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. • 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:

Biomass based co-generation project
Version: 2.3
Date: 20/01/2011

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

Hayel Saeed Anam Group (HSA) is setting up a biomass cogeneration plant in their new palm oil refinery located in the city of Dumai, on the Island of Sumatra, Indonesia. The Project is being implemented by their subsidiary, PT Pacific Indopalm Industries (hereafter referred as Project proponent).

The proposed project activity will generate thermal energy as well as electricity by using renewable biomass. The generated steam and power in the project activity will meet the energy demand of the Palm oil refinery. The project proponent has proposed the project activity in order to achieve the following objectives:

- To save equivalent amount of fossil fuel and thus effectively contribute to global efforts for mitigation of GHGs emission and climate change.
- To conserve scarce natural resources by decreasing the consumption of fossil fuels for power and steam generation.

The project activity involves the installation of 2*20TPH biomass fired boilers, 2MW back pressure turbine and 2MW full condensing turbine. Primarily Palm Kernel Shell will be used as biomass fuel in the boiler.

Indonesia has the world's largest palm plantations and many of these palm plantations are located on the island of Sumatra. The project activity is estimated to consume 81,080 MT/yr of palm kernel shell. The palm kernel shell would be procured from CPO mills located in Riau and Jambi Provinces which are among the largest producers of palm oil in Indonesia.

The proposed project activity would ensure the mitigation of green house gas emissions into the atmosphere; contributing to the improvement of local environment by eliminating pollution in the area.

Project activity's contribution to sustainable development:

The project activity contributes to the sustainable development in the following manner:

Social well-being

- The project activity will result in lower GHG emissions to the surrounding environment when compared to fossil fuel based cogeneration plant.
- The project activity will provide opportunity for biomass suppliers, contractors, local population etc.

Economic well-being

- The project activity will generate employment opportunities for skilled and unskilled workers during the project period. People will be employed on permanent or temporary basis for operation of plant, loading, unloading of biomass etc.
- The project activity will help in conservation of fast depleting natural resources like coal, thereby contributing to the economic well being of country as a whole.

Environmental well-being

- Renewable biomass will be used as a fuel in the project activity. Use of renewable fuels will reduce the GHG emissions to the environment as compared to non-renewable fuels which have positive emissions to the atmosphere. Further PP will install multi cyclone dust collector to control the emission of particulate matters.
- Project activity includes waste water treatment plant for proper treatment of waste water generated from refinery.
- Project activity will also reduce the pollution associated with the extraction of the fossil fuel
- Sea water instead of ground water will be used in the process. Sea Water Reverse Osmosis System (SWRO) will be set up to make sure that sea water ecosystem doesn't get damaged.

Technological well being:

- Project will use Biomass Fired High Pressure system which is amongst the first few of its kind in Edible Oil Refinery sector in Indonesia.
- Project will also provide in house training to the employees of PT Pacific Indopalm Industries.
- Project activity is also expected to encourage technology providers in putting more R&D efforts towards new and renewable technology development.

A.3. Project participants:

Name of Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Indonesia (host)	PT Pacific Indopalm Industries (Private entity)	No

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

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

A.4.1.1. Host Party(ies):

Indonesia

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

Province of Riau, Island of Sumatra

A.4.1.3. City/Town/Community etc:

City of Dumai

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

The geographical location of the plant is between Longitude 101^{0}27’00’’ East and Latitude 1^{0}41’00’’ North.
Nearest Airport: Dumai
Nearest Railway station: Padang
Distance between Project site and nearest Airport: 4 Km
Location is depicted in following maps-

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

The project activity is a small scale project activity and confirms to Appendix B of the simplified modalities and procedures for small-scale CDM project activities.

TYPE I: Renewable Energy Projects,

Category **IC: "Thermal energy production with or without electricity";** Version 16, Sectoral Scope 01, EB-51

Reference:
http://cdm.unfccc.int/UserManagement/FileStorage/JPDYLFAR5MKUVZ97G31H84TS0CEBQN

Technology employed for the project activity:

The proposed project activity involves the installation of a biomass based co-generation plant that supplies steam as well as electricity to the oil refinery. Primarily Palm Kernel Shell will be used as biomass fuel in the boilers. The co-generation plant entails installation of 2*20TPH biomass fired boilers, 1*2MW back pressure turbine and 1*2MW full condensing turbine. The technical specification of the boilers and turbines used in the project activity is as below.

Boiler specification

Type	Bi drum, water tube	
Capacity	2 * 20	TPH
Steam Pressure	67	Bar(g)
Steam Temperature	450	^{0}C

Back pressure turbine specification

Type	Back pressure turbine	
Capacity	1 * 2	MW
Steam inlet Pressure	66.5 to 67	Bar(g)
Steam inlet Temperature	435	^{0}C
Back pressure (Exhaust)	7	Bar(g)
Steam flow	22	TPH

Condensing turbine specification

Type	Full condensing turbine	
Capacity	1 * 2	MW
Steam inlet Pressure	66.5 to 67	Bar(g)
Steam inlet Temperature	435	^{0}C
Exhaust pressure	.01	Bar(g)
Steam flow	9.792	TPH

Process layout

The Plant is designed with other auxiliary systems also, like:-

1) Water submerged ash conveyer
2) SOOT blower system
3) Multi cyclone dust arrestor
4) Fire protection system
5) Electronic control panel
6) Waste Water Treatment Plant comprising of an Enzyme based Digestion System
7) Sea Water Reverse Osmosis System (SWRO) has been set up to reduce the consumption of ground water.
8) Shore Protection System has been setup to control soil erosion at sea shore[1].

The technology used for the project activity is environmentally safe and sound technology. The supplier of technology shall provide experienced site engineers to supervise and check the installation, settings, adjustments, tuning, commissioning and synchronization of output steam from both the boilers and synchronization of output power from both the turbines. Supplier shall provide training to the power plant operational personnel for successful operation of plant.

Steam and power consumption in process: -

A) Steam consumption in turbine:

ITEM	MT/Hr
Steam Consumption in 2 MW Back Pressure Turbine	22
Steam Consumption in 2 MW Full Condensing Turbine	9.792

B) Steam and power demand of the process:

PROCESS	Power	Steam MT/Hr – LP		Steam
	KW	Start Up	Running	MT/Hr -HP[2]
Lipico -Refinery 1500 MTD	602.40	9.42	8.69	7.10
Intersonikon -Fractionation – 600 MTD	599.90	3.35	3.09	0
Oiltek -Fractionation – 600 MTD	420.00	3.52	3.25	0
Tank farm -40,000 MT Storage capacity, Pumps for Oil Sump & Pigging System.	271.00	2.11	1.95	0
PKS Boiler – 2units - Parasitic load.	772.80	0.00	0.00	0
PKS Boiler – 2 units- Fuel handling.	41.50	0.00	0.00	0
PKS Boiler – 2 units- Thermal Deaerators.	15.00	3.60	2.35	0
Steam turbines – 2 Units.	466.00	0.00	0.00	0
SWRO Plant	240.66	0.00	0.00	0
Water Softner Plant.	12.56	0.00	0.00	0
WWTP – Effluent Plant	30.00	0.00	0.00	0
Fire Alarm & Fire fighting system.	157.50	0.00	0.00	0
Others[3]	292.63	0.00	0.00	0
TOTAL:	**3921.95**	**22.00**	**19.33**	**7.10**

[1] Plant is located at sea shore and it's utilizing sea water to meet its process water demand.

[2] HP - Refers to high pressure steam at 65 brag and LP – refers to low pressure steam at 7 barg

[3] Others refer to Street & Boundary Lights, Jetty Lights, Indoor lighting – Utility I & II, Spent earth Store, Spare Parts Store, Weighbridge, Canteen, Mosque, Security office, Main office, Water Supply System Etc.

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

Years	Estimation of annual emission reductions in tonnes of CO_2 e
2010-2011	86760
2011-2012	86760
2012-2013	86760
2013-2014	86760
2014-2015	86760
2015-2016	86760
2016-2017	86760
2017-2018	86760
2018-2019	86760
2019-2020	86760
Total estimated reduction (tonnes of CO_2 e)	867600
Total number of crediting years	10
Annual average of the estimated reductions over the crediting period	86760

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

The project activity does not involve any public funding from Annex-1 countries or through ODA.

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

The project activity is not a de-bundled component of a large project activity as there is no registered small scale project activity or application to register another project activity;

- with the same project participants
- in the same category and technology/measure; and
- whose project boundary is within 1 km of project boundary of the small scale project activity.

None of the above is applicable to the present project activity. Therefore, the project activity is not a debundled component of a large scale project activity. This is first such project from project proponent proposed under CDM.

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:

Methodology:
Type I: Renewable Energy Projects
Category **IC: "Thermal energy production with or without electricity"**
Version 16
Sectoral Scope 01
EB-51

Reference:
The list of the small-scale CDM project activity categories contained in Appendix B of the simplified M&P for small-scale CDM project activities[4].

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

The position of the CDM project activity vis-à-vis applicability conditions in the AMS-I.C is described in the following table. This methodology comprises renewable energy technologies that supply individual users with thermal energy that displaces fossil fuels under the following conditions:

Applicability Conditions	Position of the project activity vis-à-vis applicability conditions
This category comprises renewable energy technologies that supply users with thermal energy that displaces fossil fuel use. These units include technologies such as solar thermal water heaters and dryers, solar cookers, energy derived from renewable biomass and other technologies that provide thermal energy that displaces fossil fuel.	The project activity is a renewable biomass based Energy generation project. Project activity entails installation of a cogeneration unit that generates heat and electricity.
Biomass-based co-generating systems that produce heat and electricity are included in this category. For the purpose of this methodology "Cogeneration" shall mean the simultaneous generation of thermal energy and electrical and/or mechanical energy in one process. Cogeneration system may supply one of the following: (a) Electricity to a grid; (b) Electricity and/or thermal energy (steam or heat) for on-site consumption or for consumption by other facilities;	The project activity is a renewable biomass based Co-generation activity where electricity and steam is generated for on-site consumption.

