rice mill operation company, Angkor Kasekam Roongroeung Co., Ltd.

Angkor Kasekam Roongroeung Co., Ltd, as a shareholder partner, provides land for the rice husk power project. The ownership of the land will be fully transferred to ABC. The company also provides a guaranteed supply of rice husk and water under a purchasing agreement for the entire project period. The company has been operating the rice mill since 2001.

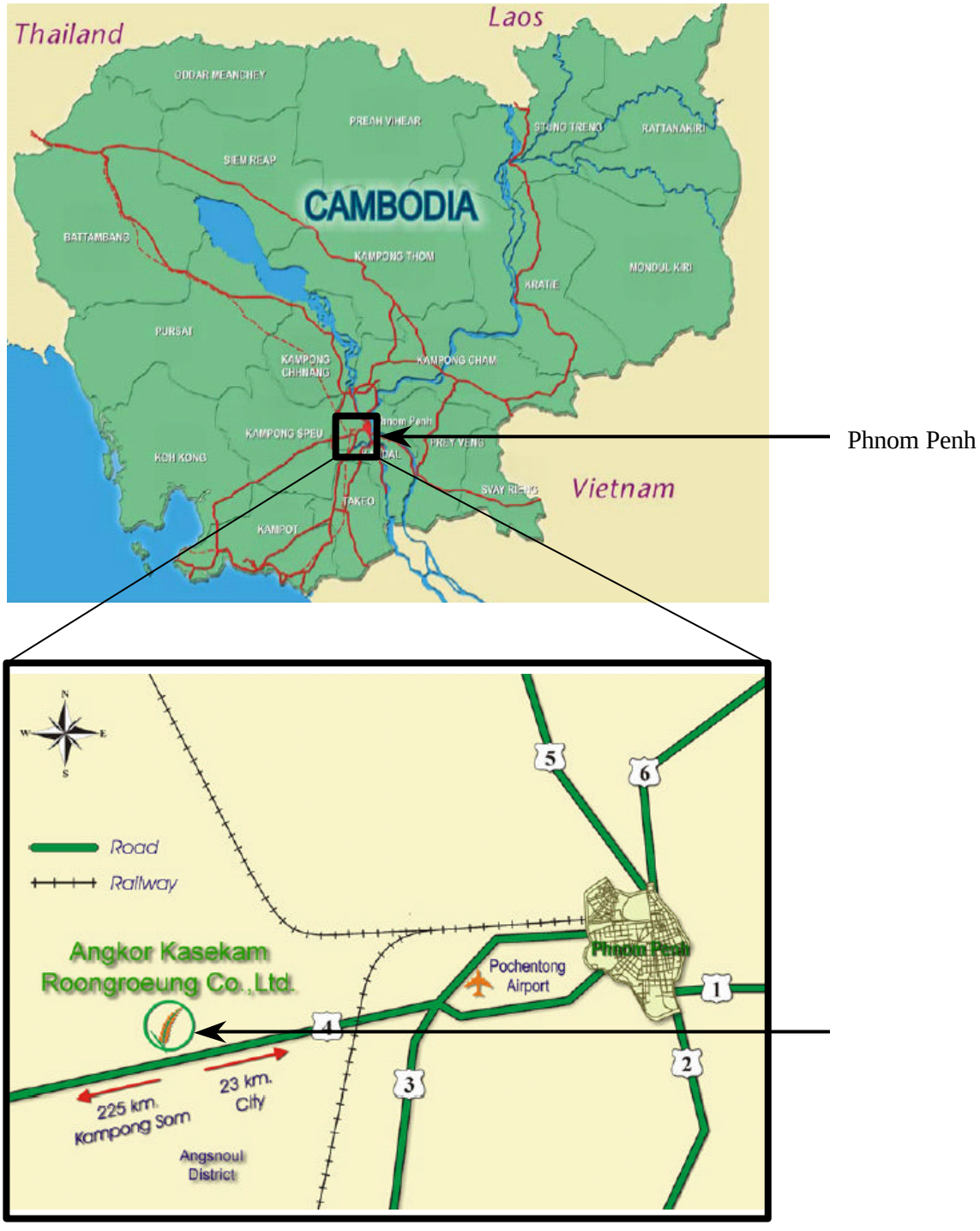
[4] An analysis conducted by Angkor Kasekam Roongroeung indicates that rice husk consists of approximately 20% of rice paddy.

The Clean Energy Finance Committee of Mitsubishi Securities is a project participant and the CDM Adviser to the Project and will be the official contact for the CDM activity described in this PDD.

A.4 Technical description of the project activity:

A.4.1 Location of the project activity:

The Project is located in Kandal province in Cambodia. It is 23 km away from Phnom Penh, the capital of Cambodia.



