

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

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**Revision history of this document**

<b>Version Number</b>	<b>Date</b>	<b>Description and reason of revision</b>
01	21 January 2003	Initial adoption
02	8 July 2005	<ul style="list-style-type: none"><li>• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document.</li><li>• As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at <a href="http://cdm.unfccc.int/Reference/Documents">http://cdm.unfccc.int/Reference/Documents</a>.</li></ul>
03	22 December 2006	<ul style="list-style-type: none"><li>• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.</li></ul>

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**SECTION A. General description of small-scale project activity**
**A.1 Title of the small-scale project activity:**

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Batu Balai and Padang Guci bundled hydropower projects

Version 1

21/10/2009

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

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The Batu Balai and Padang Guci hydropower projects are both located in Bengkulu province in the south of Sumatra, Indonesia. Both the projects are run-of-river hydroelectric power plants using a hydro source to displace electricity generated by the combustion of fossil fuels that would lead to anthropogenic emissions of greenhouse gases. The bundled project activity will produce a zero emissions source of electricity for the Sumatra Grid (hereafter referred to as the “Grid”). The electricity will be sold to the state-owned electricity company Perusahaan Listrik Negara (PLN).

Together the project activities are expected to generate 55,188 MWh of power per year. The average annual emission reduction of the bundle project activity is 37,372 tCO<sub>2</sub>e from 01/08/2010.

Annual emission reductions are only achieved with Batu Balai project, for year 1 (01/08/2010 - 01/08/2011), and from both projects, Batu Balai and Padang Guci, for year 2-7 (01/08/2011 - 01/08/2017).

**Batu Balai**

The Batu Balai project is being developed by PT Manna Energy Pratama. The company aims to utilize water of the Bengkenang River in a run-of-river hydroelectric power plant to generate 4 MW of power. The power plant consists of two turbines of 2 MW each which will supply zero emissions electricity to the Sumatra Grid.

The project is expected to generate 24,528 MWh of power per year. The average annual emission reductions are estimated to be 18,042 tCO<sub>2</sub>e per annum during the first crediting period.

**Padang Guci**

The Padang Guci project is being developed by PT Prima Mega Resources. The company aims to utilize the water of Padang Guci River in a run-of-river hydroelectric power plant to generate 5 MW of power. The power plant consists of two turbines of 2.5 MW each which will supply zero emissions electricity to the Sumatra Grid.

The project is expected to generate 30,660 MWh of power per year. The average annual emission reductions are estimated to be 19,330 tCO<sub>2</sub>e per annum during the first crediting period.

**Contribution of the projects to socio-economical well being**

The project activities improve the connectivity of the local area since it will result in the construction of additional roads.

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The projects will contribute to the socio-economic situation of the local people through the creation of employment opportunities during the construction of the power plants and through the provision of regular employment opportunities once the projects are commissioned.

### **Contribution of the projects to the Environment**

The project activities utilize the available hydro resource from Air Bengkenang and Padang Guci Rivers for generating electricity. The projects do not result in degradation of any natural resources, health standards, etc. and will not cause any air, water, or noise pollution at the project areas.

The project activities are run-of-river hydroelectric plants and do not involve the construction of any dams. The negative impacts often associated with dams such as the relocation of communities and residents as well as transfer of waterways will therefore not occur.

The project activities produce electricity without any greenhouse gas emissions. This will have a positive impact not only through a reduction of greenhouse gas emissions but also through a reduction of other harmful emissions, like NO<sub>x</sub>, SO<sub>x</sub>, and particulates that would arise in the baseline.

#### **A.3. Project participants:**

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The project participants are as follows

<b>Name of Party involved (host) indicates a host Party)</b>	<b>Private and/or public entity(ies) project participants (as applicable)</b>	<b>If Party wishes to be considered as a project participant</b>
Indonesia (host)	PT Prima Mega Resources	No
Indonesia (host)	PT Manna Energy Pratama	No
United Kingdom	Agrinergy Pte Ltd	No

Further contact information of project participants is provided in Annex 1.

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

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

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##### **A.4.1.1. Host Party(ies):**

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Indonesia

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

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##### **Batu Balai**

Bengkulu Province, South Sumatera

##### **Padang Guci**

Bengkulu Province, South Sumatera

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

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**Batu Balai**

Batu Balai village, Seginim sub-district, South Bengkulu district.

**Padang Guci**

Bungin Tambun village, Padang Guci sub-district, Kaur district.

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

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The geographical coordinates of the projects<sup>1</sup> are:

**Batu Balai:** Latitude: 4°21'S" - Longitude: 103° 08' E.

The Batu Balai project is located in Seginim sub-district, 175 km from Bengkulu.

**Padang Guci:** Latitude: 02°19'30"S - Longitude: 98°25'10"E.

The Padang Guci project is located 7 km from Padang Guci village and 190 km from Bengkulu.

The following maps show the exact location of the projects:



**Figure 1:** Location map of Indonesia

<sup>1</sup> Sources: Feasibility Study Reports (BB page 5 - PG A 3)

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Figure 3: Location map of Batu Balai project



Figure 4: Location map of Padang Guci project

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

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According to the categorization of Appendix B to the *Simplified Modalities and Procedures for Small scale CDM Project Activities*, the project type and category are as follows:

Type I: Renewable energy project

Category D.: Grid connected renewable electricity generation

**Technology Description**
**Batu Balai**

The Batu Balai hydropower project consists of two horizontal Francis turbines of 2 MW each, the total installed capacity of the power plant is 4 MW. The project is expected to generate 24,528 MWh of power per year, and has a predicted annual gross electricity output of 24,283 MWh. The produced electricity will be delivered to the grid via a 9 km new 20 kV transmission line built by Pt PLN.

