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:

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4MW Biomass Power Plants Using Waste Wood Chips & Sawdust in Central Java Province, Indonesia

Version 1.0

08/August/2007

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

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The project will be conducted by PT. Rimba Partikel Indonesia (hereinafter "PT.RPI") in the Kendal district, Central Java Province, Republic of Indonesia.
PT.RPI was founded in 1990 through the merger of companies based in Japan and Indonesia and has established a particle board plant in the Kendal district. This plant is the large-scale particle board plant on the island of Java. (See Fig-1)

Fig-1: Full view of the plant

A.2.1. The current situation and an overview of the power generation facility for the project activity

PT.RPI currently has four diesel-powered generators, each with a power generation capacity of 1.6MW. Normally PT.RPI operates two generators at a time, for an output of about 2.4MW of power. The amount of annual power generation is about 19GWh. The power generated provides all of the electricity used in the plant and the facilities on the grounds, so there is no connection to the power grid, nor any need to purchase power from outside sources for the plant and the facilities on the grounds and also to sale to outside.
The project likewise will not be connected with the external power grid nor will power be purchased from outside sources for the plant and the facilities on the grounds.

The equipment introduced under this project will include Biomass power (2.4MW) supplied to the currently existing equipment and facilities, plus the power necessary for running the generators themselves (0.7MW). Consideration has also been given to avoidance of overloads, so the equipment introduced will have a power generation capacity of 4MW.
The project plans to use 2,601 tons per month of a mixture consisting of undried offcuts, sawdust, and waste of veneer as fuel.

A.2.2. Reduction of greenhouse gases through project activities

By using wood biomass energy and discontinuing use of the diesel-powered generators relied upon up till now, we are able to reduce GHG emissions. In other words, we can calculate the amount of reduction of GHGs from the diesel power generating facilities. The existing diesel generators, however, will be neither discarded nor transferred, but operated in a supplementary fashion when inspecting the biomass generators, when malfunctions occur or there is insufficient wood biomass fuel.

We plan to operate the wood biomass generators 330 days a year, with the remaining 35 days set aside for maintenance and inspection of the power generating facilities, during which time we plan to operate the diesel generators. Since the emissions level when operating the diesel generators is equivalent to the baseline, the reduction in amount at this time will be considered zero.

A.2.3. Contribution of the project activities to sustainable development

- **Contribution to Indonesian government policy**

Until the year 2000, the government of the Republic of Indonesia provided subsidies to reduce petroleum-related fuel retail prices, but the rising cost of crude oil put too much of a financial burden on the government, so it has reduced those subsidies, and since July 2005, the price of petroleum products has risen enormously.
Moreover, in 2004, Indonesia became a net importer of petroleum, so it has been hurrying to diversify its energy sources. The country has relatively abundant coal deposits, which can be used to generate power, so it can reduce its dependence on petroleum fuels in the short term.

For the country's long term energy policy, however, the Indonesian government has put forth the goals of reducing consumption of petroleum, while increasing consumption of natural gas, coal and biomass, nuclear, hydroelectric, solar, wind and other new energy sources and renewable energy. (The Fifth Presidential Decree of 2006 declared that the government of the Republic of Indonesia would increase its use of renewable energy.) Use of biomass as an energy source would contribute to economic sustainability, which is in accord with the policies of the country.

- **Contribution to regional economy**

There are many sawmills in Central Java Province, and along the relatively large roads a survey by PT.RPI alone counted 431 sawmills. Almost all of the wood biomass to be used as a fuel in this project will be collected from these sawmills in the form of offcuts and sawdust.

According to surveys by PT.RPI, about 46,148 tons/month of wood wastes are generated at 431 sawmills. Of these 431 sawmills, 98 responded to questionnaire survey by PT.RPI regarding the quantity of wood wastes generated as well as its uses and the quantity available to P.T. Rimba Partikel Indonesia (PT.RPI), indicating that they could supply 60% of their wood wastes. In other words, about 27,000 tons/month (=46,148 tons/mo. x 60%) of excess wood wastes are generated in this region which have no other uses, and that by purchasing these continually for wood biomass-power generation, PT.RPI can contribute to both the regional economy and sustainability. (See Annex 3, Tables 4 and 5.)

In Central Java, wood wastes and sawdust are currently used as fuel for producing bricks and tiles in local industries, but since there are also diverse sources of wood biomass in this region aside from offcuts, for example, public plantation businesses and forestry companies, which generate twigs and branches, there is no pressure on the supply side.

A.3. Project participants:

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Table-1: 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 involve dwishes to beconsidered asproject participant (Yes/No)
Republic of Indonesia	Private entity PT.Rimba Partikel Indonesia	No
Japan	Private entity Sumitomo Forestry Co.,Ltd.	No

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

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

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PT.RPI is located at the private land for the factory at the eastern of Kendal district, Java Island. It is 30km west from Semarang city, the capitol city of the Central Java Province.

Source: http://www.lib.utexas.edu/maps/indonesia.html

A.4.1.1.	**<u>Host Party</u>(ies):**

>>

The Republic of Indonesia

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

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Kendal District, Province of Central Java

A.4.1.3. City/Town/Community etc:

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Desa Mororejo, Kaliwungu

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

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PT.RPI is located at S 6°56'10.02", E 110°17'23.24" by the Global Positioning System.

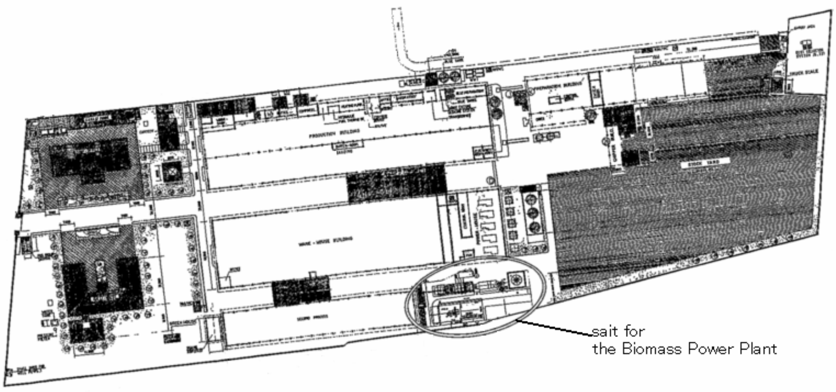

Fig-2: Layout of PT.RPI

About one kilometer north of the plant is the Java Sea. The plant is surrounded by ponds where fish and shrimp are bred, and the nearest settlement, with a population of about 5,000, is approximately 500 meters away. The center of Kaliwungu County (population 91,783 as of January 2007) is located about seven kilometers from the plant.
This district is famous throughout Indonesia for the fish raised there, which are mainly shipped fresh, but also vacuum packaged and transported to the major cities in Java. The annual production volume is about 1,200 tons.

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

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Type: TYPE 1- Renewable Energy Projects (hereinafter referred to as "Type 1.")
Category: I.A. 'Electricity generation by the user' (hereinafter referred to as "Type 1.I.A.")
The project will utilize renewable energy with a maximum power generating capacity of 15MW or less, and it does not have connection with external power grids, and be used only by the users, so it qualifies as a small-scale CDM category, Type 1.I.A.

Fig-3 gives an outline of the equipment to be introduced. The project plans to use about 2,601 tons per month of a mixture consisting of undried wood wastes (offcuts and sawdust from sawmills as well as chipped lumber wastes and sawdust) as fuel. The boilers will have a steam generating capacity of 20 tons per hour, and a power generation capacity of 4MW, but plans call for 3.1MW (the power necessary for existing equipment and facilities;2.4MW, and for running the generators themselves ;0.7MW) to be actually generated.
The exhaust gases from the boilers will pass through a drop-out chamber, followed by an electrostatic precipitator, after which they will be released through a smokestack. This will eliminate fly ash from the exhaust gases, so the plan is expected to meet the atmospheric environmental standards stipulated in the country. For the equipment design, the electrostatic precipitator can reduce the density of the soot of from

3,000mg/m^3 to 180mg/m^3 or less. Environmental standards of soot emissions density in the Kendal district is 230mg/m^3. Therefore, environmental standards can be met.

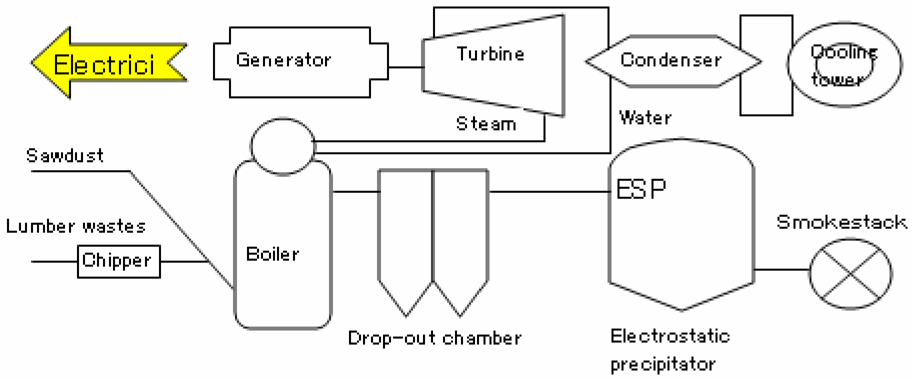

Fig-3: Project scheme

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

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Table-2: Estimation of annual emission reductions in the first crediting period

Year		Estimation of annual emission reductions in tonnes of CO_2e in the first crediting period
2008		14,860
2009		14,860
2010		14,860
2011		14,860
2012		14,860
2013		14,860
2014		14,860
Estimated reductions (tonnes of CO_2e)	Total	104,020
	Average	14,860

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

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There is no public funding involved in financing this project activities.

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

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The project will be a CDM project through small-scale biomass power generation, with a maximum generating capacity of 15MW or less, utilizing renewable energy with no connection to external power grids, and it will be PT.RPI's first and single CDM project. The proposed project activity is not a debundled component of a large scale project activity.

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:

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The project belongs to the following CDM project activities, as indicated in Appendix B for the Simplified Modalities and Procedures for Small-Scale CDM project activities.

Project type: Type 1. Renewable energy project

Project category: I.A. Electricity generation by the user/household

Also, AMS-I.A. (version 12) will be applied as a methodology.

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

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The project will use wood biomass as a substitute for fossil fuels (diesel oil) with a maximum power generating capacity of 4MW and will be independent of the power grid, so it conforms to methodology AMS-I.A.

This project activity is not under a programme of activities.

B.3. Description of the project boundary:

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B.3.1. Delineation of the project boundary

Regarding the boundary of the project, “The physical, geographical site of the renewable energy generating unit and the equipment that used the electricity produced delineates the project boundary” of the methodology AMS-I.A. to be applied. Fig-4 shows the boundary of the project.

B.3.2. Confirmation of boundary concerning the transfer of energy generating equipment

Methodology AMS-I.A. specifies that leakage must be considered in the following circumstances.