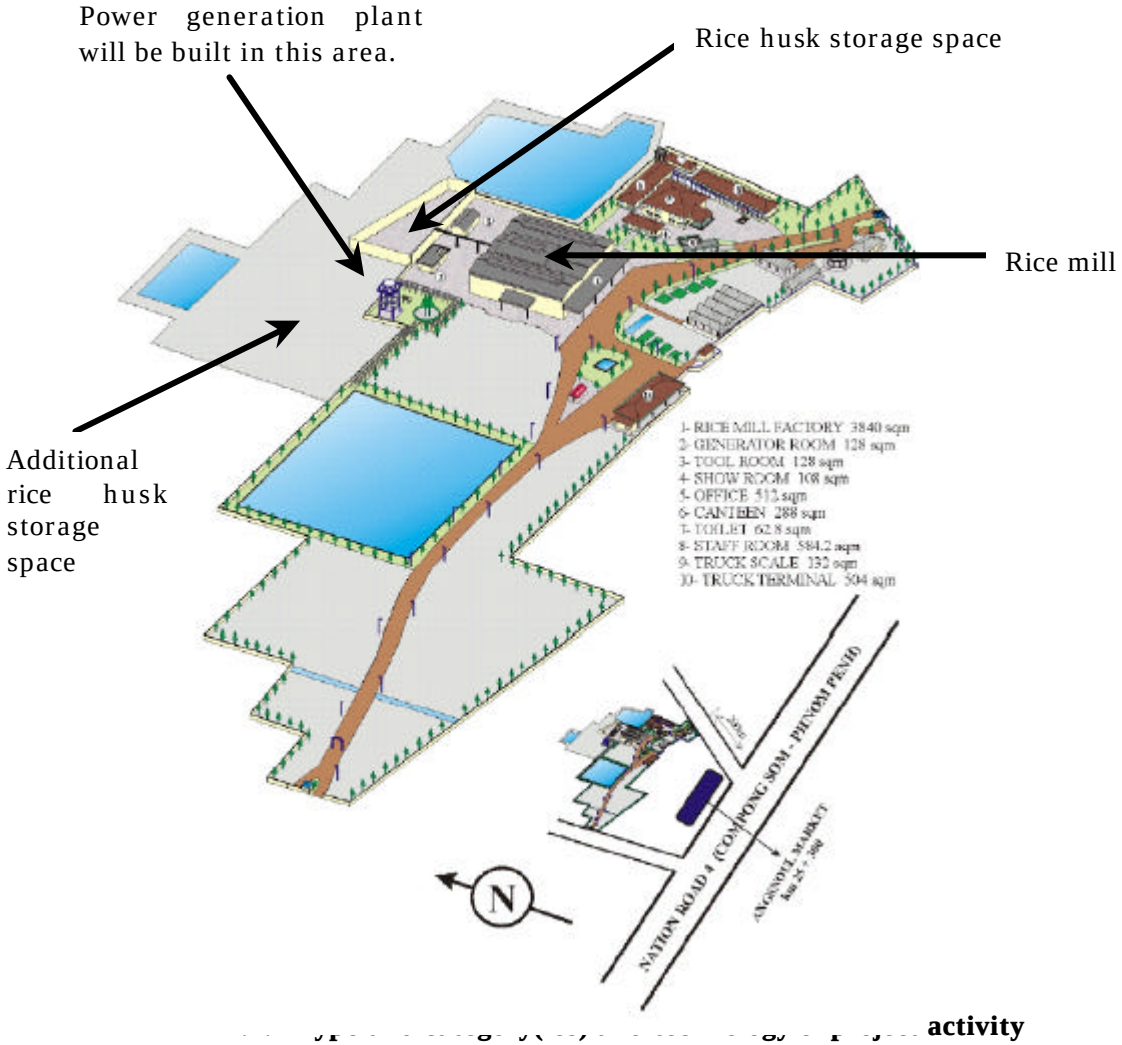
A.4.1.1 Host country Party(ies):
Cambodia

A.4.1.2 Region/State/Province etc.:
Kandal

A.4.1.3 City/Town/Community etc:
Phum Ang Snoul, Ang Snoul District

A.4.1.4 Detailed description of the physical location, including information allowing the unique identification of this project activity:

The power generation plant will be located adjacent to the rice mill. The location is indicated in the following illustration:



activity

A.4.2.1 Type and categories of project activity

In accordance with Appendix B of the simplified modalities and procedures for small-scale CDM project activities, the type and category of the proposed project activities are I.A. (Electricity generation by the user) and III.E. (Methane avoidance). The electricity generation component of

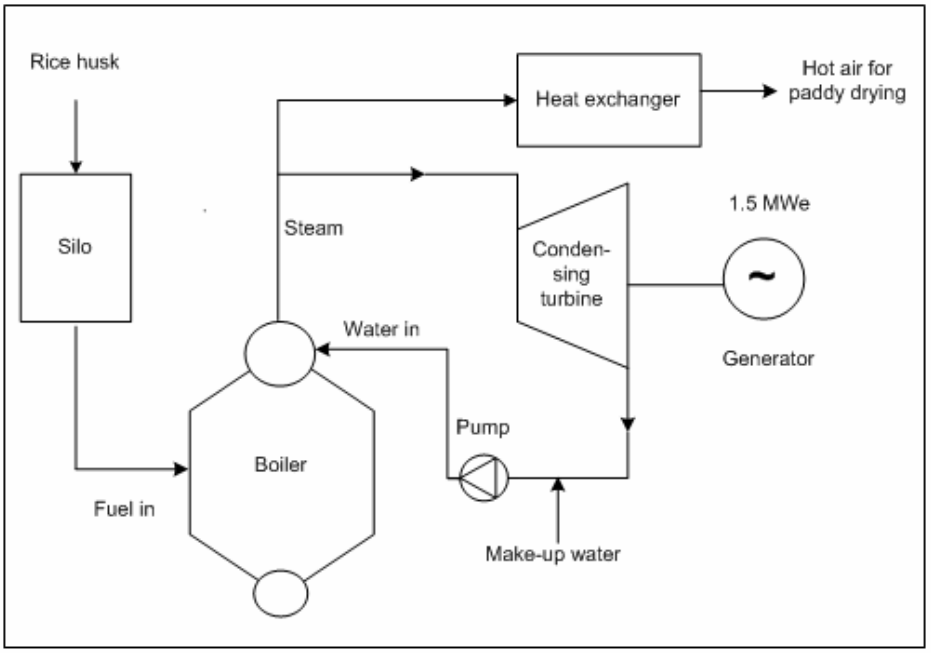
the Project is eligible for I.A., as it is a renewable energy project that supplies individual uses with a small amount of electricity and the capacity of the generator does not exceed 15MW. The methane avoidance component of the Project is eligible for III.E., as it reduces anthropogenic GHG emissions by sources and the annual project emissions are less than 15 kilotons of CO_2e.

A.4.2.2 Technology of project activity

It is proposed that the Project utilizes a travelling grate boiler, designed to burn rice husk at the moving platform of a furnace. This particular boiler is adopted due to its durable features in operation and maintenance. It maintains a reasonable efficiency rate at 76%. The technology will be procured either from Europe or Japan. Although this type of boiler is considered to be a proven technology in some Southeast Asian countries, there are no prior cases in Cambodia. The Project will become the first important case of the transfer of the technology in Cambodia.

There will be surplus steam that is not used for power generation. The surplus steam will be used for drying paddy. The rice paddy is presently placed on the ground and dried through its exposure to the sun. The utilization of surplus steam will contribute to efficient paddy drying, while it will not lead to GHG emission reductions.

The following illustrates the project scheme:



The technology and know-how being introduced by the Project is environmentally safe and sound. The Project will become a showcase as the first biomass power generation project in Cambodia and encourage similar activities in the future.

A.4.2.3 Training program for local staff

Angkor Bio Cogen is planning to hire a cogeneration plant manager and one experienced engineer for a period of 1 or 2 years. They are assigned to control the operation of the plant in the beginning and train local engineers so that the local engineers can operate the plant in the long run. The O&M contractor will simultaneously provide more training for the plant engineer and operators.

