

CAPACITY UPGRADE OF GUNUNG SALAK GEOTHERMAL POWER PLANT PROJECT, INDONESIA



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1 PROJECT DETAILS

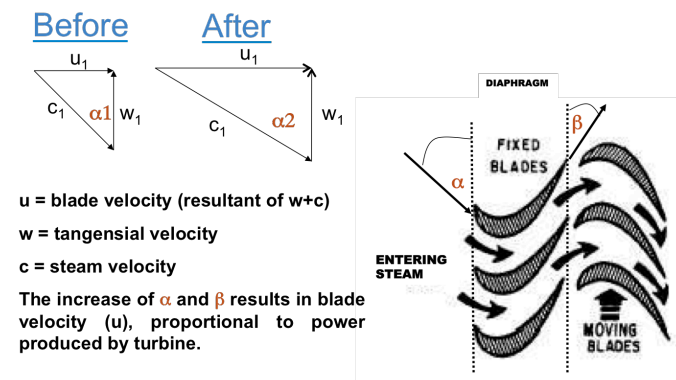
1.1 Summary Description of Project

The project activity is comprised of a capacity upgrade of Gunung Salak Geothermal Power Plant from 3 x 55 MW to 3 x 60 MW. The additional installed capacity of 15 MW at Gunung Salak Geothermal power plant generates and supplies an average of 213,959 MWh p.a. of electricity to the connected JAMALI Grid. The project is owned and developed by PT. Indonesia Power, a subsidiary company of PT. PLN (Persero), a state-owned electricity company. The proposed project will increase the utilization of renewable energy sources, in this case geothermal energy, by modifying turbines and steam gas ejectors. Steam for the project is provided by Chevron Geothermal Indonesia under an Energy Sales Contract (ESC) between PT. PLN (Persero) Pertamina, a state-owned oil and gas company, and Unocal Geothermal of Indonesia (Though today, Gunung Salak geothermal fields are owned by Chevron Geothermal Indonesia Ltd.).

The Capacity upgrade of Gunung Salak geothermal power plant project, Indonesia (referred later as the project activity) comprises of following modification¹ that has been undertaken to increase the steam flow, thus increasing the installed capacity of the power plant from 3 x 55 MW to 3 x 60 MW:

- Turbine modification, which means to modify first and second stage diaphragms by increasing nozzle size from $\alpha 1$ to $\alpha 2$ to allow steam turbine efficiency as shown in Graph 1.
- Ejector line replacement, which means to replace a smaller line of ejectors with a new design to increase the flow rate of Non-Condensable Gases (NCG) that is caused by an increase in steam flow due the project activity.

Figure 1. Nozzle increase in the diaphragms



¹ Contract for Off Shore Materials Supply for Power Up-Rating of Unit 1, 2, and 3 between PT. Indonesia Power and Ansaldo Energia SpA, dated on 22 July 2002.

The project does not modify and/or replace the whole power stations but only parts of their equipment.

In the end, the project does not really change the established technology, which consists of a steam turbine, electrical generators, a gas extraction system, a 150KV switchyard system, and a utility system. The project is using the same hot water-dominated steam characteristic from Gunung Salak Geothermal field, with a condensate re-injection well-system to maintain groundwater supply. However, the project utilizes a higher steam flow due to a capacity increase by modifying steam turbines.

1.2 Sectoral Scope and Project Type

According to the VCS, the project activity falls under the category of renewable energy projects (wind, PV, solar thermal, biomass, liquid bio-fuels, geothermal, and run-of-river hydro) with emission reductions between 5,000-1,000,000 tCO₂-e per year. The project is not part of a grouped project.

According to the CDM UNFCCC criteria, one approved GHG program by the VCS Board, the project is classified as a large scale project, which falls under Sectoral Scope 1: Energy Industries (renewable/non renewable).

1.3 Project Proponent

Name of the party involved ((host) indicates a host party)	Private and/or public entity (ies) project participants (as applicable)	Kindly indicate if the party involved to be considered as project participant (Yes/No)
Indonesia (host)	PT. Indonesia Power	No
Switzerland	South Pole Carbon Asset Management Ltd. (as carbon credit buyer)	No

Project proponents contact information as follows:

Project owner:

Organization:	PT. Indonesia Power
Street/P.O.Box:	Jl. Jenderal Gatot Subroto Kav. 18
Building:	
City:	Jakarta
State/Region:	
Postfix/ZIP:	12950
Country:	Indonesia
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Carbon credit buyer:

Organization:	South Pole Carbon Asset Management Ltd.
Street/P.O.Box:	Technoparkstrasse 1
Building:	
City:	Zurich
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Postfix/ZIP:	8005
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Telephone:	+41-44 633 7870
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E-Mail:	registration@southpolecarbon.com
URL:	www.southpolecarbon.com
Represented by:	
Salutation:	Mr.
Last Name:	Heuberger
Middle Name:	
First Name:	Renat
Mobile:	+41-79 549 3951
Direct FAX:	
Direct tel:	
Personal E-Mail:	registration@southpolecarbon.com

1.4 Other Entities Involved in the Project

Not applicable as there are no other entities except PT. Indonesia Power and South Pole Carbon Asset Management Ltd.

1.5 Project Start Date

The project start date, when the power plant started to operate normally after the capacity upgrade performance test conducted by the technology provider and at the same time the project started to reduce GHG emissions:

Unit 1: 21 June 2005

Unit 2: 4 April 2005

Unit 3: 29 September 2004

Thus, the project start date is 29 September 2004, as the earliest project start date of three units at Gunung Salak Geothermal Power Plant.

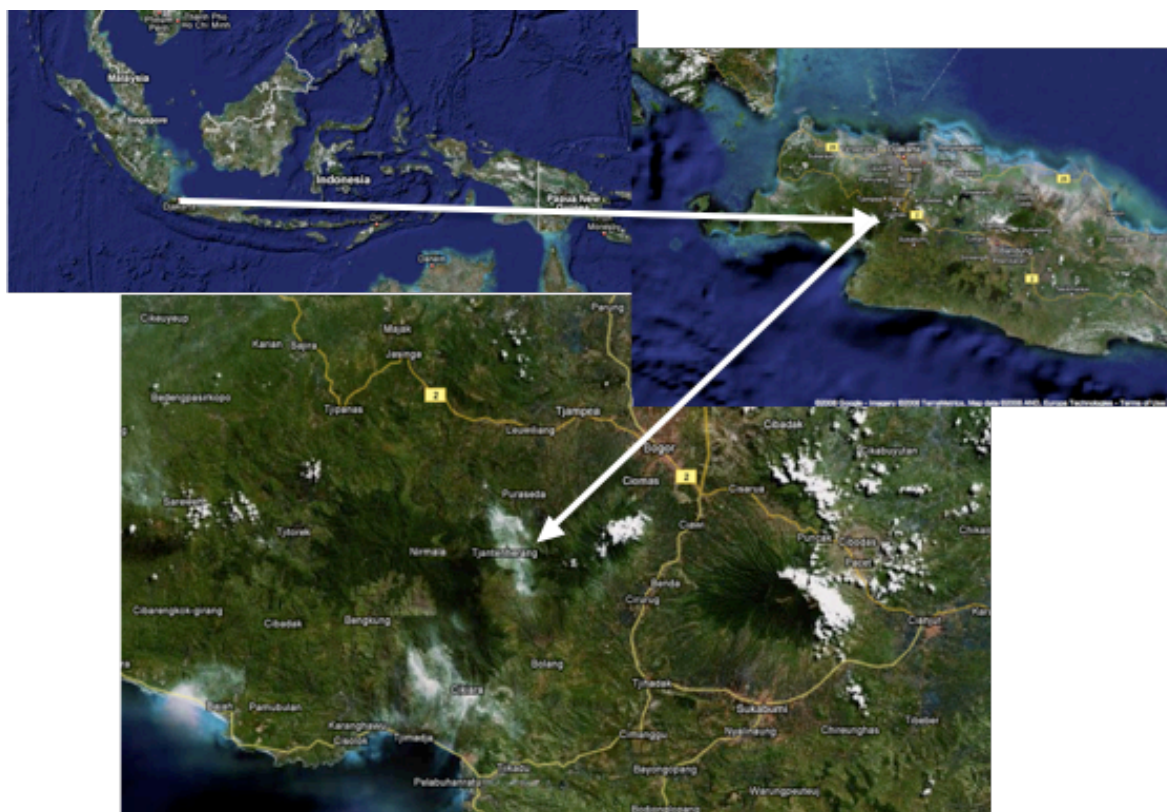
1.6 Project Crediting Period

The crediting period of this project activity is 10 years from 1 April 2006 until 31 March 2016.

1.7 Project Location

The project site is located in Awibengkok-Ratu area of Gunung Salak Geothermal field surrounded by Halimun Salak national park, which is administratively part of Bogor District and Sukabumi District, West Java Province, Indonesia. The project is located 988 m above sea level, approximately 82 km from Bogor and 58 km from Sukabumi. The exact location is 06° 44' 26" S, 106° 38' 28" E.

Figure 2. Gunung Salak geothermal power plant location



Source: Google Earth

1.8 Title and Reference of Methodology

The methodology applied for this project activity is

Type : I – Energy Industries (Renewable / Non Renewable Sources)
 Category : ACM0002 “Consolidated methodology for grid-connected electricity generation from renewable sources”
 Version : 07

Further background information on the project activity can be found in the VCS Project Description (VCS PD) and associated documents, which had already been submitted for validation as per requirements of the Voluntary Carbon Standard, Version 2007.1. The VCS PD and associated documents are available upon request.

2 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

As per VCS PD, the project activity includes Unit #1, Unit #2 and Unit #3 of Gunung Salak Geothermal Power Plant that were started to operate normally after the capacity upgrade performance test conducted

by the technology provider and at the same time the project started to reduce GHG emissions on following dates:

Unit #1: 21 June 2005

Unit #2: 4 April 2005

Unit #3: 29 September 2004

The project activity generates electricity, thus displaces electricity that would have been generated from predominantly fossil fuel based power generation.

During this 2nd verification period from 1 April 2009 to 31 March 2011, the power plant is in operation continuously (with outages – forced and planned). The reasons for the planned and forced outages are shown in the table below:

Table 1. Planned and forced outages from 1 April to 31 December 2009

No.	Unit #	Reasons	Period of outages	
			Start date & time	Finish date & time
1	1	Vibration due to earthquake	4 Jun 2009 01:23	4 Jun 2009 01:42
2	1	Vibration due to earthquake	8 Jun 2009 11:23	8 Jun 2009 11:42
3	1	Problem with circulation water systems	15 Jul 2009 07:31	15 Jul 2009 08:10
4	1	Vibration due to earthquake	2 Sept 2009 14:55	2 Sept 2009 15:26
5	1	Vibration due to earthquake	23 Oct 2009 15:34	23 Oct 2009 15:44
6	1	Half-year maintenance	5 Dec 2009 00:32	6 Dec 2009 07:58
7	2	Vibration due to earthquake	2 Apr 2009 06:03	2 Apr 2009 06:19
8	2	Problem with steam turbine (low hydraulic fluid pump)	13 May 2009 09:59	13 May 2009 10:57
9	2	Vibration due to earthquake	4 Jun 2009 01:23	4 Jun 2009 01:39
10	2	Vibration due to earthquake	8 Jun 2009 11:23	8 Jun 2009 11:34
11	2	Vibration due to earthquake	8 Jun 2009 11:46	8 Jun 2009 11:58
12	2	Problem with generator (AVR control)	19 Jun 2009 15:46	19 Jun 2009 20:03
13	2	Major inspection	1 Jul 2009 07:11	19 Jul 2009 16:56
14	2	Problem with steam turbine (high turbine vibration)	31 Jul 2009 07:00	31 Jul 2009 08:15
15	2	Problem with circulation water systems	31 Jul 2009 23:57	1 Aug 2009 10:18
16	2	Vibration due to earthquake	2 Sept 2009 14:55	2 Sept 2009 15:21
17	2	Problem with steam turbine (Max pressure microswitch is broken)	14 Sept 2009 07:16	14 Sept 2009 16:00
18	2	Problem with condensing systems	29 Oct 2009 01:05	29 Oct 2009 09:30
19	2	Problem with PLN grid (150 KV)	9 Dec 2009 15:53	9 Dec 2009 18:26
20	3	Vibration due to earthquake	2 Apr 2009 06:03	2 Apr 2009 06:19
21	3	Problem with electrical systems	21 May 2009 16:55	22 May 2009 04:15

22	3	Vibration due to earthquake	22 May 2009 06:33	22 May 2009 06:57
23	3	Problem with steam turbine (broken power relay)	22 May 2009 13:45	22 May 2009 19:12
24	3	Problem with electrical systems	23 May 2009 00:55	23 May 2009 06:45
25	3	Vibration due to earthquake	4 Jun 2009 01:23	4 Jun 2009 01:35
26	3	Vibration due to earthquake	8 Jun 2009 11:23	8 Jun 2009 11:37
27	3	Vibration due to earthquake	8 Jun 2009 11:46	8 Jun 2009 12:02
28	3	Problem with circulation water systems	30 Jun 2009 14:14	30 Jun 2009 19:14
29	3	Problem with circulation water systems	17 Jul 2009 01:39	17 Jul 2009 07:31
30	3	Half-year maintenance	10 Aug 2009 06:25	11 Aug 2009 13:45
31	3	Vibration due to earthquake	2 Sept 2009 14:55	2 Sept 2009 15:23
32	3	Vibration due to earthquake	16 Oct 2009 16:52	16 Oct 2009 17:02
33	3	Vibration due to earthquake	23 Oct 2009 15:34	23 Oct 2009 15:47