“If the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered.”

The wood biomass power generators being introduced by the project activities will be newly built, and previously existing diesel-power generators will be maintained so that it can be used when necessary, and the generators are expected to be operated when the new equipment is undergoing inspections, so there will be no leakage resulting from transference of power generators.

B.3.3. Confirmation of boundary concerning the competing use of biomass

There are many sawmills in the Central Java Province, and a survey by PT.RPI alone counted 431 sawmills along relatively large roads. These mills produce about 46,000 tons of wood waste per month, which is about 18 times the amount of fuel expected to be used in the project (2,601 tons per month). Almost all of the wood biomass to be used as a fuel in the project will be collected from these sawmills in the form of offcuts and sawdust.

Currently, the wood waste from these sawmills are mainly used by regional industries as materials or fuels for brick- and tile- making. In the Central Java Province, there are diverse sources of wood biomass in addition to offcuts and sawdust from sawmills (for example, old fruit or rubber trees discarded by publicly owned farming corporations, and twigs and branches after lumbering from publicly owned forestry corporations), so demand puts no pressure on supply, and it is thought that there is no need to take into account leakage resulting from a tight supply and demand situation by using wood biomass which would have been used elsewhere. (For details on our survey, see Annex 3.)

Therefore, it is not necessary to consider the leakage resulting from a tight supply and demand situation which is mentioned in Attachment C to Appendix B of indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories.

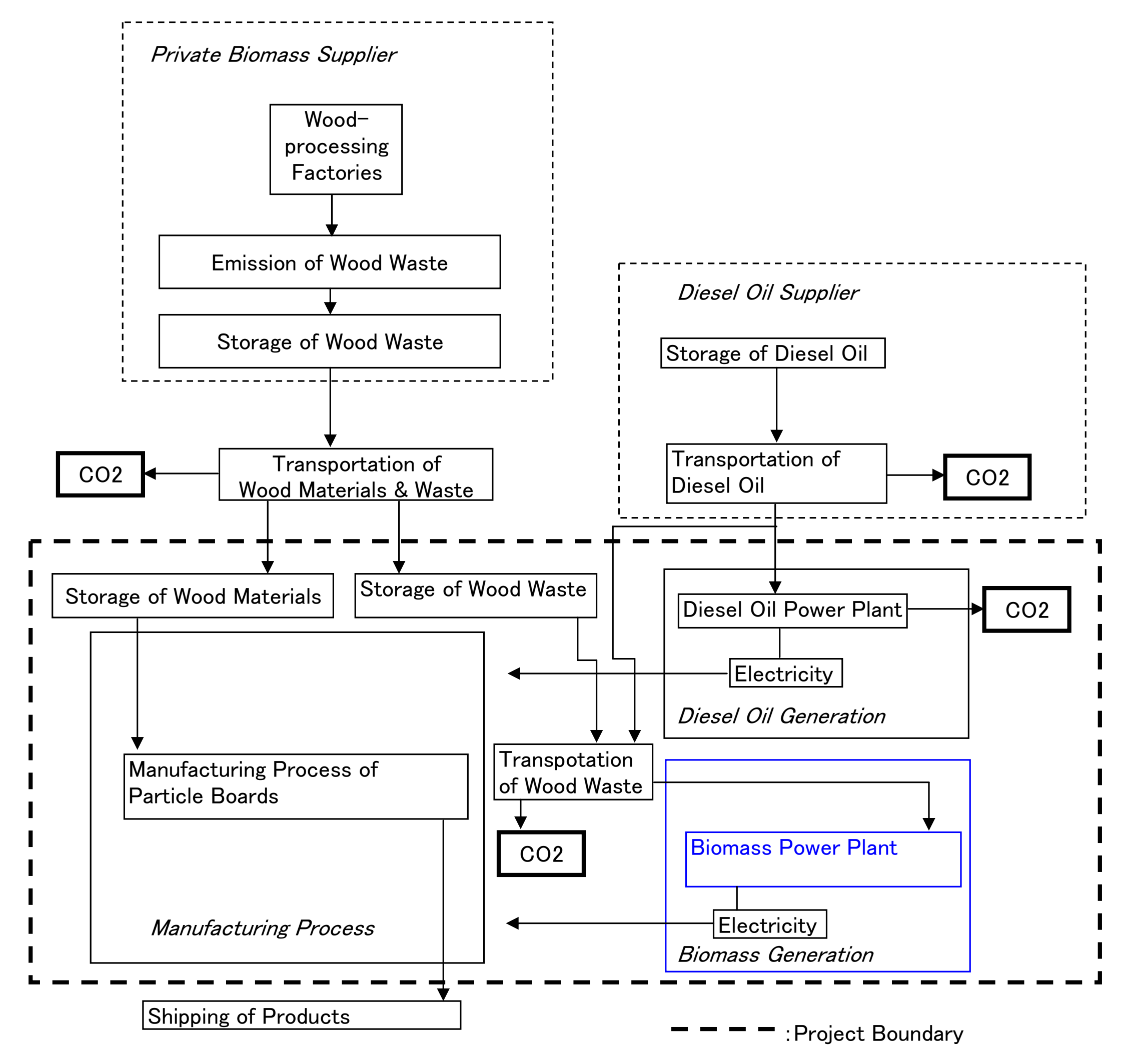

Fig- 4: Boundary of the project

B.4. Description of baseline and its development:

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In calculating the energy baseline, methodology AMS-I.A. (version 12) will be applied.

The amount of power generated by the existing diesel-powered generators is set as the energy baseline, and for the formula, which is applied to an extremely limited area, Option 2 of Paragraph 7 (b) will be utilized

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

Where:

E_B A nnual energy baseline in kWh per year

$\sum_i$ The sum over the group of "*i*" renewable energy technologies (eg solar home systems, solar pumps) implemented as part of the project. For the project, *i* is the wood biomass

O_i The estimated annual output of the renewable energy technologies of the group of "*i*" renewable energy technologies installed (in kWh per year). For the project, *i* is the wood biomass. In the baseline scenario, O_i is by using diesel oil as the fuel

l Average technical distribution losses that would have been observed in diesel-powered mini-grids installed by public programmes or distribution companies in isolated areas, expressed as a fraction. For the project, l is zero because the project does not link to the power grid

The project will continue under the current condition of no connection with external power grids and no purchase of power from outside sources for the plant and the facilities on the grounds. The estimated annual output of power produced using renewable energy technology will be the same as that produced by the current diesel-powered generators.

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:

Under the CDM project, the current diesel-powered generation will be switched to wood biomass power, so it is clear that the GHG reduction is equivalent to nearly the entire amount of GHGs that would be generated through the consumption of diesel oil if the CDM project were not implemented. In initiating the CDM project, however, the following barriers to wood biomass generation exist, and this project would not have been implemented without the CDM.

B.5.1. Investment barrier

To accomplish wood biomass-power generation, it is necessary to make about $7.1 million in capital investment. If we were to continue using the current diesel generation, this investment in facilities would not be needed. For this project activity, we will receive $3.0 million in funding from financial institutions to be applied toward the total value of the capital investment.

No capital investment is necessary to continue with the present diesel power generation. The present diesel power generators would have been used in the absence of the project activity. Therefore, the continuing use of the present diesel power generators would have led to higher emissions.

Another potential alternative energy is coal, or a fuel combining coal and wood biomass. Indonesia is a country with vast coal reserves, and there are many instances where power plants are set up using coal-fired power generation or combined power generation from coal and biomass. The equipment for generator boilers that use coal, or a substance combining coal and wood biomass, as fuel, are more compact than those that use only wood biomass, and initial costs are cheaper. As such, they could potentially be employed in this project. (a manufacturer of the same scale equipment estimates a difference of about 15-25% in cost). However, since they would emit greater amounts of GHGs than at present, they were not employed.

B.5.2. Technical barrier

- **Reliability of power output stability in biomass boilers**

It is rare for a power generator to use only wood biomass as this project does in Indonesia.
Generally, it is considered much more difficult to stabilize the energy on combustion when using wood biomass by itself than it is with coal or a mixture of coal and wood biomass. In this project, therefore, a series of systems will be devised for fuel introduction, furnace capacity, combustion method and removal of combustion ash in order to stabilize combustion energy, although this performance has yet to be finalized.

- **Skills required for boiler operation**

There are no technical barriers to continue with the current diesel power generators. However, in Indonesia a boiler which is needed for thermal power generation must be operated by a certified boiler engineer. PT.RPI must train certified personnel and teach necessary skills.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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B.6.1.1. Baseline emissions

For calculating baseline emissions, methodology AMS-I.A. (version12) will be applied.
The baseline emissions volume will be the amount of emissions that would have been produced by using diesel oil to supply the above-mentioned energy baseline. Therefore a default value 0.8 tonsCO_2e/MWh which is derived from diesel generation units can be used for the formula. (See B.6.2.1.)

The project will continue under the current condition of no connection with external power grids and no purchase of power from outside for the plant and the facilities on the grounds. The estimated annual output of power generated using renewable energy technology will be the same as that generated by the current diesel-powered generators, so E_B will be 18,663MWh/year (the average of 18,119MWh for 2004, 19,055MWh for 2005, and 18,816MWh for 2006). The actual baseline power consumption (in other words, the project's power consumption) is the power consumption measured by monitoring it after the project is underway. Therefore, the baseline emissions are equivalent to the diesel oil that would be consumed if the current diesel generators were used to obtain that amount of power.

The emissions baseline is the energy baseline with the CO_2 emissions coefficient for diesel oil used, so the following formula applies:

$$Em_{B,y} = E_{B,y} \times Emfg\text{-}_{CO2}\text{-}diesel$$

Where:

$Em_{B,y}$	Annual emissions baseline in tons-CO_2 per year
$E_{B,y}$	Annual energy baseline in MWh per year
$Emf\text{-}_{CO2}\text{-}diesel$	Carbon emissions coefficient of diesel oil for power generation (kg-CO_2/kWh)

$Emfg\text{-}_{CO2}\text{-}diesel$ is fixed values determined beforehand. (See B.6.2.1.)

In this project, the amount of power generation by the existing diesel power generation is not included in the energy supplied.

B.6.1.2. Project emissions

The amount of the next four project emissions is described as follows.

- GHG emissions resulting from burning wood biomass
- Emissions resulting from wheel loader for the project
- Emissions resulting due to start-up / auxiliary fuel use
- Emissions resulting from existing diesel power generators

B.6.1.2.1. GHG emissions resulting from burning wood biomass

The wood biomass to be used in the project will be wood waste, so it constitutes renewable biomass. Accordingly, the GHG emissions resulting from burning wood biomass can be considered zero.