[4] http://cdm.unfccc.int/UserManagement/FileStorage/V7N1LH3PYOU6JFAWISGXB89ETCQM0D

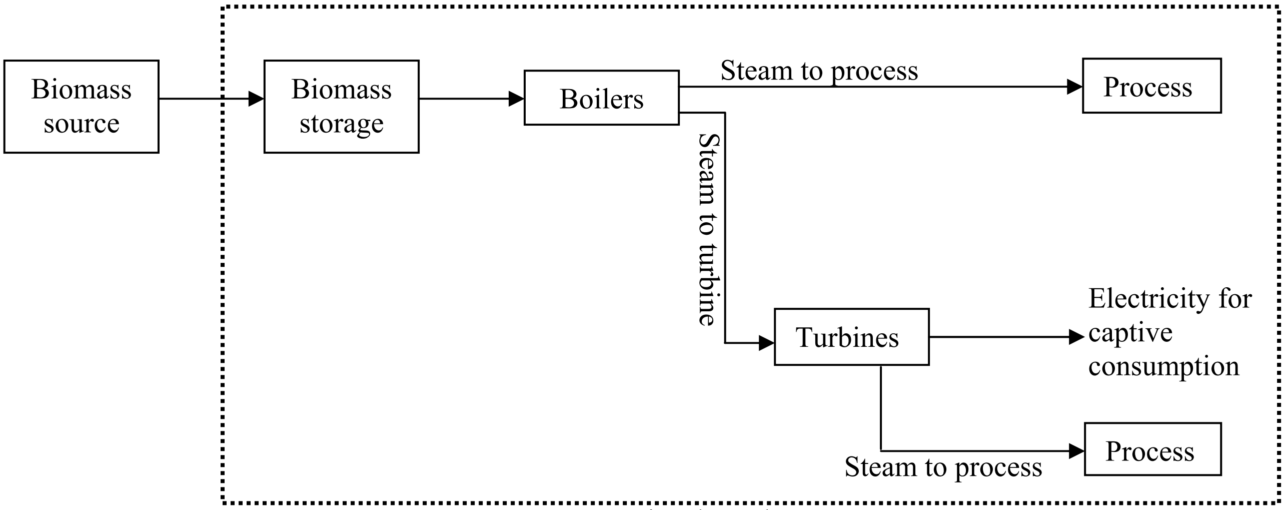
(c) Combination of (a) and (b).	
The total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW thermal.	The thermal generation capacity of the project activity is only 32 MWthermal (refer annex-3).
For co-fired systems the aggregate installed capacity (specified for fossil fuel use) of all systems affected by the project activity shall not exceed 45 MWth.	The project activity is a cogeneration project that avoids fossil fuel consumption in the production of thermal energy and electricity. The thermal generation capacity of the project activity is only ~32 MWthermal (refer annex-3).
If the project activity includes emission reductions from both the thermal and electrical energy components, the total installed energy generation capacity (thermal and electrical) of the project equipment shall not exceed 45 MW thermal. For the purpose of calculating this capacity limit the conversion factor of 1:3 shall be used for converting electrical energy to thermal energy (i.e., for renewable project activities, the maximal limit of 15 MW(e) is equivalent to 45 MW thermal output of the equipment or the plant);	Here the project activity includes emission reductions from both the thermal (32 MWth) and electrical energy (4MWe) components, the total installed energy generation capacity (electrical and thermal) of the equipment is 44 MW thermal which is less than 45 MW thermal. Capacity of plant (MWth) = 3*electrical energy (MWe)+thermal energy (MWth) =3*4+32 =44 MWth.
In case electricity and/or steam/heat produced by the project activity is delivered to another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered into specifying that only the facility generating the energy can claim emission reductions from the energy displaced.	Electricity and steam produced by the project activity is for captive consumption only.
Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category.	Project activity does not involve retrofitting or modification of an existing facility. It's a green field project.
In the case of project activities that involve the addition of renewable energy units at an existing renewable energy facility, the total capacity of the units added by the project should be lower than 45MWth and should be physically distinct from the existing units.	The project activity is not the extension of an existing renewable energy facility.
Charcoal based biomass energy generation project activities are eligible to apply the methodology only if the charcoal is produced from renewable biomass sources.	Palm kernel shell will be used as biomass fuel in the project activity. Charcoal will not be used in the project activity.

B.3. Description of the project boundary:

According to AMS I C version 16, the project boundary is defined as the physical, geographical site of the project equipment producing the renewable energy delineates the project boundary. The boundary also extends to the industrial, commercial or residential facility, or facilities, consuming energy generated by the system and the processes or equipment that is affected by the project activity.

This project boundary includes the steam generating boiler, fuel storage area, turbines and palm oil refinery.

Project boundary is illustrated in the following diagram:



Project boundary

Emission sources and gases included in or excluded from the project boundary are listed below:

Emissions sources included in or excluded from the project boundary

	Source	Gas	Included?	Justification / Explanation
Baseline	Grid electricity generation	CO_2	No	Excluded as electricity from grid is not available.
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
	Heat generation	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
	Uncontrolled burning or decay of surplus biomass residues	CO_2	No	It is assumed that CO2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
P r	On-site fossil fuel	CO_2	Yes	May be an important emission source

	and electricity consumption due to the project activity (stationary or mobile)	CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
	Off-site transportation of biomass residues	CO_2	Yes	Emission due to transportation of PKS will be accounted in case the transportation distance is more than 200 km.
		CH_4	No	Neglected as biomass is procured from CPO mills which are closer compared to coal mines.
		N_2O	No	Neglected as biomass is procured from CPO mills which are closer compared to coal mines.
	Storage of biomass Residues	CO_2	No	It is assumed that CO2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	No	Excluded for simplification. Since biomass residues are stored for less than three months, this emission source is assumed to be small.
		N_2O	No	Excluded for simplification. This emissions source is assumed to be very small.

B.4. Description of baseline and its development:

As per methodology requirement, the most plausible energy supply sources shall be established in accordance with the guidance on Greenfield projects given in the general guidance to SSC methodology for projects where no historical information is available. Since the proposed project activity is Greenfield project, hence the guidance given in general guidance to SSC methodology, version 15 has been applied.
The baseline scenario will be identified using the following steps:

Step 1: Identify the various alternatives available to the project proponent that deliver comparable level of service including the proposed project activity undertaken without being registered as a CDM project activity.

This Step serves to identify all alternative scenarios in accordance with para 12 of AMS IC version 16 to the proposed CDM project activity(s) that can be the baseline scenario:

Identification of alternative baseline scenarios:
The methodology as applied to the project activity involves the identification of baseline scenario from various alternatives available. The possible alternative scenarios available to the project proponent are as follows:

Para[5]	Alternative Scenarios	Remarks	Conclusion
12.a	Alternative 1: Electricity is imported from grid and steam is produced using fossil fuel	It considers import of electricity from grid in the absence of project activity and onsite generation of steam in a fossil fuel fired boiler. 1) Power scenario:- Due to deficit of power capacity in PLN, the state grid (PT. PLN) has refused to supply electricity to the proposed project activity. (Reference:- reply mail from PLN , No 290/161/DUM/2009) 2) Thermal energy generation scenario:- The decision on type of fossil fuel for steam generation would be based on the costs of various fuels options, i.e. fuel cost per unit of energy generation. The cost of energy generation for various fuel options is shown below*. Fuel Oil : USD 1678058/TJ Diesel : USD 2253051/TJ Coal : USD 4179/TJ As it is evident from above, coal has the lowest unit cost amongst all the fuel options available. Therefore coal would have been used as fuel in boilers in absence of the project activity for steam generation.	**Although grid power is not available to the project proponent, this option has been considered for cost comparison with other possible baseline alternatives.**

[5] Para refers to AMS I C version 16.

12.b	Alternative 2: Electricity is produced in an onsite captive power plant (with a possibility of export to the grid) using fossil fuel and thermal energy is produced using fossil fuel;	Electricity is produced in the onsite coal based captive power plant and steam requirement is met through the coal fired boiler (as coal has the lowest unit cost of energy generation amongst all the fossil fuel options available). 1) Power scenario: - Cost of setting up a coal based captive power plant in Indonesia is $1.0 million/MW[6]. Hence cost for setting up a 4.0 MW coal based captive power plant is $ 4 million. 2) Thermal energy generation scenario: - As stated above in alternative 1, coal is the most economical fossil fuel to be used in the absence of project activity for steam generation.	**This option is considered as a possible baseline alternative.**
12.c	Alternative 3: A combination of (1) & (2);	Electricity is produced from an onsite coal based captive power plant with a possibility to import/export power to grid and onsite steam generation in a coal fired boiler. 1) Power scenario:- Due to deficit of power in PLN, the state grid is unable to supply power and further the project activity will meet only captive demand of power. 2) Thermal energy generation scenario:- As stated above in alternative 1, coal is the most economical fossil fuel and it will be used in the absence of project activity for steam generation.	This is not a possible alternative to the project activity.
12.d	Alternative 4: Electricity and thermal energy are produced in a cogeneration unit, using fossil fuel (with a possibility of export of electricity to the grid/other facilities and/or thermal energy to other facilities)	This alternative is to produce both steam as well as electricity at the project site in a cogeneration facility using coal (as coal has the lowest unit cost of energy generation amongst all the fuel options available). This is a feasible option and is considered as an alternative to baseline scenario.	**This option is considered as a possible baseline alternative.**

[6] http://www.ifc.org/ifcext/spiwebsite1.nsf/1ca07340e47a35cd85256efb00700cee/7168BA33536CB36185256E7E00509516

12.e	Alternative 5: Electricity is imported from grid and steam is produced using renewable biomass	This alternative considers import of electricity from grid in the absence of project activity and onsite generation of steam in a biomass fired boiler. 1) Power scenario: - Due to deficit of power capacity in PLN, the state grid (PT. PLN) has refused to supply electricity to the proposed project activity. (Reference: - reply mail from PLN, No 290/161/DUM/2009) 2) Thermal energy generation scenario: - Thermal energy will be generated in biomass based boiler.	**Although grid power is not available to the project proponent, this option has been considered for cost comparison with other possible baseline alternatives.**
12.f	Alternative 6: Electricity is produced in an on-site captive power plant using biomass (with a possibility of export to the grid) and/or imported from the grid; steam/heat is produced using fossil fuel;	Electricity is produced in the onsite biomass based captive power plant and steam requirement is met through the coal fired boiler (as coal has the lowest unit cost of energy generation amongst all the fossil fuel options available). 1) Power scenario: - Cost of setting up a biomass based captive power plant in Indonesia is $1.2-$1.5 million/MW[7]. Hence cost for setting up a 4.0 MW coal based captive power plant is atleast $ 4.8 million. 2) Thermal energy generation scenario: - As stated above in alternative 1, coal is the most economical fossil fuel to be used in the absence of project activity for steam generation.	**This option is considered as a possible baseline alternative.**
12.g	Alternative 7: Electricity and thermal energy (steam/heat) are produced in a biomass fired cogeneration unit (without a possibility of export of electricity either to the grid or to other facilities and without a possibility of export of thermal energy to other facilities)	As per AMS IC version 16, para 12.g, footnote 7, this scenario applies to the situation where new grid connected biomass cogeneration system/s installed by the project activity produces surplus electricity compared to the pre-project situation. The proposed project activity is neither grid connected nor its generating surplus electricity compared to the pre-project situation as it is a green field project.	This option is not considered as a possible baseline alternative.
12.h	Alternative 8: Electricity and/or thermal energy produced in a co-fired system:	The cost of power generation from biomass is higher compared to coal. Hence use of biomass whether singularly or in a co-fired system would not be economical. Hence in the absence of project activity, the option of electricity and thermal generation in a co-fired system cannot be considered.	This option is not considered as a possible baseline alternative.

[7] Presentation on "Distributed Small Scale Power Plant (DSSPP) in Indonesia" by Ir. Djuwarno, MM

The proposed project activity undertaken without being registered as a CDM project activity has also been considered as an alternative scenario.

