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

**CONTENTS**



**Annexes**

**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.<br>• 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:

**Switching from mixed fuel to biomass for electricity generation at P.T. Canang Indah in Indonesia**
Version 01, 08 February 2010

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

P.T. Canang Indah (hereafter, "CI") is a wood-processing company located in Belawan, Indonesia. Its annual production capacity in 2008 was approximately 65,000 $m^3$ of particle board and approximately 120,000 $m^3$ of medium density fibreboard (MDF). Prior to 2006, CI's electricity was supplied from the PLN grid. Because the electricity supply was unstable, CI decided to construct its own power facility, a 2x7 MW coal-based power plant. The plant uses a chain-grate combustion system. In the CI power plant, the combustion system is only used for generating electricity, using steam generated by a coal-fuelled boiler to drive two turbines. The system has a maximum capacity of 94,284 MWh per year at 7,920 operating hours and 20% power plant efficiency. The power plant is equipped with two sets of back-up diesel generators for use when it is under maintenance or repairs.

In response to uncertainty surrounding the supply and price of coal, CI decided to mix coal with waste biomass comprised of wood fibres generated from the production process and palm kernel shells purchased from various palm oil plantations and companies in North Sumatera. The farthest source is Rantau Parapat and the nearest is Langkat, approximately 300 and 100 kilometres, respectively, from CI. To burn waste biomass, modification of the plant's boiler system was necessary, encompassing the addition of a screw system for the biomass feeding system to the chain-grate for the coal feeding system. Additionally, pre-treatment processing facilities for wood chips and a closed storage space for biomass handling were necessary.

In the latter part of 2008, the price and supply of coal became even more uncertain. Taking this into account, and in order to create better environmental conditions, CI decided to replace its use of coal with waste biomass that is by-products and residues, mainly comprised of palm kernel shells. Since CI's power plant is designed to burn coal, it was necessary for CI to study the feasibility of changing its boiler to fully accommodate biomass fuels, and accordingly, it conducted tests during February and March 2009. The test results showed that the maximum power generation using only biomass fuel was less than 10 MW. In addition, issues arose regarding the supply of biomass and operations of the power plant. Currently, biomass is purchased on an individual contract basis, so its supply could become unreliable.

Through this CDM project, CI aims to help achieve a cleaner environment by reducing coal consumption in generating electricity. CI will focus on not only reducing $CO_2$ emissions, but also on issues concerning the handling of coal fly ash. For the CDM project, CI will look to secure a sustainable biomass supply by establishing contracts with various biomass suppliers. A possible obstacle to fully substituting coal with biomass fuels at the power plant is a biomass supply shortage when the plant is operating at full capacity. It should be noted that the present electricity consumption of CI's production facilities is 59,784 MWh per year, which is much lower than the plant's aforementioned capacity of 94,284 MWh per year. Under current conditions, an adequate biomass supply is expected to be available. However, supply may become an issue if electricity consumption rises in line with increased production at the factory.

Another issue lies in using the coal-based power plant. The use of waste biomass fuel affects the plant's ability to reach full capacity, due to biomass' lower combustibility. Additionally, maintenance of the power plant will have to be intensified, thereby increasing the cost as well as reducing operating hours due to maintenance and repairs.

Through the CDM project, it is expected that extra spending for using waste biomass can be partially covered by revenue from the sale of Certified Emission Reductions (CERs).

## A.3. Project participants:

| Name of the 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) |
|---|---|---|
| Indonesia (host) | P.T. Canang Indah | No |
| Japan | 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:

The project is located on P.T. Canang Indah's factory area in Belawan, North Sumatera.

#### A.4.1.1. Host Party(ies):

Indonesia

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

North Sumatera Province

#### A.4.1.3. City/Town/Community etc:

Belawan

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

The address of CI's power plant is Jl. Pulo Sicanang, Belawan Sicanang, Medan, North Sumatera. It is located approximately 23 kilometres north of Medan, the capital city of North Sumatera, and approximately 4 kilometres southwest of Belawan port, the only port capable of handling containers in North Sumatera.

GPS coordinates are S3.766328° and E98.669939° (Figure 1).

