CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Annexes

Abbreviations:

BM	Build Margin
CM	Combined Margin
COD	Chemical Oxygen Demand
DOC	Degradable Organic Carbon
DOE	Designated National Entity
EIA	Environmental Impact Assessment
EFB	Empty Fruit Bunch
GHG	Greenhouse gas
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
IRR	Internal Rate of Return
LULUCF	Land use, land-use change and forestry
MCF	Methane Correction Factor
MGGE	Mas Gading Green Energy Sdn. Bhd
MGE	Mukah Green Energy Sdn. Bhd
MPOB	Malaysia Palm Oil Board
O&M	Operation and Maintenance
OM	Operating Margin
SESCO	Sarawak Electricity Supply Corporation
SWDS	Solid Waste Disposal Site

SECTION A. General description of project activity

A.1 Title of the project activity:

Construction and operation of two 11.5MW biomass power plants in Kuching and Mukah, Sarawak, Malaysia (the "Project", or the "Project Activity").

(Version 01; 22/01/2008)

A.2. Description of the project activity:

The Project Activity involves the construction and operation of two 11.5MW biomass power plants in Sarawak, Malaysia. The power plants, to be built in Kuching and Mukah, will each be built to the same specifications. The plants are expected to export 10MW of power to the Sarawak Grid, and Sarawak Energy, the grid operator, has agreed to purchase all the electricity produced by the two plants.

The power plants are to be fuelled using empty fruit bunches (EFBs) obtained from Malaysia's palm oil industry as the feedstock. The EFBs will be brought to the site by truck from the surrounding palm oil plantations, of which there are many, and where the EFBs are disposed of in solid waste disposal sites. To improve the quality of EFBs as a fuel, the moisture content will be reduced by mechanically shredding and pressing them before combustion. Each plant will process approximately 36 tonnes per hour of EFB feedstock. Once the EFBs have been mechanically treated to reduce moisture content, this will equate to approximately 23 tonnes per hour of processed biomass for combustion in the boiler.

The Project will bring about carbon emission reductions in two ways:

- By preventing the disposal of EFBs at solid waste disposal sites where they are liable to breakdown anaerobically; and
- The exported electricity generated by the combustion of the EFBs will displace grid-connected fossil-based power generation.

Emissions reductions are expected to be in the region of 300 ktCO_2/year for the first crediting period.

Construction of the two plants will follow the same timetable. Construction of the Mas Gading plant in Kuching will begin in March 2008, and construction of the Mukah plant will begin in April 2008. The Project Developer intends to bring both plants online by December 2009.

Sustainable Development Benefits

The Project will have the following sustainable development benefits:

1. Environmental

- The Project will generate electricity from biomass. Biomass is a carbon-neutral fuel, and is very low in sulphur content when compared to fossil fuels. Therefore, the plant will assist in the reduction of SO_x emissions as well as reducing greenhouse gas emissions from Malaysia's grid power generation.

- The Project will prevent around 567,648 tonnes of EFBs per annum, 283,824 tonnes at each site, being disposed of at solid waste disposal sites (SWDS). The palm oil industry in Malaysia has difficulty in disposing of the EFBs it produces, and huge quantities of EFBs are disposed of in SWDS on land around the palm oil mills. On top of the fact that methane emissions occur from the anaerobic decay of the waste when so disposed, these SWDS are frequently unmanaged, or minimally managed, leading to problems with leachate entering groundwater, as well as the waste of large areas of land for this unproductive purpose.

2. *Economic*

- Despite having large hydrocarbon resources, due to increasing domestic demand, Malaysia is about to become a net importer of petroleum products. This was the main driver behind the government's adoption of the Fuel Diversification Policy, part of the Third Outline Plan for 2001 - 2010 (OPP3). Under this policy, biomass was identified as the country's fifth fuel resource, and with the launch of the Small Renewable Energy Programme, the country sought to encourage the growth of renewable power generation from sources such as biomass. In terms of the macro-economic situation, increased use of biomass resources will help to improve Malaysia's trade balance, whilst minimizing dependence on imported fossil fuels.

- By using a waste source (EFBs) to generate a valuable product (electricity), the Project will be creating a new and sustainable economic resource.

- The construction and operation of the plants will inject new money into the local economies in which they lie. Biomass power plants are relatively labour intensive, due to the pre-treatment of the biomass fuel before injection into the boiler, so the local benefits in terms of the number of new jobs created will be significant.

3. *Social*

- As mentioned above, the project will provide a significant number of jobs, both in the construction phase and the operation phase. As well as for the operation of the plant itself, further jobs will be created due to the need for transport contractors to bring the EFBs to the Project power plants from the surrounding palm oil mills, and the subsequent removal of ash.

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 (host)	Mas Gading Green Energy Sdn. Bhd.	No
Malaysia (host)	Mukah Green Energy Sdn. Bhd.	No

Japan	Agritech Marketing Co., Ltd.	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Malaysia

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

Sarawak

A.4.1.3. City/Town/Community etc:

Mas Gading Green Energy Sdn. Bhd., Kuching
Mukah Green Energy Sdn Bhd, Mukah

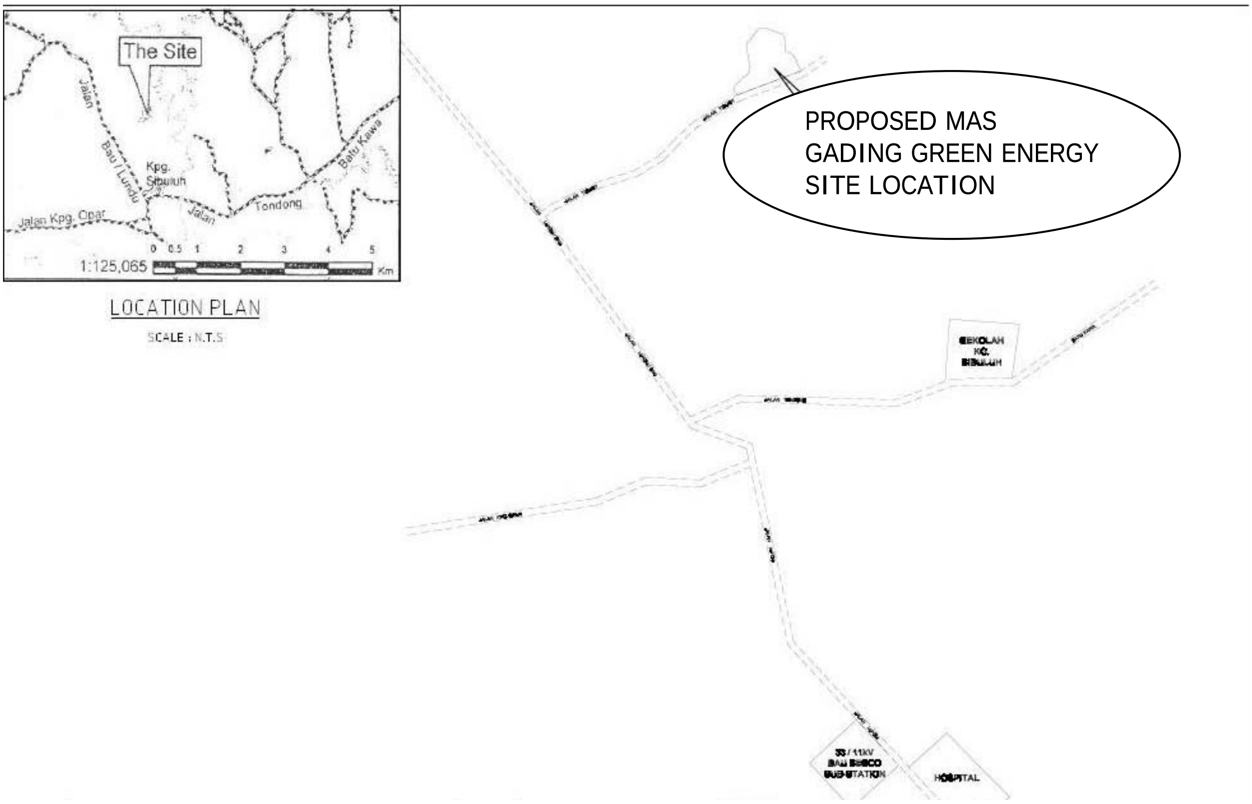
A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

Both plants are located in the Malaysian State of Sarawak, on the Isle of Borneo.

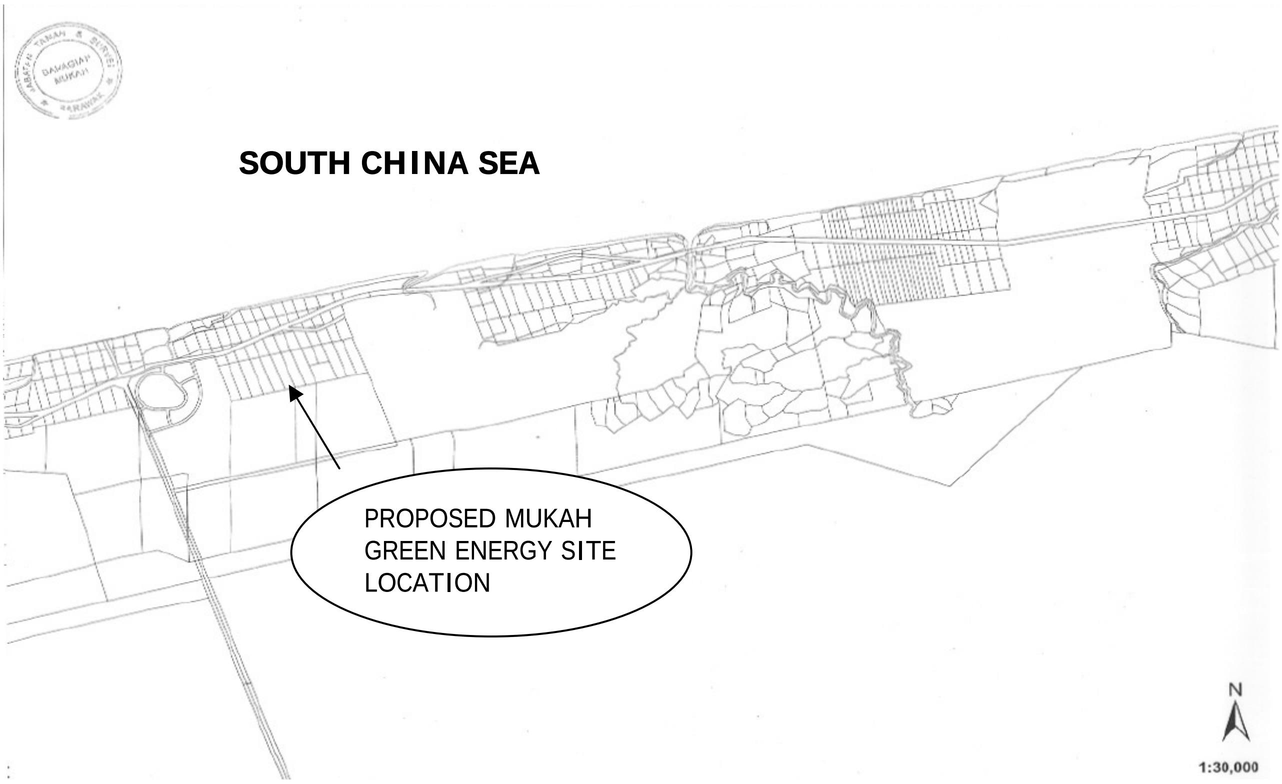
The site for the Mas Gading Green Energy Sdn. Bhd. plant is located at the following coordinates:
Longitude 1.28208 / Latitude110.07686

The site for the Mukah Green Energy Sdn. Bhd. plant is located at the following coordinates:
Longitude: 2.57932 / Latitude 112.18609

The following map shows the location of the Mas Gading plant in detail:



The following map shows the location of the Mukah plant in detail:



A.4.2. Category(ies) of project activity:

The category applicable to this Project is “Energy industries (renewable / non-renewable sources)”, Sectoral Scope 1.