Outcome of Step 1: List of all plausible alternative scenarios to the project activity:-

Alternative 1: Electricity is imported from grid and steam is produced using fossil fuel

Alternative 2: Electricity is produced in an onsite captive power plant (with a possibility of export to the grid) using fossil fuel and thermal energy is produced using fossil fuel;

Alternative 4: Electricity and thermal energy are produced in a cogeneration unit, using fossil fuel (with a possibility of export of electricity to the grid/other facilities and/or thermal energy to other facilities)

Alternative 5: Electricity is imported from grid and steam is produced using renewable biomass

Alternative 6: Electricity is produced in an on-site captive power plant using biomass (with a possibility of export to the grid) and/or imported from the grid; steam/heat is produced using fossil fuel;

The proposed project activity undertaken without being registered as a CDM project activity;

Step 2: List the alternatives identified per step 1 in compliance with the local regulations (if any of the identified baseline is not in compliance with the local regulations, then exclude the same from further consideration)

All the alternatives identified in step 1 are consistent with the laws and regulations prevalent in host country Indonesia. The national law allows power/heat generation from fossil fuels or biomass residues. There is no rule which prevents PP from purchasing/selling power from/to grid. PP has also got all the required approvals for proposed project activity from host country[8]. It is therefore fair to say that these options are consistent with the applicable laws and regulations as under existing practices.

Outcome of Step 2: All the plausible alternative scenarios for the proposed project activity as listed above are in compliance with mandatory legislation and regulations under existing practices.

Step 3: Eliminate and rank the alternatives identified in step 2 taking into account barrier tests specified in attachment A to appendix B of simplified modalities and procedures of SSC CDM.

The additionality of the project activity is explained on the basis of barrier analysis mentioned in Attachment A to Appendix B of Simplified modalities and procedures for small scale project activities. Attachment A to Appendix B mentions the barriers listed below and at least one of the listed barriers should be explained to show that the project activity could not be undertaken due to the barrier and that the CDM revenue would significantly act as an impetus for the project to survive.

1. Investment barrier
2. Technological barrier
3. Barrier due to prevailing practice
4. Other barriers

Investment barrier

This Step serves to determine which of the alternative scenarios in the short list remaining after Step 2 is the most economically or financially attractive. For this purpose, an investment comparison analysis is conducted for the remaining alternative scenarios after Step 2. If the investment analysis is conclusive, the economically or financially most attractive alternative scenario is considered as the baseline scenario.

Identification of financial indicator:

The decision of the plausible baseline for this project activity will be based on the unit cost of power generation. The option with the least unit cost of power generation will be taken as baseline option for the project activity.

As steam is also obtained in a cogeneration unit from the turbine and it is not possible to dissociate the cost of steam from that of power generated. For analysis it has been assumed that cost of power generation in Alternative 4 and project activity without CDM benefit is zero and all the cost is averaged against power generated in the system.

In Alternative 1 & 5, the cost of steam has been levelized to the cost of power withdrawal from grid and unit cost of power generation is calculated.

Similarly for comparison between these plausible baseline options, in Alternative 2 & 6, again the cost of steam has been levelized to the cost of power generation from CPP and unit cost of power generation is calculated.

---

[8] Copy of UKL and UPL along with host country approval letter have been provided to DOE

Following input parameters are considered for baseline analysis and estimation of baseline emission:

Parameter	Unit	Value	References
Equity	%	100%	BADAN KOORDINASI PENANAMAN MODAL(Nomor-819/I/PMA/2004)
O&M (% of project cost)	%	5.00%	Feasibility Analysis: Biomass Boiler in Food Industry by Anders Evald, Mohammad Iskandar Bin
Return on equity (% of project cost)	%	24%	http://www1.bnpparibas-ip.com/publications/Flyers/en/flyer_EquityIndonesia_2_en.pdf
Fuel rate- coal	USD/ton	87.48	Indonesian coal index report, Weekly average ICI prices, Issue 032, date 08 August 2008
Fuel rate – biomass	USD/ton	61.8	Quotation from PT Bina Pitri Jaya dated 9th October 2008
Efficiency of the coal based boiler	%	88%	As per boiler supplier information
Efficiency of the biomass based boiler	%	76%	As per boiler supplier (MIQ/WT 149-20/08 R2), dated 23 October 2008
Calorific value – coal	kcal/kg	5000	Indonesian coal index report, Weekly average ICI prices, Issue 032, date 08 August 2008
Calorific value - Biomass	kcal/kg	3500	As per offer from biomass supplier (PT Bina Pitri Jaya) dated 9th October 2008
Average cost of power generation in coal based CPP	USD/MWh	40	Abram Perdana, On Prospects of Sustainable Energy Sources for Power Generation in Indonesia, page 3, Table III
Average cost of power generation in biomass based CPP	USD/MWh	65	Abram Perdana, On Prospects of Sustainable Energy Sources for Power Generation in Indonesia, page 3, Table III
Electricity tariff	USD/kWh	0.068	http://www.aesieap.org/goldbook2008/s4/Indonesia.pdf
Conversion rate	USD/RM	0.2766	Currency conversion from RM to USD dated 10/12/2008 has been taken from http://finance.yahoo.com/currency-converter/?u%253Fu#from=MYR;to=USD;amt=1
Conversion rate	USD/Rp	0.0001 03	Currency conversion from Rp to USD October 2008 has been taken from http://finance.yahoo.com/currency-converter/?u%253Fu#from=IDR;to=USD;amt=10000
Turbine rated capacity	MW	4.0	As per contract copy (Contract no. 001/PII/CONTRACT/XII/2008) dated 10th December 2008-Turbine Manufacturer
Boiler rated capacity	TPH	40	As per contract copy (Contract No. P002/PII/CONTRACT/XII/2008) dated 10th December 2008-Boiler Manufacturer
Steam pressure	barg	67	As per contract copy (Contract No. P002/PII/CONTRACT/XII/2008) dated 10th December 2008-Boiler Manufacturer
Steam temperature	deg C	450	As per contract copy (Contract No. P002/PII/CONTRACT/XII/2008) dated 10th December 2008-Boiler Manufacturer
Feed water temperature	deg C	105	As per contract copy (Contract No. P002/PII/CONTRACT/XII/2008) dated 10th December 2008-Boiler Manufacturer
Auxiliary consumption in turbines	%	11.65	Auxiliary power consumption in steam turbines (466 kW) as per power consumption

		%	details
Enthalpy of steam at 67 barg and 450 deg C	kJ/kg	3290	http://www.efunda.com/materials/water/steamtable_sat.cfm
Enthalpy of feed water at 105 deg C	kJ/kg	440.2	http://www.spiraxsarco.com/resources/steam-tables/saturated-steam.asp
Enthalpy of saturated steam at 65 barg	kJ/kg	2777	http://www.spiraxsarco.com/resources/steam-tables/saturated-steam.asp
Enthalpy of saturated steam at 7 barg	kJ/kg	2769	http://www.spiraxsarco.com/resources/steam-tables/saturated-steam.asp
Enthalpy of saturated steam at 0.35 barg	kJ/kg	2689	http://www.spiraxsarco.com/resources/steam-tables/saturated-steam.asp
Running hours	hrs	7920	Based on assumption (330 days of operation in a year)
Coal emission factor	tCO2/TJ	96.1	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Table 2.2, Sub-bituminous coal, Page 2.16

Cost of baseline alternatives:-

Total cost (Alternative-1)

Description	Unit	Value	Reference/Remarks
Connection fee payable to grid	USD	150000	One time connection fee (http://www.pln.co.id/PelayananPelanggan/NewInstallation/tabid/62/Default.aspx)
2x20 Mt/Hr Boilers (Complete system) - coal	USD	3374520	As per quotation (MIQ/WT 195-20/08) dated 10th October 2008
Total	USD	3524520	This doesn't include other charges applicable (like infrastructure development for laying down grid lines etc) for taking new connection from grid. This will further increase the project cost.

Total cost (Alternative-2)

Description	Unit	Value	Reference
Cost of setting-up a Coal based CPP ($1 million/MW)	USD	4000000	http://www.ifc.org/ifcext/spiwebsite1.nsf/1ca07340e47a35cd85256efb00700cee/7168BA33536CB36185256E7E00509516
2x20 Mt/Hr Boilers (Complete system) - coal	USD	3374520	As per quotation (MIQ/WT 195-20/08) dated 10th October 2008
Total	USD	7374520	

Total cost (Alternative-4)

Description	Unit	Value	Reference
2 x20 Mt/Hr Boilers (Complete system) - Coal	USD	3374520	As per quotation (MIQ/WT 195-20/08) dated 10th October 2008
2x2 MW Turbines	USD	2365000	As per contract copy (Contract no. 001/PII/CONTRACT/XII/2008) dated 10th December 2008
Total	USD	5739520	

Total cost (Alternative-5)

Description	Unit	Value	Reference/Remarks
Connection fee payable to grid	USD	150000	One time installation cost as per information provided by PLN
2x20 Mt/Hr Boilers (Complete system) – biomass	USD	3595800	As per quotation (MIQ/WT 195-20/08) dated 10th October 2008
Total	USD	3745800	This doesn't include other charges applicable (like infrastructure development for laying down grid lines etc) for taking new connection from grid. This will further increase the project cost.

Total cost (Alternative-6)

Description	Unit	Value	Reference
Cost of setting-up a Biomass based CPP ($1.2 million/MW)	USD	4800000	Presentation on "Distributed Small Scale Power Plant (DSSPP) in Indonesia" by Ir. Djuwarno, MM
2x20 Mt/Hr Boilers (Complete system) - coal	USD	3374520	As per quotation (MIQ/WT 195-20/08) dated 10th October 2008
Total	USD	8174520	

Cost of project activity undertaken without being registered as a CDM project activity

Description	Unit	Value	Reference
2 x20 Mt/Hr Boilers (Complete system) - Biomass	USD	3595800	As per contract copy (Contract No. P002/PII/CONTRACT/XII/2008) dated 10th December 2008
2x2 MW Turbines	USD	2365000	As per contract copy (Contract no. 001/PII/CONTRACT/XII/2008) dated 10th December 2008
Total	USD	5960800	

Fuel consumption and energy generation in possible baseline alternatives:

Alternative 1

Parameter	Value	Unit
Steam generation	29.1	TPH
Steam pressure	67	Barg
Steam temperature	450	deg C
Enthalpy of steam	3290	kJ/ kg
Enthalpy of feed water input	440.2	kJ/ kg
Efficiency of boiler-Coal	88%	%
Plant run hours	7920	per annum
Fuel energy input required	746.4	TJ/annum
Coal required for steam generation	**35660**	**MT/annum**
Net Power from grid	**27989**	**MWh/annum**

Alternative 2

Parameter	Value	Unit
Steam generation	29.1	TPH
Steam pressure	67	Barg
Steam temperature	450	deg C
Enthalpy of steam	3290	kJ/ kg
Enthalpy of feed water input	440.2	kJ/ kg
Efficiency of boiler -Coal	88%	%
Plant run hours	7920	per annum
Fuel energy input required	746.4	TJ/annum
Coal required for steam generation	**35660**	**MT/annum**
Net Power from CPP	**27989**	**MWh/annum**