Table 2. Planned and forced outages from 1 January to 31 December 2010

No.	Unit #	Reasons	Period of outages	
			Start date & time	Finish date & time
1	1	Problem with steam turbine (micro switch low pressure is broken)	23 Jan 2010 23:35	24 Jan 2010 02:36
2	1	Problem with steam turbine (short circuit in the mechanical trip valve switch)	2 Apr 2010 00:59	2 Apr 2010 02:04
3	1	Problem with PLN grid (short circuit in the main transformer)	27 Jun 2010 09:07	27 Jun 2010 14:56
4	1	Problem with steam quality	27 Jun 2010 15:38	1 Jul 2010 18:03
5	1	Problem with condensing systems	13 Aug 2010 08:35	14 Aug 2010 00:02
6	1	Problem with electrical systems	29 Sept 2010 10:32	29 Sept 2010 14:15
7	1	Variable Speed Drive installation	1 Oct 2010 00:25	7 Oct 2010 18:39
8	1	Problem with condensing systems	16 Oct 2010 13:48	16 Oct 2010 22:08
9	1	Problem with condensing systems	18 Oct 2010 04:32	18 Oct 2010 17:46
10	1	Problem with electrical systems	29 Oct 2010 15:20	30 Oct 2010 05:27
11	1	Problem with electrical systems	29 Nov 2010 10:16	29 Nov 2010 16:59
12	1	Online coupler partial discharge installation	1 Dec 2010 00:29	4 Dec 2010 01:40
13	1	Problem with electrical systems	6 Dec 2010 15:38	6 Dec 2010 18:43
14	2	Half-year maintenance	20 Mar 2010 06:34	20 Mar 2010 20:24
15	2	Generator check	23 Jun 2010 00:12	24 Jun 2010 10:35
16	2	Problem with Chevron steam well	27 Jun 2010 09:07	27 Jun 2010 09:38
17	2	Major inspection	29 Oct 2010 01:06	21 Nov 2010 04:32
18	2	Problem with electrical systems	6 Dec 2010 15:38	6 Dec 2010 22:46
19	3	Problem with steam turbine (power oil pump failure)	7 Mar 2010 14:20	7 Mar 2010 18:36
20	3	Vibration due to earthquake	2 Apr 2010 02:33	2 Apr 2010 02:59
21	3	Condensor cleaning	24 Apr 2010 04:00	24 Apr 2010 19:13
22	3	Vibration due to earthquake	18 May 2010 18:59	18 May 2010 19:06
23	3	Simple inspection	19 May 2010 01:22	5 Jun 2010 06:19
24	3	Vibration due to earthquake	21 Jun 2010 21:42	22 Jun 2010 06:02
25	3	Vibration due to earthquake	26 Jun 2010 04:53	26 Jun 2010 09:16
26	3	Vibration due to earthquake	26 Jun 2010 16:51	26 Jun 2010 17:57

27	3	Problem with power supply	16 Jul 2010 13:20	16 Jul 2010 13:51
28	3	Problem with cooling systems	17 Jul 2010 15:17	17 Jul 2010 17:23
29	3	Variable Speed Drive installation	1 Aug 2010 00:20	8 Aug 2010 23:50
30	3	Problem with condensing systems	9 Aug 2010 07:06	9 Aug 2010 13:09
31	3	Vibration due to earthquake	12 Aug 2010 02:11	12 Aug 2010 02:23
32	3	Vibration due to earthquake	7 Sept 2010 12:59	7 Sept 2010 13:17
33	3	Variable Speed Drive commissioning	21 Oct 2010 00:02	23 Oct 2010 17:16
34	3	Vibration due to earthquake	21 Nov 2010 01:40	21 Nov 2010 08:45
35	3	Online coupler partial discharge installation	6 Dec 2010 03:21	7 Dec 2010 16:58

Table 3. Planned and forced outages from 1 January to 31 March 2011

No.	Unit #	Reasons	Period of outages	
			Start date & time	Finish date & time
-	-	-	-	-

Table 4. Total shutdowns and blackouts from 1 April 2009 to 31 March 2011

Year	Shutdown and blackout	
	Total (Times)	Total (Hours)
2009	33	580.08
2010	35	1,729.10
2011	-	-
Total 1 Apr 09-31 Mar 11	68	2,309.18

In addition to that, during implementation period from 1 April 2009 to 31 March 2011 there are several changes happened within the project boundary as per Table 5.

Table 5. Changes happened during implementation period from 1 April 2009 to 31 March 2011.

No.	Unit #	Date	Activities	Reasons
1.	1	9 Jun 2010	A replacement of kWh revenue meter	To acquire higher data storage (do not change the project design and monitoring plan as per registered VCS PD).
2.	1	1 Oct 2010	An installation of Variable Speed Drive (VSD)	To optimize discharge valve opening of Main Cooling Water Pump Unit #1 (do not change the project design and monitoring plan as per registered VCS PD).
3.	1	1 Dec 2010	An installation of Online coupler partial discharge	To be able to do online monitor of stator coil in the generator Unit #1 as part of predictive maintenance (do not change the project design and monitoring plan as per registered VCS PD).

4.	3	1 Aug 2010	An installation of Variable Speed Drive (VSD)	To optimize discharge valve opening of Main Cooling Water Pump Unit #3 (do not change the project design and monitoring plan as per registered VCS PD).
5.	3	6 Dec 2010	An installation of Online coupler partial discharge	To be able to do online monitor of stator coil in the generator Unit #3 as part of predictive maintenance (do not change the project design and monitoring plan as per registered VCS PD).

2.2 Deviations from the Monitoring Plan

Not applicable as the project activity does not need any deviations of the monitoring plan.

2.3 Grouped Project

Not applicable as the project activity is not part of a grouped project.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data and parameters available during validation:

Data Unit / Parameter:	EG _{historical}
Data unit:	MWh
Description:	Average net electricity delivered to the grid before the project activity until DATE _{BaselineRetrofit}
Source of data:	Project Owner-PLN revenue meter (electricity sales) Meter No. Unit #1: PS 0512A040-01 with class of accuracy 0.2 Unit #2: PS 0512A041-01 with class of accuracy 0.2 Unit #3: PS 0512A042-01 with class of accuracy 0.2 On 1 October 2008, the electricity sales flow meter was replaced by PT 0806A117-01 / PT 0806A118-01 / PT 0806A119-01.
Value applied:	EG _{historical} until DATE _{BaselineRetrofit} (MWh)

	Unit 1	411,363
	Unit 2	399,102
	Unit 3	394,696
	Total	1,205,161
	The data above is based on an average of historical net electricity generation data recorded by PT. Indonesia Power since 1999-2004 for Unit 3 and 2000-2005 for Units 1 and 2.	
Purpose of the data:	Baseline emission calculation	
Any comment:	Electricity produced is measured by a watt-hour meter (connected to a digital control system and recorded continuously), which can measure both power delivered to the grid and received from the grid. Therefore net electricity export is measured. The measurement of electricity generation is conducted on a continuous basis, where hourly and daily total electricity measurement will be available. The measurement results are summarized transparently in regular production reports. The QA/QC is conducted through cross checking with sales electricity receipts. Meters are calibrated according to the Standard Operational Procedures signed between PT. Indonesia Power and PLN (load dispatcher) or other documents, which update or replace this SOP. Data measured by meters are cross-checked by electricity sales receipt. The meter (s) is either: - be read frequently jointly by the project developer and the grid company - be only read by the project developer and data will be double checked with the electricity sales receipts - be only read by the grid company	
Data Unit / Parameter:	DATE _{BaselineRetrofit}	

Data unit:	Date														
Description:	Point in time when the existing equipment would need to be replaced in the absence of the project activity														
Source of data:	The Government Regulation No. 59 year 2007 on Geothermal Activities for 30 years average technical lifetime.														
Value applied:	<table><tr><td></td><td>Commissioning date</td><td>DATE_{BaselineRetrofit}</td></tr><tr><td>Unit 1</td><td>12 March 1994</td><td>12 March 2024</td></tr><tr><td>Unit 2</td><td>12 June 1994</td><td>12 June 2024</td></tr><tr><td>Unit 3</td><td>16 July 1997</td><td>16 July 2027</td></tr></table> The DATE_{BaselineRetrofit} comes from commissioning date of each unit added by the average technical lifetime of 30 years				Commissioning date	DATE _{BaselineRetrofit}	Unit 1	12 March 1994	12 March 2024	Unit 2	12 June 1994	12 June 2024	Unit 3	16 July 1997	16 July 2027
	Commissioning date	DATE _{BaselineRetrofit}													
Unit 1	12 March 1994	12 March 2024													
Unit 2	12 June 1994	12 June 2024													
Unit 3	16 July 1997	16 July 2027													
Purpose of the data:	Baseline emission calculation														
Any comment:	-														

Data Unit / Parameter:	GWP _{CH4}
Data unit:	tCO ₂ /tCH ₄
Description:	Global warming potential of methane, valid for the relevant commitment period
Source of data:	IPCC
Value applied:	Default value for the first commitment period = 21 tCO ₂ /tCH ₄
Purpose of the data:	Project emission calculation
Any comment:	-

Data Unit / Parameter:	P _i
Data unit:	Kg/m ³

Description:	Density of diesel fuel
Source of data:	Pertamina diesel fuel specification ²
Value applied:	0.815 kg/litre = 815 kg/m ³
Purpose of the data:	Project emission calculation
Any comment:	-

Data Unit / Parameter:	EF _{CM,y}
Data unit:	tCO ₂ /MWh
Description:	EF _{CM,y} is the combined margin CO ₂ emission factor of power plants connected to the JAMALI electricity grid in year 'y', calculated ex-ante based on the weighted average of EF _{OM,y} and EF _{BM,y}
Source of data:	PLN
Value applied:	EF _{CM,y} = 0.882 tCO ₂ /MWh
Purpose of the data:	Baseline and project emission calculations
Any comment:	No measurement required. Data is obtained based on analysis of PLN published information.

Data Unit / Parameter:	EF _{OM,y}
Data unit:	tCO ₂ /MWh
Description:	EF _{OM,y} is the average operating margin CO ₂ emission factor of power plant connected to the JAMALI electricity grid in 3 recent years available data, calculated using simple OM method for each year in which the project generation occurs. During the crediting period, this factor is calculated based on ex-ante emissions by using year 2004, 2005 and 2006 data.
Source of data:	PLN
Value applied:	EF _{OM,y} = 0.829 tCO ₂ /MWh

² Material Safety Data Sheet (MSDS) of Diesel fuel from Pertamina, <http://www.pertamina.com/index.php/detail/read/solar>, retrieved on 24 May 2012

Purpose of the data:	Baseline and project emission calculations
Any comment:	No measurement required. Data is obtained based on analysis of PLN published information. All data relevant for the calculation of $EF_{OM,y}$ are updated annually. This includes each associated fuel emission factor and corresponding net calorific values, is re-defined annually.

Data Unit / Parameter:	$EF_{BM,y}$
Data unit:	tCO ₂ /MWh
Description:	$EF_{BM,y}$ is the build margin CO₂ emission factor of power plants in the sample group 'm' connected to the JAMALI electricity grid in year 'y'. During the crediting period, this factor is calculated based on ex-ante emissions by using year 2006 data.
Source of data:	PLN
Value applied:	$EF_{BM,y} = 0.936 \text{ tCO}_2/\text{MWh}$
Purpose of the data:	Baseline and project emission calculations
Any comment:	No measurement required. Data is obtained based on analysis of PLN published information. All data relevant for the calculation of $EF_{BM,y}$ are updated annually. This includes each associated fuel emission factor and corresponding net calorific values, as well as sample group 'm' power plants (its associated generation and fuel consumption data), is re-defined annually.

Data Unit / Parameter:	$FC_{i,j,y}$
Data unit:	kT
Description:	Consumption of fuel type 'i', in year 'y', for power plant in group 'j', where: Group 'j' is power plants in JAMALI grid excluding the low-cost/must-run sources (Whichever is larger compare to

	group 'm').
Source of data:	PLN
Value applied:	Refer to: JAMALI EF grid calculation
Purpose of the data:	Baseline and project emission calculations
Any comment:	No measurement required. Data is obtained based on analysis of PLN published information.

Data Unit / Parameter:	$FC_{i,m,y}$
Data unit:	kT
Description:	Consumption of fuel type 'i', in year 'y', for power plant in group 'm', where: Group 'm' is five most recently build power plants or power plants capacity additions that comprise 20% of system generation (whichever is larger compare to group 'j').
Source of data:	PLN
Value applied:	Refer to: JAMALI EF grid calculation
Purpose of the data:	Baseline and project emission calculations
Any comment:	No measurement required. Data is obtained based on analysis of PLN published information.

Data Unit / Parameter:	$\sum_j EG_{j,y}$
Data unit:	MWh
Description:	Generation data of power plants in sample group 'j' in year 'y', where: Group 'j' is power plants in JAMALI grid excluding the low-cost/must-run sources (Whichever is larger compare to group 'm').
Source of data:	PLN
Value applied:	Refer to: JAMALI EF grid calculation

Purpose of the data:	Baseline and project emission calculations
Any comment:	No measurement required. Data is obtained based on analysis of PLN published information.

Data Unit / Parameter:	$\Sigma_m EG_{m,y}$
Data unit:	MWh
Description:	Generation data of power plants in sample group 'm' in year 'y', where: Group 'm' is five most recently build power plants or power plants capacity additions that comprise 20% of system generation (whichever is larger compare to group 'j').
Source of data:	PLN
Value applied:	Refer to: JAMALI EF grid calculation
Purpose of the data:	Baseline and project emission calculations
Any comment:	No measurement required. Data is obtained based on analysis of PLN published information.

