MONITORING REPORT FORM (F-CDM-MR)
Version 02.0

MONITORING REPORT

Title of the project activity	Wayang Windu Phase 2 Geothermal Power Project
Reference number of the project activity	3193
Version number of the monitoring report	01
Completion date of the monitoring report	25/06/2012
Registration date of the project activity	02/12/2010
Monitoring period number and duration of this monitoring period	Monitoring period number 3, Duration of this monitoring period (first and last days included): 01/11/2011 – 31/05/2012.
Project participant(s)	Star Energy Geothermal (Wayang Windu) Limited Sindicatum Carbon Capital Ltd Standard Chartered Bank Plc
Host Party(ies)	Republic of Indonesia
Sectoral scope(s) and applied methodology(ies)	Sectoral scope:1 – Energy industries (renewable/non-renewable sources) Applied Methodology: ACM0002 version 9.
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	463,833 tCO_2e
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	444,255 tCO_2e

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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The purpose of the project activity is the generation of power using a reliable and renewable resource in place of power generation by a more greenhouse gas intensive fuel/source. The project reduces greenhouse gas emissions through the displacement of fossil fuel electricity generation with a clean, renewable energy source.

The project activity, Wayang Windu Phase 2 Geothermal Power Project, involves the installation of the additional main 117 MW steam turbine and peripheral equipment to enable the turbine to be driven by the steam produced by the Wayang Windu geothermal fields. The turbine is connected to a generator which would produce the electricity to the JAMALI grid, and hence adding the electricity capacity of the existing Wayang Windu Phase 1.

Wayang Windu Phase 1 has been producing power since June 2000, supplying 110 MW of electricity into the national grid through a single buyer, PLN.

The baseline scenario for this project is the generation of electricity by the operation of grid-connected power plants and by the addition of new generation sources. In the absence of the project activity electricity will continue to be generated by the existing generation units in the JAMALI grid.

The date when the EPC contract was signed was considered as the starting date of the project activity, i.e. on 30 Jan 2007. The commercial operation of the project started in March 2009. The project activity has been registered with the United Nations Framework Convention on Climate Change (UNFCCC) as a CDM project activity (Reference No. 3193) on 2 December 2010. The details can be viewed on http://cdm.unfccc.int/Projects/DB/TUEV-SUED1260194062.48/view

The total emission reductions achieved in this monitoring period is 444,255 tCO_2e.

A.2. Location of project activity

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Wayang Windu Geothermal Power Plant is located in Pangalengan approximately 40 km south of Bandung, West Java in Indonesia. 7° 12′ 26.79″ S, 107° 37′ 44.12″ E