A.4.3. Technology to be employed by the project activity:

The technology to be used is state-of-the-art and will allow the plant to be operated solely on EFBs. The technology utilized will be standard thermal power plant cycle with a Dynamic Watercooled Stepgrate (DWS) tail end type boiler supplied by Vyncke Energietechniek N.V of Belgium. The combustion grate type DWS is a unique concept from Vyncke especially suitable for fuels with high moisture content and low ash melting points. This is the case with EFB waste due to the high potassium content in the ash derived. The boiler is specially designed to operate for up to 8000 hours a year while maintaining resistance to fouling, slagging, erosion and corrosion.

The power plant shall comprise of a biomass fired boiler and combustion system, a fully condensing steam turbine, generator, surface condenser, cooling tower, biomass fuel treatment and handling system, ash handling system, water treatment and waste water treatment system, centralised control system, fire-fighting and protection system, instrumentation and compressed air system, steam and water circuit equipment, piping, civil and structural works, overhead cranes, electrification at site and other necessary electrical systems including a diesel generator intended as a back-up system, power transformer, switchgear and the overhead transmission line.

The characteristics of EFB waste – a high-moisture, low-calorie content biomass – make it difficult to use as fuel for power generation. Advanced technologies and additional measures such as pre-treatment of the EFBs consisting of shredding and oil-water pressing to reduce the moisture content to below 48% are required. A specially designed drying zone between the point of fuel feeding and the dynamic part of the stepgrate will ensure further drying of the fuel in the combustion room.

It is noteworthy that palm oil milling factories prefer the use of fibre and shells for boiler fuel due to their more favourable characteristics and little use has been made of EFBs.

A.4.4 Estimated amount of emission reductions over the chosen crediting period:

Years	**Annual estimation of emission reductions in tonnes CO_2e**
Year 1	179,628
Year 2	220,486
Year 3	259,938
Year 4	298,032
Year 5	334,818
Year 6	370,336
Year 7	404,634
Total estimated reductions (tonnes CO_2)	**2,067,872**
Total number of crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes CO_2)	**295,410**

A.4.5. Public funding of the project activity:

The project will not receive any public funding from an Annex I country.

SECTION B. Application of a baseline and monitoring methodology

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

The Project will use Approved Consolidated Methodology ACM0006, “Consolidated methodology for electricity generation from biomass residues”, Version 06.

As determined in ACM0006, the Project will also use the following methodological tools:

- Tool to calculate the emission factor for an electricity system (Version 01).

- Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site (Version 02)
- Combined tool to identify the baseline scenario and demonstrate additionality (Version 02.1)
- Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (Version 01)
- Tool to calculate project emissions from electricity consumption (Version 01)

B.2 Justification of the choice of the methodology and why it is applicable to the project activity:

Applicability condition	The Project
This methodology is applicable to biomass residue fired electricity generation project activities, including cogeneration plants.	The boilers to be installed under the Project activity are designed to have EFBs as their primary source of biomass. Other types of biomass residue may be combusted as a secondary energy source. Small amounts of fossil fuel may be combusted as a contingency measure. Monitoring will be carried out of fuels combusted by the Project.
The project activity may include the following activities or combinations of these activities: • The installation of a new biomass residue fired power plant at a site where currently no power generation occurs (**greenfield power projects**); or • The installation of a new biomass residue fired power plant, which replaces or is operated next to existing power plants fired with either fossil fuels or the same type of biomass residue as in the project plant (**power capacity expansion projects**); or • The improvement of energy efficiency of an existing power plant (**energy efficiency improvement projects**), e.g. by retrofitting the existing plant or by installing a more efficient plant that replaces the existing plant; or • the replacement of fossil fuels by biomass residues in an existing power plant (**fuel switch projects**).	The Project will involve the construction of two biomass residue fired power plants on greenfield sites, with no existing power generation facilities.
No other biomass types other than *biomass residues*, as defined above, are used in the project plant and these biomass residues are the predominant fuel used in the project plant (some fossil fuels may be co-fired).	The primary fuel to be combusted under the Project activity is EFBs. These are a waste product from palm oil mills, where the fruit of the oil palm is processed into crude palm oil and a number of by-products. It may be necessary to use some other biomass residues, if the supply of EFBs is short – e.g. in the off-peak season for crude palm oil

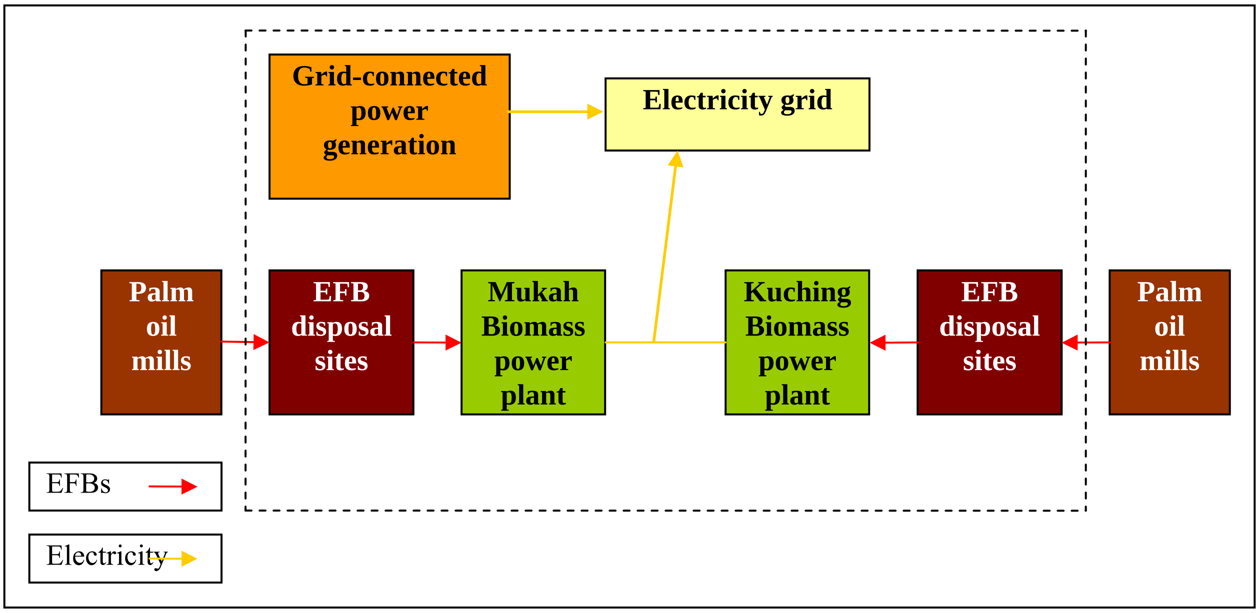
	production. In addition, small quantities of fossil fuel may be consumed as a contingency measure.
For projects that use biomass residues from a production process (e.g. production of sugar or wood panel boards), the implementation of the project shall not result in an increase of the processing capacity of raw input (e.g. sugar, rice, logs, etc.) or in other substantial changes (e.g. product change) in this process.	EFBs are a waste product of the palm oil industry. The disposal of EFBs has been causing well-documented environmental problems for a number of years. The palm oil mills that will supply EFBs to the Project activity are operating at the greatest capacity that availability of fresh oil palm fruit will allow. In most cases, this means operation at full capacity. These mills already have a huge incentive to operate to maximum capacity due to the high price of crude palm oil on the global market. The small additional income available to the mills from selling EFBs could not be seen as a major change in the economics of their operation, and therefore a change in the output or processes is highly unlikely.
The biomass residues used by the project facility should not be stored for more than one year.	The Project will not store biomass for more than one year. This will be confirmed through monitoring. The Project also has a strong incentive to use each shipment of biomass delivered to the site within a short time: the calorific value of EFBs declines rapidly over time.
No significant energy quantities, except from transportation or mechanical treatment of the biomass residues, are required to prepare the biomass residues for fuel combustion, i.e. projects that process the biomass residues prior to combustion (e.g. esterification of waste oils).	The EFBs (and any secondary biomass fuels) will be treated mechanically before injection to the boiler. However, no other significant treatment processes will be carried out. The energy for this treatment process will be supplied by the Project itself.
The methodology is only applicable for the combinations of project activities and baseline scenarios identified in Table 2 of the methodology, ACM0006.	This applicability is addressed in Section B.4 below.

B.3. Description of the sources and gases included in the project boundary

	Source	Gas	Included?	Justification / Explanation
Baseline	Electricity generation	CO_2	Yes	Main emission source
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
	Heat generation	CO_2	No	Not relevant as the project will not be producing heat for other users
		CH_4	No	Not relevant as the project will not be producing heat for other users
		N_2O	No	Not relevant as the project will not be producing heat for other users
	Uncontrolled burning or decay of surplus biomass residues	CO_2	No	It is assumed that CO_2 emissions from surplus biomass residues do not lead to any changes of carbon pools in the LULUCF sector.
		CH_4	Yes	Main emission source
		N_2O	No	Excluded for simplification. This is conservative.
Project activity	On-site fossil fuel consumption due to the project activity (stationary or mobile)	CO_2	Yes	Although fossil fuel will only be consumed as a contingency measure, any such consumption will be monitored.
		CH_4	No	Excluded for simplification. This emission source is expected to be very small.
		N_2O	No	Excluded for simplification. This emission source is expected to be very small.
	Off-site transportation of biomass residues	CO_2	Yes	May be an important emission source
		CH_4	No	Excluded for simplification. This emission source is expected to be very small.
		N_2O	No	Excluded for simplification. This emission source is expected to be very small.
	Combustion of biomass residues for electricity and / or heat generation	CO_2	No	It is assumed that CO_2 emissions from surplus biomass do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	Yes	As CH_4 emissions from decaying biomass are included, CH_4 emissions from combustion of biomass in the Project must also be included.
		N_2O	No	Excluded for simplification. This emission source is expected to be very small.
	Storage of biomass residues	CO_2	No	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	No	Excluded for simplification. Since biomass

				residues are stored for not longer than one year, this emissions source is assumed to be small.
		N_2O	No	Excluded for simplification. This emission source is expected to be very small.
	Wastewater from the treatment of biomass residues	CO_2	No	It is assumed that CO_2 emissions from surplus biomass residues do not lead to changes of carbon pools in the LULUCF sector.
		CH_4	No	The wastewater will not be treated under anaerobic conditions; therefore, it will not be necessary to include this item.
		N_2O	No	Excluded for simplification. This emission source is expected to be very small.

