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

CONTENTS

SECTION A. General description of project activity

A.1. Title of the project activity:

Lebong Hydroelectric Power Plant

PDD Version 1.0
Completion date PDD: 20/10/2010

Revision history:
Version 1.0: PDD uploaded for validation

A.2. Description of the project activity:

The project activity involves the construction and operation of the Lebong hydroelectric power plant located near the Lebong village in district of Bengkulu on the Sumatran island of Indonesia. The hydroelectric power plant is a run-of-river type that does not require the construction of a reservoir. The hydro power plant is operated and owned by PT Mega Power Mandiri and has a total installed capacity of 12 MW.

The purpose of the Lebong hydroelectric power plant as owned and operated by PT Mega Power Mandiri (hereafter referred to as the project activity) is to generate electricity and supply this to the public electricity grid. The energy source for the project activity is the Ketahun river. Power generated is transmitted over a new 20 kV power line to an existing TES sub-transformer station.

The Lebong hydroelectric power plant is expected to supply 76,300 MWh per annum to the public electricity grid.

The baseline and project scenario are summarized as follows:

- **Baseline scenario**

The baseline scenario for the proposed project activity is grid connected electricity generation in the public electricity grid. The baseline scenario is identical to the scenario existing prior to the implementation of the proposed project activity. The project activity will displace emissions associated with the continued operation of the existing grid-connected power plants and the addition of new generation sources within the public electricity grid to meet electricity demand. The emissions associated with this scenario are determined on the basis of the Combined Margin (CM) of the power grid in accordance with "Tool to calculate the emission factor for an electricity system".

- **Project scenario**

The project scenario involves the installation of a new renewable power generation plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant). The project will utilize a clean and renewable energy source (hydropower) and there are no greenhouse gas emissions associated with the generation of power from this run-of-river hydro power plant.

Contribution to sustainable development

The proposed project is a very clear step forward in the transition to a less carbon intensive power sector. The project activity aims to generate electricity in a sustainable manner as it makes use of a renewable source of energy. On the broader environmental level there are also improvements compared to fossil fuel power plants as CO2, NOx or SOx emissions are avoided. This implies significant improvements to the environment on the global level (i.e. mitigating climate change) but also on the regional and local level (i.e. mitigating air pollution & acid rains).

The project activity's contributions to sustainable development are:

- Mitigation of NOx and SOx emissions and related regional and local environmental and social concerns;
- Regional economic development through an enhancement in power availability;
- Local economic development through employment creation;
- Reducing the dependence on exhaustible fossil fuels for power generation;
- Reducing the emissions of greenhouse gases, to combat global climate change.

A.3. Project participants:

Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	the Party involved wishes to be considered as project participant (Yes/No)
Republic of Indonesia (host)	PT Mega Power Mandiri	No
Kingdom of Sweden	Nordic Environment Finance Corporation NEFCO in its capacity as Fund Manager to the NEFCO Carbon Fund (NeCF)	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Republic of Indonesia

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

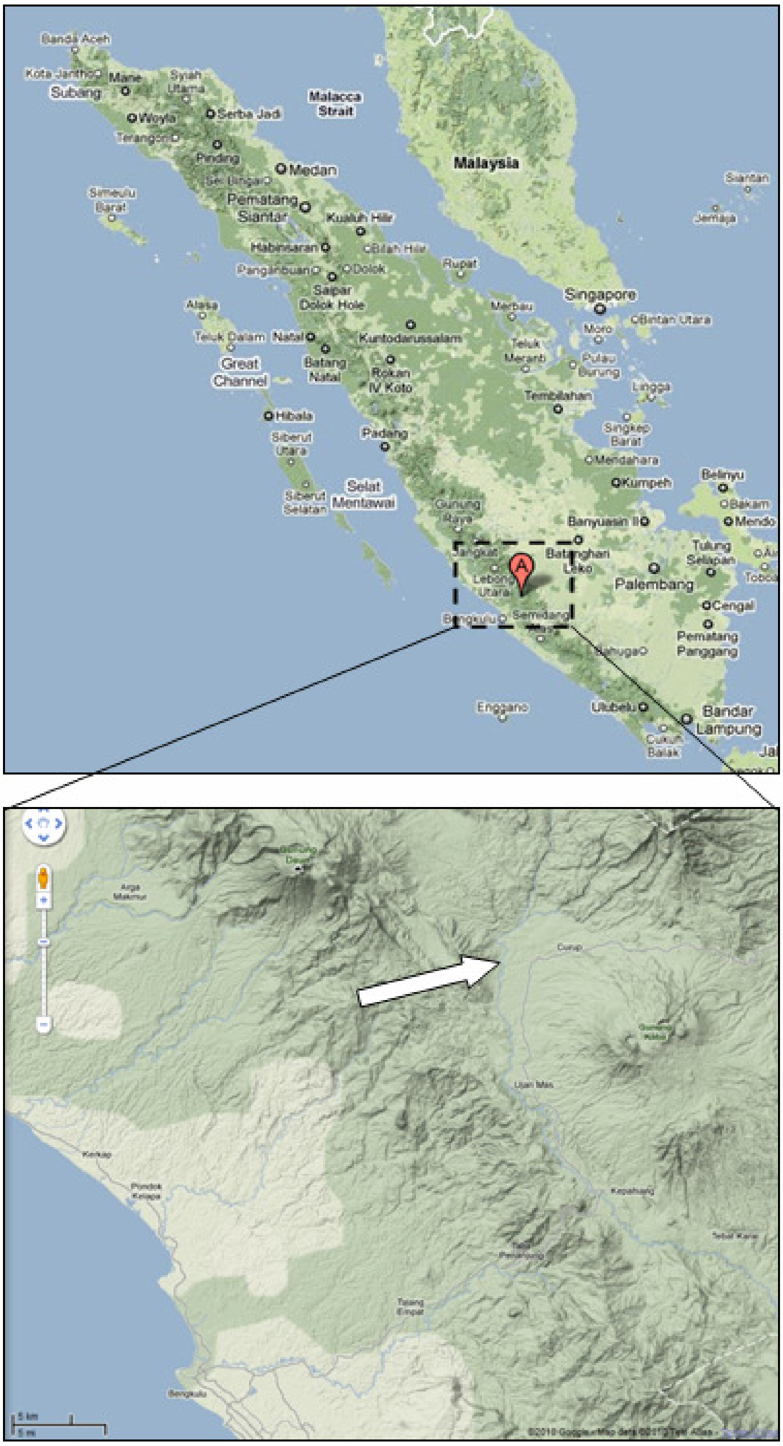
Sumatra Island, Bengkulu province

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

Lebong district, Lalang Turan Village

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

Located on the Ketahun River with the following coordinates:
$3^{O}30'$ S & $102^{O}30'$ E



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

Sectoral scope/ Category 1: Energy industries (renewable - /non-renewable sources)

Grid-connected electricity generation from renewable sources

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

Design
The project design consists of a run-of-the-river hydro power station with a weir, water intake, waterway, penstock, power house and an on-site transformer station. The project will have an installed capacity of 3 x 4 MW. The net annual power supply is 76,300 MWh.

The project is a run-of-the-river hydro power station which is known to have a marginal water storage capacity and therefore a low impact on existing biodiversity and communities. The project activity employs no reservoir.

The weir is 3 meters in height with a maximum elevation of 492.5 m. The weir can take a maximum debit of 1133 m^3 in case of flooding. Through a double intake the river water flows into the 960 m long waterway. At the end of the waterway is the headpond that with a diameter of 35 m and an overflow of 5 m. From the headpond the water enters the 605 m long penstock. Overflowing water from the headpond is released to the river again.

From the penstock the water enters the power house and the turbines. The project will comprise 3 turbine/generator units with each 4 MW capacity and jointly representing 12 MW of installed capacity. The turbine/generator units consist of horizontal shaft Francis turbines and generator. This technology is widely applied in hydroelectric power generation and further specifications are provided in table A.4.3.1 and A.4.3.2 below. Finally the water enters the tailrace to discharge into the river once again.

The project will involve a water head of 45 m of which 37.67 m will effectively be employed. Figure A.4.3.1 presents the layout of the proposed project activity.