The main purpose of the project activity is to utilize the hydrological resources of the Air Bengkenang River in a run-of-river hydroelectric power plant to supply electricity to the grid. The river covers an average area of 167 km<sup>2</sup>, assuring the continuity of a yearly average flow of 10.49 m<sup>3</sup>/sec<sup>2</sup>.

**Padang Guci**

The Padang Guci hydropower project consist of two horizontal Francis turbines of 2.5 MW each, the total installed capacity of the power plant is 5 MW. The project is expected to generate 30,660 MWh of power per year, and has a predicted annual gross electricity output of 30,353 MWh. The produced electricity will be delivered to the grid via a 9 km new 20 kV transmission line built by Pt PLN.

The main purpose of the project activity is to utilize the water of the Padang Guci River in a run-of-river hydroelectric power plant to supply electricity to the grid. The river covers an average area of 168 km<sup>2</sup>, assuring the continuity of a yearly average flow of 13m<sup>3</sup>/sec<sup>3</sup>.

The key technology parameters, for both projects, are detailed in Table A.1 below:

**Table A.1: Key technology parameters<sup>4</sup>**

Parameters	Batu Balai	Padang Guci
Gross head	42 m	39 m
Net head	42 m	36 m
Penstock length.	490 m	142 m
Penstock diameter	2.20 m	2.20 m
<b>Turbine</b>		
Type	Francis	Francis
Shaft orientation	Horizontal	Horizontal
Number of units	2	2
Capacity	2 x 2 MW	2 x 2.5 MW

<sup>2</sup> Sources: Feasibility Study Reports (BB page 30)

<sup>3</sup> Sources: Feasibility Study Reports (PG A-18)

<sup>4</sup> Sources: All values are provided from the feasibility studies (BB page 30, 36, 41 - PG A 18-20, A 27)

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<b>Generator</b>		
Rotational speed	600 rpm	750rpm
Frequency	50 Hz	50 Hz
Capacity	2 x 2250 kVA	2 x 3125 kVA
Rated Voltage	6.3 kV	6.3 kV
Rated Power factor	0.84	0.84

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

&gt;&gt;

The proposed bundled project activity has applied a seven year renewable crediting period. The first 7 year crediting period is expected to start from 01/08/2010. The total average annual emissions reduction of the project activities is estimated to be 37,373 tonnes of CO<sub>2</sub>e and the total emissions reduction during the first crediting period will be 261,609 tCO<sub>2</sub>e.

**Batu Balai**

<b>Years</b>	<b>Estimation of annual emission reductions in tonnes of CO<sub>2</sub> e</b>
01/08/2010 - 01/08/2011	18,042
01/08/2011 - 01/08/2012	18,042
01/08/2012 - 01/08/2013	18,042
01/08/2013 - 01/08/2014	18,042
01/08/2014 - 01/08/2015	18,042
01/08/2015 - 01/08/2016	18,042
01/08/2016 - 01/08/2017	18,042
<b>Total estimated reductions (tonnes of CO<sub>2</sub> e)</b>	<b>126,294</b>
<b>Total number of crediting years</b>	<b>7</b>
<b>Annual average of the estimated reductions over the crediting period (tonnes of CO<sub>2</sub> e)</b>	<b>18,042</b>

**Padang Guci**

Padang Guci hydropower plant will only be operational from 01/08/2011, therefore annual emission reductions for year 1 (01/08/2010 - 01/08/2011) are nil.

<b>Years</b>	<b>Estimation of annual emission reductions in tonnes of CO<sub>2</sub> e</b>
01/08/2010 - 01/08/2011	0
01/08/2011 - 01/08/2012	22,552
01/08/2012 - 01/08/2013	22,552
01/08/2013 - 01/08/2014	22,552
01/08/2014 - 01/08/2015	22,552
01/08/2015 - 01/08/2016	22,552
01/08/2016 - 01/08/2017	22,552
<b>Total estimated reductions (tonnes of CO<sub>2</sub> e)</b>	<b>135,315</b>
<b>Total number of crediting years</b>	<b>7</b>

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<b>Annual average of the estimated reductions over the crediting period</b> (tonnes of CO <sub>2</sub> e)	19,330
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The average annual emission reduction of the bundle projects is 37,372 tonnes of CO<sub>2</sub>e from 01/08/2010. Annual emission reductions, for year 1, are only achieved with Batu Balai project and from both projects, for year 2-7.

<b>Years</b>	<b>Estimation of annual emission reductions in tonnes of CO<sub>2</sub> e</b>
01/08/2010 - 01/08/2011	18,042
01/08/2011 - 01/08/2012	40,595
01/08/2012 - 01/08/2013	40,595
01/08/2013 - 01/08/2014	40,595
01/08/2014 - 01/08/2015	40,595
01/08/2015 - 01/08/2016	40,595
01/08/2016 - 01/08/2017	40,595
<b>Total estimated reductions</b> (tonnes of CO <sub>2</sub> e)	261,609
<b>Total number of crediting years</b>	7
<b>Annual average of the estimated reductions over the crediting period</b> (tonnes of CO <sub>2</sub> e)	37,372

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

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Neither project activities will apply for any public funding or Official Development Assistance (ODA).

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

&gt;&gt;

According to paragraph 2 of Appendix C to the Simplified Modalities and Procedures for Small-Scale CDM project activities,

*“A proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:*

- *With the same project participants;*
- *In the same project category and technology / measure; and*
- *Registered within the previous 2 years; and*
- *Whose project boundary is within 1km of the project boundary of the proposed small-scale activity at the closest point.”*

#### **Batu Balai**

The project does not have any other proposed small-scale activity within 1 km of the project boundary and is therefore is not a debundled component of a large scale project activity.

