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

CONTENTS

Revision history of this document

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

SECTION A. General description of small-scale project activity

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

>> Ranteballa Small-Scale Hydroelectric Power Project
Document version 1
3/1/2007

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

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The project activity is a small-scale CDM project activity focusing on the generation of electricity to be exported to South Sulawesi grid. The project activity is a run-of-river small-scale hydroelectric power generation project, which is also referred to as a Small-Scale Hydro Power Plant (SSHPP) developed by PT Fajar Futura Energi Luwu (hereinafter referred as to FFEL). The power plant hereinafter referred as to Ranteballa SSHPP is located in Ranteballa Village, Latimojong District, Luwu Regency, South Sulawesi Province. Ranteballa SSHPP consists of two identical power-generation units each with an installed capacity of 1,200 kW. The total installed capacity of the project activity is 2.4 MW and its annual export to the grid is estimated to be 16,819 MWh.

Under the absence of the project, there is a lack of the electricity distribution line in the villages nearest the site. With the project activity, PT Perusahaan Listrik Negara (hereinafter referred as to PLN), a state owned power utility company will develop the electricity distribution line for transmitting electricity generated by the Ranteballa SSHPP, and for supplying electricity to the villages.By taking this into account, the project will reduce the rate of the GHG emissions by approximately 10,498 tCO_2 e ton per year.

The purpose of the project activity:
The purpose of the project activity is to generate electricity and export it to the South Sulawesi grid owned by PLN, by using a renewable hydro energy source to meet the demand for electricity in Sulawesi Island. The development of the project activity will reduce GHG emissions produced by the South Sulawesi grid generation mix and support sustainable development related to energy generation.

View of project participants on the contribution of the project activity to sustainable development:
In addition to the generation of electric power, the project activity also contributes to the following:
Environment:
The project activity will utilize unused hydro potential for power generation. The project activity, which is a zero emission electricity generation, will eliminate GHG emissions produced from fossil based power generation. Apart from this, the project activity will cause no negative impact on the environment locally as well as globally.
Social:
The project activity will also assist in creating employment in the project area for either skilled or unskilled laborers during the construction and operation of the project.
Economy:
The development of the Ranteballa SSHPP will invite other investments in the region in line with the people need around the project area. The project activity will upgrade road quality, particularly road access to the SSHPP to be developed. This in turn will contribute to improvement of the local economy.
Technology:
The project activity will contribute to technology and capacity development, since part of the equipment and technical maintenance will be provided by the host country. Such a project can further stimulate initiatives for innovation in the energy sector of the host country.

A.3. Project participants:

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Table 1 Project participants of the CDM project activity

Name of party involved ((host) indicates a host Party)	Private and/or public entity (ies) project participants (as applicable)	Kindly indicate if the party involved wishes to be considered as project participants (Yes/No)
Indonesia (Host)	P.T. Fajar Futura Energi Luwu	**No**
Indonesia (Host)	Centre for Application and Assessment of Energy Resources Technology, Agency for the Application and Assessment of Technology (BPPT)	**No**
Japan	The Chugoku Electric Power Co., Inc.	**No**
Japan	Kajima Corporation	**No**

The contact information for project participants in the project activity is provided in Annex 1 in this PDD.

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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The Republic of Indonesia

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

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South Sulawesi Province

A.4.1.3. City/Town/Community etc:

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Ranteballa Village, Latimojong District, Luwu Regency

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

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Ranteballa SSHPP is located in Ranteballa Village, Latimojong District, Luwu Regency, South Sulawesi Province. The Ranteballa SSHPP is located on 02° 35’ South latitude and 120° 09’ East longitude. The map of the location is presented in Figure 1.

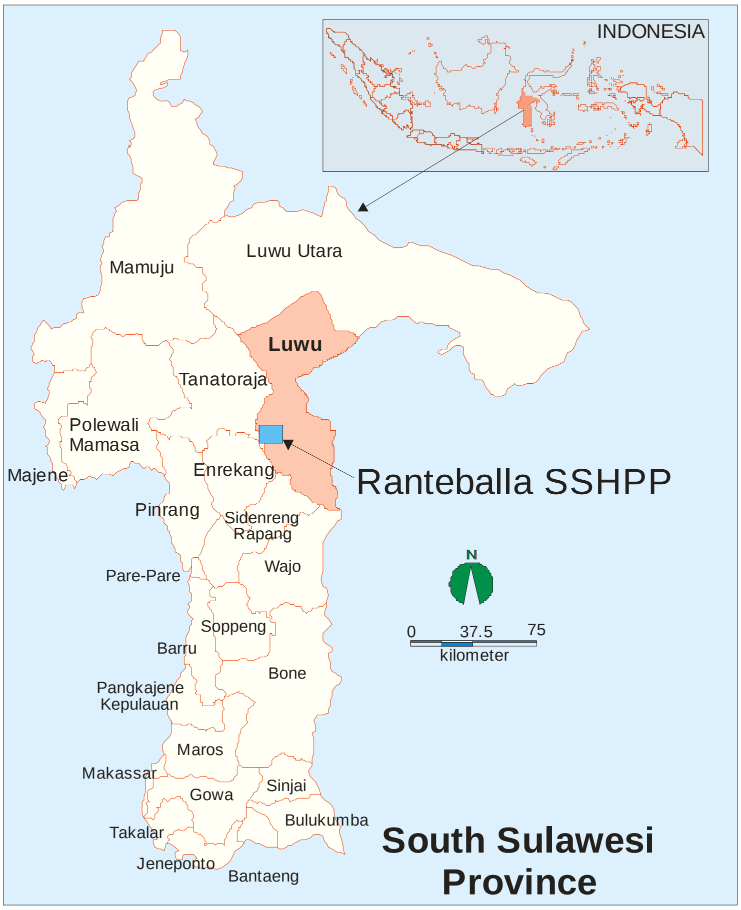

Figure 1: Map illustrating the location of the project activity

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

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Type I: Renewable Energy Project
Category 1.D: Grid connected renewable electricity generation.

The project activity is a small-scale CDM project activity which generates electricity from a renewable energy source with a total installed capacity of 2.4 MW and estimated annual net electricity generated of about 16,819 MWh to be exported to the South Sulawesi grid. Since the total capacity of the proposed project activity does not exceed the eligibility limit of 15 MW, the project activity is qualified as a small-scale CDM project activity to which simplified modalities and procedures indicated by UNFCCC can be applied. Taking into account that the project activity involves energy generation from hydro potential and exports the power to a grid, based on small-scale CDM modalities, the project activity falls under Type I, Renewable Energy Project and Category I.D. Grid connected renewable electricity generation.

Technology of the small-scale project activity

A run-of-river small-scale hydroelectric power generation technology is applied to the project activity which converts mechanical energy available in the water flow into electrical energy using hydro turbines and alternators. This is a common technology for small-scale hydroelectric power generation and has widely been used throughout the world in many hydroelectric power plants for years.

The Ranteballa SSHPP, which has a high head of 95 m, will use a Francis type turbine. The development of SSHPP technology in Indonesia is very slow as demonstrated by the small number of hydro power plants built so far. This has lead to inefficient production in the manufacture of turbines. An imported Francis type turbine from Czechoslovakia is expected to trigger manufacturing of this type of turbine.