Data Unit / Parameter:	NCV _i
Data unit:	TJ/kt
Description:	Net calorific value of fuel type 'i' for purpose of calculating grid emission factor and diesel fuel consumption
Source of data:	Publication from various country relevant sources or 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook volume 2 chapter 1 Table 1.2, page 1.18
Value applied:	HSD & Diesel Fuel = 43 TJ/kt (= 0.043 GJ/kg) MFO = 40.4 TJ/kt Coal = 21.34TJ/kt Natural gas = 48 TJ/kt
Purpose of the data:	Baseline and project emission calculations
Any comment:	-

Data Unit / Parameter:	EF _{CO2}
Data unit:	tCO ₂ /TJ
Description:	CO ₂ emission factor of fuel type 'i' for purpose of calculating grid emission factor and diesel fuel consumption
Source of data:	2006 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook volume 2 chapter 1 Table 1.4, page 1.23
Value applied:	HSD & Diesel Fuel = 74.1 tCO ₂ /TJ (= 0.074 tCO ₂ /GJ) MFO = 77.4 tCO ₂ /TJ Coal = 96.1 tCO ₂ /TJ Natural gas = 56.1 tCO ₂ /TJ
Purpose of the data:	-
Any comment:	-

3.2 Data and Parameters Monitored

Data and parameters monitored according to monitoring plan:

Data Unit / Parameter:	M _{S,y}															
Data unit:	Tonnes															
Description:	Quantity of steam produced during the year 'y'															
Source of data:	Project Owner-main steam line flow meter															
Description of measurement methods and procedures to be applied:	The measurement of steam quantities will be conducted on a continuous basis, where hourly steam flow will be available in paper format. The measurement results will be summarized in electronic format as part of monitoring plan.															
Frequency of monitoring/recording:	Steam flow is hourly measured and recorded in paper format. Subsequently, the data will be aggregated yearly in electronic format.															
Value monitored:	<table><tr><td></td><td colspan="3">Steam produced during the year 'y' (tonnes/year)</td></tr><tr><td></td><td>1 Apr-31 Dec 2009</td><td>1 Jan-31 Dec 2010</td><td>1 Jan-31 Mar 2011</td></tr><tr><td>Unit 1</td><td>2,937,540.20</td><td>3,678,467.80</td><td>984,149.70</td></tr></table>					Steam produced during the year 'y' (tonnes/year)				1 Apr-31 Dec 2009	1 Jan-31 Dec 2010	1 Jan-31 Mar 2011	Unit 1	2,937,540.20	3,678,467.80	984,149.70
	Steam produced during the year 'y' (tonnes/year)															
	1 Apr-31 Dec 2009	1 Jan-31 Dec 2010	1 Jan-31 Mar 2011													
Unit 1	2,937,540.20	3,678,467.80	984,149.70													

	Unit 2	2,975,157.40	3,975,538.30	1,052,180.80																							
	Unit 3	2,799,693.60	3,433,952.50	987,735.10																							
	Total	8,712,391.20	11,087,958.60	3,024,065.60																							
	Based on information of steam flow calibration details, there was two weeks delay in performing steam flow calibration Unit #1, #2, and #3. Referring to UNFCCC "Guidelines for assessing compliance with the calibration frequency requirements" v.01, where described that a permissible maximum error of 0.25% (steam flow meter accuracy) must be considered in PE _y calculation in case of the steam flow meter calibration delay by following formula:																										
	= Steam flow rate x (100% + accuracy of steam flow meter)																										
	= Steam flow rate x (100% + 0.25%)																										
	This PE _y conservative multiplication affected monthly steam flow data of all units in July 2010 only as shown in below table:																										
	<table><tr><td rowspan="2"></td><td colspan="3">Steam produced during the year 'y' (tonnes/year) with conservative value due to delayed calibration</td></tr><tr><td>1 Apr-31 Dec 2009</td><td>1 Jan-31 Dec 2010</td><td>1 Jan-31 Mar 2011</td></tr><tr><td>Unit 1</td><td>2,937,540.20</td><td>3,679,188.00</td><td>984,149.70</td></tr><tr><td>Unit 2</td><td>2,975,157.40</td><td>3,976,445.96</td><td>1,052,180.80</td></tr><tr><td>Unit 3</td><td>2,799,693.60</td><td>3,434,788.21</td><td>987,735.10</td></tr><tr><td>Total</td><td>8,712,391.20</td><td>11,090,422.17</td><td>3,024,065.60</td></tr></table>					Steam produced during the year 'y' (tonnes/year) with conservative value due to delayed calibration			1 Apr-31 Dec 2009	1 Jan-31 Dec 2010	1 Jan-31 Mar 2011	Unit 1	2,937,540.20	3,679,188.00	984,149.70	Unit 2	2,975,157.40	3,976,445.96	1,052,180.80	Unit 3	2,799,693.60	3,434,788.21	987,735.10	Total	8,712,391.20	11,090,422.17	3,024,065.60
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The data above is based on Steam log sheet document under Steam flow column manually recorded by PT. Indonesia Power.																											
Monitoring equipment:	Steam flow meters used from 1 April 200 to 31 March 2011 as follows:																										
	<table><tr><th>Steam flow meter</th><th>Serial number</th><th>Accuracy</th><th>Calibration Details</th></tr><tr><td>Unit #1</td><td>1LBA01CF001-B01</td><td>0.25%</td><td>Previous: 08/09/2008 13/07/2009 Current:</td></tr></table>				Steam flow meter	Serial number	Accuracy	Calibration Details	Unit #1	1LBA01CF001-B01	0.25%	Previous: 08/09/2008 13/07/2009 Current:															
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				26/07/2010 Next: 26/07/2011
	Unit #2	2LBA01CF001-B01	0.25%	Previous: 08/09/2008 15/07/2009 Current: 27/07/2010 Next: 27/07/2011
	Unit #3	3LBA01CF001-B01	0.25%	Previous: 08/09/2008 14/07/2009 Current: 28/07/2010 Next: 28/07/2011
QA/QC procedures to be applied:	Meters will be maintained and periodically calibrated internally to ensure accurate readings. As part of the QA/QC procedure a back up check calculation (to be used during emergencies such as trip, scaling in the steam pipeline, etc) will be performed in addition to the primary venturi flow meter measurement.			
Calculation method:	A back up check calculation is only applicable during emergencies such as trip or scaling in the steam pipeline occurred, which steam flow data could not be recorded.			
Any comment:	Steam flow is read continuously and logged daily. Data will be entered into the Steam flow report and will be checked for consistency when entered. During emergencies such as trip, scaling in the steam pipeline, etc, caused no steam flow recorded, a back up check calculation will be performed conservatively replacing unavailability measured steam flow for certain period. The back up check calculation is described in more detail in the SOP Carbon Credit Gunung Salak.			

Data Unit / Parameter:	$W_{\text{main,CO}_2}$																																																																																									
Data unit:	t CO ₂ /t steam																																																																																									
Description:	Average mass fraction of carbon dioxide in the produced steam (non-dimensional)																																																																																									
Source of data:	The Non-Condensable Gases (NCG) data taken from steam sampling as prescribed in the Monitoring Methodology ACM0002 version 07.																																																																																									
Description of measurement methods and procedures to be applied:	Non-condensable gases sampling should be carried out at the steam field-power plant interface using ASTM Standard Practice E1675 for Sampling 2-Phase Geothermal Fluid for Purposes of Chemical Analysis (as applicable to sampling phase steam only) as prescribed in the Monitoring Methodology ACM0002 version 07. The Non-Condensable Gases (NCG) sampling and analysis will be performed every four months, after the project is validated, by PT. Geoservices (Ltd) with a supervision of Gunung Salak Geothermal Power Plant Laboratory.																																																																																									
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	6	Dec-10	0.0051615	0.0049360	0.0044190																								
		Jan-11	0.0051615	0.0049360	0.0044190																								
		Feb-11	0.0051615	0.0049360	0.0044190																								
		Mar-11	0.0051615	0.0049360	0.0044190																								
	As per monitoring plan of VCS PD, NCG analysis should be conducted every 4 months. However, due to some internal procurement difficulties, NCG analysis in July and November 2009 was delayed as per following planning and realization date table:																												
	<table><tr><th colspan="3">NCG Analysis</th></tr><tr><th>Analysis #</th><th>Planned date</th><th>Realization date</th></tr><tr><td>1</td><td></td><td>24/03/2009</td></tr><tr><td>2</td><td>23/07/2009</td><td>27/07/2009</td></tr><tr><td>3</td><td>23/11/2009</td><td>09/12/2009</td></tr><tr><td>4</td><td>23/03/2010</td><td>23/03/2010</td></tr><tr><td>5</td><td>23/07/2010</td><td>21/07/2010</td></tr><tr><td>6</td><td>23/11/2010</td><td>22/11/2010</td></tr></table>					NCG Analysis			Analysis #	Planned date	Realization date	1		24/03/2009	2	23/07/2009	27/07/2009	3	23/11/2009	09/12/2009	4	23/03/2010	23/03/2010	5	23/07/2010	21/07/2010	6	23/11/2010	22/11/2010
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Therefore, taking into account NCG analysis delays above, a conservative approach was taken in the PE _y calculation by using the highest CO ₂ weight fraction value for each unit from 1 April 2009 to 31 March 2011. The highest value used is only for July, November and December 2009 when delays occurred. The conservative values used in each unit are: Unit #1: The highest CO ₂ weight fraction value is 0.0062075 Unit #2: The highest CO ₂ weight fraction value is 0.0079053. Unit #3: The highest CO ₂ weight fraction value is 0.0058008.																													

Monitoring equipment:	Equipments needed as per Monitoring Methodology ACM0002 version 07.
QA/QC procedures to be applied:	Gunung Salak Geothermal Laboratory QA/QC Procedure
Calculation method:	-
Any comment:	-

Data Unit / Parameter:	W _{main,CH4}
Data unit:	t CH ₄ /t steam

Description:	Average mass fraction of methane gas in the produced steam (non-dimensional).																																																																																																																			
Source of data:	The Non-Condensable Gases (NCG) data taken from steam sampling as prescribed in the Monitoring Methodology ACM0002 version 07.																																																																																																																			
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	Feb-11	0.0000017658	0.0000071020	0.0000023368																																																																																																																
	Mar-11	0.0000017658	0.0000071020	0.0000023368																																																																																																																

	As per monitoring plan of VCS PD, NCG analysis should be conducted every 4 months. However, due to some internal procurement difficulties, NCG analysis in July and November 2009 was delayed as per following planning and realization date table: <table><tr><th colspan="3">NCG Analysis</th></tr><tr><th>Analysis #</th><th>Planned date</th><th>Realization date</th></tr><tr><td>1</td><td></td><td>24/03/2009</td></tr><tr><td>2</td><td>23/07/2009</td><td>27/07/2009</td></tr><tr><td>3</td><td>23/11/2009</td><td>09/12/2009</td></tr><tr><td>4</td><td>23/03/2010</td><td>23/03/2010</td></tr><tr><td>5</td><td>23/07/2010</td><td>21/07/2010</td></tr><tr><td>6</td><td>23/11/2010</td><td>22/11/2010</td></tr></table> Therefore, taking into account NCG analysis delays above, a conservative approach was taken in the PE_y calculation by using the highest CH₄ weight fraction value for each unit from 1 April 2009 to 31 March 2011. The highest value used is only for July, November and December 2009 when delays occurred. The conservative values used in each unit are: Unit #1: The highest CH₄ weight fraction value is 0.0000156864. Unit #2: The highest CH₄ weight fraction value is 0.0000372070. Unit #3: The highest CH₄ weight fraction value is 0.0000165788.	NCG Analysis			Analysis #	Planned date	Realization date	1		24/03/2009	2	23/07/2009	27/07/2009	3	23/11/2009	09/12/2009	4	23/03/2010	23/03/2010	5	23/07/2010	21/07/2010	6	23/11/2010	22/11/2010
NCG Analysis																									
Analysis #	Planned date	Realization date																							
1		24/03/2009																							
2	23/07/2009	27/07/2009																							
3	23/11/2009	09/12/2009																							
4	23/03/2010	23/03/2010																							
5	23/07/2010	21/07/2010																							
6	23/11/2010	22/11/2010																							
Monitoring equipment:	Equipments needed as per Monitoring Methodology ACM0002 version 07.																								
QA/QC procedures to be applied:	Gunung Salak Geothermal Laboratory QA/QC Procedure																								
Calculation method:	-																								
Any comment:	-																								

Data Unit / Parameter:	EG _y
Data unit:	MWh
Description:	Net electricity delivered to the grid by the project activity
Source of data:	Project Owner-PLN revenue meter (electricity sales)
Description of measurement methods and procedures to be applied:	Electricity produced will be measured by a watt-hour meter (connected to a digital control system and recorded continuously), which can measure both power delivered to the grid and received from the grid. Therefore net

	electricity export will be measured. The measurement of electricity generation will be conducted on a continuous basis, where hourly and daily total electricity measurement will be available. The measurement results will be summarized transparently in electronic format as part of monitoring plan. While, electricity invoices (in this sense, the Energy Statement Transaction) will be compiled in paper format.																							
Frequency of monitoring/recording:	The measurement of electricity generation will be conducted on a continuous basis, where hourly and daily total electricity measurement will be available.																							
Value monitored:	<table><tr><th rowspan="2"></th><th colspan="3">EG_y (MWh)</th></tr><tr><th>1 Apr-31 Dec 2009</th><th>1 Jan-31 Dec 2010</th><th>1 Jan-31 Mar 2011</th></tr><tr><td>Unit 1</td><td>368,893.72</td><td>450,244.68</td><td>123,275.07</td></tr><tr><td>Unit 2</td><td>339,023.70</td><td>446,709.19</td><td>121,663.04</td></tr><tr><td>Unit 3</td><td>370,309.80</td><td>445,864.47</td><td>124,200.61</td></tr><tr><td>Total</td><td>1,078,227.22</td><td>1,342,818.35</td><td>369,138.72</td></tr></table> As per monitoring plan of VCS PD and SOP for electricity metering scheme, revenue meter calibration should be conducted every 2 years. However, there was a calibration delay for revenue meter of Unit #2 in 2010. Based on the UNFCCC “Guidelines for assessing compliance with the calibration frequency requirements” v.01, where described that a maximum permissible error must be considered in BE_y calculation in case of the revenue meter calibration delay as per following formula: EG_{exp} = EG_{exp} x (100% - accuracy of revenue meter) = EG_{exp} x (100% - 0.2%) EG_{imp} = EG_{imp} x (100% + accuracy of revenue meter) = EG_{imp} x (100% + 0.2%) Therefore, net electricity generation (EG_y) values used in the ER calculation as following table:		EG _y (MWh)			1 Apr-31 Dec 2009	1 Jan-31 Dec 2010	1 Jan-31 Mar 2011	Unit 1	368,893.72	450,244.68	123,275.07	Unit 2	339,023.70	446,709.19	121,663.04	Unit 3	370,309.80	445,864.47	124,200.61	Total	1,078,227.22	1,342,818.35	369,138.72
	EG _y (MWh)																							
	1 Apr-31 Dec 2009	1 Jan-31 Dec 2010	1 Jan-31 Mar 2011																					
Unit 1	368,893.72	450,244.68	123,275.07																					
Unit 2	339,023.70	446,709.19	121,663.04																					
Unit 3	370,309.80	445,864.47	124,200.61																					
Total	1,078,227.22	1,342,818.35	369,138.72																					

		EG _v (MWh) with conservative value due to delayed calibration		
		1 Apr-31 Dec 2009	1 Jan-31 Dec 2010	1 Jan-31 Mar 2011
	Unit 1	368,893.72	450,244.68	123,275.07
	Unit 2	339,023.70	446,447.10	121,419.72
	Unit 3	370,309.80	445,864.47	124,200.61
	Total	1,078,227.22	1,342,556.25	368,895.39
Monitoring equipment:	Revenue meters used between 1 April 2009 – 31 March 2011 are:			
	Revenue meter	Serial number	Class of Accuracy	Calibration date
	Unit #1	PT 0806A117-01	0.2	Previous: 12/09/2008
		MT- 1006A500-01	0.2	Current: 10/08/2010 Next: 10/08/2012
	Unit #2	PT 0806A118-01	0.2	Previous: 12/09/2008 Current: 20/04/2011 Next: 20/04/2013
	Unit #3	PT 0806A119-01	0.2	Previous: 12/09/2008 Current: 04/11/2009 ³ Next: 04/11/2011
	On 10 August 2010, PO replaced revenue meter Unit #1 with a new revenue meter with serial number MT-			

³ The reason for having only a year gap for Unit #3 revenue meter calibration is LAN communication failure, which then needed to be fixed and subsequently recalibrated. During that time, a back-up meter owned by PT. PLN (Persero) was used to measure electricity generation from Unit #3

	1006A500-01.
QA/QC procedures to be applied:	The QA/QC will be conducted through cross checking with sales electricity receipts. Meters will be calibrated once per 2 years according to the PPA signed between PT. Indonesia Power and PLN (load dispatcher) or other documents, which update or replace this PPA. Data measured by meters will be cross-checked by electricity sales receipt. The meter (s) will either: i) be read frequently jointly by the project developer and the grid company ii) be only read by the project developer and data will be double checked with the electricity sales receipts iii) be only read by the grid company
Calculation method:	-
Any comment:	PPA signed between PT. Indonesia Power and PT PLN (load dispatcher) or other documents, which update or replace this PPA.