#### **Padang Guci**

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The project does not have any other proposed small-scale activity within 1 km of the project boundary and is therefore is not a debundled component of a large scale project activity.

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

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Type I – Renewable Energy Projects

Category D – Grid connected renewable electricity generation

Version 14, valid from 17 July 2009

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

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**Table B.1: Applicability of small-scale methodology AMS-I.D**

Technology/Measure per AMS ID	Batu Balai	Padang Guci
This category comprises renewable energy generation units, such as photovoltaics, hydro, tidal/wave, wind, geothermal and renewable biomass, that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit.	The proposed project is based on hydropower, which is a renewable energy generation technology. The generated electricity is supplied to the grid which is predominantly being supplied by fossil fuel fired generating units.	The proposed project is based on hydropower, which is a renewable energy generation technology. The generated electricity is supplied to the grid which is predominantly being supplied by non-renewable by fossil fuel fired generating units.
If the unit added has both renewable and non-renewable components (e.g.. a wind/diesel unit), the eligibility limit of 15MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15MW.	The project has only renewable components with the total installed capacity of 4 MW.	The project has only renewable components with the total installed capacity of 5 MW.
Combined heat and power (co-generation) systems are not eligible under this category.	The project is not a co-generation project. This criterion is therefore not applicable.	The project is not a co-generation project. This criterion is therefore not applicable.
In the case of project activities that involve the addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct <sup>2</sup> from the existing units.	The project will not add a renewable energy generation unit at an existing renewable energy generation site. This criterion is therefore not applicable.	The project will not add a renewable energy generation unit at an existing renewable energy generation site. This criterion is therefore not applicable.
Project activities that seek to retrofit or modify an existing facility for renewable energy generation are	The project activity does not seek to modify or retrofit an existing facility. This	The project activity does not seek to modify or retrofit an existing facility. This criterion

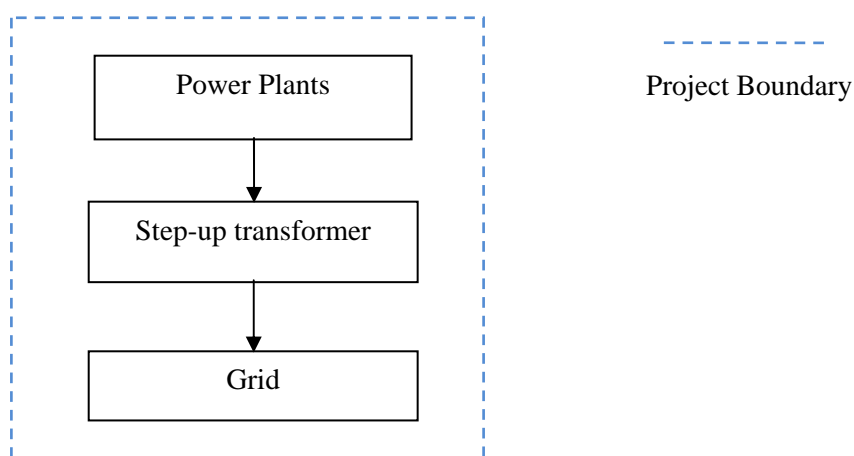
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included in this category. To qualify as a small-scale project, the total output of the modified or retrofitted unit shall not exceed the limit of 15 MW.	criterion is therefore not applicable.	is therefore not applicable.
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**B.3. Description of the project boundary:**

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As per paragraph 6 of the methodology “*The project boundary encompasses the physical, geographical site of the renewable generation source*”. The project boundary for both projects will be the same as shown below.



The electricity transmission grid of Indonesia is divided in seven independent grids, Sumatra, Jamali, three in Kalimantan, and two in Sulawesi. The Sumatra grid is not connected to Jamali, Kalimantan, and Sulawesi grids. The grid emission factor is defined by the Indonesian DNA and calculated by the Agency for the Assessment and Application of Technology, (BPPT) and Directorate General of Electricity and Energy Utilization, under the Ministry of Environment of Indonesia.

**B.4. Description of baseline and its development:**

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The project activity comprises hydropower generation units that supply electricity to and/or displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit.

As per paragraph 10 of the methodology:

*The Emission Factor can be calculated in a transparent and conservative manner as follows:*

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

OR

(b) *The weighted average emissions (in kg CO<sub>2</sub>e/kWh) of the current generation mix.*

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The Agency for the Assessment and Application of Technology, (BPPT) and Directorate General of Electricity and Energy Utilization, under the Ministry of Environment of Indonesia, has estimated the combined margin of the Sumatera grid to be 0.743 tCO<sub>2</sub>/MWh.

**Table B.2: Data used to determine the Baseline Emission factor**

Variable	Symbol	Value (tCO <sub>2</sub> /MWh)	Source
Operating Margin Emission factor	EF <sub>grid,OM,v</sub>	0.906	BPPT <sup>5</sup>
Building Margin Emission factor	EF <sub>grid,BM,v</sub>	0.581	
Combined Margin Emission factor	EF <sub>grid,CM,v</sub>	0.743	

**B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered small-scale CDM project activity:**

In accordance to Attachment A of Appendix B of the simplified modalities and procedures for small-scale CDM project activities, the project participants demonstrate that the project activity would not have occurred anyway due to the investment barrier, i.e., a financially more viable alternative to the project activities would have led to higher emissions.

**Investment Barriers:**

As an independent power producer, PT Manna Energy Pratama (Batu Balai) and PT Prima Mega Resources (Padang Guci) have decided to implement the project activities taking into consideration the CDM revenues. The need for the CDM revenues streams mainly from the high investment cost involved in the project activity.