Project description:
Ranteballa SSHPP:
The Ranteballa SSHPP mainly consists of a weir, an intake, a sand trap, a waterway, a head pond, a penstock, a powerhouse, and an outlet.

Table 2 The nominal data of Ranteballa SSHPP

Item	Unit	Ranteballa SSHPP
Total installed capacity	MW	2.4
Installed capacity of each unit	MW	1.20
Average annual export to grid (Average annual net electricity generated)	MWh	16,819
Capacity factor	%	80
Effective head	m	95
Flow rate	m^3/s	1.53
Number of units	-	2
Type of Turbines	-	Horizontal Francis

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

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The project activity will have a total installed generating capacity of 2.4 MW and will export approximately 16,819 MWh annually to the South Sulawesi grid every year. This SSHPP is expected to be operational between the mid to end of 2008. Using an emission factor of 0.624 tonnes CO_2/MWh for the South Sulawesi grid, the annual emission reductions of the project activity is estimated to be 10,498 tonnes CO_2 e (Table 3). The total GHG emission reductions over the selected crediting periods (3x7 years) estimated from the baseline analysis is 215,211 tCO_2 e.

Table 3 Estimated amount of emission reductions over the chosen crediting period

Year	Annual estimation of emission reductions in tonnes of CO_2 e
2008	5,249
2009	10,498
2010	10,498
2011	10,498
2012	10,498
2013	10,498
2014	10,498
Total estimated reductions (tonnes CO_2 e)	68,238
Total number of crediting years	7 years
Annual average over the crediting period of estimated reductions (tonnes CO_2e)	9,748

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

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There is no public funding involved for the financing of the project activity. As such it will not result in a diversion of official development assistance.

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

The project proponent confirms that the proposed project activity is not a debundled component of a larger project activity. The project proponent further confirms that there are no other small-scale CDM projects to be registered within 1 km of the project boundary of the proposed activity.

SECTION B. Application of a baseline and monitoring methodology

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

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Type: TYPE I - RENEWABLE ENERGY PROJECTS

Project category title: Category I.D. Grid Connected renewable Electricity Generation.
Reference: Appendix B of the Simplified Modalities and Procedures (hereinafter referred to as “Appendix B”) for Small-Scale CDM project activities, Category I.D. taken from the document AMS-I.D., Version 9, Scope 1, 28 July 2006.

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

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The total capacity of the project is only 2.4 MW, which is within the range of the qualifying maximum capacity of 15 MW for a small-scale CDM project activity to use simplified methodologies. The project activity is focused on the generation of electricity for a grid using potential hydropower sources. Moreover, the project is not a debundled component of a large-scale project as shown in paragraph A.4.5. Hence, the type and category of the project activity matches with the Type I.D. as specified in Appendix B.

B.3. Description of the project boundary:

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The project boundary specified in Type I.D. in Appendix B encompasses the physical, geographical site of the renewable generation source. For the project activity under consideration, the project boundary considered encompasses SSHPP facilities such as a diversion structure, sand trap, waterway, penstock, powerhouse, and outlet.

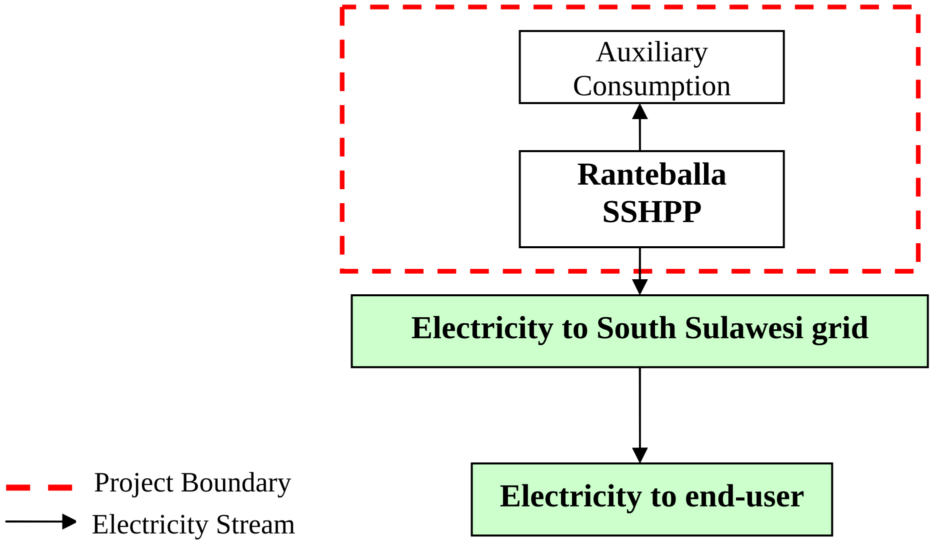

Figure 2 : Project boundary of the project activity

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

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According to Appendix B, there are two options that can be applied in the selected project category.

The latest version of the methodologies for small-scale CDM projects, Version 9, 28 July 2006, offers two options for calculating baseline emissions of Category I.D. projects. The baseline for this project has been estimated according to these methodologies. As a result, the baseline is the power generation by small hydropower plants multiplied by an emission coefficient (measured in $kgCO_2/kWh$) (tCO_2/MWh) calculated in a transparent and conservative manner as follows:

The Baseline Emission Factor is calculated as a combined margin (CM), consisting of the combination of Operating Margin (OM) and Build Margin (BM) according to the procedures prescribed in the approved methodology ACM0002.

In the calculation of the emission factor, a simple OM has been selected from the four available methods.

The Simple OM, $EF_{OM,y}$ is calculated ex-ante, based on the three-year average (year 2003, 2004, 2005) of the most recent statistics available at the time of PDD submission.

The Build Margin emission factor in year y, $EF_{BM,y}$ is calculated *ex-ante* based on the most recent information available for power plant capacity additions to the electricity system that comprises 20% of the system generation (in MWh) and that have been built most recently at the time of PDD submission.

The Baseline emission factor in year y, EF_y is the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$).

The baseline emissions are calculated by multiplying the Baseline emission factor calculated as above with the amount of electricity exported to the South Sulawesi Grid. The emission reductions

(ER_y) by the project activity in year *y* is the difference between the baseline emissions (BE_y) in year y, project emissions (PE_y) and emissions due to leakage (L_y) in year y.

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:

Emission reductions from the project:
The project activity will use hydro potential as a renewable energy source for the generation of electricity, and export generated electricity to the nearest grid. Hence, the generation of electricity by the proposed project activity is a non-GHG source and it is expected that the proportion of fossil fuel based generation in the grid will be reduced by the project activity, leading to lesser carbon intensity in the grid.

Quantity of emission reductions out of the project:
The emission reductions due to the project activity depend on the electricity exported to the South Sulawesi grid and the content of fossil fuel based generation in the grid system. Hence, the power exported to the grid in the baseline becomes the basis for estimating emission reductions. The annual emission reductions are estimated to be about 10,498 tonnes CO_2 e.

