CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006

CONTENTS

Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document. • As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <http://cdm.unfccc.int/Reference/Documents>.
03	22 December 2006	• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity

A.1 Title of the small-scale project activity:

>>
Isabela Rice husk Power Generation Project
Version 1.0
Date: 13 February 2009

A.2. Description of the small-scale project activity:

>>

Purpose of the project activity

Isabela Rice husk Power Generation project (hereafter "the Project") site is located at Municipality of San Manuel, Isabela province in central Luzon, Philippines. And the site is located in the area of Isabela La Suerte Rice Mill Corporation (hereafter "ILSRM) as rice mill factory and also project participant. ILSRM a rice mill company has three rice mill factories. The rice husk will be collected from 3 rice mill factories whose annual total amount is about 47,000t. Currently the rice husk is not utilized. It is abandoned, or used as landfill.
The main purpose of the Project is to utilize biomass fuels, especially unused rice husk for electricity generation by installing boiler, turbine generator system on site. It is planned that the maximum installed generation capacity will reach 2MW during the Project operation period by combustion of around 39,000t/year rice husk as the fuel of this power generation system. This generated power can substitute the electric supply from the diesel electric power and the public grid currently used for rice polishing. The project will also avoid the current methane emissions from the landfilled rice husk.
The Project will reduce GHG emissions from neighbouring power plant by using fossil fuel and generated from biomass decay which through the landfill by a total of approximately 186,756 tons of carbon dioxide equivalent (tCO_2e) during the 10-year crediting period from 2010 to 2019, and the annual an average of 18,675 tCO2e/year. The project will also help to avoid releasing methane emissions from the biomass decay sent to landfills and/or left to decompose.

Contribution to sustainable development

Implementation of this project will not only bring local and national environmental benefits, but also showcase a CDM project for unused rice husk using and electricity generation, in particular Isabela province and the whole Philippines, in general. The project will successfully promote the sustainable development in the following aspects:

- **Greenhouse gas emission reduction**

Without the project, CO_2, which is generated from neighbouring power plant for public grid and ILSRM owned diesel-generator by using fossil fuel and methane, which has the Global Warming Potential of 21 times than that of carbon dioxide based on the IPCC default value, and is the main content of gas produced from the biomass decay, will continue to emit directory to the atmosphere without any treatment or recovery. With the project activities, CO_2 emission from neighbouring power plant and ILSRM owned diesel-generator by using fossil fuel and methane emission from biomass decay will be reduced, resulting in a positive impact on global climate.

- **Creation of employment**

The project will be designed, constructed and operated using local resources, supported by international experts. Consequently, employment opportunities will be created during both the project construction and operation period.

- **Waste generation reduction**

This project is a power generation project using rice husk which is an agricultural waste. The amount of rice husk generation as waste is reduced by the effective use of rice husk disposed of through the project activity. Through the project activities, dumping of rice husk as waste is avoided. 39,270t/year of rice husk can be consumed as fuel in the 2MW rice husk power generation plant. The amount of waste reduction can be quantified as a pollution control effort.

A.3. Project participants:

>>

Name of Party involved(*) ((Host) indicates a host Party)	Private and/or public entity(ies) project participants(*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of the Philippines (host)	Isabela La Suerte Rice Mill Corporation (ILSRM)	No
Japan	Japan Engineering Consultants Co., Ltd. (JEC)	No

Please refer to the contact information of participants in Annex 1.

A.4. Technical description of the small-scale project activity:

A.4.1. Location of the small-scale project activity:

>>

A.4.1.1. Host Party(ies):

>>

Republic of the Philippines

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

>>

Province of Isabela, Region 2 (Cagayan Valley)

A.4.1.3. City/Town/Community etc:

>>

Municipality of San Manuel

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

>>

The project site is located within Isabela Province (Region 2 known also as Cagayan Valley) located 329 kms, North of Metro Manila in main island of Luzon. The Cagayan Valley Region is the largest rice producing region of the country.

The project is located in a rural area, and is difficult to access from major metropolitan areas. To reach the project site, one can either take an 8 to 11 hour (depending on traffic conditions which can vary widely from day to day) land trip from Manila or a commercial plane flight, scheduled every other day, from Manila to the Tuguegarao Airport in Cagayan Province. The Tuguegarao airport is not as well equipped as other provincial airports in the Philippines. Flight cancellations are common during the rainy season. The airport is 85 kilometers from the project site. From the airport, one has to take a 90 to 120 minute land trip passing through the towns of Solana, Enrile, Quezon, Mallig, Roxas, and finally, San Manuel.

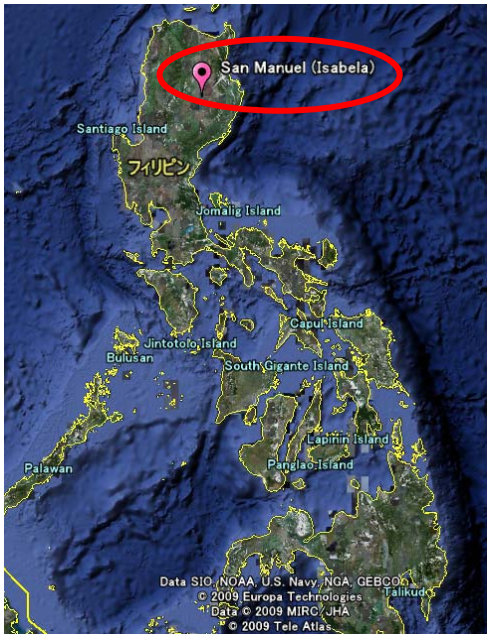


Fig.A.4.1 Project site location and condition

A.4.2. Type and category(ies) and technology/measure of the small-scale project activity:

>>

Type and category(ies)

Project activities are renewable biomass power generation with capacity of 2MW with controlled combustion. Since the power generation capacity is less than 15 MW, it is classified into a small-scale CDM project. As the result, the type and category of project activities can be defined as follows.

Type “I”: Renewable Energy Project
Category “C”: Thermal energy for the user with or without electricity

Furthermore, because of avoidance of methane generation from biomass decay through avoidance of rice husk landfilling and controlled combustion, the type and category of the project activities can be also defined as follows.

Type "III": Other Project Activities
Category "E": Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment

Technology/measures

- Boiler system
Rice husk is stored in the stock facility and supplied by husk supply conveyer from hopper of the boiler to the furnace chamber. Though the rice husk contains much Silica content in specific, it should be considered to select the boiler system with much track record and reliability. The high efficient fluidize bed will be select as the boiler system of this project. The combustion gas exhaust from the chimney, through into the filter after the heat exchange with superheater and economiser. And more, ash generated from the combustion of rice husk convey to the ash stock chamber by conveyer.

- Turbine generation system
The power generators will be run by steam turbine with the heat supplied from the rice husk combustion. The AC generators with a maximum 2MW total capacity will be installed.
Generating steam from a boiler is supplied to a steam turbine generator, and electric power is obtained. The steam used for power generation with the steam turbine is condensed by a condenser (steam condenser), it is collected again to condensate tank, and this is repeated by a condensate pump. For preventing declining water quality, concentration, etc. in this circulation cycle, the supplementary water needs to be supplied, and it is planning to supply supplementary water by digging of a well. The closed system by a cooling tower is adopted as the cooling system of each facility in a condenser and power generation equipment, and supply of supplementary water is required also here.