The project IRR has been chosen as the appropriate financial indicator in this project type and the decision-making context and is then compared to the benchmark of 19.24%. The benchmark should be based on parameters that are standard in the market. All financial information used for the benchmark determination is publicly available.

The benchmark for this project is calculated using weighted average capital cost (WACC) in which the required return on equity is calculated using CAPM (Capital Asset Pricing Method) which is widely accepted as a suitable approach among financials managers to take investment decisions and in line with the paragraph 6a of Tool for the demonstration and assessment of additionality which states benchmarks shall be derived from government bond rates, increased by a suitable risk premium. Due to the lack of data on the power sector in Indonesia, the benchmark is derived from government bond rate in Indonesia, increased by a suitable premium to reflect private investment in infrastructure sector. Infrastructure sector risks are very similar to power sector risks as both projects share similar parameters in terms of project life cycle, capital intensive, project gestation period, etc. Hence it can be assumed the capital structure can be similar to power sector due to similarity between the sectors. The calculation of the WACC yields a benchmark value of 19.24%. All the calculations underlying the project IRR and benchmark have been detailed in a spreadsheet which will be provided to the validator.

**Table B.3: Specific assumptions for project IRR calculation**

Assumptions	Batu Balai	Padang Guci	Units	Source
Plant capacity	2x2	2x2.5	MW	Feasibility study

<sup>5</sup> Source: Indonesian Directorate General of Electricity and Energy Utilization.: [Updating Baseline EF Sumatera 2008 Final](#)

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Plant load factor	70	70	%	Feasibility study <sup>6</sup>
Auxiliary consumption	1	1	%	Feasibility study <sup>6</sup>
Electricity tariff	450	460	IDR/kWh	PPA with PLN
Net electricity supplied to the grid	24,282,720	30,353,400	kWh	Feasibility study
Lifetime	25	25	years	Feasibility study
Investment Cost	60,158,140,900	80,550,155,197	IDR	Feasibility study
O&M in the year t	2,561,045,688	2,357,754,000	IDR	Financial Analysis
Income tax	30	30	%	Gvt of Indonesia
CER price	25.88	25.88	USD	<a href="http://www.ecx.eu">www.ecx.eu</a>

The revenue streams associated with the project activities are only from the generation of electricity, the results of the project IRR under this scenario is shown below:

**Table B.4: Project IRR revenue**

IRR	Without CDM
Batu Balai	12.07%
Padang Guci	11.37%

**Batu Balai**

According to calculation, Batu Balai project IRR without CDM revenue is 12.07%, which is lower than the benchmark rate of 19.24% so it can be concluded the project is additional.

**Padang Guci**

According to calculation, Padang Guci project IRR without CDM revenue is 11.37%, which is lower than the benchmark rate of 19.24% so it can be concluded the project is additional.

**Sensitivity Analysis:**

A sensitivity analysis has been performed to confirm the conclusion regarding the financial analysis. The project IRR is re-calculated for the following critical parameters:

- Electricity tariffs
- Investments costs
- O&M costs
- Plant load factor

The sensitivity analysis was conducted with variations in each of the above critical parameters.

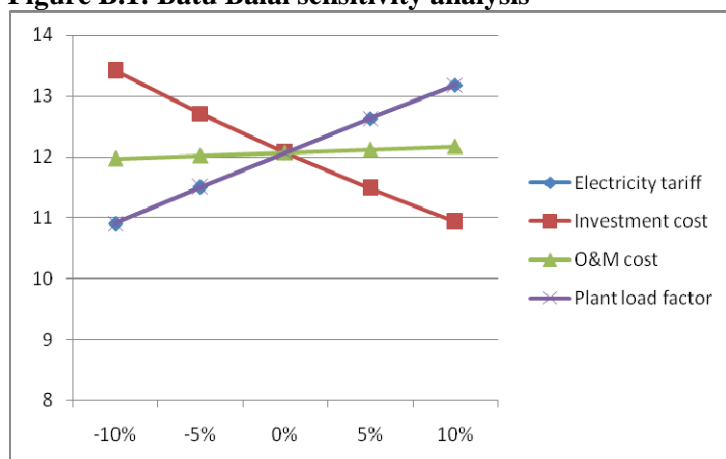
**Table B.5: Batu Balai sensitivity analysis for each option**

Parameter	-10%	-5%	0%	5%	10%
<b>Electricity tariff</b>	10.91	11.5	12.07	12.63	13.18
<b>Investment cost</b>	13.41	12.71	12.07	11.48	10.93
<b>O&amp;M cost</b>	11.97	12.02	12.07	12.12	12.17
<b>Plant load factor</b>	10.9	11.5	12.07	12.63	13.18

<sup>6</sup> Sources: Feasibility Study Reports (BB page 62 - PG A 47)

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**Figure B.1: Batu Balai sensitivity analysis**

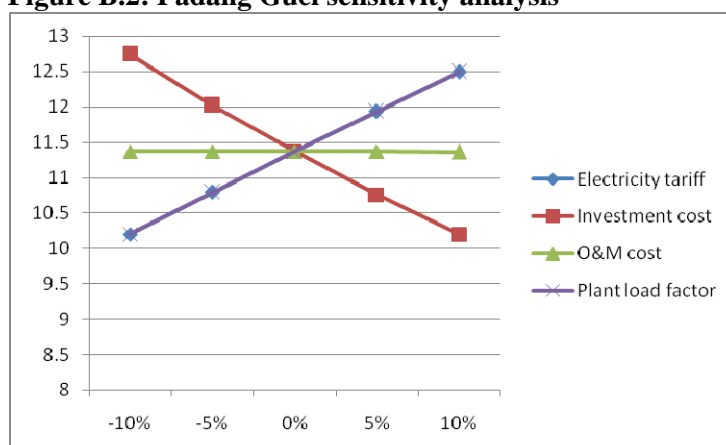


The results of the sensitivity analysis conducted confirm that the project IRR remains below the benchmark. Therefore the project activity is not considered as the most economically attractive scenario.