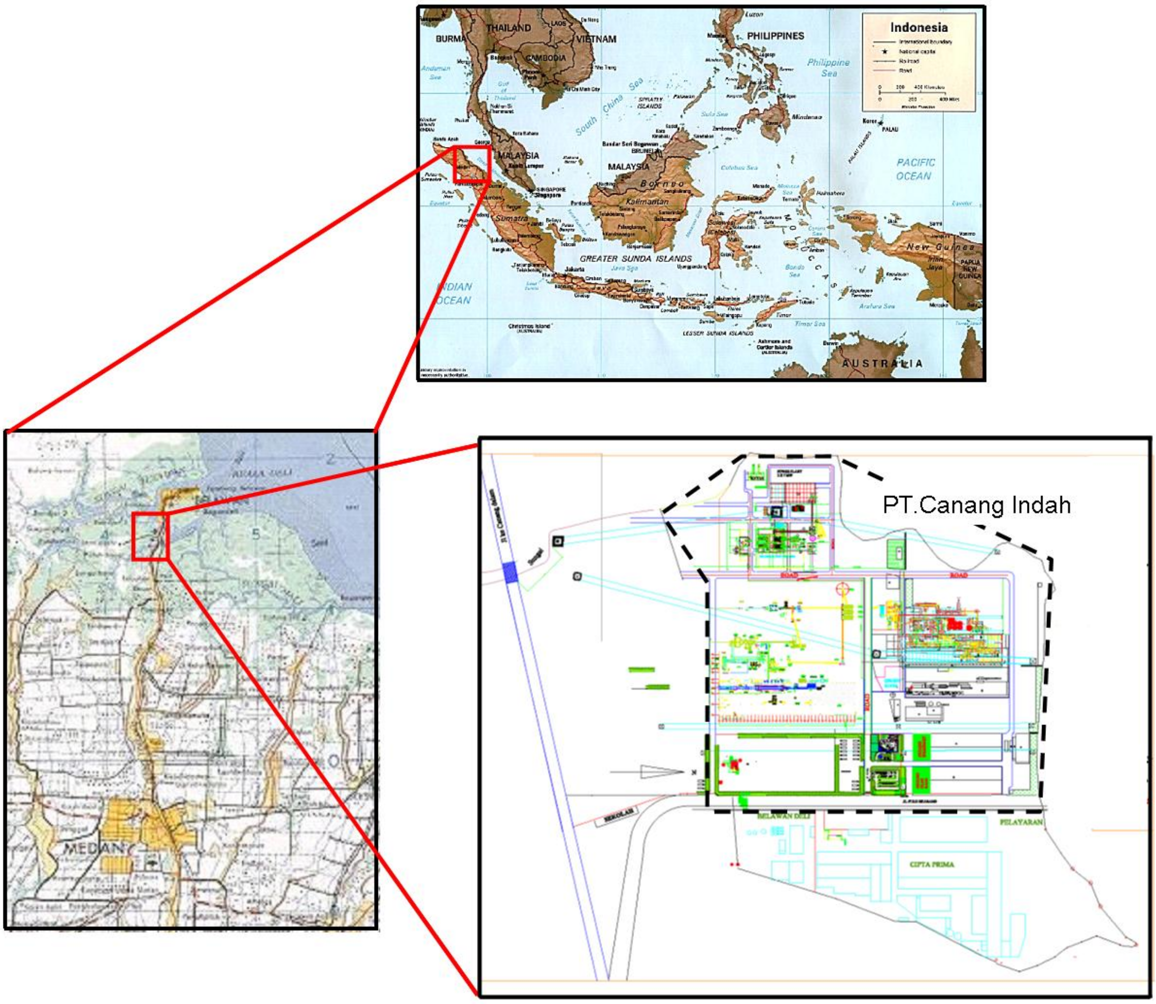


Figure 1: Project site
Source: http://www.lib.utexas.edu/maps/indonesia.html#country.html

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

CI aims to replace coal with biomass fuels for its power plant. The total capacity of the power plant is 2 x 7 MW, with maximum electricity generation of 94,284 MWh per year at 7,920 hours per year and 20% plant efficiency. However, current electricity consumption of CI's production facilities is 59,784 MWh per year, which is much lower than the power plant's full capacity. Under current conditions, biomass fuel supply to the plant is expected to be available. Assuming current electricity needs, the amount of biomass fuel required to replace coal is estimated to be 58,168 tonnes per year, if palm kernel shells are used exclusively. About applicability methodology and equipment for this project is bellows.

TypeI: Renewable energy projects
Categories: AMS-I.A. version 13 [Electricity generation by the user]

An outline of the power plant and its specifications is provided below (Figure 2). The power plant has two 7 MW generators with a total capacity of 14 MW. Power efficiency is rated at 20%.Lifetime of this plant is over 30 years.

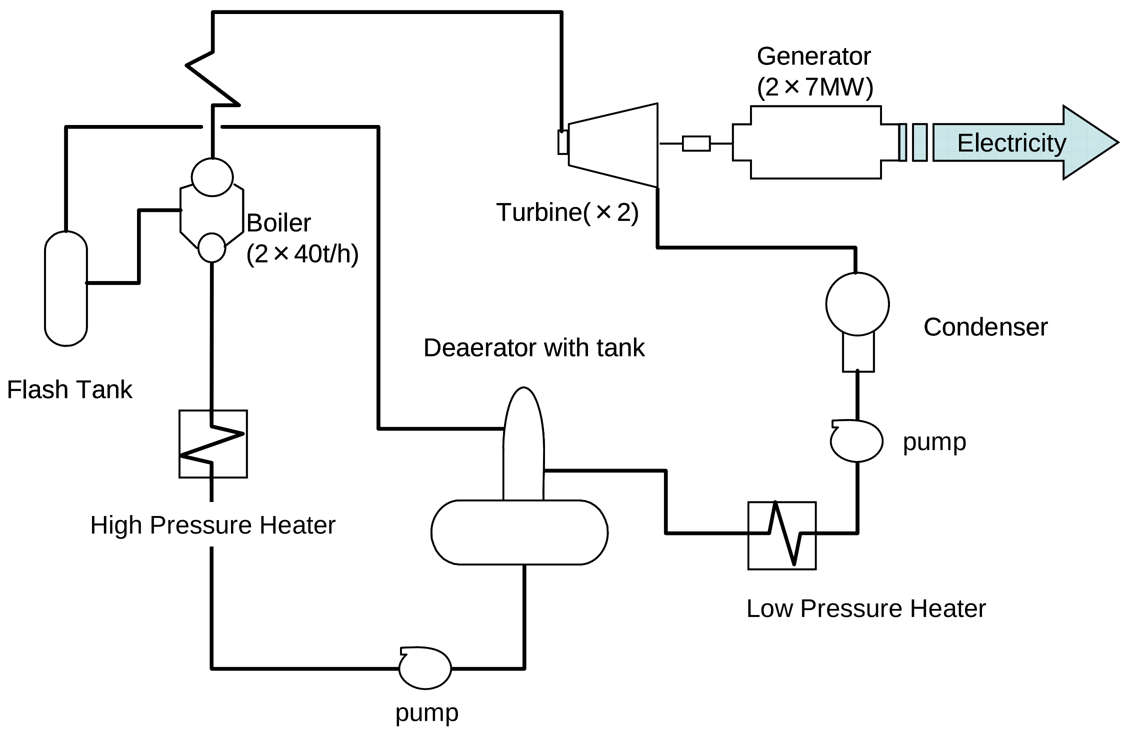


Figure 2: Outline of equipment

■ **Boiler specifications**

| | |
|---|---|
| Manufacturer | WUXI Huaguang Boiler Co., Ltd. |
| Model | SM40-3.82/450 |
| Fuel | Coal |
| Capacity | 40 t/h |
| Steam pressure | 3.82 Mpa |
| Steam temperature | 450 degrees C |
| Feed water temperature | 105 degrees C |
| Heat efficiency | 81 % |

■ **Steam Turbine Generator specifications**

| | |
|---|---|
| Manufacturer | Sichuan Dongfeng Electric Machinery Works Co., Ltd. |
| Model | QF1-7-2A |
| Capacity | 7,000kw |
| Power factor | 0.8 |
| Number of revolutions | 3,000 Rpm |

Figure 3: Steam Turbine Generator

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

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Table 1: Annual emission reductions in the first crediting period

| Year | | Estimated carbon dioxide emission reductions in first crediting period ($tCO_2$) |
|---|---|---|
| 2011 | | 93,609 |
| 2012 | | 93,609 |
| 2013 | | 93,609 |
| 2014 | | 93,609 |
| 2015 | | 93,609 |
| 2016 | | 93,609 |
| 2017 | | 93,609 |
| Estimated reductions ($tCO_2$) | Total | 655,263 |
| | Average | 93,609 |

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

CI is a privately held company, thus no public funding was or will be used to finance the CDM project. Additionally, no diversion of official development assistance (ODA) funds was or will be used for the project.

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

The project is not a debundled component of any large-scale CDM project.

As stated in Appendix C of the "Simplified Modalities and Procedures for Small-Scale CDM project activities," a proposed small-scale project activity is deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity, or an application to register another small-scale CDM project activity:

- With the same project participants;
- In the same project category and technology/measure;
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

CI has not owned or developed any registered CDM projects of the same category within one kilometer of a proposed project's boundary within the previous two years.