Figure 1 Location of Bandung

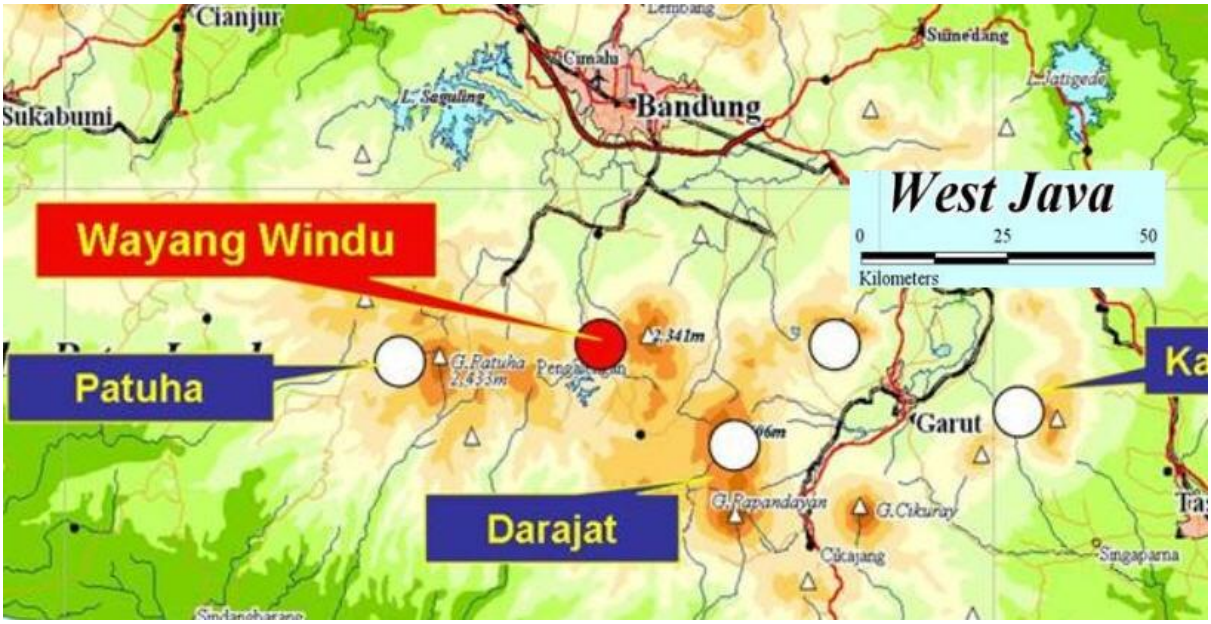

Figure 2 Location of Wayang Windu

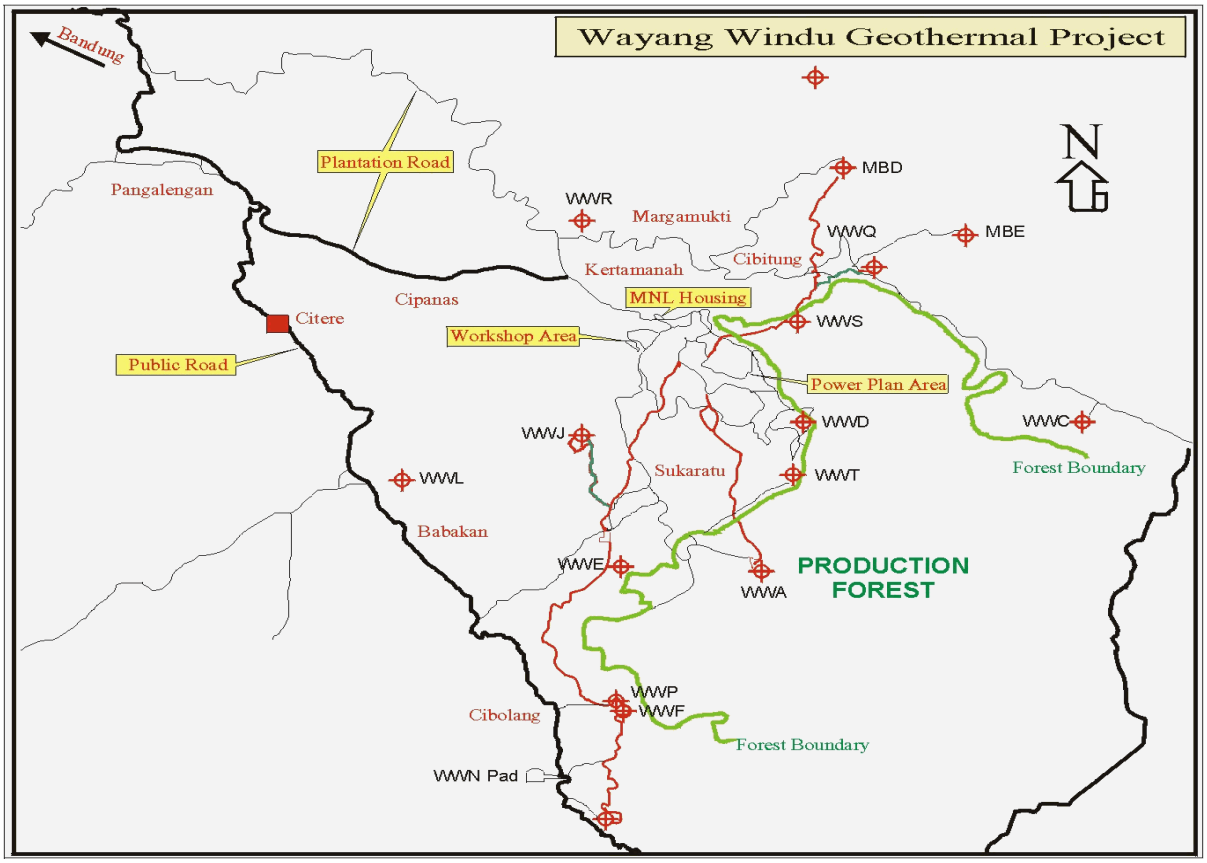

Figure 3 Location of the Wayang Windu Wells and Plant

A.3. Parties and project participant(s)

Party involved ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of Indonesia (host)	Private entity: Star Energy Geothermal (Wayang Windu) Limited (MNL)	No
United Kingdom of Great Britain and Northern Ireland	Private entity: Sindicatum Carbon Capital Ltd	No
United Kingdom of Great Britain and Northern Ireland	Public limited entity: Standard Chartered Plc	No

A.4. Reference of applied methodology

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The applied methodology: ACM0002 "Consolidated methodology for grid-connected electricity generation from renewable sources" (version 9)

This methodology also uses the build margin (BM) and operating margin (OM) approach as specified in:
- "Tool to calculate the emission factor for an electricity system" (Version 01.1)
- "Tool for the demonstration of additionality" (Version 5.2),
- "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion" (Version 02)