Justification for additionality of the project
UNFCCC's simplified modalities seek the establishment of the additionality of the small-scale project activity as described in Attachment A to Appendix B, which lists various barriers, out of which at least one barrier due to which the project would not have occurred shall be identified. Confirmation as to why the proposed project is additional is offered under the following categories of barriers: (a) investment barrier (b) barrier due to prevailing practice, and (c) other barriers.

(a) Investment Barrier
Electricity Selling Price
The unit cost of the project activity is higher than the unit cost of present coal fired power plants in Indonesia.

High investment cost per kW combined with the size of SSHPP has become an obstacle to invest in this type of power plant.

Most private sectors companies are generally only interested in the development of medium and large-scale power plants. On one hand, the obstacles for developing this project activity are exaggerated by the underdeveloped infrastructure of the project area such as limited transportation and a lack of electricity supply from PLN. On the other hand, the project activity costs required for preparing the Project Feasibility Study, Environmental Management Procedure and The Environmental Monitoring Procedure (hereinafter referred to as UKL/UPL) and other permits are comparable to those for developing large-scale power plants.

The maximum electricity selling price to PLN is equal to 0.8 multiplied by provincial BPP (Biaya Pokok Produksi/Province-wide electricity production cost) as set by the Minister of Energy and Mineral Resources[1]. However, it is quite difficult to achieve this since it must accommodate profit to the parties involved (project proponent and PLN).

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[1] Decree of the Minister of Energy and Mineral Resource no 1122 K/30/MEM/2002, June 12, 2002, regarding Distributed Small Scale Power Generation.

Given the above, the development of a small hydropower generation project in Indonesia is not attractive as a business-as-usual project for investors due to the price set in the Power Purchase Agreement (herein after referred to as “PPA”) following the Distributed Small Power Generation with PLN as the single buyer in the Indonesian electricity business.

*IRR Analysi*s
The Internal Rate of Return (hereinafter referred to as “IRR”) for the project activity was calculated at the indicated PLN purchase price of electricity with and without taking CDM benefits into consideration. The IRR value of the project activity is 15.39% if it is calculated at a 25-years project life time without the CDM scheme. This indicates that the project activity is not very attractive for FFEL. The value increases immediately to 16.65% after inclusion of the CDM scheme with a project life time of 21 years.

The inclusion of the CDM scheme into the project activity has resulted in an increase of IRR value. The increase comes from the additional revenue from the scheme. After the inclusion of CDM scheme the project activity has become feasible, and this confirmed the additionality of the CDM scheme.

(b) Barrier due to prevailing practice
Government Policies

According to RUPTL 2006-2015 of PLN and Presidential Decree No 71 of 2006 the additional capacity of power generation for the South Sulawesi grid is focused on medium and large-scale electricity generations, generated from hydro power and gas power plants as well as coal fired power plants .

The main and most common type of power generation in Indonesia is from thermal power plants and large-scale hydropowers. Their presence is supported by the availability of fossil fuel (particularly coal) and the vast experience with this technology. The lack of experience of the private sector in the development of small-scale hydroelectric power projects has made such projects an uncommon practice as indicated by their small contribution to the national electricity supply which is very low.

With no introduction of electricity generation from renewable energy sources, the South Sulawesi grid now and in the future will mainly depend on the development of thermal power generation in order to meet electricity demand in the grid. This is implicitly documented in the plans for developing electricity generation in the South Sulawesi released through RUPTL (Rencana Umum Pengusahaan Tenaga Listrik/General Electricity Supply Plan) of PLN and Presidential Regulation No.71 of 2006.

Referring to this Presidential Regulation, PLN, as the Indonesian power utility company, has been requested by the Government of Indonesia to accelerate the addition of electricity generation capacity to about 10,000 MW throughout Indonesia within the next three years by developing Coal Fired Steam Power Plants (CFSPP)[2]. Through this regulation, a steam power plant, named PLTU Bone, with a capacity of 2 x 15 MW, is planned to be developed during this period of time.

According to the RUPTL, within the next three years the installed electricity capacity in the South Sulawesi grid is planned to increase about 465 MW through electrical generations using gas and coal

[2] (Peraturan Presiden Republik Indonesia Nomor 71 Tahun 2006 tentang penugasan kepada PT Perusahaan Listrik Negara (Persero) untuk melakukan percepatan pembangunan pembangkit tenaga listrik yang menggunakan batubara).

(Table 4)[3].Table 4 presents a list of power plants under construction, committed to being developed and planned to being developed.

Table 4 List of power plants to be developed in South Sulawesi until 2009 [3]

Name of power plant	Year of operation	Owner	Status	Capacity (MW)
PLTG Sengkang	2006	IPP	On going	65
PLTA Bili-bili	2006	PLN	On going	20
PLTU Takalar	2007	IPP	Plan	15
PLTG Makassar	2007	PLN	Plan	50
PLTU Takalar	2008	IPP	Plan	15
PLTU Jeneponto	2008	PLN	Plan	100
PLTU Bosowa	2009	IPP	Plan	100
PLTU Jeneponto	2009	PLN	Plan	100

Note : PLTG (Pembangkit Listrik Tenaga Gas/Gas Turbine Power Plant), PLTU (Pembangkit Listrik Tenaga Uap/Steam Power Plant), PLTA (Pembangkit Listrik Tenaga Air/Hydro Power Plant), IPP (Independent Power Producer)

In addition to the contribution of GHG emission reductions, the proposed project activity will extend the distribution capacity in the South Sulawesi grid as well as the increase the local electricity supply. Therefore, the project activity will displace the development and operation of thermal electricity generation which in turn will result in GHG emission reductions.

General Purpose of SSHPP Development

Out of the existing potential SSHPPs in Indonesia of about 500 MW, a total capacity of only 84 MW[4] has been developed up to now by IPPs and non-IPPs. Until now (year 2006) there are only eleven small-scale hydroelectric power plants operated by IPP under a PPA in Indonesia (Table 5). Most of these SSHPPs were developed through foreign grants and/or Indonesian government funding.

Non IPP-SSHPPs are mostly developed using either with a Central Government Fund or Local Government Fund through relevant institutions. The remaining have been developed through Foreign Funds, Non Government Organizations and PLN. Up to now, the foreign fund for developing SSHPPs is generally in the form of grant.

The development of a SSHPP is generally associated with an electricity program for rural areas with the following goals :

- To use renewable energy as priority in energy generation
- To support poor societies with the assistance of the Central Government and/or Local Government
- To arrange the supply and management of electricity generation based on local energy resources for community development and improve their prosperity

The points described above indicate that the development of SSHPPs is not attractive from a business point of view and that the private financing of SSHPPs is not a common practice in Indonesia.

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[3] RUPTL PT PLN (Persero) 2006-2015

[4] Ratna Ariati, DGEEU (Directorate General Electricity and Energy Utilization):"Renewable Energy in Indonesia: Policies and Regulations", Symposium of Renewable Energy, June 2006)

This project activity will be the first SSHPP exporting electricity to the South Sulawesi grid developed by an IPP.