## 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:

This project activity falls under the definition of a small-scale CDM project activity, and therefore, falls under the following category, as indicated in Appendix B of the "Simplified Modalities and Procedures for Small-Scale CDM project activities."

Table 2: Methodologies applied

| Title | Reference documentation |
|---|---|
| Electricity generation by the user | AMS I.A./version 13 EB 42<br>Valid from 10 Oct 08 onwards |

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

The project conforms to applicability conditions as stated in the methodology of AMS I.A. Version 13, as follows:

1. The project comprises an energy generation unit for biomass fuel to supply electricity to users without going through a grid connection.
2. The capacity of the energy generation unit is 2 x 7 MW, which is less than the 15 MW eligibility limit for a small-scale CDM project activity

### B.3. Description of the project boundary:

The project boundary is delineated by the "physical, geographical site of the renewable energy generating unit," as stated in AMS I.A., Paragraph 6. Electricity will sometimes be supplied by diesel generators, such as in emergencies and during maintenance (Figure 4).

Reduction target of Greenhouse gas (GHG) is only carbon dioxide ($CO_2$).

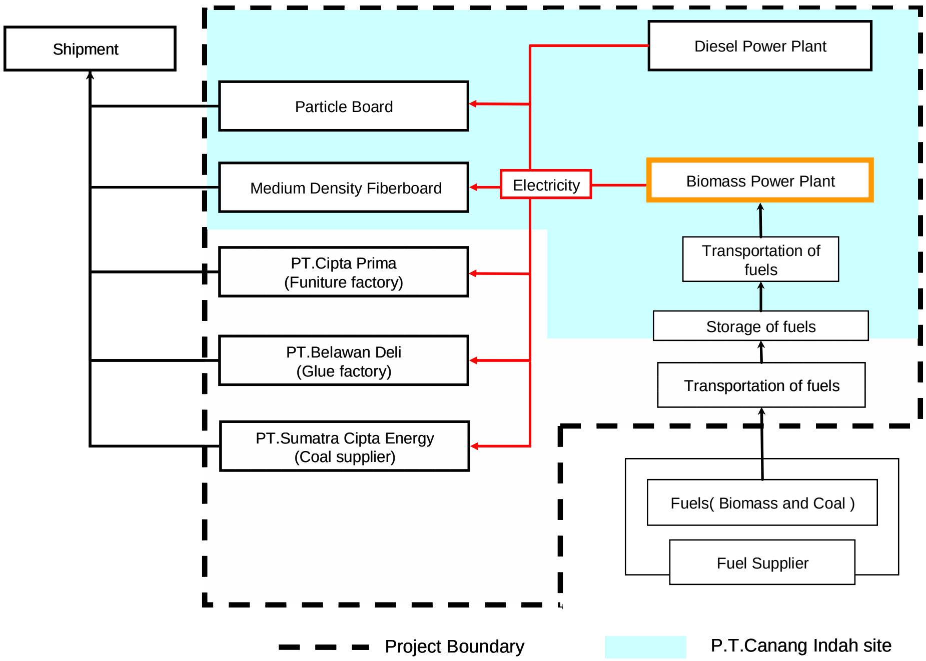


Figure 4 Project boundary

**B.4. Description of baseline and its development:**

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According to AMS I.A Version 13, the energy baseline is calculated from the “fuel consumption that would have been used in the absence of the project activity.”

The following scenarios were considered in developing the baseline

(i) Current status of the coal and waste biomass mixed fuel power generation system
(ii) Usage of diesel generators
(iii) Switchover to gas power generation
(iv) Purchase of electricity from power grids
(v) Fuel switch from coal to biomass

Among the items listed above, for item (iii), a switchover would have necessitated the installation of equipment to supply natural gas (such as pipelines) and the construction of natural gas power generation facilities, requiring a significant amount of investment. Therefore, this option was not considered for the baseline. With respect to item (iv), the purchase of electric power from the PLN grid was deemed unfeasible due to a history of power shortages and the high risk of power outages. Turning to item (ii), CI already possesses diesel generators with enough capacity for onsite power requirements. However, national policy in Indonesia is directed at lowering the proportion of its energy derived from oil while raising the proportion derived from coal. Moreover, usage of diesel oil poses major risks to achieving stable operations, since Indonesia is an oil importing country vulnerable to the impact of fluctuations in international oil prices. With respect to item (v), the maintenance costs and fuel assembling costs will become higher. Therefore, this option was not considered for the baseline.

As a result of the above, the baseline was determined according to item (i), the current status of the coal and waste biomass mixed fuel power generation system, which does not require investment costs.

CI constructed a coal power plant in 2006. Over the period from January 2007 to August 2009, calculated on an annual basis the plant generated 59,784MWh of power using 46,716 tonnes of coal and 23,916 tonnes of waste biomass. The ratio based on energy of coal to waste biomass is 7 to 3.

The equation of this project is option3 of paragraph 7(c) and paragraph 9 of AMS I.A Version 13.

**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:**

In the absence of the CDM project, CI would continue the existing practice of burning coal or mixing coal and biomass at its power plant, using an annual average of 46,716 tonnes of coal and 23,916 tonnes of biomass to generate 59,784 MWh. Through the CDM project, CI is increasing the volume of biomass it uses and reducing coal consumption. Waste biomass used will be palm kernel shells that are by-products from palm industry and occasionally waste wood from its production process. However, in its implementation of the CDM project, CI is likely to face several barriers, as described below:

***Investment barriers***
According to CI's financial analysis, current practices are already an unprofitable option, and without additional revenue, the proposed project activity will result in higher losses.

To implement the CDM project, CI will also need to secure long-term contracts with waste biomass suppliers. Currently, biomass is purchased from private suppliers (that collect biomass) on a volume basis with deadlines (e.g. one month). If the biomass suppliers succeed in meeting CI's requests before their deadlines, they receive a bonus from CI as an incentive. This scheme also assists in providing income for local people working as biomass suppliers.

CI's financial analysis also shows that increasing the volume of biomass fuel for electricity generation to meet current electricity consumption requires an additional expense of US$140,507 per year for fuel purchases and power plant maintenance. Therefore, CI will have to obtain additional financing for the expense.

***Technological barriers***
Since the power plant was originally designed for coal, the use of waste biomass fuel affects the plant's ability to reach full capacity, due to biomass' lower combustibility. Additionally, maintenance of the power plant will have to be intensified, thereby increasing the cost as well as reducing operating hours due to maintenance and repairs.

***Barriers related to the stability of biomass supply***
Although the use of biomass-based power plants has become common practice amongst Indonesian wood processing companies, waste biomass is usually obtained from a company's production process itself; therefore, availability of waste biomass supply is sustainable, controllable, and reliable. CI, however, utilizes its production waste to generate steam for its own production process, and procures waste biomass used for the power plant from external sources. Thus, availability of the supply is less reliable.