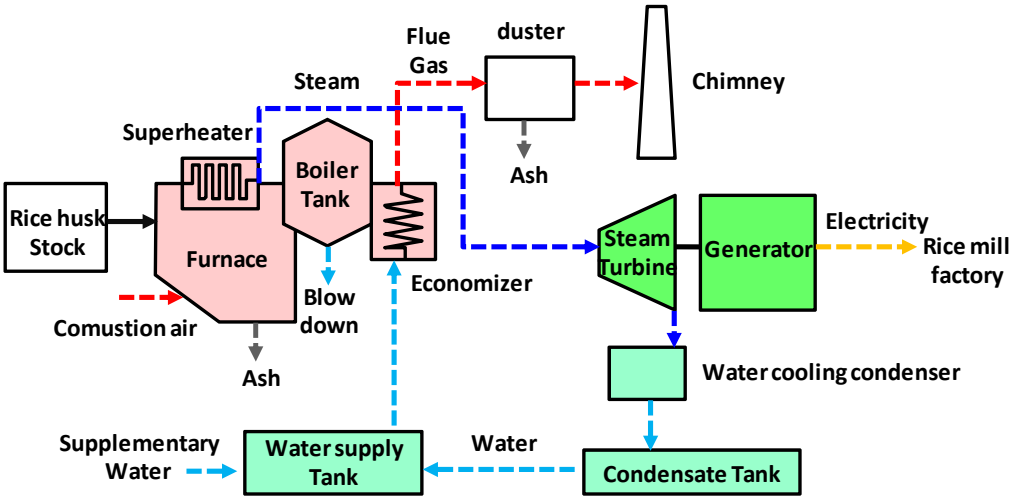


Fig. A.4.2 Plant system flow

A.4.3 Estimated amount of emission reductions over the chosen crediting period:

>>

Years	Annual estimation of emission reductions in tonnes of CO_2e 2010.1.1-2019.12.31
2010	11,226
2011	13,038
2012	14,788
2013	16,478
2014	18,109
2015	19,684
2016	21,205
2017	22,674
2018	24,092
2019	25,462
Total estimated reductions (tonnes of CO_2e)	**186,756**
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	18,675

A.4.4. Public funding of the small-scale project activity:

>>

There is no public funding used in this project.

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

According to Appendix C of Simplified Modalities & Procedures for small-scale CDM project activities, 'Debundling' is defined as the fragmentation of a large project activity into smaller parts.

With reference to the criteria mentioned, this proposed project is not a de-bundled component of a large project activity as there is no registered small-scale CDM project activity (previous 2 years). Though ILSRM is applying to aim register another 1MW small-scale CDM project activity by themselves, in the same project category and technology/measure with project boundary within 1 km radius of this project activity, this project will participate different proponents as Japan Engineering Consultants Co.,ltd and the ILSRM owned 1MW project and this 2MW project are total 3MW power generation capacity less than 15MW as large-scale CDM project. That's the reason, this project is classified a debundling of large-scale CDM project.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

>>

- Version 13 of AMS-I.C. , 28 Mar 08, "Thermal energy for the user with or without electricity"

- Version 15.1 of AMS-III.E. , 14 Dec 07, "Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment"

- Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site

- Combined tool to identify the baseline scenario and demonstrate additionality

B.2 Justification of the choice of the project category:

>>

Type I: Renewable Energy Project

Details of methodology for baseline calculations for CDM projects of capacity less than 15 MW are available in the "Appendix B of the simplified modalities and procedure for small scale CDM project activities".
Since the project activity is renewable biomass power generation within capacity of 2MW less than 15MW and will generate the electricity to private use, it is classified into a small-scale CDM project Type I and category C.

Type III: Other Project Activities

Avoidance of methane generation from rice husk decay, which dumped through to the landfill site, through controlled combustion will be carried out in this project. Because the estimated emission reduction of the project activity from avoidance of methane production will be averaged 9.3ktCO_2e per year less than 60ktCO_2e per year in any year of the crediting period, the type and category of the project activities can be defined Type III and category E.

B.3. Description of the project boundary:

>>

As per the guidelines mentioned in Type I.D. of Annex B of the simplified modalities and procedures for small-scale CDM project activities, project boundary encompasses the physical and geographical site of the renewable generation source. In addition, as per the guidelines mentioned in Type III.E. , following 4 conditions are shown,

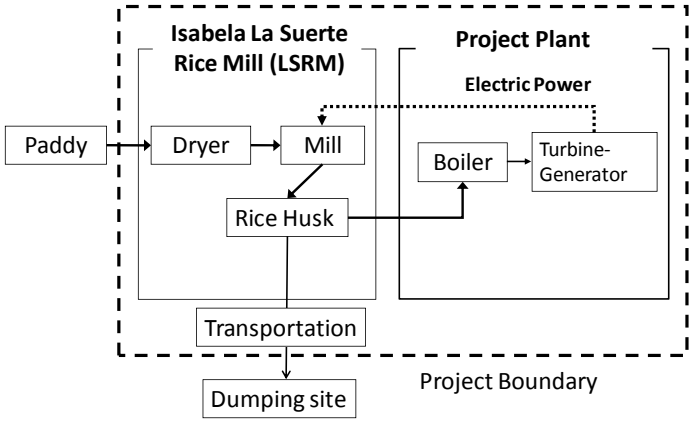
(a) Where the solid waste would have been disposed or is already deposited and the avoided methane emission occurs in absence of the proposed project activity.

(b) Where the treatment of biomass through controlled combustion, gasification or mechanical/thermal treatment takes place.

(c) Where the final residues of the combustion process will be deposited (this parcel is only relevant to controlled combustion activities).

(d) And in the itineraries between them, where the transportation of wastes and combustion residues and/or residues of gasification and mechanical/thermal treatment process occurs.

The project boundary is defined as between the existing rice mill facility and the power generation plant built by this project. Now, some parts of rice husk, which is the biomass generated from a rice mill factories, are used for the 1MW power generation operating in the site. The remaining rice husk is disposed of at the final landfill sites, which the municipality specifies. The river side disposal is the general custom. Since the methane production from decay of the biomass at the landfill sites, is avoided by implementation of this project. The landfill sites (the final landfill sites and the river side) of rice husk are interpreted as outside of the project boundary.
Because the greenhouse gas emission from the transportation of rice husk to the landfill sites is also reduced by the implementation of this project. The transportation of rice husk to the landfill sites is also included in the project boundary. There is no increase in the distance of transportation of rice husk through this project activity. The planned construction site of the power generation plant is on the site of the rice mill factory. The transportation distance of rice husk can be disregarded. Moreover, the electric power used at the rice mill factory is provided for by the electric supply from the diesel generator which is using the light oil of fossil fuel as fuel and the unstable public grid.



B.3.1 Project Boundary

B.4. Description of baseline and its development:

>>

<AMS-I.C>

Without the proposed project activity, CO2, which is generated from neighbouring power plant for public grid and private diesel generation owned ILSRM by using fossil fuel, will be emitted.
As mentioned B.2, the Project uses baseline AMS-I.C.
The baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient calculated in a transparent and conservative manner. Amounts of baseline emission are from the electric power using fossil fuel at the rice mill factories alternated through the project activity and from the public grid electric supply alternated through the project activity.

<AMS-III.E>

In the project site, also in ILSRM, the rice husk is dumped to the landfill site which designated by municipality of San Manuel and a part of remaining rice husk is dumping through to the river side as local common practice.
The baseline scenario is the situation where, in the absence of the project activity, the rice husks are dumped to decay and methane is directly emitted to the atmosphere. The baseline emissions are the amount of methane from the decay of the rice husk in the project activity.
As mentioned B.2, the project also includes a methane avoidance component that will use baseline Type III.E.

Detail of calculation methods of AMS-I.C. and AMS-III.E. are described in Annex 3.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:

Approved methodologies for small-scale CDM project activities are part of the Appendix B of the Simplified modalities and procedures for small-scale clean development mechanism project activities. Attachment A to Appendix B is noted information on additionality. According to the documents, Project participants should provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers, (a) Investment barrier, (b) Technological barrier, (c) Barrier due to prevailing practice, and (d) Other barriers.
For determination of project scenario additionality, following barriers are done:

Since the existing 1MW generation plant is working, it is difficult to prove the existence of the technological barrier and the common practice barrier. Therefore, the investment barrier analysis was carried out for the proof of the investment barrier in this study.
Since the existing 1MW generation project cannot take profitability into account, it is deficient in the attraction of investment. Implementation of this project, similar to the existing 1MW generation project, is difficult without measurement. In the economical efficiency analysis of this project, IRR without CERs profit on the sale is estimated as 9.1%, on the other hand, IRR with CERs profit on the sale of 15 U.S. dollars/CO2t is estimated as 15.8%.