Table 5 : Small-scale hydroelectric power plants under a Power Purchased Agreement (PPA)

No	Name of SSHPP	Location (Province)	Installed Capacity (kW)	Managed by	Source of Funding
1	Curug Agung	West Java	13	CV Sinar Agung Mandiri	IBEKA (NGO)[a]
2	Cinta Mekar	West Java	100	KUD Mekarsari	Gov of Indonesia and UN ESCAP [b]
3	Waikelosawa	East Nusa Tenggara	15	KUD Waikelosawa	e 7 [c]
4	Kalimaron	East java	25	Paguyuban Kalimaron	PPLH and GEF-SGP [d]
5	Melong	West Java	100	Cooperative of P3TEK	P3TEK-ESDM [e]
6	Dompyong	East Java	40	KUD Tani Tentrem	Government of Indonesia and Germany [f]
7	Santong	West Nusa Tenggara	40	KUD Gene	Distamben NTB [g]
8	Anggrek Mekarsari	West Sumatera	15	PT Anggrek Mekarsari	Rehabilited Power Plant [h]
9	Kalumpang	Central Sulawesi	1000	PT Buminata Cita Banggai Energy	IBRD/World Bank [i]
10	Hangga-hangga	Central Sulawesi	1000	PT Buminata Cita Banggai Energy	IBRD/World Bank [j]
11	Mobuya	North Sulawesi	3 x 1000	PT Cipta Daya Nusantara	BNI Bank [k]

Note : IBEKA (Institute Bisnis dan Ekonomi Kerakyatan), UN ESCAP (United Nations Economic and Social Commission for Asia and the Pacific), e 7 (Activities Implemented Jointly by the Government and the E7 Network of Expertise, a group of utilization from G7 countries), PPLH (Pusat Pendidikan Lingkungan Hidup), GEF-SGP (Global Environmental Facility-Small Grand Project), P3TEK (Pusat Penelitian dan Pengembangan Teknologi Energi)-ESDM (Energi Sumberdaya Mineral), Distamben (Dinas Pertambangan Energy) NTB(Nusa Tenggara Barat/West Nusa Tenggara), IBRD (The International Bank for Reconstruction and Development)

References: a) http://ibeka.port5.com/, b) http://ww.esdm.go.id/beritalistrik.php?news_id=368, c) http://smecda.com/Isi%20Berita/Kop%20Listrik%20Pedesaan.xls, d) http://www.kompas.com/kompas-cetak/0509/12/ilpeng/2002812.htm, e) Website Badan Penelitian dan Pengembangan Energi dan Sumber Daya Mineral, f) http://www.pln-jatim.co.id/infodis/detail2.asp?kode_berita=12, g) Ratna Ariati, DGEEU (Directorate General Electricity and Energy Utilization):"Renewable Energy in Indonesia: Policies and Regulations", Symposium of Renewable Energy, June 2006),
h) http://www.radarsulteng.com/berita/index.asp?Berita=Sulawesi%20Tengah&id=27115
i) http://members.bumn_ri.com/pt_pln/news.html?news_id=2344,
j) http://members.bumn_ri.com/pt_pln/news.html?news_id=2344, k) Personal communication

(c) other barriers

Institutional and policy barriers

Until now, the national energy policies regarding renewable energy have not been translated to specific guidelines, rules and regulations with particular focus on small-scale hydropower. Moreover, there are no integrated policies or programs regarding SSHPPs and their application. If such integrated policies or programs existed, they would help guide policy coordination among institutions in implementing the development of small-scale hydropower.

Technology barriers

The development of SSHPPs in the country is slow due to limited local industrial capacity to support SSHPP development.

Summary
The current and expected practice of predominantly relying on thermal sources and large-scale hydropower projects to expand the generation capacity, as well as the combination of low of the IRR to finance, clearly demonstrate that the Ranteballa SSHPP project is additional and therefore not the baseline scenario.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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In order to quantify emission reductions achieved by the project activity, procedures to calculate project emissions, baseline emissions, leakage and emission reductions set put in methodology are applied as follows.

Project Emissions (*PEy*)

No formulas are used. Emissions by sources are zero since hydroelectric generation power is a zero emission renewable power project.(PEy=0)

Baseline Emissions (*BEy*)

According to AMS-I.D, the baseline emissions are calculated by multiplying the net electricity generation in the project activity by the baseline emission factor for the project grid.

The baseline emissions:
$BE_y (tCO_2\ e/year) = EG_y * EF_y$

Where,
BE_y is the baseline emissions (tCO_2 e) in year *y*; EG_y is the average of historical electricity (MWh) delivered by the existing facility to the grid in year *y*; EF_y is the emission factor (tCO_2 e/MWh) as the weighted average of the Operating Margin emission factor ($EF_{OM,y}$) and the Build Margin emission factor ($EF_{BM,y}$) in year y.

Each parameter is calculated through Step 1 to 4 as follows:

Step 1. Determining the operating margin emission factor ($EF_{OM,y}$)

The Simple Operating Margin (OM) method was selected for the Calculation of Operating Margin emission factor due to the following reasons :

1. The Dispatch Data Analysis Emission Factor is not available to public,
2. and “Low-Cost and Must-Run” sources produce less than 50% of the total South Sulawesi grid generated electricity in each of the previous five years for which data is available (2001-2005).

The Simple Operating Margin emission factor ($EF_{OM,y}$) is calculated using the following equation:

$$EF_{OM,average,y}(tCO_2/MWh) = \frac{\sum_{i,j} F_{i,j,y} \bullet COEF_{i,j}}{\sum_j GEN_{j,y}} \text{ ……………………(1)}$$

Where,
$F_{i,j,y}$ is the amount of fuel i (in a mass or volume unit) consumed by relevant power sources j in years y (2003-2005), j refers to the power sources delivering electricity to the grid, not including low-operating cost and must run power plants. $COEF_{i,j}$ is the CO_2 emission coefficient of fuel i (tCO_2/mass or volume unit of the fuel), taking into account the carbon content of the fuels used by relevant power sources j. $GEN_{j,y}$ is the electricity (MWh) delivered to the grid by source j in year y.

Step 2. Calculating the build margin emission factor ($EF_{BM,y}$)

The project participants have used the most recent data from the sample group that has already been built. In the sample group used, the participants have selected the largest annual generation between the following choices :

1. The five power plants that have been built most recently, or
2. The power plants capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and that have been built most recently.

The annual generation of "the five power plants that have been built recently" was 9,212 MWh (0.38%) of total generation of the grid system, and the annual generation of "The power plants capacity addition in the electricity system that comprises 44.1% of the system generation (in MWh) and that have been built most recently" was 1,058,419 MWh. Therefore, the latest figure was selected since it has a larger annual generation than the other one.

The Build Margin emission factor ($EF_{BM,y}$) is calculated using the following equation:

$$EF_{BM,y}(tCO_2/MWh) = \frac{\sum_{i,m} F_{i,m,y} \bullet COEF_{i,m}}{\sum_m GEN_{m,y}} \text{ ……………………..….(2)}$$

Where,
$F_{i,m,y}$, $COEF_{i,m}$ and $GEN_{m,y}$ are analogous to the variables described for the simple OM method for plants *m*.

Step 3. Calculating the baseline emission factor (combined margin emission factor (EF_y)

$$EF_y = w_{OM} EF_{OM,y} + w_{BM} EF_{BM,y} \text{……………………………...………..(3)}$$

where the weights w_{OM} and w_{BM}, by default, are 50% (i.e., $w_{OM} = w_{BM} = 0.5$).