The following diagram shows the spatial extent of the project boundary:



B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

As determined in ACM0006, the baseline scenario is identified using the “Combined tool to identify the baseline scenario and demonstrate additionality” (henceforth referred to as the “Combined tool”). The latest version, Version 02.1, is used. Note that due to use of the “Combined tool”, additionality, which is typically dealt with under Section B.5 of the PDD, is covered here in Section B.4. Because the relevant situations faced by both the plants is very similar, and they of the same specification, additionality is dealt with for one mill, with the outcome applied to both.

STEP 1. Identification of alternative scenarios

Sub-step 1a. Define alternative scenarios to the proposed CDM project activity

In line with the guidance in ACM0006, alternative scenarios are considered for both power generation, and for disposal of the biomass residues.

For ***power*** generation, the realistic and credible alternatives to be considered are:

P1 The proposed project activity not undertaken as a CDM project activity.

P2 The continuation of power generation in an existing biomass residue fired power plant at the project site, in the same configuration, without retrofitting and fired with the same type of biomass residues as (co-)fired in the project activity.

P3 The generation of power in an existing captive power plant, using only fossil fuels.

P4 The generation of power in the grid.

P5 The installation of a **new** biomass residue fired power plant, fired with the same type and with the same annual amount of biomass residues as the project activity, but with a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project plant and therefore with a lower power output than in the project case.

P6 The installation of a **new** biomass residue fired power plant that is fired with the same type but with a higher annual amount of biomass residues as the project activity and that has a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project activity. Therefore, the power output is the same as in the project case.

P7 The **retrofitting** of an existing biomass residue fired power, fired with the same type and with the same annual amount of biomass residues as the project activity, but with a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project plant and therefore with a lower power output than in the project case.

P8 The **retrofitting** of an existing biomass residue fired power that is fired with the same type but with a higher annual amount of biomass residues as the project activity and that has a lower efficiency of electricity generation (e.g. an efficiency that is common practice in the relevant industry sector) than the project activity.

P9 The installation of a **new** fossil fuel fired captive power plant at the project site.

For the use of the ***biomass residues***, the realistic and credible alternative scenarios to be considered are:

B1 The biomass residues are dumped or left to decay under mainly aerobic conditions. This applies, for example, to dumping and decay of biomass residues on fields.

B2 The biomass residues are dumped or left to decay under clearly anaerobic conditions. This applies, for example, to deep landfills with more than 5 meters. This does not apply to biomass residues that are stockpiled or left to decay on fields.

B3 The biomass residues are burnt in an uncontrolled manner without utilizing it for energy purposes.

B4 The biomass residues are used for heat and/or electricity generation at the project site

B5 The biomass residues are used for power generation, including cogeneration, in other existing or new grid-connected power plants[3]

B6 The biomass residues are used for heat generation in other existing or new boilers at other sites

B7 The biomass residues are used for other energy purposes, such as the generation of biofuels

B8 The biomass residues are used for non-energy purposes, e.g. as fertilizer or as feedstock in processes (e.g. in the pulp and paper industry)

Sub-step 1b. Consistency with mandatory applicable laws and regulations:

All scenarios for power generation are consistent with Malaysia's laws and regulations.

For treatment of biomass residues, scenario B3 is prohibited by law. All other scenarios are consistent with Malaysia's laws and regulations.

Therefore, all scenarios identified above, apart from B3, are considered in Step 2.

STEP 2: Barrier analysis

Sub-step 2a. Identify the barriers that would prevent the implementation of alternative scenarios

(1) Investment barriers

The equipment costs for grid-connected biomass power plants are significantly higher than those for GHG-intensive conventional fossil fuel power plants. Although the operating and maintenance costs for biomass power plants are comparatively low, increasing their attractiveness in the long term, this is still insufficient to increase project returns to the level attained by conventional plants. In developing countries, like Malaysia, where short-term cost minimization is important, grid-connected biomass power projects do not represent an attractive course of action.

The additional revenue from the sale of CERs will increase the Project's return to a more acceptable level, enabling the implementation of the Project. Without this extra source of income, the low return combined with the real and perceived risks involved make the Project unattractive to investors.

(2) Barriers due to prevailing practice

There are currently no regulations for the management of EFB waste, except for the general ban on open-air burning as stipulated in the 1998 amendments to the Environmental Quality Act of 1974. As there is also no standard technology to manage the large volume EFB waste from palm oil mills, it is obvious that without an additional incentive such potential CER revenue, the most likely scenario is for EFB waste to be dumped and allowed to decompose under clearly anaerobic conditions in solid waste disposal sites (SWDS), resulting in significant uncontrolled emission of GHGs.–

Using biomass waste as fuel for electricity generation is not a standard waste management practice in Malaysia, even though the Small Renewable Energy Program[1] has recently been strongly promoted. The project activity, therefore, is highly unlikely to be the choice.

Sub-step 2b. Eliminate alternative scenarios which are prevented by the identified barriers.

Options P1, P3 and P4 all face similar investment barriers, primarily the high initial capital costs compared to the low returns. P3 and P4 face a further obstacle to implementation: given that the fuel to be used in the biomass generators is to be paid for, there is a clear incentive to generate the maximum amount of energy from the waste that is received. Another difficulty is that technology used to burn EFBs is relatively untested and there is not a wide selection of options available. The choice should not be seen as one between high efficiency and low efficiency, rather it is a choice between technology that has an acceptable chance of functioning effectively versus technology that has not been designed for EFB combustion and has a high likelihood of breakdown or malfunction.

As described above, the volume of EFBs produced by the mills is too great for option B1, the dumping of biomass so that it decomposes under aerobic conditions. The land requirements and the labour costs associated with the disposal of more than half a million tonnes of EFBs per year in this manner would not be feasible. Furthermore, the mulching of EFBs on plantation land exposes the plantations to increased disease risks. B2, the current predominant practice, would, on the other hand, be a viable option.

B4 would be a viable option in the Project scenario; however, in the Project's absence, there would not be alternative biomass fired plants at any of the sites, or in the regions of the sites for a similar amount of biomass waste to be combusted, thus ruling out B4 in the absence of the Project Activity, and B5. This is further demonstrated in the leakage section where it is shown that a large excess of EFBs would remain and would continue to be treated in solid waste disposal sites in the Project scenario. This large excess also shows that alternative energy or non-energy uses for the EFBs, options B6 and B7, are not widespread in the area.

For ***power generation***, the remaining options aside from the project activity are, therefore:

P1 The Project not undertaken as a CDM project activity

P2 The generation of power in the grid

[1] The Government of Malaysia has approved a policy called the Small Renewable Energy Programme, to encourage private entities generating power with renewable fuels to sell part or all of its output to regional grids.

For the use of the ***biomass residues***, the realistic and credible alternative scenarios to be considered are:

B2 The biomass residues are dumped or left to decay under clearly anaerobic conditions.

B4 The biomass residues are combusted for electricity generation at the project site.

STEP 3: Investment Analysis

Due to high initial costs associated with the planning, engineering, and construction of each plant, the Project does not represent an attractive investment opportunity in the absence of additional revenue from the sale of CERs. This PDD uses the IRR benchmark of 15% adopted by the Malaysian Government's DNA in its report entitled, "Study on Clean Development Mechanism Potential in the Waste Sectors in Malaysia"[2] which referred to similar projects to the Project Activity. An IRR is calculated for one plant and the results applied to both plants because the plants are of the same specification and have the same estimated costs and benefits. As can be seen from the financial data displayed below, the Project IRR for a plant is not high enough to justify investment, considering the risks involved. With the CER revenue incorporated into the IRR calculation, the additional revenue stream provides enough of an incentive for the Project developer to proceed.

Item	Assumptions/Sources	Value
Financial Details		
Costs		
Initial capital cost (equipment and plant costs)	Supplied by Project developer based on quotes and current prices	85,000,000MYR
Fuel cost/year (EFBs)	Based on average local price	4,000,000 MYR/year
O&M cost/yr	Supplied by Project developer based on quotes and current prices	3,500,000 MYR/year
Revenues		
Electricity tariff	Average local price (including tax)	0.210 MYR/kWh
Electricity sales	Assuming that 10MW net will be exported for 365 days a year, at a load factor of 90% (78,840 MWh/year)	16,556,400 MYR/year
Project life	Minimum projected life	21 years
Project IRR for operations		8.86%

The IRR for one plant is estimated to be 8.86%, which is much lower than the benchmark of 15%. The low IRR, compared to the hurdle rate, indicates that the Project is not financially attractive without an additional revenue stream, such as that obtained through the CDM. The relatively low return does not justify the risks associated with implementing a new biomass power project.