The training program will cover the following necessary issues:

- Basic plant operations, safety and engineering
- Fundamentals of rice husk-fired cogeneration operations
- Environmental management and awareness
- Wastewater and water treatment operations
- Power plant engineering and control systems
- Fire safety and evacuation

A.4.2.4 Fuel requirement

Cogen-AIT (Asian Institute of Technology) based in Bangkok conducted a laboratory test to measure the calorific value of ABC's rice husk. The result shows that the value is 14,800kJ/kg, equivalent to 0.014800 TJ/ton.

As described in A.2.3.1, ABC expects to produce approximately 11,880 MWh of electricity annually, of which 10,098 MWh year will be sold to the Angkor Rice Mill, with the remaining 1,782 MWh consumed internally at the plant. In terms of energy, the amount of electricity produced at the power plant will equal 42.8 TJ/year:

11,880 MWh/yr x 3,600 MJ/MWh x (1 TJ/1millionMJ) = 42.8 TJ/year

It is expected that the power generator will convert approximately 17.5% of the heat generated in its boiler to electrical power. The boiler needs to provide approximately 244 TJ/year of heat in order for the plant to generate the planned amount of electricity:

(42.8 TJ/year) / 0.175 = 244 TJ/year

Additional heat equivalent to 50TJ/year is necessary for paddy drying. The total volume of required heat is 294TJ/year:

244 TJ/year + 50TJ/year = 294 TJ/year

As indicated earlier, the boiler efficiency is 76%. The rice husk to be combusted at the ABC plant must contain the following amount of energy:

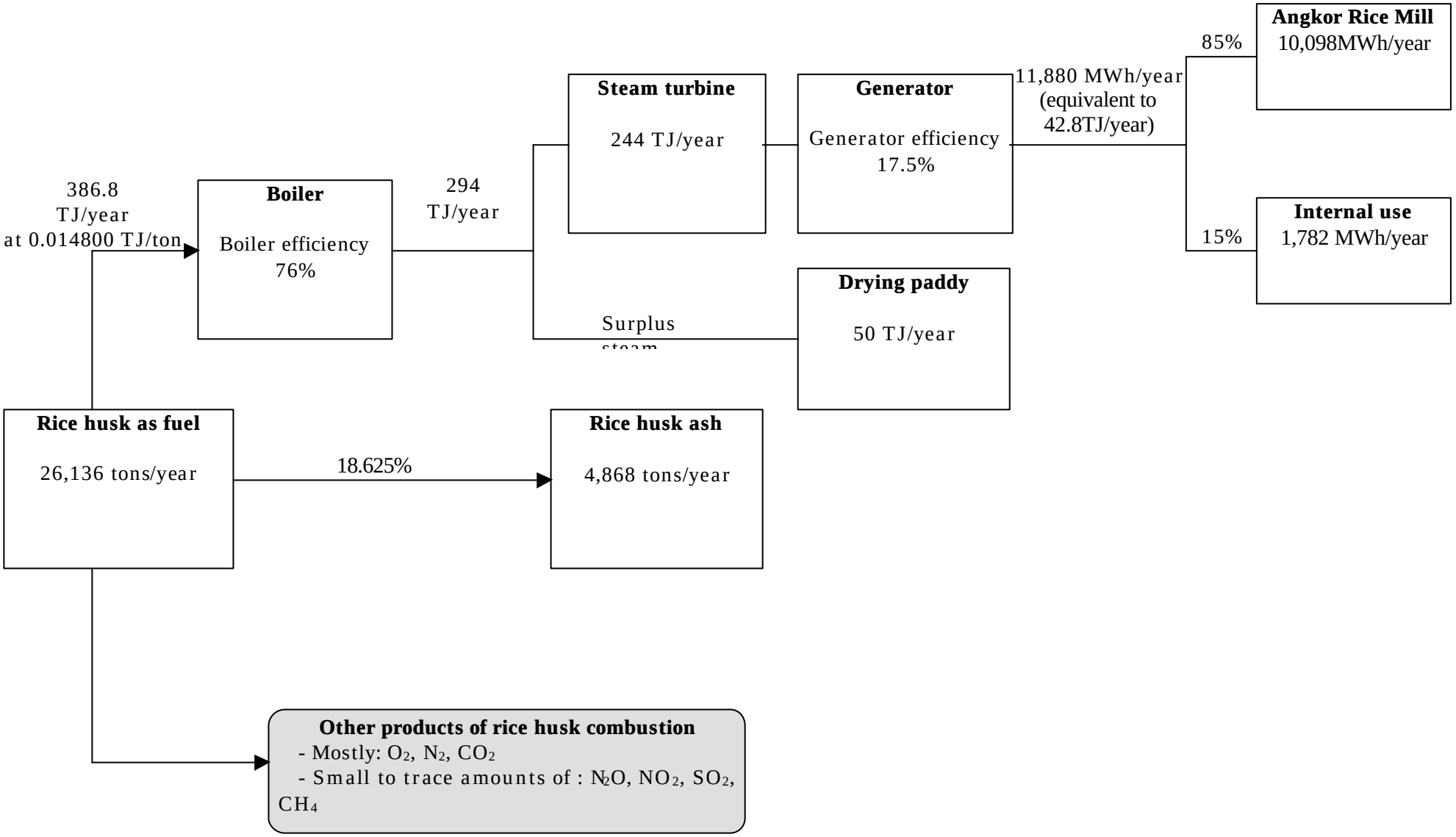
(294 TJ/year) / 0.76 = 386.8 TJ/year

Based on the calorific value of 0.014800 TJ/ton for the rice husk to be used as fuel, the quantity of rice husk needed to produce the required amount of energy is approximately 26,136 tons/year or 3.3 tons/hour:

(386.8 TJ/year) / (0.014800 TJ/ton) = 26,136 tons/year

(26,136 tons/year) / 7,920hours = 3.3 tons/hour

The relationships are summarized in the following diagram:



A.4.3 Brief statement on how anthropogenic emissions of greenhouse gases (GHGs) by sources are to be reduced by the proposed CDM project activity:

The Project will reduce anthropogenic GHG emissions by displacing the use of diesel oil for power generation. In addition, it will assist Cambodia with GHG emission reductions by avoiding methane emissions that would be produced, in the absence of the Project, from rice husk left to decay.

It is estimated that the Project will reduce on average 39,981 CO_2e annually. The total amount of the reduction for the 7-year initial crediting period is estimated at 279,867 CO_2e.