**Table B.6: Padang Guci sensitivity analysis for each option**

Parameter	-10%	-5%	0%	5%	10%
Electricity tariff	10.2	10.79	11.37	11.93	12.49
Investment cost	12.74	12.02	11.37	10.76	10.20
O&M cost	11.37	11.37	11.37	11.37	11.36
Plant load factor	10.2	10.79	11.37	11.93	12.49

**Figure B.2: Padang Guci sensitivity analysis**



The results of the sensitivity analysis conducted confirm that the project IRR remains below than the benchmark. Therefore the project activity is not considered as the most economically attractive scenario.

As validation takes place after start date we provide a chronology of events below:

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**Table B.7: Chronology of events for Batu Balai**

S. No.	Activity	Date	Source
1	Public hearing	03/04/2007	Copy
2	PPA	19/07/2007	Copy
3	CDM first contact	29/11/2007	Copy
4	CDM board meeting	18/02/2008	Copy
5	AMDAL	10/03/2008	Copy
6	EPC contract	18/04/2008	Copy
7	CDM newspaper notification	01/10/2009	Copy

**Table B.8: Chronology of events for Padang Guci**

S. No.	Activity	Date	Source
1	Public hearing	18/03/2008	Copy
2	PPA	07/04/2008	Copy
3	UPL/UKL	16/04/2008	Copy
4	CDM newspaper notification	12/10/2009	Copy
5	EPC contract	Not yet (Nov09)	

**B.6. Emission reductions:****B.6.1. Explanation of methodological choices:**

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In order to quantify emissions reductions achieved by the projects, procedures to calculate project emissions, baseline emissions, leakage and emissions reductions given by methodology are applied as follows.

**Baseline emissions**

The consolidate baseline emission for both projects Batu Balai and Padang Guci is the accumulation of both baseline emissions, as follow:

$$BE_y = BE_{y,BB} + BE_{y,PG}$$

As per paragraph 9 of the methodology:

*For all other systems, the baseline emissions are the product of electrical energy baseline  $EG_{BL,y}$  expressed in kWh of electricity produced by the renewable generating unit multiplied by an emission factor.*

$$BE_y = EG_{BL,y} \cdot EF_{CO_2} \quad (1)$$

Where:

$BE_y$	Baseline emissions in year y, tCO <sub>2</sub> e
$EG_{BL,y}$	Energy baseline in year y, kWh
$EF_y$	CO <sub>2</sub> Emission Factor in year y, t CO <sub>2</sub> e/kWh

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As presented in the above Section B.4, the Agency for the Assessment and Application of Technology, (BPPT) and Directorate General of Electricity and Energy Utilization, under the Ministry of Environment of Indonesia, has estimated the combined margin of the Sumatera grid to be 0.743 tCO<sub>2</sub>/MWh<sup>5</sup>.

$$BE_y = EG_{BL,y} \times 0.743$$

**Project Emissions**

As no fossil fuel will be combusted in the project activities, the project emissions have been considered nil.

**Leakage Emissions**

No energy generating equipment has been transferred from another activity, hence leakage has been considered nil.

**Emission Reduction**

As per paragraph 15 of the methodology:

*Emission reductions are calculated as follows:*

$$ER_y = BE_y - PE_y - LE_y \quad (2)$$

Where:

ER <sub>y</sub>	Emission reductions generated in year y, tCO <sub>2</sub> e
BE <sub>y</sub>	Baseline emissions in year y, tCO <sub>2</sub> e
PE <sub>y</sub>	Project emissions in year y, tCO <sub>2</sub> e
LE <sub>y</sub>	Leakage emissions in year y, tCO <sub>2</sub> e

Since PE<sub>y</sub> and LE<sub>y</sub> are considered nil:

$$ER_y = BE_y$$

<b>B.6.2. Data and parameters that are available at validation:</b>
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*(Copy this table for each data and parameter)*

<b>Data / Parameter:</b>	<b>EF<sub>CO2</sub></b>
Data unit:	t CO <sub>2</sub> e/kWh
Description:	Combined margin emission factor of SUMATERA Grid
Source of data used:	This emission factor value calculated by Directorate General of Electricity and Energy Utilization of Ministry and has been officially published by Ministry of Environment of Indonesia <sup>5</sup> .
Value applied:	0.743
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value used has been fixed <i>ex-ante</i> and will be used throughout the first crediting period of the project activity.
Any comment:	Publicly available data

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<b>B.6.3 Ex-ante calculation of emission reductions:</b>
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From section B.6.1 the emission reductions are given as:

$$ER_y = BE_y - PE_y - LE_y$$

**Baseline Emissions**

$$BE_y = BE_{y,BB} + BE_{y,PG} \quad \text{and} \quad BE_y = EG_{BL,y} \cdot EF_{CO_2}$$

**Batu Balai**

Based on various factors such as installed capacity, operating days, plant load factor (PLF) and auxiliary consumption, the annual electricity supplied to the grid is expected to be 24,283 MWh.

The baseline emission of Batu Balai project is calculated as:

$$BE_{y,BB} = EG_{BL,y,BB} \cdot EF_{CO_2}$$

$$BE_{y,BB} = 24,283 \times 0.743$$

$$BE_{y,BB} = 18,042 \text{ tCO}_2$$

**Padang Guci**

Based on various factors such as installed capacity, operating days, Plants load factor (PLF) and auxiliary consumption, the annual electricity supplied to the grid is expected to be 30,353 MWh.