Data Unit / Parameter:	EG _{baseline}
Data unit:	MWh
Description:	Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh)
Source of data:	Project Owner-PLN revenue meter (electricity sales)
Description of measurement methods and procedures to be applied:	Electricity produced is measured by a watt-hour meter (connected to a digital control system and recorded continuously), which can measure both power delivered to the grid and received from the grid. Therefore net electricity export is measured. The measurement of electricity generation is conducted on a continuous basis, where hourly and daily total electricity measurement will be available. The measurement result is summarized transparently in

	regular production reports.																
Frequency of monitoring/recording:	The measurement of electricity generation will be conducted on a continuous basis, where hourly and daily total electricity measurement will be available.																
Value monitored:	$EG_{baseline} = EG_{historical}, until DATE_{Baseline Retrofit}$$EG_{baseline} = EG_{y, on / after DATE_{Baseline Retrofit}}$ <table><tr><th></th><th>EG_{baseline} (MWh)</th></tr><tr><td>Unit 1</td><td>411,363.29</td></tr><tr><td>Unit 2</td><td>399,102.44</td></tr><tr><td>Unit 3</td><td>394,696.30</td></tr><tr><td>Total</td><td>1,205,162.03</td></tr></table> The data above is based on 5-years historical data recorded by PT. Indonesia Power between 1999-2004 for Unit 3 and 2000-2005 for Units 1 and 2 before the project activity.		EG _{baseline} (MWh)	Unit 1	411,363.29	Unit 2	399,102.44	Unit 3	394,696.30	Total	1,205,162.03						
	EG _{baseline} (MWh)																
Unit 1	411,363.29																
Unit 2	399,102.44																
Unit 3	394,696.30																
Total	1,205,162.03																
Monitoring equipment:	Revenue meters used between 1999 to 2004 are: <table><tr><th>Revenue meter</th><th>Serial number</th><th>Class of Accuracy</th><th>Calibration date</th></tr><tr><td>Unit #1</td><td>PS 0512A040-01</td><td>0.2</td><td>1994,1999 and 2005</td></tr><tr><td>Unit #2</td><td>PS 0512A041-01</td><td>0.2</td><td>1994,1999 and 2005</td></tr><tr><td>Unit #3</td><td>PS 0512A042-01</td><td>0.2</td><td>1994,1999 and 2005</td></tr></table> The revenue meters were externally calibrated in 1994, 1999 and 2005 by Laboratorium Kalibrasi PT. PLN (Persero). Note: On 1 October 2008, the revenue meter was	Revenue meter	Serial number	Class of Accuracy	Calibration date	Unit #1	PS 0512A040-01	0.2	1994,1999 and 2005	Unit #2	PS 0512A041-01	0.2	1994,1999 and 2005	Unit #3	PS 0512A042-01	0.2	1994,1999 and 2005
Revenue meter	Serial number	Class of Accuracy	Calibration date														
Unit #1	PS 0512A040-01	0.2	1994,1999 and 2005														
Unit #2	PS 0512A041-01	0.2	1994,1999 and 2005														
Unit #3	PS 0512A042-01	0.2	1994,1999 and 2005														

	replaced by PT 0806A117-01 / PT 0806A118-01 / PT 0806A119-01.
QA/QC procedures to be applied:	The QA/QC is conducted through cross checking with sales electricity receipts. Meters are calibrated according to the Standard Operational Procedures signed between PT. Indonesia Power and PLN (load dispatcher) or other documents, which update or replace this SOP. Data measured by meters are cross-checked by electricity sales receipt. The meter (s) is either: i. be read frequently jointly by the project developer and the grid company ii. be only read by the project developer and data will be double checked with the electricity sales receipts iii. be only read by the grid company
Calculation method:	-
Any comment:	PPA signed between PT. Indonesia Power and PT PLN (load dispatcher) or other documents, which update or replace this PPA.

Data Unit / Parameter:	EG _{imp}
Data unit:	MWh
Description:	Electricity imported from the grid
Source of data:	Project Owner-PLN revenue meter
Description of measurement methods and procedures to be applied:	Electricity imported will be measured by a watt-hour meter (connected to a digital control system and recorded continuously), which can measure both power delivered to the grid and received from the grid. Therefore net electricity export will be measured. The measurement of electricity imported will be conducted on a continuous basis, where hourly and daily total electricity measurement will be available. The measurement results will be summarized transparently in

	electronic format as part of monitoring plan. The electricity-imported data will refer to regular production spreadsheet that is recorded in electronic format.																																														
Frequency of monitoring/recording:	The measurement of electricity imported will be conducted on a continuous basis, where hourly and daily total electricity measurement will be available.																																														
Value monitored:	<table><tr><th rowspan="2"></th><th colspan="3">EG_{imp} (MWh)</th></tr><tr><th>1 Apr-31 Dec 2009</th><th>1 Jan-31 Dec 2010</th><th>1 Jan-31 Mar 2011</th></tr><tr><td>Unit 1</td><td>23.88</td><td>293.24</td><td>0.00</td></tr><tr><td>Unit 2</td><td>94.65</td><td>178.11</td><td>0.00</td></tr><tr><td>Unit 3</td><td>77.68</td><td>214.27</td><td>0.00</td></tr><tr><td>Total</td><td>196.20</td><td>685.63</td><td>0.00</td></tr></table> As per monitoring plan of VCS PD and SOP for electricity metering scheme, revenue meter calibration should be conducted every 2 years. However, there was a calibration delay for revenue meter of Unit #2 in 2010. Thus, based on the UNFCCC guidelines, the revenue meter calibration delay must be considered in EG_{imp} calculation as per following formula: EG_{imp} = EG_{imp} x (100% + accuracy of revenue meter) = EG_{imp} x (100% + 0.2%) Therefore, electricity imported from the grid (EG_{imp}) values used in the ER calculation as following table: <table><tr><th rowspan="2"></th><th colspan="3">EG_{imp} (MWh) with conservative value due to delayed calibration</th></tr><tr><th>1 Apr-31 Dec 2009</th><th>1 Jan-31 Dec 2010</th><th>1 Jan-31 Mar 2011</th></tr><tr><td>Unit 1</td><td>23.88</td><td>293.24</td><td>0.00</td></tr><tr><td>Unit 2</td><td>94.65</td><td>178.38</td><td>0.00</td></tr><tr><td>Unit 3</td><td>77.68</td><td>214.27</td><td>0.00</td></tr><tr><td>Total</td><td>196.20</td><td>685.90</td><td>0.00</td></tr></table> The data above is based on regular production spreadsheet that is recorded by PT. Indonesia Power.		EG _{imp} (MWh)			1 Apr-31 Dec 2009	1 Jan-31 Dec 2010	1 Jan-31 Mar 2011	Unit 1	23.88	293.24	0.00	Unit 2	94.65	178.11	0.00	Unit 3	77.68	214.27	0.00	Total	196.20	685.63	0.00		EG _{imp} (MWh) with conservative value due to delayed calibration			1 Apr-31 Dec 2009	1 Jan-31 Dec 2010	1 Jan-31 Mar 2011	Unit 1	23.88	293.24	0.00	Unit 2	94.65	178.38	0.00	Unit 3	77.68	214.27	0.00	Total	196.20	685.90	0.00
	EG _{imp} (MWh)																																														
	1 Apr-31 Dec 2009	1 Jan-31 Dec 2010	1 Jan-31 Mar 2011																																												
Unit 1	23.88	293.24	0.00																																												
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Unit 1	23.88	293.24	0.00																																												
Unit 2	94.65	178.38	0.00																																												
Unit 3	77.68	214.27	0.00																																												
Total	196.20	685.90	0.00																																												
Monitoring equipment:	Revenue meters used between 1 April 2009 – 31 March																																														

	2011 are:		
	Revenue meter	Serial number	Class of Accuracy
	Unit #1	PT 0806A117-01	0.2 Previous: 12/09/2008
		MT- 1006A500-01	0.2 Current: 10/08/2010 Next: 10/08/2012
	Unit #2	PT 0806A118-01	0.2 Previous: 12/09/2008 Current: 20/04/2011 Next: 20/04/2013
	Unit #3	PT 0806A119-01	0.2 Previous: 12/09/2008 Current: 04/11/2009 ⁴ Next: 04/11/2011
On 10 August 2010, PO replaced revenue meter Unit #1 with a new revenue meter with serial number MT-1006A500-01.			
QA/QC procedures to be applied:	Meters will be calibrated once per 2 years according to the PPA signed between PT. Indonesia Power and PLN (load dispatcher) or other documents, which update or replace this PPA.		
Calculation method:	-		
Any comment:	PPA signed between PT. Indonesia Power and PT PLN (load dispatcher) or other documents, which update or		

⁴ The reason for having only a year gap for Unit #3 revenue meter calibration is LAN communication failure, which then needed to be fixed and subsequently recalibrated. During that time, a back-up meter owned by PT. PLN (Persero) was used to measure electricity generation from Unit #3.

replace this PPA.

Data Unit / Parameter:	FC _{i,y}																											
Data unit:	Litres/year																											
Description:	Amount of diesel fuel used in the geothermal power plant operation																											
Source of data:	Project Owner-diesel fuel operational logbook																											
Description of measurement methods and procedures to be applied:	Fuel consumption will be recorded monthly, specifically for each fuel (currently only diesel consumption is available). Fuel consumption will be calculated from power shutdown records (hours) and/or diesel usage by using emergency diesel genset 400 KVA/320 kWh technical specification incl. its fuel consumption specification (0.260—it depends on each diesel genset), resulted in litres then converted to tonnes using fuel specific density or scientifically proven fuel densities.																											
Frequency of monitoring/recording:	Fuel consumption will be recorded monthly, specifically for each fuel (currently only diesel consumption is available).																											
Value monitored:	<table><tr><th rowspan="2">Monitoring year</th><th rowspan="2">Power shutdown/ diesel usage (hours)</th><th colspan="2">Diesel specification</th><th rowspan="2">Diesel fuel (litres/year)</th></tr><tr><th>Energy (kWh)</th><th>Fuel consumption</th></tr><tr><td>1 Apr-31 Dec 09</td><td>598.47</td><td>320</td><td>0.260</td><td>49,792.43</td></tr><tr><td>1 Jan-31 Dec 10</td><td>1,747.97</td><td>320</td><td>0.260</td><td>145,430.83</td></tr><tr><td>1 Jan-31 Mar 11</td><td>2.33</td><td>320</td><td>0.260</td><td>194.13</td></tr><tr><td>Total 1 Apr 09-31 Mar 11</td><td>2,348.77</td><td></td><td></td><td>195,417.39</td></tr></table> The data above is based on actual data recorded by PT. Indonesia Power. Power shutdown data is recorded for the whole power plant. Therefore, it is calculated once in the ER calculation of Gunung Salak Unit 1. It was found out between 1 April 2009 and 31 March 2011 that there were some missing start or stop hour of diesel genset or fire fighting warming up activities. To consider those missing data, a	Monitoring year	Power shutdown/ diesel usage (hours)	Diesel specification		Diesel fuel (litres/year)	Energy (kWh)	Fuel consumption	1 Apr-31 Dec 09	598.47	320	0.260	49,792.43	1 Jan-31 Dec 10	1,747.97	320	0.260	145,430.83	1 Jan-31 Mar 11	2.33	320	0.260	194.13	Total 1 Apr 09-31 Mar 11	2,348.77			195,417.39
Monitoring year	Power shutdown/ diesel usage (hours)			Diesel specification			Diesel fuel (litres/year)																					
		Energy (kWh)	Fuel consumption																									
1 Apr-31 Dec 09	598.47	320	0.260	49,792.43																								
1 Jan-31 Dec 10	1,747.97	320	0.260	145,430.83																								
1 Jan-31 Mar 11	2.33	320	0.260	194.13																								
Total 1 Apr 09-31 Mar 11	2,348.77			195,417.39																								

	fixed maximum 10 minutes value of each warming up as per internal working instruction for diesel genset and fire fighting is taken in the PEFF _y calculation.
Monitoring equipment:	-
QA/QC procedures to be applied:	-
Calculation method:	Fuel consumption will be calculated from power shutdown records (hours) and/or diesel usage by using emergency diesel genset 400 KVA/320 kWh technical specification incl. its fuel consumption specification (0.260—it depends on each diesel genset), resulted in litres then converted to tonnes using fuel specific density or scientifically proven fuel densities. Following is formulae to calculate fuel consumption: $\sum_i FC_{i,j,y} = \text{Total shutdown time (hours)} \times \text{Energy (kWh)} \times \text{specific fuel consumption (0.260)}$ Example of fuel consumption calculation for 1 Apr-31 Dec 2009: $\sum_i FC_{i,j,y} = 598.75 \text{ hours} \times 320 \text{ kWh} \times 0.260 = 49,816.00 \text{ litres}$
Any comment:	Fuel consumption will only occur in emergencies when power plant is not operational and the grid is also not available, a confluence of events which is expected to happen very rarely; at other times the plant will run on grid electricity. Emergency diesel genset 400 KVA/320 kWh is only for critical instrument/control system during turbine trip and shutdown.

