Project design document form for CDM project activities

(Version 06.0)

Complete this form in accordance with the Attachment "Instructions for filling out the project design document form for CDM project activities" at the end of this form.

PROJECT DESIGN DOCUMENT (PDD)

Title of the project activity: Lebong Hydroelectric Power Plant

Version number of the PDD: Version 3.~~1~~2

Completion date of the PDD: ~~23/11/2012~~06/04/2015

Project participant(s):

1. **PT Mega Power Mandiri (Private entity)**
2. **Nordic Environment Finance Corporation NEFCO in its capacity as Fund Manager to the NEFCO Carbon Fund (NeCF) (Public Entity)**

Host Party: Indonesia

Sectoral scope and selected methodology(ies), and where applicable, selected standardized baseline(s):

Energy industries (renewable - /non-renewable sources).

ACM0002- Consolidated baseline methodology for grid-connected electricity generation from renewable sources, version 13.0.0

Estimated amount of annual average GHG emission reductions: 56,691tCO_2

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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The project activity involves the construction and operation of the Lebong hydroelectric power plant located near the Lalang Turan village in Lebong district, Bengkulu province, Sumatera Island, Indonesia. The hydroelectric power plant is a run-of-the-river project with a run-of-river 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[1] 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 CO_2, 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.

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[1] Power Purchase Agreement

A.2. Location of project activity

A.2.1. Host Party

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Indonesia

A.2.2. Region/State/Province etc.

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Sumatera Island, Bengkulu province

A.2.3. City/Town/Community etc.

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Lebong district, Lalang Turan Village

A.2.4. Physical/Geographical location

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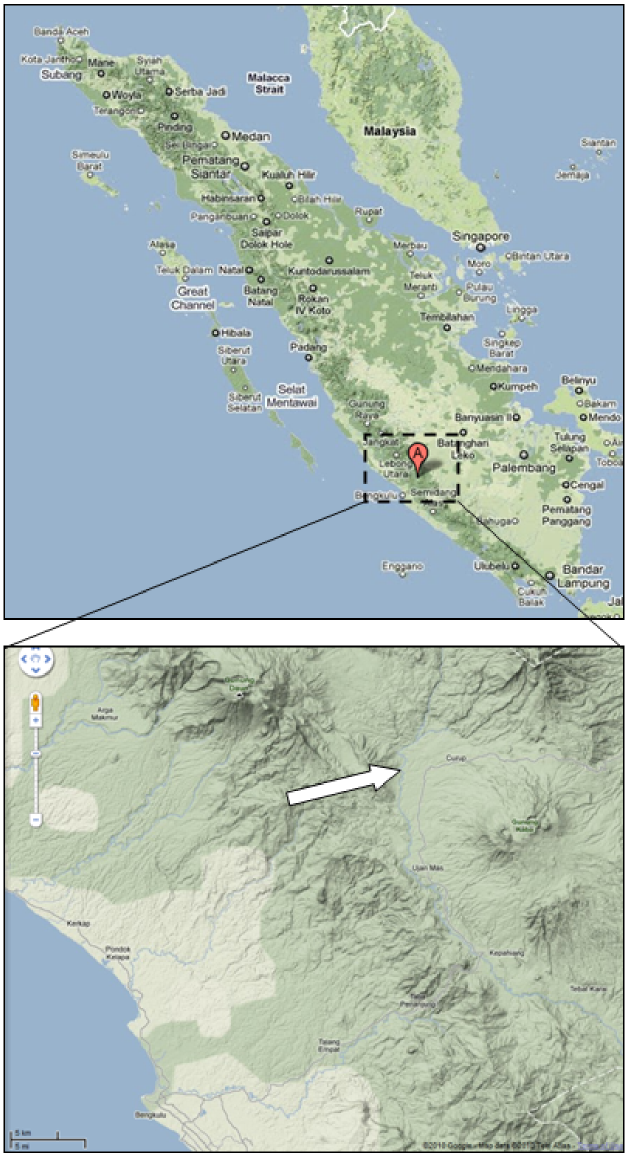
Located on the Ketahun River with the following coordinates[2]:

- Weir: 3^{O} 12.130" S & 102^{O} 18.861" E, converted to decimal GPS location to be: 3.2022 S & 102.3144 E
- Power house: 3^{O} 11.446" S & 102^{O} 18.340" E, converted to decimal GPS location to be: 3.1908 S & 102.3057 E.

~~3^{O}10'10" S & 102^{O}17'10" E, converted to decimal GPS location to be: 3.1694 S & 102.2861 E.~~

[2] GPS coordinates have been taken at the project site by the DOE during the verification site visit.
~~Feasibility Study Report~~



A.3. Technologies and/or measures

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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 is essentially a run-of- the river reservoir scheme.

The weir is 5.5 3 meters in height with a maximum elevation of 498492.5 m. The weir can take a maximum debit of 24011133 m^3 in case of flooding. Through a double intake the river water flows into the 990960 m long waterway. At the end of the waterway is the headpond that with a rectangulardiameter of 8035 m x 24m and an overflow of 175 m. From the headpond the water enters the 620.124 605 m pipe 1 and 613.085 m long pipe 2 of 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. The plant load factor of the project activity (as per feasibility study report) is 73%. 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. The operational lifetime of the project activity is 25 years[3]. Finally the water enters the tailrace to discharge into the river once again.

The project will involve a water head of 62.679 45 m of which 6037.67 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[4]

Parameter	Value
Type	Francis turbine, horizontal
Type no	HLA616551C-WJ-110
Rated Power [kW]	4639
Rated Speed [r/min]	500
Rated discharge flow [m^3/s]	8.6610.15
Rated head [m]	6045
Rated Efficiency [%]	92.93
Overhaul interval	5 years

Table A.4.3.2. Generator specifics[5]

Parameter	Value
Type	SFW – J4000-12/2150
Rated Poweroutput [kW]	4000
Rated Voltage [V]	6300
Rated Current [A]	458.2
Rated Frequency [Hz]	50
Rated Power Factor	0.8
Rated Speed [r/min]	500
Efficiency [%]	96.76
Overhaul interval	5 years

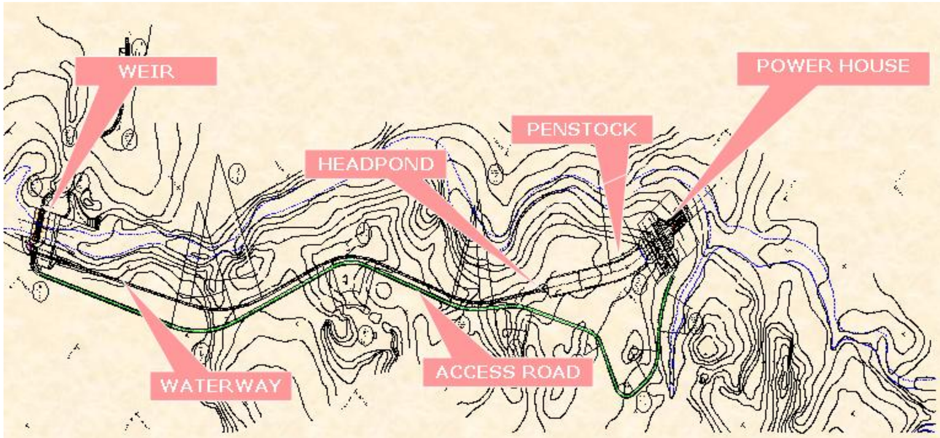
As determined in the Section B.4, the baseline scenario is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of existing grid-connected power plants and by the addition of new generation sources to the Sumatera grid.