Step 4, Calculating baseline emission (BE_y)
Baseline emission is calculated as follows:

$$BE_y (tCO_2\ e/year) = EG_y * EF_y \text{………………………..........…………..(4)}$$

Leakage (L_y)
This is not applicable as the renewable energy technology used is not equipment transferred from another activity. Therefore, as per the Simplified Procedures for Small-scale CDM Project Activities, no leakage calculation is required.

Emission Reductions (*ER_y*)
In this project activity, project emission is zero due to a zero emission renewable generation power project and leakage is considered to be negligible. Therefore, emission reductions, ER_y is equal to the total baseline emission, BE_y (equation (4)).

$ER_y=BE_y-PE_y-Ly_y$…………………………..........……………………....(5)

where $PE_y=0$ and $L_y=0$

$ER_y=BE_y$…………………………..........………………………………...(6)

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

Data / Parameter:	**Net Calorific Value (NCV)**
Data unit:	TJ/t fuel (Terra Joule/tonne fuel)
Description:	Net calorific value (energy content) per mass or volume unit of a fuel
Source of data used:	"Bahan Bakar Minyak, Elpiji dan BBG untuk kendaraan, rumah tangga, industri dan perkapalan", published by PERTAMINA 2003
Value applied:	NCV for MFO is 41.02 and HSD is 42.73
Justification of the choice of data or description of measurement methods and procedures actually applied :	The NCV data of HSD and MFO are available. Therefore, IPCC's data is not used.
Any comment:	Data provided in Annex 3

Data / Parameter:	**Density**
Data unit:	kt/k l (kilo tonne/ kilo litre)
Description:	Liquid density of HSD and MFO
Source of data used:	"Bahan Bakar Minyak, Elpiji dan BBG untuk kendaraan, rumah tangga, industri dan perkapalan", published by PERTAMINA 2003
Value applied:	Density value for MFO is 0.000990 and HSD is 0.000845
Justification of the choice of data or description of measurement methods and procedures actually applied :	The NCV data of HSD and MFO are available. Therefore, IPCC's data is not used.
Any comment:	Data provided in Annex 3

Data / Parameter:	**Carbon Content**
Data unit:	t C/TJ (tonne Carbon/Terra Joule)
Description:	Carbon content in the fuel per unit of energy
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	The carbon content of MFO is 21.1 and HSD is 20.20
Justification of the choice	Use default data

of data or description of measurement methods and procedures actually applied :	
Any comment:	Data provided in Annex 3

Data / Parameter:	Carbon oxidation factor
Data unit:	---
Description:	
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value applied:	1
Justification of the choice of data or description of measurement methods and procedures actually applied :	Use default data
Any comment:	Data provided in Annex 3

Data / Parameter:	**GEN_y**
Data unit:	MWh (Mega Watt hours)
Description:	Electricity generated
Source of data used:	PT PLN Sulawesi Selatan and Tenggara Buku Statistik 2001, 2002, 2003, 2004 and 2005
Value applied:	Available in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	All data of generated electricity for the most recent five years (2001-2005) in the South Sulawesi grid is used to calculate the ratio of Low Cost and Must Run Power Plants in the grid. Data for the most recent three year data (2003, 2004 and 2005) in the grid is used to calculate the Operating Margin emission factor(s) ($EF_{OM,y}$).
Any comment:	Data provided in Annex 3

Data / Parameter:	**Fuel consumption**
Data unit:	kl (kilo litre) , kt (kilo tonne), MMBTU (million metric british thermal unit)
Description:	Amount of fuel combusted per type of technology
Source of data used:	PT PLN Sulawesi Selatan and Tenggara Buku Statistik 2001, 2002, 2003, 2004 and 2005
Value applied:	Available in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	The most recent three years data (2003, 2004, and 2005) is used for calculating CO_2 emission.
Any comment:	Data provided in Annex 3

Data / Parameter:	Average electricity losses
Data unit:	%
Description:	The average electricity losses refers to parasitic power and electricity losses occurring in the sub-station.
Source of data used:	PT PLN Sulawesi Selatan and Tenggara Buku Statistik 2001, 2002, 2003, 2004 and 2005

Value applied:	Available in Annex 3
Justification of the choice of data or description of measurement methods and procedures actually applied :	Data for average electricity losses is used to calculate net electricity generated (electricity exported to the grid)
Any comment:	Data provided in Annex 3

Data / Parameter:	**SFC** (Specific Fuel Consumption)
Data unit:	l/kWh (litre/kilo Watt hour), MMBTU/kWh (million metric british thermal unit)
Description:	Fuel consumption per unit of energy
Source of data used:	- PT PLN Sulawesi Selatan and Tenggara Buku Statistik 2001, 2002, 2003, 2004 and 2005 - PT PLN (PERSERO) KITLUR SUMBAGUT 2004
Value applied:	SFC of Diesel Power Plant is 0.719 SFC of Combined Cycle Gas Turbine (CCGT) Power Plant is 0.506
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data is used for estimating fuel consumption of IPP's Diesel Power Plants and CCGT Power Plant in the grid. The fuel consumption of IPP's power plant is not available for publication.
Any comment:	Data provided in Annex 3

B.6.3 Ex-ante calculation of emission reductions:

>>

Project Emission

$PE_y=0$ (tCO_2/year)

Baseline Emissions (*BEy*)

Operating margin emission factor (EF_{OM})

$$EF_{OM,average,y} = \frac{\sum_{i,j} F_{i,j,y} \bullet COEF_{i,j}}{\sum_j GEN_{j,y}}$$

$= [995{,}153(tCO_2)/1{,}387{,}160\ (MWh)]_{2003}+[1{,}202{,}324(tCO_2)/1{,}528{,}877\ (MWh)]_{2004}$
$+[1{,}158{,}132(tCO_2)/1{,}666{,}309\ (MWh)]_{2005}$
$= 0.732\ (tCO_2/MWh)$

Build margin emission factor

$$EF_{BM,y} = \frac{\sum_{i,m} F_{i,m,y} \bullet COEF_{i,m}}{\sum_m GEN_{m,y}}$$

$= 546{,}896\ (tCO_2)/1{,}058{,}419\ (MWh)$
$= 0.517\ (tCO_2/MWh)$

Combine margin emission factor

$EF_y = w_{OM}\, EF_{OM,y} + w_{BM}\, EF_{BM,y} \ldots$
$= 0.5 \times 0.732\ (tCO_2/MWh) + 0.5 \times 0.517\ (tCO_2/MWh)$
$= 0.624\ (tCO_2/MWh)$

Baseline emission

$BE_y = EG_y * EF_y$
$= 16{,}819\ (MWh/year) \times 0.624\ (tCO_2/MWh)$
$= 10{,}498\ (tCO_2/year)$