Alternative 4

Parameter	Value	Unit
Boiler Rated Capacity	40	TPH
Power Gen Capacity	4.0	MW
Steam generation	40	TPH
Steam pressure	67	Barg
Steam temperature	450	deg C
Enthalpy of generated steam	3290	kJ/ kg
Enthalpy of feed water input	440.2	kJ/ kg
Efficiency of boiler - coal based	88%	%
Fuel calorific value - coal	5000	kcal/kg
Plant run hours	7920	per annum
Fuel energy input required	1026	TJ/annum
Coal requirement	**49017**	**MT/annum**
Net power Generation	**27989**	**MWh/annum**

Alternative 5

Parameter	Value	Unit
Steam generation	29.1	TPH
Steam pressure	67	Barg
Steam temperature	450	deg C
Enthalpy of steam	3290	kJ/ kg
Enthalpy of feed water input	440.2	kJ/ kg
Efficiency of boiler -Biomass	76%	%
Plant run hours	7920	per annum
Fuel energy input required	864	TJ/annum
Biomass required for steam generation	**58986**	**MT/annum**
Net Power from grid	**27989**	**MWh/annum**

Alternative 6

Parameter	Value	Unit
Steam generation	29.1	TPH
Steam pressure	67	Barg
Steam temperature	450	deg C
Enthalpy of steam	3290	kJ/ kg
Enthalpy of feed water input	440.2	kJ/ kg
Efficiency of boiler-Biomass	76%	%
Plant run hours	7920	per annum
Fuel energy input required	864	TJ/annum
Biomass required for steam generation	**58986**	**MT/annum**
Net Power from CPP	**27989**	**MWh/annum**

Project Activity undertaken without being registered as a CDM project activity

Parameter	Value	Unit
Boiler Rated Capacity	40	TPH
Power Gen Capacity	4.0	MW
Steam generation	40	TPH
Steam pressure	67	barg
Steam temperature	450	deg C
Enthalpy of generated steam	3290	kJ/ kg
Enthalpy of feed water input	440.2	kJ/ kg
Efficiency of boiler - biomass based	76%	%
Fuel calorific value - Palm Kernel Shell	3500	kcal/kg
Plant run hours	7920	per annum
Fuel energy input required	1188	TJ/annum
Biomass requirement	**81080**	**MT/annum**
Net power Generation	**27989**	**MWh/annum**

Based on the values above, the cost comparison has been carried out for equivalent power generation for all options. The comparison is shown below:

Parameter	Unit	Alt -1	Alt -2	Alt -4	Alt -5	Alt -6	Project Activity without CDM
Project Cost	**USD**	**3524520**	**7374520**	**5739520**	**3745800**	**8174520**	**5960800**
Fixed Cost							
Return on equity	USD	845885	1769885	1377485	898992	1961885	1430592
Total Fixed Cost	**USD**	**845885**	**1769885**	**1377485**	**898992**	**1961885**	**1430592**
Variable Cost							
Cost of fuel	USD	3119515	3119515	4287994	3645338	3645338	5010775
Cost of O&M	USD	176226	368726	286976	187290	408726	298040
Total Variable Cost	**USD**	**3295741**	**3488241**	**4574970**	**3832628**	**4054064**	**5308815**
Total Cost (fixed+variable)	**USD**	**4141626**	**5258126**	**5952455**	**4731620**	**6015949**	**6739407**
Total steam Generation	tonnes/annum	230472	230472	316800	230472	230472	316800
Total Power generation/withdrawal	MWh/annum	27989	27989	27989	27989	27989	27989
Cost of power generation/withdrawal	USD	1903271	1119571	0	1903271	1819303	0
Unit cost of power generation #	**USD/MWh**	**216**	**228**	**213**	**237**	**280**	**241**

#Steam cost is transferred to power

As evident from the table above, unit cost of power generation for Alternative 4 is lowest among others. Hence it can be concluded that Alternative 4 would have been the choice for steam and power generation for the project proponent over other alternatives. However sensitivity analysis for alternative 4 and project activity undertaken without CDM benefits is carried out to assess whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions.

Sensitivity Analysis:
Biomass price and coal price are identified to be the critical variables which may change and have substantial effect on the average cost of unit energy generation. The changes in unit cost of power generation with different variation in biomass price and coal price are tabulated below:

Sensitivity on fuel cost	Fuel price (USD/ton)	Unit cost of power generation in baseline scenario (USD/MWh)	Unit cost of power generation in project activity (USD/MWh)
Base value of biomass	**61.8**	**213**	**241**
10% fall in biomass price	55.62	213	223

10% hike in biomass price	67.98	213	259
Base value of coal	**87.48**	**213**	**241**
10% fall in coal price	78.73	197	241
10% hike in coal price	96.23	228	241

Sensitivity **on calorific value**	Calorific value (kcal/kg)	Unit cost of power generation in baseline scenario (USD/MWh)	Unit cost of power generation in project activity (USD/MWh)
Base value of coal	**5000**	**213**	**241**
10% fall in coal calorific value	4500	230	241
10% hike in coal calorific value	5500	199	241
Base value of biomass	**3500**	**213**	**241**
10% fall in biomass calorific value	3150	213	261
10% hike in biomass calorific value	3850	213	225

Sensitivity **on boiler efficiency**	Efficiency (%)	Unit cost of power generation in baseline scenario (USD/MWh)	Unit cost of power generation in project activity (USD/MWh)
Base value of coal	**88%**	**213**	**241**
10% fall in Boiler efficiency on coal	79%	230	241
10% hike in Boiler efficiency on coal	97%	199	241
Base value of biomass	**76%**	**213**	**241**
10% fall in Boiler efficiency on biomass	68%	213	261
10% hike in Boiler efficiency on biomass	84%	213	225

The conclusion of the sensitivity analysis is that the unit cost of power generation of the project activity is well above the unit cost of power generation of baseline scenario. Even in the case of a maximum decreased in biomass price or maximum hike in the coal price or maximum decrease in coal calorific value or maximum hike in biomass calorific value or maximum hike in biomass based boiler or maximum fall in coal based boiler,, the unit cost of power generation is well above the baseline scenario.

A complete list of identified realistic and credible barriers that may prevent alternate scenarios to occur is furnished as below for the proposed project activity is not undertaken as a CDM project activity:

Technological barriers

Lack of skilled labour:

There will be non availability of human capacity to operate and maintain the technology as this is new compared to exiting technologies in that region, which leads to an unacceptably high risk of equipment disrepair, malfunctioning or other underperformance;

Lower efficiency:

The biomass based boiler as installed in this project activity has lower efficiency as compared to coal based boiler. The boiler efficiency offered by technology supplier is 76%. This is far below the boiler efficiency achievable in a coal fired boiler (88%)[9]. The efficiency difference would affect the fuel consumption rate in boiler and hence it would cost more for the same energy output.

Barrier due to prevailing practice

Project will use Biomass Fired High Pressure system which is amongst the first few of its kind in Edible Oil Refinery sector in Indonesia. The proposed project activity is not prevailing practice in that region.

Other barriers

Power deficit in grid

Due to deficit in power capacity in PLN, the local grid is unable to provide power to the project proponent[10].

Outcome of Step 3:

From the investment analysis done above and sensitivity analysis it is concluded that the alternative 4 is financially more attractive since the unit cost of power generation of the project activity is lowest among all other alternatives. Hence the most plausible baseline scenario for this project activity is the ***Alternative 4: Electricity and steam are produced in a cogeneration unit, using coal.***

Step 4: If only one alternative remains that is:

- ***Not the proposed project activity undertaken without being registered as a CDM project activity; and***
- ***It corresponds to one of the baseline scenarios provided in the methodology; then the project activity is eligible under the methodology.***

As it is evident from step 3, that only one alternative remains (alternative 4) that is not the proposed project activity undertaken without being registered as a CDM project activity: and it corresponds to one of the baseline scenarios provided in the methodology; hence the project activity is eligible under the methodology and alternative 4 is baseline for proposed project activity.

Since the project activity is using coal in the baseline for electricity and steam generation in a cogeneration unit, therefore baseline emission is calculated as per para 17 of the small scale methodology AMS I. C version 16.

[9] As per boiler supplier information

[10] Letter from PLN dated 11/11/2009, reference no:290/161/DUM/2009

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:

Additionality has been demonstrated using "attachment A to appendix B of simplified modalities and procedures of SSC CDM" in section B.4.
The impact of CDM benefits on project activity has been demonstrated:

Parameter	Unit	Baseline Activity	Project Activity without CDM	Project Activity with CDM
Project Cost	**USD**	**5739520**	**5960800**	**5960800**
Fixed Cost				
Return on equity	USD	1377485	1430592	1430592
Total Fixed Cost	**USD**	**1377485**	**1430592**	**1430592**
Variable Cost				
Cost of fuel	USD	4287994	5010775	5010775
Cost of O&M	USD	286976	298040	298040
Total Variable Cost	**USD**	**4574970**	**5308815**	**5308815**
Income from CERs	**USD**	**0**	**0**	**2073890**
Total Cost (fixed+variable)	**USD**	**5952455**	**6739407**	**4665516**
Total steam Generation	tonnes/annum	316800	316800	316800
Total Power generation	MWh	27989	27989	27989
Cost of power generation	USD	0	0	0
Unit cost of power generation	**USD/MWh**	**213**	**241**	**167**

It is evident from the table above that the CDM revenue generated from sell of CERs will bring down the unit cost of power generation to 167 USD/MWh[11] in project activity scenario. This will make project commercially feasible compared to the identified baseline.

