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

CONTENTS

Revision history of this document

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

SECTION A. General description of small-scale project activity

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

Title of the project activity : Biomass based power plant in Batu Pahat in Johor state, Malaysia
Version : 3.1
Date : 28/06/2012

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

Purpose of project activity

The main purpose of the small scale project activity is to establish a new power plant utilising the palm oil mill biomass and wood residues to supply 10 MW net electricity to the state owned electric grid.

Project description

The project activity is installation of a new power plant consisting of a 52 ton per hour boiler and a turbine utilising the palm oil mill biomass residues such as mesocarp fibre, Empty Fruit Bunch (EFB) fibre, Palm Kernel Shell (PKS) and wood residues / chips. The project activity is established by BELL Ecopower Sdn. Bhd. ("project proponent" or PP). Most of the raw material requirement of the project activity would be met from its group company Bell Palm Industries Sdn. Bhd. ('BPI or the mill'). Part of EFB and some wood residues would be procured from external sources.

BPI operates a palm oil mill of processing capacity of 60 ton / hour and proposes to enhance the processing capacity to process about 500,000 tons of FFB/ year.

The project activity would consume following quantities of biomass residues:

From its group company – Bell Palm Industries Sdn. Bhd

Mesocarp fibre	:	28,500 tons/ year
EFB fibre (after dewatering)	:	37,136 tons / year
Palm Kernel Shells	:	15,000 tons / year

From external sources

EFB fibre (after dewatering)	:	52,006 tons / year
Wood residues/ chips	:	1,800 tons/ year

In case of low crop season or lesser production from its own palm oil mill, the project activity may import extra biomass from other palm oil mills.

The biomass residues would be combusted in the boiler producing high pressure steam. The steam is passed on to the turbine to produce electricity. The net electricity after the auxiliary consumption would be exported to the national grid of Tenaga Nasional Berhad (TNB), the state electric utility of Peninsular Malaysia.

Reduction of greenhouse gases by the project activity

The project activity would supply the electricity to the national grid of Tenaga Nasional Berhad (TNB).

The electricity grid network of Malaysia has following grids:

1. Peninsular grid
2. East Coast Sabah grid
3. West Coast Sabah grid
4. Sarawak grid

The project activity supplies electricity to the Peninsular grid of Malaysia. The installed power capacity mix of Peninsular grid as of 31 December 2007 is given in table A-1. The latest year for which information publicly available at the time of PDD submission is 2007.

Table A-1 Installed power capacity mix of Peninsular grid as of 31 December 2007[1]

Power source	Installed capacity	% share
Gas based generation	12,265 MW	61.18 %
Coal based generation	5,770 MW	28.78 %
Oil based generation	68 MW	0.34 %
Hydroelectric generation	1,944 MW	9.7 %
Total	**20,047 MW**	**100 %**

From the above table, it may be noticed that about **90.3 %** of the *installed capacity* of the Peninsular electricity grid is thermal generation with fossil fuel based sources and only 9.7 % of *installed capacity* is from hydropower. That is, the peninsular grid is powered predominantly by fossil fuels based generation.

The generation of electricity for latest three years up to 2007 for which information is publicly available is in Peninsular grid from fossil fuel sources and renewable energy is given in table A-2.

Table A-2 – Electricity generation from fossil fuel and renewable sources in Peninsular grid[2]

	2005	% share	2006	% share	2007	% share
Fuel type	GWh	%	GWh	%	GWh	%
Thermal	82,605	**95.17%**	85,421	**93.92%**	89,241	**93.81%**
Hydro	4,188	4.83%	5,529	6.08%	5,888	6.19%
Total	86,793	100.00%	90,950	100.00%	95,129	100.00%

From Table A-2, it may be seen that about 94% of generation in Peninsular grid is from fossil fuel sources and only about 5 % of generation is from renewable source of hydroelectric generation.

[1] Source : National Energy Balance 2007, Ministry of Energy, Communications and Water Malaysia

[2] Source : Study on Grid connected electricity baselines in Malaysia , December, 2008

The project activity envisages to supply about 775,780 MWh of electricity generated from renewable energy source to the grid during the crediting period of 10 years. Hence, the electricity supplied by the project activity would displace equivalent amount of electricity supplied by fossil fuel based sources and associated CO_2 emissions.

View of project participants on the contribution of project activity to sustainable development
Environmental sustainability

The project activity generates electricity from solid biomass wastes – a renewable source of energy. The project activity will lead to reduced disposal of wastes from the palm oil mill and increase the utilisation of the energy content in wastes. The energy generation from a renewable source of energy contributes for environmental sustainability.

Additionally, the project activity produces electricity without much greenhouse gas (GHG) emissions.

Thus, the following environmental benefits are derived from the project activity:

- Produces electricity from a renewable energy source
- Produces electricity without or very less GHG emissions.
- Has very little negative impact on the environment.

The project activity would install necessary pollution control equipment to minimise the emissions of particulates and other pollutants**.**

Social sustainability

The project activity would contribute for the following social benefits:

- New employment opportunities for the local population improving the social living standards of the local community
- Improve the technical skills of staff in the operations and maintenance of the higher efficient electricity generation plant
- New jobs for skilled manpower during operation of the project activity
- Increase in local business like transportation, maintenance, parts supply, food and other services which would improve the social living standards of the local community

Economical sustainability

- Decreasing the country's dependence on fast depleting fossil fuels for generation of electricity
- Improvement in local economic activity
- During operation of the project, direct and indirect employment opportunities would be available for the local community leading to economic benefits.

Technological sustainability

- Helps to meet Malaysia 's Ninth Plan target of 350 MW from renewable energy
- The project activity would establish a higher pressure and higher efficient energy generation system than that of generally used in palm oil industry in Malaysia.
- The project activity would contribute for the country's policy to promote the use of renewable energy.

All the above would contribute for the sustainable 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)
Malaysia	BELL Ecopower Sdn. Bhd. (Private entity)	No
Japan	Marubeni Corporation (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):

Malaysia

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

Johor state

A.4.1.3. City/Town/Community etc:

Batu Pahat

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

The project activity would be located in Lot no. 4960, Parit Ju, Simpang Kiri, 83000 Batu Pahat in Johor state in Malaysia. The physical coordinates of the location of the project activity are 1° 51' N and 102° 56' E.

The location of the project activity is given in the following figures:

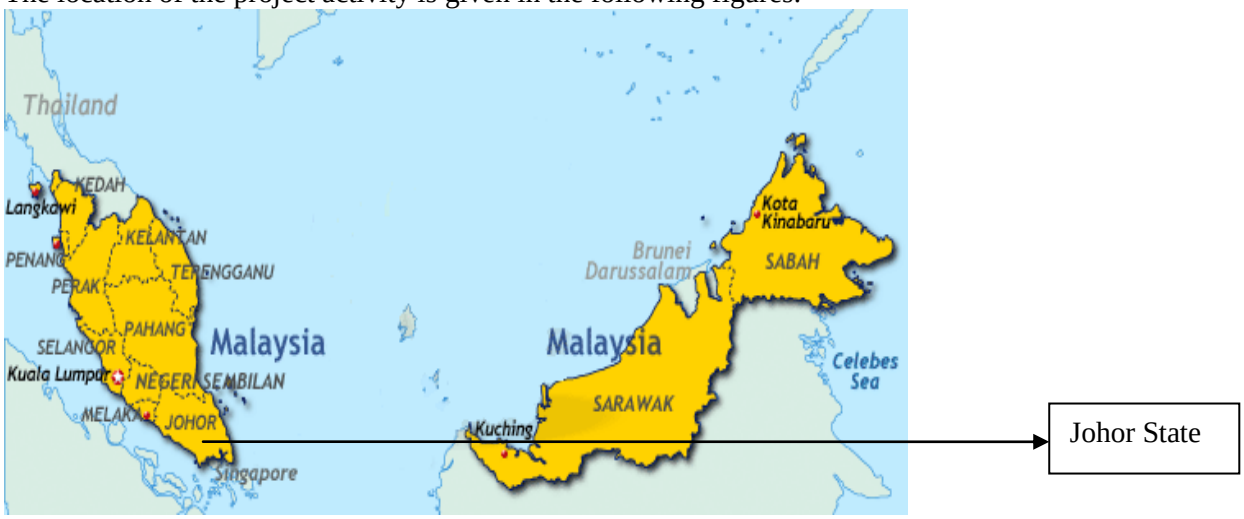


Fig 1 - Map showing Johor state in the Map of Malaysia

Fig -2 – Map showing Batu Pahat in Johor State Map

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

Since the capacity of the project activity is less than 15 MW, project activity qualifies for a small scale CDM project activity.

Scope	:	1
Sectoral Scope	:	Energy Industries (Renewable -Non-renewable sources)
Type	:	I - Renewable energy projects
Category	:	I.D - Grid connected renewable electricity generation

The project activity is a biomass based power plant of 11 MW capacity which is lesser than 15 MW, qualifying for small scale CDM project activity.

As per the provisions of Appendix B of Simplified Modalities and Procedures for Small Scale CDM Project Activities approved small scale methodology AMS I.D, ***Version 17"***, "comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and **renewable biomass**, supplying electricity to a national or regional grid".

The project activity comprises of renewable biomass power plant supplying electricity to the grid of Tenaga Nasional Berhad, which is being supplied by several fossil fuel generating units. With above considerations, the Type I.D. is the most appropriate category for the project activity. The project activity does not comprise any electricity generation from non-renewable energy sources.

The project activity would utilise EFB fibre, mesocarp fibre, palm kernel shells and wooden biomass as fuel for the project activity. The calculations for quantity of biomass required are provided in Annex 5. In case of low crop season or lesser production from its own palm oil mill, the project activity may import excess biomass from other palm oil mills.

The mesocarp fibre and palm kernel shells would be supplied as produced in the mill through conveyors. EFB would need some pre-treatment before combusted in the project activity. EFB would be subjected to dewatering in presses and size reduction in shredders in the palm oil mill and supplied to the project activity through conveyors as EFB fibre which could then be combusted in the boiler. The biomass imported from external sources would be transported in trucks.

Technology of the project activity

Boiler

Type	:	Bi-drum water tube
Draught system	:	Balance draught
Capacity	:	52 ton / hour
Design Pressure	:	49.5 bar
Working pressure	:	43 bar
Temperature	:	415 ° C super heated steam
Quantity of boiler	:	1

Boiler would be complete with following accessories:

- Boiler drums, tubes and headers
- Automatic boiler feed water regulator to maintain a constant water level in the drum
- Two units of Induced draft fans, one unit of forced draught fan
- Six sets of Rotary steam type soot blower
- Multi cyclone dust arrestor at boiler outlet
- Air compressor for boiler controls
- Boiler water sampling cooler
- Feed water pumps
- Interconnecting piping
- Economiser

Turbine

Turbine Type	:	Fully condensing
Steam Pressure	:	43 bar (abs)
Steam Temperature	:	400 ° C
Quantity	:	1

The auxiliary systems include:

- Water treatment plant
- Biomass handling system
- Cooling water plant
- Condenser
- Instrumentation controls
- Electricity Transmission

The technology is commercially available locally and environmentally safe. All necessary safety provisions and precautions would be implemented in the project activity. All necessary provisions to meet the statutory environmental standards will be implemented in the project activity. The project activity does not have any significant impact on air, water and land. Thus, an environmentally safe technology is implemented in the project activity.

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

The estimated amount of emission reductions from the small scale project activity over the chosen crediting period is given in Table A-3.

Table A-3 – Estimated amount of emission reductions

S.No.	Years	Estimation of annual emission reductions in tonnes of CO_2 e
1	Year 1	44,331
2	Year 2	47,327
3	Year 3	54,113
4	Year 4	54,113
5	Year 5	54,113
6	Year 6	54,113
7	Year 7	54,113
8	Year 8	54,113
9	Year 9	54,113
10	Year 10	54,113
Total estimated reductions (t CO_2e)		**524,560**
Total number of crediting years		10
Annual average over the crediting period of estimated reductions (tCO_2e)		**52,456**

Year 1 starts from the date of registration of the project activity as a CDM project activity

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

There is no public funding for the project activity from Annex 1 Parties.