A.4.4 Public funding of the project activity:

The financial plans for the Project do not involve public funding from Annex I Parties.

A.4.5 Confirmation that the small-scale project activity is not a debundled component of a larger project activity:

The project owner, Angkor Bio Cogen (ABC), is not involved in any other CDM project activities. The Project is not a debunded portion of a large project activity.

B. Baseline methodology

B.1 Title and reference of the project category applicable to the project activity:

In accordance with Appendix B of the simplified modalities and procedures for small-scale CDM project activities ("Appendix B"), the project activity falls under I.A. (Electricity generation by the user) regarding the electricity generation component and III.E. (Methane avoidance) regarding the methane avoidance component of the Project Activity.

B.2 Project category applicable to the project activity:

As stated in A.4.2, the electricity generation component of the Project is eligible for I.A., as it is a renewable energy project that supplies individual users with a small amount of electricity. The capacity of the generator does not exceed 15MW. The methane avoidance component of the Project is eligible for III.E., as it reduces anthropogenic GHG emissions by sources and the annual project emissions are less than 15 kilotons of CO_2e.[5]

The calculation of the baseline emissions for the electricity generation component is conducted in accordance with the instructions provided in paragraph 4 of Appendix B of the simplified modalities and procedures for small-scale CDM project activities. According to the instructions, there are two options that the project participants may choose from regarding the baseline formulae. Option 2 is selected for this project activity.

The calculation of the baseline emissions for the methane avoidance component of the Project is completed in accordance with the instructions provided in paragraph 93 of above-mentioned Appendix B.

B.3 Description of how the anthropogenic GHG emissions by sources are reduced below those that would have occurred in the absence of the proposed CDM project activity *(i.e. explanation of how and why this project is additional and therefore not identical with the baseline scenario)*:

B.3.1 Additionality

Angkor Rice Mill (and Cambodian rice millers in general) has three options for the disposal of rice husk.

Scenario 1: Piling for natural decomposition
Scenario 2: Open-air burning
Scenario 3: The Project without the CDM

The following sections elaborate on each of the scenarios.

Scenario 1: Piling for natural decomposition

The normal practice in Cambodia is to leave rice husk outside until it is naturally decomposed. Angkor Rice Mill is disposing its rice husk presently in this manner and has, in the vicinity of

[5] Paragraph 91 of Appendix B indicates that the measures that will be conducted by a project under this project category "shall both reduce anthropogenic emissions by sources, and directly emit less than 15 kilotonnes of carbon dioxide equivalent annually."

the rice mill, a large unoccupied space available for disposal. There are currently no national or local safety requirements or regulations against this method of disposal. Nor are new regulations likely during the crediting period to require Angkor Rice Mill to change its current practice.

Scenario 2: Open-air burning

While conceptually possible, this scenario is not likely. Disposal of rice husk by burning it in the open air is not common practice in Cambodia due to concerns about causing significant health hazards to the local community, in terms of toxic emissions, particulate matters, smoke as well as fire hazards.

Scenario 3: The Project without the CDM

Due to the following barriers associated with the introduction of this renewable energy technology in Cambodia, the Project's implementation impeded without the CDM:

- Barrier due to prevailing practice
- Technological barrier

Barrier due to prevailing practice:

As stated above, there are currently no regulations for the management of rice husk. It is unlikely that new regulations are introduced during the crediting period to require Angkor Rice Mill to change its current practice. There is also no standard technology available to manage rice husk. It is a normal practice in Cambodia to leave rice husk outside until it is naturally decomposed. It is apparent that without incentives in the forms of carbon credits, Angkor Rice Mill will continue the current practice.

Technological barrier:

The Project represents the first case of applying the biomass-fired power generation technology in Cambodia. While the technology has a proven track record of combusting rice husk for power generation, it is by no means guaranteed that the technology will not encounter unforeseen problems when it is applied to rice husk in Cambodia with their particular characteristics. Due to its high mineral content and composition, rice husk has a tendency to produce slag when the combustion temperature is not well controlled. Local staff will have to undergo extensive training to ensure adequate combustion temperature. Training must also be extended to cover ash disposal and other matters relating to the proper operation of the power plant. In case that the power plant is damaged, there will not be spare parts that will be immediately available in Cambodia.

Faced with the barrier due to prevailing practice as well as technological barrier outlined above, the Project will not be carried out in the course of regular business. Hence, it is additional.

B.3.2 Leakage

According to the instruction provided in paragraph 7 of Appendix B of the simplified modalities and procedures for small-scale CDM project activities, if the renewable energy technology is equipment transferred from another activity, leakage calculation is required. The Project does not transfer equipment from another activity. Therefore, this instruction is not applicable to the Project.

However, the general guidance of Appendix B of the simplified modalities and procedures for small-scale CDM project activities stipulates in paragraph 8 that leakage shall be considered for biomass projects. Following this instruction, a possibility of leakage from this Project is considered below.

As stated before, there is an abundant rice husk at the Angkor Rice Mill. The Project will only utilize 26,136 tons/year out of 47,520 tons/year rice husk that will be produced after the increased rice milling operation.

At present, there is only one use for rice husk while the majority of rice husk are left outside to decay. A very small volume of rice husk is utilized as a fuel at nearby brick factories. The following chart illustrates the amount of rice husk sold to brick factories in 2002 and 2003 and its shares of the total rice husk produced:

Year	Total rice husk produced at Angkor Rice Mill (estimation in tons)	Total rice husk sold to the brick factories (actual commercial records in tons)	Share of rice husks sold at brick factories
2002	15,840	481	3.04%
2003	15,840	530	3.34%

Only less than 4% of the produced rice husk was sold to the brick factories. This indicates that the demand for rice husk is very limited. It is also stressed that there is no demand for rice husk as a fuel for power generation in Cambodia. The Project is the first of its kind in the country. It is concluded that the Project will neither lead to fuel diversion to carbon-intensive fuels or displacement of existing or planned rice husk plants. The Project will not result in any leakage.