CDM Consideration:
As per the **GUIDANCE ON THE DEMONSTRATION AND ASSESSMENT OF PRIOR CONSIDERATION OF THE CDM (Version 03)–**

New Project Activities

1. *The Board decided that for project activities with a starting date on or after 02 August 2008, the project participant must inform a Host Party DNA and the UNFCCC secretariat in writing of the commencement of the project activity and of their intention to seek CDM status. Such notification must be made within six months of the project activity start date and shall contain the precise geographical location and a brief description of the proposed project activity, using the standardized form F-CDM-Prior Consideration. Such notification is not necessary if a PDD has been published for global stakeholder consultation or a new methodology proposed to the Executive Board for the specific project before the project activity start date.*
2. *The UNFCCC secretariat will maintain a publicly available list of such notifications[12].*

[11] Price of CER has been taken as 17 euro/CER applicable to October 2008. Link for historical CER price. http://www.bluenext.eu/

3. *When validating a project activity with a start date on or after 2 August 2008, DOEs shall ensure by means of confirmation from the UNFCCC secretariat that such a notification had been provided. If such a notification has not been provided, the DOE shall determine that the CDM was not seriously considered in the decision to implement the project activity.*
4. *Additionally for project activities for which a PDD has not been published for global stakeholder consultation or a new methodology proposed or request for revision of an approved methodology is requested, every subsequent two years after the initial notification the project participants shall inform the UNFCCC secretariat of the progress of the project activity.*

Following demonstrates the serious consideration of CDM benefits by PP in implementation of the project under discussion-

PT Pacific Indopalm Industries seriously considered the CDM benefits before implementation of the project. Following is the trail of events in the project activity -

Following are the timelines of the project –

SN	Events	Date (DD/MM/YYYY)
1	Offer for coal fired boiler	10/10/2008
2	Offer for turbines	16/10/2008
3	Offer for biomass fired boiler	23/10/2008
4	Board decision	24/10/2008
5	Final offer for turbines	28/10/2008
6	Agreement with CDM consultant	6/11/2008
7	Letter to Head of Sub-region, Dumai	8/11/2008
8	Letter to UNFCCC	10/11/2008
9	Confirmation letter from UNFCCC	11/11/2008
10	Revised and Final offer for biomass fired boiler	14/11/2008
11	Proposal from DOE	18/11/2008
12	**Contract signed with boiler supplier (Project Start date)**	**10/12/2008**
13	Contract signed with turbine supplier	10/12/2008
14	Stakeholder consultation	22/01/2009
15	Documents submission to DNA	8/5/2009
16	Contract signing with DOE	29/05/2009
17	DNA meeting for HCA	18/08/2009

Date of contract signing with boiler manufacturer has been taken as project start date. However the letter to UNFCCC has been sent well in advance. The above information demonstrates that not only project proponent considered CDM benefits during the decision making process but also started the project registration process along with the implementation of project.

[12] Proposed CDM project can be located at http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

As discussed in section B-4, in absence of the project activity, coal will be used in a co-generation unit for electricity and steam generation, therefore baseline emission is calculated as per para 17 of the small scale methodology AMS I. C version 16.

Baseline emission (BE_y):
Baseline emission is calculated as per para 17 of the small scale methodology AMS I. C version 16. The equation used for baseline emission calculation is:

$$BE_{cogen,CO2,y} = [(EG_{PJ,thermal,y} + EG_{PJ,electrical,y} * 3.6)/\eta_{BL,cogen}] * EF_{FF,CO_2} \quad (1)$$

Where,

$BE_{cogen,CO2,y}$	the baseline emissions from electricity and thermal energy displaced by the project activity during the year y in tCO_2e.
$EG_{PJ,electrical,y}$	the amount of electricity supplied by the project activity during the year y in GWh
$EG_{PJ,thermal,y}$	the net quantity of thermal energy supplied by the project activity during the year y in TJ.
3.6	conversion factor, expressed as TJ/GWh.
$EF_{FF,CO2}$	the CO2 emission factor per unit of energy of the coal that would have been used in the baseline plant in (tCO2 / TJ), IPCC default emission factor is used (96.1 tCO2/TJ)[13].
$\eta_{BL\ cogen}$	the total efficiency (thermal and electrical both included) of the cogeneration plant using coal that would have been used in the absence of the project activity. Efficiency is calculated as total energy produced (electricity and steam/heat extracted) divided by thermal energy of the fuel used.

Project Emission (PE_y):

As per para 26 of AMS IC version 16, Project emissions include:

- CO_2 emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of .Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion.;

There are no project activity emissions as this is a renewable project activity. However, small quantity of fossil fuel would be used for start up the boiler and as co-firing in the project activity. Project emissions on account of use of fossil fuel would be considered and monitored as per the "**Tool to calculate project or leakage CO2 emissions from fossil fuel combustion", version-02, EB41[14].**

Project Emissions due to Auxiliary Fuel (e.g. Coal, F.O. etc) Consumption is estimated as per the following equation:

---

[13] The upper limit of EF with 95% confidence level will result in higher baseline emission and hence higher emission reduction compared to default value of emission factor. Hence it is conservative to use default value of emission factor for calculation of baseline emission.

[14] http://cdm.unfccc.int/EB/047/eb47_repan28.pdf

$$PE_y = \sum FF_{i.y} \times NCV_i \times EF_i \qquad \textbf{(2)}$$

Where

PE_y	Project emissions from on-site fossil fuel combustion in year y, tCO2e
$\Sigma FF_{i,y}$	Quantity of fossil fuel combusted in the project plant in year y, tone or volume
NCV_i	Net calorific value of fossil fuel, TJ/tone or TJ/volume
EF_i	Emission factor for fuel i; IPCC default value, tCO2/ TJ, at the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories[15]

•CO_2 emissions from electricity consumption by the project activity using the latest version of Tool to calculate baseline, project and/or leakage emissions from electricity consumption;

During start up of cogeneration plant, auxiliary power demand will be met by stand by F.O. based DG set. Any emission due to generation of power from DG set would be considered and monitored as per the "**Tool to calculate baseline, project and/or leakage emissions from electricity consumption**". The emission factor for FO will be taken from table 1.4 of chapter 1 of Vol.2, 2006 IPCC Guidelines on National GHG Inventories, at the upper limit of the uncertainty at a 95% confidence interval.

• Any other significant emissions associated with project activity within the project boundary;

There is no significant emission associated with project activity within the project boundary.

Leakages (L_y):

A. **As per the "General guidance on leakage in biomass project activities, Version 03, EB 47"** leakage estimation has been done as below:

The project activity proposes using surplus biomass (palm kernel shell) available surplus in the region. The guidance has highlighted three distinct possibilities of leakage in biomass usage.

Biomass type	Activity/source	Shift of pre-project activities	Emission from biomass generation/cultivation	Competing use of biomass
Biomass from forest	Existing forest	-	-	X
	New forest	X	X	-
Biomass from croplands or grasslands (woody or non woody)	In the absence of the project the land would be used as cropland/wasteland	X	X	-
	In the absence of the project activity land would be abandoned	-	X	-
Biomass residues or wastes*	Biomass residues or wastes are collected and used	-	-	X

*Applicable to the project activity.

[15] The upper limit of EF with 95% confidence level has been used for calculation of project emission. This will result in higher project emission compared to default value of EF. Hence it is conservative to use.

The project activity involves procurement of biomass residue available in the region. The biomass would be procured from selected parts of Riau and Jambi Provinces. It has been demonstrated in Annex 6 that the quantity of available palm kernel shell in the region is 25% larger than the quantity of biomass that is utilized including the project activity and hence leakage emissions on account of competing use of this biomass residue has not been considered.

B. Leakage due to transportation of biomass to the plant site

The PKS used for the project activity is procured mainly from CPO mills which are located well within 200 km from the project site and the distance of transportation of PKS from CPO mills to project site is less than 200 km. Hence for ex-ante demonstration and as per AMS I C version 16, para 29, foot note 11, the emission due to transportation of PKS has been neglected.

$L_y = 0$;

However the distance of transportation will be monitored during the crediting period. Emission due to transportation will be accounted in case the transportation distance is more than 200 km in any given year. The part of total biomass quantity used in the year that would be coming from a distance more than 200 km would be considered for calculation of leakage. The quantity that would be coming from within the 200 km distance would be excluded for such calculations.

The emission from biomass transportation would be calculated using the following formula:

$$PE_{transport} = EF_{truck} \times \frac{BF_{PKS,y}}{T_{cap}} \times AVD$$

Where,

$PE_{transport}$	Project emission from diesel oil used for transportation of biomass to the Project site (tCO_2/yr)
EF_{truck}	Emission factor of light duty truck (tCO_2/km)
$BF_{PKS,y}$	The amount of PKS consumed by the Project coming from a distance more than 200 km (t-PKS/yr)
T_{cap}	The average loading capacity per delivery trip (t-PKS/trip)
AVD	Average return distance from the supplier site to the Project site (km/trip)

Emission reduction (ER_y):

The emission reduction achieved by the project activity will be the difference between the baseline emission and the sum of the project emission and leakage.

$$ER_y = BE_y - (PE_y + L_y) \quad (4)$$

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

Data / Parameter:	**EF_{CO2}**
Data unit:	tCO2/TJ
Description:	The CO_2 emission factor per unit of energy of coal that would have been

	used in the baseline plant in absence of the project activity
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 2, Page no 2.16
Value applied:	96.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	National and local data is not available for this parameter; therefore IPCC default value is used.
Any comment:	This value is ex-ante fixed and this will be used for calculation of baseline emission during the crediting period.

Data / Parameter:	η_{th}
Data unit:	%
Description:	The efficiency of the baseline coal fired boilers
Source of data used:	Default efficiency of 100%.
Value applied:	100%
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per para 18.c of AMS IC version 16, efficiency of baseline boilers are taken as 100%.
Any comment:	This value has been used for determination of baseline cogeneration efficiency.

Data / Parameter:	$SEC_{j,biomass,y,\ measured,}$
Data unit:	TJ of fuel input/TJ of boiler output
Description:	Specific Energy Consumption of biomass
Source of data used:	Calculated based on design data of the boiler
Value applied:	1.316
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per para 34 of applied methodology.
Any comment:	-

Data / Parameter:	$SEC_{j,coal,y,\ measured,}$
Data unit:	TJ of fuel input/TJ of boiler output
Description:	Specific Energy Consumption of coal
Source of data used:	Calculated based on design data of the boiler
Value applied:	1.136
Justification of the choice of data or description of measurement methods	As per para 34 of applied methodology.

and procedures actually applied :	
Any comment:	-

Data / Parameter:	**EF_{truck}**
Data unit:	tCO_2/km
Description:	Emission factor of light duty diesel truck
Source of data used:	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories: Reference Manual, Page no 1.74
Value applied:	0.000415
Justification of the choice of data or description of measurement methods and procedures actually applied :	The highest value of emission factor for light duty trucks has been taken. Hence this is conservative.
Any comment:	This value is ex-ante fixed.

B.6.3 Ex-ante calculation of emission reductions:

Baseline emission (BE_y):

The baseline emission is calculated based on equation (1) described in section B.6.1 of this PDD:

$$BE_{cogen,CO2,y} = [(EG_{PJ,thermal,y} + EG_{PJ,electrical,y} * 3.6) / \eta_{BL,cogen}] * EF_{FF,CO_2}$$

Calculation of $EG_{PJ,thermal,y}$:

Process Thermal Energy Requirement	**Value**	**Unit**
7.1 TPH saturated steam at 65 bar g	2777	kJ/ kg
18.4 TPH saturated steam at 7 bar g	2769	kJ/ kg
3.6 TPH saturated steam at .35 bar g	2689	kJ/ kg
Total steam requirement in process	29.1	TPH
Feed water at 105 deg C	440.2	kJ/ kg
Net thermal energy requirement per hr	67536	MJ/hr
Net thermal energy requirement per annum	534.9	TJ/ annum

Calculation of $EG_{PJ, electrical, y}$:

Net Power generation in Plant		
Parameter	**Value**	**Unit**
Installed capacity of turbines	4.0	MW
Running hours	7920	hrs
Gross power generation	31680	MWh
Auxiliary consumption	3691	MWh

Net power generation	**27989**	**MWh**
Net electrical energy, $EG_{PJ, electrical, y}$	100.8	TJ/ annum

Calculation of $\eta_{BL, Cogen}$:
Efficiency is calculated as total energy produced (electricity and steam/heat extracted) divided by thermal energy of the fuel used. The thermal energy of the fuel used has been calculated based on the efficiency of baseline boilers. Default efficiency (100%) of baseline boilers are determined as per AMS I C v16 para 18.c for emission calculation purpose.