B.6.1.2.2. Emissions resulting from wheel loader for the project

Within the boundary of the CDM project, sources of GHG resulting from project activities include fuel for the wheel loaders (diesel oil) used in transferring the wood biomass fuel unloaded from the trucks on the plant grounds and feeding it into the boilers. For the project, an additional wheel loader will be purchased for sole use in supplying wood biomass fuel. The amount of fuel used by the wheel loaders will be calculated by recording the flow meter readings when refueling them.
The GHG emissions will be calculated from the amount of fuel consumed using the CO_2 emissions coefficient.

$$Em_{P,y} = Fv\text{-}loader_{,y} \times Emf\text{-}_{CO2}\text{-}diesel \times Cal\text{-}diesel \times Den\text{-}diesel / 10^9$$

Where:

$Em_{P,y}$	GHG emissions from wheel loaders (tons-CO_2/y)
$Fv\text{-}loader_{,y}$	Fuel used by wheel loaders (l/y)
$Emf\text{-}_{CO2}\text{-}diesel$	Diesel oil CO_2 emissions coefficient (kg-CO_2/TJ)
Cal-diesel	Calorific value of diesel oil (TJ/Gg)
Den-diesel	Diesel oil density (kg/l)

All of the above values, except ***Em**$_{P}$*,$_y$ and ***Fv**-loader*,$_y$ are fixed values determined beforehand.(See B.6.2.3.)

The combustion of diesel oil exhausts CO_2, CH_4 and N_2O as greenhouse gas. However, the amount of emission of CH_4 and N_2O is extremely small compared to the amount of emission of CO_2. The difference between the calculation result of the formula above and the following formula was only 2 tons-CO_2 per year. Therefore the amount of emission of CH_4 and N_2O by combustion of diesel oil is neglected.

$$Em_{P,y} = Fv\text{-}loader_{,y} \times (Emf\text{-}_{CO2}\text{-}diesel + Emf\text{-}_{CH4}\text{-}diesel \times GWP\text{-}_{CH4} + Emf\text{-}_{N2O}\text{-}diesel \times GWP\text{-}_{N2O}) \times Cal\text{-}diesel \times Den\text{-}diesel / 10^9$$

Where:

$Em_{P,y}$	GHG emissions from wheel loaders (tons-CO_2/y)
$Fv\text{-}loader_{,y}$	Fuel used by wheel loaders (l/y)
$Emf\text{-}_{CO2}\text{-}diesel$	Diesel oil CO_2 emissions coefficient (kg-CO_2/TJ)
$Emf\text{-}_{CH4}\text{-}diesel$	Diesel oil CH_4 emissions coefficient (kg- CH_4/TJ)
$Emf\text{-}_{N2O}\text{-}diesel$	Diesel oil N_2O emissions coefficient (kg- N_2O/TJ)
$GWP\text{-}_{CH4}$	Global warming potential of CH_4
$GWP\text{-}_{N2O}$	Global warming potential of N_2O
$Cal\text{-}diesel$	Calorific value of diesel oil (TJ/Gg)
$Den\text{-}diesel$	Diesel oil density (kg/l)

All of the above values, except ***Em**$_{P}$*,$_y$ and ***Fv**-loader*,$_y$ are fixed values determined beforehand.(See B.6.2.3.)

B.6.1.2.3. Emissions resulting due to start-up / auxiliary fuel use

The amount of emission from the fuel (diesel oil) used for wood biomass boiler start-up operation is calculated by the following formula.

$$Em_{S,y} = Fv\text{-}start_{,y} \times Emf\text{-}_{CO2}\text{-}diesel \times Cal\text{-}diesel \times Den\text{-}diesel / 10^9$$

Where:

$Em_{S,y}$	GHG emission from start-up / auxiliary diesel oil use (ton-CO_2/y)
$Fv\text{-}start_{,y}$	Diesel oil used by start-up (*l* /y)
$Emf\text{-}_{CO2}\text{-}diesel$	Diesel oil CO_2 emissions coefficient (kg-CO_2/TJ)
$Cal\text{-}diesel$	Calorific value of diesel oil (TJ/Gg)
$Den\text{-}diesel$	Diesel oil density (kg/l)

All of the above values, except ***Em**$_{S}$*,$_y$ and ***Fv**-start*,$_y$ are fixed values determined beforehand. (See B.6.2.3.)

B.6.1.2.4. Emissions resulting from existing diesel power generators

The existing diesel-powered generators will be operated as supplementary equipment when wood biomass generation is halted. The project will be stopped during times when the project equipment is

undergoing inspection or if problems occur.
Since the emissions level when operating the diesel generators is equivalent to the baseline, the reduction in amount at this time will be considered zero.

B.6.1.3. Leakage

The following three leakages are described as follows.

- Leakage resulting from transfer of existing diesel power generator
- Leakage resulting from competing use of wood biomass
- Leakage resulting from fuel used in transport

B.6.1.3.1. Leakage resulting from transfer of existing diesel power generator

No generating equipment is transferred from another activity and the existing equipment is not transferred to another activity.
The wood biomass power generators being introduced by the project activities will be newly built, and previously existing diesel-power generators will be maintained so that it can be used when necessary, and the generators are expected to be operated when the new equipment is undergoing inspections, so there will be no leakage resulting from transference of power generators.

B.6.1.3.2. Leakage resulting from competing use of wood biomass

There are many sawmills in the Central Java Province, and a survey by PT.RPI alone counted 431 sawmills along relatively large roads. These mills produce about 46,000 tons of wood waste per month, which is about 18 times the amount of fuel expected to be used in the project (2,601 tons per month).
In addition, a wide variety of biomass is generated from sources such as old fruit and rubber trees from public plantations, and twigs and branches from the felling of trees by public forestry companies.

According to the results of a questionnaire survey of 98 of these sawmills, 60% of the wood wastes will be immediately available to PT.RPI, without putting any pressure on the supply and demand situation. Therefore, leakage from "Competing use of wood biomass" can be neglected. (See Annex 3, Tables 4 and 5.)

B.6.1.3.3. Leakage resulting from fuel used in transport

The amount of GHG emission from fuel used in transport is calculated using the following formula:

$$\boldsymbol{Em_{T}},_{y} = (\boldsymbol{Ftv}\text{-}wood,_{y} + \boldsymbol{Ftv}\text{-}P\text{-}diesel,_{y} + \boldsymbol{Ftv}\text{-}loader,_{y} + \boldsymbol{Ftv}\text{-}ash,_{y} - \boldsymbol{Ftv}\text{-}B\text{-}diesel,_{y}) \times \boldsymbol{Emf}\text{-}_{CO2}\text{-}diesel \times \boldsymbol{Cal}\text{-}diesel \times \boldsymbol{Den}\text{-}diesel / 10^{9}$$

Where,

$\boldsymbol{Em_{T}},_{y}$	GHG emissions during the transport of the fuel (ton-CO_2/y)
$\boldsymbol{Ftv}\text{-}wood,_{y}$	Fuel used in transport of wood biomass (*l*/y)
$\boldsymbol{Ftv}\text{-}P\text{-}diesel,_{y}$	Fuel for tank lorries transporting diesel oil fuel when wood biomass generation is halted (*l/y*)
$\boldsymbol{Ftv}\text{-}loader,_{y}$	Fuel for tank lorries transporting diesel oil fuel for the wheel loader (*l*/y)
$\boldsymbol{Ftv}\text{-}ash,_{y}$	Fuel for trucks transporting combustion ash (*l/y*)

***Ftv**-B-diesel*,$_y$	Fuel for transporting diesel generation fuel prior to introduction of wood biomass generation (*l/y*)
***Emf**-$_{CO2}$-diesel*	Diesel oil CO_2 emissions coefficient for transport of fuel (kg-CO_2/TJ)
***Cal**-diesel*	Calorific value of diesel oil (TJ/Gg)
***Den**-diesel*	Density of diesel oil (kg/*l*)

All of the above values, except ***Em**$_T$*,$_y$, ***Ftv**-wood*,$_y$, ***Ftv**-P-diesel*,$_y$, ***Ftv**-loader*,$_y$, ***Ftv**-ash*,$_y$ and ***Ftv**-B-diesel*,$_y$ are fixed values determined beforehand. (See B.6.2.3.)

B.6.1.3.3.1. Fuel for trucks transporting wood biomass fuel

The amount of fuel used in the transport of wood biomass fuel is calculated using the following formula:

$$Ftv\text{-}wood_{,y} = F_G\text{-}wood_{,y} / T\text{-}wood \times D\text{-}wood / M\text{-}wood$$

Where;

***Ftv**-wood*,$_y$	Fuel for trucks transporting of wood biomass (*l*/y)
***F$_G$**-wood*,$_y$	Amount of wood biomass used (tons/y)
***T**-wood*	Average load capacity of trucks that collect wood biomass fuel (tons/truck / trips)
***D**-wood*	Distance traveled by trucks that collect wood biomass fuel (km/trick / trips)
***M**-wood*	Fuel consumption of trucks that collect wood biomass fuel (km/*l*)

All of the above values, except ***Ftv**-wood*,$_y$ and ***F$_G$**-wood*,$_y$ are fixed values determined beforehand. (See B.6.3.3.1.1.)

B.6.1.3.3.2. Fuel for tank lorries transporting diesel oil fuel when wood biomass power generation is halted

The amount of fuel for tank lorries transporting diesel oil fuel is calculated using the following formula:

$$Ftv\text{-}P\text{-}diesel_{,y} = F_G\text{-}P\text{-}diesel_{,y} / T\text{-}diesel \times D\text{-}diesel / M\text{-}diesel$$

Where,

***Ftv**-P-diesel*,$_y$	Fuel for tank lorries transporting diesel oil fuel when wood biomass generation is halted (*l*/y)
***F$_G$**-P-diesel*,$_y$	Amount of diesel oil for power generation used when wood biomass generation is halted (*l*/y)
***T**-diesel*	Average load capacity of tank lorries that transport diesel oil (liters/tank lorry / trips)
***D**-diesel*	Distance traveled by tank lorries that transport diesel oil (km/tank lorry / trips)
***M**-diesel*	Fuel consumption of tank lorries that transport diesel oil (km/*l*)

The amount of diesel oil for power generation used when wood biomass generation is halted is estimated using the following formula:

$$F_G\text{-}P\text{-}diesel_{,y} = E_P\text{-}diesel_{,y} \times Cp \times InC / Cal\text{-}diesel / Den\text{-}diesel / Pf\text{-}diesel$$

Where,

F_G-*P-diesel*,$_y$	Amount of diesel oil for power generation used when wood biomass generation is halted (*l*/y)
E_P-*diesel*,$_y$	Amount of power generated by diesel power generators when wood biomass generation is halted (MWh/y)
Cp	Calorific value of power generation (kcal/kWh)
InC	International caloric unit (J/cal)
***Cal**-diesel*	Calorific value of diesel oil (TJ/Gg)
***Den**-diesel*	Density of diesel oil (kg/*l*)
***Pf**-diesel*	Diesel power generation efficiency

All of the above values, except ***Ftv**-P-diesel*,$_y$, F_G-*P-diesel*,$_y$, E_P-*diesel*,$_y$ and ***Pf**-diesel* are fixed values determined beforehand. (See B.6.2.3., B.6.2.4. and B.6.3.3.1.2.)