Table B.5.1 Investment pay-back year

	IRR
Without CERs	9.1%
With CERs	15.8%

The benchmark of the investment for this project is determined to be more than IRR10%, based on the government bond interest rates for ten years in the Philippines (about 7.5%) and the long-term interest rate (about 10%) of the Development Bank of the Philippines. Since IRR (9.1%) without CERs profit on the sale is less than the benchmark. The feasibility of this project is judged to be low when this project is not a CDM project. As mentioned above, since it is proved that an investment barrier exists, the additionality of this project is proved.
As mentioned above, as to prove that there is an investment barrier, the additionality of this project is demonstrated.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

>>

Details of methodology for baseline calculations for CDM projects of capacity less than 15 MW are available in the "Appendix B of the simplified modalities and procedure for small scale CDM project activities".

Since the project activity is renewable biomass power generation within capacity of 2MW less than 15MW and will generate the electricity to private use, it is classified into a small-scale CDM project Type I and category C. That is why we use the methodology AMS-I.C.

And more, avoidance of methane generation from rice husk decay, which dumped through to the landfill site, through controlled combustion will be carried out in this project. Because the estimated emission reduction of the project activity from avoidance of methane production will be averaged 9.3ktCO_2e per year less than 60ktCO_2e per year in any year of the crediting period, the type and category of the project activities can be defined Type III and category E. That is why we use the methodology AMS-III.E

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	**φ**
Data unit:	-
Description:	Model correction factor to account for model uncertainties
Source of data used:	
Value applied:	0.9
Justification of the choice of data or description of measurement methods and procedures actually applied :	Oonk et el. (1994) have validated several landfill gas models based on 17 realized landfill gas projects. The mean relative error of multi-phase models was assessed to be 18%. Given the uncertainties associated with the model and in order to estimate emission reductions in a conservative manner, a discount of 10% is applied to the model results.
Any comment:	

Data / Parameter:	**OX**
Data unit:	-
Description:	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	In case of the project not occurred, the landfill site which dumped the biomass is not managed solid waste disposal sites that are covered with oxidizing material such as soil or compost.
Any comment:	

Data / Parameter:	**F**
Data unit:	-
Description:	Fraction of methane in the SWDS gas (volume fraction)

Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, under anaerobic conditions in the SWDS. A default value of 0.5 is recommended by IPCC.
Any comment:	

Data / Parameter:	**DOC_f**
Data unit:	-
Description:	Fraction of degradable organic carbon (DOC) that can decompose
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

<table>
<tr><td>Data / Parameter:</td><td>MCF</td></tr>
<tr><td>Data unit:</td><td></td></tr>
<tr><td>Description:</td><td>Methane correction factor</td></tr>
<tr><td>Source of data used:</td><td>IPCC 2006 Guidelines for National Greenhouse Gas Inventories</td></tr>
<tr><td>Value applied:</td><td>0.8</td></tr>
<tr><td>Justification of the choice of data or description of measurement methods and procedures actually applied :</td><td>The landfill site that will be dumped the biomass in case of the project not occurred is unmanaged-deep solid waste disposal sites, and which have depths of more than 5 metres.
<table>
<tr><th>Classification</th><th>MCF</th></tr>
<tr><td>Anaerovic managed landfill site</td><td>1.0</td></tr>
<tr><td>Semi-aerobic managed landfill site</td><td>0.5</td></tr>
<tr><td>Unmanaged deep landfill site, depth≧5m</td><td>0.8</td></tr>
<tr><td>Unmanaged shallow landfill site, depth≦5m</td><td>0.4</td></tr>
</table></td></tr>
<tr><td>Any comment:</td><td>The methane correction factor (MCF) accounts for the fact that unmanaged SWDS produce less methane from a given amount of waste than managed SWDS, because a larger fraction of waste decomposes aerobically in the top layers of unmanaged SWDS.</td></tr>
</table>

<table>
<tr><td>Data / Parameter:</td><td>DOC_j</td></tr>
<tr><td>Data unit:</td><td>-</td></tr>
<tr><td>Description:</td><td>Fraction of degradable organic carbon (by weight) in the waste type j</td></tr>
<tr><td>Source of data used:</td><td>IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)</td></tr>
<tr><td>Value applied:</td><td>50%</td></tr>
<tr><td>Justification of the choice of data or description of measurement methods and procedures actually applied :</td><td>Apply the following values for the different waste types j:
<table>
<tr><th>Waste type j</th><th>DOC_j (% wet waste)</th><th>DOC_j (% dry waste)</th></tr>
<tr><td>Wood and wood products</td><td>43</td><td>50</td></tr>
<tr><td>Pulp, paper and cardboard (other than sludge)</td><td>40</td><td>44</td></tr>
<tr><td>Food, food waste, beverages and tobacco (other than sludge)</td><td>15</td><td>38</td></tr>
<tr><td>Textiles</td><td>24</td><td>30</td></tr>
<tr><td>Garden, yard and park waste</td><td>20</td><td>49</td></tr>
<tr><td>Glass, plastic, metal, other inert waste</td><td>0</td><td>0</td></tr>
</table>
Use 50% for DOCj value because the rice husks contain only 14% of wet and classified “Wood products (like a straw)” and “dry waste”.</td></tr>
<tr><td>Any comment:</td><td></td></tr>
</table>

Data / Parameter:	**kj**

Data unit:	-
Description:	Decay rate for the waste type j
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)
Value applied:	0.035
Justification of the choice of data or description of measurement methods and procedures actually applied :	Apply the following default values for the different waste types j

Waste type j		Boreal and Temperate (MAT≤20°C)		Tropical (MAT>20°C)	
		Dry (MAP /PET <1)	Wet (MAP/ PET >1)	Dry (MAP< 1000mm)	Wet (MAP> 1000mm)
Slowly degrading	Pulp, paper, cardboard (other than sludge), textiles	0.04	0.06	0.045	0.07
	Wood, wood products and straw	0.02	0.03	0.025	0.035
Moderately degrading	Other (non-food) organic putrescible garden and park waste	0.05	0.10	0.065	0.17
Rapidly degrading	Food, food waste, beverages and tobacco (other than sludge)	0.06	0.185	0.085	0.4

NB: MAT – mean annual temperature, MAP – Mean annual precipitation, PET – potential evapotranspiration. MAP/PET is the ratio between the mean annual precipitation and the potential evapotranspiration.

Use 0.035 for kj value because the rice husk will be classified similar to"straw" and the forecast in the Philippine will be classified "Tropical" and "wet".

Any comment:	

Data / Parameter:	**EF_y**
Data unit:	tCO_2/MWh
Description:	CO_2 emission factor of the public grid
Source of data used:	
Value applied:	0.526
Justification of the choice of data or	The value is calculated as a combined margin emission factor.

description of measurement methods and procedures actually applied :	
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:

>>

In the Approved Small-scale methodology for Thermal energy for the user with or without electricity AMS-I.C. and Avoidance of methane production from decay of biomass through controlled combustion, gasification or mechanical/thermal treatment AMS-III.E. , the emissions reduction is immediately calculated, not by deducting project emissions from baseline emissions.