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

The project proponent have a registered CDM small scale project activity – Project no. 1783 - "Methane capture from POME for electricity generation in Batu Pahat," within 1 km of project boundary of the subject project activity. The registered small scale project activity has a Type I component of 2 MW.

As per Annex 7 of the Report of the Seventh Meeting of the Executive Board- Appendix C of the Simplified Modalities and Procedures for small scale project activities– Determining the occurrence of debundling, " if the total size of an activity combined with the previous registered small – scale project activity does not exceed the limits for small scale CDM project activities, the project activity can qualify to use simplified modalities and procedures for small scale project activities

The installed capacity of the project activity is 11 MW and capacity of type I component of the registered small scale project activity is 2 MW. Since the combined capacity is 13 MW which is less than 15 MW, the project activity can use a small scale methodology and therefore is not a debundled component of a large scale project activity.

SECTION B. Application of a baseline and monitoring methodology

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

Title of approved baseline methodology: Grid connected renewable electricity generation
Reference : Version 17 of Approved Small Scale Methodology AMS I.D.
Scope number : 01
Sectoral scope : Energy industries (renewable - / non-renewable sources)

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

Appendix B of the simplified M&P for small-scale CDM project activities provides indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories. As per the M&P, the project activity falls under the approved small scale methodology *AMS I.D./ Version 17 – Grid connected renewable electricity generation.*

Justification of the small scale project activity as per technology/measure of AMS I.D/ Version 17
The applicability conditions of approved baseline methodology in the context of the project activity are given in the following table in Table B-1:

Table B -1 – Choice of methodology justification

Technology /Measure as per AMS I.D/ Version 17	Measure of project activity
This methodology comprises renewable energy generation units such as photovoltaic, hydro**,** tidal/ wave, wind, geothermal and renewable biomass : (a) Supplying electricity to a national or regional grid; or (b) Supplying electricity to an identified consumer facility via national / regional grid through a contractual arrangement such as wheeling	The small scale project activity is a renewable energy generation unit based on renewable **biomass** source. The project utilises biomass wastes such as EFB, mesocarp fibre, PKS and wood chips. EFB, mesocarp fibre and PKS are residues from a palm oil mill which is an agricultural industry. Since these are residues from an agricultural industry, they comply with definition of renewable biomass. Similarly the wood residues or wood chips proposed to be used in the project activity are from nearby wood industries, which is a forestry industry. Hence, it complies with the definition of renewable biomass. The generated electricity would be supplied to TNB grid, which is a regional grid and is the only grid operating in Peninsular Malaysia. *Since the project activity fuly meets the option (a), the measure is satisfied.*

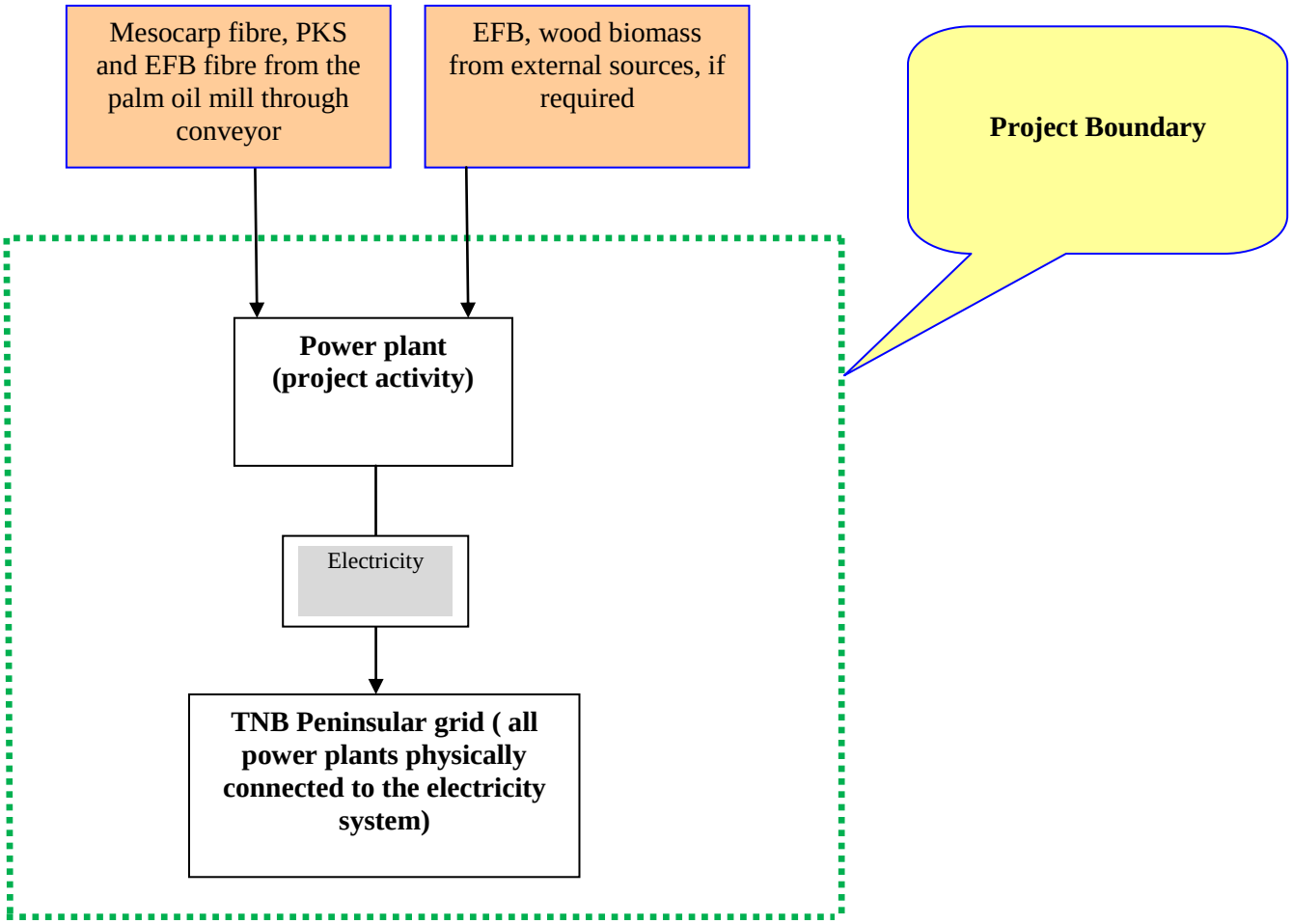
This methodology is applicable to project activities that (a) install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); (b) involve a capacity addition (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).	The project activity is a new greenfield plant. *Hence, the project activity meets the criterion.*
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: • The project activity is implemented in an existing reservoir with no change in the volume of reservoir; • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m^2; • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m^2.	This is not a hydropower project and hence this criteria is not applicable
If the new unit has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small scale CDM project activity applies only to the renewable component. If the new unit co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	The small scale project activity has only renewable component and no fossil fuel component is added. - Installed capacity of the project activity is only 11 MW (lesser than 15 MW). *Hence, the project activity meets the criterion.*
Combined heat and power (co-generation) systems are not eligible under this category.	The project activity is only a power plant and is not a cogeneration system. *Hence, the project activity meets the criterion.*
In the case of project activities that involve addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	The installed capacity of the project activity is a greenfield project of 11 MW which is lesser than 15 MW *Hence, the project activity meets the criterion.*
In the case of retrofit or replacement, to qualify as a small scale project , the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	The project activity is a greenfield project and does not involve retrofitting or replacement of existing facility. *Hence, the project activity meets the criterion.*

From the above table, it is evident that the project activity meets all the applicability conditions of the approved small scale methodology AMS I.D/ Version 17 – Grid connected renewable electricity generation as specified in *appendix B of the simplified modalities and procedures for small scale CDM project activities*.

B.3. Description of the project boundary:

As per paragraph 9 of AMS I.D, the spatial extent of the project boundary includes "the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to". For the project activity, the project boundary is the power plant and the Peninsular grid of TNB, which is the electricity system to which all power plants are physically connected.
The project boundary of the project activity is shown in Fig B-1.

Fig B - 1 Project boundary



B.4. Description of baseline and its development:

As per paragraph 10 of AMS ID / version 17, the baseline of the project activity is standardised as, ", the baseline scenario is that, the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources into the grid".

As per paragraph 11 of AMS ID / version 17, "the baseline emissions are the product of electrical energy baseline $EG_{BL,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor.

$BE_y = EG_{BL,y,} * EF_{CO2, grid,y}$

Where :

BE_y	Baseline Emissions in year *y* (t CO_2)
$EG_{BL,y}$	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year *y* (MWh)
$EF_{CO2,grid,y}$	CO_2 emission factor of the grid in year y (t CO_2/MWh)

As per paragraph 12 of the methodology AMS ID /version 17, the grid emission factor can be calculated in a transparent manner as:

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in "Tool to calculate the emission factor for an electricity system"

OR

(b) The weighted average emissions (in t CO_2 / MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

The project activity produces electricity from a renewable source and supplies to a grid which is supplied by several fossil fuel based sources. The grid is Peninsular grid of TNB where about 90 % of the installed capacity is fuelled by fossil fuels and more than 94 % of annual generation is from fossil fuel based generation. Therefore, as per AMS ID, the baseline for the project activity is the kWh produced by the project activity multiplied by the emission factor of the grid calculated by one of the two methods as mentioned above.

Information about the baseline emission factor is given in Annex 3- Baseline information.

The baseline emission factor of the grid as per combined margin is 0.684 ton CO_2e / MWh

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:

Time line and CDM consideration for the project activity

Signing of contract with CDM consultant	:	17/05/2008

Notification to UNFCCC regarding CDM consideration was sent on 24/08/2008 and resent on 07/10/ 2008.

Notification was sent to DNA, Malaysia vide letter no BEPSB – DNA- CDM 01 dated 24 /08/2008

Local stakeholders' meeting at the project site	:	28/08/2008
Acknowledgement from UNFCCC	:	20/10/2008
Appointment of DOE	:	29/04/2009
PDD webhosted in UNFCCC CDM website	:	17 /06/2009
Letter of approval from DNA, Japan	:	30/11/2010
Final Letter of approval from DNA, Malaysia	:	04/02/2011

The project proponent have a registered CDM small scale project activity – Project no. 1783 - "Methane capture from POME for electricity generation in Batu Pahat,", registered on 24/10/2008. The notifications sent to UNFCCC and DNA regarding CDM consideration and the fact that the PP has already registered a CDM project shows very clearly that PP is well aware of CDM and its incentives. The investment analysis below shows that the returns from the project activity are very crucial for the project to make commercial sense.

Justification for additionality of the project

Simplified modalities and procedures for small scale CDM project activities guides to establish additionality of the project activity as per Attachment A to Appendix B. The Attachment A to appendix B mentions various barriers and requires explanation to show that the project activity would not have occurred due to at least **any one** barrier.

Establishing the project activity is a voluntary step undertaken by the project proponent with no direct or indirect mandate by law. The main driving forces to this 'climate change initiative' have been GHG reduction and subsequent carbon financing against sale consideration of carbon credits.

However, the project has various barriers associated to project implementation. The barriers faced by the project activity are discussed below:

B.5.1- Investment barrier

The most important barrier for the project activity is the investment barrier due to low returns from the project activity by sale of electricity to the grid.