The baseline emission of Padang Guci project is calculated as:

$$BE_{y,PG} = EG_{BL,y,PG} \cdot EF_{CO_2}$$

$$BE_{y,PG} = 30,353 \times 0.743$$

$$BE_{y,PG} = 22,552 \text{ tCO}_2$$

Therefore the Baseline emission of the bundled project activity is calculated as follow:

$$BE_y = BE_{y,BB} + BE_{y,PG}$$

$$BE_y = 18,042 + 22,552$$

$$BE_y = 40,594 \text{ tCO}_2$$

**Emission Reduction**

Since  $PE_y$  and  $LE_y$  are considered nil:

Therefore consolidated annual emission reduction of both Batu Balai and Padang Guci projects is:

$$ER_y = BE_y$$

Year 1 01/08/2010 - 01/08/2011	Year 2-7 01/08/2011 - 01/08/2017
$ER_y = BE_{y,BB}$	$ER_y = BE_{y,BB} + BE_{y,PG}$
$ER_y = 18,042 \text{ tCO}_2$	$ER_y = 40,594 \text{ tCO}_2$

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The annual emission reductions attributable to the proposed bundled project activity are only achieved with Batu Balai project, 18,042 tCO<sub>2</sub>e for year 1 (01/08/2010 - 01/08/2011), and from both projects, Batu Balai and Padang Guci, 40,594 tCO<sub>2</sub>e for year 2-7 (01/08/2011 - 01/08/2017).

<b>B.6.4 Summary of the ex-ante estimation of emission reductions:</b>
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**Table B.8: Ex-ante estimation of emission reductions due to the Batu Balai Project**

Year	Estimation of project activity emissions (tCO <sub>2</sub> e)	Estimation of baseline emissions (tCO <sub>2</sub> e)	Estimation of leakage (tCO <sub>2</sub> e)	Estimation of overall emission reductions (tCO <sub>2</sub> e)
01/08/2010 - 01/08/2011	0	18,042	0	18,042
01/08/2011 - 01/08/2012	0	18,042	0	18,042
01/08/2012 - 01/08/2013	0	18,042	0	18,042
01/08/2013 - 01/08/2014	0	18,042	0	18,042
01/08/2014 - 01/08/2015	0	18,042	0	18,042
01/08/2015 - 01/08/2016	0	18,042	0	18,042
01/08/2016 - 01/08/2017	0	18,042	0	18,042
<b>Total estimated reduction (tCO<sub>2</sub>e)</b>	<b>0</b>	<b>126,294</b>	<b>0</b>	<b>126,294</b>

**Table B.9: Ex-ante estimation of emission reductions due to the Padang Guci Project**

Year	Estimation of project activity emissions (tCO <sub>2</sub> e)	Estimation of baseline emissions (tCO <sub>2</sub> e)	Estimation of leakage (tCO <sub>2</sub> e)	Estimation of overall emission reductions (tCO <sub>2</sub> e)
01/08/2010 - 01/08/2011	0	0	0	0
01/08/2011 - 01/08/2012	0	22,552	0	22,552
01/08/2012 - 01/08/2013	0	22,552	0	22,552
01/08/2013 - 01/08/2014	0	22,552	0	22,552
01/08/2014 - 01/08/2015	0	22,552	0	22,552
01/08/2015 - 01/08/2016	0	22,552	0	22,552
01/08/2016 - 01/08/2017	0	22,552	0	22,552
<b>Total estimated reduction (tCO<sub>2</sub>e)</b>	<b>0</b>	<b>135,315</b>	<b>0</b>	<b>135,315</b>

**Table B.10: Ex-ante estimation of emission reductions due to the projects**

Year	Estimation of project activity emissions (tCO <sub>2</sub> e)	Estimation of baseline emissions (tCO <sub>2</sub> e)	Estimation of leakage (tCO <sub>2</sub> e)	Estimation of overall emission reductions (tCO <sub>2</sub> e)
01/08/2010 - 01/08/2011	0	18,042	0	18,042
01/08/2011 - 01/08/2012	0	40,594	0	40,594
01/08/2012 - 01/08/2013	0	40,594	0	40,594
01/08/2013 - 01/08/2014	0	40,594	0	40,594
01/08/2014 - 01/08/2015	0	40,594	0	40,594

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01/08/2015 - 01/08/2016	0	40,594	0	40,594
01/08/2016 - 01/08/2017	0	40,594	0	40,594
<b>Total estimated reduction (tCO<sub>2</sub>e)</b>	<b>0</b>	<b>261,610</b>	<b>0</b>	<b>261,610</b>

Annual emission reductions of the bundled project activity, for year 1, are only achieved with Batu Balai project and from both projects, for year 2-7.

<b>B.7 Application of a monitoring methodology and description of the monitoring plan:</b>
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<b>B.7.1 Data and parameters monitored:</b>
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**Batu Balai**

<b>Data / Parameter:</b>	$EG_{BL,y, BB}$
Data unit:	kWh
Description:	Net electricity supplied by the Batu Balai project to the grid, in year y
Source of data to be used:	Plant records
Value of data	24,282,720
Description of measurement methods and procedures to be applied:	Hourly measurement and monthly recording will be applied. Joint meter reading will be taken at the interconnection point monthly by project proponent and PLN. This will act as the basis for calculation of emission reductions.
QA/QC procedures to be applied:	As per the PPA, meters will be calibrated annually by PLN or an accredited independent third party. Data measured by meters will be cross checked with records for sold electricity.
Any comment:	All data will be kept for a minimum of 2 year following issuance of certified emission reductions or the end of the crediting period, whichever is later.