B.4 Description of the project boundary for the project activity:

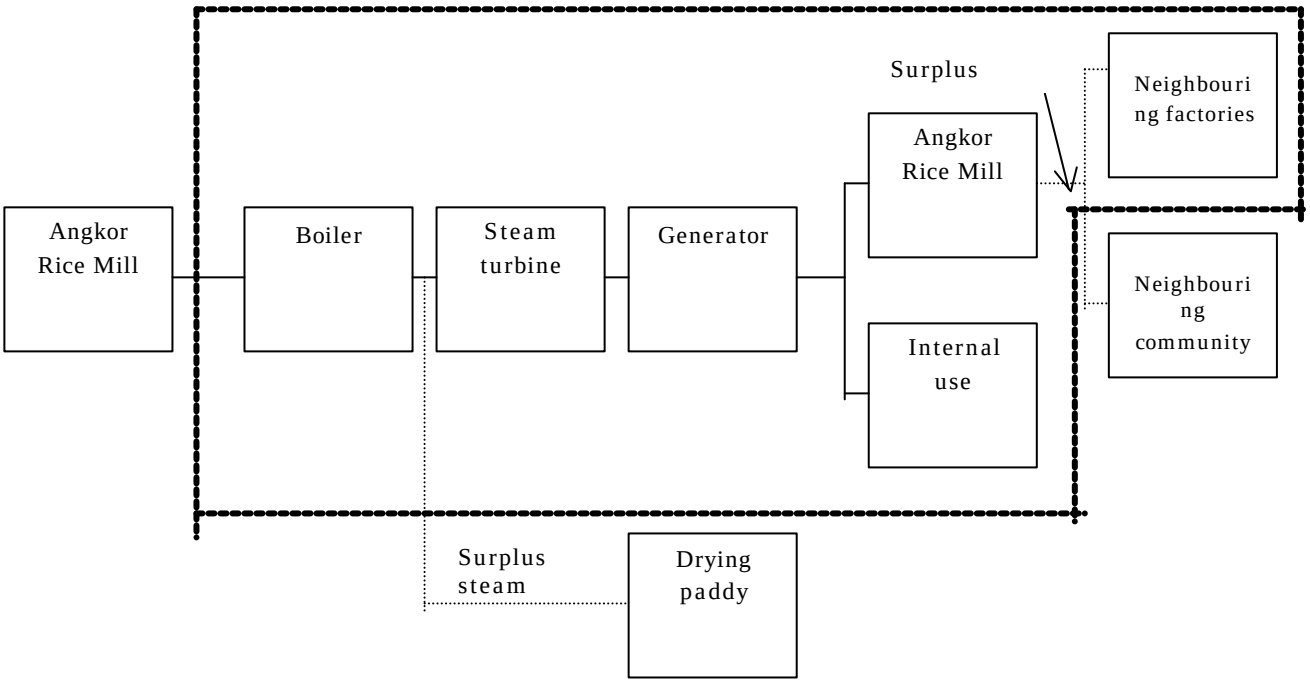
In accordance with paragraph 3 of Appendix B of the simplified modalities and procedures for small-scale CDM project activities, the project boundary for the project activity associated with electricity generation can be defined as follows:

> The physical, geographical site of the generating unit and the equipment that uses the electricity produced delineates the project boundary.

In accordance with paragraph 92 of Appendix B of the simplified modalities and procedures for small-scale CDM project activities, the project boundary for the project activity associated with methane avoidance can be defined as follows:

> The project boundary is the physical, geographical site where the treatment of biomass takes place.

The project boundary is indicated by a bold dotted line in the following illustration:



B.5 Details of the baseline and its development:

B.5.1 Specify the baseline for the proposed project activity using a methodology specified in the applicable project category for small-scale CDM project activities contained in appendix B of the simplified M&P for small-scale CDM project activities:

As stated in B.2, the calculation of the baseline emissions for the electricity generation component is conducted in accordance with the instructions provided in paragraph 4 of Appendix B of the simplified modalities and procedures for small-scale CDM project activities. According to the instructions, there are two options that the project participants may choose from regarding the baseline formulae. Option 2 is selected for this project activity.

The calculation of the baseline emissions for the methane avoidance component of the Project is completed in accordance with the instructions provided in paragraph 93 of above-mentioned Appendix B.

B.5.2 Date of completing the final draft of this baseline section *(DD/MM/YYYY)*:

January 2005

B.5.3 Name of person/entity determining the baseline:

Clean Energy Finance Committee
Mitsubishi Securities Company Co. Ltd.
Tokyo, Japan
Tel: (81-3) 6213-6860
E-mail: hatano-junji@mitsubishi-sec.co.jp

The Clean Energy Finance Committee, Mitsubishi Securities Co. Ltd. is the CDM Adviser to the Project and will be the official contact for the CDM activity described in this PDD.

C. Duration of the project activity and crediting period

C.1 Duration of the project activity:

C.1.1 Starting date of the project activity:

January 2006 (planned construction starting date)

C.1.2 Expected operational lifetime of the project activity:

The project activity is expected to have a minimum operational lifetime of 20 years.

C.2 Choice of the crediting period and related information:

C.2.1 Renewable crediting period

C.2.1.1 Starting date of the first crediting period

January 2007

C.2.1.2 Length of the first crediting period

7 years

C.2.2 Fixed crediting period *(at most ten (10) years)*:

C.2.2.1 Starting date *(DD/MM/YYYY)*:

C.2.2.2 Length (max 10 years):

D. Monitoring methodology and plan

D.1 Name and reference of approved methodology applied to the project activity:

In accordance with Appendix B of the simplified modalities and procedures for small-scale CDM project activities ("Appendix B"), the project activity falls under I.A. (Electricity generation by the user) regarding the electricity generation component and III.E. (Methane avoidance) regarding the methane avoidance component of the Project. The monitoring plan for the Project will follow paragraphs 8 and 96 thereof.

D.2 Justification of the choice of the methodology and why it is applicable to the project activity:

See B.2.

D.3 Data to be monitored:

ID number	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is archived data to be kept?	Comment
D.3-1	Quantitative	Generated electricity	MWh	m	monthly (aggregate)	100%	electronic	minimum of two years after last issuance of CERs	*As indicated in A.3, ABC has a separate and independent shareholding structure from Angkor Kasekam Roongroeung, the rice mill. The electricity generation record will be kept at ABC that will be subject to a financial auditing every year.*
D.3-2	Quantitative	Amount of rice husk combusted	ton	m	monthly (aggregate)	100%	electronic	minimum of two years after last issuance of CERs	*Will be measured by a flow meter with a scale function. The flow meter will be attached to the conveyor to transport rice husk from the rice mill to ABC.*
D.3-3	Quantitative	Energy content of biomass treated	TJ/ton	m	Yearly	100%	Electronic	minimum of two years after last CER issuance	*Will be measured by an independent third party.*

As described in B 3.2, the Project will neither lead to fuel diversion to carbon-intensive fuels or displacement of existing or planned rice husk plants. The demand for rice husk other than from the Project is very limited and will remain so in the future. Monitoring a possibility of leakage is unnecessary.