An investment analysis of the project activity is conducted with the Internal Rate of Return (IRR) as the financial indicator. 'Internal Rate of Return' is one of the known financial indicators used by UNFCCC, banks, financial institutions and project developers to assess the viability of the project and for making investment decisions.
The IRR was estimated with the following input values:

Installed capacity	:	11 MW
Export capacity	:	10 MW

Total project cost	:	RM 54.576 Million – Source ; Feasibility Study for the project .
Sale price/kWh	:	RM 0.21 – Source : Tariff agreed for similar project by PP
Plant Utilisation factor	:	75 % during first year, 80% during second year and 91.3 % during subsequent years (8000 hours of operation per year) – Source : Feasibility Study for the project
Income Tax	:	Exempted for first 10 years -conservative assumption

The Project IRR is calculated as per latest "Guidelines on the assessment of investment analysis". The internal rate of return of the project activity is 6.69 % for 20 years. The IRR for the project activity is 2.14 % for 10 years. *The spread sheet for IRR calculations are attached as Appendix- 1.*

The latest Guidelines on the assessment of investment analysis suggests that commercial borrowing rate to be one of the benchmarks for Project IRRs[3]. As per Guidance 12 of the latest Guidelines on the assessment of investment analysis, version 05, 'local commercial lending rates' has been specified as one of the benchmark for Project IRRs. Therefore, local commercial lending rate has been adopted as benchmark for the project activity.

Bank Negara is the Central bank of Malaysia which fixes Base Lending rate (BLR) which is also called as Cost Of Fund (COF) or Effective Cost Of Funds (ECOF). The banks usually charge a spread over ECOF to cover their costs and profit and the rate arrived as a sum of (BLR + spread) is charged as interest rates. For the year 2008, Bank Negara has announced a BLR of 6.48% [4] . Bank Pembangunan (Development Bank) finances for renewable energy projects, CDM projects, waste management projects, etc., Bank Pembangunan charges a spread of 2.5% over ECOF[5]. Therefore the commercial lending rate becomes 6.48+2.5 = 8.98 % which is the benchmark for the project activity.

It may be seen that the IRR of the project activity is lower than the benchmark. The project activity would not be able to even service the debt component of the project with sale of electricity to the grid. This has been one of the main reasons for many projects not coming up in Malaysia in spite of availability of huge quantity of biomass in the country. In spite of Government' s initiative to promote renewable energy, there has been a reluctance on the part of the electric utility to offer better prices to facilitate establishment of such projects on a commercial scale as the purchase price offered by the electric utility does not make the projects commercially viable.

The project activity has a clear investment barrier as Project IRR is lower than the borrowing rate.

B.5.1.1 Sensitivity analysis:

A sensitivity analysis with variations as suggested by Guidelines on the assessment of investment analysis was carried out as below:

1. Variations in Investment cost
2. Variations in revenue (export of electricity to the grid)
3. Variations in O&M costs

[3] Guidance 12 of "Version 05- Guidelines on the assesment of investment analysis, EB 62 Annex 5"

[4] Annual Report 2009 of Bank Negara

[5] Brochure of Bank Pembangunan.

As per guidance, sensitivity analysis for investment costs has to be carried out only for the components that constitute more than 20 % of the investment costs. In the project case, the cost of boiler and turbine would constitute for more than 20 % of the investment cost. These two items contribute for about 40 % of the project cost. As a conservative estimate, the variation is considered for 50 % of the project cost.

The project IRR with +10 and -10 % variations for variables listed above are presented in the Table B-2.

Table B-2 – Project IRR without CDM revenues for various variations

S. No.	Parameters	Variation	IRR for 20 years without CDM revenues	IRR for 10 years without CDM revenues	Comments
1.	Variation in Investment costs	+10%	6.27 %	1.62%	The IRR is lower than the benchmark
		-10%	7.14 %	2.69%	The IRR is lower than the benchmark
2	Variation in revenues (export of electricity to the grid)	+ 10%	7.90 %	3.77%	The IRR is lower than the benchmark Increase is considered only for first two years as 8000 hours of operation (maximum) has already been considered in the original IRR calculations
		-10%	0.18%	-3.69%	The IRR is lower than the benchmark
3.	Variation in O&M cost	+10%	8.55%	3.90%	The IRR is lower than the benchmark
		-10%	4.83%	0.50%	The IRR is lower than the benchmark

The results of the sensitivity analysis conducted confirm that the financial internal rate of return of the project activity without CDM revenues is much lower than the benchmark of commercial borrowing rate.

It must be mentioned here that the commercial borrowing rate is a very conservative benchmark as the project IRR calculations also has equity component and it is very unlikely that investors would invest in the project with expectations to get returns as only that of commercial borrowing rates. The IRR of the project is lower than the benchmark and therefore not attractive financially.

B.5.1.2. IRR with CDM revenues

The registration of the project activity as CDM project activity would provide the project activity additional source of revenue. The IRR of the project activity increases to 12.73 % with expected sale of CERs generated from the project activity. This would make the project commercially viable and financially attractive.

The above facts and figures clarifies that the 'project activity is financially a non-viable activity' and is robust to reasonable variations in the critical assumptions and the CDM revenue, the project activity would obtain through sale of the emission reductions is very crucial to sustain the operations of the project activity to make it financially attractive.

B.5.2. Policy Barriers – Monopoly market

There is no open market for sale of electricity and government owned TNB is the monopoly purchaser of electricity generated by the generating companies in Malaysia. There are not even other government owned competing agencies and TNB is the only purchaser of electricity. The independent power producers have to sell only to TNB and therefore are at a disadvantage to negotiate the energy sales price and other terms of the sales contract. The monopoly market controlled by government owned entity is a barrier for investment.

B.5.3. Prevailing practice

There is only one grid connected electricity generation plant in Peninsular Malaysia[6] and that is a 2 MW landfill gas project under implementation. The other project, Kunak biomass power plant is in Sabah region in East Malaysia. There are about 249 palm oil mills operating in Peninsular Malaysia[7] as of December 2007. Although sufficient experience is available with palm oil mills in implementation and operation of biomass power plants, there is not a single palm oil biomass based grid connected electricity generation project in Peninsular Malaysia. This shows that biomass based grid connected electricity generation projects is not a common practice in Peninsular Malaysia.

There are about 405 palm oil mills in entire Malaysia including East Malaysia[8] and there is only one grid connected palm oil biomass based electricity generation project which is Kunak Biomass Power plant[7]. This Kunak project is also under validation process to be registered as CDM project and therefore, there is no grid connected electricity generation project from biomass in entire Malaysia which clearly demonstrates that the project activity is not a common practice in Malaysia.

All the above barriers clearly show that considerable investment, technological, market and current prevailing practice barriers exist for the project activity. The project activity as already explained would reduce GHG Emissions by displacing grid electricity by renewable source of energy. Therefore, it may be concluded that the project activity is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

6.1.1 Emission Reduction by project activity

The emission reduction by the project activity is given by the following formula:

ER_y = BE_y - PE_y - LE_y ---------- (Eq. 1)

(ton CO_2 e/year) (ton CO_2 e/year) (ton CO_2 e/year) (ton CO_2 e/year)

Where,

[6] EPU, 2006: 9th Malaysia Plan 2006-2010: p 401: "Under the Small Scale Renewable Energy Power Programme (SREP) two projects with a combined grid connected capacity of 12 MW were implemented" – during the 8th Plan from 2000-2005. These were the Kunak Biomass Power Plant (10 MW) and a landfill gas project (2 MW)

[7] http://econ.mpob.gov.my/stat/web_report1.php?val=200713 – official website of Malaysian Palm Oil Board

ER_y	-	Emission reduction per annum by project activity in ton CO_2 e/year
BE_y	-	Baseline emissions in year y (ton CO_2 e/year)
PE_y	-	Project emissions in year y (ton CO_2 e/year)
LE_y	-	Leakage emissions in year y (ton CO_2 e/year)

6.1.2 Baseline emissions (BE_y)

The baseline emissions of the project activity are calculated as per following formula:

BE_y = $EG_{BL,y}$ * $EF_{CO2,grid,y}$ ---------- (Eq.2)

(ton CO_2 e/year) (MWh /year) (ton CO_2 e /MWh)

Where,

BE_y	-	Baseline emissions in year y (ton CO_2 e /year)
$EG_{BL,y}$	-	is quantity of net electricity supplied to the grid by the project activity in year *y* (MWh / year)
$EF_{CO2,grid,y}$	-	is CO_2 emission factor of the grid in year y (t CO_2/MWh)

6.1.3. Project emissions (PE_y)

The project emissions for the project activity are given in para 20 of the methodology which states:

i. For most renewable energy project activities, $PE_y = 0$. However, for the following categories of project activities, project emissions have to be considered following the procedure described in the most recent version of ACM0002.
   - Emissions related to the operation of geothermal power plants (e.g. non-condensable gases, electricity/fossil fuel consumption);
   - Emissions from water reservoirs of hydro power plants.

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

Since the project activity is neither a geothermal power plant nor a hydro power plant from water reservoir, (i) listed above is not applicable. Further, since no fossil fuel is consumed in the project activity, (ii) is also not applicable.

However, there may be proect emissions from another source – due to electricity consumed from the grid occassioanly which has been considered and accounted in the section below.

6.1.3.1 Project emissions due to electricity consumption

The project activity may consume electricity from the grid during start up of the project activity. The emissions due to electricity consumption by the project activity would be accounted as project emissions. This is expected to happen only during start up of the project activity. After commissioning the project

activity, the electricity required to run the installations in the power plant would be powered by the project itself.

These emissions due to import of electricity is given by the following formula as per "Tool to calculate baseline, project and/or leakage emissions from electricity consumption" / version 01

PE_y = El_{imp} * $EF_{CO2,grid,y}$ * $(1 + TDL_y)$ -- Eq.3
(ton CO_2e /yr) (MWh/year) (ton CO_2e /MWh)

Where PE_y is the project emissions due to electricity consumed from the grid in ton CO_2e/year

El_{imp} is the quantity of electricity imported from the grid in MWh/year

$EF_{CO2,grid,y}$ is the baseline emission factor of the grid in ton CO_2e /MWh

TDL_y is the average technical transmission and distribution loses for providing electricity in the grid in the year y

Determination of Transmission and distribution losses

TDL is determined based on the net electricity generation and net electricity consumption data of Peninsular grid. The latest year for which these data are publicly available at the time of submission of PDD is 2007.

TDL is determined below:

Net electricity generation in Peninsular grid for the year 2007	:	92,055 GWh[8]
Net electricity consumption in Peninsular grid for the year 2007	:	81,710 GWh[9]
Transmission and distribution losses	:	10,345 GWh
Transmission and distribution losses % (TDL%)	:	11.24 %

6.1.3.2. Project emissions due to transportation of biomass

Most of the biomass utilised for the operations are procured from the group company nearby and are conveyed through the conveyor. The conveyor uses electricity generated from biomass based electricity generation system and therefore there would be no direct GHG emissions due to transportation of biomass from its group company. However, some biomass would be transported from external sources.

The emissions due to consumption of fossil fuel for transportation of biomass would be accounted as project emissions.

In the absence of specific formula in AMS ID, the formula to calculate the emissions from the transport has been taken from ACM0006 which is :

$$PET_y = \frac{\sum_k BF_{T,k,y}}{TL_y} \cdot AVD_y \cdot E_{km,CO2,y}$$ ---------- Eq.4

[8] Source : National Energy Balance, 2007, Malaysia, Ministry of Energy, Water and Communications, Malaysia

[9] Source : National Energy Balance, 2007, Malaysia, Ministry of Energy, Water and Communications, Malaysia

Where,

PET_y	=	CO_2 emissions during the year y due to transport of the biomass residues to the project site (t CO_2/year)
TL_y	=	Average truck load of the trucks used (tons) during the year y
$BF_{T,k,y}$	=	Quantity of biomass residue type k transported to the project site during the year y (tons)
AVD_y	=	Average round trip distance (from and to) between the biomass residue fuel supply sites and the site of the project activity during the year y (km)
$EF_{km,CO2,y}$	=	Average CO_2 emission factor for the trucks measured during the y (t CO_2/km)

6.1.4. Leakage (PL_y)

6.1.4.1. Leakage due to transfer of equipment

As per paragraph 22 of AMS I.D / Version 17, leakage is to be considered only "if the energy generating equipment is transferred from another activity". Since this does not apply for the project activity, there is no leakage associated with the project activity and therefore, leakage is zero.

6.1.4.2. Leakage due to competing use of biomass

In addition to the leakage specified in the methodology AMS ID, Attachment C to Appendix B – Indicative Simplified baseline and monitoring methodologies for selected small scale CDM Project activity categories specifies assessment of leakage due to competing use of biomass in the region of at least 50 km radius of the project activity.