**Padang Guci**

<b>Data / Parameter:</b>	$EG_{BL,y, PG}$
Data unit:	kWh
Description:	Net electricity supplied by Padang Guci project to the grid, in year y
Source of data to be used:	Plant records
Value of data	30,353,400
Description of measurement methods and procedures to be applied:	Hourly measurement and monthly recording will be applied. Joint meter reading will be taken at the interconnection point monthly by project proponent and PLN. This will act as the basis for calculation of emission reductions.
QA/QC procedures to be applied:	As per the PPA, meters will be calibrated annually by PLN or an accredited independent third party. Data measured by meters will be cross checked with records for sold electricity.
Any comment:	All data will be kept for a minimum of 2 year following issuance of certified emission reductions or the end of the crediting period, whichever is later.

**B.7.2 Description of the monitoring plan:**

&gt;&gt;

As per paragraph 16 of the methodology, monitoring shall consist of metering:

- The net electricity generated ( $EG_{BL,y}$ ), and

The overall authority for the monitoring of the project activity will be with the power plant manager.

**Internal Audits**

An internal audit will be carried out every year to ensure that the monitoring parameters are being monitored in accordance with Section B.7.1.

**Monitoring procedures**

To calculate the amount of electrical energy that will be sold to the grid (PLN), the project owner will install a set of tools that measure voltage transformers, current transformers and electronic kWh meter at to the transaction point at medium voltage network of 20 kv.

Hourly measurement and monthly recording will be applied. This data will form the basis of the ongoing calculation which will then be tallied against the monthly recordings taken by PLN along with a representative from the factory.

There will be three 8 hour shifts and the readings from energy meters will be taken on an hourly basis by the shift supervisor and recorded in logbooks. This hourly data will be signed off at the end of every shift by the engineer in charge of the shift and again at the end of each day by the power plant manager. The power plant manager will analyze the data every month and report to the head office.

**Period of archiving**

The monthly data will be archived electronically at the end of the month and invoices of electricity sales will be maintained.

**Training requirements**

Before the project commissioning date, the staff in charge during erection will be trained, to operate and maintain the equipments efficiently. Apart from this, a complete manuals and documentation providing details for the maintenance schedule and the required activities will be associated with it.

After power plants are commissioned, employees will be given periodic training to ensure that parameters are monitored in accordance with section B.7.1.

**Calibration of equipments**

The monitoring meters will be calibrated according to national standards each year. The calibration certificates will be made available at the time of verification. Before being installed, the measurement tools will be grounded and sealed and witnessed by all parties and then sealed.

**QA/ QC of monitored data**

The monitored data will be reported to Agrinergy on a monthly basis for the calculation and estimation of emission reductions. This data will be checked against initial estimates and a summary report will be provided quarterly by Agrinergy. If the project is not performing as expected or if there are any negative impacts on the volume of emission reductions obtained, on the basis of the monthly data being monitored, a report will be sent to the project proponent outlining where the project is deviating in its generation of emission reductions and the immediate measures which need to be undertaken to maintain the expected generation of emission reductions from the operation of this project. Should there be significant changes

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to the set-up or operation of the plant, these will be notified to Agrinergy and amendments to the PDD will be requested through a DOE.

The uncertainty in data is low as the data will be regularly monitored by Agrinergy. At the end of each year of operation Agrinergy will prepare a monitoring report that will be submitted to a DOE for verification, however visits to the site may be undertaken by Agrinergy during the first year to check that the procedures and monitoring plan are being followed.

All data will be kept for a minimum of 2 years following issuance of certified emission reductions or the end of the crediting period, whichever is later, and the storage of this data will be the responsibility of the project developers.

<b>B.8 Date of completion of the application of the baseline and monitoring methodology and the name of the responsible person(s)/entity(ies)</b>
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01/07/2009

Mr. Donald Gautier, PT Agrinergy Indonesia. [donald.gautier@agrinergy.com](mailto:donald.gautier@agrinergy.com)

Not a project participant

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**SECTION C. Duration of the project activity / crediting period**

**C.1 Duration of the project activity:**

**C.1.1. Starting date of the project activity:**

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18/04/2008 – EPC contract for Batu Balai

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

>>

30 years

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

**C.2.1. Renewable crediting period**

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

>>

01/08/2010 or the date of registration (whichever is later)

**C.2.1.2. Length of the first crediting period:**

>>

7 years

**C.2.2. Fixed crediting period:**

**C.2.2.1. Starting date:**

>>

Not Applicable

**C.2.2.2. Length:**

>>

Not Applicable

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**SECTION D. Environmental impacts**

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

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**Batu Balai**

Referring the Regulation of Minister of Environment No.11 Year 2006<sup>7</sup> Article 2, an Environmental Impact Assessment (EIA) is required projects that a join on protected forest. Since a part of this project area joins the Bukit Raja Mandara protected forest, it requires an Environmental Impact Assessment to be carried out.

The Environmental Impact Assessment of the project activity has already been submitted by PT Manna Energy Pratama and this has been approved by the Regent of South Bengkulu District on 10<sup>th</sup> March 2008.

**Impact due to pre- construction activity**

The activity during pre-construction that could arise impact for environment is the decrease of local income.

**Padang Guci**

Referring to the Regulation of Minister of Environment No.11 Year 2006, an Environmental Impact Assessment is not required for a hydroelectric power project whose capacity is less than 50 MW. Since the capacity of this project is only 5 MW, it does not require an EIA to be carried out. However Environmental Management Plan and Environmental Monitoring Plan were developed for the project activity.