Table A.4.3.1. Turbine specifics

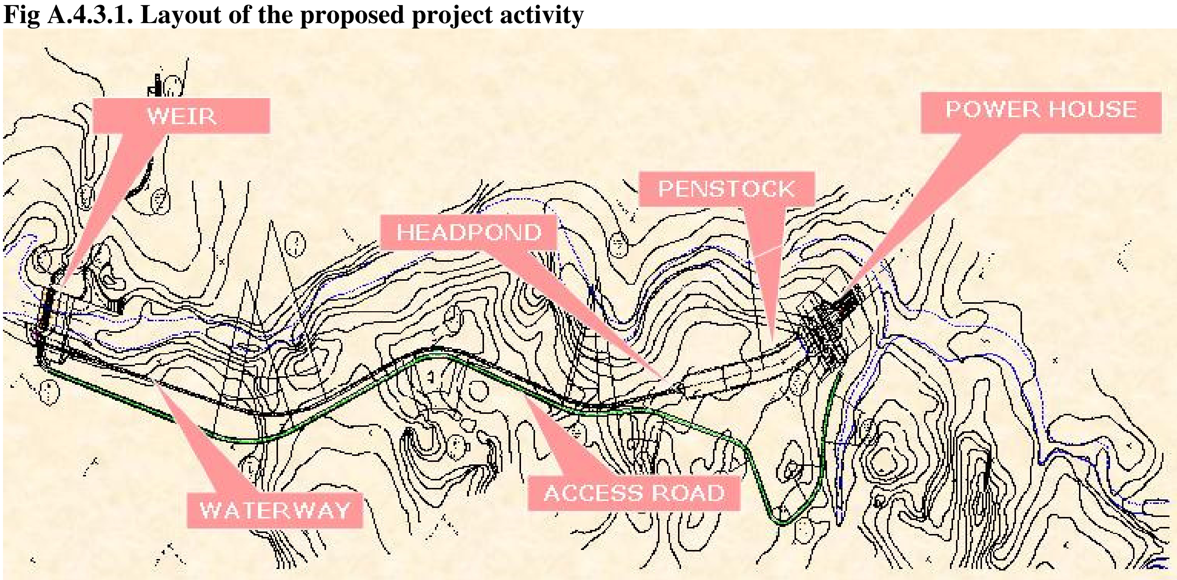
Parameter	Value
Type	Francis turbine, horizontal
Type no	HLA551C-WJ-110
Rated Speed [r/min]	500
Rated flow [m^3/s]	10.15
Rated head [m]	45

Table A.4.3.2. Generator specifics

Parameter	Value
Type	SFW – J4000-12/2150
Rated output [kW]	4000
Rated Voltage [V]	6300

Rated Current [A]	458.2
Frequency [Hz]	50
Rated Power Factor	0.8
Rated Speed [r/min]	500

Fig A.4.3.1. Layout of the proposed project activity



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

The estimated emission reductions of the chosen crediting period are provided in table A.4.4.1 below.

Table A.4.4.1. Estimated amount of emission reductions

Years	Annual estimation of emission reductions in tonnes of CO_2 e
30/03/2012 – 29/03/2013	56,709
30/03/2013 – 29/03/2014	56,709
30/03/2014 – 29/03/2015	56,709
30/03/2015 – 29/03/2016	56,709
30/03/2016 – 29/03/2017	56,709
30/03/2017 – 29/03/2018	56,709
30/03/2018 – 29/03/2019	56,709
Total estimated reductions (tonnes of CO_2 e)	**396,964**
Total number of crediting years	**7**
Annual average over the crediting period of estimated reductions (tonnes of CO_2 e)	56,709

A.4.5. Public funding of the project activity:

There is no public funding from Annex I countries available to the proposed project.

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 activity applies the approved consolidated baseline and monitoring methodology ACM0002 - "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" version 12.1.0.

The methodology draws upon:

- Tool for the demonstration and assessment of additionality, version 05.2.1
- Tool to calculate project or leakage CO2 emissions from fossil fuel combustion, version 02
- Tool to calculate the emission factor for an electricity system, version 02.2.1

For more information on the baseline and monitoring methodology we refer to the UNFCCC website: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

As the project activity involves a grid connected hydro power plant it makes use of the ACM0002 consolidated baseline and monitoring methodology. The project activity meets the general applicability conditions as explained in table B.2.1.

Table B.2.1: Applicability conditions of methodology ACM0002 version 12.1.0.

Applicability Conditions	Justification
This methodology is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated 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 generates electricity by utilising hydro energy and is therefore considered a renewable generation unit. The project activity supplies all its power to the grid. The project activity qualifies as (a) greenfield plant*
The methodology is applicable under the following conditions:	
The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;	*The project activity involves a hydro power plant*
In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2:	*Not applicable for project activity as it involves a Greenfield project*

on page 10 to calculate the parameter EGPJ,y): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity;	
In case of hydro power plants, one of the following conditions must apply: • The project activity is implemented in an existing reservoir, with no change in the volume of reservoir; or • 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/m2; or • 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/m2.	*The project activity results in a new reservoir with a power density far greater than 4 W/m2. (see section B6 for further details on the Power Density)*
The methodology is not applicable to the following:	
• Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; • Biomass fired power plants; • Hydro power plants1 that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m2.	*The project activity involves a run of the river hydro power plant with a new reservoir that has a power density far greater than 4 W/m2. (see section B6 for further details on the Power Density)*

In addition to the applicability as per ACM0002, the project activity also meets the applicability conditions of the tools it draws upon.

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

The baseline of the proposed project activity consists of the continuation of power generation in the public electricity grid. The proposed project activity will generate electricity from a renewable energy source and displace power generation of the public electricity grid. Table B.3.1 indicates which emission sources are considered for the project activity.

[1] Project participants wishing to undertake a hydroelectric project activity that result in a new reservoir or an increase in the existing reservoir, in particular where reservoirs have no significant vegetative biomass in the catchments area, may request a revision to the approved consolidated methodology.

Table B.3.1: Emissions sources included in or excluded from the project boundary

Source		Gas	Included?	Justification / Explanation
Baseline	Emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source as per ACM0002
		CH_4	No	As per ACM0002
		N_2O	No	As per ACM0002
Project activity	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	As per ACM0002 for hydro power plants
		CH_4	No	The power density is 3,600 W/m^2 (see section B6), thus the project emission CH_4 is considered to be zero as per ACM0002
		N_2O	No	As per ACM0002 for hydro power plants

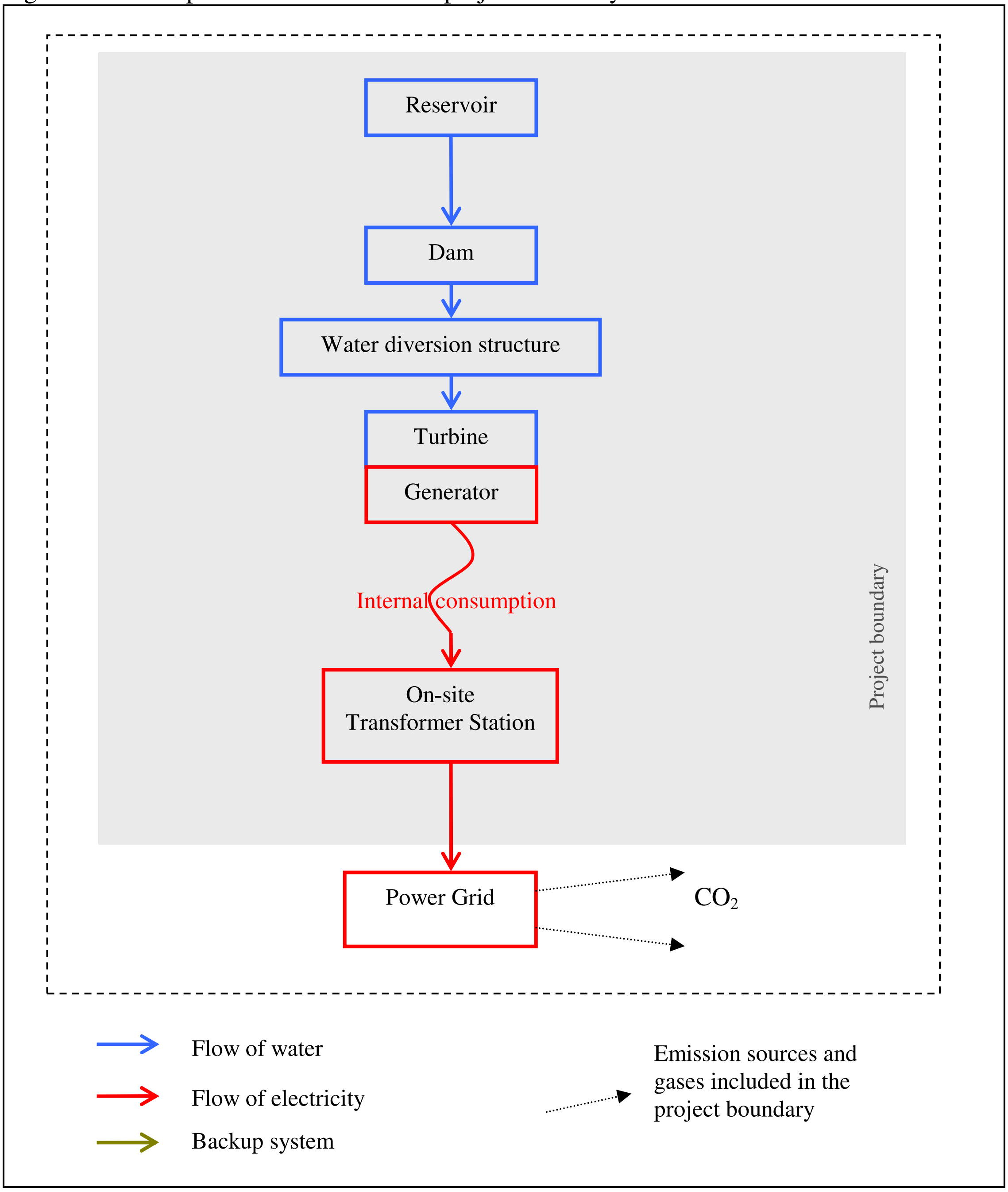
In line with methodology ACM0002 the project boundary encompasses the physical, geographical site of the renewable generation source. Therefore it includes the area occupied by the components of the hydropower station until the connection with the grid, which includes:

- Dam structure including weir and water retaining section;
- Water diversion structure including water intake, waterway, headpond and penstocks;
- Power house including turbines/generators and auxiliary equipment;
- On-site switching/transformer station (owned by the project entity); and
- Transmission lines to the grid.