Table 6. Technical details of monitoring instruments

S.No	Equipment	Description
1	Electricity Revenue Meter Unit #1 (1 Apr 09-10 Aug 10) For EGY and EGimp	Name: Static Energy Meter Manufacturer: ION Type: 8600 Unit #1: PT 0806A117-01 Class of Accuracy: 0.2 Date of Calibration: 12/09/2008 Range: 5 A; 57.7 V; 50 Hz
2	Electricity Revenue Meter Unit #1 (10 Aug 10-31 Mar 11)	Name: Static Energy Meter Manufacturer: Schneider Electric Type: ION 8600 Unit #1: MT-1006A500-01

	For EGy and EGimp	Class of Accuracy: 0.2 Date of Calibration: 10/08/2010 Range: 2.5 A; 57 - 277 V; 50 Hz
3	Electricity Revenue Meter Unit #2 (1 Apr 09-31 Mar 11) For EGy and EGimp	Name: Static Energy Meter Manufacturer: ION Type: 8600 Unit #2: PT 0806A118-01 Class of Accuracy: 0.2 Date of Calibration: 12/09/2008 & 20/04/2011 Range: 5 A; 57.7 V; 50 Hz
4	Electricity Revenue Meter Unit #3 (1 Apr 09-31 Mar 11) For EGy and EGimp	Name: Static Energy Meter Manufacturer: ION Type: 8600 Unit #3: PT 0806A119-01 Class of Accuracy: 0.2 Date of Calibration: 12/09/2008 & 04/11/2009 Range: 0.05 - 20 A; 57 - 277 V; 50 Hz
5	Steam Flow Meter Unit #1 For MS,y	Name: Main Steam Flow Meter Transmitter Manufacturer: ABB Kent – Taylor Model No.: KDC/SKSTSLSB1620/SR Serial No.: 1592055219 Instrument No.: 1LBA01CF001-B01 Range: Input: 0 ~ 200 mBar Output: 4 ~ 20 mA DC Scale: 0 ~ 100 % Accuracy: 0.25 % Date of Calibration: 08/09/2008, 13/07/2009 & 26/07/2010
6	Steam Flow Meter Unit #2 For MS,y	Name: Main Steam Flow Meter Transmitter Manufacturer: Fisher Rosemount Model No.: 3051CD2A02A1AB1H204 Smart Family Serial No.: 01449549 Instrument No.: 2LBA01CF001-B01 Range: Input: 0 ~ 200 mBar Output: 4 ~ 20 mA DC

		Scale: 0 ~ 100 % Accuracy: 0.25 % Date of Calibration: 08/09/2008, 15/07/2009 & 27/07/2010
7	Steam Flow Meter Unit #3 For MS,y	Name: Main Steam Flow Meter Transmitter Manufacturer: ABB Kent – Taylor Model No.: 621RC2ULB111121 Remote Seal Serial No.: 95034SR96045 Instrument No.: 3LBA01CF001-B01 Range: Input: 0 ~ 200 mBar Output: 4 ~ 20 mA DC Scale: 0 ~ 100 % Accuracy: 0.25 % Date of Calibration: 08/09/2008, 14/07/2009 & 28/07/2010

3.3 Description of the Monitoring Plan

This section presents the steps taken to monitor on regular basis the GHG emission reductions from the capacity upgrade project at Gunung Salak geothermal power plant in Indonesia.

The purpose of the monitoring plan is to present reliable and complete data and to ensure that all actual project data is well organized in term of collection and archiving.

Prior to the start of the crediting period, the organization of the monitoring team is established. Clear roles and responsibilities are assigned to all staff and the power plant manager involved in the VCS project, who have overall responsibility for the monitoring system in the project, ensuring trained staff perform the monitoring duties and that where trained monitoring staff are absent, the integrity of the monitoring system is maintained by other trained staff. Initial training is conducted and regular checks performed to ensure adequacy of monitoring data.

Table 7. List of training from 1 April 2009 to 31 March 2011

No.	Date	Name of Training	Participants	Organizer
1	12-Jan-2010	CDM and VCS Verification of Gunung Salak Geothermal Power Plant	a) Chemical & Environment, Operation & Commerce,	PT. Indonesia Power

			Plant Operator, Maintenance b) Public Relation c) Finance & Administration d) HSE (Health & Safety Environment), etc.	
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Besides above CDM and VCS trainings, there are also other internal trainings such as plant operation, maintenance, engineering and logistics and also other competencies such as English, etc that have been conducted from 1 April 2009 to 31 March 2011 referring to internal training documentation, which have been provided to DOE during verification site visit.

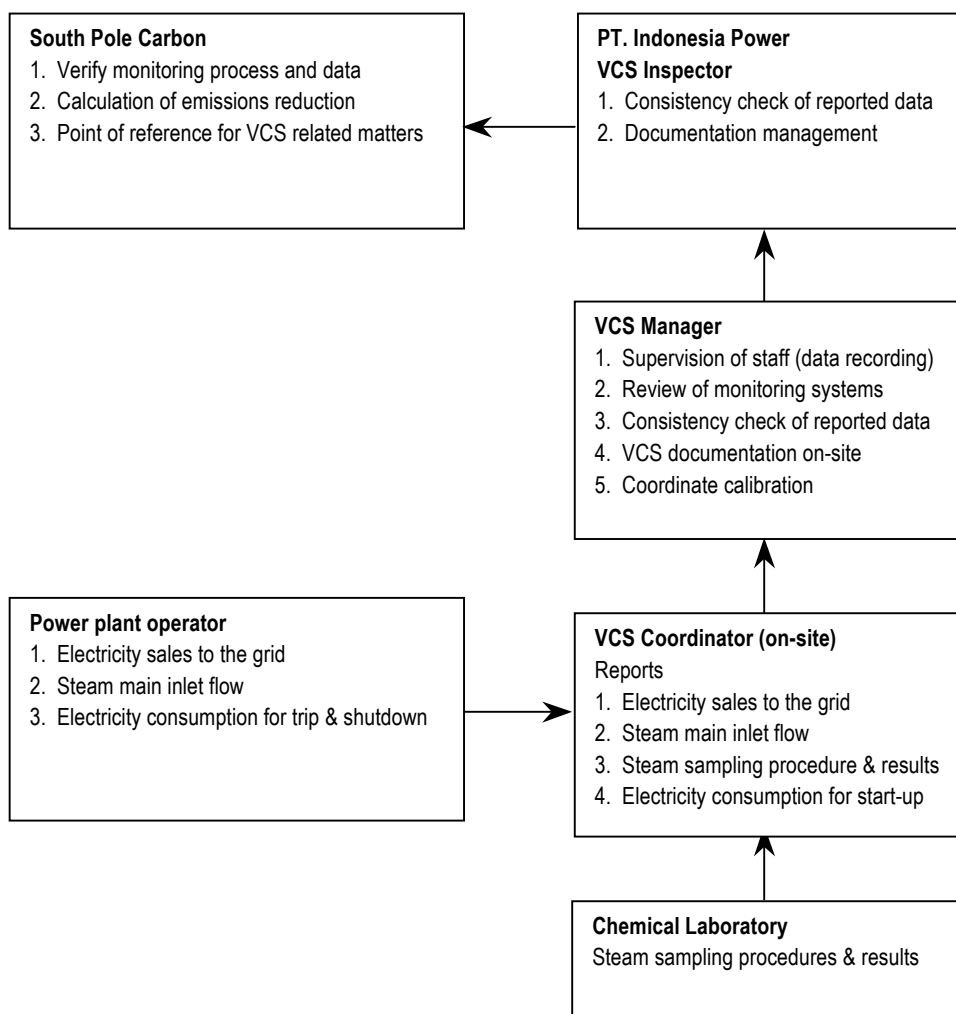
Details of Monitoring Team and Responsibilities

The electricity exported and imported together with steam flow rate and NCG characteristics required for emission reduction calculation were obtained by certain procedures set out in the monitoring plan. To address all O&M issues, the overall authority and responsibility belongs to the VCS Manager, which effectively controls and monitors the complete process in the power plant.

The Monitoring data of the equipments are recorded by the Technicians/ supervisors every shift (including the Chemical laboratory office for NCG characteristics) and submitted to the VCS Coordinator. The VCS Coordinator reports monthly to the VCS Manager. The VCS Manager submits a yearly report to the VCS Inspector, which is directly forwarded to South Pole Carbon.

Monitoring Organisation Chart

Figure 3. Gunung Salak geothermal power plant organization chart



During monitoring period from 1 April 2009 to 31 March 2011, there are significant changes of person in charge (PICs) due to regular internal rotation or promotion. Therefore, following table shows person in charge before and after 17 August 2010, when the Gunung Salak sub-unit manager or VCS manager as per monitoring plan of VCS PD is replaced.

Table 8. Gunung Salak geothermal power plant team and responsibilities from 1 April 2009 to 17 August 2010

Team	Jobs and responsibilities	Position at the PT. Indonesia Power	Represented by (name)
VCS Inspector	Asses yearly report and discuss with South Pole if corrections needed in the monitoring SOP	Senior Environmental Expert	Mrs. Anna Reani

VCS Manager	• Documented and stored monthly report. • Prepare yearly report	Gunung Salak Site Manager	Mr. Eko Yuniarto
VCS Coordinator	• Prepare monthly report in the excel sheet		Mr. Yus Faisal
Power plant operator (per shift)	• Record hourly data of steam flow, EG_y, EG_{imp}, blackouts/power shutdowns and any emergencies occurred.	Operator	Operator
Chemical Laboratory	• Supervise NCG sampling and analysis from the external certified Laboratory	Laboratory officer	Mr. Yuansah

Table 9. Gunung Salak geothermal power plant team and responsibilities since 17 August 2010

Team	Jobs and responsibilities	Position at the PT. Indonesia Power	Represented by (name)
VCS Inspector	• Asses yearly report and discuss with South Pole if corrections needed in the monitoring SOP	Senior Environmental Expert	Mrs. Anna Reani
VCS Manager	• Documented and stored monthly report. • Prepare yearly report.	Gunung Salak Site Manager	Mr. Doni Bakar
VCS Coordinator	• Prepare monthly report in the excel sheet	AMA Renval Operation	Mr. Rinduan
Power plant operator (per shift)	• Record hourly data of steam flow, EG_y, EG_{imp},	Operator	Operator

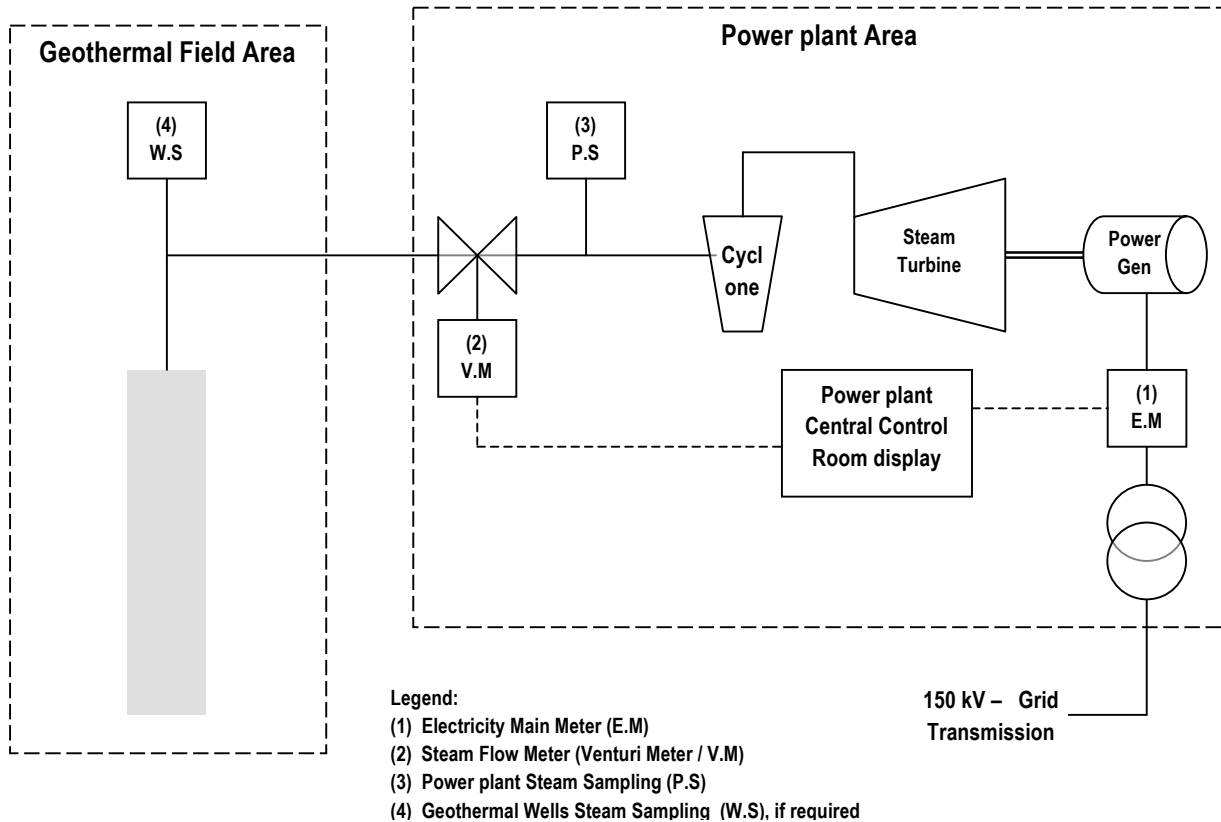
	blackouts/power shutdowns and any emergencies occurred.		
Chemical Laboratory	Supervise NCG sampling and analysis from the external certified Laboratory	Laboratory officer	Mr. Yuansah and Mr. Viki

Measures to ensure the result/uncertainty analysis

The monitoring data of the equipments are recorded by supervisors for every shift and submitted to the VCS Coordinator. The VCS Coordinator compiles all daily-recorded (four-monthly assessment for NCG characteristic) data and reports monthly to the General Manager (acted as the VCS Manager). The VCS Manager will documented and stored monthly report in the Project office, and then submits yearly reports to the VCS Inspector in the head office and directly forwarded to South Pole Carbon Asset Management. By this operational structure, the VCS Inspector together with South Pole can monitor the project activity and make amendments immediately, if needed. The monitored parameters have low level of uncertainty. Therefore the possible monitoring data adjustments are not envisaged for the project. Reported results and data will be compared with the previous results and data and will be thoroughly checked for any inconsistency.