Parameter	Value	Unit
Net thermal energy, $EG_{PJ, thermal,y}$	534.9	TJ/ annum
Net electrical energy, $EG_{PJ, electrical, y}$	100.8	TJ/ annum
Energy output – baseline ($EG_{PJ, thermal,y}$ + $EG_{PJ, electrical, y}$)	635.6	TJ/ annum
Fuel energy input considering 88% of baseline boilers	1026	TJ/ annum
Fuel energy input considering 100% of baseline boilers	1026*88%=903	TJ/ annum
$\eta_{BL, Cogen}$ (considering baseline boiler's efficiency as 100%)	(534.9+100.8)/ 903 =70%	%

Now, baseline emission (BE_y) = [(534.9 + 100.8)/70%] * 96.1 = 86760 tCO_2/annum

Project Emission (PE_y):
The project emission is calculated based on equation (2) described in section B.6.1 of this document:

$$PE_y = \sum FF_{i,y} \times NCV_i \times EF_i$$

= 0 (For ex-ante estimation)

Leakages (L_y):
As described in section B.6.1 of this document, the ex-ante estimation of Leakage emission is zero for the project activity.

Emission reduction (ER_y):
The emission reduction achieved by the project activity will be the difference between the baseline emission and the sum of the project emission and leakage and is calculated based on equation (4) in section B.6.1 of this document.

$$ER_y = BE_y – (PE_y + L_y)$$

$$ER_y = 86760 – (0 + 0) = 86760 \text{ tCO2/annum}$$

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

Year	Estimation of project activity emissions (tCO2e)	Estimation of baseline emissions (tCO2e)	Estimation of leakage (tCO2e)	Estimation of overall emission reductions (tCO2)
2010-11	0	86760	0	86760
2011-12	0	86760	0	86760

2012-13	0	86760	0	86760
2013-14	0	86760	0	86760
2014-15	0	86760	0	86760
2015-16	0	86760	0	86760
2016-17	0	86760	0	86760
2017-18	0	86760	0	86760
2018-19	0	86760	0	86760
2019-20	0	86760	0	86760
Total (tonnes of CO2 e)	**0**	**867600**	**0**	**867600**

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

Data monitored and required for verification and issuance will be kept for a minimum of two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	$\mathbf{Q_{steam,\,a,\,i}}$ **and** $\mathbf{Q_{steam,\,b,\,i}}$
Data unit:	Tonne
Description:	Quantity of steam generated in boiler A and boiler B.
Source of data to be used:	Onsite measurement
Value of data	40 TPH (Ton per hour)
Description of measurement methods and procedures to be applied:	Directly measured using steam flow meter. Data will be monitored on daily basis.
QA/QC procedures to be applied:	Steam flow meters will be calibrated annually as per national standard procedures.
Any comment:	-

Data / Parameter:	$\mathbf{T_{steam,\,a,\,i}}$ **and** $\mathbf{T_{steam,\,b,\,i}}$
Data unit:	Degree C
Description:	Temperature of the steam generated in boiler A and boiler B
Source of data to be used:	On-site measurement
Value of data	450 deg C
Description of measurement methods and procedures to be applied:	Measured using on-site temperature gauge. The data will be monitored on hourly basis.
QA/QC procedures to be applied:	Gauges will be calibrated annually as per national standard procedures.

Any comment:	-

Data / Parameter:	**$P_{steam, a, i}$ and $P_{steam, b, i}$**
Data unit:	Barg
Description:	Pressure of the steam generated in boiler A and boiler B
Source of data to be used:	On-site measurement
Value of data	67 barg
Description of measurement methods and procedures to be applied:	Measured using on-site pressure gauge. The data will be monitored on hourly basis.
QA/QC procedures to be applied:	Gauges will be calibrated annually as per national standard procedures.
Any comment:	-

Data / Parameter:	**$E_{steam, a, i}$ and $E_{steam, b, i}$**
Data unit:	kJ/kg
Description:	Enthalpy of the steam generated in boiler A and boiler B.
Source of data to be used:	Steam table http://www.efunda.com/materials/water/steamtable_sat.cfm
Value of data	3290 kJ/kg
Description of measurement methods and procedures to be applied:	Calculated value based on steam temperature and pressure.
QA/QC procedures to be applied:	This is calculated value. No need of QA/QC procedure.
Any comment:	-

Data / Parameter:	**$T_{FW, a, i}$ and $T_{FW, b, i}$**
Data unit:	Degree C
Description:	Temperature of the feed water into boiler A and boiler B
Source of data to be used:	On-site measurement
Value of data	105 deg C
Description of measurement methods and procedures to be applied:	Measured using on-site temperature gauge. The data will be monitored on hourly basis.
QA/QC procedures to be applied:	Gauges will be calibrated annually as per national standard procedures.
Any comment:	-

Data / Parameter:	**$E_{FW, a, i}$ and $E_{FW, b, i}$**
Data unit:	kJ/kg
Description:	Enthalpy of feed water into boiler A and boiler B

Source of data to be used:	http://www.spiraxsarco.com/resources/steam-tables/saturated-steam.asp
Value of data	439.5 kJ/kg
Description of measurement methods and procedures to be applied:	Calculated value based on feed water temperature.
QA/QC procedures to be applied:	This is calculated value. No need of QA/QC procedure.
Any comment:	-

Data / Parameter:	$\mathbf{Q_{biomass,\ y}}$
Data unit:	Tonne
Description:	Quantity of PKS (biomass) combusted in year y
Source of data to be used:	On-site measurement as mentioned in annex 5
Value of data	81080 Tonne/year
Description of measurement methods and procedures to be applied:	Quantity of biomass used in project activity would be measured as per method given in annex 5 on daily basis. The quantity of biomass will also be measured using weigh scale at the time of procurement.
QA/QC procedures to be applied:	The actual consumption data will be cross checked with the biomass procurement data. Weigh scale will be calibrated annually as per national standard procedures.
Any comment:	-

Data / Parameter:	$\mathbf{BF_{PKS,\ y}}$
Data unit:	Tonne
Description:	The amount of PKS consumed by the Project coming from a distance more than 200 km (t-PKS/yr)
Source of data to be used:	Biomass procurement data
Value of data	0 Tonne/year
Description of measurement methods and procedures to be applied:	One way distance covered by every delivery along with quantity of PKS will be monitored on daily basis. The amount of PKS consumed by the project coming from a distance more than 200 km will be used for calculation of emission due to transportation.
QA/QC procedures to be applied:	Weigh scale will be calibrated annually as per national standard procedures.
Any comment:	-

Data / Parameter:	$\mathbf{Q_{coal,y}}$
Data unit:	Tonne
Description:	Quantity of coal combusted in year y
Source of data to be used:	On-site measurement as mentioned in annex 5
Value of data	0 (for ex-ante calculation)
Description of measurement methods	Quantity of coal used in project activity would be measured as per method given in annex 5 on daily basis. The quantity of coal will also be measured using weigh

and procedures to be applied:	scale at the time of procurement.
QA/QC procedures to be applied:	The data will be cross checked with the coal procurement data. Weigh scale will be calibrated annually as per national standard procedures.
Any comment:	

Data / Parameter:	$\mathbf{Q_{FO,y}}$
Data unit:	Tonne
Description:	Quantity of F.O. combusted in year y
Source of data to be used:	On-site measurement
Value of data	0 (for ex-ante calculation)
Description of measurement methods and procedures to be applied:	Quantity of F.O. used in project activity would be measured using volume meter on daily basis and recorded in Log books.
QA/QC procedures to be applied:	The data will be crossed check with the FO bills and data entered in log book.
Any comment:	

Data / Parameter:	$\mathbf{EF_{Coal}}$
Data unit:	tCO_2/TJ
Description:	The CO_2 emission factor per unit of energy of coal that would be used for start up the boiler and as co-firing in the project activity
Source of data used:	At the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Value of data:	100
Description of measurement methods and procedures to be applied	Value will be taken from recent IPCC guidelines on National GHG Inventories
QA/QC procedures to be applied:	No Need of QA/QC procedures
Any comment:	This value will be used for calculation of project emission.

Data / Parameter:	$\mathbf{EF_{FO}}$
Data unit:	tCO_2/TJ
Description:	The CO_2 emission factor per unit of energy of FO that would be used for start up the boiler in the project activity
Source of data used:	At the upper limit of the uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Value of data:	78.8
Description of measurement methods and procedures to be applied	Value will be taken from recent IPCC guidelines on National GHG Inventories

QA/QC procedures to be applied:	No Need of QA/QC procedures
Any comment:	This value will be used for calculation of project emission.

Data / Parameter:	**$NCV_{biomass}$**
Data unit:	kcal/kg
Description:	Net calorific value of PKS (biomass)
Source of data to be used:	Laboratory test report.
Value of data	3500 kcal/kg
Description of measurement methods and procedures to be applied:	NCV will be tested once in six months from outside laboratory.
QA/QC procedures to be applied:	No Need of QA/ QC procedures
Any comment:	-

Data / Parameter:	**NCV_{coal}**
Data unit:	kcal/kg
Description:	Net calorific value of coal
Source of data to be used:	For ex-ante calculation, NCV of coal has been taken from- Indonesian coal index report, Weekly average ICI prices, Issue 032, date 08 August 2008
Value of data	5000 kcal/kg
Description of measurement methods and procedures to be applied:	NCV will be taken from supplier data.
QA/QC procedures to be applied:	No Need of QA/ QC procedures
Any comment:	-

Data / Parameter:	**NCV_{FO}**
Data unit:	TJ/Gg
Description:	Net calorific value of F.O.
Source of data to be used:	For ex-ante calculation, NCV of coal has been taken from- 2006 IPCC Guidelines for National Greenhouse Gas Inventories, volume 2, page no 1.18
Value of data	40.4 TJ/Gg
Description of measurement methods and procedures to be applied:	NCV will be taken from supplier data.
QA/QC procedures to be applied:	No Need of QA/ QC procedures
Any comment:	-

Data / Parameter:	**EG_y**
Data unit:	GWh

Description:	Gross electricity generated by the project activity during the year y
Source of data to be used:	Onsite Measurement
Value of data	31.680 GWh (based on 330 days of operation)
Description of measurement methods and procedures to be applied:	Directly measured using energy meter. Data will be monitored on daily basis.
QA/QC procedures to be applied:	Energy meter is calibrated annually as per national standard procedures.
Any comment:	-