As in the case of CI, there are other companies also procuring waste biomass for power generation from external sources. However, according to the latest information available, among companies generating power on a similar scale to CI in North Sumatera, none have a facility equivalent to CI's that can generate power using 100% biomass waste procured externally.

**B.6. Emission reductions:**

**B.6.1. Explanation of methodological choices:**

The CDM project will reduce coal consumption in the power plant by reducing the volume of coal currently used and increasing the volume of waste biomass fuel.

Baseline emissions of the project comprise emissions generated by burning coal and diesel oil that would have been used in the absence of the project activity.

Baseline and project activity emissions are both calculated based on the amount of fuel (coal and diesel oil) consumed.

***<u>Emission reductions</u>***

$$ER = BE - PE - LE \quad (1)$$

Where:

| | |
|---|---|
| BE | Baseline emissions ($tCO_2$/yr) |
| PE | Project emissions ($tCO_2$/yr) |
| LE | Leakage ($tCO_2$/yr) |

***<u>Baseline emissions</u>***

The baseline is calculated based on a scenario of using an average of 46,176 tonnes of coal annually for electricity generation, the current average electricity consumption of 59,784 MWh per year, and an average of 26,868 litres per year of diesel oil for the diesel generators.

Existing use of waste biomass in mixed fuel is considered as zero emission.

$$BE = BE_{coal} + BE_{diesel\ oil} \quad (1)$$

Where:

| | |
|---|---|
| $BE_{coal}$ | Baseline emissions from coal consumption ($tCO_2$/yr) |
| $BE_{diesel\ oil}$ | Baseline emissions from diesel oil consumption ($tCO_2$/yr) |

The baseline emissions from coal consumption is calculated using the following equation:

$$BE_{coal} = FC_{coal-baseline} \times NCV_{coal} \times EF_{coal} \quad (2)$$

Where:

| | |
|---|---|
| $BE_{coal}$ | Baseline emissions from coal consumption ($tCO_2$/yr) |
| $FC_{coal-baseline}$ | Baseline amounts of coal consumption (tonnes/yr) |
| $NCV_{coal}$ | Net calorific value of coal (TJ/tonne) |
| $EF_{coal}$ | Emission factor of coal ($tCO_2$/TJ) |

➢ ***Net calorific value of coal ($NCV_{coal}$)***

$$NCV_{coal} = (GCV_{coal} \times Inc - (SE_{water} \times MC_{coal})) / 10^6$$

Where:

| | |
|---|---|
| $NCV_{coal}$ | Net calorific value of coal (TJ/tonne) |
| $GCV_{coal}$ | Gross calorific value of coal (kcal/kg) |
| Inc | International caloric unit (kJ/kcal) |
| $SE_{water}$ | Specific enthalpy of H2O vaporization (kJ/kg) |
| $MC_{coal}$ | Moisture content of coal (%) |

The baseline emissions from diesel oil consumption is calculated using the following equation:

$$BE_{diesel\ oil} = FC_{diesel\ oil\text{-}baseline} \times NCV_{diesel\ oil} \times EF_{diesel\ oil} \qquad (3)$$

Where:

| | |
|---|---|
| $BE_{diesel\ oil}$ | Baseline emissions from diesel oil consumption ($tCO_2$/yr) |
| $FC_{diesel\ oil\text{-}baseline}$ | Baseline amounts of diesel oil consumption (tonnes/yr) |
| $NCV_{diesel\ oil}$ | Net calorific value of diesel oil (TJ/tonne) |
| $EF_{diesel\ oil}$ | Emission factor of diesel oil ($tCO_2$/TJ) |

A diesel oil density value of 0.837 kg/litre is used to convert the diesel oil consumption unit, which was originally recorded in litres, to tonnes.

***Project emissions***

For power generation of less than 10 MW, a 100% biomass scheme will be applied. Thus, project emission will be calculated from the amount of diesel oil used for fuelling the diesel generators. However, since biomass supply is less reliable, project emissions will also take into account the amount of alternative fuels (e.g. coal) used in the case of biomass supply shortage. Any event of biomass shortage will be recorded in the monitoring activity.

As coal will be used for power generation of more than 10 MW, coal consumption will also be factored in the project emission calculation.

The formula used to calculate project emissions is basically similar to the formula for calculating baseline emissions.

$$PE = PE_{coal} + PE_{diese\ oil} \qquad (1)$$

Where:

| | |
|---|---|
| $PE_{coal}$ | Project emissions from coal consumption ($tCO_2$/yr) |
| $PE_{diesel\ oil}$ | Project emissions from diesel oil consumption ($tCO_2$/yr) |

Project emissions from coal consumption is calculated using the following equation:

$$PE_{coal} = FC_{coal\text{-}project} \times NCV_{coal} \times EF_{coal} \quad (2)$$

Where:

| | |
|---|---|
| $PE_{coal}$ | Project emissions from coal consumption ($tCO_2$) |
| $FC_{coal\text{-}project}$ | Project amounts of coal consumption (tonnes/yr) |
| $NCV_{coal}$ | Net calorific value of coal (TJ/tonne) |
| $EF_{coal}$ | Emission factor of coal ($tCO_2$/TJ) |

Project emissions from diesel consumption is calculated using the following equation:

$$PE_{diesel\ oil} = FC_{diesel\ oil\text{-}project} \times NCV_{diesel\ oil} \times EF_{diesel\ oil} \quad (3)$$

Where:

| | |
|---|---|
| $PE_{diesel\ oil}$ | Project emissions from diesel oil consumption ($tCO_2$) |
| $FC_{diesel\ oil\_project}$ | Project amounts of diesel oil consumption (tonnes/yr) |
| $NCV_{diesel\ oil}$ | Net calorific value of diesel oil (TJ/tonne) |
| $EF_{diesel\ oil}$ | Emission factor of diesel oil ($tCO_2$/TJ) |

***Leakage***

Regarding emissions from fuel transportation activity, coal was purchased from other provinces and transported by ship to Belawan port, while palm kernel shells were purchased from mills and plantations in North Sumatera. Therefore, emissions from fuel transportation under the baseline scenario are higher than emissions from the project activity. Accordingly, leakage from fuel transportation is considered zero.