More information can be found on the UNFCCC CDM website:
(http://cdm.unfccc.int/methodologies/DB/UB3431UT9I5KN2MUL2FGZXZ6CV71LT)

A.5. Crediting period of project activity

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Crediting Period: 02 December 2010 – 01 December 2017 (Renewable)

SECTION B. Implementation of project activity

B.1. Description of implemented registered project activity

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Geothermal energy in Wayang Windu is stored in a steam reservoir within the earth's crust. Dry saturated steam at high pressure is produced at the surface from wells drilled into this reservoir. The steam is delivered to the power generation facilities through a steam gathering system, to move the turbine blades and drive a generator hence generating electricity. Exhaust steam from the turbine is condensed in a direct contact condenser and part of the condensed exhaust steam is re-injected into the geothermal reservoir, with the remaining being evaporated in the cooling towers. The electricity produced is transferred by the load dispatcher at the adjacent power switchyard to the transmission lines located outside the power plant.

The power plant will consist of a conventional geothermal condensing steam turbine generator with a capacity of 117 MW. Energy of condensation will be transferred to the circulating cooling water system in the steam exhaust condenser and will subsequently be rejected to atmosphere in a conventional mechanical draught cooling tower.

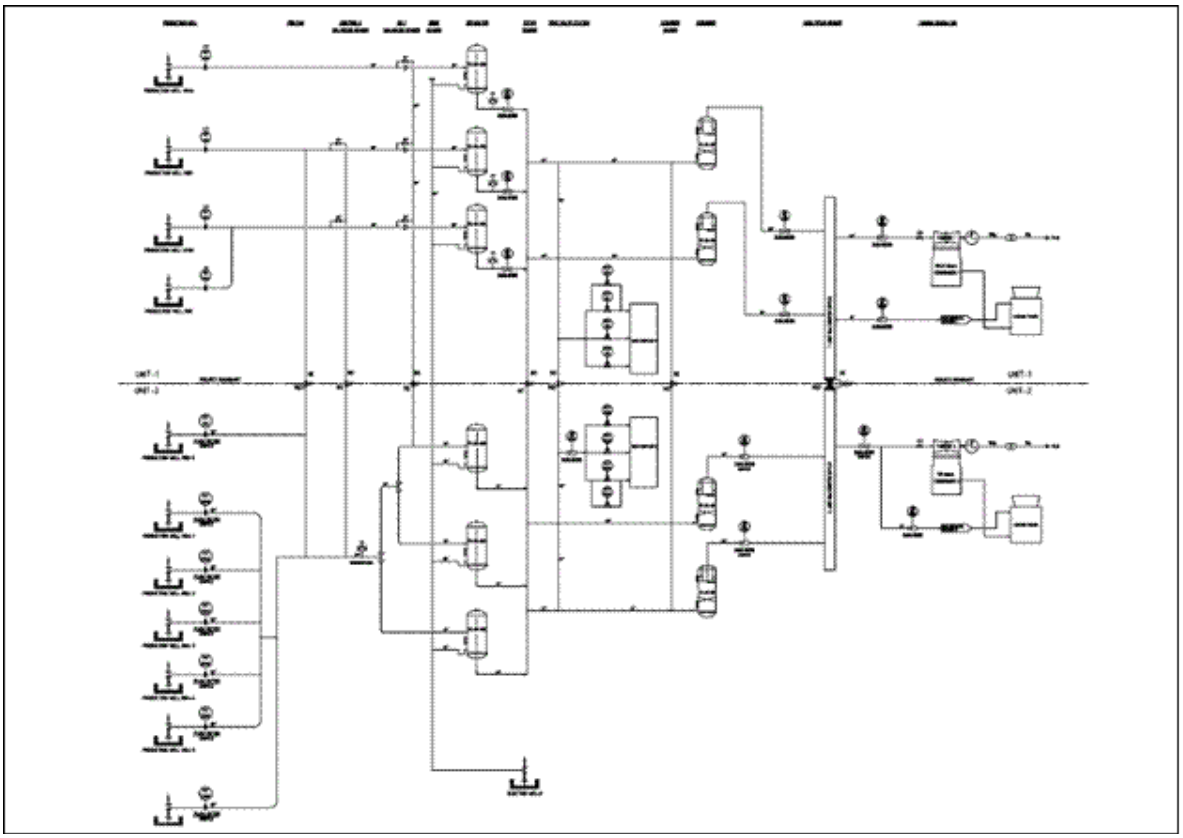

Figure 4 Diagram of the Technical Process (also see Figure 5)

List of Main Equipment and Systems:
- 117 MW steam turbine
- 17,900 m3/hour condenser
- Cooling tower
- 137.5 MVA Main Generator
- 150kV/13.8kV Generator Transformer
- Scrubbers
- Separator
- Plant DCS (Distributed Control System)
- SAGS (Steamfield Above Ground System)

Wayang Windu Phase 2 Geothermal Power Project Plant started operation on 1 Mar 2009 and the project activity was registered as a CDM activity on 2 Dec 2010.