The Environmental Management Plan and Environmental Monitoring Plan of the project activity have already been submitted by PT Prima Mega Resources and this has been approved by the Head of Environment and Cleaning Service Agency of Kaur Regency on 16<sup>th</sup> April 2008.

**Table D.1: Pre- Construction Phase**

Environmental Component	Possible Impacts	Environmental Management Plan
Employment	Increase of locals income from project survey activity	<ul style="list-style-type: none"> <li>• Inform the locals that the project survey activity will be only temporary</li> </ul>

**Table D.2: Construction Phase**

Environmental Component	Possible Impacts	Environmental Management Plan
Area	Decrement of locals area due to the project activity land use	<ul style="list-style-type: none"> <li>• To pay the compensation of land use as per the agreed price</li> </ul>
Air quality and noise	Increase of dust level due to the mobilization of equipments and material and noise due to the	<ul style="list-style-type: none"> <li>• Managing the truck loading schedule and repairing the road damage</li> <li>• Frequent maintenance of soil excess</li> </ul>

<sup>7</sup> Source : Regulation of Minister of Environment No.11 Year 2006 - <http://www.menlh.go.id/popup.php?cat=201&id=2531>

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	construction activity	around the construction site and spraying around the construction site to reduce the amount of dust
<b>Land erosion</b>	Land erosion due to the land opening	<ul style="list-style-type: none"> <li>• To construct the proper water-channel on the drainage canal</li> <li>• To construct the erosion controller building</li> <li>• To plant the vegetation on the open land</li> <li>• To conduct the stiffening of mountain side that has a erosion potential</li> </ul>
<b>Surface water</b>	Decrease of surface water quality and the disturbance of fishing at the river downstream	<ul style="list-style-type: none"> <li>• To place the land and felled tree about 50 m from the river side in order to avoid it flow to the river</li> </ul>
<b>Employment</b>	Decrease of locals income	<ul style="list-style-type: none"> <li>• The work lay off will be done after the contract end.</li> <li>• To give the proper separation pay</li> </ul>

**Table D.3: Operation Phase**

<b>Environmental Component</b>	<b>Possible Impacts</b>	<b>Environmental Management Plan</b>
Employment	Increase of locals income	<ul style="list-style-type: none"> <li>• To provide priority for locals by considering the work qualification required in the project.</li> <li>• To inform the locals concerning employment opportunity and the requirements necessary.</li> <li>• To provide wage in accordance with the applicable standard, education level and work expertise</li> </ul>
Surface water	Decrease of water flow	<ul style="list-style-type: none"> <li>• To strive the water flow</li> <li>• To maintain the water stream of Padang Guci by replanting the productive plant</li> </ul>

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

&gt;&gt;

No environmental impacts were considered significant.

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**SECTION E. Stakeholders' comments**

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

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**Batu Balai**

PT Manna Energy Pratama communicated to the relevant stakeholders the development of this project activity. The stakeholders list includes the government and non -government parties, which are involved in the project activity at various stages.

PT Manna Energy Pratama posted a notice in a local newspaper called Harian Rakyat Bengkulu on 1<sup>st</sup> March 2007 for announcing the stakeholder meeting to the public. PT Manna Energy Pratama has conducted a stakeholder consultation process in an open and transparent manner on 3/04/2007 at Seginim sub-district office- South Bengkulu District. The meeting was attended by the representatives of the identified stakeholders. The list of participants with their signature and comments are kept for record and photographs of the event will be provided to the validator during site visit.

PT Manna Energy Pratama also communicated to the relevant stakeholder the decision to do the project as CDM project through a notice in newspaper “Radar Seletan” on 01<sup>st</sup> October 2009. No comment or suggestions has been input from stakeholders.

**Padang Guci**

PT Prima Mega Resources communicated to the relevant stakeholders the development of this project activity. The stakeholders list includes the government and non -government parties, which are involved in the project activity at various stages.

PT Prima Mega Resources has conducted a stakeholder consultation process in an open and transparent manner on 18/03/2008 at Padang Guci sub district. The meeting was attended by the representatives of the identified stakeholders. The list of participants with their signature and comments are kept for record and photographs of the event will be provided to the validator during site visit.

PT Manna Energy Pratama also communicated to the relevant stakeholder the decision to do the project as CDM project through a notice in newspaper “Radar Seletan” on 12<sup>th</sup> October 2009. No comment or suggestions has been input from stakeholders.

**E.2. Summary of the comments received:**

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**Batu Balai**

No negative comments were received. Overall, the locals and government really support this mini hydro power plant development. The complete minutes of the local stakeholder meeting will be provided to the validator during site visit.

**Padang Guci**

No comments were received in response to the newspaper notice.

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

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The questions of the stakeholders were answered by the project owners during the meeting and no negative comments received in the consultation and the interviews.

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**Annex 1****CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

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**Annex 2**

**INFORMATION REGARDING PUBLIC FUNDING**

No public fund has been used in these project activities.

**Annex 3****BASELINE INFORMATION****Grid Emission Factors**

The Operating Margin data for the most recent three years and Build Margin data for the Sumatra Grid based on database in Directorate General of Electricity and Energy Utilization and approved by Ministry of Environment of Indonesia are as follows:

Build Margin (tCO <sub>2</sub> /MWh) (50%)	0.581
Average Operating Margin (tCO <sub>2</sub> /MWh) (50%)	0.906
<b>Combined Margin (tCO<sub>2</sub>/MWh)</b>	<b>0.743</b>

The EF of the Sumatera Electricity Grid for 2007 is **0.743** tCO<sub>2</sub>e/MWh

**Annex 4****MONITORING INFORMATION**

Please refer to section B7.2

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