Leakage

$L_y = 0\ (tCO_2/year)$

Emission Reduction

$ER_y = BE_y$
$= 10{,}498\ (tCO_2/year)$

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

>>

Year	Estimation for Project Activity Emissions	Estimation of Baseline Emissions	Estimation of Leakage	Estimation of overall emission reductions
2008	0	5,249	0	5,249
2009	0	10,498	0	10,498
2010	0	10,498	0	10,498
2011	0	10,498	0	10,498
2012	0	10,498	0	10,498
2013	0	10,498	0	10,498
2014	0	10,498	0	10,498
Total (tonnes of CO_2)	**0**	**68,238**	**0**	**68,238**

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**Electricity from Ranteballa SSHPP**
Data unit:	kWh (kilo Watt hour)
Description:	Electricity exported to grid
Source of data to be used:	Electricity exported to the grid as recorded in a kWh meter

Value of data	Electricity generated sold to PLN
Description of measurement methods and procedures to be applied:	Measured continuously using a kWh meter.
QA/QC procedures to be applied:	The kWh meter will undergo/maintenance/calibration subject to appropriate industry standards.
Any comment:	

B.7.2 Description of the monitoring plan:

>>

Parties involved in monitoring

Either FFEL or PLN will be responsible for the accurate reading of kWh meter. The amount of emission reductions will be easily monitored through the exported electricity to the grid. FFEL and PLN will form an Operational Committee consisting of 2 persons from PLN and 2 persons from FFEL.

Quality Assurance and Quality Control

The quality assurance and quality control for recording, maintaining and archiving data shall be maintained by FFEL. FFEL will provide personnel that are in charge of data collection. In order to maintain and upgrade the ability and skill of the operator, training related to electrical engineering and operation of power generation will be performed.

On site procedures

The operator of FFEL and PLN will record production displayed in the kWh meter, every 1st day of the month. The difference of the reading between two consecutive months is the electricity exported to the grid during the previous month.

A copy of the invoice to PLN will be used by FFEL as the basis for determining the emission reductions for that month. FFEL will keep the copy of the invoice for at least two years after issuance of the Certified Emission Reduction (CER).

Procedures for Calibrating of Equipment

The kWh meter installed will be of a digital type. The kWh meter to be used will be calibrated and periodically recalibrated by the Metrology Office.

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

>>

Date of completing the final draft of this baseline section *(DD/MM/YYYY)*

3/1/2007

Name of person/entity of determining baseline:

Name : Mr. Gunawan Onie, Mr. Liong Widjaja and Mr. Roberth R. Batara
Unit : PT Fajar Futura Energi Luwu
Address : Jl Tanjung Duren Raya No. 12, Jakarta, Indonesia
Tel : +62-21-563-5635
Mobile : +62-21-568-5050
E-mail : roberthbatara@yahoo.co.id

Name : Mr.Tatsuya Kunishi, Dr. Akira Irie
Unit : The Chugoku Electric Power Co., Inc.
Address : 4-33, Komachi, Naka-ku, Hiroshima, Japan
Tel : +81 (82) 523-6361
Mobile : +81 (82) 523-6367
E-mail : 357147@pnet.energia.co.jp, 262802@pnet.energia.co.jp

Name : Kozo Bando Ph.D
Unit : Kajima Corporation
Address : 3-7-1 Nishi-Shinjuku, Shinjuku-ku, Tokyo, Japan
Tel : +81-3-5321-7332
Fax : +81-3-5321-7328
E-mail : bandok@kajima.com

Name : Dr. Irhan Febijanto, Mr. Rohmadi Ridlo and Ms.Widyawati
Unit : Centre for Energy Resources Development Technology, Agency for the Application and Assessment of Technology (BPPT)
Address : Jalan M.H. Thamrin No 8, Gedung BPPT II Lantai 22, Jakarta 10340, Indonesia
Tel : 021-3169884
Mobile : -
E-mail : irhan@bandung.wasantara.net.id

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
01-07-2008

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

>>
30 y-0m

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:

>>
01-07-2008

C.2.1.2. Length of the first crediting period:

>>
7y-0m

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
Not applicable

C.2.2.2. Length:

>>
Not applicable

SECTION D. Environmental impacts

>>

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

>>
Referring to the Decree of the Minister of the Environment (MENLH No.17, 2001) of the Republic of Indonesia, an "Environmental Impact Assessment (hereinafter referred to as AMDAL)" is not required for a small hydroelectric power project whose capacity is less than 50 MW such as Ranteballa SSHPP. As this SSHPP's total capacity is only 2.4 MW, it requires no AMDAL. Instead, a submission of UKL/UPL is required by the MENLH No.17 (2001).

The UKL/UPKLs of the SSHPP has already been submitted by FFEL, and the permissions for developing power plant by the local government has already been granted (RANTEBALLA SSHPP; No.180/19/HUK/2005, dated January 17, 2005).

The water flow in the river will be maintained to preserve the river ecosystem. The water exiting the turbine is discharged back to the Ranteballa river. There are no public activities that utilize river water. For this reason, there would be no extremely negative impact through the utilization of the river water for the project activity.

The scale of the proposed project activity is small. Between the intake and tailrace of the SSHPP there is no water utilization such as for farmland irrigation or for daily use by the local population so that the environmental impacts related to the project activity are negligible. After being used for power generation, water is return to the Ranteballa river. In brief, the project activity will not result in significant impacts to the environment.

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

>>
The project activity requires no AMDAL and will not result in significant impacts to the environment.

SECTION E. Stakeholders' comments

>>

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

>>
The stakeholders of this CDM project activity development include the government and non-government parties of the Republic of Indonesia, such as local populations, local government, who are either indirectly or directly involved in different roles at different stages in the project activity. All the necessary permits from the government parties have been obtained.

FFEL had organized a stakeholder's consultation with the villagers surrounding Ranteballa SSHPP to inform related stakeholders regarding the environmental and social impacts of the project activity and to discuss their concerns (anxiety) regarding the development of the project activity. The invitation for the stakeholder's consultation was sent out to the villagers, local communities and local state governments in the SSHPP's regions requesting them to participate and voice any suggestions/objections regarding the project activity. The stakesholder's meeting was held on 28 December 2006 at Ranteballa Village, Latimojong District, Luwu Regency, South Sulawesi Province.

FFEL has received written approval from the elected local government authority (or Bupati/Regent/officer in charge of a regency) representing local community.
The representatives of the stakeholder comments who attended the meeting were the Head of Luwu Sub-District, Head of Ranteballa villages, and several head of villages surrounding Ranteballa village, some public figures of the villages, government representative of the Luwu Regency and the Mine and Energy Service. There were 111 peoples attending the meeting.

In terms of applicable regulations, the developer must obtain approval from the Regent prior to starting construction for every project (including small hydropower plant projects). The details of the approval result will be available upon validation request.

E.2. Summary of the comments received:

>>

Generally, the agenda of the stakeholder's consultation of Ranteballa SSHPP was set as follows:

1. Registration
2. Introduction and welcome address
3. Description of the project activity, CDM, Environmental and Social issues
4. Discussion (question and answer session)
5. Reading the draft minutes of the meeting and signing of the minutes of the meeting.

The summary of the consultation is as follows:

1. FFEL introduced the contents and purpose of the meeting, benefits of hydropower project and the increase in employment opportunities for the local villagers owing to the manpower required in the development of the project activity.
2. Generally local villagers support the development of Ranteballa SSHPP because this would give direct as well as indirect benefits to the local community.
3. The development of the project activity will be implemented according to the prevailing regulations.