<AMS-I.C.>

The expected GHG emission reduction through this project unites the GHG emission reduction by the alternative of fossil fuel use and grid power supply is as follows;

Table B6.3.1 Emission reduction through diesel generation and grid power displacement

Year of operation	Diesel Generation Displacement Emission Reductions (tCO_2e)	Grid power Displacement Emission Reductions (tCO_{2e})
2010	3,101	6,249
2011	3,101	6,249
2012	3,101	6,249
2013	3,101	6,249
2014	3,101	6,249
2015	3,101	6,249
2016	3,101	6,249
2017	3,101	6,249
2018	3,101	6,249
2019	3,101	6,249
Total	**31,010**	**62,490**

<AMS-III.E.>

Combustion improver of fossil fuel is not used in the power generation plant of this project. Moreover, since the incineration residue of rice husk is transferred free as soil conditioner to surrounding farms, use of the fossil fuel for transporting it is to be expected. Since hauling becomes unnecessary to the landfill site of rice husk, it is judged that there is no increase in the amount of the project emission reduction. Furthermore, since the power plant planned construction site and the rice husk storage warehouse are at the same site, the distance of transporting of rice husk to the power plant can be mostly disregarded.
The expected GHG emission reduction through this project unites the GHG emission reduction by the avoidance of methane by the avoidance of rice husk decay with controlled combustion is as follows;

Table B6.3.2 Emission reduction through avoidance of methane production from biomass decay

Year of operation	Avoidance of methane generation (tCO2e)	CO2 emission from combustion of the auxiliary fuel (tCO2e)	CO2 emissions through incremental transportation (tCO2e)	Emission reductions from project activity (tCO2e)
2010	1,876	0	0	1,876
2011	3,688	0	0	3,688
2012	5,438	0	0	5,438
2013	7,128	0	0	7,128
2014	8,759	0	0	8,759
2015	10,334	0	0	10,334
2016	11,855	0	0	11,855
2017	13,324	0	0	13,324
2018	14,742	0	0	14,742
2019	16,112	0	0	16,112
Total	**93,256**	**0**	**0**	**93,256**

B.6.4 Summary of the ex-ante estimation of emission reductions:

>>

Table B6.4.1 Gross emission reductions

Operating year	GHG emission reductions by displacement of fossil fuel utilization and grid power (tCO2e)	GHG emission reductions by avoidance of methane generation (tCO2e)	Total emission reductions (tCO2e)
2010	9,350	1,876	11,226
2011	9,350	3,688	13,038
2012	9,350	5,438	14,788
2013	9,350	7,128	16,478
2014	9,350	8,759	18,109
2015	9,350	10,334	19,684
2016	9,350	11,855	21,205
2017	9,350	13,324	22,674
2018	9,350	14,742	24,092
2019	9,350	16,112	25,462
Total	**93,500**	**93,256**	**186,756**

B.7 Application of a monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

Data / Parameter:	Qproduct, y

Data unit:	Tonnes
Description:	amount of rice husk generated from the rice mill factory in each year
Source of data to be used:	On site measurement
Value of data	47,400 t/year
Description of measurement methods and procedures to be applied:	On site scale, continuously, 100% of data are monitored.
QA/QC procedures to be applied:	The scale will be calibrated regularly according to manufacturer's regulations.
Any comment:	

Data / Parameter:	**Qconsump, y**
Data unit:	Tonnes
Description:	amount of rice husk combusted in the generation plant in each year
Source of data to be used: :	On site measurement
Value of data	39,270 t/year
Brief description of measurement methods and procedures to be applied:	On site solid flow meter or scale, continuously, 100% of data are monitored.
QA/QC procedures to be applied:	The meter will be calibrated regularly according to manufacturer's regulations.
Any comment:	

Data / Parameter:	**Qash_product, y**
Data unit:	Tonnes
Description:	amount of ash generated from the generation plant in each year
Source of data to be used::	On site measurement
Value of data	
Brief description of measurement methods and procedures to be applied:	On site scale, continuously, 100% of data are monitored.
QA/QC procedures to be applied:	The scale will be calibrated regularly according to manufacturer's regulations.
Any comment:	

Data / Parameter:	**Qash_dump, y**
Data unit:	Tonnes
Description:	amount of ash transported from the generation plant to neighbouring farmer in each year
Source of data to be	On site measurement

used::	
Value of data	
Brief description of measurement methods and procedures to be applied:	On site scale, continuously, 100% of data are monitored.
QA/QC procedures to be applied:	The schale will be calibrated regularly according to manufacturer's regulations.
Any comment:	

Data / Parameter:	**EG_y**
Data unit:	MWh
Description:	Total amount of electricity generation from power plant
Source of data to be used::	On site measurements and cross check through electricity sales receipts
Value of data	
Brief description of measurement methods and procedures to be applied:	On site electricity meters, continuously, 100% of data are monitored and are cross checked with receipts from the Power Supplier Company
QA/QC procedures to be applied:	Electricity meter will be calibrated regularly according to the manufacturer's requirements. Measurement results will be cross-checked with the quantity of invoices from the grid operator to insure consistency
Any comment:	

Data / Parameter:	**H (Operating hours)**
Data unit:	Hours/year
Description:	Operating hours of the power plant
Source of data to be used::	On site measurement
Value of data	7,200 hours/year
Brief description of measurement methods and procedures to be applied:	On site measurement of the operating hours of the generators, 100% of all data are measured and archived electronically, recording frequency will be annually
QA/QC procedures to be applied:	The meter will be calibrated regularly according to manufacturer's regulations
Any comment:	

Data / Parameter:	**CTy**
Data unit:	tonnes/truck
Description:	Average truck capacity for rice husk and ash transportation
Source of data to be used::	Local actual condition
Value of data	t/truck
Brief description of measurement methods	On site truck scale. The weight of all truck for rice husk and ash transportation should be weighted.

and procedures to be applied:	
QA/QC procedures to be applied:	The scale will be calibrated regularly according to manufacturer's regulations.
Any comment:	

B.7.2 Description of the monitoring plan:

>>

The project participants will select a Professional Company (PC) specializing in making the Plant facility to construct and operate the proposed project. Project participants are responsible for supervising the project implementation, performance, and the monitoring activities to be conducted by the professional company.

The selected Professional Company will construct and operate the proposed project and is also responsible for all monitoring activities to assure that all activities consistent with the Monitoring Plan (see the Annex 4 of this document for more details of Monitoring Plan). PC will handle the monitoring under the supervision of Project participants.

PC will establish a quality management system, which ensures the quality and accuracy of the measured data, including corrective measures in case of non-conformity. The quality management system will include:

- Written procedures for operating facilities, periodic maintenance methods, daily work schedules
- List of personnel and training plan of those people involved
- Responsibility of involved persons
- Reporting system
- Data collection, archiving and accumulating for an written monitoring report for verification
- In the event of accidents, countermeasures will be implemented and documented
- Internal audits
- Instruments for measuring the necessary data will be periodically calibrated (according to the manufacture), a calibration plan will be determined
- Monitoring data will be constantly recorded and archived electronically
- Special storage regulations for monitored data will be determined, including backup copy

B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)

>>

Date of completing the final draft of this baseline section: 13/02/2009
Name of person/entity determining the baseline:

Company Name: Japan Engineering Consultant Co., Ltd.
Address: 33-11 Honcho 5-Chome Nakanoku –Ku, Tokyo, Japan
Zip Code: 164-8601

Contact person: Hideo Furuta
Tel: +81-3-5341-5158
Fax: +81-3-5385-8510

CDM – Executive Board

Email: furutahi@jecc.co.jp

Contact person: Taisuke Odera
Tel: +81-3-5341-5158
Fax: +81-3-5385-8510
Email: oodera-ta@jecc.co.jp

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
Operation starting date: 01/01/2010.

C.1.2. Expected operational lifetime of the project activity:

>>
10 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:

>>
Not applicable

C.2.1.2. Length of the first crediting period:

>>
Not applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
The project will start on 01/01/2010.

C.2.2.2. Length:

>>
10 years

SECTION D. Environmental impacts

>>

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

>>

The environmental impact assessment system in the Philippines was established under Executive Order No. 1151 in 1977. This system required all government agencies, private groups and corporations to survey in advance the impacts of projects, operations and other activities above a certain scale and make sure that the activities will not have an bad impact on the surrounding environment and health of local citizens, etc. Project operators are required to compile an Environmental Impact Statement (EIS) or an Initial Environmental Examination (IEE), etc. and to apply for permission to the DENR or local secretariat. If the environmental criteria are complied with, an Environmental Compliance Certificate (ECC) recognizing project implementation is issued.