The project activity makes use of an 80 KVA emergency diesel generator that is used in the unusual scenario where the project activity is not in operation and there are grid power outages. Emissions as a result of this diesel generator are neglected as this is considered immaterial and represent far less than 1% of total emissions.[2]

[2] Based on the conservative estimate that the generator is operated 100 hours a year on 100% load factor, the plant will generate 100h * 80 kW = 8,000 kWh. Assuming a conservative emission factor for diesel generators (as per methodology AMS.I.F, table I.F.1) of 1.0 kgCO_2/kWh, the generator will emit 8.0 tCO_2/annum. This is less than 0.02% of the projects' ex-ante emission reduction.

Figure B.3.1: Graphical illustration of the project boundary



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

Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. Following the methodology we assume that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants.

Therefore the baseline is the MWh produced by the renewable generating unit multiplied by an emission coefficient (measured in tCO_2e/MWh) calculated in a transparent and conservative manner as:

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

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):

The additionality of the project activity shall be demonstrated and assessed using the latest version of the "Tool for the demonstration and assessment of additionality" that applies a step-wise approach to demonstrate and assess additionality.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a: Define alternatives to the project activity
According to the Validation and Verification Manual (version 01.2): "105. The PDD shall identify credible alternatives to the project activity in order to determine the most realistic baseline scenario, unless the approved methodology that is selected by the proposed CDM project activity prescribes the baseline scenario and no further analysis is required". There is no need to further analyze alternatives to the project activity to assess and demonstrate the additionality, since the methodology ACM0002 prescribes the baseline scenario for the proposed project as below:

- In case the project activity involves the installation of a new grid-connected renewable power plant/unit, the baseline scenario is the following:

  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, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

As the project activity involves a greenfield grid connected renewable power plant, the following alternative scenario is identified:

- Alternative scenario: continuation of the current situation. In this case, the proposed project would not be constructed and the power will be solely supplied from the public electricity grid.

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

The alternative scenario "continuation of the current situation", where basically the project owner decides to not implement the hydroelectric power plan is consistent with the national laws and regulation as the project owner has no formal obligation to build power plants.

We conclude that the alternative scenario is consistent with mandatory laws and regulations.

Step 2: Investment analysis

Sub-step 2a: Determine appropriate analysis method
As the project activity produces a revenue stream other than those related to CDM (i.e. power sales), the simple cost analysis (option I) is excluded as an appropriate analysis method for the investment analysis. The investment comparison analysis (option II), is not used since the project entity is not considering investing in the development of one of the other identified alternatives. Consistent with the tool we therefore select the benchmark analysis (option III) as the most appropriate analysis method.

Sub-step 2b: Option III. Apply benchmark analysis
Following standards on how Indonesian project developers determine the financial returns of their projects, we apply the post tax equity IRR as the appropriate financial indicator. This indicator allows for effective comparison of the project returns with the benchmark.

The financial analysis is based on parameters that are (a) standard in the market and (b) consider the specific characteristics of the project type, but not linked to the subjective profitability expectation or risk profile of a particular project developer.

Sub-step 2c: Calculation and comparison of financial indicators

<u>Benchmark</u>
The project returns need to be compared with an appropriate benchmark. Following the "Guidelines of the Assessment of Investment Analysis" (EB61, Annex 13) the appropriate benchmark for equity IRR should reflect the expected returns on equity. The guidance also argues that in the cases of projects which could be developed by an entity other than the project participant the benchmark should be based on publicly available data sources which can be clearly validated by the DOE. As this project activity could also be undertaken by another entity we need publicly available data on the applied benchmark.

We refer to the appendix of the "Guidelines of the Assessment of Investment Analysis" (EB61, Annex 13) and apply the costs of equity of group 1 (including energy industries) of Indonesia which is 12.5%. This cost of equity is expressed in real terms and therefore needs to be adjusted to represent the nominal terms as does the financial indicator. This is done by adjusting for the inflation at the time of the investment decision. We applied the three year average based on publically available data, published by the statistic department of the OECD.

After adjusting for inflation the benchmark was determined on 23.61%.

<u>Project returns</u>
All input parameters for the determination of project returns are based on information that was available prior to the investment decision date. The initial investment decision to start the construction on the project activity was made in December 2007 after which the first construction agreement was signed shortly after in January 2008.

Table B.5.1 provides an overview of the project activity's main financial assumptions. The complete financial model and all underlying assumption are provided in the excel spreadsheet.

Table B.5.1 – Financial assumptions project activity

Financial assumption	Value
Power tariff	435 IDR/kWh
Total investment	167 bln IDR
Inflation rate	9.87%
Annual power generation	76,300 MWh
Project lifetime	25 years
Annual O&M expenditure	2.289 bln IDR

Based on the assumptions provided in table B.5.1 and in the financial model we conclude that the project activity has an equity IRR of 17.32%without considering the carbon revenues of the project.

Table B.5.2 - Comparison of economic indicators

Proposed Project Activity	
Benchmark	23.61%
Phase 1 – IRR without CDM revenues	17.32%

Table B.5.2 clearly indicates that the return on equity of the project activity is below the sectoral benchmark without taking into account CDM revenues. This demonstrates that the proposed project activity is not a commercially attractive option without the support of CDM.

Sub-step 2d: Sensitivity analysis

In the sensitivity analysis, the return on equity is subjected to sensitivities in key project assumptions. Following EB61 annex 13 guidance, only those values that constitute for more than 20% of the total project costs or total project revenues should be subjected to a reasonable variation. Key assumptions that qualify for this are provided in table B.5.3 below and subjected to sensitivities of +/- 10%. The impact of the sensitivity analysis on the overall equity IRR of the project activity are presented in the same table.

Table B.5.3 – Sensitivity analysis

	Sensitivity		
	-10%	0%	+10%
Power sales	14.74%	17.32%	20.04%
Power tariff	14.34%	17.32%	20.42%
Investment	20.38%	17.32%	14.93%
O&M	17.74%	17.32%	16.90%
Benchmark	23.61%		

Based on the outcome of the sensitivity analysis we conclude that even after the sensitivity analysis the equity IRR for this project activity will not cross the benchmark. It is extremely unlikely that any of the key assumptions will exceed +/- 10% sensitivities and therefore we conclude that the sensitivity analysis confirms that the project activity is financially unattractive without considering the benefits of CDM.

Step 3: Barrier analysis

As the investment analysis provides sufficient justification for the demonstration of additionality, we do not claim any other barriers in step 3.

Step 4: Common practice analysis

Sub-step 4a: Analyse other activities similar to the proposed project activity
As a first step in the common practice analysis we provide an analysis of any other activities that are operational and that are similar to the proposed project activity. Following the additionality tool;

"Projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc."

In Indonesia a clean distinction is made between mini-hydro power projects (abbreviated as PLTM) and normal hydro power projects (abbreviated as PLTA). Project with a installed capacity of 10 MW or less are considered mini hydro power plants (PLTM) and larger projects fall in the PLTA category. The 10 MW boundary is also reflected in several Indonesian governmental policies regarding hydro power plants[3]. With the project activity being normal hydro power project, only those projects larger than 10 MW are considered. In accordance with the above definition, the common practice analysis will consider Sumatra as the region of assessment as it has a different socio economic climate than the remainder of the Indonesian islands and because the island has its own independent electricity system.

Based on the above definition the common practice analysis considers all the hydro power projects on the Sumatra that are connected to the grid as listed in the table B.5.4 below.