B.6.1.3.3.3. Fuel for tank lorries transporting diesel oil fuel for wheel loader (*l*/y)

This project will use special wheel loaders, differentiated from those used to transport particle-board materials, and the fuel they use will be monitored.
Fuel for tank lorries transporting diesel oil fuel for the wheel loader is calculated using the following formula:

***Ftv**-loader*,$_y$ = ***Fv**-loader*,$_y$ / ***T**-diesel* × ***D**-diesel* / ***M**- diesel*

Where,

***Ftv**-loader*,$_y$	Fuel for tank lorries transporting diesel oil fuel for the wheel loader (*l*/y)
***Fv**-loader*,$_y$	Fuel used by the wheel loader (l/y)
***T**-diesel*	Average load capacity of tank lorries that transport diesel oil (liters/tank lorry / trips)
***D**-diesel*	Distance traveled by tank lorries that transport diesel oil (km/tank lorry / trips)
***M**-diesel*	Fuel consumption of tank lorries that transport diesel oil (km/*l*)

All of the above values, except ***Ftv**-loader*,$_y$ and ***Fv**-loader*,$_y$ are fixed values determined beforehand. (See B.6.3.3.1.3.)

B.6.1.3.3.4. Fuel for trucks transporting combustion ash (*l*/y)

The amount of fuel used in the transport of combustion ash is calculated using the following formula:

***Ftv**-ash*,$_y$ = F_G-*ash*,$_y$ / ***T**-ash* × ***D**-ash* / ***M**-ash*

Where,

Ftvash,$_y$	Fuel used in combustion ash transport (*l*/y)
F_G-*ash*,$_y$	Amount of ash disposed (tons/y)
***T**-ash*	Average load capacity of vehicles that transport combustion ash (tons/vehicle / trips)
***D**-ash*	Distance traveled by vehicles that transport combustion ash (km/vehicle / trips)
***M**-ash*	Fuel consumption of vehicles that transport combustion ash (km/*l*)

All of the above values, except ***Ftv**-ash*,$_y$ and F_G-*ash*,$_y$ are fixed values determined beforehand. (See B.6.3.3.1.4.)

B.6.1.3.3.5. Fuel used in transport of diesel oil fuel for existing diesel power generation. (*l*/y)

The amount of fuel used in the transport of diesel oil fuel is calculated using the following formula:

$$Ftv\text{-}B\text{-}diesel_{,y} = F_G\text{-}B\text{-}diesel_{,y} / T\text{-}diesel \times D\text{-}diesel / M\text{-}diesel$$

Where,

$Ftv\text{-}B\text{-}diesel_{,y}$	Fuel used in diesel oil transport for existing diesel power generation(*l*/y)
$F_G\text{-}B\text{-}diesel_{,y}$	Amount of diesel oil used for existing diesel power generation (*l*/y)
$T\text{-}diesel$	Average load capacity of tank lorries that transport diesel oil (liters/tank lorry / trips)
$D\text{-}diesel$	Distance traveled by tank lorries that transport diesel oil (km/tank lorry / trips)
$M\text{-}diesel$	Fuel consumption of tank lorries that transport diesel oil (km/*l*)

The amount of diesel oil used for existing diesel power generation is calculated using the following formula:

$$F_G\text{-}B\text{-}diesel_{,y} = E_{B,y} \times Cp \times InC / Cal\text{-}diesel / Den\text{-}diesel / Pf\text{-}diesel$$

Where,

$F_G\text{-}B\text{-}diesel_{,y}$	Amount of diesel oil used for existing diesel power generation (*l*/y)
$E_{B,y}$	Annual energy baseline in MWh per year (MWh/y)
Cp	Calorific value of power generation (kcal/kWh)
InC	International caloric unit (J/cal)
$Cal\text{-}diesel$	Calorific value of diesel oil (TJ/Gg)
$Den\text{-}diesel$	Density of diesel oil (kg/*l*)
$Pf\text{-}diesel$	Diesel power generation efficiency

All of the above values, except $Ftv\text{-}B\text{-}diesel_{,y}$, $F_G\text{-}B\text{-}diesel_{,y}$, $E_{B,y}$ and $Pf\text{-}diesel$ are fixed values determined beforehand. (See B.6.2.3., B.6.2.4. and B.6.3.3.1.5.)

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

B.6.2.1. Data for Baseline emissions

Data / Parameter:	$Emfg\text{-}_{CO2}\text{-}diesel$
Data unit:	tons CO_2e/MWh
Description:	CO_2 emissions coefficient of diesel power generation
Source of data used:	Methodology, AMS-I.A. version number 12
Value applied:	0.8
Justification of the choice of data or description of measurement methods and procedures actually applied :	It is according to the AMS-I.A. version number 12
Any comment:	N/A

B.6.2.2. Data for Project emissions

Data / Parameter:	***Cal**-wood*
Data unit:	TJ/Gg
Description:	Calorific value of diesel oil
Source of data used:	2006 IPCC Guidelines for National Greenhouses Gas Inventories
Value applied:	15.6
Justification of the choice of data or description of measurement methods and procedures actually applied :	It is according to the 2006 IPCC Guidelines .
Any comment:	N/A

B.6.2.3. Data for Project emissions & Leakage

Data / Parameter:	***Emf**-$_{CO2}$-diesel*
Data unit:	kg-CO_2/TJ
Description:	CO_2 emissions coefficient of diesel oil for transport of fuel
Source of data used:	2006 IPCC Guidelines for National Greenhouses Gas Inventories
Value applied:	74,100
Justification of the choice of data or description of measurement methods and procedures actually applied :	It is according to the 2006 IPCC Guidelines.
Any comment:	N/A

Data / Parameter:	***Emf**-$_{CH4}$-diesel*
Data unit:	kg-CH_4/TJ
Description:	CH_4 emissions coefficient of diesel oil for transport of fuel
Source of data used:	2006 IPCC Guidelines for National Greenhouses Gas Inventories
Value applied:	3.9
Justification of the choice of data or description of measurement methods and procedures actually applied :	It is according to the 2006 IPCC Guidelines.
Any comment:	N/A

Data / Parameter:	***Emf**-$_{N2O}$-diesel*
Data unit:	kg-N_2O/TJ
Description:	N_2O emissions coefficient of diesel oil for transport of fuel
Source of data used:	2006 IPCC Guidelines for National Greenhouses Gas Inventories
Value applied:	3.9

Justification of the choice of data or description of measurement methods and procedures actually applied :	It is according to the 2006 IPCC Guidelines.
Any comment:	N/A

Data / Parameter:	***GWP-***$_{CH4}$
Data unit:	tCO_2e/tCH_4
Description:	Global warming potential of CH_4
Source of data used:	1996 IPCC SAR The Science of Climate Change
Value applied:	21
Justification of the choice of data or description of measurement methods and procedures actually applied :	It is according to the 1996 IPCC SAR The Science of Climate Change.
Any comment:	N/A

Data / Parameter:	***GWP-***$_{N2O}$
Data unit:	tCO_2e/tN_2O
Description:	Global warming potential of N_2O
Source of data used:	1996 IPCC SAR The Science of Climate Change
Value applied:	310
Justification of the choice of data or description of measurement methods and procedures actually applied :	It is according to the 1996 IPCC SAR The Science of Climate Change.
Any comment:	N/A

Data / Parameter:	***Cal-****diesel*
Data unit:	TJ/Gg
Description:	Calorific value of diesel oil
Source of data used:	2006 IPCC Guidelines for National Greenhouses Gas Inventories
Value applied:	43.0
Justification of the choice of data or description of measurement methods and procedures actually applied :	It is according to the 2006 IPCC Guidelines.
Any comment:	N/A

Data / Parameter:	***Den**-diesel*
Data unit:	kg/*l*
Description:	Density of diesel oil
Source of data used:	Product catalog of the national petroleum company Pertamina
Value applied:	0.837
Justification of the choice of data or description of measurement methods and procedures actually applied :	Measurements made by the national petroleum company Pertamina
Any comment:	N/A

B.6.2.4. Data for Leakage

Data / Parameter:	***Cp***
Data unit:	kcal/kWh
Description:	Calorific value of power generation
Source of data used:	Based on definitions
Value applied:	860
Justification of the choice of data or description of measurement methods and procedures actually applied :	Conversion of power into a calorific value
Any comment:	N/A

Data / arameter:	***InC***
Data unit:	J/cal
Description:	International caloric unit
Source of data used:	Based on definitions
Value applied:	4.1868
Justification of the choice of data or description of measurement methods and procedures actually applied :	Conversion of a calorific value into energy
Any comment:	*N/A*

B.6.3 Ex-ante calculation of emission reductions:

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B.6.3.1. Baseline emissions

Baseline emission calculated are 14,930 tons CO_2 per year using the following formula:

$\boldsymbol{Em}_{\boldsymbol{B},y} = \boldsymbol{E}_{\boldsymbol{B},y} \times \boldsymbol{Emfg}\text{-}_{CO2}\text{-}diesel$

$= 18{,}663 \times 0.8$
$= 14{,}930$

Actual amount of power generated by wood biomass power generator ($\boldsymbol{E_{B}},_{y}$) is monitored in the project. (See B.7.1 and Annex 4)

B.6.3.2. Project emissions

B.6.3.2.1. Emissions resulting from wheel loader for the project

Currently, the same kind of wheel loaders that are used to carry raw materials are being used, so to calculate the amount of fuel consumed in transporting the fuel, the amount of fuel consumption expected to be needed for the project is estimated. Calculating GHG emissions using the formula below yields 70 tons CO_2 per year.

$$Em_{P,y} = Fv\text{-}loader_{,y} \times Emf\text{-}_{CO2}\text{-}diesel \times Cal\text{-}diesel \times Den\text{-}diesel / 10^9$$
$$= 26{,}402 \times 74{,}100 \times 43.0 \times 0.837 / 10^9$$
$$= 70$$

Actual amount of fuel used by wheel loader ($Fv\text{-}loader_{,y}$) is monitored in the project. (See B.7.1 and Annex 4)

The difference between the calculation result of the formula above and the following formula was only 2 tons-CO_2 per year. Therefore the amount of emission of CH_4 and N_2O by combustion of diesel oil is neglected.

$$Em_{P,y} = Fv\text{-}loader_{,y} \times (Emf\text{-}_{CO2}\text{-}diesel + Emf\text{-}_{CH4}\text{-}diesel \times GWP\text{-}_{CH4} + Emf\text{-}_{N2O}\text{-}diesel \times GWP\text{-}_{N2O}) \times Cal\text{-}diesel \times Den\text{-}diesel / 10^9$$
$$= 26{,}402 \times (74{,}100 + 3.9 \times 21 + 3.9 \times 310) \times 43.0 \times 0.837 / 10^9$$
$$= 72$$

B.6.3.2.2. Emissions resulting due to start-up / auxiliary fuel use

The amount of emission from the fuel used for wood biomass boiler start-up operation is 0.05 tons CO_2 per year using the following formula;
Since the annual amount of emission is very small, it is neglected.

$$Em_{S,y} = Fv\text{-}start_{,y} \times Emf\text{-}_{CO2}\text{-}diesel \times \mathbf{Cal}\text{-diesel} \times \mathbf{Den}\text{-diesel} / 10^9$$
$$= 20 \times 74{,}100 \times 43.0 \times 0.837 / 10^9$$
$$= 0.053$$

Fuel for start-up operation of wood biomass boiler is estimated to be consumed 20 liter per year.
Inspection and maintenance of the boiler are due to be carried out once in three months. Therefore, start-up operation for boiler is performed 4 times per year. The fuel for start-up operation used for one time is 5 liter.