The palm oil mills within 50 km radius of the project activity excluding Bell Palm Industries, their processing capacity, average operating hours, FFB processed and biomass residues produced in the region are given in the Table B-3.

Table B-3 – Biomass residues production in the region

S.No	**Name of the mill**	**Mill Capacity (ton / hour)**	**Operating hours (approx)**	**FFB processed (ton/ year)**	**Mesocarp fibre produced (ton/ year)** (@12.7% of FFB processed)	PKS (ton/ year) (@ 5.7% of FFB processed)	**EFB (ton/ year)** (@21.1% of FFB processed)
1	Bandung Palm Oil Mill	40	6,000	240,000	30,480	13,680	50,640
2	Sawit Muar POM	60	6,000	360,000	45,720	20,520	75,960
3	Bukit Pasir POM	30	6,000	180,000	22,860	10,260	37,980
4	Lengga POM	60	6,000	360,000	45,720	20,520	75,960

5	Syrikat Perusahaan Kelapa Sawit POM	60	6,000	360,000	45,720	20,520	75,960
6	Ayer Hitam POM	40	6,000	240,000	30,480	13,680	50,640
Total		**290**		**1,740,000**	**220,980**	**99,180**	**367,140**

Most of mesocarp fibre and a part of PKS are used as fuel within the palm oil mill for their energy requirements. EFB has no use and generally disposed in the plantations and subjected to decay.

There are no official statistics available on the information about usage of mesocarp fibre in the mills. However industry sources have informed that about 80 – 90 % of the mesocarp fibre is consumed in the mill [10]. Therefore, higher figure of 90% is considered for estimation purposes for conservatism.
Again there are no official figures of usage of PKS. Wide range figures of 20 – 50 % of the PKS is said to be used in the palm oil mills[10]. The higher figure of 50 % has been considered for estimation purposes.

The details of biomass utilised and excess biomass available in the region is given in Table B-4.

Table B- 4- Leakage assessment due to competing use of biomass residues in the region

	Mesocarp fibre (tons/ year)	**PKS (tons/ year**	**EFB (tons/ year)**
Total biomass available in the region (from table B-3)	220,980	99,180	367,140
Biomass utilised	@90% 198,882	@ 50% 49,590	0
Excess biomass available in the region	22,098	49,590	367,140
Biomass from BPI for the project activity	28,500	15,000	58,357 (at 65 % moisture)
Total biomass available	50,598	64,590	425,497
Biomass required for the project activity	28,500	15,000	140,080 (at 65 % moisture)
Excess biomass %	44%	77%	67 %

From the above, it may be seen that all biomass are available in excess of 25 % in the region. Hence leakage due to biomass availability is not considered and taken as zero for the project activity.

6.1.5. Emission Reductions

Therefore, emission reductions by the project activity are given by the following formula:

ER_y = BE_y - PE_y ---------- (Eq. 5)
(ton CO_2 e/year) (ton CO_2 e/year) (ton CO_2 e/year)

[10] Source : Renewable Energy Resources by Anders Evald and Others.

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

Data / Parameter:	**P_{czp}**
Data unit:	MW
Description:	Installed capacity of the project activity
Source of data used:	-
Value applied:	11 MW
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is to justify the choice of the project category.
Any comment:	-

Data / Parameter:	**$EF_{CO2, grid, y}$**
Data unit:	ton CO_2e /MWh or kg CO_2e/ kWh
Description:	Baseline emission factor of the Peninsular grid (CO_2 emission factor of the grid electricity)
Source of data used:	Study on Grid connected Electricity Baselines in Malaysia, prepared by CDM Energy Secretariat, Pusat Tenaga Malaysia (PTM-Malaysian Energy Centre), now renamed as Malaysia Green Technology Corporation published in December, 2008.
Value applied:	0.684
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data is required to estimate the emission reductions. CDM Energy Secretariat of PTM is the official agency of Malaysian Government and has been publishing the grid emission factor and has been periodically reviewing it. The emission factor has been revised as late as December, 2008
Any comment:	PTM has estimated emission factor for both the approaches of combined margin method (0.695 ton CO_2e /MWh) and weighted average emission method (0.684 ton CO_2e /MWh). ***Lower value of 0.684 has been adopted for conservatism.***

Data / Parameter:	**SFC_{MF}**
Data unit:	ton of mesocarp fibre / MWh
Description:	Specific fuel consumption of mesocarp fibre
Source of data used:	Calculated based on the calorific value of the fuel and operating parameters of the boiler and turbine
Value applied:	1.411 – Detailed calculations are given in Annex 6
Justification of the choice of data or description of measurement methods and procedures actually applied :	The calorific value of the biomass is adopted from "Renewable Energy Resources – Integrated Resources Planning" by Anders Evald and others and operating parameters of the boiler and turbine are as per the equipment suppliers.
Any comment:	–

Data / Parameter:	**SFC_{PKS}**
Data unit:	ton of PKS / MWh
Description:	Specific fuel consumption of PKS
Source of data used:	Calculated based on the calorific value of the fuel and operating parameters of the boiler and turbine
Value applied:	0.905 - Detailed calculations are given in Annex 6
Justification of the choice of data or description of measurement methods and procedures actually applied :	The calorific value of the biomass is adopted from "Renewable Energy Resources – Integrated Resources Planning" by Anders Evald and others and operating parameters of the boiler and turbine are as per the equipment suppliers.
Any comment:	–

Data / Parameter:	**$SFC_{EFB\ fibre}$**
Data unit:	ton of EFB fibre / MWh
Description:	Specific fuel consumption of EFB fibre
Source of data used:	Calculated based on the calorific value of the fuel and operating parameters of the boiler and turbine
Value applied:	1.780 - Detailed calculations are given in Annex 6
Justification of the choice of data or description of measurement methods and procedures actually applied :	The calorific value of the biomass is adopted from "Renewable Energy Resources – Integrated Resources Planning" by Anders Evald and others and operating parameters of the boiler and turbine are as per the equipment suppliers.
Any comment:	–

Data / Parameter:	**SFC_{wood}**
Data unit:	ton of wood / MWh
Description:	Specific fuel consumption of wood
Source of data used:	Calculated based on the calorific value of the fuel and operating parameters of the boiler and turbine
Value applied:	1.566 - Detailed calculations are given in Annex 6
Justification of the choice of data or description of measurement methods and procedures actually applied :	The calorific value of the biomass is adopted from "Renewable Energy Resources – Integrated Resources Planning" by Anders Evald and others and operating parameters of the boiler and turbine are as per the equipment suppliers.
Any comment:	–

Data / Parameter:	**TDL_y**
Data unit:	%
Description:	Average technical transmission and distribution losses in the grid
Source of data:	From electricity generation and consumption data from National energy Balance , Malaysia
Value applied	11.24%
Justification of the choice of data or description of measurement methods and:	In the absence of publicly available information, the transmission and distribution losses are calculated based on the net electricity generation and net electricity consumption data of Peninsular grid for the year 2007
Any comment:	-

B.6.3 Ex-ante calculation of emission reductions:

6.3.1. Baseline emissions

The ex-ante baseline emissions of the project activity are calculated as per equation 2 in section 6.1.2 :

BE_y	=	$EG_{BL, y}$	*	$EF_{CO2, grid, y}$
(ton CO_2 e/year)		(MWh /year)		(ton CO_2e /MWh)

Where,

BE_y - is baseline emissions in ton CO_2e /year

$EG_{BL,y}$ is quantity of net electricity supplied to the grid by the project activity in year *y* (MWh)

$EF_{CO2,grid,y}$ is CO_2 emission factor of the grid in year y (t CO_2/MWh)

The estimated net electricity supplied to the grid is estimated as follows:

Net electricity export per year = 10 MW

During first year, the project activity is expected to operate at 75% capacity utilisation factor and at 80 % during second year and at 91.3 % (about 8000 hours)[11] during subsequent years.

Net electricity exported during first year = 10 MW * 8760 hours/ year*75%
= 65,700 MWh/ year

Net electricity exported during second year = 10 MW * 8760 hours/ year*80%
= 70,080 MWh/ year

Net electricity exported during subsequent years = 10 MW * 8000 hours / year
= 80,000 MWh/ year

The baseline emission factor of the grid is **0.684 t CO_2e /MWh.**

Applying these values in the formula for baseline emissions,

Baseline emissions for the first year of operation are,

BE_1	=	65,700	*	0. 684	=	44,938.8 ton CO_2 e/year
(ton CO_2 e/year)		(MWh /year)		(ton CO_2 e /MWh)		

≈ **44,939 ton CO_2e/ year**

Baseline emissions for the second year of operation are,

BE_2	=	70,080	*	0. 684	=	47,934.72 ton CO_2 e/year
(ton CO_2 e/year)		(MWh /year)		(ton CO_2 e /MWh)		

≈ **47,935 ton CO_2 e/year**

Baseline emissions for subsequent years of operation are,

BE_y	=	80,000	*	0. 684	=	**54,720 ton CO_2 e/year**
(ton CO_2 e/year)		(MWh /year)		(ton CO_2 e /MWh)		

[11] Feasibility Study Report

6.3.2 Project emissions

6.3.2.1 Project emissions due to electricity consumption

The project emissions due to electricity consumption are given by equation (3) in section 6.1.3.1

PE_y = El_{imp} * $EF_{CO2,grid,y}$ * $(1 + TDL_y)$

(ton CO_2e /yr) (MWh/year) (ton CO_2e /MWh)

Where PE_y is the project emissions due to electricity consumed from the grid in ton CO_2e/year

El_{imp} is the quantity of electricity imported from the grid in MWh/year

$EF_{CO2, grid, y}$ is the baseline emission factor of the grid in ton CO_2e /MWh

TDL_y is the average technical transmission and distribution loses of the grid

The project activity would import electricity from the grid during start up to run the electrical installations in the power plant. The approximate power requirement of the auxiliary equipment in the power plant is 1.0[12] MW. During start up, these equipment would draw grid electricity for a maximum of two hours and this is expected to occur for 6 times in a year.

Power requirement of the auxiliary equipment	=	1.0 MW
Number of hours of operation each time	=	2 hours
Number of times expected per year	=	6 times / year
Electricity consumed by the project activity	=	1 MW * 2 hours * 6 times/ year
	=	12 MWh/ year

PE_y = 12 MWh/ year * 0.684 t CO_2 e/MWh * 1.1124

= 9 t CO_2 e / year

6.3.2.2. Project emissions due to transportation of biomass

Quantity of EFB fibre required for the project @45% moisture	=	89,142 tons/ year
Quantity of EFB fibre available from the mill	=	37,136 tons / year
Quantity of EFB that needs to be transported, at 45 % moisture	=	52,006 tons/ year
Quantity of EFB that needs to be transported at 65 % moisture	=	81,724 tons/ year
Quantity of wood to be transported	=	1,800 tons / year
Total quantity of biomass transported, $BF_{T,k,y}$	=	83,524 tons/ year
Average truck load , TL_y	=	15 tons / trip
Average round trip distance, AVD_y	=	100 kms[13]

[12] This figure is assumed for estimation purposes. Actual electricity consumed from the grid would be monitored and used for estimation of project emissions.