Sensitivity Analysis

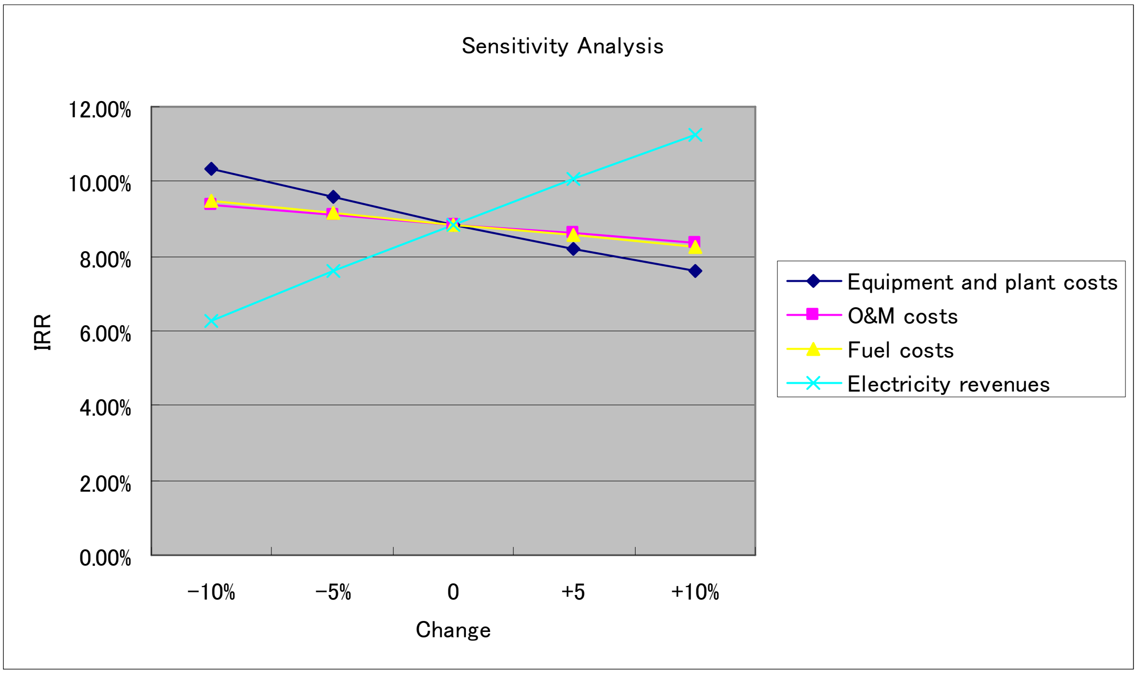
[2] http://cdm.eib.org.my/upload/articles1016,article,1154653437,Report_WasteSector_Summary%20report.pdf

The following sensitivity analysis is performed to confirm the conclusion regarding the financial attractiveness of the Project is robust:

1) The costs for equipment and plant is 10% lower than expected (Project IRR =10.34%)
2) O&M costs will be 10% lower than expected (Project IRR = 9.38%)
3) Fuel costs are 10% lower than expected (Project IRR = 9.46%)
4) The average tariff for electricity is 10% higher than expected (Project IRR = 11.26%)

The following table and diagram give the results of the sensitivity analysis for each scenario

Changes	-10%	-5%	0	+5	+10%
Equipment and plant costs	10.34%	9.57%	8.86%	8.21%	7.61%
O&M costs	9.38%	9.12%	8.86%	8.60%	8.34%
Fuel costs	9.46%	9.16%	8.86%	8.56%	8.26%
Electricity revenues	6.29%	7.60%	8.86%	10.08%	11.26%



As can be seen from the above analysis, in the absence of the CDM revenue stream the Project is not likely to lead to significant enough returns to warrant investment. Even under the favourable conditions supposed in the sensitivity analysis, the IRR of the Project Activity is significantly lower than the benchmark of 15%.

Investment in the Project Activity without CDM, scenario P1, is therefore not likely to happen and energy will most likely be generated from existing and new grid-connected power stations. The above IRR calculations show that the Project Activity is not feasible without some form of additional revenue such as that available through the CDM. Without CDM registration, therefore, EFBs would most likely continue to be disposed of at SWDS (option B2), resulting in significant GHG emissions from their anaerobic decay.

This PDD identifies the baseline as:

P2 The generation of power in the grid; and

B2 The biomass residues are dumped or left to decay under clearly anaerobic conditions.

This corresponds to scenario 2 in the methodology.

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 CDM project activity (assessment and demonstration of additionality): >>

Due to use of the "Combined tool", as required by ACM0006, the issue of additionality was covered under Section B.4 above.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

As described above, the project activity comes under scenario 2 in the methodology, ACM0006: biomass power generation and exporting of the power to the grid, replacing a baseline scenario of dumping of biomass at a solid waste disposal site.

Total emission reductions will be calculated for each plant individually, in line with the methodology ACM0006, and then totalled. The calculations to be used are as follows:

$$ER_y = ER_{electricity,y} + BE_{biomass} - PE_y - L_y$$

Where:

ER_y = Emissions reductions of the project activity during the year *y* (tCO_2/yr)

$ER_{electricity,y}$ = Emission reductions due to displacement of electricity during the year *y* (tCO_2/yr)

$BE_{biomass}$ = Baseline emissions due to natural decay or burning of anthropogenic sources of biomass residues during the year *y* (tCO_2/yr)

PE_y = Project emissions during the year *y* (tCO_2/yr)

L_y = Leakage emissions during the year *y* (tCO_2/yr)

Project emissions (PE_y)

Of the potential project emissions listed in the methodology, the following are relevant to the Project, as described in section B.3:

- CO_2 emissions from transportation of biomass residues to the project site (PET_y)
- CO_2 emissions from on-site consumption of fossil fuels due to the project activity ($PEFF_y$)
- CH_4 emissions from the combustion of biomass residues ($PE_{Biomass,CH4,y}$)

Project emissions are calculated as follows:

$PE_y = PET_y + PEFF_y + (GWP_{CH4} \cdot PE_{Biomass,CH4,y})$

Where:
PET_y = CO_2 emissions during the year *y* due to transportation of the residues to the project plant (tCO_2/yr)
$PEFF_y$ = CO_2 emissions during the year *y* due to fossil fuels co-fired by the generation facility or other fossil fuel consumption at the project site that is attributable to the project activity (tCO_2/yr)
GWP_{CH4} = Global Warming Potential for methane valid for the relevant commitment period
$PE_{Biomass,CH4,y}$ = CH_4 emissions from the combustion of biomass residues during the year *y* (tCH_4/yr)

Carbon dioxide emissions from combustion of fossil fuels for transportation of biomass residues to the project plant (PET_y)

This PDD selects the following option from the methodology:
Option 1: Emissions are calculated on the basis of distance and the number of trips (or the average truck load).

$$PET_y = \frac{\sum_k BF_{T,k,y}}{TL_y} \cdot AVD_y \cdot EF_{km,CO2,y}$$

Where:
$BF_{T,k,y}$ = Quantity of biomass residue type k that has been transported to the project site during the year y
TL_y = Average truck load of the trucks used (tonnes) during the year y
AVD_y = Average round trip distance (from and to) between the biomass residue fuel supply sites and the site of the project plant during the year y (km)
$EF_{km,CO2,y}$ = Average CO_2 emission factor for the trucks measured during the year y (tCO_2/km)

Carbon dioxide emissions from on-site consumption of fossil fuels ($PEFF_y$)

The proper and efficient operation of the biomass residue-fired power plant may require the use of some fossil fuels as a contingency measure. The resulting CO_2 emissions are calculated as described in the latest version of the tool to calculate project or leakage CO_2 emissions from fossil fuel combustion (version 1), using the following formula:

$$PEFF_y = \sum_i FC_{i,y} \times COEF_{i,y}$$

Where:
$FC_{i,y}$ = Quantity of fossil fuel type *i* combusted in the boiler during the year *y* (m^3/yr)
$COEF_{i,y}$ = CO_2 emission coefficient of fuel type *i* in year *y* (tCO_2/m^3)
i = Fuel types combusted in the boiler during the year *y*

The CO_2 emission coefficient $COEF_{i,y}$ will be calculated according to the preferred option in the tool, option A, based on the chemical composition of fossil fuel type *i*, using the following approach:

$COEF_{i,y}$ = $w_{C,i,y,i}$ × $\rho_{i,y}$ × 44/12

Where:

$w_{C,i,y,i}$ = Weighted average mass fraction of carbon in fuel type *i* in year *y* (tC/t fuel)

$\rho_{i,y}$ = Weighted average density of fuel type *i* in year *y* (t/m^3)

44/12 = Fuel types combusted in the boiler during the year *y*

Methane emissions from combustion of biomass residues ($PE_{Biomass,CH4,y}$)

Emissions from this source are calculated as follows:

$$PE_{Biomass,CH4,y} = EF_{CH4,BF} \cdot \sum_k BF_{k,y} \cdot NCV_k$$

Where:

$BF_{k,y}$ = Quantity of biomass residue type *k* combusted in the project plant during the year *y* (tonnes of dry matter)

NCV_k = Net calorific value of the biomass residue type *k* (GJ/ton of dry matter)

$EF_{CH4,BF}$ = CH_4 emission factor for the combustion of biomass residues in the project plant ($kgCH_4$/TJ)

This PDD calculates EF_{CH4} using the following standard IPCC default data from table 4 and table 5 of the methodology[3]; assuming that EFBs are best characterized as wood waste, in line with previous decisions by the Executive Board:

A Waste type	B Default emission factor (kg CH_4/TJ)	C Assumed uncertainty	D Conservativeness factor	E Conservative EF, B×D (kg CH_4/TJ)
EFBs (wood waste)	30	300%	1.37	41.1

Applying the conservativeness factor to the default IPCC emission factor, a conservative emission factor of 41.1 kg CH_4/TJ is obtained.

Emission reductions due to displacement of electricity ($ER_{electricity,y}$)

Emission reductions due to the displacement of electricity are calculated by multiplying the net quantity of increased electricity generated with biomass residues as a result of the project activity (EG_y) with the CO_2 baseline emissions factor for the electricity displaced due to the Project ($EF_{electricity,y}$), as follows:

$ER_{electricity,y}$ = EG_y × $EF_{electricity,y}$

Where:

EG_y = Net quantity of increased electricity generation as a result of the project activity (incremental to baseline generation) during the year y (MWh)

$EF_{electricity,y}$ = CO_2 emission factor for the electricity displaced due to the project activity during the

[3] Originally from 2006 IPCC Guidelines, Volume 2, Chapter 2, Tables 2.2 to 2.6

year y (tCO_2/MWh)

Determination of $EF_{electricity,y}$

The electricity generated by the Project Activity will displace electricity from other power generation plants connected to the Sarawak Grid. Under the Project Activity, electricity is not be generated from fossil fuels on-site. The emission factor for the displacement of electricity, therefore, corresponds to the grid emission factor ($EF_{electricity,y} = EF_{grid,y}$), and has been determined *ex ante* as directed in the tool to calculate the emission factor for an electricity system, as follows:

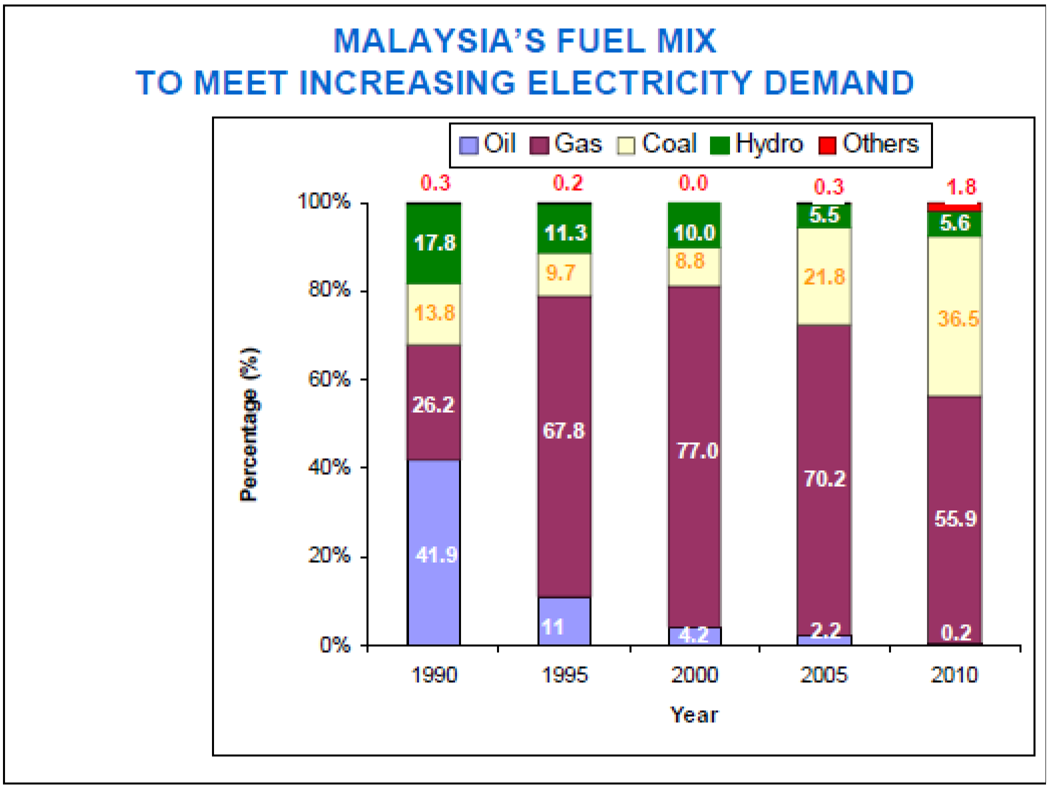
STEP 1. Identify the relevant electric power system

The grid to which the power plants will provide electricity is the Sarawak Grid. The power plants have signed contractual agreements with Sarawak Energy, the company that manages the grid, to this end.

STEP 2. Select an operating margin (OM) method

Dispatch data is unavailable for the Sarawak Grid; therefore, this PDD selects option (a), the Simple OM method, to calculate this parameter.[4] As shown in the figure below, low-cost/must-run resources constitute less than 50% of total grid generation, and are predicted to constitute less than 50% for the medium term (oil, gas and coal consistently make up over 80% of the mix).

[4] The fact that the low-cost/must-run resources constitute less than 50% of total grid generation in the exporting grid is shown in annex 3. In calculating the simple operating margin emission factor of the exporting grid, the ex-post option is applied.



Source: Ministry of Energy, Water and Communications, Malaysia[5]

STEP 3. Calculate the operating margin emission factor according to the selected method

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generation power plants serving the system, not including low-cost/must-run power plants/units. It is calculated based on data on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system (option C) because the necessary data for option A or option B is not available, nuclear and renewable power generation are considered as low-cost/ must-run power sources and the quantity of electricity supplied to the grid by these sources is known. Electricity imports are treated as one power plant.

$$EF_{grid,OMsimple,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_{grid,y}}$$

Where:

$EF_{grid,OMsimple,y}$ Simple operating margin CO_2 emission factor in year y (tCO_2/MWh)

[5] http://www.jcoal.or.jp/publication/kokusaikaigi/pdf/CCD2007/CCD2007SymposiumS1-3.pdf

$FC_{i,y}$	Amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)
$NCV_{i,y}$	Net calorific value (energy content) of fossil fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$	CO2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
$EG_{grid,y}$	Net electricity generated and delivered to the grid by all power sources serving the system, not including low-cost/must-run power plants/units in year y (MWh)
i	All fossil fuel types combusted in power sources in the project electricity system in year y
y	The three most recent years for which data is available at the time of submission of the CDM-PDD to the DOE for validation (ex-ante option)

STEP 4. Identify the cohort of power units to be included in the build margin

Of the two options presented for the identification of the cohort of power units, *m*, option (a), the set of five power units that have been built most recently, is selected because it comprises the larger annual generation of the two options.

There are no CDM-registered projects connected to the Sarawak Grid.

Option 1, ex-ante calculation of the build margin emission factor for the first crediting period is selected. For the second crediting period, the build margin emission factor will be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period will be used. Under this option, no monitoring of the emission factor is necessary during the crediting period.

STEP 5. Calculate the build margin emission factor

The build margin emission factor is the generation-weighted average emission factor (tCO_2/MWh) of all five power units identified in Step 4 above, during the most recent year for which power generation data is available. It is calculated as follows

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:

$EF_{grid,BM,y}$	Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit *m* in year y (MWh)
$EF_{EL,m,y}$	CO_2 emission factor of power unit $_m$ in year y (tCO_2/MWh)
m	Power units included in the build margin
y	Most recent historical year for which power generation data is available

STEP 6. Calculate the combined margin emission factor

The combined margin emission factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

Where:

$EF_{gird,BM,y}$	Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EF_{gird,OM,y}$	Operating margin CO_2 emission factor in year y (tCO_2/MWh)
w_{OM}	Weighting of operating margin emissions factor (%)
w_{BM}	Weighting of build margin emissions factor (%)

The following default values will be applied for w_{OM} and w_{BM}:

- w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period, and w_{OM} = 0.25 and w_{BM} = 0.75 for the second and third crediting period.

The BM for the Sarawak Grid is 0.947 tCO_2/MWh, and the OM is 0.852 tCO_2/MWh. Giving each an equal weighting, the combined margin for the Sarawak Grid is 0.900 tCO_2/MWh (tables are shown in Annex 3).

Baseline emissions due to natural decay or uncontrolled burning of anthropogenic sources of biomass residues ($BE_{biomass}$)

For scenario 2 projects, baseline emissions due to uncontrolled burning or decay of the biomass residues ($BE_{Biomass,y}$) should be determined consistently with the most plausible baseline scenario for the use of the biomass residues, using the following two steps:

Step 1. Determination of the quantity of biomass residues used as a result of the project activity ($BF_{PJ,k,y}$)

The amount of EFBs prevented from being disposed of in SWDS is, as described in the methodology, equal to the amount of EFBs disposed of by the Project Activity:
$BF_{PJ,k,y} = BF_{k,y}$

Step 2. Estimation of methane emissions, consistent with the baseline scenario for the use of biomass residues

The baseline scenario identified in section B.4 for the biomass is B2, "anaerobic decay of the biomass residues". Therefore, in line with the methodology, baseline emissions from this source are calculated using the latest version of the tool to determine methane emissions avoided from dumping waste at a solid waste disposal site", according to the following formula:

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

Where:

φ is the model correction factor to account for model uncertainties (0.9)

f	is the fraction of methane captured at the SWDS and flared, combusted or used in another manner
GWP_{CH4}	is the global warming potential (GWP) of methane
OX	is the oxidation factor (reflecting the amount of methane from SWDS that is oxidised in the soil or other material covering the waste
16/12	is the conversion factor for carbon (C) to methane (CH_4)
F	is the fraction of methane in the SWDS gas (volume fraction) (0.5)
DOC_f	is the fraction of degradable organic carbon (DOC) that can decompose
MCF	is the methane correction factor
$W_{j,x}$	is the amount of organic waste type *j* prevented from disposal in the SWDS in the year x (tonnes)
DOC_j	is the fraction of degradable organic carbon (by weight) in the waste type *j*
k_j	is the decay rate for the waste type *j*
j	is the waste type category
x	is the year during the crediting period: x runs from the first year of the first crediting period (x=1) to the year y for which avoided emissions are calculated
y	is the year for which methane emissions are calculated

The EFBs that would have been disposed of at a SWDS in the absence of the Project Activity come under the category wood and wood products, as directed by the Meth Panel and Executive Board.

Leakage

The main potential source of leakage for this project activity is an increase in emissions from fossil fuel combustion or other sources due to diversion of biomass residues from other uses to the project plant as a result of the project activity.

For scenario 2 projects, the project developer must demonstrate that the use of the biomass residues does not result in increased fossil fuel consumption elsewhere. This PDD selects option L_2 from the methodology and demonstrates that there is an abundant surplus of the biomass residue in the region of the project activity which is not utilized. For this purpose, demonstrate that the quantity of available biomass residue of type *k*(EFBs) in the region is at least 25% larger than the quantity of biomass residues of type *k* (EFBs) that are utilized (e.g. for energy generation or as feedstock), including the project plant.

If leakage effects cannot be ruled out by the above method, then leakage emissions will be calculated as follows:

$$L_y = EF_{CO2,LE} \cdot \sum_k BF_{PJ,k,y} \cdot NCV_k$$

Where:

L_y	= Leakage emissions during the year y (tCO_2/yr)
$BEF_{CO2,LE}$	= CO_2 emission factor of the most carbon intensive fuel used in the country (tCO_2/GJ)
$BF_{PJ,k,y}$	= Incremental quantity of biomass residue type k used as a result of the project activity in the project plants during the year y (tonnes)
k	= Types of biomass residues for which leakage effects could not be ruled out
NCV_k	= Net calorific value of the biomass residue type k (GJ/ton of dry matter)

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

Data / Parameter:	**GWP_{CH4}**
Data unit:	tCO_2e/tCH_4
Description:	Global warming potential for CH_4
Source of data used:	2006 IPCC Guidelines
Value applied:	21
Justification of the choice of data or description of measurement methods and procedures actually applied :	21 for the first commitment period. Shall be updated according to any future COP/MOP decisions.
Any comment:	-

Data / Parameter:	**$EF_{grid,y}$**
Data unit:	tCO_2/MWh
Description:	Emission factor for the grid in year y
Source of data used:	Calculated as the combined margin emission factor, using the procedures in the latest approved version of the consolidated baseline methodology for grid-connected electricity generation from renewable sources.
Value applied:	0.900
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated as described in section B.6.1
Any comment:	-

Data / Parameter:	**$EF_{CH4,BF}$**
Data unit:	tCH_4/GJ
Description:	CH_4 emission factor for the combustion of biomass residues in the project plant
Source of data used:	Calculated as described in the methodology
Value applied:	41.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	The following data from the 2006 IPCC Guidelines, as given in the methodology, was used in the calculation. (see table below)
Any comment:	To be updated in line with the latest version of the IPCC Guidelines

Waste type	**Default emission factor (kg CH_4/TJ)**	**Assumed uncertainty**	**Conservativeness factor**
EFBs (wood waste)	30	300%	1.37

Data / Parameter:	**NCV_i**
Data unit:	GJ/kg

Description:	Net calorific value of the fossil fuel type *i*
Source of data used:	2006 IPCC Guidelines
Value applied:	-
Justification of the choice of data or description of measurement methods and procedures actually applied :	This PDD assumes that no fossil fuel will be combusted in the Project Activity. However, if as a contingency some fossil fuel is used, the relevant NCV data will be taken from the latest version of the IPCC Guidelines.
Any comment:	