- Environmental Impact

Air Quality Impact

By the law ("Philippine Clean Air Act") about air pollution prevention, non-controlling combustion (direct incineration in the outdoors etc.) of the biomass and waste is forbidden. However, it is the practical disposal method of rice husks that piling-up and leaving like the open dumping due to the low economic level and managed incineration processing is not carried out. Therefore, the leaving rice husk is in the status which natural decomposition was carried out and has been decayed.

If a project is not carried out, methane which is the greenhouse gas with 21 times of the grobal warming potential of CO2 which is not processed and collected at all by decomposition of rice husk is directly emitted to the atmosphere. Air quality is improved by avoidance of methane generation by project activities and direct emission to the atmosphere being reduced.

On the other hand, equipment, such as a boiler, may produce exhaust gas by the form, operation, and operation and maintenance, and may discharge organic and harmful gas. However, as compared with an environmental impact in case a project is not carried out, these influences are very small and are controlled by high level exhaust management, monitoring, and operation and maintenance. Moreover, the bad smell generated from the rice husk decay is also minimized by avoidance of disposal of rice husk.

Noise

There is a project site in a suburb, the vast rice field has spread around, and residents is not living in the neighborhood. The power generation plant considered to be the main sources of noise can secure a suitable distance from residents' sphere of life. It is thought that it is controllable by a low noise level, such as installing facilities of a boiler, a turbine, etc. in a building, in addition installing other equipments in the outdoors.

Dust

Since scattering of a dust is assumed at the time of construction and the earthwork for the project, it is required to prevent a dust by water sprinkling etc.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

According to project scales (plant scale, power generation capacity, area, etc.), the procedure concerning a group classification and a required environmental impact are defined. According to the standard of the procedure concerning the environmental impact indicated to "REVISED PROCEDURAL MANUAL FOR DENR ADMINISTRATIVE ORDER NO.30 SERIES OF 2003" (DAO 03-30), this project is classified into a waste power generation project. Demand standards differ as follows according to power generation capacity.

- Power generation capacity ≧50MW ==> Submission of EIS Receipt of ECC
- 1MW≦power generation capacity ≦50MW ==> Submission of IEE Receipt of ECC
- Power generation capacity ≦1MW ==> Submission of PDR Receipt of CNC

Where:
EIS : Environmental Impact Statement
ECC : Environmental Compliance Certificate
IEE : Initial Environment Examination
PDR : Project Description Report
CNC : Certificate of Non-Coverage

The planed power generation capacity of this project is 2MW. Submission of IEE is needed. If the applications are satisfactory, ECC will be published in about two months after application.
The procedure will be handled with the project participants.

SECTION E. Stakeholders' comments

>>

E.1. Brief description how comments by local stakeholders have been invited and compiled:

>>

"The guideline of stakeholder comment collection (INTERIM GUIDELINES ON THE CONDUCT OF STAKEHOLDERS' CONSULTATION UNDER DAO 2005-17)" is shown as the guidance about holding of the stakeholder meeting in the Philippines. It is indicated in the guideline that the following documents are required as record of stakeholder comment collection.

a. Proof of Written Announcement / Invitation
b. List of Participants – containing complete names, specific organizations and sectors/affected groups represented, signatures
c. Minutes of Proceedings – with a section on stakeholder profiling; photos and presentation materials as annexes
d. Summary of Issues and Concerns Raised
e. Proposed Measures to Address Issues and Concerns
f. Site / Vicinity Map

With above documents, project participants will take place the stakeholder meeting.
Based on the guidelines, in order to make the neighboring people understand the contents of the CDM project, the data for explanation which includes the explanation of the structure of a CDM project, global warming, and greenhouse gas, etc. will be made. The neighboring people explanation meeting will be held after the SPC is established.

E.2. Summary of the comments received:

>>

The comments of the Sun Manuel Municipality are as follows.

If environmental standards etc. are observed, an enterprise like this project will be welcomed. The municipality expects this project will lead also to the improvement in the brand of rice. The disposal of waste, including rice husk etc. is insufficient because of the shortage of their budget, and the restriction of the local government's authority, etc. This project plan is very good for the improvement of the waste and for the electric power supply.

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

>>

The local authorities are all very supportive of the proposed project. Therefore, there is no need to modify the project due to the comments received. Environment Impact Assessment should be taken strictly under the procedural manual for DENR Administrative Order No.30.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Isabela La Suerte Rice Mill Corporation
Street/P.O.Box:	National Highway, District 1
Building:	
City:	San Manuel
State/Region:	Isabela, Cagayan Valley
Postfix/ZIP:	
Country:	Philippines
Telephone:	(6378) 6646013, (6378) 6646039
FAX:	(6378) 6646116
E-Mail:	
URL:	
Represented by:	
Title:	CEO
Salutation:	Mr.
Last Name:	Tan
Middle Name:	Pua
First Name:	Ricardo “Richard”
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Organization:	Japan Engineering Consultants Co., Ltd. (JEC)
Street/P.O.Box:	33-11 Honcho 5-Chome
Building:	
City:	Nakano-ku
State/Region:	Tokyo
Postcode/ZIP:	164-8601
Country:	Japan
Telephone:	+81-3-5341-5111
FAX:	+81-3-5385-8500
E-Mail:	
URL:	www.jecc.co.jp/
Represented by:	
Title:	
Salutation:	
Last name:	
Middle name:	
First name:	
Department:	
Mobile:	

Direct FAX:	
Direct tel:	
Personal e-mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding involved in this project.

Annex 3

BASELINE INFORMATION

< AMS-I.C. >

The amount of baseline emission of electricity power alternated through the project activity by fossil fuel displacement and public grid electric supply during year is calculated as following formula;

$BE_y = BE_{power,\ fuel,\ y} + BE_{power,\ grid,\ y}$

Where:

BE_y	: Amount of baseline emission from the electric power alternated through the project activity in the year "y"
$BE_{power,\ fuel,y}$	: Amount of baseline emission from the electric power using fossil fuel at the rice mill factories alternated through the project activity in the year "y"
$BE_{power,\ grid,y}$	: Amount of baseline emission from the public grid electric supply alternated through the project activity in the year "y"

(1) Baseline emission from the electric power using fossil fuel

The amount of baseline emission from the electric power using fossil fuel at the rice mill factories alternated through the project activity during year is calculated by the following formula.

$BE_{power,\ fuel,y} = Q_{y,\ diesel} \times EF_{diesel}$

Where:

Q_y	: Annual consumption of diesel oil
EF_{diesel}	: CO2 emission factor of diesel oil

According to the track record of diesel consumption amount for rice mill factory, it is calculated by averaged 3,760L/day consumption amount multiple operation date per year as followings;

$Q_{y,diesel}$ = 3,760 * 300 * 0.86/1000 = 970 t/year (diesel density: 0.86kg/L)

And, $EF_{,diesel}$ is calculated from CO_2 emission factors for diesel oil.

EF_{diesel} = CO_2 emission factor for diesel oil * Net calorific value

CO_2 emission factors and fraction of carbon oxidised[1]

[1] IPCC 2006 Guidelines for National Greenhouse Gas Inventories

Items	Value	Unit
CO_2	74100	kg/TJ
CH_4	3	kg/TJ
N_2O	0.6	kg/TJ
OX	1	-

CO_2 emission factor = C emission factor * fraction of C oxidised * 44/12 + CH_4 emission factor * 21 + N_2O emission factor * 310
= 74,100 * 1 + 3 / 1,000 * 21+ 0.6 /1,000 * 310 = 74.35 tCO2e/TJ

$E_{y,fuel}$ = 74.35 * 43.0(TJ/10^3t) /1000 = 3.197 tCO_2e/tonnes fuel (diesel Net calorific value:43.0TJ/10^3t)

According to above, $BE_{power, fuel,yl}$ is calculated as follows,

$BE_{power, fuel,y} = Q_{y, diesel} \times EF_{diesel}$ = 970 * 3.197 = **3,101 tCO_2e/yr**

(2) Baseline emission from the public grid electric supply alternated through the project activity

The amount of baseline emission from public grid electric supply is calculated by multiplying the electric energy from the public grid alternated through the project activity by the emission factor of the grid.