[13] Considered for estimation purposes. Actual distance would be monitored during operation of the plant

Emission factor of diesel per kilometre (km), $EF_{km,CO2,y}$

Diesel consumption	= 60 litres/ 100 km	=	0.6 litre / km
Density of diesel		=	0.845 kg / litre
Diesel consumption		=	0.507 kg of diesel/ km
Calorific value of diesel		=	42.4960 GJ/ tonne [14]
CO_2 emission factor of diesel		=	0.0748 t CO_2/ GJ[15]
Emission factor of diesel		=	3.1787 t CO_2 / tonne
		≈	3.1787 kg CO_2 / kg of diesel.
Emission factor of diesel		=	3.1787 kgCO_2/ kg X 0.507 kg / km
		=	1.612 kg CO_2 / km
$EF_{km,CO2,y}$		=	0.001612 t CO_2 / km

PET_y = 83,524 tons/ year / 15 tons / trip X 100 kms x 0.001612 t CO_2 / km

= **598 ton CO_2 / year**

Total Project emissions = 9 + 598

= 607 ton CO_2e / year

6.3.3. Emission Reductions

Ex-ante emission reductions by the project activity are estimated equation 5 in section 6.1.5 :

ER_y (ton CO_2 e/year) = BE_y (ton CO_2 e/year) - PE_y (ton CO_2 e/year)

Applying the baseline and project emissions, Emission reductions for the first year would be,

ER_1 (ton CO_2 e/year) = 44,939 (ton CO_2 e/year) - 607 (ton CO_2 e/year) = **44,331 t CO_2e / year**

Emission reductions for the second year would be,

ER_2 (ton CO_2 e/year) = 47,935 (ton CO_2 e/year) - 607 (ton CO_2 e/year) = **47,327 t CO_2e / year**

Emission reductions for subsequent years would be,

ER_2 (ton CO_2 e/year) = 54,720 (ton CO_2 e/year) - 607 (ton CO_2 e/year) = **54,113 t CO_2e / year**

An excel spread sheet is attached as Appendix 2 giving the calculations.

[14] Source : National default value for diesels as per National Energy Balance ,2005, Malaysia

[15] Source : Upper value of Table 1.4 of chapter 1 of IPCC 2006 as per methodology

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

The crediting period would start from the date of registration of the project activity. The estimated ex-ante emission reductions of the project activity are given in the table B – 5

Table B –5 – Ex-ante emission reductions of the project activity

Year	Baseline emissions (ton CO_2 e)	Project emissions (ton CO_2e)	Leakage (ton CO_2e)	Emission reductions (ton CO_2e)
1	44,939	607	0	44,331
2	47,935	607	0	47,327
3	54,720	607	0	54,113
4	54,720	607	0	54,113
5	54,720	607	0	54,113
6	54,720	607	0	54,113
7	54,720	607	0	54,113
8	54,720	607	0	54,113
9	54,720	607	0	54,113
10	54,720	607	0	54,113
Total	**530,634**	**6,070**	**0**	**524,560**

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

B.7.1 Data and parameters monitored:

ID No.	01
Data / Parameter:	$EF_{CO2,y}$
Unit:	tCO_2e/MWh
Description:	CO_2 emission factor of the grid
Source of data	Calculated if data required for calculation are publicly available. If data is not publicly available, the latest emission factor published by relevant authorities shall be used.
Value of data applied for ex-ante estimation purposes	0.684
Brief description of measurement methods and procedures to be applied:	As per 'Tool to calculate the emission factor for an electricity system' if necessary data are available or adopt the latest emission factor published by relevant authorities
Monitoring / recording frequency	-

QA/QC procedures to be applied:	Since calculated / adopted from publicly available information, QA/QC procedures are not applicable.
Any comment:	The data would be archived electronically for the crediting period and two years thereafter.

ID No.	02
Data / Parameter:	$EG_{,actual\ y}$
Unit:	MWh /y
Description:	Quantity of net electricity supplied to the grid in year y
Source of data	Measured in energy meter (s) / Monthly invoice
Value of data applied for ex-ante estimation purposes	80,000 MWh/ year
Brief description of measurement methods and procedures to be applied:	The data is measured in the energy meter, used to measure the electricity supplied to the grid. The electricity exported would be recorded for billing purposes.
Monitoring / recording frequency	The data will be continuously monitored, hourly measured and recorded monthly.
QA/QC procedures to be applied:	The data will be cross checked with records / invoice / receipts for sold electricity. The meter would be calibrated once in 3 years as per manufacturer standards.
Any comment:	The data would be archived electronically for the crediting period and two years thereafter.

ID No.	03
Data / Parameter:	**El_{imp}**
Unit:	MWh
Description:	Electricity imported from the grid by the project activity
Source of data	Monthly invoice
Value of data applied for ex-ante estimation purposes	12 MWh/ year
Brief description of measurement methods and procedures to be applied:	Measured in the energy meter. The electricity consumed from the grid would be billed by TNB to the project proponent. This would be used to estimate the project emissions.
Monitoring / recording frequency	The data will be continuously monitored and recorded monthly.
QA/QC procedures to be applied:	The meter would be calibrated as per manufacturer standards.
Any comment:	The data would be archived electronically for the crediting period and two years thereafter.

ID No.	**04**
Data / Parameter:	**$Q_{MF,y}$**
Unit:	Ton/y
Description:	Quantity of mesocarp fibre used in the project activity in year y

Source of data	Plant records
Value of data applied for ex-ante estimate purposes	25,800 tons / year
Brief description of measurement methods and procedures to be applied:	Quantity of mesocarp fibre from its group mill and from other sources, if any, would be weighed /monitored and recorded.
Monitoring / recording frequency	All incoming biomass would be monitored continuously whenever mesocarp fibre enters the project activity and estimated using annual energy / mass balance
QA/QC procedures to be applied:	The weighing instrument would be calibrated as per manufacturer standards. The quantity of biomass would be adjusted for the moisture content in order to determine the quantity of dry biomass. Aan annual energy balance would be performed based on purchase quantities and stock changes. The consistency of ex post measurements will be checked with annual data of energy generation, biomass used and the efficiency of energy generation determined ex ante.
Any comment:	The data would be archived electronically for the crediting period and two years thereafter.

ID No.	05
Data / Parameter:	**$Q_{PKS,y}$**
Unit:	Ton/y
Description:	Quantity of palm kernel shell used in the project activity in year y
Source of data	Plant records
Value of data applied for ex-ante estimate purposes	15,000 tons / year
Brief description of measurement methods and procedures to be applied:	Quantity of PKS from its group mill and from other sources, if any, would be weighed / monitored and recorded.
Monitoring / recording frequency	All incoming biomass would be monitored continuously whenever palm kernel shell enters the project activity and estimated using annual energy / mass balance
QA/QC procedures to be applied:	The weighing instrument would be calibrated as per manufacturer standards. The quantity of biomass would be adjusted for the moisture content in order to determine the quantity of dry biomass.An annual energy balance would be performed based on purchase quantities and stock changes. The consistency of ex post measurements will be checked with annual data of energy generation, biomass used and the efficiency of energy generation determined ex ante.
Any comment:	The data would be archived electronically for the crediting period and two years thereafter.

ID No.	**06**
Data / Parameter:	**Q_{EFB}**
Unit:	Tons
Description:	Quantity of EFB

Source of data	Plant records
Value of data applied for ex-ante estimate purposes	89,142 tons / year at 45 % moisture.
Brief description of measurement methods and procedures to be applied:	Quantity of EFB fibre from its group mill and from other sources, if any, would be weighed / monitored and recorded.
Monitoring / recording frequency	All incoming biomass would be monitored continuously whenever plam kernel shell enters the project activity and estimated using energy / mass balance
QA/QC procedures to be applied:	The weighing instrument would be calibrated as per manufacturer standards. The quantity of biomass would be adjusted for the moisture content in order to determine the quantity of dry biomass and / an annual energy balance would be performed based on purchase quantities and stock changes. The consistency of ex post measurements will be checked with annual data of energy generation, biomass used and the efficiency of energy generation determined ex ante.
Any comment:	The data would be archived electronically for the crediting period and two years thereafter.

ID No.	**07**
Data / Parameter:	**Q_{wood}**
Unit:	Tons/ year
Description:	Quantity of wood biomass
Source of data	Plant records
Value of data applied for ex-ante estimate purposes	1800
Brief description of measurement methods and procedures to be applied:	Quantity of wood biomass combusted in the project activity would be weighed / monitored and recorded
Monitoring / recording frequency	All incoming biomass would be monitored continuously whenever plam kernel shell enters the project activity and estimated using annual energy / mass balance
QA/QC procedures to be applied:	The weighing instrument would be calibrated as per manufacturer standards. The quantity of biomass would be adjusted for the moisture content in order to determine the quantity of dry biomass and / an annual energy balance would be performed based on purchase quantities and stock changes. The consistency of ex post measurements will be checked with annual data of energy generation, biomass used and the efficiency of energy generation determined ex ante.
Any comment:	The data would be archived electronically for the crediting period and two years thereafter.

ID No.	**08**
Data / Parameter:	**AVD_Y**
Unit:	Km.
Description:	Round trip distance (from and to) between biomass source sites and the project activity.

Source of data:	Plant records
Value of data applied for ex-ante estimate purposes	100
Brief description of Measurement methods and procedures to be applied	The distance of transportation of biomass / source of the biomass would be recorded
Monitoring frequency:	Whenever a truck arrives at the project activity
QA/QC procedures:	-
Any comment:	The data would be archived electronically for the crediting period and two years thereafter.

ID No.	**09**
Data / Parameter:	$\mathbf{EF_{km,CO2,y}}$
Uunit:	tCO_2/km.
Description:	Average CO_2 emission factor for the trucks during the year y.
Source of data:	Sample measurement of the fuel type, fuel consumption and distance travelled for all truck types will be conducted once in a year.
Value of data applied for ex-ante estimates	0.001612 t CO_2 / km
Brief description of Measurement methods and procedures to be applied	CO_2 emissions from fuel consumption for the trucks shall be calculated as follows: Fuel consumption per kilometre multiplied by the calorific value of the fuel multiplied by the CO_2 emission factor of the fuel. $EF_{km,CO2,y}$ = Fuel consumption / km * Calorific value (NCV) of the fuel in GJ/ ton) * CO_2 emission factor of the fuel (EF_{CO2}) in tCO_2/ GJ. Average value of CO_2 emission factor of all the trucks would be calculated and adopted for calculation of ex-post emission reductions For NCV and $EF_{CO2,}$ reliable national default values or IPCC default value values would be used. A value of 0.845 kg/ litre would be used for density of diesel to convert the fuel in litres to kilograms or tonnes.
Monitoring frequency:	The fuel consumption for types of trucks delivering biomass would be done once in a year.
QA/QC procedures:	-
Any comment:	Data would be archived electronically for the crediting period and 2 years thereafter

ID No.	**10**
Data / Parameter:	$W_{mesocarp}$
Unit:	%.
Description:	Moisture content of mesocarp fibre.
Source of data	Publicly available information / Literature
Value of data applied for ex-ante estimates	37

Brief description of measurement methods and procedures to be applied:	This data is determined ex ante.
Monitoring frequency	The ex-ante value will be used during the crediting period.
QA/QC procedures to be applied:	
Any comment:	Data would be archived electronically for the crediting period and 2 years thereafter

ID No.	11
Data / Parameter:	W_{PKS}
Unit:	%.
Description:	Moisture content of palm kernel shell.
Source of data	Publicly available information / Literature
Value of data applied for ex-ante estimates	12
Brief description of measurement methods and procedures to be applied:	This data is determined ex ante.
Monitoring frequency	The ex-ante value will be used during the crediting period.
QA/QC procedures to be applied:	
Any comment:	Data would be archived electronically for the crediting period and 2 years thereafter

ID No.	12
Data / Parameter:	W_{EFB}
Unit:	%
Description:	Moisture content of EFB
Source of data	Publicly available information / Literature
Value of data applied for ex-ante estimates	67
Brief description of measurement methods and procedures to be applied:	This data is determined ex ante.
Monitoring frequency	The ex-ante value will be used during the crediting period.
QA/QC procedures to be applied:	
Any comment:	Data would be archived electronically for the crediting period and 2 years thereafter

ID No.	13
Data / Parameter:	W_{wood}
Unit:	%
Description:	Moisture content of wood residues

Source of data	Plant records
Value of data applied for ex-ante estimates	35
Brief description of measurement methods and procedures to be applied:	This data is determined ex ante.
Monitoring frequency	The ex-ante value will be used during the crediting period.
QA/QC procedures to be applied:	
Any comment:	Data would be archived electronically for the crediting period and 2 years thereafter