Data / Parameter:	φ
Data unit:	Fraction
Description:	Model correction factor to account for model uncertainties
Source of data used:	The latest version of the methane avoidance tool (see EB26 report, Annex 14)
Value applied:	0.9
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value suggested in the tool.
Any comment:	-

Data / Parameter:	**f**
Data unit:	Fraction
Description:	Fraction of methane captured at the SWDS and flared, combusted or used in another manner
Source of data used:	The latest version of the methane avoidance tool (see EB26 report, Annex 14)
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	No methane would be captured at the SWDS in the baseline scenario.
Any comment:	-

Data / Parameter:	**OX**
Data unit:	Fraction
Description:	Oxidation factor (reflecting the amount of methane from SWDS that is oxidised in the soil or other material covering the waste
Source of data used:	The latest version of the methane avoidance tool (see EB26 report, Annex 14)
Value applied:	0
Justification of the choice of data or description of	Value selected as directed in the methodological tool for uncovered solid waste disposal sites.

measurement methods and procedures actually applied :	
Any comment:	-

Data / Parameter:	**F**
Data unit:	Fraction
Description:	Fraction of methane in the SWDS gas (volume fraction)
Source of data used:	The latest version of the methane avoidance tool (see EB26 report, Annex 14)
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	Value applied as per the instructions in the methodological tool
Any comment:	-

Data / Parameter:	**DOC_f**
Data unit:	Fraction
Description:	Fraction of degradable organic carbon (DOC) that can decompose
Source of data used:	The latest version of the methane avoidance tool (see EB26 report, Annex 14)
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	Value applied as per the instructions in the methodological tool
Any comment:	

Data / Parameter:	**MCF**
Data unit:	Fraction
Description:	Methane correction factor
Source of data used:	The latest version of the methane avoidance tool (see EB26 report, Annex 14)
Value applied:	0.8
Justification of the choice of data or description of measurement methods and procedures actually applied :	Value for deep, unmanaged landfill site selected according to the guidance in the methodological tool.
Any comment:	-

Data / Parameter:	**DOC_j**
Data unit:	Fraction

Description:	Fraction of degradable organic carbon (by weight) in the waste type j
Source of data used:	The latest version of the methane avoidance tool (see EB26 report, Annex 14)
Value applied:	0.43
Justification of the choice of data or description of measurement methods and procedures actually applied :	The waste type is expected to be consistent (EFBs). In accordance with Paragraph 29 of EB33 Meeting Report[6], wood was chosen for waste type of the EFB.
Any comment:	-

Data / Parameter:	**k_j**
Data unit:	Decay rate
Description:	Decay rate for the waste type j
Source of data used:	The latest version of the methane avoidance tool (see EB26 report, Annex 14)
Value applied:	0.035
Justification of the choice of data or description of measurement methods and procedures actually applied :	The waste type is expected to be consistent (EFBs). In accordance with Paragraph 29 of EB33 Meeting Report, wood was chosen for waste type of the EFB.
Any comment:	-

B.6.3 Ex-ante calculation of emission reductions:

Monitoring will be carried out for each plant individually, and the data used in the monitoring report to calculate actual emission reductions for each plant separately. However, for the sake of simplicity and given that the two biomass power plants in this project are each to be constructed to the same specifications, this PDD calculates the emission reductions for one plant as a reference. Total emissions are then calculated at the end by multiplying each of the results by 2.

Emission reductions

Emission reductions are calculated using the following formula:

$$ER_y = ER_{electricity,y} + BE_{biomass} - PE_y - L_y$$

Project emissions (PE_y)

Project emissions are calculated as follows:

$$PE_y = PET_y + PEFF_y + (GWP_{CH4} \cdot PE_{Biomass,CH4,y})$$

For year 1, $PE_y = 940 + 0 + (21 \times 64)$

[6] http://cdm.unfccc.int/EB/033/eb33rep.pdf

= 2, 284 tCO_2e /year

Carbon dioxide emissions from combustion of fossil fuels for transportation of biomass residues to the project plant (PET_y)

As described in section B.6.1, this PDD selects option 1 from the methodology. Assuming an average of 15 tonnes is to be carried by each truck on each trip, emission reductions are calculated as follows:

$$PET_y = \frac{\sum_k BF_{T,k,y}}{TL_y} \cdot AVD_y \cdot EF_{km,CO2,y}$$

PET_y = (283,824/15) × 63.5 × (0.782/1000)

= 940 tCO_2/year

Carbon dioxide emissions from on-site consumption of fossil fuels ($PEFF_y$)

Whilst there will be contingency plans in place for the use of fossil fuels in the boiler, the boiler is fully expected to operate only on biomass. Any fossil fuel use will be monitored and the emissions from the use thereof will be estimated in accordance with the calculations in section B.6.1.

For the sake of simplicity, however, this PDD assumes that GHG emissions from this source are zero.

Methane emissions from combustion of biomass residues ($PE_{Biomass,CH4,y}$)

Each plant is expected to combust around 181,332 tonnes of processed EFBs per annum. Using the NCV information provided by the Project developer (8.59 GJ/ton), and the conservative emission factor calculated in section B.6.1 (41.1kg CH_4/TJ), emissions from this source are calculated as follows:

$$PE_{Biomass,CH4,y} = EF_{CH4,BF} \cdot \sum_k BF_{k,y} \cdot NCV_k$$

$$= (41.1/1000) \times 181,332 \times 8.59$$

$$= 64 \ tCH_4/year$$

<u>Emission reductions due to displacement of electricity ($ER_{electricity,y}$)</u>

It is estimated that one plant will produce in the region of 78,840 MWh per year. Assuming a grid emission factor of 0.900 tCO_2/MWh, emissions reductions from this source are calculated as follows:

$$ER_{electricity,y} = EG_y \times EF_{electricity,y}$$

$$= 78,840 \times 0.900$$

$$= 70,942 \ tCO_2/year$$

<u>Baseline emissions due to natural decay or uncontrolled burning of anthropogenic sources of biomass residues ($BE_{biomass}$)</u>

<u>Step 1</u>

As described in section B.6.1, the total biomass residue used in one plant is considered the amount of biomass prevented from being disposed of at SWDS (283,824 tonnes/year).

<u>Step 2</u>

The amount of methane that would have been produced in year y in the absence of the construction of each plant under the Project Activity is calculated as follows:

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

Emissions from this are source shown below for the first crediting period (calculated using an Excel spreadsheet which will be made available for review at validation):

Year	**CH_4 Emissions (t/y)**	**CO_2e (t/y)**
1	1,119	21,156
2	2,200	41,585
3	3,244	61,311
4	4,252	80,358
5	5,225	98,751
6	6,165	116,510
7	7,072	133,659
Average	**4,182**	**79,047**
Total	**29,277**	**553,330**

Total baseline emissions

Total baseline emissions for one plant are calculated in the following table:

Year	**Displaced GHG emissions from SWDS**	**Displaced GHG emissions from electricity production**	**Total**
	(tCO_2e/year)	(tCO_2e/year)	(tCO_2e/year)
1	21,156	70,942	92,098
2	41,585	70,942	112,527
3	61,311	70,942	132,253
4	80,358	70,942	151,300
5	98,751	70,942	169,693
6	116,510	70,942	187,452
7	133,659	70,942	204,601

Leakage from increased fossil fuel use due to the replacement of biomass fuel with fossil fuel ($L_{y,fossil}$)

Option L_2 is selected to show there is no leakage as regards an increase in the use of fossil fuel.

The availability of EFBs is assessed by using official data from the Malaysian Palm Oil Board (MPOB)[7]. No official data is available on EFBs per se, but the volume of Fresh Fruit Bunches input into Malaysia's palm oil mills is monitored by MPOB, therefore the amount of EFBs available can be calculated. The 2006 FFB throughput in Malaysia's palm oil mills is summarised in the following table:

(Tonnes)

	All-Malaysia	Malaysian Borneo	Sarawak
January	4,819,724	2,311,272	466,536
February	5,531,230	2,244,135	467,079
March	6,280,401	2,513,270	496,132
April	6,679,708	2,518,521	498,815
May	7,044,301	2,644,379	555,100
June	6,830,421	2,538,325	545,161
July	6,860,789	2,536,158	590,892
August	7,661,789	2,894,457	710,942
September	7,943,326	3,309,698	751,893
October	6,787,335	3,124,179	667,053
November	7,521,918	3,316,420	685,939
December	5,703,937	2,681,737	557,060
Annual Total	79,664,879	32,632,551	6,992,602

In Sarawak alone, the total FFB throughput for 2006 was 6.99 million tonnes. A standard figure for the amount of EFBs produced is 23% of the FFB throughput, by weight. In Sarawak in 2006, this corresponds to approximately 1.61 million tonnes of EFBs per year.

The methodology requires that there is an excess of 25% or more of the biomass feedstock required by the project, otherwise leakage effects must be calculated as described in section B.6.1. In total, the Project Activity is expected to handle 567,648 tonnes of EFBs per year, all sourced from palm oil mills in Sarawak. Therefore, for there to be no leakage effects, that would require approximately 710,000 tonnes of EFBs to be disposed of in SWDS in Sarawak in the absence of the Project Activity. This is less than half of the 1.61 million tonnes of EFBs produced annually in Sarawak, where EFBs are predominantly disposed of in SWDS, with minimal mulching or alternative uses of EFBs, such as combustion in biomass generators.

This figure will be monitored each year to ensure that the surplus remains above 25%.

The Project activity will involve the combustion of EFBs in two biomass power plants. In the absence of the Project activity, the EFBs would have been disposed of at SWDS. Save for an increase in fuel use for biomass transportation and the possible use of fossil fuels under contingency plans, the greenhouse gas emissions from both of which are included as project emissions, the use of EFBs in the Project activity will not lead to an increase in the use of fossil fuels.

This PDD, therefore, assumes that leakage emissions are zero.