B.6.3.3. Leakage

GHGs emitted as the result of fuel consumption by transport trucks carrying wood biomass fuel and diesel oil will be considered as leakage. The results of our estimates show GHG emissions from fuel used in transport to be extremely small (1.8%) compared to emissions generated by the project, and that it comprised mainly of emissions from fuel used by trucks transporting wood biomass.
If PT.RPI did not use wood biomass fuel, in other words, without the CDM project, under current conditions the wood biomass that would have been used would either have been transported for use elsewhere or discarded. Without the CDM project, those trucks transporting wood biomass to be used in the CDM project would be used for transferring and discarding the wood biomass or used in some different transport business. Therefore, the fuel consumption for the trucks transporting the wood biomass does not arise from implementation of the CDM project, and would have arisen anyway. The same is true of the fuel consumption for the tank lorries transporting diesel oil, so we consider there to be no leakage resulting from the project activity.
For further details on the results of our estimates, see B.6.3.3.1 below.

B.6.3.3.1. Amount of GHG emission from fuel used in transport

The amount of GHG emission calculated from fuel used in transport is 269 tons-CO2/year using the following formula:

$$Em_{T,y} = (Ftv\text{-}wood_{,y} + Ftv\text{-}P\text{-}diesel_{,y} + Ftv\text{-}loader_{,y} + Ftv\text{-}ash_{,y} - Ftv\text{-}B\text{-}diesel_{,y}) \times Emf\text{-}_{CO2}\text{-}diesel \times Cal\text{-}diesel \times Den\text{-}diesel / 10^9$$

$$= (103{,}630 + 163 + 33 + 3{,}122 - 6{,}031) \times 74{,}100 \times 43.0 \times 0.837 / 10^9$$
$$= 100{,}917 \times 74{,}100 \times 43.0 \times 0.837 / 10^9$$
$$= 269$$

B.6.3.3.1.1. Fuel used in transport of wood biomass

Fuel used in transport of wood biomass calculated are 103,624 *l*/year using the following formula:

$$Ftv\text{-}wood_{,y} = F_G\text{-}wood_{,y} / T\text{-}wood \times D\text{-}wood / M\text{-}wood$$
$$= 31{,}214 / 5 \times 83 / 5$$
$$= 103{,}630$$

The load capacity of the transporting trucks (***T**-wood*) and the calorific value (***M**-wood*) have small error values after the project's implementation and are thought to have little impact on the emissions volume, so the figures are considered as fixed values

The round-trip distance of 83.0 km from RPI to the sawmills (*D-diesel*) is estimated from the weighted average of the distances to sawmills (41.5 km) from which 2,601 tons/month of wood biomass can be obtained. (See Annex 3, Table-6)

The amount of wood biomass used is calculated using the following formula:

$$F_G\text{-}wood_{,y} = E_{O,y} \times Cp \times InC / Cal\text{-}wood / Pf\text{-}wood / 10^3$$
$$= 24{,}207 \times 860 \times 4.1868 / 15.6 / 0.179 / 10^3$$
$$= 31{,}214$$ (The amount used monthly is 2,601 tons per month.)

All of the above values, except F_G-*wood*,y and E_O,y are fixed values determined beforehand. (See B.6.2.2. and B.6.2.3.)
where;
According to the equipment manufacturer's design values, 0.7MW of power capacity is needed to run the equipment itself, so the following formula is used in the estimate:
Power consumed by the power generators themselves = 0.7 × 330 × 24
= 5,544

Where:
Annual number of days operating: 330 days
Time period operating per day: 24 hours

The total power generated (E_O,y) is the sum of the power consumed by the power generators themselves plus the power used by the existing equipment and facilities.

The total power generated is calculated using the following formula:
E_O,y = 18,663 + 5,544
= 24,207

Efficiency of the power generation using wood biomass boilers (***Pf***-*wood* = 17.9%) is decided as following. This value was provided by a coordinator of project equipment.

Power energy when generating 4MW/hr is (a) 3,440,000kcal/hr.
Steam required to run the turbines has the following characteristics:
Amount: 19.8 tons/hr
Pressure: 3.7Mpa
Temperature: 420 deg.c.
Steam supplied from the boilers to the turbines has the following characteristics:
Amount: 20 tons/hr
Pressure: 3.82Mpa
Temperature: 435 deg.c.
Amount of energy at this time is 3,223kJ/k, which equals 769.8kcal/kg when it is converted to its calorific value.
Therefore, 20 tons of steam is equivalent to 15,396,000kcal/hr.
Thermal efficiency of the wood biomass-fueled boiler design provided by the boiler manufacturers involved in the project is 80%, so the energy needed from burning the wood biomass is (b) 19,245,000kcal/hr, and because this amount of energy is required to generate 4MW of power, the efficiency is calculated to be 17.9%, (a)/(b)%.

B.6.3.3.1.2. Fuel for transporting diesel oil fuel when wood biomass power generation is halted (*l*/y)

The amount of fuel used in transport of diesel oil fuel is calculated using the following formula:
Ftv-*P-diesel*,y = F_G-*P-diesel*,y **/** ***T***-*diesel* × ***D***-*diesel* **/** ***M***-*diesel*
= 130,289 / 16,000 × 60 / 3
= 163

Where;
F_G-*P-diesel*,y = E_P-*diesel*,y × ***Cp*** × ***InC*** **/** ***Cal***-*diesel* **/** ***Den***-*diesel* **/** ***Pf***-*diesel*
= 504 × 860 × 4.1868 / 43.0 / 0.837 / 0.387
= 130,289

The load capacity of the transporting tank lorries (***T**-diesel*) and the calorific value (***M**- diesel*) have small error values after the project's implementation and are thought to have little impact on the emissions volume, so the figures are considered as fixed values.

The distance travelled (***D**-diesel*) is 60km. It is the round-trip distance between the plant and Semarang Harbor, which is considered as a fixed value.

The diesel output (E_P*-diesel,y*) consumed during biomass generator outage time for maintenance and inspection is 504MWh/year can be calculated using the following formula:

E_P*-diesel*,$_y$ = 12 x 35 x 1.2
= 504

Biomass-powered generator maintenance/inspection: 35 days/year
Generation time during maintenance/inspection: 12 hours/day
Generation capacity during maintenance/inspection: 1.2MW (for running a single generator)

Diesel power generation efficiency (***Pf**-diesel* = 38.7%) is decided as following.
The average amount of diesel oil use for power generation over the three years from 2004 to 2006 is 4,822,022 liter/year.
2004: 4,720,183 liter
2005: 4,826,698 liter
2006: 4,919,185 liter
Then, the average amount of power generated (E_B,y) is 18,663 MWh/year
Therefore, diesel power generation efficiency (38.7%) is calculated using the following formula:

Pf-diesel = 18,663 × ***Cp*** × ***InC*** / ***Cal***-diesel / ***Den***-diesel / 4,822,022
= 18,663 × 860 × 4.1868 / 43.0 / 0.837 / 4,822,022
= 0.387

Where,

Pf-diesel	Diesel power generation efficiency (%)
Cp	Calorific value of power generation (860 kcal/kWh)
InC	International caloric unit (4.1868 J/cal)
Cal-diesel	Calorific value of diesel oil (43.0 TJ/Gg)
Den-diesel	Density of diesel oil (0.837 kg/*l*)

All of the above values, except ***Pf***-diesel are fixed values determined beforehand. (See B.6.2.3 and B.6.2.4.)

B.6.3.3.1.3. Fuel for tank lorries transporting diesel oil fuel for wheel loader (*l*/y)

The amount of fuel used in the transport of diesel oil fuel for wheel loader which is used exclusively for the project is calculated using the following formula:

***Ftv**-loader*,$_y$ = ***Fv**-loader*,$_y$ / ***T**-diesel* × ***D**-diesel* / ***M**- diesel*
= 26,402 / 16,000 × 60 / 3
= 33

The load capacity of the transporting tank lorries (***T**-diesel*) and the calorific value (***M**- diesel*) have small error values after the project's implementation and are thought to have little impact on the emissions volume, so the figures are considered as fixed values.

The distance travelled (***D**-diesel*) is 60 km. It is the round-trip distance between the plant and Semarang Harbor, which is considered as a fixed value.

Actual amount of fuel used by wheel loader ($Fv\text{-}loader,_y$) is monitored in the project. (See B.7.1 and Annex 4)

B.6.3.3.1.4. Fuel for trucks transporting combustion ash (*l*/y)

The amount of combustion ash is estimated to be generated 5% (1,561 tons/y)of the weight of the fuel (31,214 tons/y).

Fuel used for trucks transporting combustion ash is calculated using the following formula:

$$Ftv\text{-}ash,_y = Fv\text{-}ash,_y / T\text{-}ash \times D\text{-}ash / M\text{-}ash$$
$$= 1,561 / 5 \times 50 / 5$$
$$= 3,122$$

The load capacity of the transporting tank lorries (***T**-diesel*) and the calorific value (***M**- diesel*) have small error values after the project's implementation and are thought to have little impact on the emissions volume, so the figures are considered as fixed values.
The distance travelled (***D**-diesel*) is 50 km. It is the round-trip distance between the plant and disposal place, which is considered as a fixed value.

B.6.3.3.1.5. Fuel used in transport of diesel oil fuel for existing diesel power generation. (*l*/y)

The amount of fuel used in the transport of diesel oil fuel is calculated using the following formula:

$$Ftv\text{-}B\text{-}diesel,_y = F_G\text{-}B\text{-}diesel,_y / T\text{-}diesel \times D\text{-}diesel / M\text{-}diesel$$
$$= 4,824,555 / 16,000 \times 60 / 3$$
$$= 6,031$$

$$F_G\text{-}B\text{-}diesel,_y = E_B,_y \times Cp \times InC / Cal\text{-}diesel / Den\text{-}diesel / Pf\text{-}diesel$$
$$= 18,663 \times 860 \times 4.1868 / 43.0 / 0.837 / 0.387$$
$$= 4,824,555$$

The load capacity of the transporting tank lorries (***T**-diesel*) and the calorific value (***M**- diesel*) have small error values after the project's implementation and are thought to have little impact on the emissions volume, so the figures are considered as fixed values.
The distance travelled (***D**-diesel*) is 60 km. It is the round-trip distance between the plant and Semarang Harbor, which is considered as a fixed value.