Fig A.4.3.1. Layout of the proposed project activity

[3] Source: Feasibility Study Report 2007

[4] Technical agreement between PT MPM and Wide Easy Engineering Company – Item 2 and nameplates of turbine and generator installed in the plant.

[5] Generator Technical Data



A.4. Parties and project participants

Party involved (host) indicates host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Indonesia (host)	Private Entity: PT Mega Power Mandiri	No
Sweden	Public Entity: Nordic Environment Finance Corporation NEFCO in its capacity as Fund Manager to the NEFCO Carbon Fund (NeCF)	No

A.5. Public funding of project activity

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No public funds from Annex I countries is involved in this project.

SECTION B. Application of selected approved baseline and monitoring methodology and standardized baseline

B.1. Reference of methodology and standardized baseline

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The project activity applies the approved consolidated baseline and monitoring methodology ACM0002 - "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" version 13.0.0.

The methodology draws upon:

- Tool for the demonstration and assessment of additionality, version 06.1.0
- 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. Applicability of methodology and standardized baseline

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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 13.0.0.

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. Hence this criteria is applicable*
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. Hence this criteria is applicable*
In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 10 to calculate the parameter $EG_{PJ,y}$): 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;	*Not applicable for project activity as it involves a Greenfield project*
In case of hydro power plants, one of the following conditions must apply: • The project activity is implemented in an existing single or multiple reservoir, with no change in the volume of reservoir; or • The project activity is implemented in an existing single or multiple 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	• *Not relevant as the project activity is not implemented in an existing reservoir.* • *The project activity results in a new single reservoir with a power density far greater than 4 W/m2. (see section B6 for further details on the Power Density)* • *The project activity results in a new single reservoir with a*

than 4 W/m2; or • The project activity results in new single or multiple reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m2.	*power density of 598 W/ m2, far greater than 4 W/m2. (see section B6 for further details on the Power Density)*
In case of hydro power plants using multiple reservoirs where the power density of any of the reservoirs is lower than 4 W/m^2 all the following conditions must apply: • The power density calculated for the entire project activity using equation 5 is greater than 4 W/m^2; • Multiple reservoirs and hydro power plants located at the same river and where are designed together to function as an integrated project[6] that collectively constitute the generation capacity of the combined power plant; • Water flow between multiple reservoirs is not used by any other hydropower unit which is not a part of the project activity; • Total installed capacity of the power units, which are driven using water from the reservoirs with power density lower than 4 W/m^2, is lower than 15 MW; • Total installed capacity of the power units, which are driven using water from reservoirs with power density lower than 4 W/m^2, is less than 10% of the total installed capacity of the project activity from multiple reservoirs.	*Not Applicable, as the project activity results in a new single reservoir with the power density of 598 W/ m^2, much greater than 4 W/m^2*
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 plants[7] 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.	*Not relevant for project activity since:It is a renewable energy project with no fuel-switch involved and no biomass fired.* *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 the case of retrofits, replacements, or capacity	*This condition is not applicable since the*

[6] This requirement can be demonstrated, for example: (i) by the fact that water flow from upstream power units spilling directly to the downstream reservoir; or (ii) through the analysis of the water balance. Water balance is the mass balance of water fed to power units, with all possible combinations of multiple reservoirs and without the construction of reservoirs. The purpose of such water balance is to demonstrate the requirement of specific combination of multiple reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum three years prior to implementation of CDM project activity.

[7] 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.

additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	*project activity is the installation of a new hydro power plant.*

In addition to the applicability as per ACM0002 ver. 13.0.0, the project activity also meets the applicability conditions of the tools it draws upon.

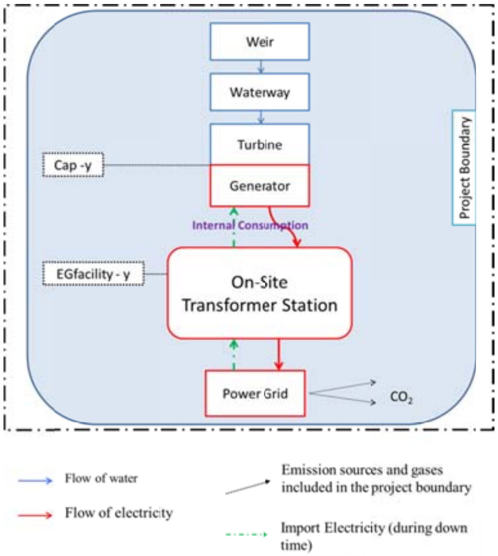
B.3. Project boundary

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project scenario	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	Minor emission source
		CH_4	Yes	The power density is 598 W/m2 (see section B6), thus the project emission CH4 is considered to be zero as per ACM0002 ver. 13.0.0
		N_2O	No	Minor emission source

In line with methodology ACM0002 ver. 13.0.0 the project boundary is: The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to. 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 all power plants connected physically to the grid (Sumatera grid).

Figure B.3.1: Graphical illustration of the project boundary



B.4. Establishment and description of baseline scenario

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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 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 to the Sumatera grid 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. Demonstration of additionality

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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 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:

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

Accordingly, the realistic and credible alternatives to the proposed project are:

(a) The proposed project is undertaken without registering it as a CDM project activity.
(b) The baseline scenario: Electricity delivered to the grid by the project activity that would have otherwise been generated by the operation of the grid connected power plants and by the additional of new generation sources

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” (EB62, Annex 5) 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" (EB62, Annex 5) 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 five year average forecasting from 2008 – 2012 based on publically available data, published by IMF[8].

After adjusting for inflation the benchmark was determined on 20.73%.

Project returns

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 April 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 spread sheet.

Table B.5.1 – Financial assumptions project activity

Financial assumption	Value	Source
Power tariff	IDR 435 /kWh	FSR
Total investment	IDR 167,847,045,313	FSR
Pre-Operation	IDR 6,165,667,000	FSR
Financial and Administration	IDR 16,921,870,697	FSR
Electromechanical works	IDR 33,466,608,000	FSR
Metal works	IDR 3,356,078,000	FSR
Civil works	IDR 93,974,494,616	FSR
Distribution and switchyard	IDR 11,539,577,000	FSR
Supporting facilities	IDR 2,422,750,000	FSR
Loan amount	IDR 118,344,479,000	FSR
Interest rate	15%	FSR
Loan repayment term	60 months	FSR
Grace period	12 months	FSR
Inflation rate	7.32%	IMF
Capacity	12 MW	FSR
Annual power generation	76,300 MWh	FSR
Plant Load Factor	73%	FSR
Project lifetime	25 years	FSR
Expenses		
Water level Tariff	IDR 5/kWh	FSR
Marketing Expense	IDR 5/kWh	FSR
HRD Expense	IDR 10/kWh	FSR
O&M Expense	IDR 10/kWh	FSR
Insurance (first year)	IDR 251,770,568	FSR
Office Administration	IDR 5/kWh	FSR
Depreciation and amortisation		
Pre-Operation	5 y	FSR
Financial and Administration	5 y	FSR
Physical Works	25 y	FSR
Income Tax		

[8] IMF, WEOD, October 2008, http://www.imf.org/external/pubs/ft/weo/2008/02/weodata/index.aspx

On first Rp 50,000,000	10%	FSR
On income Rp 50,000,000 - 100,000,000	15%	FSR
After Rp 100,000,000	30%	FSR

Based on the assumptions provided in table B.5.1 and in the financial model we conclude that the project activity has equity IRR of 15.68% without considering the carbon revenues of the project.