ID No.	14
Data / Parameter:	$NCV_{mesocarp}$
Unit:	GJ/ton.
Description:	Net calorific value of mesocarp fibre.
Source of data:	Plant records
Value of data applied for ex-ante estimates	11.1 on wet basis and 19 on dry basis
Brief description of measurement methods and procedures to be applied :	Measurements based on dry biomass shall be carried out in internal/ external lab according to relevant national / international standards
Monitoring frequency	Measurement shall be done once in the first year of the crediting period. The calorific value shall be measured quarterly in the first year of the crediting period taking at least 3 samples for each measurement. The average value shall be used for the rest of the crediting period.
QA/QC procedures:	The consistency of the measurements shall be checked by comparing the measurement result with with values in the literature or values used in the national GHG inventory if available. If the measurement results differ significantly (say more than 10%) literature values, additional measurements shall be conducted.
Any comment:	Data would be archived electronically for the crediting period and 2 years thereafter

ID No.	15
Data / Parameter:	NCV_{PKS}
Unit:	GJ/ton.
Description:	Net calorific value of PKS
Source of data:	Plant records
Value of data applied for ex-ante estimates	17.3 on wet basis and 20.0 on dry basis
Brief description of measurement methods and procedures to be applied :	Measurements based on dry biomass shall be carried out in internal/ external lab according to relevant national / international standards

Monitoring frequency	Measurement shall be done once in the first year of the crediting period. The calorific value shall be measured quarterly taking at least 3 samples for each measurement. The average value shall be used for the rest of the crediting period.
QA/QC procedures:	The consistency of the measurements shall be checked by comparing the measurement result with values in the literature or values used in the national GHG inventory, if available. If the measurement results differ significantly (say more than 10%) literature values, additional measurements shall be conducted.
Any comment:	Data would be archived electronically for the crediting period and 2 years thereafter

ID No.	16
Data / Parameter:	NCV_{EFB}
Unit:	GJ/ton.
Description:	Net calorific value of EFB
Source of data:	Plant records
Value of data applied for ex-ante estimates	4.3 on wet basis and 18 on dry basis
Brief description of measurement methods and procedures to be applied :	Measurements based on dry biomass shall be carried out in internal/ external lab according to relevant national / international standards
Monitoring frequency	Measurement shall be done once in the first year of the crediting period. The calorific value shall be measured quarterly in the first year of the crediting period taking at least 3 samples for each measurement. The average value shall be used for the rest of the crediting period.
QA/QC procedures:	The consistency of the measurements shall be checked by comparing the measurement result with values in the literature or values used in the national GHG inventory, if available. If the measurement results differ significantly (say more than 10%) literature values, additional measurements shall be conducted.
Any comment:	Data would be archived electronically for the crediting period and 2 years thereafter

ID No.	17
Data / Parameter:	NCV_{wood}
Unit:	GJ/ton.
Description:	Net calorific value of wood residues
Source of data:	Plant records
Value of data applied for ex-ante estimates	10 on wet basis on 19 on dry basis
Brief description of measurement methods and procedures to be applied :	Measurements based on dry biomass shall be carried out in internal/ external lab according to relevant national / international standards
Monitoring frequency	Measurement shall be done once in the first year of the crediting period. The calorific value shall be measured quarterly in the first year of the crediting

	period taking at least 3 samples for each measurement. The average value shall be used for the rest of the crediting period.
QA/QC procedures:	The consistency of the measurements shall be checked by comparing the measurement result with values in the literature or values used in the national GHG inventory if available If the measurement results differ significantly (say more than 10%) literature values, additional measurements shall be conducted.
Any comment:	Data would be archived electronically for the crediting period and 2 years thereafter

B.7.2 Description of the monitoring plan:

The operating staff of the power plant would be trained by the suppliers of the major equipment of the project activity in operation, maintenance, preventive maintenance and trouble shooting of the power plant. The technical experts of the power plant supplier would stay in the plant during commissioning of the power plant and train the staff. They would also provide the operation and maintenance manuals of the power plant.

The plant would be operated in 24 hours based on three shifts. The power plant would be operated by the operators. There would be two operators in each shift. These operators would be certified by Jabatan Kesikatan Keselamatan Persekutuan (JKKP), Department of Health and Safety. The operators would be responsible for recording the operating parameters like biomass quantity combusted in the power plant, gross electricity generated, etc.,

The operator would continuously monitor the operating data and generation data. The electricity exported to the grid would be measured at the export meter. The export meter would be in the interconnection point. The electricity exported by the project activity would be recorded by representatives of TNB and project proponents during the last week of each month. This reading would be the basis for invoicing by the project proponent and would be the basis for calculation of baseline emissions. These meter readings would be maintained by the project proponent in power plant and in the head office. Monthly invoices are prepared based on the meter reading.

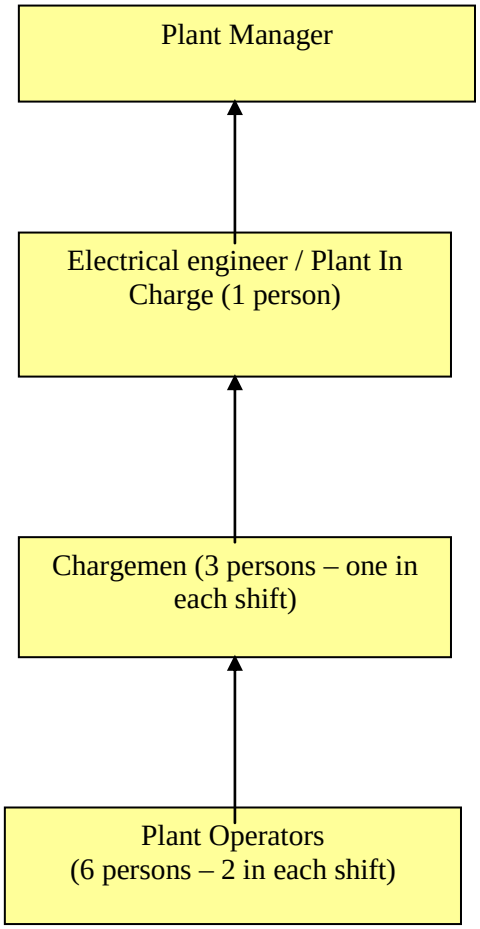
The records maintained by the plant operators would be daily checked by the Electrical Engineer / Plant in charge. The Plant In charge would be responsible for calibration of measuring instruments. They would regularly monitor the operation of the project activity and the plant records. The Mill Manager would be overall responsible for operation of the project activity. He would periodically check the records and operating parameters.

Internal Audits

The internal audit of the project activity would be conducted by the General Manager. The General Manager would conduct an internal audit. He would review all the records, safety installations, operating procedures, etc., any corrective action to be taken would be recorded and steps would be taken to implement the corrective action.

The structure of the monitoring team of the project activity is given in Fig B-2.

Fig B-2 – Management structure of the CDM monitoring



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

Ilango S Bharathi. G.
YTL SV Carbon Sdn. Bhd.
50250 Kuala Lumpur, Malaysia
Tel : + 603-2144 7200
website: **www.ytl-svcarbon.com**

Date of completing the final draft of this baseline section *(DD/MM/YYYY)*:
18/04/2012 (last updated)

The entity determining the baseline and monitoring methodology is not a Project Participant.

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:

24/11/2008

The date of purchase contract with the boiler supplier of the project activity is considered as the starting date of the project activity. This is the first purchase contract for the project activity.

In accordance with para 68 of EB 41 and Annex 46 of EB 41, a letter with reference :BEPSB –DNA-CDM 01 dated 24 August 2008 was sent to DNA, Malaysia and BEPSB –UNFCCC- CDM 01 dated 24 August 2008 was sent to UNFCCC informing the intention to implement the project activity as CDM project activity and seek CDM status for the same.

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

25 y- 0 m

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

The project activity would apply fixed crediting period. The crediting period would start only after the registration of the project activity as a CDM project activity.

C.2.1. Renewable crediting period

Not Applicable

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

Not Applicable

C.2.1.2. Length of the first crediting period:

Not Applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

01/08/2012 or the date of registration whichever is later.
The crediting period would not commence before the date of registration of the project activity as CDM project activity.

C.2.2.2. Length:

10 y -0 m

SECTION D. Environmental impacts

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

Under Malaysian Environmental Quality (Environmental Impact Assessment) (Prescribed Activities) Order 1987, the project activity is not required to carry out an Environmental Impact Assessment. However, the installation of a boiler with stack emissions will require permission from the Department of Environment, Malaysia. The project developer will obtain the necessary approvals before commissioning and during operation of the project activity.

However, a brief review of the environmental impacts due to the project activity is discussed below;

Impact on Air
The burning of biomass in the boiler would lead to emissions. A multi cyclone dust arrestor would be provided to reduce particulate emission level in the flue gas. A self-supporting stack of 45 metre height would be provided to vent off the exhausts to the atmosphere.

Impact on water

No water is consumed for the project activity and no wastewater is discharged from the project activity and hence, there is no impact on water due to the project activity.

Impact due to odour
There are absolutely no odour issues due to the project activity.

The project activity has many positive environmental impacts, few of which are highlighted below:

- Electricity generation from a solid waste and a renewable energy source
- Electricity generation with very less or negligible GHG emissions
- Promoting better image on palm oil production technology.

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

The environmental impacts due to the project activity are not considered to be significant by the Host Party and the project participants.

SECTION E. Stakeholders' comments

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

A local stakeholder meeting was held for the project activity on 28 th August, 2008 at the project proponent's premises at Parit Ju in Batu Pahat to compile the views and comments of the local stakeholders.

Invitation to the local stakeholders

Letters of invitations were sent to various institutions such as Malaysian Palm Oil Board, Tenaga Nasional Berhad, the electric utility, Department of Environment, non –governmental organisations, local community, other palm oil mills in the area, etc.,

Advertisement was published in newspaper, "The Star on Thursday 21 August 2008" inviting local public to attend a meeting on the project activity. The copy of Newspaper Advertisement is attached as Annex 6.

Notice was displayed in the Notice Board of the premises inviting the staff of the project proponent to attend the meeting and give their comments.

The list of attendees of the local stakeholders meeting is given in the Table E-1 below

Table E-1 – List of attendees of the local stakeholders meeting

No.	Name	Organization
1	En. Anuar Bin Ismail	Department of Environment
2	Dr. Khalid Haron	Malaysia Palm Oil Board
3	Dr. Pola Singh	Principal Consultant
4	Mr. Ilango S Bharathi.	CDM Consultant
5	Ir. S Murugiah	Principal Electrical Consultant, CNE Services
6	Mr. Hou Wan Hoo	General Manager, BELL Palm Industries Sdn Bhd
7	Mr. Lee Che Chuan	Group Engineer, BELL GROUP OF COMPANIES
8	Syed Nasir	Director, Kilang Sawit Batu Pahat Sdn Bhd
9	En. Sahari Bin Msarom	Ketua Kampong (Head of Village) Kampong Parit Ju
10	En. Samad Bin Marsidi	Member of Village Committee, Kampong Parit Ju
11	Tn Hj Ab Rahman B. Shahrom	Local Resident / Imam
12	En. Johari Bin Sapawi	Local Resident / Teacher
13	Mohd. Yazi Imman	Local Resident / Teacher
14	Mohd Nurkhasyiruz Norshid	Local Resident
15	En. Karim Bin Masrom	Local Resident
16	En. Hamis Bin Supat	Local Resident
17	En Yazid Bin Tuziman	Local Resident
18	Puan Roha abd kadir	Local Resident
19	En Selamat Bin Manaf	Local Resident
20	En. Latif Bin Yusof	Local Resident
21	Mr. Tan Swee Seng	Local Resident
22	Mr. Dora A. Kadir	Local Resident
23	En. Ahmad Bin Ali	Local Resident
24	Mr. Lau Choon Wah	B.P Plantation
25	Mr. Andrew Chiew	Highland Palm Produce
26	Mr. Jason Gan	Cemerlang Sawit
27	Mr. Goh Soon Hoe	Eng Hup Soon
28	En. Ismudin Arif	JODA
29	En Syamsila abd Kadir	JODA
30	Mr. Hou Wan Hoo	General Manager, BELL Palm Industries Sdn Bhd
31	Mr. Arumugam	Acting Mill Manager, BELL Palm Industries Sdn Bhd

32	Mr. Thangga	Account Executive ,BELL Palm Industries Sdn Bhd
33	Puan Ruzaini	Staff, BELL Palm Industries Sdn Bhd
34	S.D. Muthiuh	Staff, BELL Palm Industries Sdn Bhd
35	Mr. Lee Yew Chong	Mill Manager, Syarikat Perusahaan Kelapa Sawit Sdn Bhd
36	Mr. Bala	BELL Management Sdn Bhd
37	Mr. Tiong Mee Hoe	BELL Management Sdn Bhd

E.2. Summary of the comments received:

Mr. Hou Wan Hoo, representative of the project proponent welcomed the delegates of the meeting and explained about the broad objectives of the project activity and requested the delegates to freely view their opinions and comments about **the** project activity. Presentations were made explaining the project activity, about the climate change, initiatives of UNFCCC in fighting the climate change, CDM process etc., and the project activity's eligibility to be a CDM project.