Diesel power generation efficiency (***Pf**-diesel* = 38.7%) is decided as following.
The average amount of diesel oil use for power generation over the three years from 2004 to 2006 is 4,822,022 liter/year.

2004: 4,720,183 liter
2005: 4,826,698 liter
2006: 4,919,185 liter
Then, the average amount of power generated (***E**$_B$*,y) is 18,663 MWh/year
Therefore, diesel power generation efficiency (38.7%) is calculated using the following formula:
Pf-diesel = 18,663 × ***Cp*** × ***InC*** / ***Cal***-diesel / ***Den***-diesel / 4,822,022
= 18,663 × 860 × 4.1868 / 43.0 / 0.837 / 4,822,022
= 0.387
Where,

Pf-diesel — Diesel power generation efficiency (%)
Cp — Calorific value of power generation (860 kcal/kWh)
InC — International caloric unit (4.1868 J/cal)
Cal-diesel — Calorific value of diesel oil (43.0 TJ/Gg)
Den-diesel — Density of diesel oil (0.837 kg/*l*)

All of the above values, except ***Pf***-diesel are fixed values determined beforehand. (See B.6.2.3 and B.6.2.4.)

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

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The predicted decrease in GHG emissions (***ER**$_O$*,y) resulting from the project is calculated using the following formula:

***ER**$_O$*,y = ***Em**$_B$*,y – ***Em**$_P$*,y
= 14,930 – 70
= 14,860

Table-3: Summary of the ex-ante annual emission reductions during the first crediting period

year	Estimation of Project activity emissions (tCO_2e)	Estimation of baseline emissions (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of overall emission reductions (tCO_2e)
2008	70	14,930	0	14,860
2009	70	14,930	0	14,860
2010	70	14,930	0	14,860
2011	70	14,930	0	14,860
2012	70	14,930	0	14,860
2013	70	14,930	0	14,860
2014	70	14,930	0	14,860
Total	490	104,510	0	104,020
Average	70	14,930	0	14,860

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

B.7.1 Data and parameters monitored:

Data monitored and required for verification and issuance are to be kept for a minimum of two years after the end of the crediting period or the last issuance of CERs for the project activities, whichever occurs

later.
The organization chart of PT.RPI for monitoring is presented in Annex 4.

- **Parameter for Baseline emissions**

Data / Parameter:	$E_{B,y}$
Data unit:	MWh/year
Description:	Baseline amount of power generated (excluding consumption by the power generators themselves)
Source of data to be used:	Actual amount of power generated recorded by PT.RPI
Value of data	18,663
Description of measurement methods and procedures to be applied:	A wattmeter is installed for the wood biomass power generators and the values from all of them are recorded. The power generators are operated 24 hours and day, and the four employees in charge of the equipment are rotated in a three shift per day cycle. Values from the wattmeter in each shift are recorded in a log book each shift by the person in charge for the generators. Once a month, the results are collected and reported to the Accounting & Finance Division. The Power House & Heavy Equipment Section of Technical Division will calculate the GHG emissions related to the CDM project and report that to the Accounting & Finance Division. Estimated value: $E_{B,y}$ = 18,663 This is the average amount of power generated over the three years from 2004 to 2006. 2004: 18,119MWh 2005: 19,055MWh 2006: 18,816MWh
QA/QC procedures to be applied:	The precision of the measuring device is controlled by the ISO 9001 management system.
Any comment:	N/A

- **Emissions from the project within the boundary**

Data / Parameter:	***Fv**-loader*,y
Data unit:	*l* / year
Description:	Amount of fuel used by the wheel loaders
Source of data to be used:	Actual amount of fuel recorded by PT.RPI
Value of data	26,402
Description of measurement methods and procedures to be applied:	Values are recorded using a measuring device in the refueling equipment at the refueling stations on the plant grounds. Wheel loader is refueled once or twice a day. For the project, an additional wheel loader will be purchased for sole use in supplying wood biomass fuel. The operator of this wheel loader drives it to the refueling station, where the person in charge of the Purchasing Division performs the refueling and records in a log book, which is always maintained at the refueling station. Date of refueling, vehicle number, amount of fuel and name of person refueling are recorded. Once a month, the amount of fuel used by each wheel loader is reported to the Power House & Heavy Equipment Section of

	Technical Division. The Power House & Heavy Equipment Section of Technical Division will calculate the GHG emissions related to the CDM project and report that information to the Accounting & Finance Division. Estimated value: PT.RPI plans to purchase the same type of wheel loader for the project as is currently used to transport wood materials. The amount of fuel consumed by the wheel loader for the transport of wood biomass fuel for the project is estimated according to the actual values in 2006 of wood materials carried by the wheel loaders and the actual amount of fuel they consumed. Result of fuel consumption for wheel loaders transporting wood materials in 2006 were: Raw materials carried: 142,577 tons/year Fuel consumed: 120,596 *l*/year Estimated annual amount of wood biomass consumed: 31,214 tons per year (2,601 tons per month). Therefore, amount of fuel consumed is calculated using the following formula: $Fv\text{-}loader,y = 31{,}214 \times 120{,}596 / 142{,}577$ $= 26{,}402$ The amount of wood biomass used is calculated using the following formula: $F_G\text{-}wood,_y = E_O,_y \times Cp \times InC / Cal\text{-}wood / Pf\text{-}wood / 10^3$ $= 24{,}207 \times 860 \times 4.1868 / 15.6 / 0.179 / 10^3$ $= 31{,}214$ (The amount used monthly is 2,601 tons per month.) All of the above values, except $F_G\text{-}wood,_y$, $E_O,_y$ and ***Pf**-wood* are fixed values determined beforehand. (See B.6.2.2. and B.6.2.3.) where; According to the equipment manufacturer's design values, 0.7MW of power capacity is needed to run the equipment itself, so the following formula is used in the estimate: Power consumed by the power generators themselves = 0.7 × 330 × 24 = 5,544 Where: Annual number of days operating: 330 days Time period operating per day: 24 hours The total power generated (E_O,y) is the sum of the power consumed by the power generators themselves plus the power used by the existing equipment and facilities. The total power generated is calculated using the following formula: $E_O,_y = 18{,}663 + 5{,}544$ $= 24{,}207$ Efficiency of the power generation using wood biomass boilers (***Pf**-wood* = 17.9%) is decided as following. This value was provided by a coordinator of

	project equipment. Power energy when generating 4MW/hr is (a) 3,440,000kcal/hr. Steam required to run the turbines has the following characteristics: Amount: 19.8 tons/hr Pressure: 3.7Mpa Temperature: 420 deg.c. Steam supplied from the boilers to the turbines has the following characteristics: Amount: 20 tons/hr Pressure: 3.82Mpa Temperature: 435 deg.c. Amount of energy at this time is 3,223kJ/k, which equals 769.8kcal/kg when it is converted to its calorific value. Therefore, 20 tons of steam is equivalent to 15,396,000kcal/hr. Thermal efficiency of the wood biomass-fueled boiler design provided by the boiler manufacturers involved in the project is 80%, so the energy needed from burning the wood biomass is (b) 19,245,000kcal/hr, and because this amount of energy is required to generate 4MW of power, the efficiency is calculated to be 17.9%, (a)/(b)%.
QA/QC procedures to be applied:	The precision of the measuring equipment is controlled by the ISO 9001 management system.
Any comment:	N/A

B.7.2. Description of the monitoring plan:

>>

In order to monitor the reduction of GHG emissions, it is important to measure the amount of power generated accurately and control it.

PT.RPI has been registered as an ISO 9001-certified plant since December 29, 1999 (Certification No. 191014, Komite Akreditasi Nasional), so plans call for continual control to be maintained by documenting procedures in the ISO manual related to monitoring and autonomous monitoring of the procedures, thus achieving accurate measurement.

In the ISO control procedures manual, it is clearly specified that the measuring instruments must be calibrated once a year.

Currently, a system has been built for the operator to report the measurements of power generated by the diesel-powered generators to the Accounting & Finance Division at the end of each month. And then monthly report on the costs of power generation and manufacturing is made, and examined by the supervisors and directors, then presented to the president. The amount of power generated by the CDM project equipment will also be continually controlled under the same way. The amount of power generated by the CDM project equipment will also be continually controlled under the same system. The amount of the reduction in GHG emissions will be calculated by the Technical Division and reported to the Accounting & Finance Division.

The fuel used by the wheel loaders, forklifts and other vehicles will be separately recorded. It will also be calculated and controlled, in the same way as power generation, as a manufacturing cost. The amount of fuel used for the wheel loader which is exclusively used for the project in the CDM project will be reported by the Purchasing Division to the Technical Division, which will calculate the reduction in GHG emissions and report it to the Accounting Department. (See Fig-14)

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

>>

The completion of the baseline and monitoring methodology is 08/08/2007.
The technicians determining the baseline methodology include:

1. Atsushi Ikeda

   Sumitomo Forestry Co., Ltd.
   Marunouchi Trust Tower North, 1-8-1, Marunouchi, Chiyoda-ku, Tokyo, JAPAN 100-8270
   Tel: +81-3-6730-3520
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2. Ryo Soda

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   Tel: +81-3-6730-3520
   E-mail: rsoda@sfc.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:

>>
Foundation work for the project will be started in March 2007.

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

>>
More than 25 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:

>>
01/01/2008

C.2.1.2. Length of the first crediting period:

>>
7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
N/A

C.2.2.2. Length:

>>
N/A

SECTION D. Environmental impacts

>>

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

>>

Located in the sub-district of Kendal, Central Java Province, PT.RPI is obligated to conduct the following surveys and submit reports on them. It is currently fulfilling this obligation and will continue to survey and conduct the same kind of control and reporting after the project is introduced.

Submission of documents to local governments
PT.RPI manufactures particle board, so it must submit, once every year, its plans to the government in the form of an Environmental Monitoring Plan (in Indonesian, Rencana Pemantauan Lingkungan; RPL) and an Environmental Management Plan (in Indonesian, Rencana Pengelolaan Lingkungan; RKL).

Regarding the RPL, PT.RPI is obligated to commission investigations by public institutions twice a year and report the results to the Kendal district. These investigations include water quality, air quality, noise and vibrations. PT.RPI has installed water purification facilities and soot collectors and is in compliance with environmental standards. In worksites where sound levels exceed environmental standards, workers are required to wear protective gear, and work is prohibited in areas where vibrations exceed the standards.
Regarding the RKL, in accordance with ISO 14001, the company must make and implement plans for improving the working environment regarding safety and hygiene at plants and for reducing the environmental impact, and then report on this. It is reported at the latest in November, 2006. PT.RPI obtained ISO 14001 certification (Certificate number 05/EM/023) on October 21, 2005.