$BE_{power, grid, y} = EG_y * EF_{y, grid}$

Where:

EG_y : Electric energy from the public grid alternated through the project activity
$EF_{y, grid}$: Emission factor of the grid

The emission factor is calculated in accordance with the latest version of the AMS I.D and as a tool to calculate the emission factor for an electricity system, because the consumption does not exceed the CDM small scale thresholds as defined by the Executive Board.

The baseline is the kWh produced by the renewable generating unit multiplied by an emission factor calculated in a transparent and conservative manner as:

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the approved methodology ACM0002. Any of the four procedures to calculate the operating margin can be chosen, but the restrictions to use the Simple OM and the Average OM calculations must be considered

OR

(b) The weighted average emissions (in kg CO_2e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used. Calculations must be based on data from an official source and made publicly available.

$\mathbf{EF_y\ (tCO_2/MWh) = W_{OM} \times EF_{OM,y} + W_{BM} \times EF_{BM,y}}$

W_{OM} = The weights is 0.5
$EF_{OM,y}$ = Operating Margin Emissions Factor
W_{BM} = The weights is 0.5
$EF_{BM,y}$ = Build Margin Emissions Factor

The above equation is that of the Consolidated Methodology for Grid-Connected Electricity Generation from Renewable Sources ACM0002.

Because the data needed by Option (a) are available, we choose Option (a) under paragraph 9 to demonstrate the emission in baseline scenario.

The "approximate operating margin" is expressed below:

$$EF_{OM,y}(tCO_2/MWh) = \frac{\sum_{i,j} F_{i,j,y} * COEF_{i,j}}{\sum_j GEN_{j,y}}$$

Where:

$EF_{OM,y}$ = Approximate operating margin in tCO_2/MWh
$F_{i,j,y}$ = Amount of fuel *i* consumed by power sources *j* in year y;
j = Power sources delivering electricity to the grid, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation, and power plant capacity additions registered as CDM project activities;
$COEF_{i,j}$ = Carbon coefficient of fuel *i* in tCO_2/tce;
$GEN_{j,y}$ = Electricity delivered to the grid by fuel source *j*, MWh.

The "build margin" is expressed below:

$$EF_{BM,y}(tCO_2/MWh) = \frac{\sum_{i,m,y} F_{i,j,y} * COEF_{i,m}}{\sum_m GEN_{m,y}}$$

Where:
$EF_{BM,y}$ = Build margin in tCO_2/MWh
$F_{i,m,y}$ = Amount of fuel *i* consumed by plant *m* in year y;
m = Sample group of the plants already built;
$COEF_{i,m}$ = Carbon coefficient of fuel *i* in tCO_2/tce;
$GEN_{m,y}$ = Electricity delivered to the grid by plant m in tCO_2/MWh;

Calculate the baseline emission factor

Based on the approved methodology for small-scale projects AMS-I.D, the average of the "approximate operating margin" and the "build margin" (in kg CO2e/kWh), will be applied in the project.

(1) Simple operating margin

For this project, it will be based on the emissions during 3 latest years of all generating sources serving the Luzon grid system, excluding hydro, geothermal, wind, low-cost biomass, nuclear and solar generation.

Approximate operating margin is calculated as follows:

Power Generation of Luzon (Year2005-2007)

LUZON Grid	2005	2006	2007
Oil-Based	2,021,641	1,711,415	2,192,048
Combined-Cycle	90,608	238,870	652,834
Diesel	1,910,774	1,315,067	1,348,033
Gas Turbine	1,433	-	-
Oil Thermal	18,826	157,478	191,182
Coal	14,653,275	14,099,158	14,417,796
Natural Gas	16,860,917	16,365,960	18,789,414
Geothermal	2,742,203	3,519,417	3,600,503
Hydro	4,331,224	5,492,271	4,562,309
Wind	17,469	53,235	57,842
Total Generation	40,626,730	41,241,457	43,619,911

*Source: Department of Energy. PowerStats 2007

Calculated table of Simple OM

	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
Item	2005-2007 Average Electricity Generation	Heat Rate	Fuel Consumption Impact		Carbon Emission Factor	Unadjusted Annual Carbon Emission Impact	Combustion Efficiency	Actual Carbon Emission Impact	Annual Carbon Dioxide Emission Impact	Simple OM Emission Factor
Abbreviation	GEN		FCI	FCI	Carbon Emission Factor	CEI	COM EFF	Adjusted CEI	tCO2	EF Simple OM
Data Source	PDOE Powerstats	PDOE	(A) x (B)	[(C) x 1055]/10^1	IPCC	(D) x (E)	IPCC	(F) x (G)	(H) x (44/12)	(I) / (A/1000)
Unit	kwh/yr	BTU/kwh	BTU/yr	TJ/yr	tC/TJ	tC/yr	%	tC/yr	tCO2/yr	
Combined-Cycle	327,437,333	10,850	3.553E+12	3748.09	20.20	75,711.48	99	74,954.37	274,832.69	
Diesel	1,524,624,667	10,850	1.654E+13	17452.00	20.20	352,530.35	99	349,005.04	1,279,685.16	
Gas Turbine	477,667	14,400	6.878E+09	7.26	20.20	146.59	99	145.12	532.11	
Oil Thermal	122,495,333	10,850	1.329E+12	1402.17	21.10	29,585.86	99	29,290.00	107,396.67	
Coal	14,390,076,333	9,773	1.406E+14	148369.10	26.80	3,976,291.82	98	3,896,765.99	14,288,141.95	
Natural Gas	17,338,763,667	6,550	1.136E+14	119815.19	15.30	1,833,172.43	99.5	1,824,006.57	6,688,024.09	
Total	33,703,875,000								22,638,612.67	**0.672**

Simple operating margin (OM) = $\underline{0.672(tCO_2/MWh)}$

(2) Build margin

In terms of the build margin, it is impossible to cover all the power sources including small-scale ones and, thus, calculation is made as to the following five large-scale power sources which are scheduled to launch operation by according to data obtained from Department of Energy, Philippines.

Build margin is calculated as follows:

Recent 5 Power plants in operation

Plant	Date of Commision	Location	2007 Power Generation (MWh)
San Roque Hydro	May-2003	Benguet	728,751
San Lorenzo Natural Gas	Sep-2002	Sta.Rita, Batangas	3,652,594
Ilijan Natural Gas	Jun-2002	Ilijan, Batangas	7,799,563
Sta.Rita Natural Gas	Sep-2001	Sta.Rita, Batangas	7,337,257
North wind power	Jun-2005	Ilocos Sur	57,842
Total			19,576,007

Calculated table of BM

	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)
Item	2007 Electricity Generation	Heat Rate	Fuel Consumption Impact		Carbon Emission Factor	Unadjusted Annual Carbon Emission Impact	Combustion Efficiency	Actual Carbon Emission Impact	Annual Carbon Dioxide Emission Impact	Build Margin Emission Factor
Abbreviation	GEN	HR	FCI	FCI	Carbon Emission Factor	CEI	COM EFF	Adjusted CEI	tCO2	EF BM
Data Source	PDOE	PDOE	(A) x (B)	[(C)x1055] /10^12	IPCC	(D) x (E)	IPCC	(F) x (G)	(H) x (44/12)	(I) / (A)
Unit	MWh/yr	BTU/kwh	BTU/yr	TJ/yr	tC/TJ	tC/yr	%	tC/yr	tCO2/yr	
San Roque Hydro	728,751									
San Lorenzo Natural Gas	3,652,594	6,805	2.49E+13	26222.977	15.3	401,211.54	99	397,199.43	1,456,397.91	
Ilijan Natural Gas	7,799,563	6,550	5.11E+13	53896.930	15.3	824,623.03	99	816,376.80	2,993,381.61	
Sta.Rita Natural Gas	7,337,257	6,986	5.13E+13	54077.272	15.3	827,382.26	99	819,108.43	3,003,397.59	
North wind power	57,842									
Total	19,576,007								7,453,177.11	**0.381**