Monitoring equipments

Figure 4. Gunung Salak geothermal power plant monitoring equipments



4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

Baseline emissions as described in the ACM0002 v.07 is calculated as following:

$$BE_y = (EG_y - EG_{baseline}) EF_{grid,CM,y}$$

$$EG_{baseline} = EG_{historical}, \text{ until Date}_{Baseline Retrofit}$$

$$EG_{baseline} = EG_{y,on/after Date}_{Baseline Retrofit}$$

Where:

BE_y	Baseline emissions in year y (tCO ₂ /yr)
EG_y	Electricity supplied by the project activity to the grid (MWh)
$EG_{baseline}$	Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh). For new power plants this value is taken as zero.
$EF_{grid,CM,y}$	Combined margin CO ₂ emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system"

$EG_{\text{historical}}$ Average of historical electricity delivered by the existing facility to the grid (MWh).

$DATE_{\text{BaselineRetrofit}}$ Point in time when the existing equipment would need to be replaced in the absence of the project activity (date)

The project has taken the emission factor 0.882 tCO₂/MWh for estimation of baseline emission reductions as conservative. The emission factor is calculated in the validated VCS PD according to the procedures prescribed in the “Tool to calculate the emission factor for an electricity system, Version 01, 19 October 2007 (EB 35). According to the latest version of the tool, the JAMALI power grid is selected as the project boundary, as the regional interconnected grid covering three islands very close to each other (Java, Madura, and Bali islands) and separated by a relatively long distance from other islands in Indonesia (no interconnection exists to other islands).

The Operating Margin is fixed ex-ante by using 3 recent years available data, which are 2004, 2005 and 2006 data. The 2004, 2005 and 2006 Operation Margin Emission Factor is calculated as follows: 0.764, 0.854 and 0.867 tCO₂e/MWh. The average Operating Margin Emission Factor (2004, 2005 and 2006) is 0.829 tCO₂e/MWh. While the ex-ante Build Margin Emission Factor is calculated to be 0.936 tCO₂e/MWh by dividing total CO₂ emissions by the total annual generation data. The values are presented in Table 10.

Table 10. Emission factor of Jamali Grid as per validated VCS PD

Parameter	As per the validated VCS project data
Operating Margin (OM) in t CO ₂ / MWh	0.829
Build Margin (BM), in t CO ₂ / MWh	0.936
Combined Margin (CM) Simple average of OM and BM in t CO ₂ / MWh	0.882

BE_y Calculation for Gunung Salak unit #1

During current monitoring period from 1 April 2009 to 31 March 2011, there is a replacement of revenue meter from PT 0806A117-01 to MT-1006A500-01 on 10 August 2010 as explained in section 3.2 above. This revenue meter replacement did not and will not affect electricity export or import measurement.

Table 11. Baseline emission (BE_y) calculation for Gunung Salak unit #1

Month/Ye	EG _y	BE _y
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ar	Half-hourly production E_{exp}	Half-hourly production E_{imp}	Half-hourly production ($E_{exp}-E_{imp}$)	As per invoice	Conservative (with 0.2% permissible error due to a delayed calibration schedule)	EG_y	$EG_{baseline}$	Total
	kWh	kWh	kWh	kWh	kWh	MWh	MWh	tCO ₂
Apr-09	41,213,532.95	0.00	41,213,532.95	41,213,532.95	41,213,532.95	41,213.53	34,280.27	6,115.13
May-09	42,611,502.99	0.00	42,611,502.99	42,611,502.99	42,611,502.99	42,611.50	34,280.27	7,348.14
Jun-09	40,829,221.72	1,669.78	40,827,551.94	40,829,221.72	40,827,551.94	40,827.55	34,280.27	5,774.70
Jul-09	41,862,406.60	2,058.51	41,860,348.09	41,862,406.60	41,860,348.09	41,860.35	34,280.27	6,685.62
Aug-09	41,436,669.05	0.00	41,436,669.05	41,436,669.05	41,436,669.05	41,436.67	34,280.27	6,311.94
Sep-09	39,850,958.32	2,086.20	39,848,872.12	39,850,958.32	39,848,872.12	39,848.87	34,280.27	4,911.50
Oct-09	40,989,073.39	747.39	40,988,326.00	40,989,073.39	40,988,326.00	40,988.33	34,280.27	5,916.50
Nov-09	40,026,414.75	0.00	40,026,414.75	40,026,414.75	40,026,414.75	40,026.41	34,280.27	5,068.10
Dec-09	40,097,821.90	17,316.79	40,080,505.11	40,097,821.90	40,080,505.11	40,080.51	34,280.27	5,115.80
Total 2009	368,917,601.68	23,878.67	368,893,723.01	368,917,601.67	368,893,723.01	368,893.72	308,522.47	53,247.45
Total 2009 ROUND OWN								53,247
Jan-10	42,152,200.00	5,200.00	42,147,000.00	42,152,200.00	42,147,000.00	42,147.00	34,280.27	6,938.45
Feb-10	38,053,400.00	0.00	38,053,400.00	38,053,400.00	38,053,400.00	38,053.40	34,280.27	3,327.90
Mar-10	41,964,000.00	0.00	41,964,000.00	41,964,000.00	41,964,000.00	41,964.00	34,280.27	6,777.05
Apr-10	40,556,800.00	3,300.00	40,553,500.00	40,556,800.00	40,553,500.00	40,553.50	34,280.27	5,532.98
May-10	41,716,300.00	0.00	41,716,300.00	41,716,300.00	41,716,300.00	41,716.30	34,280.27	6,558.57
Jun-10	34,785,200.00	125,700.00	34,659,500.00	34,785,200.00	34,659,500.00	34,659.50	34,280.27	334.48
Jul-10	30,745,709.59	7,719.12	30,737,990.47	30,745,709.59	30,737,990.47	30,737.99	34,280.27	0.00*
Aug-10	31,082,692.21	19,448.05	31,063,244.16	31,082,692.21	31,063,244.16	31,063.24	34,280.27	0.00*
Sep-10	40,091,296.08	14,188.08	40,077,108.00	40,091,296.08	40,077,108.00	40,077.11	34,280.27	5,112.81
Oct-10	31,344,800.00	75,237.60	31,269,562.40	31,344,800.00	31,269,562.40	31,269.56	34,280.27	0.00*
Nov-10	39,632,835.38	24,453.14	39,608,382.24	39,632,835.38	39,608,382.24	39,608.38	34,280.27	4,699.39
Dec-10	38,412,694.81	17,997.53	38,394,697.28	38,412,694.81	38,394,697.28	38,394.70	34,280.27	3,628.92
Total 2010	450,537,928.07	293,243.52	450,244,684.55	450,537,928.07	450,244,684.55	450,244.68	411,363.29	42,910.55
Total 2010 ROUND OWN								42,910
Jan-11	42,707,628.50	0.00	42,707,628.50	42,707,628.50	42,707,628.50	42,707.63	34,280.27	7,432.93
Feb-11	38,594,301.68	0.00	38,594,301.68	38,594,301.68	38,594,301.68	38,594.30	34,280.27	3,804.97
Mar-11	41,973,136.95	0.00	41,973,136.95	41,973,136.95	41,973,136.95	41,973.14	34,280.27	6,785.10
Total 2011	123,275,067.13	0.00	123,275,067.13	123,275,067.13	123,275,067.13	123,275.07	102,840.82	18,023.00
Total 2011 ROUND OWN								18,023
TOTAL 2009-2011 ROUND OWN								114,180

* Zero value is considered due to negative BE_y (a subtraction of $EG_y-EG_{baseline}$) values, e.g. Unit #1, July 2010 $\rightarrow 30,737.99 - 34,280.27 = -3,542.28$ tCO₂.

BE_y Calculation for Gunung Salak unit #2

During current monitoring period from 1 April 2009 to 31 March 2011, there is a calibration delay for revenue meter Unit #2 in 2010, which has been considered in the ER calculation for Unit #2. The calibration delay is caused by procurement difficulties as to assign 3rd party contractor to do the calibration. However, since then, the project owner commits to do its best to avoid this unnecessary delay in the future. This revenue meter calibration delay affected emission reduction calculation from September 2010 to March 2011, which considered a deduction of 0.2% for EG_{exp} and an additional of 0.2% of EG_{imp} referring to the UNFCCC "Guideline for assessing compliance with the calibration frequency requirement v.1", which described that a maximum permissible error from the manufactures specification should be taken into baseline emissions (BE_y) calculation as explained in section 3.2 above.

Table 12. Baseline emission (BE_y) calculation for Gunung Salak unit #2

Month/Year	EG_y					BE_y		
	Half-hourly production E_{exp}	Half-hourly production E_{imp}	Half-hourly production ($E_{exp}-E_{imp}$)	As per invoice	Conservative (with 0.2% permissible error due to a delayed calibration schedule)	EG_y	$EG_{baseline}$	Total
	kWh	kWh	kWh	kWh	kWh	MWh	MWh	tCO ₂
Apr-09	40,176,906.96	1,025.58	40,175,881.38	40,176,906.96	40,175,881.38	40,175.88	33,258.54	6,101.10
May-09	41,895,350.31	4,185.57	41,891,164.74	41,895,350.31	41,891,164.74	41,891.16	33,258.54	7,613.98
Jun-09	40,348,815.19	12,632.29	40,336,182.91	40,348,815.19	40,336,182.91	40,336.18	33,258.54	6,242.48
Jul-09	14,909,608.34	53,547.48	14,856,060.86	14,909,608.34	14,856,060.86	14,856.06	33,258.54	0.00*
Aug-09	39,903,818.76	666.84	39,903,151.92	39,903,818.76	39,903,151.92	39,903.15	33,258.54	5,860.55
Sep-09	37,907,164.95	12,964.08	37,894,200.87	37,907,164.95	37,894,200.87	37,894.20	33,258.54	4,088.66
Oct-09	41,416,379.78	7,256.36	41,409,123.42	41,416,379.78	41,409,123.42	41,409.12	33,258.54	7,188.82
Nov-09	40,629,788.14	0.00	40,629,788.14	40,629,788.14	40,629,788.14	40,629.79	33,258.54	6,501.44
Dec-09	41,930,508.64	2,367.28	41,928,141.36	41,930,508.64	41,928,141.36	41,928.14	33,258.54	7,646.59
Total 2009	339,118,341.07	94,645.47	339,023,695.60	339,118,341.07	339,023,695.60	339,023.70	299,326.83	51,243.62
Total 2009 ROUNDOWN								51,243
Jan-10	41,639,076.05	0.00	41,639,076.05	41,639,076.05	41,639,076.05	41,639.08	33,258.54	7,391.64
Feb-10	37,505,515.20	0.00	37,505,515.20	37,505,515.20	37,505,515.20	37,505.52	33,258.54	3,745.84
Mar-10	40,217,608.76	19,551.03	40,198,057.73	40,217,608.76	40,198,057.73	40,198.06	33,258.54	6,120.66
Apr-10	39,529,546.66	0.00	39,529,546.66	39,529,546.66	39,529,546.66	39,529.55	33,258.54	5,531.03
May-10	40,136,513.35	0.00	40,136,513.35	40,136,513.35	40,136,513.35	40,136.51	33,258.54	6,066.38
Jun-10	36,703,745.29	25,190.95	36,678,554.34	36,703,745.29	36,678,554.34	36,678.55	33,258.54	3,016.46
Jul-10	40,133,152.40	0.00	40,133,152.40	40,133,152.40	40,133,152.40	40,133.15	33,258.54	6,063.41
Aug-10	40,107,597.25	0.00	40,107,597.25	40,107,597.25	40,107,597.25	40,107.60	33,258.54	6,040.87
Sep-10	38,931,842.85	0.00	38,931,842.85	39,009,862.58	38,931,842.85	38,931.84	33,258.54	5,003.86
Oct-10	36,072,575.29	8,448.94	36,064,126.35	36,144,865.02	36,064,126.35	36,064.13	33,258.54	2,474.53
Nov-10	13,766,176.44	119,391.20	13,646,785.25	13,793,763.97	13,646,785.25	13,646.79	33,258.54	0.00*
Dec-10	41,882,125.07	5,796.29	41,876,328.78	41,966,057.18	41,876,328.78	41,876.33	33,258.54	7,600.89
Total 2010	446,625,474.61	178,378.41	446,447,096.20	446,887,303.71	446,447,096.20	446,447.10	399,102.44	59,055.55
Total 2010 ROUNDOWN								59,055
Jan-11	42,009,255.15	0.00	42,009,255.15	42,093,442.03	42,009,255.15	42,009.26	33,258.54	7,718.13
Feb-11	37,848,429.81	0.00	37,848,429.81	37,924,278.37	37,848,429.81	37,848.43	33,258.54	4,048.29

Mar-11	41,562,033.06	0.00	41,562,033.06	41,645,323.71	41,562,033.06	41,562.03	33,258.54	7,323.68
Total 2011	121,419,718.02	0.00	121,419,718.02	121,663,044.11	121,419,718.02	121,419.72	99,775.61	19,090.10
Total 2011 ROUND OWN								19,090
TOTAL 2009-2011 ROUND OWN								129,388

* Zero value is considered due to negative BE_y (a subtraction of EG_y-EG_{baseline}) values, e.g. Unit #2, July 2009 → 14,856.06 – 33,258.54 = -18,398.48 tCO₂.

BE_y Calculation for Gunung Salak unit #3

During current monitoring period from 1 April 2009 to 31 March 2011, revenue meter Unit #3 is operating without any issue. Thus, ER calculation is provided as per registered VCS PD.