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[7] http://econ.mpob.gov.my/economy/annual/stat2006/Processing2.2.htm

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

Estimated emission reductions for one plant are as follows:

Year	Estimation of baseline emissions (tCO_2e)	Estimation of project emissions (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of emission reductions (tCO_2e)
2009	92,098	2,284	0	89,814
2010	112,527	2,284	0	110,243
2011	132,253	2,284	0	129,969
2012	151,300	2,284	0	149,016
2013	169,693	2,284	0	167,409
2014	187,452	2,284	0	185,168
2015	204,601	2,284	0	202,317
TOTAL	1,049,924	15,988	0	1,033,936

Total estimated emission reductions for both plants are as follows:

Year	Estimation of baseline emissions (tCO_2e)	Estimation of project emissions (tCO_2e)	Estimation of leakage (tCO_2e)	Estimation of emission reductions (tCO_2e)
2009	184,196	4,568	0	179,628
2010	225,054	4,568	0	220,486
2011	264,506	4,568	0	259,938
2012	302,600	4,568	0	298,032
2013	339,386	4,568	0	334,818
2014	374,904	4,568	0	370,336
2015	409,202	4,568	0	404,634
TOTAL	2,099,848	31,976	0	2,067,872

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**$BF_{k,y}$**
Data unit:	Tonnes of dry matter
Description:	Quantity of biomass residue type *k* combusted in the project plant during the year *y*
Source of data to be used:	On-site measurements
Value of data applied	181,332 tonnes of processed EFBs/plant/year, giving a total of 362,664 tonnes of

for the purpose of calculating expected emission reductions in section B.5	EFBs per year for the Project Activity.
Description of measurement methods and procedures to be applied:	Monitored continuously using a weight meter and an annual energy balance will be prepared. Measurements adjusted for moisture content in order to determine dry weight. The quantity shall be crosschecked with the quantity of electricity generated.
QA/QC procedures to be applied:	Crosscheck the measurements with an annual energy balance that is based on the quantities obtained and stock changes.
Any comment:	-

Data / Parameter:	**$BF_{T,k,y}$**
Data unit:	Tonnes of dry matter
Description:	Quantity of biomass residue type *k* that has been transported to the project site during the year *y*
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	A total of 362,664 tonnes of EFBs in dry matter per year. [181,332 tonnes of EFBs per plant per year] (as determined in B.6.1, Baseline emissions due to natural decay or uncontrolled burning of anthropogenic sources of biomass residues, Step 1)
Description of measurement methods and procedures to be applied:	Monitored continuously using a weight meter and an annual energy balance will be prepared. Adjust for the moisture content in order to determine the quantity of biomass. The quantity shall be crosschecked with the quantity of electricity generated.
QA/QC procedures to be applied:	Crosscheck the measurements with an annual energy balance that is based on the quantities obtained and stock changes.
Any comment:	-

Data / Parameter:	**AVD_y**
Data unit:	km
Description:	Average round trip distance (from and to) between biomass fuel supply sites and the project site
Source of data to be used:	Records by project participants on the origin of the biomass
Value of data applied for the purpose of calculating expected emission reductions in section B.5	63.5
Description of measurement methods and procedures to be applied:	Continuously
QA/QC procedures to	Check consistency of distance records provided by the truckers by comparing

be applied:	recorded distances with other information from other sources (e.g. maps)
Any comment:	-

Data / Parameter:	**N_y**
Data unit:	number
Description:	Number of truck trips for the transportation of biomass
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	18,922
Description of measurement methods and procedures to be applied:	Monitored continuously.
QA/QC procedures to be applied:	Check consistency of the number of truck trips with the quantity of biomass combusted, e.g. in relation to previous years
Any comment:	-

Data / Parameter:	**TL_y**
Data unit:	tonnes
Description:	Average truck load of the trucks used for transportation of biomass
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	15 tonne equivalent of wet matter
Description of measurement methods and procedures to be applied:	Determined by averaging the weights of each truck carrying biomass to the project plant. Monitored continuously, aggregated annually.
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	**$EF_{km,CO2,y}$**
Data unit:	tCO_2/km
Description:	Average CO_2 emission factor for the trucks during the year y
Source of data to be used:	UNEP study http://www.unepfi.org/fileadmin/documents/ghg_indicator_2000.pdf
Value of data applied for the purpose of calculating expected	0.782

emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Monitor at least annually.
QA/QC procedures to be applied:	Cross-check measurement results with emission factors referred to in the literature.
Any comment:	-

Data / Parameter:	**$EF_{CO2,FF,i}$**
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor for fossil fuel type *i*
Source of data to be used:	Data from the supplier, national data or 2006 IPCC Guidelines, in that order of preference.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	- This PDD assumes no additional fossil fuel will be combusted under the Project Activity.
Description of measurement methods and procedures to be applied:	-
QA/QC procedures to be applied:	Documents detailing the emission factor to be checked against IPCC defaults.
Any comment:	-

Data / Parameter:	**$FF_{project\ plant,i,y}$**
Data unit:	m^3 per year
Description:	Quantity of fossil fuel type *i* combusted in the project plant during the year *y*
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	Monitor continuously using volume meters.
QA/QC procedures to be applied:	Cross-check the measurements with an annual energy balance that is based on purchased quantities and stock changes.
Any comment:	The only use of fossil fuels at the plant will be as a contingency fuel for the boilers. This PDD assumes the value is 0 for the sake of simplicity.

Data / Parameter:	**$EG_{project\ plant,y}$**
Data unit:	MWh/yr
Description:	Net quantity of electricity generated in the project plant during the year *y*
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	78,840
Description of measurement methods and procedures to be applied:	Monitored continuously.
QA/QC procedures to be applied:	The consistency of metered net electricity generation should be cross-checked with receipts from electricity sales and the quantity of fuels fired (e.g. check whether the electricity generation divided by the quantity of fuels fired results in a reasonable efficiency that is comparable to previous years)
Any comment:	-

Data / Parameter:	**NCV_k**
Data unit:	GJ/t on of dry matter
Description:	Net calorific value of biomass residue type *k*
Source of data to be used:	Results provided by the project developer.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	8.59 GJ/tonne of processed EFBs
Description of measurement methods and procedures to be applied:	Measurements shall be made at least every six months, and taking three samples each time. Measurements shall be carried out at reputed laboratories and according to relevant international standards. Measurements will be made for the NCV based on dry biomass.
QA/QC procedures to be applied:	Check the consistency of the measurements by comparing the measurement results with measurements from previous years, relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. If the measurements results differ significantly from previous measurements or other relevant sources, conduct additional measurements. Ensure that the NCV is determined on the basis of dry biomass.
Any comment:	-

Data / Parameter:	**$EF_{burning,CH4,k,y}$**
Data unit:	tCH_4/GJ
Description:	CH_4 emission factor for uncontrolled burning of the biomass residue type *k* during the year *y*
Source of data to be	Information provided by the Project developer.

used:	
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0
Description of measurement methods and procedures to be applied:	The Project developer will provide data that shows that the biomass would all have been disposed of at SWDS in the absence of the Project activity.
QA/QC procedures to be applied:	Check the measurement methods.
Any comment:	-

Data / Parameter:	-
Data unit:	Tonnes
Description:	Quantity of biomass residues of type k that are utilized (e.g. for energy generation or as feedstock) in the defined geographical region
Source of data to be used:	Surveys or statistics
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Only the amount consumed by the project.
Description of measurement methods and procedures to be applied:	Annually monitored.
QA/QC procedures to be applied:	Crosschecked with purchase receipt.
Any comment:	Applicable to leakage section.

Data / Parameter:	-
Data unit:	Tonnes
Description:	Quantity of available biomass residues of type k in the region
Source of data to be used:	Malaysia Palm Oil Board
Value of data applied for the purpose of calculating expected emission reductions in section B.5	6,992,602 tonnes of FFB
Description of measurement methods and procedures to be applied:	Annually monitored.

QA/QC procedures to be applied:	This involves the use of official data from the Malaysia Palm Oil Board. Quality control of this data is beyond the control of project developer.
Any comment:	Applicable to leakage section.

Data / Parameter:	**$EC_{PJ,y}$**
Data unit:	MWh
Description:	On-site electricity consumption attributable to the project activity during the year y
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	Use electricity meters. The quantity shall be cross-checked with electricity purchase receipts. Monitored continuously, aggregated at least annually.
QA/QC procedures to be applied:	Crosscheck the measurement results with invoices for purchased electricity if available.
Any comment:	The Project is fully expected to provide its own electricity. However, this will be monitored as part of the monitoring plan for QA/QC purposes.

Data / Parameter:	**$W_{j,x}$**
Data unit:	Tonnes
Description:	Amount of organic waste type *j* prevented from disposal in the SWDS in the year x
Source of data to be used:	Actual measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Equivalent to the amount to be consumed by the project. (Equal to $BF_{T,k,y}$)
Description of measurement methods and procedures to be applied:	Monitored continuously using a weight meter and an annual energy balance will be prepared. Measurements adjusted for moisture content in order to determine dry weight. The quantity shall be crosschecked with the quantity of electricity generated.
QA/QC procedures to be applied:	Crosscheck the measurements with an annual energy balance that is based on the quantities obtained and stock changes.
Any comment:	-

Data / Parameter:	**x**
Data unit:	-
Description:	the year during the crediting period: x runs from the first year of the first crediting period (x=1) to the year y for which avoided emissions are calculated

Source of data to be used:	-
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	-
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	**y**
Data unit:	-
Description:	is the year for which methane emissions are calculated
Source of data to be used:	-
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	-
QA/QC procedures to be applied:	-
Any comment:	-

Data / Parameter:	$\mathbf{BEF_{CO2,LE}}$
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor of the most carbon intensive fuel used in the country
Source of data to be used:	Latest IPCC Guidelines
Value of data applied for the purpose of calculating expected emission reductions in section B.5	-
Description of measurement methods and procedures to be applied:	-

QA/QC procedures to be applied:	-
Any comment:	-

B.7.2 Description of the monitoring plan:

Purpose

The monitoring methodology clearly describes how to identify and collect the necessary data. The following is a summary list of the main items to be monitored:

Monitoring framework

The figure below outlines the operational and management structure that Group will be implemented to monitor emission reductions and any leakage effects generated by the Project Activity. An environmental management team will be established at each plant will be responsible for the monitoring of all the aforementioned parameters. Each team will be composed of a general manager and a group of operators. The group of operators, under the supervision of the general manager, will be assigned for the monitoring of different parameters on a timely basis and will perform the recording and archiving of data in an orderly manner. Monitoring reports will be forwarded to and reviewed by the general manager on a monthly basis in order to ensure the Project follows the requirements of the monitoring plan.

The performance of the Project will be reviewed and analyzed by consultants on a regular basis.

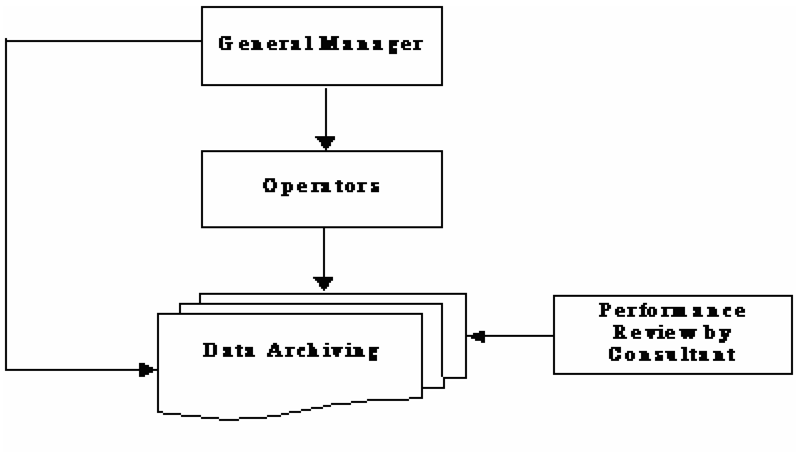

Figure: Operational and management structure for monitoring the Project activity.