Build margin (BM) = 0.381 (tCO_2/MWh)

EF_y (tCO_2/MWh) = 0.5 * $EF_{AOM,y}$ + 0.5 * $EF_{BM,y}$

Emission factor is calculated as 0.5 * 0.672 + 0.5 * 0.381 = **0.526** kg-CO_2/kWh

In 2010, when this project will be started, the electricity demand of the three rice mill factories is estimated at a total of 3,500kW. The annual operation is based on the 300 days for 24 hours. Since the electricity demand of the head office factory used as the project site and the 2nd factory are estimated at 3,100kW, these factories are supplied from 2,000kW (2MW) generated in this project and 1,000kW (1MW) generated in the existing plant.
Electric power required at the head office factory and the 2nd factory is provided for with the electric supply from 350kW of diesel electric power generation currently used at the head office factory and electric supply from the public grid. For this reason, this project activity can be alternated with 2,000kW which is united with 350kW from the diesel generation and 1,650kW from the grid.
Therefore, the amount of baseline emission from public grid electric power is as follows.

$BE_{power, grid, y}$ = 1650kw * 24 * 300 * 0.526 = **6,249 tCO2e/year**

Therefore, the amount of GHG emission reduction by displacement of fossil fuel at the rice mill factories and displacement of the power supply from public grid base on the AMS-I.C. is as follows.

$BE_y = BE_{power, fuel, y} + BE_{power, grid, y}$ = 3,101 + 6,249 = **9,350 tCO2e/year**

<AMS-III.E>

The project also includes a methane avoidance component that will use baseline Type III.E, as defined in paragraph 93 of Appendix B.

The baseline scenario is the situation where, in the absence of the project activity, rice husk are left to decay and methane is emitted to the atmosphere. The baseline emissions are the amount of methane from the decay of the rice husk combusted in the project activity. The Yearly Methane Generation Potential is calculated using the first order decay model based on the discrete time estimate method of the IPCC Guidelines, as described in category AMS III-G. Baseline emissions shall exclude methane emissions that would have to be removed or combusted to comply with national or local safety requirement or legal regulations.

$$BE_y = BE_{CH4,SWDS,y}$$

Where:

BE_y : Baseline emission of methane production from the decay of rice husk in the year "y"
$BE_{CH4, SWDS,y}$: CO2 equivalent GHG emission reduction calculated from the amount of methane production at the final landfill sites

The estimation of the methane emission potential of a solid waste disposal site ($BE_{CH4,SWDS,y}$, in tCO_2e) shall be undertaken using the "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site", found on the CDM website[1].

According to "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site", the amount of methane produced in the year y ($BE_{CH4,SWDS,y}$) is calculated as follows:

$$BE_{CH4,SWDS,y} = \varphi \cdot (1-f) \cdot GWP_{CH4} \cdot (1-OX) \cdot \frac{16}{12} \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1}^{y} \sum_{j} W_{j,x} \cdot DOC_j \cdot e^{-k_j \cdot (y-x)} \cdot \left(1-e^{-k_j}\right)$$

Where:

$BE_{CH4,SWDS,y}$ = Methane emissions avoided during the year y from preventing waste disposal at the solid waste disposal site (SWDS) during the period from the start of the project activity to the end of the year y (tCO_2e)
φ = Model correction factor to account for model uncertainties (0.9)

f = Fraction of methane captured at the SWDS and flared, combusted or used in another manner

GWP_{CH4} = Global Warming Potential (GWP) of methane, valid for the relevant commitment period

OX = Oxidation factor (reflecting the amount of methane from SWDS that is oxidised in the soil or other material covering the waste)

F = Fraction of methane in the SWDS gas (volume fraction) (0.5)

DOC_f = Fraction of degradable organic carbon (DOC) that can decompose

MCF = Methane correction factor

$W_{j,x}$ = Amount of organic waste type j prevented from disposal in the SWDS in the year x (tons)

DOC_j = Fraction of degradable organic carbon (by weight) in the waste type j

k_j = Decay rate for the waste type j

j = Waste type category (index)

x = Year during the crediting period: x runs from the first year of the first crediting period (x = 1) to the year y for which avoided emissions are calculated (x = y)

y = Year for which methane emissions are calculated

These parameters are chosen as follows,

Parameters for calculation of methane emissions

Parameter	Value		
φ	0.9	default	
f	0	default	
GWP_{CH4}	21	default	
OX	0	IPCC2006[2]	unmanaged site
F	0.5	IPCC2006	
DOCf	0.5	IPCC2006	
MCF	0.8	IPCC2006	unmanaged-deep site
Wj,x	21,650	ILSRM data	
DOCj	0.5	IPCC2006	
kj	0.035	IPCC2006	

φ and f are determined as default value and GWP_{CH4} has the Global Warming Potential of 21 times than that of carbon dioxide based on the IPCC default value.

In case of the project not occurred, the landfill site which dumped the biomass is not managed solid waste disposal sites that are covered with oxidizing material such as soil or compost. Therefore, OX is determined 0 based on IPCC 2006 Guidelines for National Greenhouse Gas Inventories

F reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, under anaerobic conditions in the SWDS. Default value of 0.5 is recommended by IPCC.

[2] IPCC 2006 Guidelines for National Greenhouse Gas Inventories

Fraction of degradable organic carbon (DOC) that can decompose is recommended as 0.5 by IPCC.

The landfill site that will be dumped the biomass in case of the project not occurred is unmanaged-deep solid waste disposal sites, and which have depths of more than 5 metres as local situation. Thus, 0.8 is chosen for MCF.

DOCj is chosen as 0.5 based on IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5).
Apply the following values for the different waste types *j*:

Waste type *j*	**DOC_j (% wet waste)**	**DOC_j (% dry waste)**
Wood and wood products	43	50
Pulp, paper and cardboard (other than sludge)	40	44
Food, food waste, beverages and tobacco (other than sludge)	15	38
Textiles	24	30
Garden, yard and park waste	20	49
Glass, plastic, metal, other inert waste	0	0

Use 50% for DOCj value because the rice husk contain only less than 14% of wet and classified “Wood products” and “dry waste” like a straw.

Use 0.035 for kj value because the rice husk will be classified similar to “straw” and the Philippine forecast will be classified “Tropical” and “wet”.
Apply the following default values for the different waste types j

Waste type j		Boreal and Temperate (MAT≤20°C)		Tropical (MAT>20°C)	
		Dry (MAP /PET <1)	Wet (MAP/ PET >1)	Dry (MAP< 1000mm)	Wet (MAP> 1000mm)
Slowly degrading	Pulp, paper, cardboard (other than sludge), textiles	0.04	0.06	0.045	0.07
	Wood, wood products and straw	0.02	0.03	0.025	0.035
Moderately degrading	Other (non-food) organic putrescible garden and park waste	0.05	0.10	0.065	0.17
Rapidly degrading	Food, food waste, beverages and tobacco (other than sludge)	0.06	0.185	0.085	0.4

The amount of project emission of this project is calculated based on the amount of the combustion improver of fossil fuel in the power generation plant, the increase in fossil fuel use by the difference of the transportation distance of rice husk to the power generation plant in the baseline scenario from the distance of the transportation to the landfill sites in the project scenario and the increase in fossil fuel used by the tucking of the incineration residue discharged from project activities to the landfill site and to other users.