Table B.5.4 – List of hydro power plants larger than 10 MW and connected to the public electricity grid

Plant Name	MW	Start operation	Developer
PLTA BAGM	10.50	1976	PLN[4]
PLTA TANGGA	318.00	1982	IPP[5]
PLTA SIGURA-GURA	286.00	1982	IPP
PLTA MJAU	51.00	1983	PLN
PLTA TES II	17.64	1991	PLN
PLTA PEKANBARU	114.00	1998	PLN
PLTA SKRK	175.00	1998	PLN
PLTA BATUTEGI	28.00	2002	PLN
PLTA BESAI	90.00	2001	PLN
PLTA SIPAN SIHAPORAS	50.00	2004	PLN
PLTA Renun	82.00	2005	PLN
PLTA Musi	215.48	2006	PLN

Source: PLN Sumbagut and Sumbagsel (Sumatra)

Of the remaining listed projects we can conclude that most of the power plants are developed by the national utility company that has different investment objectives than an independent power producer like the Project Entity and can therefore not be considered similar. This leaves us with two projects that developed as IPPs which are PLTA Tangga and Sigura-Gura. There are 3 key issues that explain why these two projects are substantially different compared to the project activity:

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[3] E.g.: Ministerial Regulation No 2/2006 on Medium Scale Renewable Energies Based Power Plants, Government of India in which

[4] PLN – State owned utility company in Indonesia

[5] IPP – Independent Power Producer

- Both project employ an installed capacity that is over 10 times the size of the project activity
- Project was undertaken as a joint venture between the between Indonesian and Japanese Government[6], where government have different objective than private investors
- Both projects started operation about 30 year ago when Indonesia had a very different investment climate compared to present day.

Sub-step 4b: Discuss any similar options that are occurring
There are no other project activities occurring that are similar to the project activity. Hence, we conclude that the common practice analysis once again confirms that the project activity would not be undertaken without the support of CDM.

Prior CDM Consideration
Table B.5.5 provides an overview of key events in the development of the project, indicating that the benefits of CDM have been seriously taken into account in the development of the proposed project activity.

In March 2007, about a year before the project entity decided to start the works on the project activity it signed an Emission Reduction Purchase Agreement (ERPA) for its first hydro power plant, the Parlilitan Project. The party engaged in the CDM development of this Parlilitan project was also engaged in negotiations with the Project Entity on the ERPA for the Lebong project.

From the initial planning phase onwards, CDM has been considered as an important revenue for the project activity and has been included in the Feasibility Study Report (FSR) as prepared in January 2007.

The Project Entity's history with CDM with the Parlilitan project and their clear considerations of the carbon revenues in the project planning stage are clear indicators that the project entity was well aware of the benefits of CDM and that it has seriously considered the carbon revenues in the decision to start the works on the project activity. Hence we conclude that the prospects of the project activity being registered as a CDM project were seriously considered and played a crucial role in the decision to implement the project.

Table B5.5: Timeline of events indicating the serious CDM consideration

Date	Event	Remark
01/01/2007	Finalising of feasibility study report (FSR) completed by technical consultant	FSR mentions CDM as a revenue for the project activity
23/03/2007	ERPA signed with EcoSecurities by project entity for the Parlilitan HPP project	Early awareness of the CDM
01/072007	PPA signed	
19/09/2007	Start GSP for HPP Parlilitan as developed by the Project Entity	

[6] www.inalum.co.id

01/12/2007	Board decision to start with the construction of the project activity	Investment decision date
01/01/2008	Construction agreement signed with contractor for waterway and land clearing	Project start date
01/10/2009	Letter of Bank stating the importance of CDM for Lebong	
22/05/2009	Loan secured with BMI bank	Financial closure
24/03/2009	Turbine Purchase Agreement signed	
02/02/2010	LOI signed with Nefco on the emission reduction purchase of Lebong	

Conclusions additionality assessment
Based on the additionality assessment as described above we conclude that the during the investment decision the project activity had an equity IRR that was below the sectoral benchmark returns. Hence the project is considered unattractive without the benefits of CDM and is therefore additional. This is reconfirmed by the outcome of the common practice analysis that demonstrated that no similar project activities have been conducted in the past. It can also be concluded that CDM has been seriously considered by the project entity in the decision to start the project.
Therefore, in accordance with the applicable UNFCCC guidance on the assessment of additionality the project activity is deemed additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Baseline emissions
In accordance with methodology ACM0002 the baseline emissions for power generation is the MWh produced by the renewable energy generating unit (the project), multiplied by an emission coefficient (measured in tCO2e/MWh) as follows:

$$BE_y = EG_{BL,y} * EF_{CO2,grid,y}. \quad (1)$$

Where:
BE_y = Emission reductions due to displacement of grid electricity (tCO2);
$EG_{BL,y}$ = Electricity supplied to the grid by the Project in year y (MWh);
$EF_{CO2,grid,y}$ = Emission factor for grid electricity for year y (tCO2/MWh).

$$EF_{CO2,grid,y} = EF_{grid,OM,y} * w_{OM} + EF_{grid,BM,y} * w_{BM} \quad (2)$$

Where:
w_{OM} = Weighting of operating margin emissions factor (fraction), 0.5 by default;
w_{BM} = Weighting of build margin emissions factor (fraction), 0.5 by default;
$EF_{grid,OM,y}$ = Operating margin CO2 emission factor in year y (tCO2/MWh);
$EF_{grid,BM,y}$ = Build margin CO2 emission factor in year y (tCO2/MWh).

Grid emission factor
The baseline emission factor for the public electricity grid is calculated in accordance with the "Tool to calculate the emission factor for an electricity system" (Version 2, EB 50 Report, Annex 14). It is a

combination of the build margin, representing emission characteristics of the latest power plants and the operating margin, representing emission characteristics of an increase or decrease in electricity generation. In-line with the tool, the project activity adopts on the ex-ante approach where the emission factor for the crediting period is determined based on the data available at the time of submission for validation.

The following steps are applied in accordance with the tool:

STEP 1: Identify the relevant electric power system
STEP 2: Choose whether to include off-grid power plants in the project electricity system (optional)
STEP 3: Select an Operating Margin method
STEP 4: Calculate the operating margin emissions factor according to the selected method
STEP 5: Identify the group of power units to be included in the build margin (BM)
STEP 6: Calculate the build margin emission factor
STEP 7: Calculate the combined margin (CM) emissions factor

STEP 1: Identify the relevant electric power system

The project activity is connected to the Sumatra Electricity Grid. Since the electricity systems of the Sumatran provinces are interconnected and there is no grid connection with any of the other Indonesian island, the Sumatra Electricity Grid is identified as the relevant electric power system.

STEP 2: Choose whether to include off-grid power plants in the project electricity system (optional)

Following the Tool, project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

- Option I: Only grid power plants are included in the calculation.
- Option II: Both grid power plants and off-grid power plants are included in the calculation. Only grid power plants are included in the calculation

We select option I and include only grid connected power plants in the calculation of the grid emission factor.

STEP 3: Select an operating margin (OM) method

The tool offers several options for the calculation of the OM emission factor:
(a) Simple OM, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM

According to the tool, the simple OM method (option a) can only be used if low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production. The tool defines “low-cost/must run” resources as “power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation.”

The Simple OM is applicable to this project since it involves hydropower which has low marginal generation costs. And as table B.6.1.1 shows below, hydropower resources constitute less than 50% of Sumatra's total grid generation on average over five recent years. Therefore, the simple OM can be used in the calculation of the OM emission factor.

According to the underlying information as made available by the BPPT the power generated by low-cost/must run resources constitutes all less than 50% during the five latest years of available data (2003-2007). See table 6.1.1 for the percentage power generated by low cost/must run power generation facilities.

Table B.6.1.1: Electricity generation of the Sumatra Electricity Grid, 2003-2007

Year		2003	2004	2005	2006	2007
Low Cost/Must Run (%)		20.95%	17.90%	17.28%	19.52%	21.99%

Source: Emission factor for the Sumatra Grid, by BPPT, October 2008

Data vintage selection
In accordance with the tool, the OM is calculated according to the "*ex-ante* option": a three-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, and without the requirement to monitor and recalculate the emissions factor during the crediting period.

STEP 4: Calculate the operating margin emissions factor according to the selected method

According to the simple OM method, the OM emission factor is calculated as the generation-weighted average tCO2 emissions per unit of net electricity generation (tCO2/MWh) of all generating power plants serving the system, excluding the low-cost/must-run power plants/units. The Tool provides 2 options how to calculate this OM emission factor:

- Option A: Based on the net electricity generation and a CO2 emission factor of each power unit
- Option B: Based 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.

Although preferred, option A is excluded as data net electricity per plant is not available. Since the project complies with the following conditions;
(a) data for option A is not available;
(b) 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; and
(c) off-grid power plants are not included in the calculation,

We turn to option B. Under this option, the simple OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost/must-run power plants/units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OM,simple,y} = \frac{\sum_m FC_{i,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{\sum_m EG_y}$$

Where:

- $EF_{grid,OMsimple,y}$ is the simple operating margin CO_2 emission factor in year y (tCO_2/MWh)
- $FC_{i,y}$ is the amount of fossil fuel type i consumed in the project electricity system in year y (mass or volume unit)
- $NCV_{i,y}$ is the net calorific value (energy content) of fossil fuel type i in year y (GJ/mass or volume unit)
- $EF_{CO2,i,y}$ is the CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)
- EG_y is the 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 are all fossil fuel types combusted in power sources in the project electricity system in year y
- y is the relevant year as per the data vintage chosen in Step 3

Calculation of the OM emission factor according to the above yields a value of 0.906 tCO2e/MWh. For details we refer to Annex 3

STEP 5: Identify the group of power units to be included in the build margin (BM)

Following the Tool the sample group of power units m used to calculate the build margin consists of either:

(a) The set of five power units that have been built most recently; or
(b) The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

Since 20 % of the most recent power units constitute the larger option, option b has been chosen to determine the power unit sample group for determination of the Build Margin.