Table 13. Baseline emission (BE_y) calculation for Gunung Salak unit #3

Month/Year	EG _y					BE _y		
	Half-hourly production E _{exp}	Half-hourly production E _{imp}	Half-hourly production (E _{exp} -E _{imp})	As per invoice	Conservative (with 0.2% permissible error due to a delayed calibration schedule)	EG _y	EG _{baseline}	Total
	kWh	kWh	kWh	kWh	kWh	MWh	MWh	tCO ₂
Apr-09	41,446,598.45	653.10	41,445,945.35	41,446,598.44	41,445,945.35	41,445.95	32,891.36	7,545.15
May-09	41,413,734.61	28,916.62	41,384,817.99	41,413,734.61	41,384,817.99	41,384.82	32,891.36	7,491.23
Jun-09	40,665,969.17	8,906.82	40,657,062.35	40,665,969.17	40,657,062.35	40,657.06	32,891.36	6,849.35
Jul-09	39,672,800.00	10,900.00	39,661,900.00	39,672,800.00	39,661,900.00	39,661.90	32,891.36	5,971.62
Aug-09	39,488,200.00	22,900.00	39,465,300.00	39,488,200.00	39,465,300.00	39,465.30	32,891.36	5,798.22
Sep-09	41,658,600.00	1,200.00	41,657,400.00	41,658,600.00	41,657,400.00	41,657.40	32,891.36	7,731.65
Oct-09	42,642,200.00	4,200.00	42,638,000.00	42,642,200.00	42,638,000.00	42,638.00	32,891.36	8,596.54
Nov-09	41,343,891.67	0.00	41,343,891.67	41,343,891.67	41,343,891.67	41,343.89	32,891.36	7,455.13
Dec-09	42,055,482.94	0.00	42,055,482.94	42,055,482.94	42,055,482.94	42,055.48	32,891.36	8,082.76
Total 2009	370,387,476.83	77,676.54	370,309,800.29	370,387,476.83	370,309,800.29	370,309.80	296,022.23	65,521.64
Total 2009 ROUND OWN								65,521
Jan-10	42,573,621.39	0.00	42,573,621.39	42,573,621.39	42,573,621.39	42,573.62	32,891.36	8,539.76
Feb-10	38,020,320.84	0.00	38,020,320.84	38,020,320.84	38,020,320.84	38,020.32	32,891.36	4,523.74
Mar-10	40,384,359.68	9,576.26	40,374,783.42	40,384,359.68	40,374,783.42	40,374.78	32,891.36	6,600.38
Apr-10	36,942,826.40	15,581.63	36,927,244.77	36,942,826.40	36,927,244.77	36,927.24	32,891.36	3,559.65
May-10	24,348,530.15	14,345.80	24,334,184.35	24,348,530.15	24,334,184.35	24,334.18	32,891.36	0.00*
Jun-10	32,016,301.74	49,061.25	31,967,240.49	32,016,301.74	31,967,240.49	31,967.24	32,891.36	0.00*
Jul-10	39,451,162.22	18,841.77	39,432,320.45	39,451,162.22	39,432,320.45	39,432.32	32,891.36	5,769.13
Aug-10	31,494,765.47	37,230.16	31,457,535.31	31,494,765.47	31,457,535.31	31,457.54	32,891.36	0.00*
Sep-10	40,582,592.79	802.89	40,581,789.90	40,582,592.79	40,581,789.90	40,581.79	32,891.36	6,782.96
Oct-10	38,768,861.02	35,096.68	38,733,764.34	38,768,861.02	38,733,764.34	38,733.76	32,891.36	5,153.00
Nov-10	40,781,770.34	15,725.77	40,766,044.57	40,781,770.34	40,766,044.57	40,766.04	32,891.36	6,945.47
Dec-10	40,713,635.78	18,011.76	40,695,624.02	40,713,635.78	40,695,624.02	40,695.62	32,891.36	6,883.36

Total 2010	446,078,747.82	214,273.97	445,864,473.85	446,078,747.82	445,864,473.85	445,864.47	394,696.30	54,757.46
Total 2010 ROUND OWN								54,757
Jan-11	42,948,459.18	0.00	42,948,459.18	42,948,459.18	42,948,459.18	42,948.46	32,891.36	8,870.36
Feb-11	38,701,228.80	0.00	38,701,228.80	38,701,228.80	38,701,228.80	38,701.23	32,891.36	5,124.31
Mar-11	42,550,918.82	0.00	42,550,918.82	42,550,918.82	42,550,918.82	42,550.92	32,891.36	8,519.73
Total 2011	124,200,606.80	0.00	124,200,606.80	124,200,606.80	124,200,606.80	124,200.61	98,674.08	22,514.40
Total 2011 ROUND OWN								22,514
TOTAL 2009-2011 ROUND OWN								142,792

* Zero value is considered due to negative BE_y (a subtraction of EG_y-EG_{baseline}) values, e.g. Unit #3, May 2010 → 24,334.18 – 32,891.36 = -8,557.18 tCO₂.

4.2 Project Emissions

Project Emissions

Project emissions as described in the ACM0002 v.07 are considered from:

- a) Fugitive carbon dioxide and methane emissions due to release of non-condensable gases from the produced steam (PES_y); and

$$PE_y = PES_y + PEFF_y$$

$$PES_y = (w_{main,CO_2} + w_{main,CH_4} \times GWP_{CH_4}) \cdot M_{s,y}$$

Where:

PE _y	Project emissions in year y (tCO ₂ /yr)
PES _y	Project emissions of carbon dioxide and methane due to the release of non-condensable gases from the steam produced in the geothermal power plant in year y (tCO ₂ /yr)
PEFF _y	Project emissions from combustion of fossil fuels related to the operation of the geothermal power plant in year y (tCO ₂ /yr)
w _{main,CO2}	Average mass fraction of carbon dioxide in the produced steam (non-dimensional)
w _{main,CH4}	Average mass fraction of methane gas in the produced steam (non-dimensional)
GWP _{CH4}	Global warming potential of methane valid for the relevant commitment period (tCO ₂ /tCH ₄)
M _{s,y}	Quantity of steam produced during the year 'y' (tonnes)

During current monitoring period from 1 April 2009 to 31 March 2011, there is a calibration delay for steam flow meter Unit #1, #2 and #3 in 2010, which has been considered in the ER calculation. This steam flow meter calibration delay affected emission reduction calculation in July 2010, when the calibration should have been conducted. Considering this event, PE_y in July 2010 as refer to the UNFCCC Guideline for assessing compliance with the calibration frequency requirement v.1” is corrected by 0.25% steam flow meter accuracy explained in section 3.2 above.

In addition to that, NCG analysis in July and November 2009 was delayed due to internal procurement difficulties. These events affected PES_y calculation in July, November and December 2009. Considering these NCG analysis delays, CH_4 and CO_2 weight fraction values are also corrected and replaced by the highest value of each unit within the monitoring period from 1 April 2009 to 31 March 2011.

The conservative CH_4 weight fraction values used in each unit for July, November and December 2009 are:

Unit #1: The highest CH_4 weight fraction value is 0.0000156864.

Unit #2: The highest CH_4 weight fraction value is 0.0000372070.

Unit #3: The highest CH_4 weight fraction value is 0.0000165788.

While for CO_2 weight fraction values are:

Unit #1: The highest CO_2 weight fraction value is 0.0062075

Unit #2: The highest CO_2 weight fraction value is 0.0079053.

Unit #3: The highest CO_2 weight fraction value is 0.0058008.

Corrected CH_4 and CO_2 weight fraction values for all units that are used in the PES_y calculation are presented in Table 14 and Table 15.

Table 14. Corrected CH_4 weight fraction values used in the project emission of NCG from the produced steam (PES_y) calculation

Analysis #	Period to be used in PES_y calculation	CH_4 values to be used in PES_y calculation (non dimensional)		
	Month/Year	UNIT #1	UNIT #2	UNIT #3
1	Apr-09	0.0000054432	0.0000372070	0.0000151592
	May-09	0.0000054432	0.0000372070	0.0000151592
	Jun-09	0.0000054432	0.0000372070	0.0000151592
	Jul-09	0.0000156864	0.0000372070	0.0000165788
2	Aug-09	0.0000156864	0.0000008908	0.0000165788
	Sep-09	0.0000156864	0.0000008908	0.0000165788
	Oct-09	0.0000156864	0.0000008908	0.0000165788
	Nov-09	0.0000156864	0.0000372070	0.0000165788
3	Dec-09	0.0000156864	0.0000372070	0.0000165788
	Jan-10	0.0000009664	0.0000001650	0.0000013974

4	Feb-10	0.0000009664	0.0000001650	0.0000013974
	Mar-10	0.0000009664	0.0000001650	0.0000013974
	Apr-10	0.0000006720	0.0000015023	0.0000029276
	May-10	0.0000006720	0.0000015023	0.0000029276
	Jun-10	0.0000006720	0.0000015023	0.0000029276
5	Jul-10	0.0000006720	0.0000015023	0.0000029276
	Aug-10	0.0000000040	0.0000000058	0.0000000046
	Sep-10	0.0000000040	0.0000000058	0.0000000046
	Oct-10	0.0000000040	0.0000000058	0.0000000046
6	Nov-10	0.0000000040	0.0000000058	0.0000000046
	Dec-10	0.0000017658	0.0000071020	0.0000023368
	Jan-11	0.0000017658	0.0000071020	0.0000023368
	Feb-11	0.0000017658	0.0000071020	0.0000023368
	Mar-11	0.0000017658	0.0000071020	0.0000023368

Table 15. Corrected CO₂ weight fraction values used in the project emission of NCG from the produced steam (PES_y) calculation

Analysis #	Period to be used in PES _y calculation	CO ₂ values to be used in PES _y calculation (non dimensional)		
	Month/Year	UNIT #1	UNIT #2	UNIT #3
1	Apr-09	0.0017001	0.0055766	0.0052603
	May-09	0.0017001	0.0055766	0.0052603
	Jun-09	0.0017001	0.0055766	0.0052603
	Jul-09	0.0062075	0.0079053	0.0058008
2	Aug-09	0.0053252	0.0065586	0.0058008
	Sep-09	0.0053252	0.0065586	0.0058008
	Oct-09	0.0053252	0.0065586	0.0058008
	Nov-09	0.0062075	0.0079053	0.0058008
3	Dec-09	0.0062075	0.0079053	0.0058008
	Jan-10	0.0062075	0.0052667	0.0048961
	Feb-10	0.0062075	0.0052667	0.0048961
	Mar-10	0.0062075	0.0052667	0.0048961
4	Apr-10	0.0037350	0.0079053	0.0049105
	May-10	0.0037350	0.0079053	0.0049105
	Jun-10	0.0037350	0.0079053	0.0049105
	Jul-10	0.0037350	0.0079053	0.0049105
5	Aug-10	0.0038912	0.0056317	0.0045080
	Sep-10	0.0038912	0.0056317	0.0045080
	Oct-10	0.0038912	0.0056317	0.0045080
	Nov-10	0.0038912	0.0056317	0.0045080
6	Dec-10	0.0051615	0.0049360	0.0044190
	Jan-11	0.0051615	0.0049360	0.0044190
	Feb-11	0.0051615	0.0049360	0.0044190
	Mar-11	0.0051615	0.0049360	0.0044190

PES_y calculation for Gunung Salak unit #1

Table 16. Project emission from fugitive carbon dioxide and methane emissions due to release of non-condensable gases from the produced steam (PES_y) for Gunung Salak unit #1

Month/year	PES _y				
	W _{Main,CH₄,y}	W _{Main,CO₂,y}	M _{s,y}		Total
			Monthly steam flow	Conservative (with 0.25% permissible error due to a delayed calibration schedule)	
	tCH ₄ /t _{Steam}	tCO ₂ /t _{Steam}	tonnes / month	tonnes / month	tCO ₂
Apr-09	0.0000054432	0.0017000802	322,191.00	322,191.00	584.58
May-09	0.0000054432	0.0017000802	331,780.70	331,780.70	601.98
Jun-09	0.0000054432	0.0017000802	319,813.10	319,813.10	580.26
Jul-09	0.0000156864	0.0062074560	331,358.00	331,358.00	2,166.04
Aug-09	0.0000156864	0.0053251509	333,866.60	333,866.60	1,887.87
Sep-09	0.0000156864	0.0053251509	322,883.70	322,883.70	1,825.77
Oct-09	0.0000156864	0.0053251509	331,753.50	331,753.50	1,875.92
Nov-09	0.0000156864	0.0062074560	322,421.00	322,421.00	2,107.62
Dec-09	0.0000156864	0.0062074560	321,472.60	321,472.60	2,101.42
Total 2009			2,937,540.20	2,937,540.20	13,731.48
Total 2009 ROUNDUP					13,732
Jan-10	0.0000009664	0.0062074560	335,104.90	335,104.90	2,086.95
Feb-10	0.0000009664	0.0062074560	303,420.80	303,420.80	1,889.63
Mar-10	0.0000009664	0.0062074560	335,687.90	335,687.90	2,090.58
Apr-10	0.0000006720	0.0037350080	324,454.70	324,454.70	1,216.42
May-10	0.0000006720	0.0037350080	335,016.10	335,016.10	1,256.02
Jun-10	0.0000006720	0.0037350080	279,734.00	279,734.00	1,048.76
Jul-10	0.0000006720	0.0037350080	288,078.90	288,799.10	1,082.74
Aug-10	0.0000000040	0.0038912040	277,587.00	277,587.00	1,080.17
Sep-10	0.0000000040	0.0038912040	318,164.00	318,164.00	1,238.07
Oct-10	0.0000000040	0.0038912040	251,702.60	251,702.60	979.45
Nov-10	0.0000000040	0.0038912040	319,925.30	319,925.30	1,244.92
Dec-10	0.0000017658	0.0051614982	309,591.60	309,591.60	1,609.44
Total 2010			3,678,467.80	3,679,188.00	16,823.14
Total 2010 ROUNDUP					16,824
Jan-11	0.0000017658	0.0051614982	339,854.60	339,854.60	1,766.76
Feb-11	0.0000017658	0.0051614982	307,551.90	307,551.90	1,598.83
Mar-11	0.0000017658	0.0051614982	336,743.20	336,743.20	1,750.59
Total 2011			984,149.70	984,149.70	5,116.18
Total 2011 ROUNDUP					5,117
TOTAL 2009-2011 ROUNDUP					35,673

PES_y calculation for Gunung Salak unit #2

Table 17. Project emission from fugitive carbon dioxide and methane emissions due to release of non-condensable gases from the produced steam (PES_y) for Gunung Salak unit #2