Table B.5.2 - Comparison of economic indicators

Proposed Project Activity	
Benchmark	20.73%
IRR without CDM revenues	15.68%

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, 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	13.35%	15.68%	18.12%
Power tariff	12.97%	15.68%	18.48%
Investment	18.46%	15.68%	13.50%
O&M	16.06%	15.68%	15.30%
Benchmark	20.73%		

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. Based on the analysis result above, that it is extremely unlikely that any of the Power sales and Power Tariff increase 10% as in the PPA already simulated the annual electricity generated and the price of the electricity for a total period of project activity. The investment cost and Operation and Maintenance cost is unlikely to be reduced by 10%, as the common practice, the cost in developing the hydroelectric power plant will be increasing depend on the inflation. Therefore we conclude that the sensitivity analysis confirms that the project activity is financially unattractive without considering the benefits of CDM.

Table B.5.4 provides the variation values of each parameter in the sensitivity analyses that causes the IRR to cross the benchmark. It further provides justification on the likelihood of such scenario to occur.

Table B.5.4. Value at which sensitivity reaches the benchmark

Scenario	**Change at which IRR reach benchmark**	**Percentage change at which IRR reach benchmark**	**Likelihood of occurrence**
Investment	Investment is reduced from	-16.50%	The capital costs included within the financial model are taken from the

	IDR 167.847 billion to IDR 140.152 billion		approved FSR. The actual capital costs incurred to date have been significantly higher than these partially due to high levels of inflation in Indonesia as of average 7.32% per year in the period of 2008-2012, estimated by IMF[9]
Power Sales	Power generation is increased from 76,300 MWh to 91,560 MWh	+20%	The power generation has been determined based upon the detailed hydrological study by a independent consultant. The approach that maximized the energy output or in other words the plant load factor (PLF) was selected. An increase in of power sales by 20% is highly unlikely.
Power tariff	Power tariff is increased from 435 IDR/kWh to 513.3 IDR/kWh	+18%	The electricity tariff utilised is taken from the FSR and also has been supported by the PPA. As the tariff for the hydro power plant with will be fixed tariff, it will be unlikely that the power tariff will be increase to this amount.
Operation & Maintenance	O&M is decreased to 0	-100%	The O&M cost cannot become negative hence this scenario is not plausible.

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

The common practice analysis is conducted in accordance with the "Tool for the demonstration and assessment of additionality, version 06.1.0" which takes a four step approach as indicated below.

Step 1: *Calculate applicable output range as +/-50% of the design output or capacity of the proposed project activity.*

The capacity of the proposed project is 12MW, so the range will be from 6 to 18 MW.

Step 2: *In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number Nall. Registered CDM project activities shall not be included in this step*

With refer to the "Tool for the demonstration and assessment of additionality, version 06.1.0" that project participants may provide justification that the applicable geographical area is smaller than the host country for technologies that vary considerably from location to location depending on local conditions. The project activity will apply the smaller geographical area on provincial level, which is Bengkulu Province. The consideration taken is refer to the tools referred paragraph 9 (d) (ii) and (iv), and also the national regulation as per the Decree of Ministry Energy and Mineral Resource (MEMR)[10] No. 002 year 2006, on article 3, related to the difference of the power tariff per each province. Hence the projects located outside Bengkulu province are considered different

[9] http://www.imf.org/external/pubs/ft/weo/2008/02/weodata/index.aspx

[10] http://prokum.esdm.go.id/permen/2006/permen-esdm-02-2006.pdf

based on (ii) other financial flows and (iv) legal regulations. Hence, for common practice analysis Bengkulu province is considered appropriate.

Following are the list of the power plant in the selected geographical area (Bengkulu Province) within the range in the step 1

Table B.5.4: List of relevant power plant project activities within the 6– 18 MW range

No	Power Plant Name	Year COD	Capacity	Developed as CDM	Project Entity Type
			MW	y/n	
1	PLTD PBAAI #1 [SULZER]	1984	6.37	N	state owned
2	PLTD PBAAI #2 [SULZER]	1984	6.37	N	state owned

Source: PLN Sumbagsel (Sumatera), Bengkulu Province Sector

Note:
PLTD: *Pembangkit Listrik Tenaga Diesel* (Diesel Power Plant)
Sumbagsel: Sumatera Bagian Selatan (South Side of Sumatera)

Among the listed projects, Nall = 2

Step 3: *Within plants identified in Step 2, identify those that apply technologies different that the technology applied in the proposed project activity. Note their number Ndiff.*

According to the “Tool for the demonstration and assessment of additionality” (version 06.1.0), different technologies are technologies that deliver the same output and differ by at least one of the following: (i) energy source/fuel; (ii) feed stock; (iii) size of installation (power capacity); (iv) investment climate at the date of the investment decision; (v) other features (unit cost of output)

As per investment climate, the guidance further distinguishes between the following (inter alia):

- Access to technology;
- Subsidies or other financial flows;
- Promotional policies;
- Legal regulations;

Of the 2 remaining projects, all were undertaken by state-owned enterprises. Investments made by state-owned enterprises have the objective to benefit the state and are often not primarily based on the direct financial merits of the company. This is inherently different from the objectives of private firms that primarily pursue profits over the benefits to the nation as a whole.

State-owned enterprises received special support from the government for the construction of power plants as the government was of the opinion that power generation played a critical role for the economic development of the country. This support includes, but is not limited to, determining EPC contractor without tendering procedures, encouragement of financing arrangement from local commercial banks, government guarantee for a loan for equipment importing. Hence we can conclude that those listed power projects owned by state owned companies are undertaken in a different investment climate and cannot be considered similar to the project activity as it is developed by a private enterprise.

Hence, Ndiff= 2.

Step 4: *Calculate factor F=1-Ndiff/Nall representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity.*
The proposed project activity is a common practice within a sector in the applicable geographical area if the factor F is greater than 0.2 and Nall-Ndiff is greater than 3.

Based on the above findings on Nall and Ndiff we can conclude the following:

- F= 1 – 2/2= 0; which is less than 0.2
- Nall-Ndiff = 2-2 = 0 ; which is less than 3

Hence, following the “Guidelines on the common practice” the proposed project activity is not considered a common practice.

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 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
22/01/2007	Finalising of feasibility study report (FSR) completed by technical consultant	FSR mentions CDM as a revenue for the project activity
15/03/2007	ERPA between MPM and Buyer regarding 5 project (include Lebong HEPP). Signed by MPM on 20 March 2007, signed by Ecosecurities on 5th April 2007	Early Awareness of the CDM development
16/04/2007	Board decision to start with the construction of the project activity	Investment decision date
19/07/2007	PPA signed	
28/01/2008	Construction agreement signed with contractor for waterway and land clearing	Project start date
01/02/2009	MoU of CVDT and MPM for conditional offer to determine maximized value and purchase certified emission reduction	Awareness of the CDM development
13/04/2009	Loan secured with BMI bank	Financial closure
10/07/2009	Signed CDM Project Services Agreement between Global Carbon Exchange and PT Mega Power Mandiri, concerning the Lebong CDM Project	Awareness of the CDM development
18/07/2009	Turbine Purchase Agreement	Agreement Document

	signed	
02/02/2010	LOI signed with Nefco on the emission reduction purchase of Lebong	Agreement Document
04/11/2010	ERPA with NEFCO	Agreement Document

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

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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:

$$BE_y = EG_{PJ,y} \cdot EF_{grid,CM,y}$$ **(Equation 6 of the ACM0002 ver.13.0.0)**

Where:
BE_y = Emission reductions due to displacement of grid electricity (tCO2/yr);
$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr);

Calculation of $EG_{PJ,y}$
As per the methodology ACM0002 ver. 13.0.0, the calculation of $EG_{PJ,y}$ for greenfield plant should be as following.
If the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then:

- $EG_{PJ,y} = EG_{facility,y}$ **(Equation 7 of ACM0002 ver. 13.0.0)**

Where:
$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh/yr)
$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y* (MWh/yr)

$EF_{grid,CM,y}$ = Emission factor for grid electricity for year y (tCO2/MWh).