Monitoring equipment and installation

The Project Activity requires the monitoring of the following items:

- Electricity demand of the biomass power plants and other local loads at each site throughout the project.

- Amount of EFBs transported to and from each site, and the distances involved.
- Amount of processed EFBs combusted in the boiler.
- Regulations and/or policy that could influence the use of EFBs and generation of power in the region.
- Project electricity generation, including:
    - Each plant's electricity imports and exports.
    - Electricity demand and generation of the proposed project activity.
    - Confirmation to meet applicability conditions.
- FFB throughput of mills in Sarawak (for leakage calculation)

All the items to be monitored under the Project Activity will be monitored individually for each plant and aggregated annually.

Calibration

Regular calibration will be necessary for all meters and instruments. The necessary calibration will be performed as per industry practices, by a suitably skilled technician at the required frequency (at least once a year). A certificate of calibration will be provided for each piece of equipment after completion.

Data management

All data collected as part of monitoring should be archived electronically and be kept at least for 2 years after the end of the crediting period. 100% of the data should be monitored if not indicated otherwise in Section B.7.1 above.

Monitoring report

A monitoring report in line with CDM regulations and the requirements of this monitoring methodology will be issued annually by the general manager.

The monitoring report will contain a summary of the whole monitoring plan, and will describe the implementation of the monitoring plan in that particular year, present the relevant results and data, and calculate emission reductions for the period.

The report will include:

- Quality assurance reports for the monitoring equipment;
- Calibration reports for the monitoring equipment (including relevant standards and regulations);
- Any maintenance and repair of monitoring equipment;
- The qualifications of the persons responsible for the monitoring and calculations;
- The tests performed and data obtained;
- Emission reduction calculations;
- A summary of the monitoring plan in that particular year;
- Any other information relevant to the monitoring plan.

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

Baseline study completed 22/01/2008 by:

Joseph Cairnes
Clean Energy Finance Committee,
Mitsubishi UFJ Securities Co., Ltd.
8th Floor, Mitsubishi Building,
Marunouchi 2-5-2, Chiyoda-ku,
Tokyo, 100-0005, JAPAN.

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:

01/03/2008

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

21 years

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

C.2.1. Renewable crediting period

The option of the seven-year renewable crediting period is selected for the Project.

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

01/01/2009

C.2.1.2. Length of the first crediting period:

Seven (7) years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

N/A

C.2.2.2. Length:

N/A

SECTION D. Environmental impacts

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

The legislation relating to Environmental Impact Assessments (EIA) in Malaysia is the Environmental Quality Order of 1987, which is based on the Environment Quality Act of 1974. According to this Order[8], the implementation of an EIA is required only for the following types of activities:

- Construction of steam-based-generation power stations that burn fossil fuels and have a capacity of more than 10 megawatts.
- Dams and hydroelectric power schemes with either or both of the following:
  - dams over 15 metres high and ancillary structures covering a total area in excess of 40 hectares.
  - reservoirs with a surface area in excess of 400 hectares.
- Construction of combined cycle power stations.
- Construction of nuclear-fuelled power stations.

Therefore, power plants with 11.5MW generation capacity are not required to carry out EIA under Malaysian regulations.

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 entire plant water system will be designed as "Zero Waste Water Discharge System". The waste water will be routed to a neutralization pit from where it will be sent to the evaporation pond. Cooling tower and boiler blow down will be taken to a small guard pond for treatment before being sent to the evaporation pond or being reused in the plant.

The Project will have an overwhelmingly positive impact on the environment by reducing EFB waste that is currently dumped and left to rot, emitting large amounts of methane in the decomposition process. Not only is methane a GHG but also a safety hazard due to its flammability. Moreover, the reduction in the amount of rotting EFBs will reduce the pungent odours and vermin problems that result from such a method of disposal.

SECTION E. Stakeholders' comments

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

Separate stakeholder meetings were held for the Mas Gading and Mukah plants. The stakeholder meeting for Mas Gading was held from 3p.m. on the 15th December 2007, and the stakeholder meeting for Mukah was held from 10a.m. on the 19th December 2007. The stakeholder meetings were organised with assistance from elected local representatives in each area.

Approximately fifty-five people attended the Mas Gading stakeholder consultation, and just over 70 people attended the Mukah stakeholder consultation. The stakeholder meetings both followed the following format that was designed to inform the participants and invite them to share their views on the developments:

1) Meeting called to order.

[8] Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 1987

2) Introduction to project.
3) Consultant engineer discussed:
   - The background of the project;
   - The benefits to the local community;
   - The project implementation and parties involved;
   - The power plant;
   - The project and Government Policy.
4) Question and answer session.

E.2. Summary of the comments received:

Questions and answers from the stakeholder meeting for the Mas Gading plant:

	Questions	Answers
1	When do you plan to construct the power plant and commence operation?	We plan to commence construction in this coming March 2008 and to begin operation in November 2009.
2	How do you handle the waste of the power plant, such as ash and wastewater?	Ash from burning the EFBs can be used as fertilizer for palm tree plantations. The waste water will be treated before it is disposed of in the river. The project will comply with the Environmental Act of Malaysia, which ensures the acceptable level of environmental impact.
3	How many people will be employed during the construction and operation phases of the plant?	During the construction period, possibly more than 100 skilled and unskilled workers will be hired by the construction contractors. During operation, MGGE will employ around 35 workers with various skills.
4	What will the salary rate be for people involved in plant operation?	The salary rate will be adjusted according to the market.

NB. No negative comments were made regarding the Mas Gading plant.

Questions and answers from the stakeholder meeting for the Mukah plant:

	Questions	Answers
1	Where is the exact location of the proposed power plant?	In Matadeng, Mukah, close to the Mukah coal fire power.
2	Why was this site chosen?	Because 1) the electricity supply in this area is

		facing shortages. Even though this project is small, it can help stabilize the system; and 2) there are many of EFB wasted around this area since there are many palm oil mills. We can make good use of this renewable biomass for electricity and better for the environment.
3	When do you plan to construct the power plant and commence operation?	We plan to commence construction in this coming April and to begin operation in December 2009.
4	To whom you sell electricity?	MGE will sell electricity to SESCO, through its transmission line, which will benefit to stability of electricity system in this area.
5	How do you generate electricity from EFB?	1) Burn the EFB to boil water 2) Boil water will create steam 3) Steam pressure will turn the turbine 4) The turbine will generate electricity
6	How do you handle ash after burning EFB?	Ash from burning EFB can be used as fertilizers for plantation of palm trees.
7	How do you handle the air, water, noise and smell?	The project will comply with the Environmental Act of Malaysia, which ensures the minimum and accepted level of environmental impact.
8	Will the people of Mukah be paying more for electricity?	No. The power generated will be sold to SESCO, which in turn will sell it to the people of Mukah at their rates.
9	What benefits will the community get from the project?	The local residents will have job opportunities during construction and operation. Also local business will have opportunities for goods supply and service.
10	How many people will be employed?	During construction period, it may be more than 100 skilled and unskilled workers to be hired by the construction contractors. During operation period of 21 years, MGE will hire around 20 various skilled workers.

NB. No negative comments were made regarding the Mukah plant.

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

Detailed summaries of both stakeholder meetings were prepared, including the issues highlighted and the answers given. No follow up was necessary because all questions were answered satisfactorily during the meeting by the technical experts present, by referring to the current project plans.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Middle Name:	-
First Name:	Zaharah
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Title:	President
Salutation:	Mr.
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The financial plans for the Project do not involve any public funding from Annex 1 countries.

Annex 3

BASELINE INFORMATION

Build margin

Existing Power Plant Unit Information (the 5 most recently built units)

Unit name	Commissioning	Fuel Type	Capacity	Generation	Fuel		MMBTU to GJ conversion factor (for natural gas *)	NCV of fuel (TJ/Gg)	Oxidation	IPCC EF of fuel	CO_2 Emissions
	Month/Year		(MW)	(MWh)	Consumption		(MMBTU to GJ)		Factor	*(tCO2/TJ)*	*(tCO_2)*
SPC2 Unit 4	JUL. '04	COAL	55	333,611	236,581	tons	n/a	19.9	1	89.5	421,363
SPC2 Unit 3	MAY '04	COAL	55	292,673	207,550	tons	n/a	19.9	1	89.5	369,657
SPC Unit 1	JAN. '99	GAS	105	1,292,609	16,529,772	mmbtu	1		1	54	946932.7837
SPC Unit 2	JAN. '99	GAS	105								
SPC1 Unit 2	MAY '98	COAL	50	312,707	210,899	tons	n/a	19.9	1	89.5	375,622
				2,231,600							2,113,576
						Build margin	=	Total emissions / Total generation			
							=	0.9471122			

Operating margin

Plant type	Generation (GWh)		
	2004	**2005**	**2006**
Hydroelectric	355.95	512.46	351.98
Natural gas	2667.67	2710.62	2960.79
Heavy oil			
Diesel oil	80.97	28.74	78.66
Lignite			
Imported coal	1094.72	1143.03	1237.49
Renewable energy			
Imported			
Total	4199.31	4394.85	4628.92

Generation data for the Sarawak Grid

Plant type (2004)	**Data received**	Density t/m3	EF kg/TJ	NCV MJ/t or GJ/MMBTU	CO2 emissions
Hydroelectric					
Natural gas	35627467.1 mmBTU		54300	1.055	2040972.894
Heavy oil					
Diesel oil	80293188.31 litres	0.85	72600	41400	205132.5557
Lignite					
Imported coal	694870.759 tons		89500	19900	1237599.565
Renewable energy					
Imported					
Total					3483705.015

Plant type (2005)	**Data received**	Density t/m3	EF kg/TJ	NCV MJ/t or GJ/MMBTU	CO2 emissions
Hydroelectric					
Natural gas	37070847.5 mmBTU		54300	1.055	2123659.105
Heavy oil					
Diesel oil	68711271.29 litres	0.85	72600	41400	175543.1436
Lignite					
Imported coal	815336.729 tons		89500	19900	1452155.481
Renewable energy					
Imported					

Total			3751357.73

Plant type (2006)	**Data received**	Density t/m3	EF kg/TJ	NCV MJ/t or GJ/MMBTU	CO2 emissions
Hydroelectric					
Natural gas	39677342.6 mmBTU		54300	1.055	2272976.087
Heavy oil					
Diesel oil	90626002.29 litres	0.85	72600	41400	231530.7669
Lignite					
Imported coal	861112.264 tons		89500	19900	1533683.998
Renewable energy					
Imported					
Total					4038190.852

Annex 4

MONITORING INFORMATION

Monitoring described in full in section B.7.2 above.

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