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

>>

There were no negative comments received in the consultation and the interviews, which were recorded and signed by the stakeholders.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	PT. Fajar Futura Energi Luwu
Street/P.O.Box:	Jl Tanjung Duren Raya No. 12
Building:	N/A
City:	Jakarta
State/Region:	N/A
Postfix/ZIP:	
Country:	Indonesia
Telephone:	+62-21-563-5635
FAX:	+62-21-568-5050
E-Mail:	roberthbatara@yahoo.co.id
URL:	N/A
Represented by:	
Title:	President Director
Salutation:	Mr.
Last Name:	Roberth R.
Middle Name:	N/A
First Name:	Batara
Department:	N/A
Mobile:	N/A
Direct FAX:	N/A
Direct tel:	N/A
Personal E-Mail:	N/A

Organization:	The Chugoku Electric Power Co., Inc.
Street/P.O.Box:	4-33, Komachi, Naka-ku
Building:	
City:	Hiroshima
State/Region:	Hiroshima Prefecture
Postfix/ZIP:	730-8701
Country:	Japan
Telephone:	+81-82-523-6424
FAX:	+81-82-523-6422
E-Mail:	N/A
URL:	http://www.energia.co.jp/
Represented by:	
Title:	Manager
Salutation:	Mr.
Last Name:	Takeyama
Middle Name:	
First Name:	Takayoshi
Department:	Energia Division
Mobile:	N/A
Direct FAX:	N/A
Direct tel:	N/A
Personal E-Mail:	N/A

Organization:	KAJIMA Corporation
Street/P.O.Box:	3-7-1 Nishi Shinjuku Shinjuku-ku
Building:	Shinjuku Park Tower 29F
City:	Tokyo
State/Region:	Tokyo
Postfix/ZIP:	163-1029
Country:	Japan
Telephone:	+81-3-5321-7332
FAX:	+81-3-5321-7328
E-Mail:	bandok@kajima.com / kozo_bando@hotmail.com
URL:	http://www.kajima.co.jp/
Represented by:	Kozo Bando
Title:	General Manager
Salutation:	Ph.D.
Last Name:	Bando
Middle Name:	N/A
First Name:	Kozo
Department:	CDM/JI Group, Environmental Engineering Division
Mobile:	+81-90-4714-9778
Direct FAX:	+81-3-5321-7328
Direct tel:	+81-3-5321-7332
Personal E-Mail:	kozo_bando@hotmail.com

Organization:	Centre for Application and Assessment of Energy Resources Technology, Agency for the Application and Assessment of Technology
Street/P.O.Box:	Jl. M.H. Thamrin no.8
Building:	BPPT building 2nd, 22nd flr.
City:	Jakarta
State/Region:	
Postfix/ZIP:	1340
Country:	Indonesia
Telephone:	+62-21-316-9860
FAX:	+62-21-316-9867
E-Mail:	N/A
URL:	N/A
Represented by:	
Title:	Researcher
Salutation:	Dr.
Last Name:	Febijanto
Middle Name:	N/A
First Name:	Irhan
Department:	N/A
Mobile:	N/A
Direct FAX:	N/A
Direct tel:	N/A
Personal E-Mail:	N/A

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

NOT APPLICABLE

Annex 3

BASELINE INFORMATION

Table 6 Fuel Specifications

Fuel Type	(A)	(B)	(C)	(D)	(E)	(F)	(G)
	Calorific value per mass	Default Carbon Content	Default Carbon Oxidation factor	**Carbon (A)x(B)x(C)**	**CO_2 emissions (D) x 44/12**	**Density**	**CO_2 emissions (E) x (F)**
	TJ/kt fuel	(tC/TJ)	-	tC/kt fuel	tCO_2/kt fuel	kt/k l	tCO_2/kl fuel
Data source	PERTAMINA	IPCC	IPCC	-	-	-	
MFO	41.02	21.10	1.00	865.50	3,173.51	0.000990	3.14
HSD	42.73	20.20	1.00	863.12	3,164.77	0.000845	2.67

Note : *HSD : High Diesel Speed, MFO : Marine Fuel Oil, IPCC : Intergovernmental Panel on Climate Change; PERTAMINA: Perusahaan Pertambangan Minyak dan Gas Bumi Negara/State-Owned Oil Company of Indonesia,* kt fuel: kilo tonne fuel; tC: tonne carbon, TJ: Terra Joule, kl fuel : kilo litre fuel

Operating margin calculation

Table 7 Power Plants in the grid by source (MWh)

Fuel type	2,001	2,002	2,003	2,004	2,005
Hydro	943,833	803,776	759,557	778,341	746,882
HSD	272,648	368,051	413,760	528,523	624,392
MFO	35,892	35,268	56,699	20,761	3,431
NG	772,612	920,036	935,635	1,002,974	1,067,873
Total	2,024,986	2,127,131	2,165,650	2,330,599	2,442,578

Source : *PT PLN (PERSERO) STATISTIK*
Note : *NG: Natural Gas*

Table 8 : Ratio of Low Cost and Must Run Power Plants in the most recent five years (2001 - 2005)

	Units	2001	2002	2003	2004	2005
Total Generation	GWh	2,025	2,127	2,166	2,331	2,443
Low Cost and Must-run generation	GWh	944	804	760	778	747
Low Cost and Must-Run Generation/ Total Generation	%	**47**	**38**	**35**	**33**	**31%**

Source : *PT PLN (PERSERO) STATISTIK*

Table 9 : Percentage of Average Losses in Sub-Stations

Year	Total Generation	Parasitic Power	Losses in Sub-Stations	Percentage	Total
	MWh	MWh	MWh	%	
2001	2,232,820,911	17,163,716	904,240	0.81%	0.81%
2002	2,355,302,413	32,088,756	1,997,869	1.45%	1.45%
2003	2,411,025,929	30,829,949	1,636,204	1.35%	1.35%
2004	2,597,307,972	35,815,362	3,305,548	1.51%	1.51%
2005	2,724,892,528	44,060,358	3,162,368	1.73%	1.73%

Source : *PT PLN (PERSERO) STATISTIK*

Table 10 : Five year average of Specified Fuel Consumption and CO_2 Emission Factor of Diesel Power Plant

Power plant type	2001	2002	2003	2004	2005	Average (A)	CO_2 emissions (B)	Average CO_2 emission factor (A) x (B)
	l/kWh	l/kWh	l/kWh	l/kWh	l/kWh	l/kWh	tCO_2/kl fuel	tCO_2/MWh
Diesel	0.28	0.27	0.27	0.27	0.26	0.27	2.67	**0.719**

Source : *PT PLN (PERSERO) STATISTIK*

Table 11 : Five year average of Specified Fuel Consumption and CO_2 Emission Factor of Combined Cycle Gas Turbine Power Plant

Power plant type	1999	2000	2001	2002	2003	Average (A)	CO_2 emissions (B) = (A) x 1.055072 x 10^{-3}	Effective CO_2 emission factor (C)	Average CO_2 emission factor (B) x (C)
	MMBTU/kWh	MMBTU/kWh	MMBTU/kWh	MMBTU/kWh	MMBTU/kWh	MMBTU/kWh	TJ/MWh	(kg CO_2/TJ)	tCO_2/MWh
CCGT	0.00862	0.008552	0.008368	0.008696	0.008502	0.0085476	0.009018347	56,100.0	**0.506**

Source : *PT PLN (PERSERO) STATISTIK*, **Note :** *CCGT : Combined Cycle Gas Turbine*

The average CO_2 Emission Factors calculated as in table 10 and in table 11 are used for estimating CO_2 emitted from Diesel Power Plants and Combined Cycle Gas Turbine Power Plants owned by IPP (Independent Power Producer).