STEP 6: Calculate the build margin emission factor

According to the Tool, the BM emission factor is calculated as the generation-weighted average emission factor (measured in tCO_2/MWh) of all power units m during the most recent year y for which data is available:

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

Where:

- $EF_{grid,BM,y}$ is the build margin CO_2 emission factor in year y (tCO_2/MWh)
- $EG_{m,y}$ is the net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
- $EF_{EL,m,y}$ is the CO_2 emission factor of power unit m in year y (tCO_2/MWh)
- m are the power units included in the build margin

- *y* is the most recent historical year for which power generation data is available

Calculation of the BM emission factor according to the above yields a value of 0.581 tCO2e/MWh. For details we refer to Annex 3.

The calculation of the BM emission factor for the first crediting period is done once (*ex-ante*) and will not be updated during the first crediting period. This has the advantage of simplifying monitoring and verification of emission reductions.

STEP 7: Calculate the combined margin (CM) emissions factor

The Baseline Emission Factor is calculated as a combined margin, using a weighted average of the OM and BM emission factors.

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

Where:

- $EF_{grid,BM}$ is the Build Margin CO_2 emission factor in year *y* (tCO_2/MWh) y BM grid EF , ,
- $EF_{grid,OM}$ is the Operating Margin CO_2 emission factor in year *y* (tCO_2/MWh) y OM grid EF , ,
- W_{OM} is the weighting of the Operating Margin emissions factor (%)
- W_{BM} is the weighting of the Build Margin emissions factor (%)

The Emission Factor Tool provides the following default weights: Operating Margin, W_{OM} = 0.5; Build Margin, W_{BM} = 0.5. Applying the default weights and the calculated emission factors, we calculate a Combined Margin Baseline Emission Factor of **0.743** tCO_2e/MWh.

Project emissions
In accordance with the methodology, emissions from the water reservoirs of hydro power plants need to be treated as project emissions in those cases where the power density of the project exceeds 10 W/m^2. The power density of the project is calculated as follows:

$PD = Cap_{PJ} – Cap_{BL} / A_{PJ} – A_{BL}$

Where:

PD	= Project density of the project activity
Cap_{PJ}	= Installed capacity of the hydro power plant after the implementation of the project activity (W).
Cap_{BL}	= Installed capacity of the hydro power plant before the implementation of the project activity (W). For new power plants this is zero
A_{PJ}	= Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2)
A_{BL}	= Area of the reservoir measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2). For new reservoirs, this value is zero

As the project activity does not employ a reservoir, the power density is infinite and therefore greater than 10. Without a clear definition for "reservoir" in the methodology, it might be interpreted as all water storage capacity of the hydro power plant. Based on a conservative estimate, the surface area is determined to be 30,000 m^2. With the newly installed capacity of 12 MW the power density is therefore 3600 W/m^2. This is greater than 10 W/m^2 and we therefore conclude that no project emissions need to be accounted for.

Emission reduction
As the project emissions are zero, the baseline emissions equal the overall emissions reduction as a result of the project activity.

Leakage
There is no leakage associated with the project activity.

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

Data / Parameter:	**$EF_{CM,grid,y}$**
Data unit:	tCO2e/MWh
Description:	Combined Margin Grid Emission Factor
Source of data used:	Calculated ex-ante based on BPPT data
Value applied:	0. 743 tCO2e/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated ex-ante based on the OM and BM emissions factor. See Annex 3.
Any comment:	-

Data / Parameter:	**$EF_{grid,OMsimple,y}$**
Data unit:	tCO2/MWh
Description:	Simple Operating Margin CO_2 Emission Factor in year *y*
Source of data used:	Calculated ex-ante based on BPPT data
Value applied:	0.906 tCO2/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated ex-ante based on the OM and BM emissions factor. See Annex 3.
Any comment:	-

Data / Parameter:	**$FC_{OM,i,y}$**
Data unit:	Mass or volume unit
Description:	Amount of fossil fuel type i consumed in year y
Source of data used:	Calculated ex-ante based on BPPT data
Value applied:	See annex 3 for more details
Justification of the choice of data or description of	Calculated ex-ante based on 2005 – 2007 data. See section B6 for more details on the justification of the data selection.

measurement methods and procedures actually applied :	
Any comment:	-

Data / Parameter:	**$EG_{OM, y}$**
Data unit:	MWh
Description:	Net electricity generated in year y
Source of data used:	Calculated ex-ante based on BPPT data
Value applied:	See annex 3 for more details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated ex-ante based on 2005 – 2007 data. See section B6 for more details on the justification of data selection.
Any comment:	-

Data / Parameter:	**$NCV_{i,y}$**
Data unit:	GJ/mass or volume unit
Description:	Net calorific value (energy content) of fossil fuel type i in year y
Source of data used:	Calculated ex-ante based on BPPT data
Value applied:	See annex 3 for more details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated ex-ante based on 2005 – 2007 data. See section B6 for more details on the justification of data selection.
Any comment:	-

Data / Parameter:	**$EF_{CO2,i,y}$**
Data unit:	tCO_2/GJ
Description:	CO_2 emission factor of fossil fuel type *i* used in power unit *m* in year *y.*
Source of data used:	Data used are IPCC default values at the lower limit of the uncertainty at a 95% confidence interval. See 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Chapter 1, Volume 2 (Energy), Table 1.4.
Value applied:	See annex 3 for more details
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	**$EF_{grid,BM,y}$**
Data unit:	tCO2e/MWh
Description:	Build Margin Grid Emission Factor

Source of data used:	Calculated ex-ante based on BPPT data
Value applied:	0.581 tCO_2e/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated ex-ante based on 2007 data and selection of recently build power plants.
Any comment:	-

Data / Parameter:	**$FC_{BM,i,y}$**
Data unit:	Mass or volume unit
Description:	Amount of fossil fuel type i consumed in year y by selection of recently build power plants
Source of data used:	Calculated ex-ante based on BPPT data
Value applied:	See annex 3 for more details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated ex-ante based on 2007 data and selection of recently build power plants. See section B6 for more details on the justification of data selection.
Any comment:	-

Data / Parameter:	**$EG_{BM,\,y}$**
Data unit:	MWh
Description:	Net electricity generated in year y by selection of recently build power plants
Source of data used:	Calculated ex-ante based on BPPT data
Value applied:	See annex 3 for more details
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated ex-ante based on 2007 data and selection of recently build power plants. See section B6 for more details on the justification of data selection.
Any comment:	-

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

The annual power production of the project activity is 76,300 MWh. Based on the applicable grid emissions factor of 0.743 tCO_2/MWh the emission reduction of the project activity is 56,709 tCO_2 for each of the 7 years during the crediting period.

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

56,709 tCO_2 = 76,300 MWh * 0.743 tCO_2/MWh

$PE_y = 0$

ER_y = 56,709 tCO_2

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

Table B6.4.1 provides the ex-ante estimated annual emission reductions over the 7 year crediting period.

Table B6.4.1 Estimation of the emission reductions in the 1st crediting period

Year	Estimation of project activity emission reductions (tonnes of CO2e)	Estimation of baseline emission reductions (tonnes of CO2e)	Estimation of leakage (tonnes of CO2e)	Estimation of emission reductions (tonnes of CO2e)
30/03/2012 – 29/03/2013	0	56,709	0	56,709
30/03/2013 – 29/03/2014	0	56,709	0	56,709
30/03/2014 – 29/03/2015	0	56,709	0	56,709
30/03/2015 – 29/03/2016	0	56,709	0	56,709
30/03/2016 – 29/03/2017	0	56,709	0	56,709
30/03/2017 – 29/03/2018	0	56,709	0	56,709
30/03/2018 – 29/03/2019	0	56,709	0	56,709
Total (tonnes of CO2e)	0	396,964	0	396,964

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**EGfacility,y**
Data unit:	MWh/yr
Description:	Quantity of net electricity generation supplied by the project plant to the grid in year *y*.
Source of data to be used:	Measured at the primary power meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	76,300 MWh
Description of measurement methods and procedures to be applied:	The net supply of power to the grid by the proposed project activity is measured through standard electricity metering instruments. The measurement of electricity will be in accordance with the PPA. The metering instruments will be calibrated annually. The net amount of power supplied to the grid by the project will be continuously measured and recorded monthly.
QA/QC procedures to	This data will be directly used for calculation of emission reductions. The

be applied:	records of the grid company (evidenced by sales records) will be cross-checked by readings recorded by the project entity
Any comment:	See also Section B.7.2 for more details