In case where Angkor Rice Mill sells surplus electricity to the neighbouring community, the amount of the sold electricity will be subtracted from the amount of generated electricity in GHG emission reduction calculation.

D.4 Name of person/entity determining the monitoring methodology:

Clean Energy Finance Committee

Mitsubishi Securities Company Co. Ltd.
Tokyo, Japan
Tel: (81-3) 6213-6860
E-mail: hatano-junji@mitsubishi-sec.co.jp

The Clean Energy Finance Committee, Mitsubishi Securities Co. Ltd. is the CDM Adviser to the Project and will be the official contact for the CDM activity described in this PDD.

E. Calculation of GHG emission reductions by sources

E.1 Formulae used:

E.1.1 Selected formulae as provided in appendix B:

E.1.1.1 Baseline emissions

E.1.1.1.1 Baseline emissions for electricity generation

The calculation of the baseline emissions for the electricity generation component is conducted in accordance with the instructions provided in paragraphs 4 and 6 of Appendix B of the simplified modalities and procedures for small-scale CDM project activities. According to the instructions, there are two options that the project participants may choose from regarding the baseline formula. As stated in B.2, Option 2 is selected for this project activity.

The formula is expressed as follows:

$$E_B = \Sigma_i O_i / (1 - l)$$

where,

E_B = annual energy baseline (in kWh per year)

Σ_i = the sum over the group of "i" renewable energy technologies implemented as part of the project

Oi = the estimated annual output of the renewable energy technologies of the group of "i" renewable energy technologies installed (in kWh per year)

l = average technical distribution losses that would have been observed in diesel powered mini-grids installed by public programs or distribution companies in isolated areas, expressed as a fraction.

According to paragraph 6 of Appendix B of the simplified modalities and procedures for small-scale CDM project activities, the emissions baseline is the energy baseline

calculated above times the CO_2 emission coefficient for the fuel displaced. Following the instruction, a default value of 0.9 kg CO_2e/kWh, which is derived from diesel generation units, will be used.

The distribution loss (*l*) is zero as the diesel power plant is currently located on-site.

Calculation

As calculated in A.2.3.1, the total quantity of generated electricity (E_B) will be 10,098 MWh/year.

Fuel consumption in energy equivalent (CO_2 ton/year)	=	Total electricity generated (MWh/year)	x	CO_2 emission coefficient (kg CO_2e/kWh)	x	(kWh/MWh)	x	(ton/kg)
	=	10,098	x	0.9	x	1,000	x	1/1,000
	=	9,088	CO_2 ton/year					

E.1.1.1.2 Baseline emissions for methane avoidance

The calculation of the baseline emissions for the methane avoidance component of the Project is completed in accordance with the instructions provided in paragraph 93 of Appendix B of the simplified modalities and procedures for small-scale CDM project activities. The formulae used in the calculation are following:

$$CH_4\_IPCCdecay = (MCF * DOC * DOC_F * F * 16/12)$$

where,

$CH_4\_IPCC_{decay}$ IPCC CH_4 emission factor for decaying biomass in the region of the project activity (tons of CH_4/ton of biomass)

MCF methane correction factor (fraction, default is 0.4 for less than 5 meters in depth)

DOC degradable organic carbon (fraction, default is 0.3)

DOC_F fraction DOC dissimilated to the gas (default is 0.77)

F Fraction of CH_4 in gas (default is 0.5)

$$BE_y = Q_{biomass} * CH_4\_IPCC_{decay} * GWP\_CH_4$$

where,

BE_y Baseline methane emissions from biomass decay (tons of CO_2e)

$Q_{biomass}$ Quantity of biomass treated under the project activity (tons)

CH_4_GWP GWP for CH_4 (tons of CO_2e/ton of CH_4)

Calculation

$CH_4\_IPCCdecay$ = MCF x DOC x DOC_F xF x16/12

= 0.4 x 0.3 x 0.77 x 0.5 x 16/12

= 0.0616 (ton CH_4/ton)

MCF	0.4: IPCC default value
DOC	0.3: IPCC default value
DOC_F	0.77: IPCC default value
Fraction of CH_4 in gas	0.5: IPCC default value

BE_y		$Q_{biomass}$		$CH_4\_IPCC_{decay}$		GWP_CH_4
(tons/year)	=	(tons/year)	x	(ton CH_4/ton)	x	(ton CO_2/ton CH_4)
	=	26,136		0.0616		21
	=	33,810	CO_2 tons/year			

E.1.1.2 Project emissions

Following paragraph 95 of Appendix B of the simplified modalities and procedures for small-scale CDM project activities, the project activity emissions will be determined as follows:

$PE_y = Q_{biomass} * E_{biomass} (CH_4bio\_comb * CH_4\_GWP + N_2Obio\_comb * N_2O\_GWP)/10^6$

where,

PE_y	Project activity emissions (kilotons of CO_2e)
$Q_{biomass}$	Quantity of biomass treated under the project activity (tons)
$E_{biomass}$	Energy content of biomass (TJ/ton)
CH_4bio_comb	CH_4 emission factor for biomass combustion (kg of CH_4/TJ, default value is 300)
CH_4_GWP	GWP for CH_4 (tons of CO_2e/ton of CH_4)
N_2Obio_comb	N_2O emission factor for biomass combustion (kg/TJ, default value is 4)
N_2O_GWP	GWP for N_2O (tons of CO_2e/ton of NO_2)

Calculation

PE_y	=	$Q_{biomass}$	x	$E_{biomass}$	x	(CH_4bio_comb x CH_4_GWP	+	N_2Obio_comb x N_2O _GWP)	÷	1000 (kg/ton)
(CO_2 tons/year)		(tons/year)		(TJ/ton)		(kg CH_4/TJ x ton CO_2/ ton CH_4)		(kg N_2O /TJ x ton CO_2/ ton N_2O)		

= 26,136 x 0.014800 x (300 x 21 + 4 x 310) ÷ 1000

= 2,917 CO_2 tons/year

E.1.1.3 Leakage

As stated earlier, leakage calculation associated with the electricity generation component of the Project Activity is not required. According to paragraph 94 of Appendix B of the simplified modalities and procedures for small-scale CDM project activities, leakage calculation is not required for the methane avoidance component of the Project Activity.