$EF_{grid,CM,y} = EF_{grid,OM,y} * w_{OM} + EF_{grid,BM,y} * w_{BM}$ **(Equation 13 of the referred tool)**

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).

<u>Grid emission factor</u>
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 02.2.1 EB 63 Report Annex 19). 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.

Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system”.

According to “Tool to calculate the emission factor for an elecrticity system” (version 02.2.1), the following six steps are applied:
STEP 1. Identify the relevant electricity systems;
STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional);
STEP 3. Select a method to determine the operating margin (OM);
STEP 4. Calculate the operating margin emission factor according to the selected method;
STEP 5. Calculate the build margin (BM) emission factor;
STEP 6. Calculate the combined margin (CM) emissions factor.

Step 1. Identify the relevant electricity systems;
The spatial extent of the proposed project boundary includes the project site and all power plants connected physically to the electricity system that the CDM project power plant is connected to.
The project is located in North Sumatera Province, Indonesia where is covered by Sumatera Power Grid, according to PT PLN (Persero). Thus, the relevant electric power system is Sumatera Power Grid. According to PLN's actual grid structure, Sumatera Grid covers NAD province, North Sumatera Province, Riau province, West Sumatera province.

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

In this Project Activity, Option I is applied. Only grid power plants are included in the calculation.

Step 3: Select a method to determine the Operating Margin (OM)
The “Tool to calculate the emission factor for an electricity system” (Version 02.2.1; 29/09/2011) provides four options for calculating the Operating Margin:

(a) Simple OM; or
(b) Simple adjusted OM; or
(c) Dispatch data analysis OM; or
(d) Average OM

From 2003 to 2007, among the total electricity generation of Sumatera Grid that the CPA is connected into, the amount of low-cost/must-run resources to the Sumatera electricity grid accounts for 20.95%, 17.90%, 17.28%, 19.52% and 21.99% respectively, all less than 50%,

therefore option (a) can be used to calculate the operating margin emission factor of Sumatera Grid.

The rate of low-cost/must run resources based on electricity generation in Sumatera Grid is showed in the following table:

Table B.6.1 Rate of low cost/must-run sources based on electricity generation[11]

Year	2003	2004	2005	2006	2007	Average
Rate of low cost/must-run sources generation, %	20.95%	17.90%	17.28%	19.52%	21.99%	19.57%

The "Tool" offers the choice between two data vintages to calculate the Simple OM emission factor ($EF_{grid,OMsimple,y}$):

- *Ex-ante* option: If the ex ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the SSC-CDM-PDD to the DOE for validation For off-grid power plants, use a single calendar year within the five most recent calendar years prior to the time of submission of the CDM-PDD for validation.
- Ex-post option: If the ex post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required calculating the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year y-1 may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year preceding the previous year y-2 may be used. The same data vintage (y, y-1, y-2) should be used throughout all crediting periods.

The simple OM emission factor is calculated *ex-ante* using the data from 2003 to 2007 released by DNA Indonesia in December 2008.

Step 4: 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 net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run plants/units.

The "Tool to calculate the emission factor for an electricity system" offers two options to calculate $EF_{grid,OMsimple,y}$:

- *Option A*: Based on net electricity generation and a CO_2 emission factor of each power unit[12]; or
- *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.

The calculation is 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 B). This option is selected because the necessary data for Option A is not available and only

[11] Data prepared by DNA Indonesia on December 2008.

[12] Power units should be considered if some of the power units at the site of the power plant are low-cost/must-run units and some are not. Power plants can be considered if all power units at the site of the power plant belong to the group of low-cost/must-run units or if all power units at the site of the power plant do not belong to the group of low-cost/must-run units.

renewable power generations are considered as low-cost/must-run power sources and the quantity of electricity supplied to the grid by this source is known and off-grid power plants are not included in the calculation.

Option B - Calculation based on total fuel consumption and electricity generation of the system
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:

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

(Equation 7 of Tool)

Where:

$EF_{grid,OMsimple,y}$	Simple operating margin CO_2 emission factor in year *y* (tCO2/MWh)
$FC_{i,y}$	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)
$EF_{CO2,i,y}$	CO_2 emission factor of fossil fuel type *i* in year *y (* tCO2/GJ)
EG_y	Net quantity of 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 relevant year as per the data vintage chosen in step 3

For this approach (simple OM) to calculate the operating margin, the subscript m refers to the power plants/units delivering electricity to the grid, not including low-cost/must-run power plants/units.

$EF_{grid,OMsimple,y}$ = 0.906 tCO_2e/MWh (see Annex 3 for details)

Step 5: Calculate the build margin (BM) emission factor

According to “Tool to calculate the emission factor for an electricity system” (Version 02.2.1; 29/09/2011), there are two options to calculate the Build Margin emission factor as follows:

Option 1: For the first crediting period, calculate the build margin emission factor ex-ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation, For the second crediting period, the build margin emission factor should 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 should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2: For the first crediting period, the build margin emission factor shall be updated annually, ex-post, including those units built u p to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex ante, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

In terms of vintage of data, Option 1 shall be chosen for the proposed project. Details are as follows: in the first and fixed crediting period, calculating the BM emission factor ex-ante shall be

based on the most recent information available on units already built for sample group *m* at the time of SSC-CDM-PDD submission to the DOE for validation.

In term of vintage of data, there are two options for selecting the sample group of power units (*m*):

a) The set of five power units, excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently ($SET_{5\text{-units}}$) and determine their annual electricity generation ($AEG_{SET\text{-}5units,}$ in MWh); or
b) Determine their annual electricity generation of the project system, excluding power units registered as CDM project activities (AEG_{total}, in MWh). Identify the set of power units excluding power units registered as CDM project activities, that started to supply electricity to the grid most recently and that comprise 20% of AEG_{total} (if 20% falls on part of the generation of a unit, the generation of that unit is fully included in the calculation) ($SET_{\geq 20\%}$) and determine their annual electricity generation ($AGE_{SET\geq 20\%}$), in MWh);

From $SET_{5\text{-units}}$ and $SET_{\geq 20\%}$ select the set of power units that comprises the larger annual electricity generation (SET_{sample}).
As results from EF excel sheet released by DNA Indonesia, **$AEG_{SET\text{-}5units}$ = 748,913 MWh** and **$AGE_{SET\geq 20\%}$ = 3,248,295 MWh** (see Annex 3 for details).
The comparison carried out by the project participants shows that the group of power capacity additions that have been built most recently and comprise 20% of the system electricity generation ($SET_{\geq 20\%}$) has the larger annual generation than the group of five power units ($SET_{5\text{-units}}$) that have been built most recently and hence it (SET_{sample}) is employed.