Combustion improver of fossil fuel is not used in the power generation plant of this project. Moreover, since the incineration residue of rice husk is transferred free as soil conditioner to surrounding farms, use of the fossil fuel for transporting it is to be expected. Since hauling becomes unnecessary to the landfill site of rice husk, it is judged that there is no increase in the amount of the project emission reduction. Furthermore, since the power plant planned construction site and the rice husk storage warehouse are at the same site, the distance of transporting of rice husk to the power plant can be mostly disregarded.

The amount of GHG emission reduction is an amount which deducted the amount of project reduction and leakage from the amount of baseline reduction. Therefore, the amount of GHG emission reduction by avoidance of the methane production calculated based on the AMS-Ⅲ.E. is as follows.

Emission reduction by avoidance of the methane generation from biomass decay

Year of operation	Baseline emission by avoidance of methane generation (tCO_2e)	Project emission from combustion of the auxiliary fuel (tCO_2e)	Project emissions through incremental transportation (tCO_2e)	Leakage (tCO_2e)	Emission reductions from project activity (tCO_2e)
2010	1,876	0	0	0	1,876
2011	3,688	0	0	0	3,688
2012	5,438	0	0	0	5,438
2013	7,128	0	0	0	7,128
2014	8,759	0	0	0	8,759
2015	10,334	0	0	0	10,334
2016	11,855	0	0	0	11,855
2017	13,324	0	0	0	13,324
2018	14,742	0	0	0	14,742
2019	16,112	0	0	0	16,112
Total	**93,256**	**0**	**0**	**0**	**93,256**

Leakage must be taken into consideration, when energy generation equipment is transported from other activities, or when the existing equipment is transported to other activities. In this project, since the power generation plant becomes independent of other activities and is newly established, leakage is not taken into consideration.

Therefore, based on above analysis, the baseline emission and the emission reductions achieved by the proposed project are shown below.

Gross emission reductions

Operating year	GHG emission reductions by displacement of fossil fuel utilization and grid power (tCO2e)	GHG emission reductions by avoidance of methane generation (tCO2e)	Total emission reductions (tCO2e)
2010	9,350	1,876	11,226
2011	9,350	3,688	13,038
2012	9,350	5,438	14,788
2013	9,350	7,128	16,478
2014	9,350	8,759	18,109
2015	9,350	10,334	19,684
2016	9,350	11,855	21,205
2017	9,350	13,324	22,674
2018	9,350	14,742	24,092
2019	9,350	16,112	25,462
Total	**93,500**	**93,256**	**186,756**

Annex 4

MONITORING INFORMATION

1. Monitoring methodology

In this project, parameters required for verification of the amount of emission reduction are monitored based on the AMS-I.C. and the AMS-Ⅲ.E. Monitoring is based on the direct measurement for the amount of rice husk combustion and generated electricity in each part of the plant and dynamo, etc. In the monitoring plan, the method of measuring those values by instrumentation apparatus is adopted. The items which should be monitored in this project are shown below.

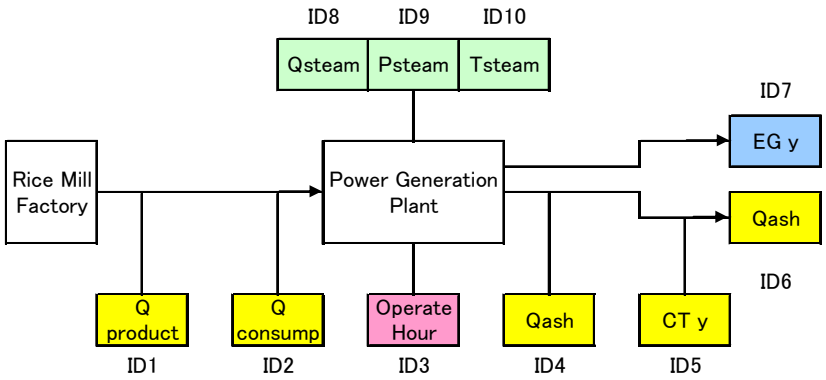


Fig. 7.2.1 Monitoring Flow

- Qproduct, y : Annual quantity of rice husk production
- Qconsump, y : Annual consumption of rice husk (quantity of combustion in the project plant).
- Qash_product, y : Annual quantity of incineration ash production
- Qash_dump, y : Annual quantity of incineration ash dumping
- Qsteam : Quantity of steam
- Psteam : Pressure of steamy
- Tsteam : Temperature of steam
- EGy : Annual electric power generation
- H : Operation time
- CTy : Amount of conveyance by truck
- Regulations of the relation of project activity

It is necessary to specify the rice husk amount of consumption per unit production of electricity as beforehand from equipment specification etc. The electric energy which will be actually generated should be compared with electric energy calculated from the amount of rice husk consumption and a unit production of electricity.

2. Monitoring Management

· CDM Monitoring Manager

One competent manager, who will be designated by the project developer, will be responsible for this monitoring plan and supervise the collected data. He/She will report monthly to the Management Board (MB) of the project developer about project performance and data. He/She will inform the MB

immediately as soon as he/she detects non-conformance in the performance to the mentioned regulations, problems in the performance (e.g. flow meters not working, data not correct). The CDM Monitoring Manager will be the main contact person for the verifiers, as well as San Manuel relevant local authorities, during the crediting period.

· CDM Project Team
This project team will gather, at least monthly, to discuss the performance of the CDM project. Member of the CDM Project Team includes CDM Monitoring Manager, the MB, and the chief engineer of the project plant. The meeting of the CDM project team can be part of regular meetings, but meeting minutes are recorded as required. In case of non-conformance, each members of the team can call in for a CDM project team meeting.

3. Quality control and quality assurance procedures

Regarding quality control and quality assurance procedures to be undertaken for the monitored indicators, the practices to be implemented in the context of the proposed project are as follows:

· On site monitoring records
- Daily readings of all field meters will be filled out in paper worksheets and filed consequently. All data collected will also be entered in electronic worksheets and stored in computer immediately and in discs periodically.
- Periodic controls of the on site monitoring records will be carried out to check any deviation from the estimated ERs following the guidelines for plant operation and monitoring for correction or future references.
- Periodic reports to evaluate performance and assist with performance management will be elaborated.

· Equipment calibration and maintenance
- Truck scale, flow meters, hour meter, and other sensors will be subject to regular maintenance and testing according to the technical specifications from the manufactures to ensure accuracy and good performance.
- Calibration of equipment will be conducted periodically according to their technical specifications.

· Corrective actions
- Actions to correct deviations from the Monitoring Plan and the guidelines for plant operation and monitoring will be implemented as these deviations are observed either by the operator or during internal audits.
- Except periodic meeting, additional technical meetings among the operator, the MB of the developer will be held, if necessary, in order to define the corrective actions to be carried out.

· **Site audits**
- CDM Project Team will make regular site audits to ensure that monitoring and operational procedures are being observed in accordance with the Monitoring Plan and the guideline for plant operation and monitoring.

· **Training**
- For all employees, involved in this project, a Training Plan will be created. It ensures that both project operational staff and monitoring staff are properly trained to enable them to undertake the tasks required by this Monitoring Plan. Appropriate staff training must be provided before the project starts operating and generating ERs.

· **Documents storage**
- List of monitoring equipment (truck scale, solid flow meter, hour meter, electricity meter, etc.), including their numbers, names, manufacturers, specifications, use requirements, etc.
- Calibration lists and reports, including equipment or parts calibrated, date, method and procedures of calibration, their precision after these procedures, personnel, devices needed, etc.
- Maintenance lists and reports, including equipment or parts maintained, date, method and procedures of maintenance, their performance after these procedures, personnel, devices needed, etc.
- Operational manual of the proposed project
- Meeting minutes of CDM project team meeting
- Non-conformance reports
- Worksheets, monthly and yearly
- Training plan
- Internal audit/inspection reports, including personnel, time, findings, corrective actions, follow-up inspections
- Annual monitoring review