Data / Parameter:	Cap_{PJ}
Data unit:	W
Description:	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data to be used:	Project site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	3 x 4,000,000 W
Description of measurement methods and procedures to be applied:	Determine the installed capacity based generator nameplates
QA/QC procedures to be applied:	-
Any comment:	-

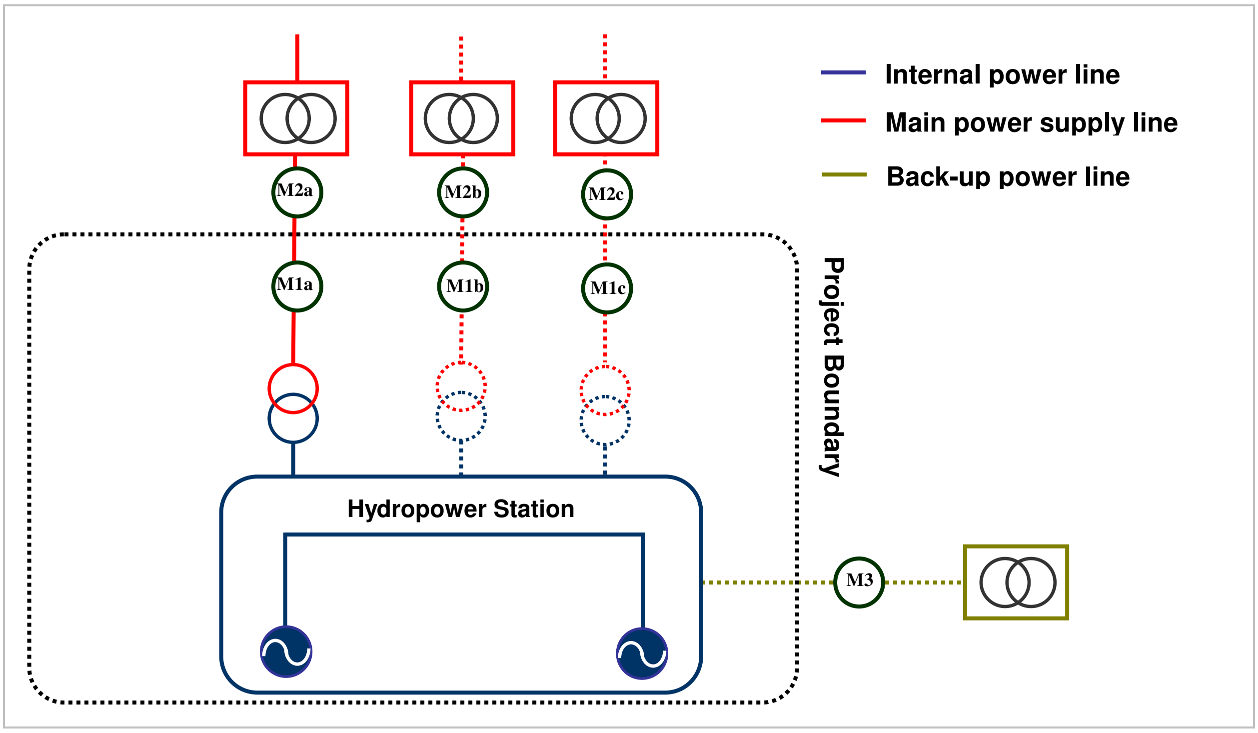
Data / Parameter:	A_{PJ}
Data unit:	m^2
Description:	Area of the reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full
Source of data to be used:	Project site
Value of data applied for the purpose of calculating expected emission reductions in section B.5	30,000 m^2
Description of measurement methods and procedures to be applied:	Measured from topographical surveys, maps, satellite pictures, etc
QA/QC procedures to be applied:	-
Any comment:	-

B.7.2. Description of the monitoring plan:

The proposed project activity is connected to the Public Power Grid through one or more on-site transformer stations. The project is connected to the TES transformer station through 3 km 20 kV power lines and might in the future also connect to the grid through other main power lines. The project may furthermore be connected to a back-up power line to provide emergency power in case the project is not operational. An indicative grid connection diagram is provided in figure B.7.2.1. The solid lines indicate connection lines that are currently intended with the dotted lines indicating potential future additions.

The grid connection diagram indicates the principles for positioning of metering instruments that will be used in the monitoring of emission reductions. A separate detailed grid connection diagram will be prepared which is updated on the basis of the actual implementation of the project's grid connection and which will serve as the basis for periodic verification. The project entity will ensure that the actual implementation of grid connection will not deviate from the procedures outlined in this section.

Figure B.7.2.1 Indicative grid connection diagram



The project entity will meter electric power according to the following principles:

- **Power supplied to the grid through main power lines:**
  As indicated in Figure B.7.2.1, the project might be connected by multiple main power lines (indicated in red) which will deliver power generated by the project to the grid. Net power supplied to the grid is metered as below:
  - <u>Project entity:</u> The power supplied to the grid is metered by the project entity at a point after power has been transformed to high voltage. Therefore, no further transformer losses will occur before the project is connected to the grid. The power supply of the project to the grid will be metered with standard electricity meters in accordance with national regulations. The metering instruments should record the net supply as the main power supply lines can transfer power in both directions. The

metering instruments may record either a net figure of power delivered to the grid or two readings, i.e. power delivered to the grid and power received from the grid.
    - Grid company: The grid company will meter the power supply also at the high voltage side of the on-site transformer station with its own metering equipment. The meter will be located at the TES Substation owned and operated by the state utility. The regulations of the grid company require annual calibrations of both metering instruments.
    - Calibration: Calibrations are carried out by the grid company or by a certified company. If there are any substantial discrepancies between the readings of the metering instruments throughout the year, both instruments will be recalibrated.

- **Power received through back-up power lines:**
  As indicated in Figure B.7.2.1 the project may be connected by a back-up emergency power line (indicated in brown) which delivers power from the grid to the project in case of emergencies or when the turbines of the proposed project activity are not in operation. Net power received from the grid is metered as below:
    - Grid company:
      The grid company will meter the power supplied to the project with its own metering equipment in accordance with national regulations.
    - Calibration:
      Calibrations are carried out by the grid company or by a certified company.

The project entity will collect the sales receipts for power supplied to the grid and billing receipts for power received from the grid as evidence. The net supply (i.e. gross supply minus supply by the grid to the project) will be used in the calculations. In case of discrepancies between the metering instruments of the grid company and the project entity, the readings of the grid company will prevail. All records of power delivered to the grid, sales receipts and the results of calibration will be collated in a central place by the project entity.

An overview of detailed information on minimum accuracy requirements of the metering instruments, measuring intervals, recording form, calibration and available documentation is provided in table B.7.2.1.

Determination of net power supply:

Net electricity supplied to the grid by the project ($EG_{BL,y}$ in section B.7.1.) is calculated on a monthly basis as:

Equation B.13

$$EG_{BL,y} = ES_y - ED_y$$

With:

- ES_y, electricity supplied by the project through the main power line(s) (in MWh) metered by the grid company (evidenced by monthly sales receipts) and cross-checked against the readings of metering instruments of the project entity.
- ED_y, electricity delivered to the project through possible back-up power line(s) metered by the grid company (evidenced by monthly billing receipts).

Table B.7.2.1 Details of metering instruments

Meter	Operated by	Electronic measurement	Manual logging	Recording	Calibration	Accuracy	Documentation
M1 x	Project entity	Hourly data record	Daily (optional) [7]	Monthly	Annually	1% or more accurate	Print out of electronic record and optional paper log. Data will consist of two readings, i.e. power delivered to the grid and power received from the grid or combined as net supply.
M2 x	Grid company	-	-	Monthly	Annually	1% or more accurate	Monthly sales receipts (for power delivered to grid) and billing invoices (for power received from the grid), or alternatively a single receipt which shows net power received.
M3 x	Grid company	-	-	Monthly	Annually	1% or more accurate	Monthly billing invoices (for power received from the grid).

Reporting, archiving and preparation for periodic verification

The project entity will in principle report the monitoring data annually but may deviate to report at intervals corresponding to agreed verification periods and will ensure that these intervals are in accordance with CDM requirements. The project entity will ensure that all required documentation is made available to the verifier. Data record will be archived for a period of 2 years after the crediting period to which the records pertain.

PROCEDURES IN CASE OF DAMAGED METERING EQUIPMENT / EMERGENCIES

[7] The project entity intends to log the readings of meters M1x and M1x manually in daily logs, but these logs will not form a formal requirement during verification. The ACM0002 methodology only requires hourly electronic measurement and these manual log records will only be maintained for back-up purposes. The project entity may deviate from this procedure during actual operation of the project.