E.1.2 Description of formulae when not provided in appendix B:

E.1.2.1 Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary:

E.1.2.2 Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities

E.1.2.3 The sum of E.1.2.1 and E.1.2.2 represents the project activity emissions

E.1.2.4 Describe the formulae used to estimate the anthropogenic emissions by sources of GHG's in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities

E.1.2.5 Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period

E.2 Table providing values obtained when applying formulae above

	Baseline emissions		Project emissions	Emission reductions
Year	CO_2 emissions from diesel electricity generation (CO_2 tons)	CH_4 emissions from rice husk piled at the disposal site (CO_2e tons)	CH_4 and N_2O emissions from rice husk fuelled electricity generation (CO_2e tons)	Emission reductions (CO_2e tons)
2,007	9,088	33,810	2,917	39,981
2,008	9,088	33,810	2,917	39,981
2,009	9,088	33,810	2,917	39,981
2,010	9,088	33,810	2,917	39,981
2,011	9,088	33,810	2,917	39,981
2,012	9,088	33,810	2,917	39,981
2,013	9,088	33,810	2,917	39,981
Total	63,616	236,670	20,419	279,867

F. Environmental impacts

F.1 If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

An Environmental Impact Assessment (EIA) is not required for a power generation project less than 5MW in capacity in Cambodia.

The Project does not cause negative environmental impacts. The environmental concerns relating to steam turbine is virtually zero. Other points noted for ABC's plant are following:

- The combustion of rice husk may present some concerns because of the low density of the husk and the high particulate in the flue gas. However, automation of the combustion control as well as wet scrubber will help in reducing the particular emissions at the stack.

- SO_2 emissions will be minimal. NOx emissions will be maintained within the prevailing emission standards promulgated by the Ministry of Industry Mines and Energy (MIME). The monitoring of the emissions will be decided in consultation with the MIME.

- Wastewater will be treated at site before being release to either natural ponds or small waterways. Regular testing of effluent will be carried out by in -house operations team.

G. Stakeholders comments

G.1 Brief description of the process by which comments by local stakeholders have been invited and compiled:

To ensure a correct process for stakeholders' comments for the Project, Angkor Bio Cogen consulted with Cambodia's Ministry of Environment, Ministry of Industry, Mines and Energy (MIME), Ministry of Environment and relevant government entities on numerous occasions.

ABC conducted a public consultation meeting on September 18th 2004. The meeting took place at Angkor Kasekam Roongroeung office at the rice mill.

There were twenty-two participants in the meeting who live nearby the project site. The participants included employees of the rice mill as well as members of Ang Snoul Village. Ang Snoul Village is situated in Perk Commune that covers several villages in Ang Snoul District. The chief of Ang Snoul Village and the chief of Perk Commune attended the meeting to represent the village and commune respectively. The power plant will be located in the Ang Snoul Village that is the only village in the vicinity of the project site. Appendix 1 shows the list of the attendees.

The followings are brief descriptions of ABC's presentation at the meeting.

- Described the main objective of the Project to utilize biomass to generate electricity.
- Explained the process that uses heat from rice husk combustion to generate steam and to drive a generator to produce power.
- Explained how the Project contributes to reducing GHG emissions.
- Explained how the produced electricity may become available at nearby villages including Ang Snoul Village. (Access to the electricity distribution system is currently unavailable at the villages. As described in A. 2.3.2, Angkor Rice Mill and ABC are jointly exploring a possibility of providing a small volume of electricity to the villages with a relatively small charge.)
- Described safety of the machines as well as maintenance and operation of the machines controlled by experienced team carefully.
- Explained how well the particulate emissions will be managed.

G.2 Summary of the comments received:

All the attendees expressed their support to the Project. They hoped that the Project would begin soon in order to access to lower price and reliable electricity that Angkor Rice Mill plans to provide. They recognized that the Project would bring environmental and economic benefits to the community and contributes to the improvement of the quality of life in the neighbourhood.

There were no negative comments on the Project.

G.3 Report on how due account was taken of any comments received:

Annex 1

CONTACT INFORMATION FOR PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Angkor Bio Cogen Co., Ltd (ABC)
Street/P.O.Box:	Phum Angsnoul
Building:	
City:	
State/Region:	Angsnoul District, Kandal Province
Postcode/ZIP:	
Country:	Cambodia
Telephone:	(+855)-23-369218
FAX:	(+855)-23-364228
E-Mail:	angkorrice@hotmail.com
URL:	www.angkorrice.com
Represented by:	
Title:	**Managing Director**
Salutation:	Mr.
Last Name:	Chieu
Middle Name:	
First Name:	Adisorn
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Organization:	Mitsubishi Securities Co., Ltd. (CDM Advisor)
Street/P.O.Box:	2-5-2 Marunouchi, Chiyoda-ku
Building:	Mitsubishi Building, 2nd Floor
City:	Tokyo
State/Region:	
Postcode/ZIP:	100-0005
Country:	Japan
Telephone:	(81-3) 6213-6860
FAX:	(81-3) 6213-6175
E-Mail:	hatano-junji@mitsubishi-sec.co.jp
URL:	www.mitsubishi-sec.jp/english_fs.html
Represented by:	
Title:	Chairman
Salutation:	Mr.
Last Name:	Hatano
Middle Name:	
First Name:	Junji
Department:	Clean Energy Finance Committee
Mobile:	
Direct FAX:	

Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The financial plans for the Project do not involve public funding from Annex I countries.

Appendix

LIST OF COMMUNITY MEMBERS
PARTICIPATED IN THE PUBLIC CONSULTATION MEETING

	Name	Designation/Position
1.	Penh Phal	Chief commune, Perk Commune
2.	Keo Sarom	Chief Villager of Ang Snoul Village
3.	Ty Khoeun	Villager, Ang Snoul Village
4.	Chan Bunny	Villager, Ang Snoul Village
5.	Chea Sok	Villager, Ang Snoul Village
6.	Loth Roeun	Villager, Ang Snoul Village
7.	Chin Sarath	Villager, Ang Snoul Village
8.	Men Sary	Villager, Ang Snoul Village
9.	Nov Vanna	Villager, Ang Snoul Village
10.	Sum Sombo	Villager, Ang Snoul Village
11.	Chup Sophan	Villager, Ang Snoul Village
12.	Hok Lay	Villager, Ang Snoul Village
13.	Ry Ra	Villager, Ang Snoul Village
14.	Chieu Hieng	AKR, chairman
15.	Adisorn Chieu	ABC, chairman
16.	May sineth	AKR, administrative staff
17.	Bou Chanthoeun	AKR, administrative staff
18.	Srun bunthan	AKR, administrative staff
19.	Chea Daneith	AKR, administrative staff
20.	Soeung Kolap	AKR, administrative staff
21.	Bun chat	AKR, security guard
22.	Nov Leng	AKR, security guard
23.	Nguon Savorn	AKR, rice machines operator
24.	Chan Lundy	AKR, rice machines operator

添付資料 2.