The questions / opinions of the delegates of the meeting and responses from the project proponent are given below:

Question #1. – Can this project supply the generated electricity to the local communities at a special rate?
Response from PP : In response to this question raised by resident from local community, Mr. Murugiah of CNE Services, a principal electrical consultant and former Engineer of Tenaga Nasional Berhad commented that the electricity generated via biomass project will be allowed to be used by the project developer at site or connected to National Grid. The current Malaysian law does not allow the independent power developer to sell the electricity directly to the local community.

Question # 2 : - Does this project would cause air pollution and deteriorate air quality?
Response from PP : In responding to this question raised by resident from local community, Mr. Lee Che Chuan, of the project proponent explained that the boiler used for generating the steam from the burning of biomass has been designed with the higher efficiency that emissions would meet the standards of the Department of Environment and therefore does not pollute the air. A stack of suitable height would be provided to vent off the exhausts to ensure that the ground level concentrations are below the required standards.

Question # 3 : What are the benefits to the local communities and how can the local community play its part to make this project a success?
Response from PP : *In responding to this question raised by Dr. Pola Singh, principal consultant Mr.Hou Wan Hoo, General Manager of Bell Palm Industries Sdn Bhd commented that with the implementation of the project activity, new job opportunities for skilled workers such as electrical technicians and unskilled workers such as biomass fuel feeders for the boiler would be created. Additionally, the quality of electricity in the vicinity of the project activity would improve.*

Question #4 : Would there be too much noise due to the big boiler and turbine?
Response from PP : The noise will be below the permissible limits and local community would definitely not be affected by the noise of the project activity.

Conclusion

Generally, the stakeholders who attended this consultation meeting expressed their satisfaction towards implementation of the proposed biomass project because it will eliminate the current practice of dumping and stacking up the un-used empty fruit bunches and avoid open fire when the biomass accidentally catch fire.

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

Since there was no comment requiring action from the project proponents, no action was taken due to the comments.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Project Participant -1 – Host Party

Organization:	BELL Ecopower Sdn Bhd
Street/P.O.Box:	125, Jalan SS 15/5A,
Building:	
City:	Subang Jaya
State/Region:	Selangor Darul Ehsan
Postfix/ZIP:	47500
Country:	Malaysia
Telephone:	+ 60 3 5634 3888
FAX:	+ 60 3 5634 0723
E-Mail:	bell@bell.com.my
URL:	
Represented by:	
Title:	Project Manager
Salutation:	Mr.
Last Name:	Themudu
Middle Name:	Subramaniam
First Name:	Bala
Department:	Procurement
Mobile:	+60 17 8335399
Direct FAX:	+60 3 5634 0723
Direct tel:	+60 3 56348576
Personal E-Mail:	bala@bell.com.my

Project Participant 2 - Annex I Party

Organization:	Marubeni Corporation
Street/P.O.Box:	4-2, Ohtemachi 1-chome
Building:	
City:	Chiyoda-ku
State/Region:	Tokyo
Postfix/ZIP:	100-0008
Country:	Japan
Telephone:	+ 81 3 3282 2394
FAX:	+ 81 3 3282 2616
E-Mail:	
URL:	http://www.marubeni.co.jp
Represented by:	
Title:	General Manager

Salutation:	Mr.
Last Name:	Yoshida
Middle Name:	
First Name:	Atsushi
Department:	Emissions Credit Business Sec. Environmental Solutions Sec., Global Environment Projects Dept.
Mobile:	
Direct FAX:	+81 3 3282 2616
Direct tel:	+81 3 3282 2394
Personal E-Mail:	Yoshida-Atsushi@marubeni.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

There is no public funding of the project activity from Annex 1 Parties. The project activity would be financed by internal resources and financing by banks in Malaysia.

Annex 3

BASELINE INFORMATION

As per paragraph 12 of AMS I.D / version 17, the baseline grid emission factor has to be calculated in a transparent and conservative manner as follows:

(a) A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in "tool to calculate the emission factor for an electricity system" .

(OR)

(b) The weighted average emissions (in t CO_2e/ MWh) of the current generation mix. The data of the year in which project generation occurs must be used.

Identification of the applicable grid system for the project activity

The electricity grid network of Malaysia has following grids:

1. Peninsular grid
2. East Coast Sabah grid
3. West Coast Sabah grid
4. Sarawak grid

The project activity supplies electricity to the Peninsular grid of Malaysia. At present, all grids are independent and are not interconnected. There is no export or import of electricity among the grids. The Peninsular grid is largest of them and is totally independent from other grids. Therefore, Peninsular grid is chosen as the applicable grid system for the project activity.

The installed capacity of the Peninsular grid is about 92 %[16] of total installed capacity of Malaysia. All other grids constitute for only 9 % of the total capacity.

The installed capacity of fuel mix in Peninsular grid as of 31 December, 2007 is given in Table A-3-1

Table A-3-1 – Fuel mix in Peninsular grid

Fuel Mix	TNB	IPP	Total
	MW	MW	MW
Steam			
Coal	2070	3700	5770
Gas	240	600	840
Combined cycle	2762	6058	8820
Gas turbine			0
Diesel	68		68
Gas	1365	1240	2465

[16] Source: National Energy Balance, Malaysia, 2007

Hydro	1911	20	1931
Mini Hydro	13		13
Total	**8,429**	**11,618**	**20,047**

Grid emission factor

The grid emission factor for each grid is calculated and published by CDM Energy Secretariat of Pusat Tenaga Malaysia (PTM) (Malaysia Energy Centre) as "Study on Grid Connected Electricity Baselines, Malaysia, " (hereinafter referred to as "Baseline study") and the latest Study was published in December, 2008.

PTM is the official agency of DNA, Malaysia and has been involved in approval of CDM projects and capacity building for CDM in Malaysia.

AMS ID suggests estimating the emission factor of the grid by two approaches:

a) Combined Margin Method as per "Tool to calculate the emission factor for an electricity system" and
b) The weighted average emissions (in kg CO_2e/ kWh) of the current generation mix. The data of the year in which project generation occurs must be used.

The Baseline study by PTM, Malaysia has estimated the emission factor for both the approaches and has updated in December, 2008, which are as follows:

Emission factor of the Peninsular grid as per combined margin method: 0.684 ton CO_2 e / MWh
Emission factor of the Peninsular grid as per option (b) : 0.695 ton CO_2 e / MWh

Since the methodology specifies that conservative value should be used, value of **0.684 t CO_2 / MWh** has been adopted as emission factor of the grid.

Determination of Transmission and distribution losses

TDL is determined based on the net electricity generation and net electricity consumption data of Peninsular grid. The latest year for which these data are publicly available is 2007.

TDL is determined as follows:

Net electricity generation in Peninsular grid for the year 2007 : 92,055 GWh[17]
Net electricity consumption in Peninsular grid for the year 2007 : 81,710 GWh[18]
Transmission and distribution losses : 7,191 GWh
Transmission and distribution losses % (TDL%) : 11.24 %

[17] Source : National Energy Balance, 2007, Malaysia, Ministry of Energy, Water and Communications, Malaysia

[18] Source : National Energy Balance, 2007, Malaysia, Ministry of Energy, Water and Communications, Malaysia

Annex 4

MONITORING INFORMATION

As emission reductions from the project activity are determined by the amount of electricity exported to the grid, it is essential to have a monitoring system in place and ensure that the project activity produces and exports the rated power at the stipulated norms. The sole objective of having monitoring system is to have a constant watch on the emission reductions.

The quantity of mesocarp fibre, EFB fibre, palm kernel shells and wood biomass if any, combusted in the project activity would be monitored separately.

The emission reductions of the project activity would be given by the following formula:

ER (ton CO_2 e) = BE (ton CO_2 e) - PE (ton CO_2 e) - L_p

Where ER is the emission reductions in ton CO_2 eq during the monitoring period
BE is the baseline emissions in ton CO_2 eq during the monitoring period
PE is the project emissions in ton CO_2 eq during the monitoring period
L_p is the leakage emissions in ton CO_2 eq during the monitoring period

Baseline emissions of the project activity are calculated by multiplying the net electricity exported to the grid in MWh during the monitoring period with the baseline emission factor of the Peninsular grid in ton CO_2 e/ MWh. The net electricity exported by the project activity would be metered in the Export meter. The metering equipment is maintained in accordance with Manufacturer Standards. The monthly meter readings are taken at the interconnection point during the last day of each month. The monthly reading is jointly certified by representative from TNB and representative of the project proponent.

The baseline emissions are calculated as per following formula:

BE	=	$EG_{BL,y}$	*	$EF_{CO2,grid,y}$
(ton CO_2 e)		(MWh)		(ton CO_2 e /MWh)

Where,

BE - Baseline emissions in ton CO_2 e during the monitoring period
$EG_{BL,y}$ - Net electricity exported to grid during the monitoring period in MWh
$EF_{CO2, grid,y}$ - Baseline emission factor of the grid in ton CO_2 e /MWh

The project emissions are calculated by multiplying the electricity consumed by the project activity from the grid in MWh during the monitoring period with the baseline emission factor of the grid in t CO_2 e/ MWh. The baseline emission factor of the grid would be adjusted for transmission and distribution losses of the grid. The electricity consumed by the project activity would be billed by TNB every month and this bill would be the basis of estimation of project emissions. The emissions due to consumption of electricity from the grid are very less and quite insignificant as compared to baseline emissions. However, it shall be monitored and accounted.

The project emissions of the project activity are calculated as per following formula:

PE_y	=	El_{imp}	*	$EF_{CO2,grid,y}$	*	$(1+TDL_y)$
(ton CO_2 e)		(MWh /year)		(ton CO_2e /MWh)		

Where,

PE_y - Project emissions in ton CO_2e during the monitoring period
El_{imp} - Electricity consumed from the grid in MWh during the monitoring period
$EF_{CO2,grid,y}$ - Baseline emission factor of the grid in ton CO_2e /MWh
TDL_y - Transmission and distribution losses of the grid in percentage.