The build margin emission factor is the generation-weighted average emission factor (tCO_2/MWh) of all power plant units *m* during the most recent year *y* for which power generation data is available at the time of preparing the PDD. Hence, the BM emission factor will be calculated in year 2007 based on the data made available by DNA Indonesia in December 2008.

The Build Margin is calculated as:

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

(Equation 13 of Tool)

Where:

$EF_{grid,BM,y}$	The 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	The most recent historical year for which electricity generation data is available

$EF_{grid,BM,y}$ = 0.581 tCO_2e/MWh (see Annex 3 for details)

Step 6: Calculate the combined margin emission factor

The calculation of the combined margin (CM) emission factor $EF_{grid,CM,y}$ is based on one of the following methods:
(a) Weighted average CM; or
(b) Simplified CM.

The weighted average CM method (option A) should be used as the preferred option.
The combined margin emissions factor is calculated as follows:

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

(Equation 14 of Tool)

Where:

$EF_{grid,BM,y}$	Build margin CO_2 emission factorin year y. (tCO_2/MWh)
$EF_{grid,OM,y}$	Operating margin CO_2 emission factor in year *y* (tCO_2/MWh)
w_{OM}	Weighting of the operating margin emission factor. (%)
w_{BM}	Weighting of the build margin emission factor. (%)

As indicated in the Tool, for other projects except wind and solar power generation project activities, 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. Using these values and the values of Operating Margin and Build Margin emission factors, the Combined Margin Emission Factor can be calculated as 0.743 tCO2e/MWh.

$EF_{grid, CM, y}$ = 0.743 tCO_2e/MWh

Project emissions

Project emission is calculated based on the methodology applied as follow:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$$ **(Equation 1 of ACM0001 ver.13)**

Where:

PE_y	=	Project emissions in year *y* (tCO_2e/yr)
$PE_{FF,y}$	=	Project emissions from fossil fuel consumption in year *y* (tCO_2/yr)
$PE_{GP,y}$	=	Project emissions from the operation of geothermal power plants due to the release of non-condensable gases in year *y* (tCO_2e/yr)
$PE_{HP,y}$	=	Project emissions from water reservoirs of hydro power plants in year *y* (tCO_2e/yr)

Fossil fuel combustion ($PE_{FF,y}$)

With refer to the methodology ACM0002 ver.13, the use of fossil fuels for the back up or emergency purposes (e.g. diesel generators) can be neglected. Since the project activity may use the diesel generator as the back-up purpose, the $PE_{FF,y}$ considered as zero.

Emissions of non-condensable gases from the operation of geothermal power plants ($PE_{GP,y}$)

The project activity is hydro power plant, therefore the $PE_{GP,y}$ is not accounted to this analysis.

Hence, PEy = $PE_{HP,y.}$

The power density of the project is calculated as follows:

$$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$ **(Equation 5 of ACM0002 ver.13)**

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 is a run of the river hydro power project and the project is essentially a run-of- the river reservoir scheme the power density is infinite and therefore greater than 10 W/m^2. 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 20,052 m^2. With the newly installed capacity of 12 MW the power density is therefore 598 W/m^2. This is greater than 10 W/m^2 and we therefore conclude that no project emissions need to be accounted for.

Based on the equation 4 of ACM0002 ver. 13, if the power density of the project activity (PD) is greater than 10 $W/m^{2,}$ $PE_{HP,y} = 0$

Leakage

Based on the methodology ACM0002 ver. 13, there is no leakage associated with the project activity.

Emission reduction

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

As per equation 11 of ACM0002 ver.13.0.0

$$ER_y = BE_y - PE_y$$

Where:

ER_y	=	Emission reductions in year *y* (tCO_2e/yr)
BE_y	=	Baseline emissions in year *y* (tCO_2/yr)
PE_y	=	Project emissions in year *y* (tCO_2e/yr)

B.6.2. Data and parameters fixed ex ante

Data / Parameter	$EF_{CM,grid,y}$
Unit	tCO_2e/MWh
Description	Combined Margin Grid Emission Factor
Source of data	Calculated ex-ante based on BPPT data
Value(s) applied	0.743 tCO_2e/MWh
Choice of data or Measurement methods and procedures	Calculated ex-ante based on the OM and BM emissions factor. See Annex 3.
Purpose of data	
Additional comment	Calculation of baseline emissions.

Data / Parameter	$\mathbf{EF_{grid,OMsimple,y}}$
Unit	tCO_2/MWh
Description	Simple Operating Margin CO_2 Emission Factor in year *y*
Source of data	Calculated ex-ante based on BPPT data
Value(s) applied	0.906 tCO_2/MWh

Choice of data or Measurement methods and procedures	Calculated ex-ante based on the OM and BM emissions factor. See Annex 3.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$FC_{OM,i,y}$
Unit	Mass or volume unit
Description	Amount of fossil fuel type i consumed in year y
Source of data	Calculated ex-ante based on BPPT data
Value(s) applied	See annex 3 for more details
Choice of data or Measurement methods and procedures	Calculated ex-ante based on 2005 – 2007 data. See section B6 for more details on the justification of data selection.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$EG_{OM,\ y}$
Unit	MWh
Description	Net electricity generated in year y
Source of data	Calculated ex-ante based on BPPT data
Value(s) applied	See annex 3 for more details
Choice of data or Measurement methods and procedures	Calculated ex-ante based on 2005 – 2007 data. See section B6 for more details on the justification of data selection.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$NCV_{i,y}$
Unit	GJ/mass or volume unit
Description	Net calorific value (energy content) of fossil fuel type i in year y
Source of data	Calculated ex-ante based on BPPT data
Value(s) applied	See annex 3 for more details
Choice of data or Measurement methods and procedures	Calculated ex-ante based on 2005 – 2007 data. See section B6 for more details on the justification of data selection.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$EF_{CO2,i,y}$
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	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(s) applied	See annex 3 for more details
Choice of data or Measurement methods and procedures	-
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$EF_{grid,BM,y}$
Unit	tCO_2e/MWh
Description	Build Margin Grid Emission Factor
Source of data	Calculated ex-ante based on BPPT data
Value(s) applied	0.581 tCO_2e/MWh
Choice of data or Measurement methods and procedures	Calculated ex-ante based on 2007 data and selection of recently build power plants.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$FC_{BM,i,y}$
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	Calculated ex-ante based on BPPT data
Value(s) applied	See annex 3 for more details
Choice of data or Measurement methods and procedures	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.
Purpose of data	Calculation of baseline emissions.
Additional comment	-

Data / Parameter	$EG_{BM,y}$
Unit	MWh
Description	Net electricity generated in year y by selection of recently build power plants
Source of data	Calculated ex-ante based on BPPT data
Value(s) applied	See annex 3 for more details
Choice of data or Measurement methods and procedures	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.
Purpose of data	Calculation of baseline emissions.

Additional comment	-

Data / Parameter	Cap_{BL}
Unit	W
Description	Installed capacity of the hydro power plant before the implementation of the project activity
Source of data	Project site
Value(s) applied	For new hydro power plants, this value is zero
Choice of data or Measurement methods and procedures	Determine the installed capacity based on recognized standards
Purpose of data	Calculation of project emissions.
Additional comment	-

Data / Parameter	A_{BL}
Unit	m^2
Description	Area of the single or multiple reservoirs measured in the surface of the water, before the implementation of the project activity, when the reservoir is full (m^2).
Source of data	Project site
Value(s) applied	For new reservoirs, this value is zero
Choice of data or Measurement methods and procedures	Measured from topographical surveys, maps, satellite pictures, etc.
Purpose of data	Calculation of project emissions.
Additional comment	-

B.6.3. Ex ante calculation of emission reductions

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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 56,691 tCO_2 for each of the 7 years during the crediting period.