Data / Parameter:	**$EG_{Aux,y}$**
Data unit:	GWh
Description:	Auxiliary electricity consumption by the project activity during the year y
Source of data to be used:	Onsite Measurement
Value of data	3.691 GWh (Auxiliary power consumption in steam turbine is 466 kW as per power consumption details)
Description of measurement methods and procedures to be applied:	Directly measured using energy meter. Data will be monitored on daily basis.
QA/QC procedures to be applied:	Energy meter is calibrated annually as per national standard procedures.
Any comment:	-

Data / Parameter:	**$Q_{steam,\ back\ pressure}$**
Data unit:	Tonne
Description:	Quantity of back pressure Steam from turbine
Source of data to be used:	Onsite measurement
Value of data	22 TPH
Description of measurement methods and procedures to be applied:	Directly measured using steam flow meter. Data will be monitored on daily basis.
QA/QC procedures to be applied:	Steam flow meter is calibrated annually as per national standard procedures.
Any comment:	-

Data / Parameter:	**$T_{steam,\ back\ pressure}$**
Data unit:	Degree C
Description:	Temperature of back pressure steam from turbine.
Source of data to be used:	Onsite measurement
Value of data	
Description of	Measured using onsite temperature gauge. Data will be measured on hourly

measurement methods and procedures to be applied:	basis.
QA/QC procedures to be applied:	Gauge should be calibrated annually as per national standard procedures.
Any comment:	

Data / Parameter:	$\mathbf{P_{steam,back\ pressure}}$
Data unit:	barg
Description:	Pressure of back pressure steam from turbine
Source of data to be used:	Onsite measurement
Value of data	7 barg
Description of measurement methods and procedures to be applied:	Measured using onsite pressure gauge. Data will be measured on hourly basis.
QA/QC procedures to be applied:	Gauge will be calibrated annually as per national standard procedures.
Any comment:	-

Data / Parameter:	$\mathbf{E_{steam,\ back\ pressure}}$
Data unit:	kJ/kg
Description:	Enthalpy of back pressure steam from turbine
Source of data to be used:	Estimated based upon back pressure steam temperature and pressure using steam table. Data will be monitored on daily basis.
Value of data	2769 kJ/kg
Description of measurement methods and procedures to be applied:	Estimated values
QA/QC procedures to be applied:	This is a calculated value read from standard steam tables. No need of QA / QC procedures
Any comment:	-

Data / Parameter:	$\mathbf{Q_{steam,\ live}}$
Data unit:	Tonne
Description:	Quantity of live Steam for process heating
Source of data to be used:	Onsite measurement
Value of data	7.1 TPH
Description of measurement methods and procedures to be applied:	Directly measured using steam flow meter. Data will be monitored on hourly basis.
QA/QC procedures to be applied:	Steam flow meter is calibrated annually as per national standard procedures.
Any comment:	-

Data / Parameter:	$T_{steam, live}$
Data unit:	Degree C
Description:	Temperature of live steam for process heating.
Source of data to be used:	Onsite measurement
Value of data	450 deg C
Description of measurement methods and procedures to be applied:	Measured using onsite temperature gauge. Data will be measured on hourly basis.
QA/QC procedures to be applied:	Gauge will be calibrated annually as per national standard procedures.
Any comment:	

Data / Parameter:	$P_{steam,live}$
Data unit:	barg
Description:	Pressure of live steam for process heating
Source of data to be used:	Onsite measurement
Value of data	67 barg
Description of measurement methods and procedures to be applied:	Measured using onsite pressure gauge. Data will be measured on hourly basis.
QA/QC procedures to be applied:	Gauge will be calibrated annually as per national standard procedures.
Any comment:	-

Data / Parameter:	$E_{steam, live}$
Data unit:	kcal/kg
Description:	Enthalpy of live steam for process heating
Source of data to be used:	Steam table http://www.efunda.com/materials/water/steamtable_sat.cfm
Value of data	3290 kJ/kg
Description of measurement methods and procedures to be applied:	Calculated value based on steam temperature and pressure.
QA/QC procedures to be applied:	This is a calculated value read from standard steam tables. No need of QA / QC procedures
Any comment:	-

Data / Parameter:	$SEC_{j,biomass,y, measured}$
Data unit:	TJ of fuel input/TJ of boiler output
Description:	Specific Energy Consumption of biomass
Source of data to be used:	Calculated based on actual operational data.

Value of the data:	
Description of measurement methods and procedures to be applied:	As per para 34 of applied methodology. Data will be monitored on yearly basis.
QA/QC procedures to be applied:	No Need of QA/QC procedures
Any comment:	-

Data / Parameter:	**$SEC_{j,coal,y, measured}$**
Data unit:	TJ of fuel input/TJ of boiler output
Description:	Specific Energy Consumption of coal
Source of data to be used:	Calculated based on actual operational data.
Value of the data:	
Description of measurement methods and procedures to be applied:	As per para 34 of applied methodology. Data will be monitored on yearly basis.
QA/QC procedures to be applied:	No Need of QA/QC procedures
Any comment:	-

Data / Parameter:	**T_{cap}**
Data unit:	t/trip
Description:	Average tonnage of PKS per delivery
Source of data to be used:	Estimation from aggregate monthly delivery and the number of delivery
Value of data	-
Description of measurement methods and procedures to be applied:	• Aggregate monthly PKS delivery is based on the monitoring of $Q_{biomass, y}$. • Number of delivery per month is based on the delivery record.
QA/QC procedures to be applied:	
Any comment:	The amount of biomass from individual suppliers, and frequency of delivery will be recorded in log book. Therefore the tonnage per number of delivery can be easily identified.

Data / Parameter:	**AVD**
Data unit:	km
Description:	Return distance from the supplier site to the Project site
Source of data to be used	Estimated
Value of data	-
Description of	PT Pacific will request all suppliers to fill supplier registration data including

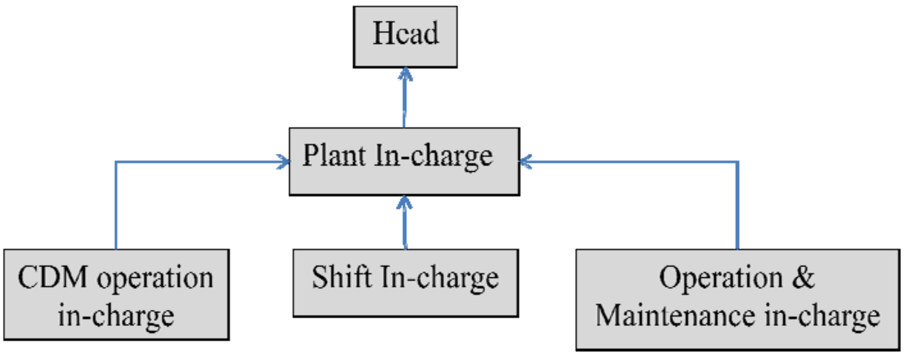
measurement methods and procedures to be applied:	location relative to plant site. If the supplier is a third party, this data refers to the collection site.
QA/QC procedures to be applied:	The reported distance will be crossed check with the distance between plant site and address of PKS supplier. In case of any mismatch the largest distance will be considered for calculation.
Any comment:	

B.7.2 Description of the monitoring plan:

The project proponent proposes the following structure for data monitoring, collection, data archiving and calibration of equipments for this project activity. The team comprises of the following members.

1. Head
2. Plant In-charge
3. Shift In-charge

Organisational Structure for Monitoring



Responsibilities of Head: Overall functioning and maintenance of the project activity.

Responsibilities of Plant In-charge: Responsible for maintaining the data records, ensures completeness of data, and reliability of data (calibration of equipments).

Responsibilities of Shift In-charge: Responsibility for day to day data collection and maintains day to day log book for monitored data.

Data source: As per section B.7.1

Data collection and record keeping: Data will be collected at the plant operation site under the supervision of the shift-in-charge and records will be maintained in daily logs. The reports are checked periodically by the Plant In-charge and discussed thoroughly with the data monitoring personnel. A separate log will also be maintained for the biomass supply on the site, its storage and usage in the project activity.

Reliability of data collected: The reliability of the measuring equipments will be calibrated as per section B.7.1. Documents pertaining to testing of equipments shall be maintained by Plant In-charge.

Frequency of monitoring: As per section B.7.1.

Archiving of data: The data, collected as part of monitoring will be archived electronically and it'll be kept for at least 2 years after the crediting period or from first issuance.

Maintenance of instruments and equipments used in data monitoring: The Operations Department shall be responsible for the proper functioning of the equipments/ instruments and shall take a corrective action if found not operating, as required.

Emergency preparedness: The project activity will not result in any unidentified activity that can result in substantial emissions from the project activity. No need for emergency preparedness in data monitoring is visualized.

Emission reduction calculation: Emission reduction calculations and monitoring report will be done annually based on the data collected. This will be done by the team. The monitoring report and the emission reduction calculation will be maintained by the head for verification.

Training of CDM team personnel: Training of the CDM team and plant personnel will be carried out on operation, maintenance and monitoring of GHG reduction parameters through a planned schedule in advance and a record of various training programs undertaken would be kept for verification.

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 baseline and monitoring was completed on 04/04/2009 by the project proponent, whose details are as follows:

Mr. Salah Ahmed Hayel Saeed
Managing Director
PT Pacific Indopalm Industries
Menara Kadin Indonesia, 17th Floor, Unit D&E
Jl. H.R. Rasuna Said, Blok X-5, Kav. 2&3, Jakarta 12950 – Indonesia

Mr. Arvind Johar
Country Manager
Indonesia Rep. Office
Pacific Inter-link SDN BHD
Menara Kadin Indonesia, 17th Floor, Unit D&E
Jl. H.R. Rasuna Said, Blok X-5, Kav. 2&3, Jakarta 12950 – Indonesia

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:

10/12/2008[16]

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

40 Years and 0 months

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:

NA

C.2.1.2. Length of the first crediting period:

NA

C.2.2. Fixed crediting period:

Yes

C.2.2.1. Starting date:

The start date of the crediting period is 01/03/2011 or a date not earlier than the date of registration of the small scale project activity

C.2.2.2. Length:

10 years and 0 months

[16] Date on which contract was signed with boiler manufacturer

SECTION D. Environmental impacts

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

Indonesia does not require Environmental Impact Assessments (EIA) for biomass power plant project generating less than 10 MW. As this project activity does not generate 10 MW, an EIA is not required[17]. However, the project proponent had conducted an environmental study (UKL/UPL) for the refinery unit.

Brief description of the expected environmental impact of the project

The project activity is located in district: River of Nine; City: Dumai ;Province: Riau.

The proposed project activity will have no impact on climate. Soil quality shall not change during construction and operation of the project activity. The project activity is a renewable energy activity. Therefore direct impact on overall hydrology of the area is not envisaged.

No forest of any type falls within the project area. There are no wildlife sanctuaries or fragile ecosystems within the project area. Therefore, direct impact on ecosystem is not envisaged.

There are no adverse impacts on health of the workers and local people due to the project activity. The project activity will result in lower GHG emissions to the surrounding environment and thus improve the working conditions inside the plant premises as well as improving the local environment for people living in close proximity.

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 is no adverse impact by the project activity on environment. It has only positive impacts in terms of GHG emission reduction.