Month/year	PES _y				Total
	W _{Main,CH4,y}	W _{Main,CO2,y}	M _{s,y}		
			Monthly steam flow	Conservative (with 0.25% permissible error due to a delayed calibration schedule)	
tCH ₄ /t _{Steam}	tCO ₂ /t _{Steam}	tonnes / month	tonnes / month	tCO ₂	
Apr-09	0.0000372070	0.0055766420	351,294.60	351,294.60	2,233.53
May-09	0.0000372070	0.0055766420	362,652.20	362,652.20	2,305.74
Jun-09	0.0000372070	0.0055766420	347,364.70	347,364.70	2,208.54
Jul-09	0.0000372070	0.0079052686	138,421.10	138,421.10	1,202.41
Aug-09	0.0000008908	0.0065585796	361,613.70	361,613.70	2,378.44
Sep-09	0.0000008908	0.0065585796	342,071.00	342,071.00	2,249.90
Oct-09	0.0000008908	0.0065585796	358,856.70	358,856.70	2,360.30
Nov-09	0.0000372070	0.0079052686	351,340.70	351,340.70	3,051.96
Dec-09	0.0000372070	0.0079052686	361,542.70	361,542.70	3,140.58
Total 2009			2,975,157.40	2,975,157.40	21,131.40
Total 2009 ROUNDUP					21,132
Jan-10	0.0000001650	0.0052666955	363,069.50	363,069.50	1,913.43
Feb-10	0.0000001650	0.0052666955	327,924.40	327,924.40	1,728.21
Mar-10	0.0000001650	0.0052666955	355,702.90	355,702.90	1,874.61
Apr-10	0.0000015023	0.0079052686	351,347.00	351,347.00	2,788.58
May-10	0.0000015023	0.0079052686	363,016.50	363,016.50	2,881.20
Jun-10	0.0000015023	0.0079052686	333,906.40	333,906.40	2,650.15
Jul-10	0.0000015023	0.0079052686	363,064.40	363,972.06	2,888.78
Aug-10	0.0000000058	0.0056317420	363,065.20	363,065.20	2,044.73
Sep-10	0.0000000058	0.0056317420	351,354.30	351,354.30	1,978.78
Oct-10	0.0000000058	0.0056317420	323,543.70	323,543.70	1,822.15
Nov-10	0.0000000058	0.0056317420	120,012.00	120,012.00	675.89
Dec-10	0.0000071020	0.0049359589	359,532.00	359,532.00	1,828.26
Total 2010			3,975,538.30	3,976,445.96	25,074.78
Total 2010 ROUNDUP					25,075
Jan-11	0.0000071020	0.0049359589	363,067.70	363,067.70	1,846.24
Feb-11	0.0000071020	0.0049359589	327,935.00	327,935.00	1,667.58
Mar-11	0.0000071020	0.0049359589	361,178.10	361,178.10	1,836.63
Total 2011			1,052,180.80	1,052,180.80	5,350.45
Total 2011 ROUNDUP					5,351
TOTAL 2009-2011 ROUNDUP					51,558

PES_y calculation for Gunung Salak unit #3

Table 18. Project emission from fugitive carbon dioxide and methane emissions due to release of non-condensable gases from the produced steam (PES_y) for Gunung Salak unit #3

Month/year	PES _y			
	W _{Main,CH4,y}	W _{Main,CO2,y}	M _{S,y}	Total

			Monthly steam flow	Conservative (with 0.25% permissible error due to a delayed calibration schedule)	
	tCH ₄ /t _{Steam}	tCO ₂ /t _{Steam}	tonnes / month	tonnes / month	tCO ₂
Apr-09	0.0000151592	0.0052603488	308,791.60	308,791.60	1,722.65
May-09	0.0000151592	0.0052603488	308,615.00	308,615.00	1,721.67
Jun-09	0.0000151592	0.0052603488	310,117.90	310,117.90	1,730.05
Jul-09	0.0000165788	0.0058008440	315,321.60	315,321.60	1,938.91
Aug-09	0.0000165788	0.0058008440	302,961.60	302,961.60	1,862.91
Sep-09	0.0000165788	0.0058008440	308,220.50	308,220.50	1,895.25
Oct-09	0.0000165788	0.0058008440	316,723.30	316,723.30	1,947.53
Nov-09	0.0000165788	0.0058008440	310,050.60	310,050.60	1,906.50
Dec-09	0.0000165788	0.0058008440	318,891.50	318,891.50	1,960.86
Total 2009			2,799,693.60	2,799,693.60	16,686.34
Total 2009 ROUNDUP					16,687
Jan-10	0.0000013974	0.0048960714	321,545.20	321,545.20	1,583.74
Feb-10	0.0000013974	0.0048960714	291,264.70	291,264.70	1,434.60
Mar-10	0.0000013974	0.0048960714	319,667.90	319,667.90	1,574.50
Apr-10	0.0000029276	0.0049105472	301,051.10	301,051.10	1,496.83
May-10	0.0000029276	0.0049105472	181,751.90	181,751.90	903.68
Jun-10	0.0000029276	0.0049105472	153,677.60	153,677.60	764.09
Jul-10	0.0000029276	0.0049105472	334,283.20	335,118.91	1,666.22
Aug-10	0.0000000046	0.0045080460	249,593.70	249,593.70	1,125.20
Sep-10	0.0000000046	0.0045080460	328,264.30	328,264.30	1,479.86
Oct-10	0.0000000046	0.0045080460	308,435.80	308,435.80	1,390.47
Nov-10	0.0000000046	0.0045080460	322,272.20	322,272.20	1,452.85
Dec-10	0.0000023368	0.0044189946	322,144.90	322,144.90	1,439.37
Total 2010			3,433,952.50	3,434,788.21	16,311.41
Total 2010 ROUNDUP					16,312
Jan-11	0.0000023368	0.0044189946	339,275.90	339,275.90	1,515.91
Feb-11	0.0000023368	0.0044189946	306,962.30	306,962.30	1,371.53
Mar-11	0.0000023368	0.0044189946	341,496.90	341,496.90	1,525.83
Total 2011			987,735.10	987,735.10	4,413.27
Total 2011 ROUNDUP					4,414
TOTAL 2009- 2011 ROUNDUP					37,413

b) Carbon dioxide emissions from fossil fuel combustion (PEFF_y)

As referred to the "Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion" v.01, project emissions coming from fossil fuel combustion is calculated as following:

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

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y}$$

Where:

- PEFF_y Project emissions from combustion of fossil fuels related to the operation of the geothermal power plant in year y (tCO₂/yr)
- PE_{FC,j,y} CO₂ emissions from fossil fuel combustion in process 'j' during the year 'y' (t CO₂ e/year). This parameter shall be calculated as per the latest version of the Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion, where 'j' stands for the processes required for the operation of the geothermal power plant.
- FC_{j,i,y} Quantity of fuel type 'i' combusted in process 'j' during the year 'y' (mass or volume unit)
- COEF_{j,y} CO₂ emissions coefficient of fuel type 'i' in year 'y' (t CO₂ e/mass or volume unit)
- NCV_{i,y} Weighted average net calorific value of the fuel type 'i' in year 'y' (GJ/mass or volume)
- EF_{CO2,i,y} Weighted average CO₂ emission factor of fuel type 'i' in year 'y' (t CO₂ /GJ)

PEFF_y calculation for the whole power plant (Unit #1, #2 and #3)

During current monitoring period from 1 April 2009 to 31 March 2011, it was found out that there were some missing start or stop hour of diesel genset and fire fighting warming up activities as per available documentation (diesel genset and fire fighting usage records). Therefore, to consider these missing data, a fixed maximum 10 minutes value of each warming up as per internal working instruction for diesel genset and fire fighting has been taken into account in the PEFF_y calculation.

Table 19. Project emission from carbon dioxide emissions from fossil fuel combustion (PEFF_y) for all units

Month/year	PEFF _y					
	FC _{j,i,y}			NCV _{i,y}	EF _{CO2,i,y}	Total
	Diesel usage	Diesel density	Total			
	litre	kg/litre	tonnes			
Apr-Dec 2009	49,792.43	0.815	40.58	0.043	0.074	0.1291
Total 2009 ROUNDUP						1
Jan-Dec 2010	145,430.83	0.815	118.53	0.043	0.074	0.3772
Total 2010 ROUNDUP						1
Jan-Mar 2011	194.13	0.815	0.16	0.043	0.074	0.0005
Total 2011 ROUNDUP						1
TOTAL 2009-2011 ROUNDUP						3

4.3 Leakage

Leakage emissions as described in the ACM0002 v.07 is 0 for retrofit project as following:

$$LE_y = 0$$

Where:

LE_y Leakage emissions in year y (tCO₂/yr)

4.4 Summary of GHG Emission Reductions and Removals

The emission reductions calculations as described in the ACM0002 v.07 are as follows:

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y Emission reductions in year y (tCO₂/yr)

BE_y Baseline emissions in year y (tCO₂/yr)

PE_y Project emissions in year y (tCO₂/yr)

LE_y Leakage emissions in year y (tCO₂/yr)

ER calculation for Gunung Salak Unit 1

Table 20. Emission reduction calculation for Gunung Salak unit #1

Month/Year	BE_y	PE_y		ER_y
		PES_y	$PEFF_y$	
Apr-09	6,115.13	584.58		
May-09	7,348.14	601.98		
Jun-09	5,774.70	580.26		
Jul-09	6,685.62	2,166.04		
Aug-09	6,311.94	1,887.87		
Sep-09	4,911.50	1,825.77		
Oct-09	5,916.50	1,875.92		
Nov-09	5,068.10	2,107.62		
Dec-09	5,115.80	2,101.42		
Total 2009	53,247.45	13,731.48	0.1291	
Total 2009 ROUNDUP/DOWN	53,247	13,732	1	39,514
Jan-10	6,938.45	2,086.95		
Feb-10	3,327.90	1,889.63		
Mar-10	6,777.05	2,090.58		
Apr-10	5,532.98	1,216.42		
May-10	6,558.57	1,256.02		
Jun-10	334.48	1,048.76		
Jul-10	0.00	1,082.74		
Aug-10	0.00	1,080.17		
Sep-10	5,112.81	1,238.07		

Oct-10	0.00	979.45		
Nov-10	4,699.39	1,244.92		
Dec-10	3,628.92	1,609.44		
Total 2010	42,910.55	16,823.14	0.3772	
Total 2010 ROUNDUP/DOWN	42,910	16,824	1	26,085
Jan-11	7,432.93	1,766.76		
Feb-11	3,804.97	1,598.83		
Mar-11	6,785.10	1,750.59		
Total 2011	18,023.00	5,116.18	0.0005	
Total 2011 ROUNDUP/DOWN	18,023	5,117	1	12,905
TOTAL 2009-2011 ROUNDUP/DOWN	114,180	35,673	3	78,504

ER calculation for Gunung Salak Unit 2

Table 21. Emission reduction calculation for Gunung Salak unit #2

Month/Year	BE _y	PE _y		ER _y
		PES _y	PEFF _y	
Apr-09	6,101.10	2,233.53		
May-09	7,613.98	2,305.74		
Jun-09	6,242.48	2,208.54		
Jul-09	0.00	1,202.41		
Aug-09	5,860.55	2,378.44		
Sep-09	4,088.66	2,249.90		
Oct-09	7,188.82	2,360.30		
Nov-09	6,501.44	3,051.96		
Dec-09	7,646.59	3,140.58		
Total 2009	51,243.62	21,131.40	0	
Total 2009 ROUNDUP/DOWN	51,243	21,132	0	30,111
Jan-10	7,391.64	1,913.43		
Feb-10	3,745.84	1,728.21		
Mar-10	6,120.66	1,874.61		
Apr-10	5,531.03	2,788.58		
May-10	6,066.38	2,881.20		
Jun-10	3,016.46	2,650.15		
Jul-10	6,063.41	2,888.78		
Aug-10	6,040.87	2,044.73		
Sep-10	5,003.86	1,978.78		
Oct-10	2,474.53	1,822.15		
Nov-10	0.00	675.89		
Dec-10	7,600.89	1,828.26		
Total 2010	59,055.55	25,074.78	0	
Total 2010 ROUNDUP/DOWN	59,055	25,075	0	33,980
Jan-11	7,718.13	1,846.24		
Feb-11	4,048.29	1,667.58		
Mar-11	7,323.68	1,836.63		
Total 2011	19,090.10	5,350.45	0	

Total 2011 ROUNDUP/DOWN	19,090	5,351	0	13,739
TOTAL 2009-2011 ROUNDUP/DOWN	129,388	51,558	0	77,830

ER calculation for Gunung Salak Unit 3

Table 22. Emission reduction calculation for Gunung Salak unit #3

Month/Year	BE _y	PE _y		ER _y
		PES _y	PEFF _y	
Apr-09	7,545.15	1,722.65		
May-09	7,491.23	1,721.67		
Jun-09	6,849.35	1,730.05		
Jul-09	5,971.62	1,938.91		
Aug-09	5,798.22	1,862.91		
Sep-09	7,731.65	1,895.25		
Oct-09	8,596.54	1,947.53		
Nov-09	7,455.13	1,906.50		
Dec-09	8,082.76	1,960.86		
Total 2009	65,521.64	16,686.34	0	
Total 2009 ROUNDUP/DOWN	65,521	16,687	0	48,834
Jan-10	8,539.76	1,583.74		
Feb-10	4,523.74	1,434.60		
Mar-10	6,600.38	1,574.50		
Apr-10	3,559.65	1,496.83		
May-10	0.00	903.68		
Jun-10	0.00	764.09		
Jul-10	5,769.13	1,666.22		
Aug-10	0.00	1,125.20		
Sep-10	6,782.96	1,479.86		
Oct-10	5,153.00	1,390.47		
Nov-10	6,945.47	1,452.85		
Dec-10	6,883.36	1,439.37		
Total 2010	54,757.46	16,311.41	0	
Total 2010 ROUNDUP/DOWN	54,757	16,312	0	38,445
Jan-11	8,870.36	1,515.91		
Feb-11	5,124.31	1,371.53		
Mar-11	8,519.73	1,525.83		
Total 2011	22,514.40	4,413.27	0	
Total 2011 ROUNDUP/DOWN	22,514	4,414	0	18,100
TOTAL 2009-2011 ROUNDUP/DOWN	142,792	37,413	0	105,379

The summary of emission reductions for the chosen monitored period i.e. from 1 April 2009 to 31 March 2011 is provided in Table 23.

Table 23. Summary of emission reduction calculation from 1 April 2009 to 31 March 2011

Year	BE	PE	ER
1 April-31 December 2009	170,011	51,552	118,459
1 January-31 December 2010	156,722	58,212	98,510
1 January-31 March 2011	59,627	14,883	44,744
TOTAL	386,360	124,647	261,713

5 ADDITIONAL INFORMATION

Additional information related to this Monitoring Report and ER calculation will be provided separately to the DOE.