***Specific fuel consumption(SFCi)***

According to AMS I.A. Paragraph 16, in projects that mix fossil fuels and waste biomass, the specific fuel consumption of each type of fuel must be determined, and a predetermined equation must be used. In CI's case, this applies to the specific fuel consumption of coal and palm kernel shells by ex-ante calculation (whereas in the event it uses other fuels, the specific fuel consumption of those particular fuels must also be provided in advance).
The equation is presented below:

$$SFCi = (PTE \times 10^3) / ((NCVi \times 10^9) / Inc) \quad (1)$$

Where:

| | |
|---|---|
| SFCi | Specific fuel consumption of fuel i (tonnes/MWh) |
| PTE | Calorific value required for electricity production (kcal/kWh) |
| NCVi | Net calorific value of fuel i (TJ/tonne) |
| Inc | International caloric unit (kJ/kcal) |

- ***Net calorific value of fuel i (NCVi)***

$$NCVi = (GCVi \times Inc - ( SE_{water} \times MCi )) / 10^6$$

Where:

| | |
|---|---|
| NCVi | Net calorific value of palm kernel shells (TJ/tonne) |
| GCVi | Gross calorific value of palm kernel shells (kcal/kg) |
| Inc | International caloric unit (kJ/kcal) |
| $SE_{water}$ | Specific enthalpy of H2O vaporization (kJ/kg) |
| MCi | Moisture content of palm kernel shells (%) |

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

| **Data / Parameter:** | **$FC_{coal-baseline}$** |
|---|---|
| Data unit: | tonnes/yr |
| Description: | Amount of baseline coal consumption |
| Source of data used: | CI Power Plant |
| Value applied: | 46,716 |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | The amount of coal consumed by the CI power plant for electricity generation per year has been calculated from the average annual coal consumption between January 2007 and August 2009. |
| Any comment: | N/A |

| **Data / Parameter:** | **$EF_{coal}$** |
|---|---|
| Data unit: | $tCO_2/TJ$ |
| Description: | Emission factor of coal |
| Source of data used: | 2006 IPCC default Emission Factor for sub-bituminous coal |
| Value applied: | 96.1 |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | The IPCC default was used as no country specific values were available |
| Any comment: | N/A |

| **Data / Parameter:** | **$GCV_{coal}$** |
|---|---|
| Data unit: | kcal/kg |
| Description: | Gross calorific value of coal |
| Source of data used: | CI internal laboratory |
| Value applied: | 5,170 |
| Justification of the | The average GCV of coal used by CI was obtained from analysis performed by |

| | |
|---|---|
| choice of data or description of measurement methods and procedures actually applied: | its internal laboratory for each coal shipment purchased.<br><br>Equipment used for the analysis was calibrated internally in CI's laboratory, while the calibration tools and equipment were calibrated externally at relevant national institutions. |
| Any comment: | N/A |

| **Data / Parameter:** | **Inc** |
|---|---|
| Data unit: | kJ/kcal |
| Description: | International calorific value |
| 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: | — |
| Any comment: | N/A |

| **Data / Parameter:** | **$SE_{water}$** |
|---|---|
| Data unit: | kJ/kg |
| Description: | Specific enthalpy of $H_2O$ vaporization |
| Source of data used: | Based on definitions |
| Value applied: | 2,256 |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | 100℃, 1 atmosphere condition |
| Any comment: | N/A |

| **Data / Parameter:** | **$MC_{coal}$** |
|---|---|
| Data unit: | % |
| Description: | Moisture content of coal |
| Source of data used: | CI internal laboratory |
| Value applied: | 29 |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | The average value of the moisture content of coal used by CI is obtained from analysis performed by its internal laboratory for each coal shipment purchased.<br><br>Equipment used for the analysis is calibrated internally in CI's laboratory, while the calibration tools and equipment have been calibrated externally at relevant national institutions. |
| Any comment: | N/A |

| | |
|---|---|
| **Data / Parameter:** | **$FC_{diesel\ oil\text{-}baseline}$** |
| Data unit: | tonnes/yr |
| Description: | Baseline for amount of diesel oil consumption |
| Source of data used: | CI Power Plant |
| Value applied: | 22.49 |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | The amount of diesel oil consumed by CI for the back-up diesel generators used during power plant maintenance has been calculated from the average annual diesel oil consumption between January 2007 and August 2009<br><br>A diesel oil density value of 0.837 kg/litre was used to convert the diesel oil consumption unit from litres to tonnes. |
| Any comment: | N/A |

| | |
|---|---|
| **Data / Parameter:** | **$NCV_{diesel\ oil}$** |
| Data unit: | TJ/tonne |
| Description: | Net calorific value of diesel oil |
| Source of data used: | 2006 IPCC default Emission Factor for diesel oil |
| Value applied: | 0.043 |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | The IPCC default was used as no country specific values were available |
| Any comment: | N/A |

| | |
|---|---|
| **Data / Parameter:** | **$EF_{diesel\ oil}$** |
| Data unit: | $tCO_2/TJ$ |
| Description: | Emission factor of diesel oil ($tCO_2/TJ$) |
| Source of data used: | 2006 IPCC default Emission Factor for diesel oil |
| Value applied: | 74.1 |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | The IPCC default was used as no country specific values were available |
| Any comment: | N/A |

| **Data / Parameter:** | **PTE** |
|---|---|
| Data unit: | kcal/kWh |
| Description: | Calorific value required for electricity production |
| Source of data used: | Based on heat balance from manufacture |
| Value applied: | 4,392.85 |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | Based on heat balance from manufacture |
| Any comment: | N/A |

| **Data / Parameter:** | **$GCV_{kernel}$** |
|---|---|
| Data unit: | kcal/kg |
| Description: | Gross calorific value of palm kernel shells |
| Source of data used: | Measured data |
| Value applied: | 4,489 |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | Measured data was provided by SUCOFINDO (Superintending Company of Indonesia), commissioned as a third party by CI. |
| Any comment: | N/A |

| **Data / Parameter:** | **$MC_{kernel}$** |
|---|---|
| Data unit: | % |
| Description: | Moisture content of palm kernel shells |
| Source of data used: | Measured data |
| Value applied: | 12 |
| Justification of the choice of data or description of measurement methods and procedures actually applied: | Measured data was provided by SUCOFINDO (Superintending Company of Indonesia), commissioned as a third party by CI. |
| Any comment: | N/A |

**B.6.3 Ex-ante calculation of emission reductions:**

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***Emission reductions***

$$ER = BE - PE - LE \quad (1)$$
$$= 94{,}350 - 741 - 0$$
$$= 93{,}609\ (tCO_2/yr)$$

***Baseline emissions***

$$BE = BE_{coal} + BE_{diesel\ oil} \quad (1)$$
$$= 94{,}278 + 72$$
$$= 94{,}350\ (tCO_2/yr)$$

$$BE_{coal} = FC_{coal\text{-}baseline} \times NCV_{coal} \times EF_{coal} \quad (2)$$
$$= 46{,}716 \times 0.0210 \times 96.10$$
$$= 94{,}278\ (tCO_2/yr)$$

- ***Net calorific value of coal ($NCV_{coal}$)***

$$NCV_{coal} = (GCV_{coal} \times Inc - (SE_{water} \times MC_{coal}))\ /\ 10^6$$
$$= (5{,}170 \times 4.1868 - (2{,}256 \times 29\%))\ /\ 10^6$$
$$= 0.0210\ (TJ/tonne)$$

$$BE_{diesel\ oil} = FC_{diesel\ oil\text{-}baseline} \times NCV_{diesel\ oil} \times EF_{diesel\ oil} \quad (3)$$
$$= 22.49 \times 0.043 \times 74.1$$
$$= 72\ (tCO_2/yr)$$

A diesel oil density value of 0.837 kg/litre was used to convert diesel oil consumption unit from litres to tonnes.