[17] Summary of Environmental and Social Considerations, Page no 7, Table 1- Facilities subject to EIA in the electricity sector, and authorities competent to their EIA

SECTION E. Stakeholders' comments

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

Stakeholder consultation for the project activity has been conducted to account for the views of the people impacted either directly or indirectly due to the project activity. This has been carried out at all levels of stakeholders –

1. Dumai Inspectorate
2. Co-operation, UKM and Urban community of Dumai
3. Family planning Board, community empowerment of women and child of Dumai
4. Education secretary of Dumai
5. Hygiene and gardening Dumai service
6. Labour and transmigration Dumai Service
7. Communication Dumai service
8. Public work dumai service
9. Lubuk Gaung Figure Society
10. Administrator port, Dumai
11. Head of Sub-region, Sungal Sembilan, Dumai

The project proponent informed and requested all stakeholders about their views regarding the project activity. A letter was sent to Head of Sub-region, Sungal Sembilan, Dumai *dated on 08/11/2008* with the details of the project activity and request for their suggestions. An advertisement was also published to inform local people regarding the project activity. The newspaper advertisement describes in brief about the project activity, the benefits associated with the project activity.

A meeting was also held with all stakeholders on 22/01/2009. Meeting presided with the brief introduction of the Stakeholders. Representatives from project proponent briefed about the agenda of the

meetings and introduced the Global Warming, Climate Change and CDM. He also explained about the project activity and how the identified project fulfil the requirements of CDM and the purpose of meeting as to seek the concern, opinion and suggestion of the stakeholders.

E.2. Summary of the comments received:

The comments can be summarized as positive and environmental friendliness due to the reduction of fossil fuel in power production and Socio economic benefits from the project activity is also appreciated.

The stakeholders expressed their happiness due to the new proposed project since the new project has created employment opportunities. It has also created additional revenue for local people which will positively help in improving standard of life as well as socio economic conditions of village.

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

There were no negative comments received from the stakeholders. Therefore, It was not necessary to take due account of any of the other comments received.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	PT Pacific Indopalm Industries
Street/P.O.Box:	Menara Kadin Indonesia
Building:	17th Floor, Unit D & E
City:	Jakarta
State/Region:	
Postfix/ZIP:	12950
Country:	Indonesia
Telephone:	+62 21 5790 3777
FAX:	+62 21 5790 3733
E-Mail:	
URL:	
Represented by:	
Title:	Managing Director
Salutation:	Mr.
Last Name:	Saeed
Middle Name:	Ahmed Hayel
First Name:	Salah
Department:	
Mobile:	
Direct FAX:	(62-21)5790 3733
Direct tel:	(62-21)5790 3777
Personal E-Mail:	salah@pacificindomas.com

Organization:	PT Pacific Indopalm Industries
Street/P.O.Box:	Menara Kadin Indonesia
Building:	17th Floor, Unit D & E
City:	Jakarta
State/Region:	
Postfix/ZIP:	12950
Country:	Indonesia
Telephone:	+62 21 5790 3777
FAX:	+62 21 5790 3733
E-Mail:	
URL:	
Represented by:	
Title:	Country Manager – Indonesia Rep. Office
Salutation:	Mr.
Last Name:	Johar
Middle Name:	
First Name:	Arvind
Department:	
Mobile:	
Direct FAX:	(62-21) 5790 3733
Direct tel:	(62-21)5790 3777
Personal E-Mail:	Arvind@pacificinter-link.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

NO PUBLIC FUNDING IS INVOLVED

Annex 3

BASELINE INFORMATION SSC LIMIT

Capacity of plant		
Parameter	**Value**	**Unit**
Boiler Rated Capacity	40	TPH
Steam generation	40	TPH
Steam prerrure	67	barg
Steam temperature	450	deg C
Enthalpy of generated steam	3290	kJ/ kg
Enthalpy of feed water input	440.2	kJ/ kg
Energy output of the boiler	113991	MJ/hr
Thermal output from boiler	32	MWth
Turbine rated capacity	4	MWe
Total Capacity of plant	**44**	**MWth**

Annex 4

MONITORING INFORMATION

Please refer section B.7 in the PDD

Annex 5
Coal and biomass consumption: Tare Weight Method

The quantity of coal and biomass is also determined through the Tare Weight method. The Tare weight, also called unladen weight refers to the weight of an empty bucket. By subtracting it from the gross weight (laden weight), the weight of coal or biomass (the net weight) can be determined.

Quantity of coal/biomass per bucket (MT) =
Gross weight of the bucket (laden with coal/biomass) –Tare weight of the bucket (unladen)
………..Equation (a)

Total coal/biomass (MT) =

Quantity of coal/biomass per bucket (as determined from above) X Number of times the bucket is loaded with coal/biomass ……..Equation (b)

For standardizing the process, the quantity of coal/biomass that can be carried in the bucket has been pre-determined in the following manner:

Standardization of the bucket for coal quantity determination

1. Loading the bucket with coal and measuring the weight (gross weight)
2. Unloading the bucket and measuring the tare weight (unladen weight)
3. Measuring the difference between the gross weight and the unladen weight (weight of coal) as per the equation (a)
4. The process was repeated for a few times to get an average value.
5. The average value is then taken as the quantity of coal that the bucket can carry.

To get the total coal consumption, the average net weight per bucket is multiplied by the number of times the bucket is used for loading the coal.

<u>Standardization of the bucket for biomass quantity determination</u>

1. Loading the bucket with biomass and measuring the weight (gross weight)
2. Unloading the bucket and measuring the tare weight (unladen weight)
3. Measuring the difference between the gross weight and the unladen weight (weight of biomass) as per the equation (a)
4. The process was repeated for a few times to get an average value.
5. The average value is then taken as the quantity of biomass that the bucket can carry.

To get the total biomass consumption, the average net weight per bucket is multiplied by the number of times the bucket is used for loading the biomass.

Annex 6
Demonstration of surplus availability of biomass

This section aim to demonstrate that the amount of PKS available in the market is more than 25% of the PKS consumed by the project.

Amount of PKS used by the project activity is 81081 MT/year.

Amount of Shells Available in the market:
The following approach was taken to estimate the amount of PKS available in the market:

Step1 - Identifying total plantation area of palm trees in Indonesia
The distribution of planted area by provinces is given in table below for 2005:-

Province	Area (Mn Ha)	
Nangroe Aceh Darusalam	0.22	
North Sumatra	0.68	
West Sumatra	0.20	
Riau	1.40	
The Rest of Sumatra	1.25	
Total Sumatra		**3.75**
Java	**0.02**	**0.02**
West Kalimantan	0.46	
Central Kalimantan	0.34	
South Kalimantan	0.20	
East Kalimantan	0.20	
Total Kalimantan		**1.20**
Sulawesi	**0.12**	**0.12**
Irian Jaya (Papua)	**0.06**	**0.06**
Total	**5.15**	**5.15**

Out of 5.15 million ha planted area about 1 million ha is immature and 4.15 million ha is mature of productive.

Step2 – Estimation of FFB production from plantation area
The average Fresh fruit bunch (FFB) production rate is 17.33 tons per ha. This is based on 23 ton of FFB production per ha for large companies, 16 tons of FFB per ha for smaller companies and 13 ton of FFB per ha for smaller holders.
Based on this assumption, total FFB production in 2006 is 71.93 million tons from 4.15 million ha of plantation[18].

[18] Indonesia palm oil industry by Derom Bangun, Page no 3 and 6

Step3 – Estimation of PKS generation from FFB processing
The processing of FFB results in 6%[19] generation of PKS by weight.
Hence PKS production is 4.31 million tons from processing of 71.93 million tons of FFB in CPO mills.

Step4 – Estimation of available PKS in CPO mills
It is assumed that 50% of PKS is consumed by palm oil industries to meet their in-house thermal energy demand and 25% is used by other industries and only 25% of PKS is available[20]. Hence net PKS available in CPO mills after meeting the in-house thermal energy demand and supplying PKS to other industries is 1.077 million tons.

The assumption that 25% of PKS is consumed in other industries is valid because most of the other industries (similar to our project activity generating captive power) are running on conventional type of fossil fuels[21]. However we have considered that 25% of PKS is consumed in other industries.

Step5 – Trend of PKS generation in future
In the past 16 years notably since 1989, oil plantations in Indonesia expanded by 12% annually on the average[22]. Hence it can be safely assumed that the plantation area will increase in near future at least at the rate of 12% per annum. Since the data considered for analysis refers to 2006. Hence the available PKS in 2008 will be approximately 1.35 million tons.

Step 6 – Consumption of PKS
It is assumed that major part of PKS will be consumed in biomass based steam/electricity generation projects in Indonesia. PKS consumed in other industries has already been considered. However for conservativeness, PKS consumed in registered projects will also be deducted from available PKS.

Sl. No.	Registered Project	Date of registration	Quantity consumed (MT/year)	Reference
1	MSS Biomass 9.7 MWe Condensing Steam Turbine Project	17/06/2006	146475	Page no 33 of registered PDD
2	MNA Biomass 9.7 MWe Condensing Steam Turbine Project	31/08/2006	157300	Page no 36 of registered PDD
3	Nagamas Biomass Cogeneration Project in Indonesia Hereafter referred to as “the Project” or “the Project activity”	23/11/2007	59400	Page no 37 of registered PDD
4	Amurang Biomass Cogeneration Project	20/12/2007	35000	Page no 21 of registered PDD
5	Listrindo Kencana Biomass Power Plant	08/12/2008	44458	Page no 27 of registered PDD
6	Present project activity	-	81080	-

Total PKS consumption is 523713 MT/year.

[19] http://www.biomass-asia-workshop.jp/biomassws/02workshop/reports/2005121302CR-MALAYSIA.pdf
[20] Palm Kernel Shell (PKS) is More Than Biomass for Alternative Fuel After 2005 by Mohammad Dit
[21] Electric power sector in Indonesia by Anasia Silviati, US commercial service, CS Jakarta dated 11/08/2005, page 5
[22] http://www.datacon.co.id/Palm%20Oil%2006.html

Step 7– Surplus availability of PKS
Total estimated amount of PKS generation = 1350000 MT/ year
Total estimated consumption of PKS including project activity = 523713 MT/year
Surplus amount of biomass = 826287 MT/year or 157%

Hence surplus amount of biomass is 157% compared to the estimated consumption of PKS. Hence there will not be any leakage due to competing use of biomass.

Further PP has received letters from CPO mills for assured supply of enough PKS to meet its fuel energy demand.

Sl. No.	Company	Amount (MT/month)[23]
1	PT. Padasa Enam Utama	1000
2	PT. Bina Pitri Jaya	900
3	PT. Srikandi Jaya Permai	2000
4	PT. Karya Agung Sawita	2000
5	PT. Surya Bratasena Plantation	2000

Total PKS supply per year = 7900 X 12 = 94800 MT/year.
This assures enough fuel supply for proposed project activity.

- - - - -

[23] Letters from suppliers have been provided to DOE for validation