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

56,691 tCO_2 = 76,300 MWh * 0.743 tCO_2/MWh

$PE_y = 0$

ER_y = 56,691 tCO_2

B.6.4. Summary of ex ante estimates 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	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
01/12/2012 – 30/11/2013	56,691	0	0	56,691
01/12/2013 – 30/11/2014	56,691	0	0	56,691
01/12/2014 – 30/11/2015	56,691	0	0	56,691
01/12/2015 – 30/11/2016	56,691	0	0	56,691
01/12/2016 – 30/11/2017	56,691	0	0	56,691
01/12/2017 – 30/11/2018	56,691	0	0	56,691
01/12/2018 – 30/11/2019	56,691	0	0	56,691
Total	**396,837**	**0**	**0**	**396,837**
Total number of crediting years	**07 years**			
Annual average over the crediting period	**56,691**	**0**	**0**	**56,691**

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data / Parameter	**$EG_{facility,y}$**
Unit	MWh/yr
Description	Quantity of net electricity generation supplied by the project plant to the grid in year *y*.
Source of data	Measured at the primary power meter
Value(s) applied	76,300 MWh
Measurement methods and procedures	This value will be calculated based on the reading on one ~~bi-~~directional energy meters that measure the value of export ~~and import~~ electricity. The value will be monitored every hour and recorded in a log book. . The measurement of electricity will be in accordance with the PPA. The metering instruments will be calibrated ~~annually~~ every 05 years[13]. The net amount of power supplied to the grid by the project will be continuously measured and recorded monthly.
Monitoring frequency	Continuous measurement and at least monthly recording

[13] Following MEMR 37-2008.

QA/QC procedures	The amount from primary meter (POPLN) can be is cross-checked with the comparisonsecond meter (POPLN). In case of inconsistencies between these meters, a Commissions appointed by PLN and PO will determine the amount of power supplied to the grid. This is in line with the procedure to determine power sales as PPA. The bi one directional meters have registered accuracy class of 0.2S or 0.5S IEC 687and/or 2 IEC 1268 that complies towith Indonesian Standard.
Purpose of data	Calculation of baseline emissions.
Additional comment	Monitored data will be kept for two years after the end of each crediting period or the last issuance of CERs, whichever occurs later.

Data / Parameter	Cap_{PJ}
Unit	W
Description	Installed capacity of the hydro power plant after the implementation of the project activity
Source of data	Project site
Value(s) applied	3 x 4,000,000 W
Measurement methods and procedures	Determine the installed capacity based generator nameplates. The data should be recorded yearly.
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	Calculation of project emissions.
Additional comment	-

Data / Parameter	A_{PJ}
Unit	m^2
Description	Area of the run of river reservoir measured in the surface of the water, after the implementation of the project activity, when the run of river reservoir is full
Source of data	Project site
Value(s) applied	20,052 m^2
Measurement methods and procedures	Measured from topographical surveys, maps, satellite pictures, etc. The data should be recorded yearly.
Monitoring frequency	Yearly
QA/QC procedures	-
Purpose of data	Calculation of project emissions.
Additional comment	-

B.7.2. Sampling plan

>>

Not applicable.

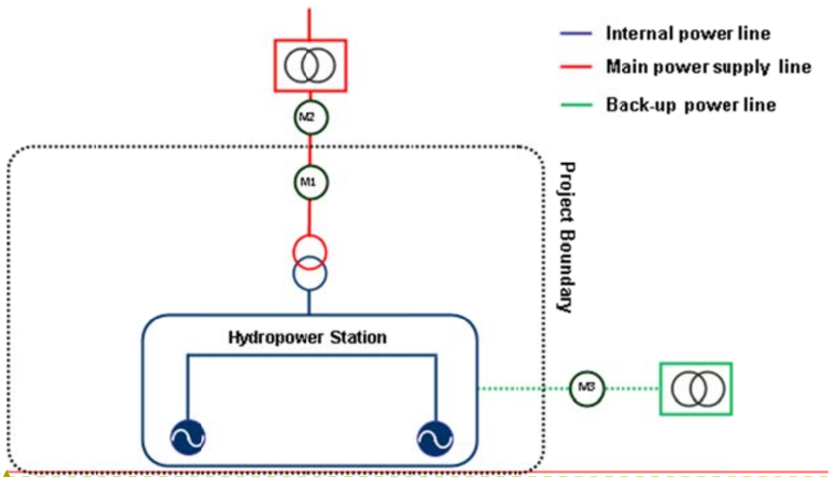
B.7.3. Other elements of monitoring plan

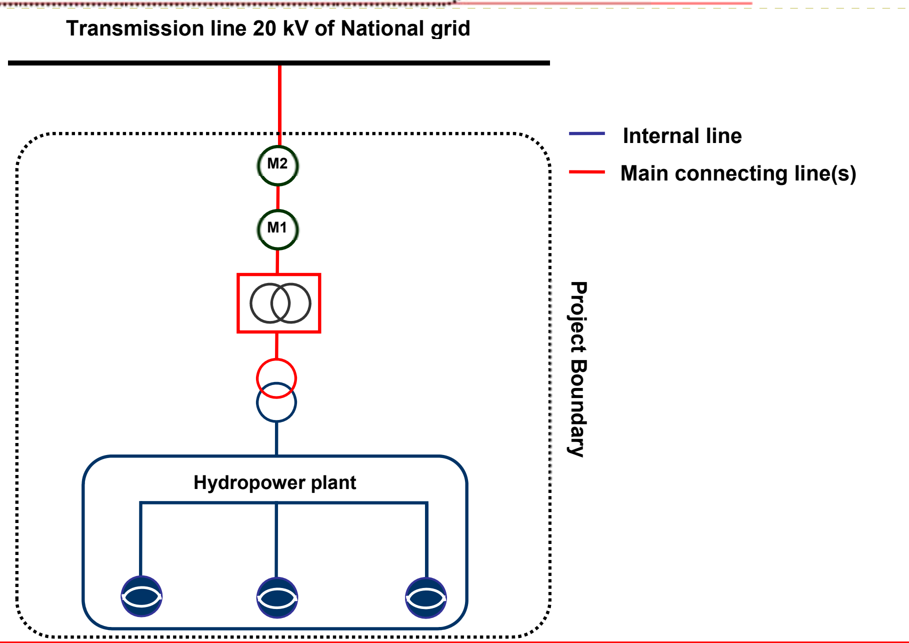
>>

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 (import) power line to provide emergency power in case the project is not operational.~~

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





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

- **Power supplied to the grid through main power line~~s~~:**
  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:
  - o Project entity: 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 electricity~~net~~ supply to the Grid via ~~as~~ the main power supply line~~s~~. ~~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.~~
  - o Grid company: The grid company will will join with the project entity to meter the power supply to the Grid ~~also at the high voltage side of the on-site transformer station~~ with its own metering equipment. M2 (primary meter) is ~~The meter will be located at the TES Substation~~ owned and operated by the project entity while the M1 (comparison meter or backup meter) belongs to the Grid Company. Both the meters will be located at the power house~~state utility~~. The national regulations of the grid company requires every 05 year ~~annual~~ calibrations of both metering instruments.
  - o Calibration: Calibrations are carried out by the grid company or by a certified company every 05 years. If there are any substantial discrepancies between the readings of the metering instruments throughout the year, the error~~both~~ instruments will be recalibrated.