Damages to metering equipment:
In case metering equipment is damaged and no reliable readings can be recorded the project entity will estimate net supply by the proposed project activity according to the following procedure:

1. **In case metering equipment operated by project entity is damaged only:**
   The metering data logged by the grid company, evidenced by sales receipts will be used as record of net power supplied to the grid for the days for which no record could be recorded.
2. **In case both metering equipment operated by project entity and grid company are damaged:**
   The project entity and the grid company will jointly calculate a conservative estimate of power supplied to the grid. A statement will be prepared indicating:
   ► the background to the damage to metering equipment
   ► the assumptions used to estimate net supply to the grid for the days for which no record could be recorded
   ► the estimation of power supplied to the grid
   The statement will be signed by both a representative of the project entity as well as a representative of the grid company.

The project entity will furthermore document all efforts taken to restore normal monitoring procedures.

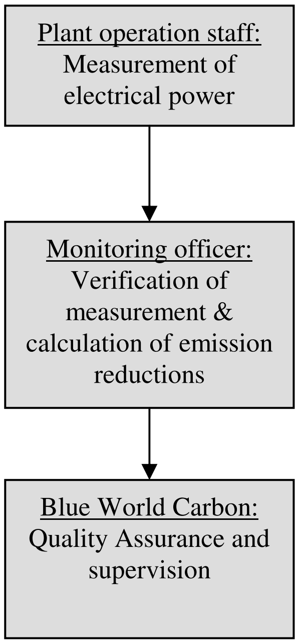
Emergencies:
In case of emergencies, the project entity will not claim emission reductions due to the project activity for the duration of the emergency. The project entity will follow the below procedure for declaring the emergency period to be over:

1. The project entity will ensure that all requirements for monitoring of emission reductions have been re-established.
2. The monitoring officer and the head of operations of the hydropower station will both sign a statement declaring the emergency situation to have ended and normal operations to have resumed.

OPERATIONAL AND MANAGEMENT STRUCTURE FOR MONITORING
The monitoring of the emission reductions will be carried out according to the scheme shown in Figure B7.2.2. The project entity will engage its CDM advisor, Blue World Carbon to assure that all monitoring requirements are met. Within the project entity a monitoring officer is appointed who will carry the day-to-day supervision responsibility. The first step is the measurement of the electrical energy supplied to the grid and reporting of daily operations, which will be carried out by the plant operation staff.

The monitoring officer who will be responsible for verification of the measurement, collection of sales receipts, collection of billing receipts of the power supplied by the grid to the hydropower plant and the calculation of the emissions reductions. The monitoring officer will prepare operational reports of the project activity, recording the daily operation of the hydropower station including operating periods, power delivered to the grid, equipment defects, etc. The selection procedure, tasks and responsibilities of the monitoring officer are described in detail in Annex 4. Finally, the monitoring reports will be reviewed by Blue World Carbon.

Figure B7.2.2 Management structure in order to monitor emission reductions



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):

Date of completion of the baseline study and monitoring methodology: 14/10/2011

Name of person responsible for the baseline study and the monitoring methodology:

Blue World Carbon

Mr. Willem Christiaens Email: Willem.Christiaens@BlueWorldCarbon.com

SECTION C. Duration of the project activity / crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

The project activity's starting date is 01/01/2008 (Construction agreement)

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

25 year, 0 months

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

A 3 x 7 year renewable crediting period will be applied.

C.2.1. Renewable crediting period:

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

Starting date of the crediting period is start operation of the project activity on 30/03/2012 or date of registration whichever is later

C.2.1.2. Length of the first crediting period:

The first crediting period is 7 years and 0 months from the start of the crediting period

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable, a renewable crediting period will be applied

C.2.2.2. Length:

Not applicable, a renewable crediting period will be applied

SECTION D. Environmental impacts

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

In-line with national regulations the project was not required to conduct an Environmental Management Efforts (UKL) and Environmental Monitoring Efforts (UPL). The UKL and UPL have been approved by the government authorities on May 2006. The UKL and UPL report contains:

1) Initiator Identity
2) Plan of Activities
3) Environmental impact assessment
4) Environmental management programme
5) Environmental monitoring programme
6) Statement of charge

Key environmental impacts as identified in the UKL and UPL are indicated in table D.1.1.

Table D.1.1 – Environmental impact matrix

No	Activity / Environment	Pre-Construction		Construction					Operation			Post-Operation	
		Survey (Sigi)	Land acquiring	Acceptance of labor	Mobilization of equipment and materials	Opening and maturation land	Construction of major buildings, facilities and infrastructure MHEP	Reduction of Manpower	Acceptance of labor	Operation and maintenance of hydro power plant	Reduction of Labor	Restructure the Ex-building	Utilization of a location for other purposes
I	**Physical-Chemistry**												
1	Concentration of dust				b								
2	Noise				b							b	
3	River water quality					b	b						
4	Erosion												
5	Water discharge									b			a
6	Space, land, and land		b										
II	**Biology**												
1	Vegetation												
2	Habitat of Wildlife					b							
3	Wildlife						b						
4	Biota of water						b						
III	**Social**												
1	An income residents	a	b	a				b	a	a	b		
2	Jealousy Labor			b					b				
3	Economy of a community									a			
4	Mobility Residents									a			
5	Condition of road				b								
6	Environmental Aesthetics					b						a	
7	Earning a seven regions									a			
IV	**Public Health**												
1	An environmental sanitation												
2	A public health												a

Description:

a	Positive impact not important	b	Negative impact is not significant	c	Negative impact is significant

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:

None of the environmental impacts as identified in the Environmental Impact Assessment are considered significant by the Indonesian authorities and the Project Entity. The UKL and UPL were approved on May 2006 by the national authorities.

SECTION E. Stakeholders' comments

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

The stakeholders of the project activity were invited to an informative public meeting in the morning of 15/12/2010. During the meeting the Project Entity's representative informed the public about the details of both the construction and operation phase of the hydro power plant and elaborated on the impacts of the project on stakeholders' livelihoods. Regional and local government officials were invited to speak during the meeting and to provide their opinion about the project. The Blue World Carbon representative explained that the project is in the process to be registered under the CDM and provided further background on this mechanism. The meeting was concluded by a Q&A session that allowed all stakeholders to provide feedback, comments and questions that where addressed by the Project Entity's representative.

The announcement of the stakeholder consultation meetings were done by advertisements through two local newspapers and through personal invitation letters, calls, etc. This resulted in an attendance of over 40 stakeholders with different interests in the project activity such as local officials, religious leaders and nearby residents.

E.2. Summary of the comments received:

The main comments that were received are summarised below. Besides these comments there were also many unrelated questions on forestry in the region and on the objective and possibilities of the Clean Development Mechanism.

Representative of the Energy and Mining Bureau of Lebong District - DPE
We are glad with this project development as it is the first CDM project in Lebong district. By developing this project, we do not just think about ourselves but also give a contribution to the world.

Sub-district chief
Carbon credit information of CDM should be delivered to the community in a transparent and proper way, so that the local community will understand that the project activity has a positive impact in many aspects.

Chief of Turan Lalang Village
The local community supports the development of the project activities. At present we are happy with the development of access road and steel bridge that will be useful for local transportation.

Local People Representative
We hope that the project will soon generate electricity and recruit local people for operating and maintenance of the plant

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

All comments were noted and no action was needed.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	PT Mega Power Mandiri
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URL:	
Represented by:	
Title:	Director
Salutation:	Mr.
Last Name:	Santoso
Middle Name:	
First Name:	Joko
Department:	
Mobile:	
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Personal E-Mail:	bkkpower@indosat.net.id

Organization:	Nordic Environment Finance Corporation NEFCO in its capacity as Fund Manager to the NEFCO Carbon Fund (NeCF)
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

The Project does not receive any public funding from Annex I countries.