The reports are submitted to the following three governmental bodies
Kendal Sub-District Commerce and Industry Agency (in Indonesian, Dinas Perindustrian dan Perdagangan : DISPERINDAG)
Central Java Province Environmental Impact Management Agency (in Indonesian, Badan Pengelolaan dan Pengendalian Dampak Lingkungan : BAPPEDAL)
Kendal Sub-District Environmental Impact Management Agency (in Indonesian, Pengendalian Dampak Lingkungan Daerah : PEPADAL)

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:

>>

The Republic of Indonesia has adopted a system for the Environmental Impact Assessment (EIA; "Analisis Mengenai Dampak Lingkungan", AMDAL), requiring each place of business to have a management system in line with the magnitude of impact on the environment.
When biomass power generators with a capacity of 10MW or more are introduced, they are subject to EIA, but the capacity of this project is only 4MW, so EIA is not required.

However, UKL (Environmental Operational Effort)/UPL (Environmental Monitoring Effort) is required by the local government. The UKL/UPL for this project has already been submitted by PT.RPI, and the permissions for the project have already been granted by the local government of Kendal district on May 2007. (See Appendix-1)

SECTION E. Stakeholders' comments

>>

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

>>

On November 1, 2006, invitations letter for stakeholder meeting were sent to representatives of the parties concerned in the vicinity of the plant and officials of environmental-related government bodies. The stakeholder meeting was held subsequently on November 21 at the Kaliwungu sub-district offices.

At the meeting, there was an explanation of the causes of global warming, the equipment being introduced by PT.RPI and the project's objectives, followed by a Q&A session.

- **Attendees, affiliation, etc.**

(1) IWAN	Vice Head of PEDALDA Kendal Sub-District
(2) DRS. NUNG TUBENO	Head of Kaliwungu Sub-District
(3) PRASETYADI UTOMO	Secretary of DNA on CDM
(4) JOSELITO	Climate Change Division of the Department of Environment
(5) RENDRA KURNIA HASAN	Climate Change Division of the Department of Environment
(6) ASTUTI NINGSIH S.Sos	Head of government section of Kaliwungu Sub-district
(7) WAHYUDI S.Sos	Head of peace and order section of Kaliwungu Sub-district
(8) SUGIARTO	Chief of Mororejo Village
(9) NUR KHOLIS	Chief of Sub Village
(10) ISWOKO	Chief of Sub Village
(11) TURMUDI	Service Section of Mororejo Village
(12) SAFI'UDIN	Service Section of Mororejo Village
(13) KARIRI	Service Section of Mororejo Village
(14) H.YAHYA	Head of Delegation in Mororejo village
(15) H.PURNAWI	Member of Delegation in Mororejo village
(16) KY.ASRORI	Member of Delegation in Mororejo village
(17) KY.MAHMUDUN	Member of Delegation in Mororejo village
(18) EDY S.	Member of Delegation in Mororejo village
(19) SUPRIYANTO	Member of Delegation in Mororejo village
(20) MUHDHOR	Member of Delegation in Mororejo village
(21) JAYULI	Member of Delegation in Mororejo village

Fig-5 : Questions from the stakeholders

Fig-6 : Responses from PT.RPI

Fig-7: Attendees of the stakeholders meeting

E.2. Summary of the comments received:

>>

- NUR KHOLIS (Chief of Sub Village) complaint and demands:

(1) Dust from the Particle Board plant is currently polluting surrounding ponds. We have understood that improvements will be made in or after 2008 by introducing the new equipment, but can't something be done about this problem before then?

(2) We would like you to repair the road used to service the aquaculture ponds on the south side of PT.RPI.

(3) We would like you to provide some seedlings for trees on the district's soccer field and along the coast.

- SUGIARTO (Chief of Mororejo Village) complaints:

(4) Transport trucks gathering in front of PT.RPI sometimes blocked the traffic.

- IWAN (Vice Head of PEDALDA Kendal Sub-District) asks:

(5) What is the mechanism of heat energy generation using sawdust in biomass power generation?

- MUHDHOR (Member of delegation from Mororejo Village) asks:

(6) Biomass power generation will use large amounts of underground water, but will the residents' wells be okay?

- H. PURNAWI (Member of delegation from Mororejo Village) asks:

(7) Will the introduction of biomass power generation bring new employment opportunities?

- DRS. NUNG TUBENO (Head of Kaliwungu Sub-District) asks:

(8) What countermeasures are being considered for smoke exhausted from the biomass power generators?

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

>>

- Responses to complaint and demands of NUR KHOLIS

(1) Before PT.RPI uses wood waste as fuel for the project, PT.RPI will repair the covers and reduce the amount of dust produced.
(2) PT.RPI has plans to repair the road on the south side in 2007.
(3) PT.RPI is raising seedlings for planting and is able to provide some of them.

- Response to complaint of SUGIARTO

(4) PT.RPI will instruct the trucking company to send vehicles in line with the shipping schedule of PT.RPI.

- Response to question of IWAN

(5) The sawdust is burned in the boiler, transforming it into heat energy. The calorific value is about 40% that of diesel oil.

- Response to question of MUHDHOR

(6) PT.RPI has plans to take water from 100m underground, a different level from that used by the residents' wells, so it will not affect them.

- Response to question of H. PURNAWI

(7) The operators of the current diesel-powered generators are planned to be in charge of the biomass generators, and we don't know yet if any new employees will be needed.

- Response to question of DRS. NUNG TUBENO

(8) In addition to the standard drop-out chambers, plans call for the biomass power generators to have electrostatic precipitators installed, and PT.RPI aim to keep the level of soot below the government's environmental standards.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Sumitomo Forestry Co., Ltd.	
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E-Mail:		
URL:	http://sfc.jp/ie/index.html	
Represented by:		
Title:	Manager	Team Manager
Salutation:	Mr.	Mr.
Last Name:	Ikeda	Soda
Middle Name:		
First Name:	Atsushi	Ryo
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Direct FAX:		
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CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	PT. Rimba Partikel Indonesia	
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State/Region:	Jawa Tengah	
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E-Mail:		
URL:		
Represented by:		
Title:	Director	Ass General Manager
Salutation:	Mr.	Mr.
Last Name:	Watanabe	Wijaya
Middle Name:		Johannes
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no ODA or public aid/support for the project.

ANNEX 3
BASELINE INFORMATION

1. Survey of quantity of wood biomass fuel produced

1.1 Objective

This project is scheduled to reduce all the amounts of baseline emissions of GHG from the diesel power generation equipment used now. discharged by introduction of the wood biomass power generation by PT.Rimba Partikel Indonesia (PT.RPI)

By introducing wood biomass power generation to PT.RPI, the project comprises a plan to reduce all emissions to below the baseline level, which is the volume that would have been emitted by existing power generators.

The project plans to purchase about 2,601 tons of wood biomass per month for fuel from outside of the project boundary.

Therefore, the following surveys were necessary:

(1) Quantity of wood biomass produced which can be used as fuel for power generation

(2) Quantity available to PT.RPI

(3) Risk of leakage when purchasing wood biomass

(4) Calculation of transport distances for wood biomass fuel

(5) Present status of wood biomass utilization by local residents

(6) Ensuring a supply of wood biomass for the future

1.2. Method and result of survey

1.2.1. Survey of quantity available for power generation fuel

As can be seen in the photos below, there are places where the project is to be implemented with piles of discarded wood waste from sawmills in the mountains in Wonosobo district of Central Java Province.

Fig-8: Sawdust abandoned to the a river (30/Aug/2006)

Fig-9: A valley filled with waste (30/Aug/2006)

Fig-10: Sawdust fills the valley (30/Aug/2006)

Fig-11: A valley filled with sawdust (18/Oct/2006)

The project is a plan to primarily use offcuts and sawdust generated by nearby sawmills as a fuel source. PT.RPI surveyed 431 sawmills along about 200 km of relatively wide roads in the vicinity of PT.RPI to check the amount of wood waste. (This survey was conducted from August to December 2006.)

Table-4: Survey result of amount of wood biomass generated for fuel.

Name of sub-district	Distance to plant (km)	the Number of sawmill	Offcuts (ton/month)	Sawdust (ton/month)
Kendal	15	24	2,402	872
Batang	80	49	3,160	1,930
Pekalongan	85	18	893	436
Tegal	150	4	288	81
Brebes	165	21	1,588	337
Demak	25	10	0	1,705
Ambarawa	60	23	1,530	430
Salatiga	70	16	1,360	411
Temanggung	175	9	100	1,386
Wonosobo	200	63	8,506	2,310
Banjarnegara	230	21	1,706	357
Banyumas	265	71	5,832	999
Purworejo	200	20	1,194	260
Jepara	120	22	1,286	527
Bantul	150	20	356	150
Boyolali	100	8	576	359
Wonogiri	175	16	1,360	387
Klaten	100	16	884	190
Total		*431	33,021	13,127
			*46,148	

The survey's results indicated that the amount of wood waste generated came to 46,148 tons per month, so the amount of fuel expected to use per month, 2,601 tons, accounts to about 6% of the total wood waste.

1.2.2. Survey of quantity available to PT.RPI

The results of our oral survey into the quantity of biomass available for the project from the 98 sawmills listed above in Table 5, without reducing supplies to other businesses using wood wastes and sawdust from sawmills and without causing the price to increase from its present level, showed that of the 11,785 tons/month of usable biomass generated, 7,072 tons/month (60%) could be supplied to PT.RPI at current prices without reducing supplies to other businesses (Table-5). In this region, 46,148 tons/month are generated overall, so we estimate that it would be possible to supply PT.RPI with at least 27,000 tons/month (46,148 x 60%).

1.2.3. Risk of leakage

According to paragraph 18 of 'Attachment C to Appendix B of Indicative Simplified Baseline and Monitoring Methodologies for Selected Small-Scale CDM Project Activity Categories, leakage is considered to be negligible if the annual quantity of available biomass in the affected region is 25% or greater than the quantity already in use, including that to be used by the project in question.

Table-5: Results of the questionnaire to the sawmill.

Name of sub-district	the Number of sawmill	Available Biomass (ton/month)		Supply ratio for PT.RPI		
		Offcut	Sawdust	Offcut (%)	Sawdust (%)	Amount (tons/month)
Wonosobo	17	2,512	731	58.4 %	60.1 %	1,906
Purworejo	2	48	16	50.0 %	50.0 %	32
Temanggung	1	480	160	50.0 %	0.0 %	240
Kendal	10	672	226	67.3 %	75.7 %	623
Batang	14	1,616	548	72.5 %	60.6 %	1,504
Ambarawa	2	208	24	26.9 %	50.0 %	68
Yogjakarta	13	458	195	15.1 %	55.4 %	177
Klaten	16	1,104	222	71.7 %	68.5 %	944
Salatiga	16	1,408	668	66.8 %	70.8 %	1,414
Jepara	7	264	225	33.0 %	34.2 %	164
Available Total	*98	8,770	3,015	60.3 %	58.4 %	7,072
		11,785				
Utilized Biomass	11,785 - 7,072 + 2,601 = 7,314			11,785 / 7,314 = 1.61		

The quantity of available biomass in the affected region in this case is 11,785 tons/month, the quantity already in use is 11,785 - 7,072 = 4,713 tons/month, and the amount to be used by the project is 2,601 tons/month; therefore the ratio of the quantity available to the quantity utilized would be 11,785 divided by (4,713 + 2,601) = 1.61. In other words, the quantity of available biomass is about 161% (greater than 125%) of the amount of wood waste utilized, including that to be used by this project, so no leakage would result from competition for utilization of wood biomass fuel.