There is no electricity imported from the Grid in the project boundary. In emergency cases, the project will use a small backup diesel generator instead for auxiliary maintenance activities such as welding, repairing etc., but not for generating power for internal using purposes.

- ~~**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 dotted green straight line) 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:~~
  - ~~o Grid company:~~
    ~~The grid company will meter the power supplied to the project with its own metering equipment in accordance with national regulations.~~
  - o ~~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 but in this case the net supply is equal to the gross supply) will be used in the calculations. Primary meter M2 measures the amount of electricity of purchasing, selling as basis to make invoices as well as determines net electricity generation by the project activity to calculate emission reductions. In normal operation condition, the result of M1 could be used to cross check and confirm the correct data of M2. If there are any problems of M2, the result of M1 during break-down period could be used invoicing and calculating the net electricity generation by the project instead of the incorrect result of M2 or any way agreed between the Project Entity (i.e. PT Mega Power Mandiri) and the Grid Company (i.e. PT PLN)[14].~~In case of discrepancies between the metering instruments of the grid company and the project entity, the readings of the grid company~~

[14] Following PPA signed between Project Entity (PT. Mega Power Mandiri) and the Grid Company (PT. PLN) on 19/07/2007 and the national regulation MEMR 37-2008.

~~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 ($EG_{facility,y}$ in section B.7.1.) is calculated on a monthly basis as:

Equation B.13

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

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 (backup meter)	Grid Company ~~Project entity~~	Continuous	Daily (optional) [15]	every 05 years[16] ~~Monthly~~	every 05 years[17] ~~Annually~~	0.5S (kWh-active); 2 (kVArh-reactive) ~~1% or more accurate~~	Print out of electronic record and optional paper log. Data will consist of one ~~two~~ readings~~s~~, i.e. power delivered to the grid ~~and power received from the grid or combined as net supply.~~
M2 (Primary meter)	Project entity~~Grid company~~	Continuous	Daily (optional) [18]	Monthly	every 05 years[19] ~~Annually~~	0.2S (kWh-active); 2 (kVArh-reactive)~~1% or~~	Monthly sales receipts (for power delivered to grid) ~~and billing invoices (for power received from the grid), or~~

[15] The project entity intends to log the readings of meters M1x and ~~M1x~~ M2x manually in daily logs, but these logs will not form a formal requirement during verification. The ACM0002 methodology requires continuous measurement and at least monthly recording. 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.

[16] Following the Regulation MEMR No.37-2008

[17] Following the Regulation MEMR No.37-2008

[18] The project entity intends to log the readings of meters M1x and ~~M1x~~ M2x manually in daily logs, but these logs will not form a formal requirement during verification. The ACM0002 methodology Continuous measurement and at least monthly recording 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.

[19] Following the Regulation MEMR No.37-2008

						~~more accurate~~	~~alternatively a single receipt which shows net power received.~~

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

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.
To ensure for monitoring effectively, the Project Owner expects the organization chart of Lebong HEPP on CDM who are responsible for collecting, monitoring, auditing and storing data.

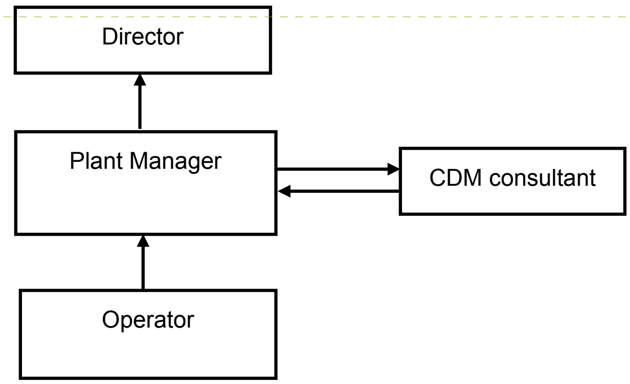


Figure B.7.2.2 Operational chart of Lebong HEPP.

Role and responsibility

Personal role and responsibility in organization chart as the following:

Director

Take overall responsibility for all activities of the project activity and approve report of internal audit and management review annually.

Plant Manager

- Take responsibility for monitoring procedure.
- Checking the performance of monitoring plan.
- Report the quality of monitoring to CDM Manager.
- Review monitoring report and guide for monitoring.
- Review calculation the emission reduction (CER).
- Produce monthly electricity production.
- Implement the internal audit, i.e. check how the monitoring procedure to be done in the plant in line with the CDM monitoring manual or not.
- Join with representative of the Grid company to read data of meters for billing purpose in the end of every month.
- Cooperate with CDM consultant staff to ensure the CDM monitoring procedure implemented in the plant that is following the applicable methodology.

Operator

- Record data monthly and at the beginning or end of crediting period as per CDM monitoring manual.
- Notify Shift Leader about data electricity production/turbin.
- Notify Technical Division and Shift Leader if there are any problems of meters.
- Calculation the emission reduction (CER).
- Transfer and store data into computer (if applicable)

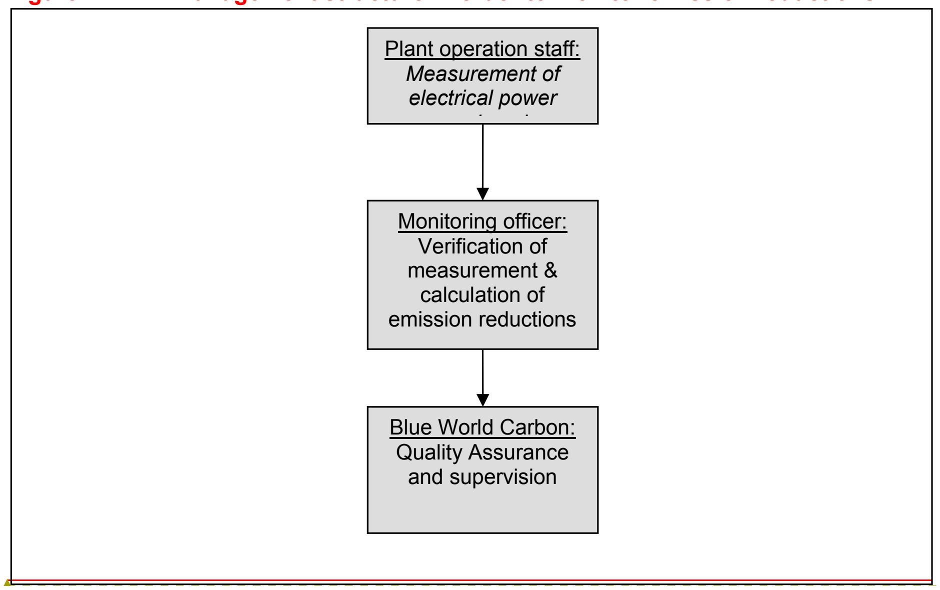
CDM Consultant

- Train directly qualified staffs of the plant in monitoring and supporting on CDM monitoring methodology.
- Check documented evidences of data.
- Prepare monitoring report at the end of crediting period
- Cooperate with the plant throughout the verification period
- Being in charge of monitoring report and verification with DOE

~~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**~~



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B.8. Date of completion of application of methodology and standardized baseline and contact information of responsible persons/ entities

>>

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
Director of Operation.