ステークホルダー公聴会参加者一覧

カンボジア精米工場における籾殻コージェネレーション発電事業に関する

ステークホルダー公聴会参加者名簿

名前	所属
Chieu Hieng	AKR チェアマン
Adisorn Chieu	ABC チェアマン
Penh Phal	Perk Commune 長
Keo Sarom	アンスヌール村　村長
Ty Khoeun	アンスヌール村　村民
Chan Bunny	アンスヌール村　村民
Chea Sok	アンスヌール村　村民
Loth Roeun	アンスヌール村　村民
Chin Sarath	アンスヌール村　村民
Men Sary	アンスヌール村　村民
Nov Vanna	アンスヌール村　村民
Sum Sombo	アンスヌール村　村民
Chup Sophan	アンスヌール村　村民
Hok Lay	アンスヌール村　村民
Ry Ra	アンスヌール村　村民
May sineth	AKR 職員
Bou Chanthoeun	AKR 職員
Srun bunthan	AKR 職員
Chea Daneith	AKR 職員
Soeung Kolap	AKR 職員
Bun chat	AKR, 保安要員
Nov Leng	AKR, 保安要員
Nguon Savorn	AKR 精米機オペレーター
Chan Lundy	AKR 精米機オペレーター

添付資料 3.

プロジェクト IRR キャッシュフロー

ABC 籾殻発電プロジェクト IRR キャッシュフロー

Item \ Year			2005	2006	2007	2008	2009
Profit & loss	Revenue		807,840	807,840	807,840	807,840	807,840
	O&M cost		(153,552)	(153,552)	(153,552)	(153,552)	(153,552)
	（Profit & loss for this term）		654,288	654,288	654,288	654,288	654,288
	Accumulated profit before depreciation		654,288	1,308,576	1,962,864	2,617,152	3,271,440
Payback		(3,463,800)	(2,809,512)	(2,155,224)	(1,500,936)	(846,648)	(192,360)
CASH FLOW		(3,463,800)	654,288	654,288	654,288	654,288	654,288
PROJECT IRR before tax (10years)	**17.9%**						

2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
807,840	807,840	807,840	807,840	807,840	807,840	807,840	807,840	807,840	807,840
(170,871)	(170,871)	(170,871)	(170,871)	(170,871)	(188,190)	(188,190)	(188,190)	(188,190)	(188,190)
636,969	636,969	636,969	636,969	636,969	619,650	619,650	619,650	619,650	619,650
3,925,728	4,562,697	5,199,666	5,836,635	6,473,604	7,110,573	7,730,223	8,349,873	8,969,523	9,589,173
461,928	1,098,897	1,735,866	2,372,835	3,009,804	3,646,773	4,266,423	4,886,073	5,505,723	6,125,373
636,969	636,969	636,969	636,969	636,969	619,650	619,650	619,650	619,650	619,650

2020	2021	2022	2023	2024
807,840	807,840	807,840	807,840	807,840
(188,190)	(188,190)	(188,190)	(188,190)	(188,190)
619,650	619,650	619,650	619,650	619,650
10,208,823	10,828,473	11,448,123	12,067,773	12,687,423
6,745,023	7,364,673	7,984,323	8,603,973	9,223,623
619,650	619,650	619,650	619,650	619,650

添付資料 4.

仮有効化審査結果概要

DRAFT-VALIDATION REPORT

Date of first issue: 2005-02-17	Project No.: 28624552.
Approved by: Einar Telnes Technical Director	Organisational unit: DNV Certification, International Climate Change Services
Client: Mitsubishi Securities Co., Ltd.	Client ref.: Masachika Suzuki

Summary:
DNV is currently validating "Angkor Bio Cogen Rice Husk Power Project in Cambodia" on the basis of UNFCCC and host Party criteria for CDM projects, as well as criteria given to provide for consistent project operations, monitoring and reporting. UNFCCC criteria refer to the Kyoto Protocol criteria and the CDM rules and modalities. This draft validation report summarises the preliminary findings of the validation.

The validation was performed as a desk review of the documents presented by Mitsubishi Securities. Interviews with Mitsubishi Securities was carried out to clarify the raised issues as well as with the stakeholders in Cambodia.

The project intends to:

- Construct a boiler/turbine generator unit in an adjacent premise of a rice mill
- Burn rice husk to be by-produced by the rice mill and supplying the generated power to the rice mill
- Reduce CH4 generation/emissions from decaying rice husk and CO2 currently generated by a diesel generator at the rice mill
- Achieve 39,981 tCOe/year GHG emission reductions totally (279,867 tCO2e during the first crediting period of seven years)

The following corrective action requests (CAR) and requests for clarification (CL) have been identified and not yet resolved:

- Host/donor country approval for the project (CAR)
- Statement for CER allocation (CAR)
- Energy content measurement of biomass (CL)
- The PDD has not yet been published for inviting comment from Parties, stakeholders and UNFCCC accredited NGOs (CL)

In summary, the GHG emission reductions by the project are likely to be real, measurable and give long-term benefit and are additional to what would have occurred in the absence of the project. Thus, upon the satisfactory resolution of these CARs and CLs presented in this report, it is the validation team's opinion that the project is likely to meet the relevant UNFCCC requirements for the CDM/SSC-CDM and therefore will recommend the project for registration with the UNFCCC.

This document must be seen in conjunction with the Validation Verification Guidelines and the CDM Protocol

Report No.: 2005-0221	Subject Group: Environment
Report title: Angkor Bio Cogen Rice Husk Power Project in Cambodia	
Work carried out by: Akira Sekine, DNV Japan Thivakaran Narayanan, DNV Malaysia	
Work verified by: Einar Telnes, DNV Norway	
Date of this revision: 2005-02-17	Rev. No.: 00
Number of pages: 11	

Indexing terms

Key words: Climate Change Kyoto Protocol Validation Clean Development Mechanism	Service Area: Verification Market Sector: Methane avoidance and biomass

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