1.2.4. Calculation of transport distances for wood biomass fuel

If PT.RPI is to procure biomass, we will usually do so from nearby sources, so we investigated the quantity of available biomass and the quantity utilized (that is to say, the quantity already utilized + that to be supplied to PT.RPI) at the sources nearest to PT.RPI in order of their proximity, judging leakage to be zero if the quantity available exceeded the quantity utilized by 25% or more, and calculated the weighted averages of the distances traveled for collecting biomass from these sources.

Table 6 gives the results of our estimates of total available biomass quantity, the quantities available to PT.RPI and those already utilized, in order of source proximity. The quantity of available biomass within a radius of 70 km of PT.RPI, 7,005 tons/month, was found to be 1.27 times the quantity of biomass utilized, including the quantity required by the project (the quantity already utilized (7,005 - 4,103 = 2,902 tons) added to the amount to be supplied to PT.RPI (2,601 tons/month) brings the sum total to 5,503 tons/month), which is greater than 125%. Within this range, the weighted average of the distances from PT.RPI (41.5 km) is taken as the distance for collection, and the necessary round-trip distance is taken as 83.0 km.

Table-6 Estimation of distance to collect wood biomass fuel

<table>
<tr><th rowspan="2">Name of sub-district</th><th rowspan="2">Distance to PT.RPI</th><th colspan="2">Available Biomass (Survey result) (ton/month)</th><th colspan="2">Supply ratio (%)</th><th>Supply amount (ton/month)</th></tr>
<tr><th>Offcut</th><th>Sawdust</th><th>Offcut</th><th>Sawdust</th><th>Total</th></tr>
<tr><td>Kendal</td><td>15</td><td>2,402</td><td>872</td><td>67.3%</td><td>75.7%</td><td>2,276</td></tr>
<tr><td>Ambarawa</td><td>60</td><td>1,530</td><td>430</td><td>26.9%</td><td>50.0%</td><td>627</td></tr>
<tr><td>Salatiga</td><td>*70</td><td>1360</td><td>411</td><td>66.8%</td><td>70.8%</td><td>1,200</td></tr>
<tr><td rowspan="2">Available Total</td><td rowspan="2">Weighted average *41.5km</td><td>5,292</td><td>1,713</td><td></td><td></td><td rowspan="2">4,103</td></tr>
<tr><td colspan="2">7,005</td><td></td><td></td></tr>
<tr><td colspan="2">Wood wastes available</td><td colspan="2">7,005 –
4,103 + 2,601 = 5,503</td><td colspan="3">7,005 / 5,503 = 1.27</td></tr>
</table>

1.2.5. Currently situation of utilization by local resident

The results of an interview survey of sawmill businesses showed that wood biomass generated by sawmills in Central Java Province is used mostly by manufacturers of bricks or tiles in order to fire the bricks or tiles in kilns.

Brick production is conducted in the fields, where soil is mixed with chaff and sawdust. The mixture is placed in molds and allowed to dry naturally, then the dried bricks are stacked inside a hut (Fig-12) and fired for about two days. About 120,000 bricks are produced in each batch. This is done once during the rainy season and twice during the dry season, for a total of three batches a year. Twenty tons of fuel is used per batch in the rainy season, and 15 tons per batch in the dry season, for a total of 50 tons of offcuts used per year for each brick-making session.

Fig-12: Being prepared for brick firing (22/Jun/2006)

Fig-13: Kiln is being prepared for tile firing (01/Sep/2006)

Production of tiles is done in the gardens of private homes, where clay and sand are mixed and then formed in a manual press. They are allowed to dry naturally, then they are stacked in a hut (Fig-13) and fired for about two days. One batch produces about 5,000 tiles. Production is conducted 24 times a year, with each tile-making session using about 120 tons of offcuts per year.

There are diverse supply sources of wood biomass such as old fruit and rubber trees from public plantations, and twigs and branches after lumbering from the felling of trees by public forestry companies in Central Java Province, and even considering the amount of demand by other wood biomass users, such as brick and tile manufacturers, it is considered possible to sufficiently ensure the wood biomass be used for the project.

1.2.6. Outlook for procuring wood biomass fuel

PT.RPI plans to increase the ratio of raw material coming from afforestation that they use to manufacture particle board.
PT.RPI began afforestation efforts in 2002, and since 2006 a portion of their materials have been derived from such efforts. Starting the same year, PT.RPI began a joint tree-planting project with State Forest Corporation Perhutani, Indonesia. Seedlings such as Acacia mangium, cultivated by PT.RPI, were planted on some land in Perhutani, and PT.RPI plans to purchase the harvested trees and use them as raw material after approximately five years.

Perhutani, located in Central Java, harvests approximately 800,000 m3 of material annually from about 600,000ha of afforested land. The majority of the Java teak planted is used as raw material for furniture, but the teak can only be harvested after approximately 60 to 80 years. In contrast to Java teak, trees such as the Acacia mangium have a rotation period of five years, and therefore Perhutani can increase not only profits with a short term cash flow but also employment opportunities for local residents and the chance to offer wood waste for fuel. PT.RPI is targeting material quality and stable pricing. At the same time, as an eco business, PT.RPI aims to increase the ratio of sustainable raw material it acquires.

After 2007, there are plans to plant one million seeds over approximately 600ha every year, and to harvest 70,000 tons/year in the fifth year. Around 50% of the 140,000 wet tons of raw material PT.RPI uses annually will be obtained by harvesting raw material from the afforestation initiatives. PT.RPI will increase afforested areas in the future, aiming to obtain 100% of its material from these sources.

Therefore, offcuts collected by PT.RPI from the surrounding lumber mills at present will decrease each year from 2006 for raw material for use as wood biomass, and after 2010 the volume collected should be approximately less than 20% of the current amount. All the wood waste that are currently used as raw material for particle board can be used as fuel, so for this project there are no concerns about securing fuel in the near future.

Annex 4

MONITORING INFORMATION

Table-7: Data to be collected in order to monitor the emissions from the project activity, and the archiving/storage method.

ID number	Data type	Data variable	Data unit	Measured (m), calculated (c), or estimated (e)	Recording frequency	Percentage of data to be monitored	Archiving/Storage method (electronic/ paper)	Comment
$E_{B,y}$	Quantitative	Generated power	kWh	m	Continuously	100%	Electronic and paper	Power generated by the project, of which is to be supplied to existing equipment and facilities
$Fv\text{-}loader_{,y}$	Quantitative	Fuel	liter	m	Each time	100%	Electronic and paper	Fuel transport and supply to boilers by the wheel loader which is exclusively for the project, within the project boundaries

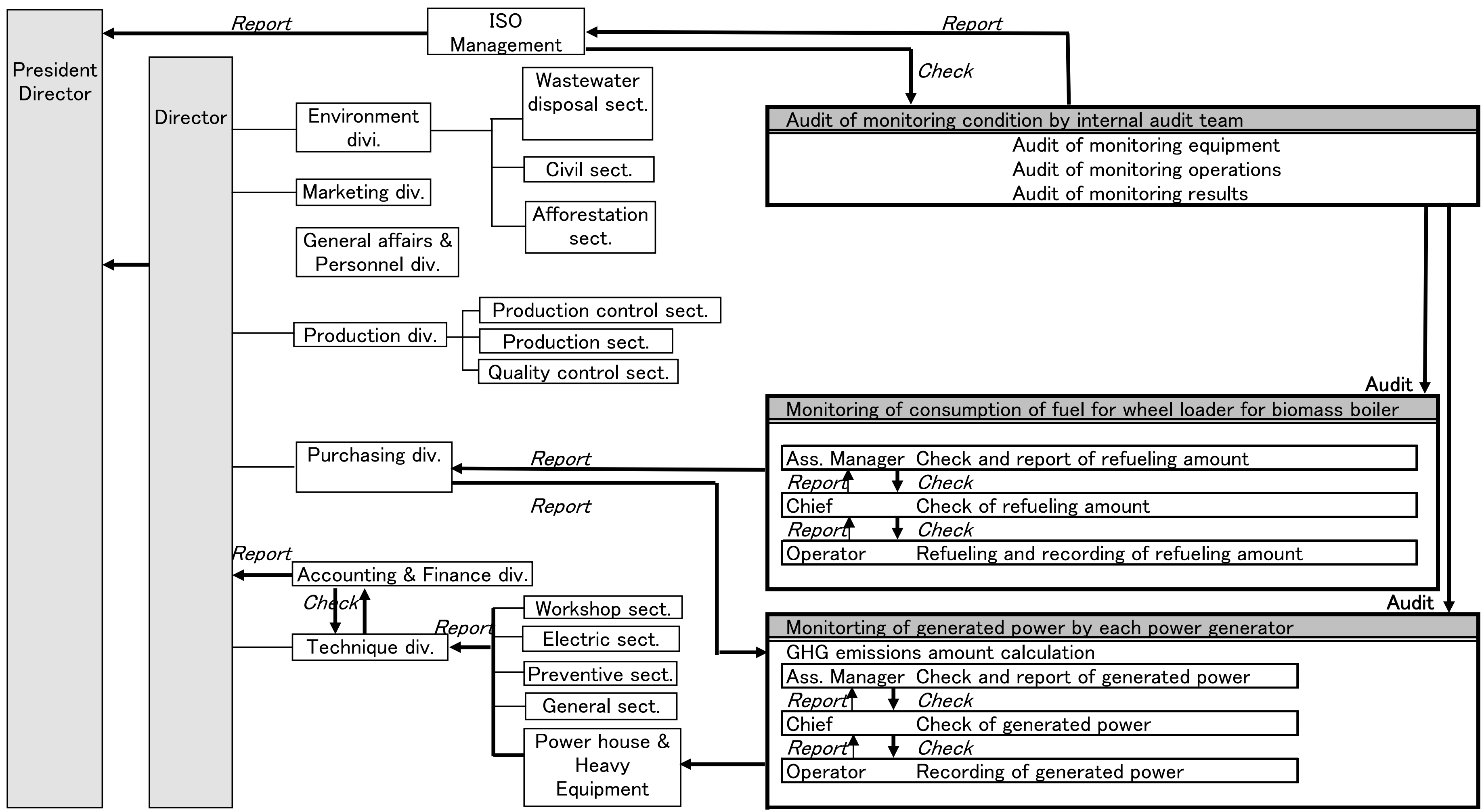

Fig-14: Organizational chart of PT.RPI for monitoring.