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>>

The project activity's starting date is 28/01/2008 (Construction agreement signed with contractor for waterway and land clearing)

C.1.2. Expected operational lifetime of project activity

>>

25 year, 0 months

C.2. Crediting period of project activity

C.2.1. Type of crediting period

>>

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

C.2.2. Start date of crediting period

>>

Starting date of the crediting period is start operation of the project activity on 01/12/2012 or date of registration whichever is later

C.2.3. Length of crediting period

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

SECTION D. Environmental impacts

D.1. Analysis of environmental 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	No Significant Positive Impact	b	No Significant Negative Impact	c	there is significant negative impact

D.2. Environmental impact assessment

>>

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. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>>

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 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 consideration of comments received

>>

All comments were noted and no action was needed.

SECTION F. Approval and authorization

>>

The Letters of Approval have been issued by the DNA host country of Indonesia on 14/05/2012 and by the DNA of Sweden on 04/07/2012.

- - - - -

Appendix 1. Contact information of project participants and responsible persons/ entities

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	PT Mega Power Mandiri
Street/P.O. Box	Jln. Amil No 7
Building	
City	Jakarta
State/Region	Buncit Raya
Postcode	12740
Country	Republic of Indonesia
Telephone	+62 21 799 0218
Fax	
E-mail	bkkpower@indosat.net.id
Website	
Contact person	
Title	Director
Salutation	Mr.
Last name	Santoso
Middle name	
First name	Joko
Department	
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	bkkpower@indosat.net.id

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Nordic Environment Finance Corporation NEFCO in its capacity as Fund Manager to the NEFCO Carbon Fund (NeCF)
Street/P.O. Box	Fabianinkatu 34, P.O. Box 249
Building	34
City	Helsinki
State/Region	
Postcode	FI-00171
Country	Finland
Telephone	+358 10 6180 644
Fax	+358 9 630 976
E-mail	
Website	
Contact person	Ash Sharma

Title	Vice President, Head of Carbon Finance and Funds
Salutation	Mr.
Last name	Sharma
Middle name	
First name	Ash
Department	
Mobile	+358 10 6180 644
Direct fax	+358 9 630 976
Direct tel.	
Personal e-mail	ash.sharma@nefco.fi

Project participant and/or responsible person/ entity	☐ Project participant ☒ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
Organization name	Blue World Carbon SEA Pte Ltd
Street/P.O. Box	15A Temple Street #02-01
Building	
City	Singapore
State/Region	
Postcode	058562
Country	Singapore
Telephone	+65 6338 9411
Fax	+65 6338 9411
E-mail	
Website	www.blueworldcarbon.com
Contact person	Joost Willem van Acht
Title	Managing Director
Salutation	Mr.
Last name	van Acht
Middle name	
First name	Joost Willem
Department	
Mobile	
Direct fax	+65 6338 9411
Direct tel.	+65 6338 9411
Personal e-mail	joost.van.acht@blueworldcarbon.com

Appendix 2. Affirmation regarding public funding

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

Appendix 3. Applicability of methodology and standardized baseline

The applicability of selected methodology has been demonstrated in section B.2 above.

Appendix 4. Further background information on ex ante calculation of emission reductions

Calculation of Operating Margin

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

Fuel	Unit	Sumbagsel (include IPP)	Sumbagut	Total	EF (tC/TJ)	Oxidation (%)	NCV	CO_2 Emission (tCO_{2e})
		A	B	C = A + B	D	E	F	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)	Sumbagut	Total	EF (tC/TJ)	Oxidation (%)	NCV	CO_2 Emission (tCO_{2e})
		A	B	C = A + B	D	E	F	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)	Sumbagut	Total	EF (tC/TJ)	Oxidation (%)	NCV	CO_2 Emission (tCO_{2e})
		A	B	C = A + B	D	E	F	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

$EF_{OM 2006}$	0.906	tCO2e/MWh	Operating Margin

Calculation of Building Margin

#	Station	Installed capacity (kW)	Year of Commission	Fuel Type	Fuel				Electricity Generation		
					Coal (ton)	Gas (MMBTU)	HSD (kl)		2007 (Gross)	Parasitic load (ave)	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

Legend:
MFO: Marine Fuel Oil
IDO: Industrial Diesel Oil
HSD: High Speed Diesel
NCV: Net Calorific Value
IPP: Independent Power Producer
PPO: Pure Plant Oil
MMBTU: Million Metric Thermal British Units
PLTU: Pembangkit Listrik Tenaga Uap (Steam/Coal Power Plant)
PLTG: Pembangkit Listrik Tenaga Gas (Open Cycle Gas Power Plant)
PLTD: Pembangkit Listrik Tenaga Diesel (Diesel Power Plant)
PLTA: Pembangkit Listrik Tenaga Air (Hydro Power Plant)
PLTGU: Pembangkit Listrik Tenaga Gas-Uap (Combined Cycle Power Plant)
Sumbagsel: Sumatera Bagian Selatan (South Side of Sumatera)
Sumbagut: Sumatera Bagian Utara (North Side of Sumatera)

Appendix 5. Further background information on monitoring plan

No additional information.

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

Appendix 6. Summary of post registration changes

A. There are some corrections need to be addressed for the project:

1. The precise GPS coordinates of the project have been updated after the site visit verification in section A.2 above and section A.2.4 of revised PDD (version 03.2)
2. Corrections on some parameters of turbine-generator specification. Please see the revised PDD (version 03.2) and section B.1 of this MR.
3. Corrections on some technical parameters of the project have been addressed in the revised PDD (version 03.2).
4. Correction on the backup meter's position: The backup meter is installed at the power house of Lebong Hydropower plant.
5. Accuracy of meters have been corrected more accurately following the meter specifications as well as the national requirement in MEMR 37-2008, i.e. 0.2S (kWh-active) and 2 (kVArh-reactive) for main meter (M2) and 0.5S (kWh-active) and 2 (kVArh-reactive) for backup meter (M1).
6. Operational And Management Structure for Monitoring

The operational and management structure for monitoring of the project has been corrected according to the actual organization established to manage and monitor the project in section B.7.3 of revised PDD (version 03.2).

B. Permanent changes from registered monitoring plan

1. The type of meters installed in the plant measuring the electricity exported to the Grid has been incorrectly mentioned as bidirectional meters instead of one directional meters, which has been corrected in the monitoring report. There is no electricity imported from the Grid in case of emergencies or when the turbines of the proposed project activity are not in operation, i.e. the backup power line (via M3) figured in green dotted line in the Figure B.7.2.1 of the registered PDD does not exist in the reality. In case of emergencies, the project will use the power generated from backup diesel generator for auxiliary maintenance activities such as welding, repairing etc.
2. Changes in calibration frequency

As per section B.7.2 of the registered PDD, the meters need to be recalibrated annually. However, following the national regulation MEMR 37-2008, the calibration frequency is required every 05 years. The PPA signed between the project entity (PT Mega Power Mandiri) and Grid company (PT PLN) on 19/07/2007 also reflected the same situation. Hence, the calibration frequency of the meters has been revised to every 05 years actually.

All the changes above do not impact on:
(a) Additionality of the project activity;
(b) Scale of the project activity;
(c) Applicability and application of the approved baseline methodology and, where applicable, the approved standardized baseline under which the project activity has been registered;
(d) Compliance of the monitoring plan with the applied methodology; or
(e) The level of accuracy and completeness in the monitoring of the project activity;
Hence, these changes do not require prior approval by the Board following Appendix 1 of PS.

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