Annex 3

BASELINE INFORMATION

Calculation of Operating Margin

Table 3: Simple OM Emission Factors Calculation of Sumatera Grid for Year 2005

Fuel	Unit	Sumbagsel (include IPP) A	Sumbagut B	Total C = A + B	EF (tC/TJ) D	Oxidation (%) E	NCV F	CO_2 Emission (tCO_{2e}) G
MFO	kiloliter	510	323,472	323,982	21.1	100%	40,767 MJ/kl	1,021,834
IDO	kiloliter	15,662	0	15,662	20.2	100%	37,219 MJ/kl	43,177
HSD	kiloliter	176,692	1,009,112	1,185,804	20.2	100%	36,542 MJ/kl	3,209,402
Coal	ton	1,651,943	0	1,651,943	25.8	100%	27,444 MJ/ton	4,288,852
Natural Gas	MMBTU	20,792,324	14,299,034	35,091,358	15.3	100%		2,076,978
								10,640,244

Table 4: Simple OM Emission Factors Calculation of Sumatera Grid for Year 2006

Fuel	Unit	Sumbagsel (Include IPP) A	Sumbagut B	Total C = A + B	EF (tC/TJ) D	Oxidation (%) E	NCV F	CO_2 Emission (tCO_{2e}) G
MFO	kiloliter	0	256,020	256,020	21.1	100%	40,767 MJ/kl	807,483
IDO	kiloliter	17,137	0	17,137	20.2	100%	37,219 MJ/kl	47,243
HSD	kiloliter	188,208	1,150,461	1,338,668	20.2	100%	36,542 MJ/kl	3,623,133
Coal	ton	1,530,391	0	1,530,391	25.8	100%	27,444 MJ/ton	3,973,273
Natural Gas	MMBTU	27,980,333	7,994,188	35,974,521	15.3	100%		2,129,251
								10,580,383

Table 5: Simple OM Emission Factors Calculation of Sumatera Grid for Year 2007

Fuel	Unit	Sumbagsel (Include IPP) A	Sumbagut B	Total C = A + B	EF (tC/TJ) D	Oxidation (%) E	NCV F	CO_2 Emission (tCO_{2e}) G
MFO	kiloliter	0	281,427	281,427	21.1	100%	40,767 MJ/kl	887,616
IDO	kiloliter	7,989	0	7,989	20.2	100%	37,219 MJ/kl	22,025
HSD	kiloliter	108,594	1,250,672	1,359,267	20.2	100%	36,542 MJ/kl	3,678,883
Coal	ton	1,706,554	0	1,706,554	25.8	100%	27,444 MJ/ton	4,430,637
Natural Gas	MMBTU	32,399,087	10,131,294	42,530,382	15.3	100%		2,517,277
								11,536,438

Total Generation Capacity (2005-2007) excl. Low-Cost/Must-Run

Type of Power Plant	Fuel type	2005 MWh	2006 MWh	2007 MWh
Hydro		2,505,314	2,948,239	3,593,005
Geothermal		0	0	0
Steam - Oil	MFO	1,060,814	837,664	949,438
Steam - Gas	Natural Gas	125,254	113,808	119,821
Steam - Coal	Coal	2,932,330	2,868,414	3,257,691
Diesel	HSD	529,384	567,470	498,576
Diesel	IDO	66,887	73,971	34,026
Diesel	PPO	0	5,108	0
Combustion Turbine - Oil	HSD	451,084	517,802	417,080
Combustion Turbine - Gas	Natural Gas	1,154,204	974,046	1,206,994
Combined Cycle - Oil	HSD	0	0	0
Combined Cycle - Gas	Natural Gas	5,672,687	6,221,137	6,259,426
Total		14,497,958	15,127,659	16,336,057
Total Low Cost Must Run		2,505,314	2,953,347	2,953,347
Total Generation excl. Low-Cost/Must-Run		11,992,644	12,174,312	13,382,710
Internal use rate		3.98%	3.47%	3.52%
Net Electricity		11,514,899	11,751,548	12,911,406

Total Emissions / Total Generation

		2005	2006	2007
Total Emissions	tCO2e	10,640,244	10,580,383	11,536,438
Total Generation	MWh	11,514,899	11,751,548	12,911,406
$EF_{OM,y}$	tCO2e/MWh	0.924	0.900	0.894

EF_{OM2006}	0.906	tCO2e/MWh	Operating Margin

Calculation of Building Margin

#	Station	Installed capacity (kW)	Year of Commission	Fuel Type	Fuel: Coal (ton)	Fuel: Gas (MMBTU)	Fuel: HSD (kl)		Electricity Generation: 2007 (Gross)	Electricity Generation: Parasitic load (ave)	Electricity Generation: 2007 (Net)
	--	--	--	--	--				MWh	%	MWh
1	PLTU Tarahan 1	100,000	2007	coal & HSD	47,926		1,284		105,450	3.52%	101,736
2	PLTU Tarahan 2	100,000	2007	coal & HSD	98,072		2,903		204,410	3.52%	197,212
3	PLTG Riau Power (rental)	20,000	2007	Gas		1,119,896			74,994	0.00%	74,994
4	PLTD Sewa Arti Duta AU (rental)	15,000	2007	HSD			20,270		77,297	0.00%	77,297
5	PLTG Meppo Gen (IPP)	80,000	2007	Gas		5,292,873			297,674	0.00%	297,674
6	PLTG Apung	30,000	2007	HSD			2,816		9,817	3.52%	9,471
7	PLTA 1 Renun	41,000	2006	Hydro					163,003	3.52%	157,262
8	PLTA Musi 1	71,825	2006	Hydro					183,105	3.52%	176,657
9	PLTA Musi 2	71,825	2006	Hydro					183,499	3.52%	177,036
10	PLTA Musi 3	71,825	2006	Hydro					197,278	3.52%	190,330
11	PLTD-12 Gunung Sitoli	1,010	2005	HSD			866		3,176	3.52%	3,064
12	PLTD-13 Gunung Sitoli	1,010	2005	HSD			866		3,176	3.52%	3,064
13	PLTD-1 Teluk Dalam	1,010	2005	HSD			871		3,176	3.52%	3,064
14	PLTA-2 Renun	41,000	2005	Hydro					163,003	3.52%	157,262
15	PLTG Inderalaya II	40,000	2004	Gas & HSD		2,492,620	1		227,141	3.52%	219,141
16	PLTG Truck Mounted 1	20,000	2004	Gas		1,463,191			125,434	3.52%	125,434
17	PLTG Truck Mounted 2	20,000	2004	Gas		0			0	3.52%	0
18	PLTG Rental Tl. Duku #1	20,000	2004	Gas		365,123			16,040	0.00%	16,040
19	PLTD 12 LUENG BATA*	3,450	2004	HSD			1,451		5,017	3.52%	4,841
20	PLTD 13 LUENG BATA*	3,450	2004	HSD			1,451		5,017	3.52%	4,841
21	PLTD 14 LUENG BATA*	3,450	2004	HSD			1,451		5,017	3.52%	4,841
22	PLTGU Borang (IPP)	150,000	2004	Gas		13,156,205			1,247,034	0.00%	1,247,034
					145,998	23,889,909	34,230		3,299,757		3,248,295

'power plant capacity additions in the elc. System that comprise 20% of the system generation…'

		2007
Total Generation	MWh	16,336,057
22-last	MWh	3,299,757
22-last / Total	%	20.2

22-last Total Emissions / 22-last Total Generation

Parameter	Unit	2007
Total Power Generated (net)	**MWh**	3,248,295
Fuel Consumption (HSD)	kl	34,230
	TJ	1,251
EF	tC/TJ	20.20
Oxidation		100%
Emissions from HSD	**tCO2e**	**92,644**
Fuel Consumption (Gas)	MMBTU	23,889,909
	TJ	25,205
EF	tC/TJ	15.30
Oxidation		100%
Emissions from Natural Gas	**tCO2e**	**1,413,990**
Fuel Consumption (Coal)	ton	145,998
	TJ	4,007
EF	tC/TJ	25.8
Oxidation		100%
Emissions from Coal	**tCO2e**	**379,047**
Total Emissions	**tCO2e**	**1,885,681**
EF_{BM2007}	**tCO2e/GWh**	**580.5**
EF_{BM2007}	**tCO2e/MWh**	**0.581**

EF_{BM2007}	**0.581**	**tCO2e/MWh**	**Building Margin**

Calculate the baseline emission factor EF_y

W_{OM}	0.5	(Default value)
W_{BM}	0.5	(Default value)

EF_y	=	W_{OM}	*	EF_{OM2006}	+	W_{BM}	*	EF_{BM2006}
0.743		0.5		0.906		0.5		0.581

The EF of the Sumatera Electricity Grid for 2007 is EF_{2006} 0.743 tCO_2e/MWh

Annex 4

MONITORING INFORMATION

Selection procedure:
The monitoring officer will be appointed by the project entity's management. The monitoring officer will be selected from among the senior technical or managerial staff.

Tasks and responsibilities:
The monitoring officer will be responsible for carrying out the following tasks

- **Supervise and verify metering and recording:**
  The monitoring officer will coordinate with the plant manager to ensure and verify adequate metering and recording of data, including power delivered to the grid.
- **Collection of additional data, sales / billing receipts:**
  The monitoring officer will collect sales receipts for power delivered to the grid, billing receipts for power delivered by the grid to the hydropower station and additional data such as the daily operational reports of the hydropower station.
- **Calculation of emission reductions:**
  The monitoring officer will calculate the annual emission reductions on the basis of net power supply to the grid. The monitoring officer will be provided with a calculation template in electronic form by the project's CDM advisors.
- **Preparation of monitoring report:**
  The monitoring officer will annually prepare a monitoring report which will include among others a summary of daily operations, metering values of power supplied to and received from the grid, copies of sales/billing receipts, a report on calibration and a calculation of emission reductions.

Support:
The monitoring officer will receive support from Blue World Carbon in his/her responsibilities through the following actions:

- Initial training on CDM, monitoring methodology, monitoring procedures and requirements and archiving
- Provide the monitoring officer with a calculation template in electronic form for calculation of annual emission reductions
- Continuous advice to the monitoring officer on a need basis
- Periodic review of monitoring report

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