Table 12 : CO_2 Emissions and Electricity Generated in 2003

		(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Item		Electricity generated	Fuel consumption	Density	Fuel consumption (B) x (C)	Calorific value per mass	Calorific value per mass	Calorific value (D) x (E)	Carbon Emission factor	Oxidation factor	CO_2 emissions (G)x(H)x(I)X44/12	CO_2 emission factor
unit		MWh	kl	kt/k l	kt	TJ/kt	TJ/kt	TJ	tC/TJ	-	tCO_2	tCO_2/MWh
Data source		PLN	PLN	PERTAMINA		PERTAMINA	IPCCC			IPCCC		
PLN	HSD	207,307	110,428	0.000845	93.3	42.73	-	3,987	20.2	1	295,310	-
PLN	MFO	56,699	23,860	0.000990	23.6	41.02	-	969	21.1	1	74,962	-
IPP	HSD	206,453	-		-	-	-	-	-	1	148,516	**0.719**
IPP	NG	935,635	-		-	-	48.00	-	15.3	1	473,365	**0.506**
Total		1,406,094									992,153	0.706

Source : PT PLN

Table 13 : CO_2 Emissions and Electricity Generated in 2004

		(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Item		Electricity generated	Fuel consumption	Density	Fuel consumption (B) x (C)	Calorific value per mass	Calorific value per mass	Calorific value (D) x (E)	Carbon Emission factor	Oxidation factor	CO_2 emission s (G)x(H)x(I)X44/12	CO_2 emission factor
unit		MWh	kl	kt/k l	kt	TJ/kt	TJ/kt	TJ	tC/TJ	-	tCO_2	tCO_2/MWh
Data source		PLN	PLN	PERTAMINA		PERTAMINA	IPCCC			IPCCC		
PLN	HSD	296,860	186,089	0.000845	157.2	42.73	-	6,719	20.2	1	497,641	-
PLN	MFO	20,761	9,739	0.000990	9.6	41.02	-	396	21.1	1	30,599	-
IPP	HSD	231,663	-		-	-	-	-	-	1	166,651	**0.719**
IPP	NG	1,002,974	-		-	-	48.00	-	15.3	1	507,434	**0.506**
Total		1,552,258									1,202,324	0.775

Source : PT PLN

Table 14 : CO_2 Emissions and Electricity Generated in 2005

		(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)
Item		Electricity generated	Fuel consumption	Density	Fuel consumption (B) x (C)	Calorific value per mass	Calorific value per mass	Calorific value (D) x (E)	Carbon Emission factor	Oxidation factor	CO_2 emissions (G)x(H)x(I)X44/12	CO_2 emission factor
unit		MWh	kl	kt/k l	kt	TJ/kt	TJ/kt	TJ	tC/TJ	-	tCO_2	tCO_2\MWh
Data source		PLN	PLN	PERTAMINA		PERTAMINA	IPCCC			IPCCC		
PLN	HSD	429,713	176,820	0.000845	149.4	42.73	-	6,384	20.2	1	472,857	-
	MFO	3,431	1,579	0.000990	1.6	41.02	-	64	21.1	1	4,961	-
IPP	HSD	194,679	-		-	-	-	-	-	1	140,046	**0.719**
	NG	1,067,873	-		-	-	48.00	-	15.3	1	540,268	**0.506**
Total		1,406,094									1,158,132	0.683

Source : PT PLN

The CO_2 emissions of PLN power plants are calculated from the fuel consumption of the power plant. Since fuel consumption data for IPP's power plants is not available, the CO_2 emissions data for IPP's power plants is obtained by multiplying the CO_2 emission factor by the electricity generated.

Table 15 : Three year average (2003-2005) of Emission Factor Operating Margin

Item	Unit	2003	2004	2005	TOTAL
Total Emissions	**tCO_2 e**	992,153	1,202,324	1,158,132	**3,352,609**
Total Generation	**MWh (gross)**	1,406,094	1,552,258	1,695,696	**4,654,048**
	MWH (net)	1,387,160	1,528,877	1,666,309	**4,582,347**
EF_{OM}	**tCO_2 e/MWh**	0.715	0.786	0.695	**0.732**

Build margin calculation

Table 16 : Sample plant group (M) for determining Build Margin Emission Factor

Sample group (m) Classification	"The five power plants that have been built recently"	"The power plants capacity addition in the electricity system that comprises 20% of the system generation (in MWh) and that have been built most recently"	Comments
Electricity quantity	9,212 MWh	1,058,419 MWh	Total generation is 2,400 (GWh) in South Sulawesi grid (based on PT PLN Sulselra statistic data in year 2005)
Proportion (ratio to total generation in South Sulawesi grid)	0.38 %	44.1%	
Selected group		**O**	

Note : Sulselra (Sulawesi Tenggara/ South East Sulawesi)

Table 17 : Sample group plants used in the Build Margin calculation and CO_2 Emission Factor for Build Margin

Owner	**Power Plant**		**Year**	**2005**						
	Name	**Type**		Installed Capacity (MW)	**Unit**	**Total capacity (MW)**	**Electricity generated** Gross (MWh) (A)	**Electricity generated** Net (MWh) (B)	**Average CO_2 emissions tCO_2/MWh (C)**	**Emissions (tCO_2) (A) x (C)**
IPP	Sengkang	CCGT	2000	130.0	1	130.0	1,067,872	1,049,366.5	0.506	540,268.1
IPP	Sewatama	Diesel	2005	1.0	15	15.0	9,212	9,053.2	0.719	6,627.4
Total								1,058,419.7		546,895.6
EF_{BM} (tCO_2e/MWh)									**0.517**	

Table 18 : Estimation of GHG emission reduction

Item	Unit	Ranteballa SSHPP
$EF_{OM,average,y}$	(tCO_2 e/MWh)	0.732
$EF_{BM,y}$	(tCO_2 e /MWh)	0.517
EF_y	(tCO_2 e /MWh)	0.624
EG_y	MWh/year	16,819
BE_y	(tCO_2 e /year)	10,498
PE_y	(tCO_2 e /year)	0
L_y	(tCO_2 e /year)	0
ER_y	(tCO_2 e /year)	10,498

Annex 4

MONITORING INFORMATION

Table 19 : Data to be monitored in the project activity

ID number	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	For how long is archived data to be kept?	Comment
1	Electricity from Ranteballa SSHPP	Electricity exported to grid	*kWh*	**m**	Monthly	100%	Electronic and Paper	*Four years after verification*	Meter is regularly calibrated by Metrology Office