***Project emissions***

$$PE = PE_{coal} + PE_{diesel\ oil} \quad (1)$$
$$= 0 + 741$$
$$= 741\ (tCO_2/yr)$$

$$PE_{coal} = FC_{coal\text{-}project} \times NCV_{coal} \times EF_{coal} \quad (2)$$
$$= 0 \times 0.0210 \times 96.10$$
$$= 0\ (tCO_2/yr)$$

$$PE_{diesel\ oil} = FC_{diesel\ oil\text{-}project} \times NCV_{diesel\ oil} \times EF_{diesel\ oil} \quad (3)$$
$$= 232.49 \times 0.043 \times 74.1$$
$$= 741\ (tCO_2/yr)$$

***Specific fuel consumption (SFCi)***

➢ ***Specific fuel consumption of coal ($SFC_{coal}$)***

$$SFC_{coal} = (PTE \times 10^3) / ((NCV_{coal} \times 10^9) / Inc)$$
$$= (4{,}392.85 \times 10^3) / ((0.0210 \times 10^9) / 4.1868) \quad (1)$$
$$= 0.88 \text{ (tonnes/MWh)}$$

➢ ***Specific fuel consumption of palm kernel shells ($SFC_{kernel}$)***

$$SFC_{kernel} = (PTE \times 10^3) / ((NCV_{kernel} \times 10^9) / Inc) \quad (2)$$
$$= (4{,}392.85 \times 10^3) / ((0.0185 \times 10^9) / 4.1868)$$
$$= 0.99 \text{ (tonnes/MWh)}$$

✓ ***Net calorific value of palm kernel shells ($NCV_{kernel}$)***

$$NCV_{kernel} = (GCV_{kernel} \times Inc - (SE_{water} \times MC_{kernel})) / 10^6$$
$$= (4{,}489 \times 4.1868 - (2{,}256 \times 12\%)) / 10^6$$
$$= 0.0185 \text{(TJ/tonne)}$$

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

The project activity is expected to reduce $CO_2$ emissions by 93,609 $tCO_2$ per year. The following table shows the estimated amount of emission reductions over the chosen crediting period.

| Year | Estimation of baseline emissions ( $tCO_2$) | Estimation of project emissions ( $tCO_2$) | Estimation of leakage ($tCO_2$) | Estimation of overall emission reductions ($tCO_2$) |
|---|---|---|---|---|
| 2011 | 94,350 | 741 | 0 | 93,609 |
| 2012 | 94,350 | 741 | 0 | 93,609 |
| 2013 | 94,350 | 741 | 0 | 93,609 |
| 2014 | 94,350 | 741 | 0 | 93,609 |
| 2015 | 94,350 | 741 | 0 | 93,609 |
| 2016 | 94,350 | 741 | 0 | 93,609 |
| 2017 | 94,350 | 741 | 0 | 93,609 |
| **TOTAL** | **660,450** | **5,187** | **0** | **655,263** |

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

### B.7.1 Data and parameters monitored:

| **Data / Parameter:** | **$FC_{coal\text{-}project}$** |
|---|---|
| Data unit: | tonnes/yr |
| Description: | Amount of project coal consumption |
| Source of data to be used: | CI Power Plant |
| Value of data | 0 |
| Description of measurement methods and procedures to be applied: | As coal is not used at the present stage, preliminary calculations assume 0t/yr of coal consumption. In the event that coal is used, the amount used will be monitored in the same manner as that of waste biomass. |
| QA/QC procedures to be applied: | Instrument accuracy will be monitored according to the ISO 9001 standard for management systems. |
| Any comment: | N/A |

| **Data / Parameter:** | **$FC_{diesel\ oil\text{-}project}$** |
|---|---|
| Data unit: | tonnes/yr |
| Description: | Amount of project diesel oil consumption |
| Source of data to be used: | CI Power Plant |
| Value of data | 232.49 |
| Description of measurement methods and procedures to be applied: | The actual amount of diesel oil consumption will be recorded with a flow meter.<br><br>A diesel oil density value of 0.837 kg/litre is used to convert the diesel oil consumption unit from litres to tonnes. |
| QA/QC procedures to be applied: | Instrument accuracy will be monitored according to the ISO 9001 standard for management systems. |
| Any comment: | N/A |

| **Data / Parameter:** | **$FC_{kernel}$** |
|---|---|
| Data unit: | tonnes/yr |
| Description: | The amount of palm kernel shells consumed annually by the CI power plant for electricity generation, assuming current electricity consumption and use of 100% biomass fuel |
| Source of data to be used: | CI Power Plant |
| Value of data | 58,168 |
| Description of measurement methods and procedures to be | Quantity of palm kernel shells is monitored by truck scale.<br>We currently plan to generate electricity using only palm kernel shells. |

| | |
|---|---|
| applied: | |
| QA/QC procedures to be applied: | Instrument accuracy will be monitored according to the ISO 9001 standard for management systems. |
| Any comment: | N/A |

| **Data / Parameter:** | **FCi** |
|---|---|
| Data unit: | tonnes/yr |
| Description: | The amount of fuel i consumed annually by the CI power plant for electricity generation |
| Source of data to be used: | CI Power Plant |
| Value of data | — |
| Description of measurement methods and procedures to be applied: | We currently plan to generate electricity using only palm kernel shells. Other types of waste biomass might also be used, however, and consumption of each type will be monitored by truck scale. |
| QA/QC procedures to be applied: | Instrument accuracy will be monitored according to the ISO 9001 standard for management systems. |
| Any comment: | N/A |

| **Data / Parameter:** | **GCVi** |
|---|---|
| Data unit: | kcal/kg |
| Description: | Gross calorific value of fuel i used for electricity generation |
| Source of data to be used: | CI Internal Laboratory |
| Value of data | — |
| Description of measurement methods and procedures to be applied: | If other types of waste biomass other than palm kernel shells use for electricity generation, the gross calorific value of that fuel is monitored.<br><br>This value will be monitored by CI's internal laboratory.<br><br>Equipment used for analysis will be calibrated internally in CI's laboratory, while the calibration tools and equipment are calibrated externally at relevant national institutions. |
| QA/QC procedures to be applied: | Instrument accuracy will be monitored according to the ISO 9001 standard for management systems. |
| Any comment: | N/A |