Transmission and distribution losses of the project shall be estimated based on the total electricity generated in the grid and total electricity consumed in the grid as shown below:

$$TDL = 1 - \frac{\text{Electricity consumed in the Peninsular grid in GWh}}{\text{Electricity generated in the Peninsular grid in GWh}}$$

Project emissions due to transportation of biomass

The project activity would be fuelled by the biomass residues produced by BPI. However, if biomass is imported from external sources during low crop season or due to lesser production in the mill, the emissions due to consumption of fossil fuel used for transportation of biomass would be calculated as project emissions and deducted from the baseline emissions. The emissions due to consumption of fossil fuel for transportation of biomass would be calculated as described in section B.6.1.3.2

Annex 5 - Biomass requirement for 11 MW project

Capacity of new boiler	52	ton/ hr	FSL
Capacity of the turbine	11	MW	FSL
Steam requirement as per manufacturer	4.59	ton of steam/ MWh	
Steam required for full capacity	50.49	ton/ hr	
Pressure of steam	43	bar	
Temperature of steam	415	deg C	
Heat required to produce 1 ton of steam	2.9	GJ/ ton	
Boiler efficiency	85%		FSL
Number of hours of operation	8000	hours	FSL
Heat input required	**1,378,080**	**GJ/ year**	
Annual FFB production capacity	500,000	ton FFB/ year	Proposed by PP
Fuel Availability			
Mesocarp fibre			
Mesocarp production rate	12.7%[19]	ton / ton FFB	
Mesocarp produced in the mill	63,500	tons/ year	
Mesocarp consumed in the mill	35,000	tons/ year	
Mesocarp available for the project activity	28,500	tons/ year	
Calorific value of mesocarp fibre	11.1	GJ/ ton	Footnote 21
Heat input from fibre	**316,350**	GJ/ year	
Palm Kernel Shell			
Shell production rate	5.7%		Footnote 21
PKS produced	28,500	tons/ year	
Shell available for the project activity	15,000	tons/ year	
Calorific value of PKS	17.3	GJ/ ton	Footnote 21
Heat input from PKS	**259,500**	GJ/ year	
EFB Fibre			
EFB production rate at 65 % moisture	21.1%		Footnote 21
Quantity of EFB produced	105,500	tons/ year	
Moisture content of EFB produced	65%		Footnote 21
Moisture after dewatering	45%		Estimated

[19] Source : Renewable Energy Resources – Anders Evald and Others

EFB fibre production at 45% moisture	67,136	tons/year	
EFB fibre consumed in the mill	30,000	tons/ year	
EFB fibre available for the project activity	37,136	tons/ year	
EFB fibre procured from external sources	52,006	tons/ year	
Calorific value of EFB on dry basis	18.0	GJ/ ton	Footnote 21
Calorific value of EFB of 45 % moisture	8.8	GJ/ton	
Heat input from EFB	**784,230**	GJ/ year	
Wood			
Wood quantity	1800	ton/year	
Heat value of wood	10	GJ/ton	
Heat input from wood	18,000	GJ/ year	

Total heat available	**1,378,080**	**GJ/ year**

Annex 6 - Specific Fuel Consumption of biomass fuels

Specific fuel consumption of Mesocarp fibre		
Quantity of Mesocarp fibre	1	ton
Calorific value of mesocarp fibre at wet basis (as received)	11.10[20]	GJ/ ton as received
Heat input	11.1	GJ
Boiler efficiency	85%	
Heat out put	9.435	GJ
Heat required per ton of steam	2.9	GJ / ton of steam
Steam produced	3.2534	ton of steam
Steam required	4.59	ton steam/ MWh[21]
Electricity produced	0.7088	MWh/ ton of Mesocarp fibre
Specific fuel consumption of Mesocarp fibre	**1.411**	**ton of mesocarp fibre/ MWh**
Specific fuel consumption of Palm kernel shell		
Quantity of PKS	1	ton
Calorific value of PKS at wet basis (as received)	17.30[22]	GJ/ ton
Heat input	17.3	GJ
Boiler efficiency	85%	
Heat out put	14.705	GJ
Heat required per ton of steam	2.9	GJ / ton of steam
Steam produced	5.0707	ton of steam
Steam required	4.59	ton steam/ MWh
Electricity produced	1.1047	MWh/ ton of Palm kernel shell
Specific fuel consumption of Palm kernel shell	**0.905**	**ton of PKS/ MWh**
Specific fuel consumption of EFB		
Quantity of EFB	1	ton at 45 % moisture
Calorific value of EFB on dry basis	18.0[23]	GJ/ ton
Calorific value of EFB of 45 % moisture	8.8	GJ/ton
Heat input	8.80	GJ/ ton
Boiler efficiency	85%	
Heat out put	7.48	GJ

[20] Source : Renewable Energy Resources – Anders Evald and Others,

[21] Source : Turbine supplier

[22] Source : Renewable Energy Resources – Anders Evald and Others.

[23] Source : Renewable Energy Resources – Anders Evald and Others,

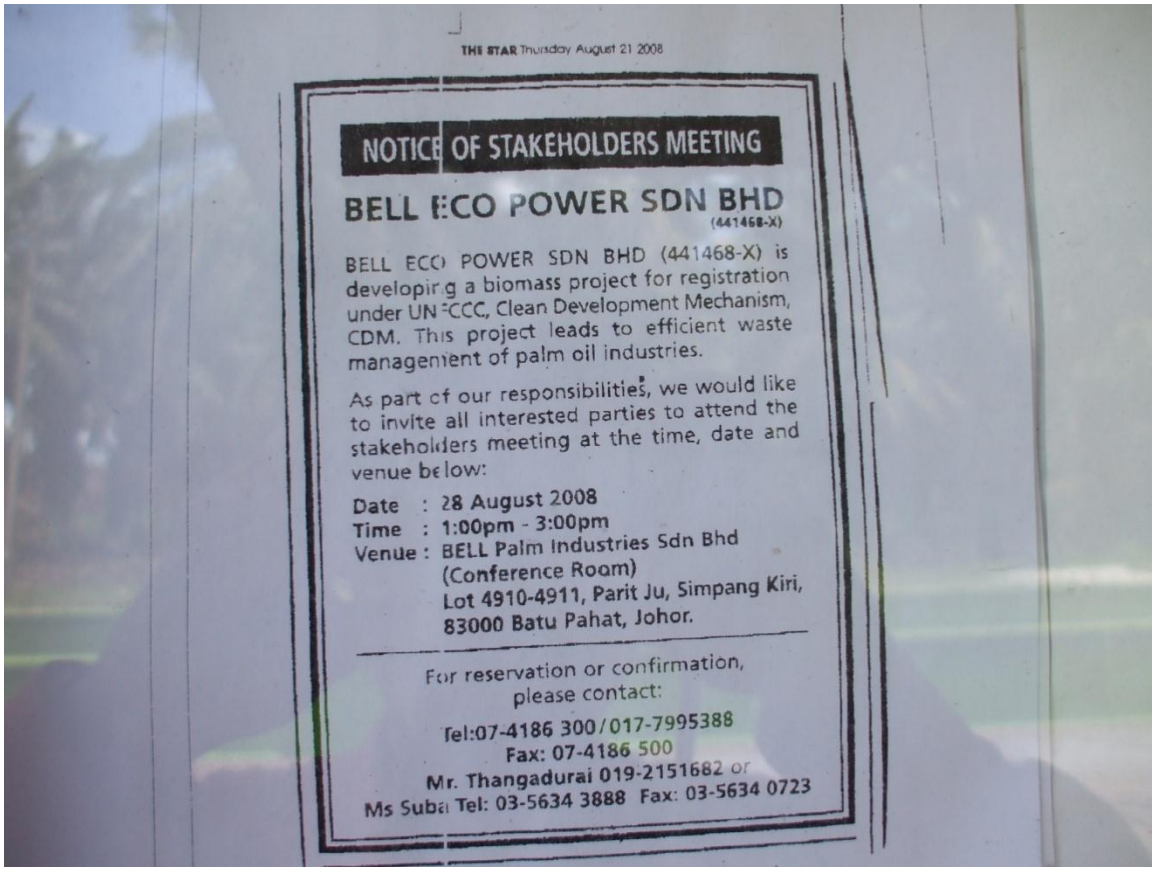
Heat required per ton of steam	2.9	GJ / ton of steam
Steam produced	2.5793	ton of steam
Steam required	4.59	ton steam/ MWh
Electricity produced	0.5619	MWh/ ton of EFB
Specific fuel consumption of EFB	**1.780**	**ton of EFB/ MWh**
Specific fuel consumption of wood		
Quantity of wood	1	ton
Calorific value	10[24]	GJ/ton
Heat input	10.00	GJ/ ton as received
Boiler efficiency	85%	
Heat out put	8.5	GJ
Heat required per ton of steam	2.9	GJ / ton of steam
Steam produced	2.9310	ton of steam
Steam required	4.59	ton steam/ MWh
Electricity produced	0.6386	MWh/ ton of wood
Specific fuel consumption of wood	**1.566**	**ton of wood / MWh**

[24] Source : Renewable Energy Resources – Anders Evald and Others

Annex 7

Advertisement for local stakeholders' meeting

The copy of the newspaper advertisement on 21 August 2008 inviting for local stakeholders meeting is given below:



THE STAR Thursday August 21 2008

NOTICE OF STAKEHOLDERS MEETING

BELL ECO POWER SDN BHD
(441468-X)

BELL ECO POWER SDN BHD (441468-X) is developing a biomass project for registration under UNFCCC, Clean Development Mechanism, CDM. This project leads to efficient waste management of palm oil industries.

As part of our responsibilities, we would like to invite all interested parties to attend the stakeholders meeting at the time, date and venue below:

Date : 28 August 2008
Time : 1:00pm - 3:00pm
Venue : BELL Palm Industries Sdn Bhd
(Conference Room)
Lot 4910-4911, Parit Ju, Simpang Kiri,
83000 Batu Pahat, Johor.

For reservation or confirmation, please contact:

Tel:07-4186 300/017-7995388
Fax: 07-4186 500
Mr. Thangadurai 019-2151682 or
Ms Suba Tel: 03-5634 3888 Fax: 03-5634 0723

Annex 8

Photographs of local stakeholder meeting

Few photographs of the local stakeholder meeting are attached in this annex.


TATION MEETING

Annex 9 –Abbreviations

AMS	Approved small scale methodology
BM	Build Margin emission factor
CDM	Clean Development Mechanism
CM	Combined Margin
CO_2 e or CO_2 eq	Carbon di Oxide equivalent
CPO	Crude Palm Oil
EFB	Empty Fruit Bunch
FFB	Fresh Fruit Bunch
FO	Fuel oil
GHG	Green House Gases
GWh	Giga watt hour
IPCC	Inter Governmental Panel on Climate Change
Kcal/kg	Kilocalories per kilogram
Kg CO_2 eq/kWh	Kilogram carbon di oxide equivalent per kilowatt hour
kV	Kilo Volt
kW	Kilo watt
kWh	Kilo watt hour
M&P	Modalities and Procedures
MPOB	Malaysian Palm Oil Board
MW	Megawatt
MWh	Mega watt hour
MWh/year	Mega watt hour per year
OM	Operating margin emission factor
PKS	Palm kernel shell
RM	Ringgit Malaysia, official currency of Malaysia (1 US$=RM3.5 approx)
tCO_2e/ MWh	tonnes carbon di oxide per mega watt hour
tCO_2e or tCO_2eq or ton CO_2e	tonnes carbon di oxide equivalent
TDL	Transmission and distribution losses
TNB	Tenaga Nasional Berhad
UNFCCC	United Nations Framework Convention on Climate Change
US$	United States Dollars

Annex 10 - List of References

Sl. No.	Particulars of the references
1.	United Nations Framework Convention on Climate Change (UNFCCC), http://unfccc.int
2.	UNFCCC document: Clean Development Mechanism, Simplified Project Design Document for Small Scale Project Activities (SSC-PDD), Version 03
3.	UNFCCC document: Simplified modalities and procedures for small–scale clean development mechanism project activities
4.	UNFCCC document: Appendix B of the simplified modalities and procedures for small–scale CDM project activities - Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories - Type I.D Grid connected renewable electricity generation Version 17
5.	Guidelines on the assessment of investment analysis- Version 5.0 – EB-62 Annex 5
6.	National Energy Balance, 2007 by Ministry of Energy, Water and Communications, Malaysia
7.	Study on Grid Connected Electricity Baselines in Malaysia – Version 2.0 - published in December, 2008 by CDM Energy Secretariat, Pusat Tenaga Malaysia (Malaysia Energy Centre), Ministry of Energy, Water and Communications, Malaysia
8.	Renewable Energy Resources – Integrated Resource Planning, February, 2005 by Anders Evald and others, prepared by DANIDA for Government of Malaysia
9.	Directory of Malaysian Palm Oil Processing Sectors, MPOB, Ministry of Plantation , Industries & Commodities, 2006