| | |
|---|---|
| **Data / Parameter:** | **MCi** |
| Data unit: | % |
| Description: | Moisture content of fuel i |
| Source of data to be used: | CI Internal Laboratory |
| Value of data | — |
| Description of measurement methods and procedures to be applied: | If other types of waste biomass other than palm kernel shells use for electricity generation, the moisture content of that fuel is monitored.<br><br>This value will be monitored by CI's internal laboratory.<br><br>Equipment used for the analysis will be calibrated internally in CI's laboratory, while the calibration tools and equipment are calibrated externally at relevant national institutions. |
| QA/QC procedures to be applied: | Instrument accuracy will be monitored according to the ISO 9001 standard for management systems. |
| Any comment: | N/A |

| | |
|---|---|
| **Data / Parameter:** | **EG** |
| Data unit: | MWh/year |
| Description: | Amount of electricity generated by the CI power plant |
| Source of data to be used: | CI Power Plant |
| Value of data | 59,784 |
| Description of measurement methods and procedures to be applied: | The actual amount of electricity produced will be recorded with a dedicated power generation monitor. |
| QA/QC procedures to be applied: | Instrument accuracy will be monitored according to the ISO 9001 standard for management systems. |
| Any comment: | N/A |

**B.7.2 Description of the monitoring plan:**

Monitoring will be conducted by a designated team consisting mainly of staff from the power plant. All related data and information will be stored by the team coordinator, collected on a daily basis, and reviewed monthly and annually.

Beside power plant parameters, monitoring will also cover recorded data related to the supply of waste biomass, including the source; site location and distance from CI; transportation method and amount of fuel used; and price.

Any case of biomass supply shortage that may cause CI to shift its fuel back to coal will also be recorded.

The calorific value and moisture content of every waste biomass shipment will be examined by CI's internal laboratory.

Equipment used for the analysis is calibrated internally by CI's QA/QC sub-department, while the calibration tools and equipment are calibrated externally at relevant national institutions.

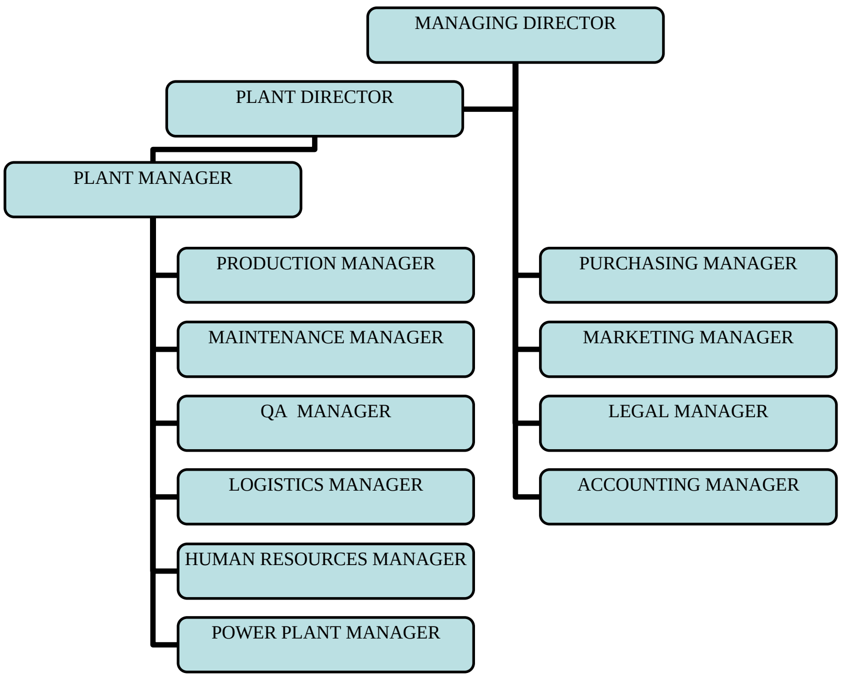


Figure 5 Management Structure

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

A baseline study was completed on January 19, 2010, by Dr. Retno G. Dewi and Ms. Syahrina D. Anggraini from CER Indonesia, and by Mr. Yasuhiro Yokoyama from Sumitomo Forestry Co., Ltd.

## 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:

The starting date of the project activity is January 1, 2011, or the project's registration date.

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

Over 20 years

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

#### C.2.1. Renewable crediting period

##### C.2.1.1. Starting date of the first crediting period:

>>
January 1, 2011, or the project's registration date.

##### C.2.1.2. Length of the first crediting period:

>> 7 years

#### C.2.2. Fixed crediting period:

##### C.2.2.1. Starting date:

>> Not applicable

##### C.2.2.2. Length:

>> Not applicable

## 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 State Ministry of Environment Decree No.11/2006 states that biomass power generation facilities with capacity of 10MW or greater are considered to be in a business category to which the AMDAL method of environmental impact assessment shall be applied. As the total installed capacity of CI's power plant is 14 MW, AMDAL has been completed. It was endorsed by the mayor of Medan City on November 10, 2009, under the validation code of 660/914.K/2009.The results of surveys of the AMDAL are to be submitted to Medan City twice yearly.

Since the project activity will make use of waste biomass, greater reductions of air contaminant when compared to the utilization of fossil fuels.

### 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:

There are no significant environmental impacts not covered in section D.1.

## SECTION E. Stakeholders' comments

>>

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

A stakeholder meeting was held in Medan on January 19, 2010. It was not held at the power plant due to logistical reasons. The meeting was attended by 13 representatives from local government agencies, NGOs, and the local community.

### E.2. Summary of the comments received:

Stakeholders, particularly those from local environmental agencies, supported the implementation of project activities. They stated that the project could serve as an example for other companies to increase their level of environmental awareness, as well as an effective solution to the issue of ash removal. Community representatives asked for more information regarding climate change issues, and the possibility of more employment opportunities for local people.

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

CI is taking into consideration suggestions of holding activities to educate local communities on climate change related issues. Regarding work opportunities, CI has mostly hired its staff from nearby areas, thereby providing work opportunities for local people. As for skilled workers, CI does not discriminate based on nationality or region, and welcomes qualified local candidates.

Figure 6 Stakeholder meeting picture 1

Figure 7 Stakeholder meeting picture 2

Figure 8 Stakeholder meeting picture 3

Figure 9 Stakeholder meeting picture 4

## Annex 1

**CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

| | |
|---|---|
| Organization: | P.T. Canang Indah |
| Street/P.O.Box: | Jl. Prof. H.M. Yamin SH No. 46 |
| Building: | |
| City: | Medan |
| State/Region: | North Sumatera |
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| Country: | Indonesia |
| Telephone: | +62-61-4525799 |
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| E-Mail: | |
| URL: | www.tjipta.com |
| Represented by: | |
| Title: | |
| Salutation: | |
| Last Name: | |
| Middle Name: | |
| First Name: | |
| Department: | |
| Mobile: | |
| Direct FAX: | |
| Direct tel: | |
| Personal E-Mail: | |

| | |
|---|---|
| Organization: | Sumitomo Forestry Co.Ltd. |
| Street/P.O.Box: | 1-3-2 Otemachi |
| Building: | Keidanren Kaikan |
| City: | Chiyoda-ku |
| State/Region: | Tokyo |
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| E-Mail: | |
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| Represented by: | |
| Title: | Manager |
| Salutation: | Mr. |
| Last Name: | Ikeda |
| Middle Name: | |
| First Name: | Atsushi |
| Department: | Environmental management |
| Mobile: | |
| Direct FAX: | |

| | |
|---|---|
| Direct tel: | |
| Personal E-Mail: | ikd@sfc.co.jp |

**Annex 2**

**INFORMATION REGARDING PUBLIC FUNDING**

No public funds or ODA were used to support the proposed project

## Annex 3

## BASELINE INFORMATION

### (1) Electricity generation and fuel consumption

The baseline was developed through an analysis of CI's data between January 2007 and August 2009. It was calculated by multiplying CI's coal consumption during this period with its calorific value and emission factor. An annual average was then calculated from the results.

Data on coal consumption used for the baseline calculation is as follows:

| Month | Electricity generation (MWh) | Coal consumption (tonnes) | Diesel oil consumption (litres) | Palm kernel shells consumption (t) | Woody biomass consumption (t) |
|---|---|---|---|---|---|
| January 2007 | 3,535.63 | 2,773.55 | - | 702.74 | - |
| February 2007 | 2,720.16 | 1,428.75 | - | 1,197.45 | - |
| March 2007 | 4,496.54 | 2,495.68 | - | 1,758.41 | - |
| April 2007 | 4,360.90 | 3,629.49 | - | 1,658.02 | - |
| May 2007 | 3,518.64 | 2,693.30 | 28,060.00 | 1,174.90 | - |
| June 2007 | 4,241.95 | 3,036.93 | - | 1,062.57 | - |
| July 2007 | 4,718.02 | 3,451.15 | 9,000.00 | 1,324.12 | - |
| August 2007 | 5,800.75 | 5,134.82 | - | 1,574.94 | - |
| September 2007 | 5,678.50 | 5,863.87 | 750.00 | 522.53 | - |
| October 2007 | 5,914.37 | 6,977.21 | 125.00 | - | - |
| November 2007 | 5,436.86 | 6,546.85 | 125.00 | - | - |
| December 2007 | 5,508.43 | 6,757.03 | 50.00 | - | - |
| January 2008 | 5,954.40 | 8,035.40 | 200.00 | - | - |
| February 2008 | 5,348.88 | 6,051.50 | 125.00 | - | - |
| March 2008 | 5,744.45 | 5,911.60 | 125.00 | - | - |
| April 2008 | 5,624.06 | 5,356.45 | 50.00 | 465.45 | - |
| May 2008 | 5,820.62 | 5,228.84 | 200.00 | 1,088.16 | 174.00 |
| June 2008 | 4,083.26 | 4,128.75 | 10,000.00 | 731.65 | - |
| July 2008 | 5,641.78 | 4,541.07 | 2,500.00 | 1,819.35 | 52.08 |
| August 2008 | 5,854.18 | 4,832.07 | 250.00 | 1,816.13 | - |
| September 2008 | 5,327.28 | 3,365.22 | 750.00 | 2,727.28 | - |
| October 2008 | 5,638.75 | 3,970.54 | 50.00 | 2,525.97 | 44.39 |
| November 2008 | 3,428.78 | 1,326.83 | 400.00 | 2,962.04 | 44.46 |
| December 2008 | 3,734.78 | 547.16 | 925.00 | 4,072.54 | - |
| January 2009 | 2,765.09 | 603.20 | 1,375.00 | 2,896.90 | - |
| February 2009* | 4,863.60 | - | - | - | - |

| | | | | | |
|---|---|---|---|---|---|
| March 2009* | 5,841.36 | - | - | - | - |
| April 2009 | 5,539.10 | 200.70 | 1,500.00 | 4,932.00 | 2,902.30 |
| May 2009 | 5,759.86 | 1,754.20 | 125.00 | 4,843.86 | 1,666.04 |
| June 2009 | 5,654.16 | 1,560.10 | 250.00 | 5,675.04 | 2.66 |
| July 2009 | 5,800.03 | 1,183.00 | 275.00 | 5,103.32 | 1,114.30 |
| August 2009 | 5,807.23 | 7,407.20 | 1,000.00 | 831.73 | 324.35 |
| Monthly average | 4,982.00 | 3,893.00 | 2,239.00 | 1,782.00 | 211.00 |
| Yearly average | 59,784.00 | 46,716.00 | 26,868.00 | 21,384.00 | 2,532.00 |

* The trial period for the application of full biomass is excluded from calculations

**(2) Waste biomass availability**

CI intends to use palm kernel shells that is by-products from palm industry, currently its most-used biomass fuel, as the primary fuel in this CDM project.

Besides palm kernel shells, other types of waste biomass that can be used are palm oil extracts such as empty fruit bunches (EFB) and fibre, wood fibre generated from CI's factory operations, and old gum tree roots.

According to the results of a study commissioned to an external party, the calorific value and moisture content of palm kernel shells used by CI was 4,489 cal/kg and 12%, respectively. CI conducted trial tests in February and March 2009 that demonstrated the viability of power generation using 100% palm kernel shells. It was also able to secure the necessary supply for power generation.

In addition to the use of palm kernel shells, which has emerged as a highly competitive biomass fuel, the roots of old gum trees from abandoned plantations represent an untapped fuel source, though an uncompetitive one. Of the total 289,054 tonnes of scrap wood CI used as a raw material for its product manufacturing in 2008, wood from old gum trees made up 80%, or approximately 231,000 tonnes. CI used old gum trees of less than 15 centimetres in diameter as a raw material for its medium-density fibre board and particle board, whereas trees of more than 15 centimetres in diameter are generally used for timber. Since the roots of an old gum tree are about 20% the volume of the tree itself, it is conceivable that these roots constitute from 30 to almost 40% of the total raw materials used by CI.

Conservatively assuming that 30% of total raw materials used are gum tree roots, the amount of this material would total 69,373 tonnes per year. This represents 119% of CI's total fuel requirements, and therefore a surplus of biomass material. As such, there is no need to consider leakage from competing uses for the waste biomass.

## Annex 4

### MONITORING INFORMATION

Monitoring power plant related parameters will be conducted by the officers of CI's power plant, and assisted by its QA division.

- - - - -