During this monitoring period, no planned and unplanned outages occurred to Wayang Windu Phase 2. Refer to Annex 4 Monitoring Equipments for changes in the monitoring equipments during this monitoring period.

B.2. Post registration changes

B.2.1. Temporary deviations from registered monitoring plan or applied methodology

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No temporary deviations from the registered monitoring plan or applied methodology have been applied for this monitoring period.

B.2.2. Corrections

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No corrections to project information or parameters fixed at validation for this monitoring period.

B.2.3. Permanent changes from registered monitoring plan or applied methodology

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There have been no permanent changes from registered monitoring plan or applied methodology submitted or approved during this monitoring period with this monitoring report.

B.2.4. Changes to project design of registered project activity

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There have been no changes to the project design of the project activity submitted or approved during this monitoring period with this monitoring report.

B.2.5. Changes to start date of crediting period

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There have been no changes to the start date of crediting period submitted or approved during this monitoring period with this monitoring report.

B.2.6. Types of changes specific to afforestation or reforestation project activity

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Not applicable

SECTION C. Description of monitoring system

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The location of measurement devices installed is presented in figures 5,6,7,8 below:

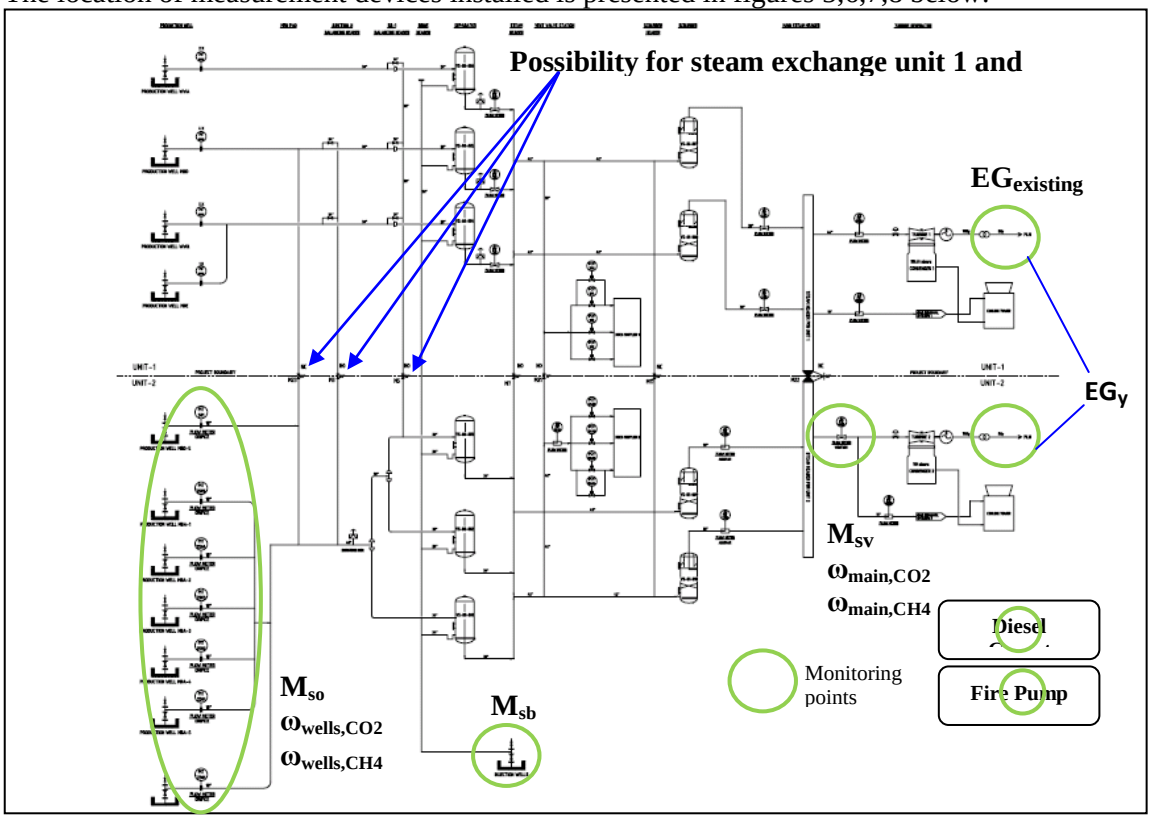


Figure 5 Simplified Process Flow Diagram for Monitoring

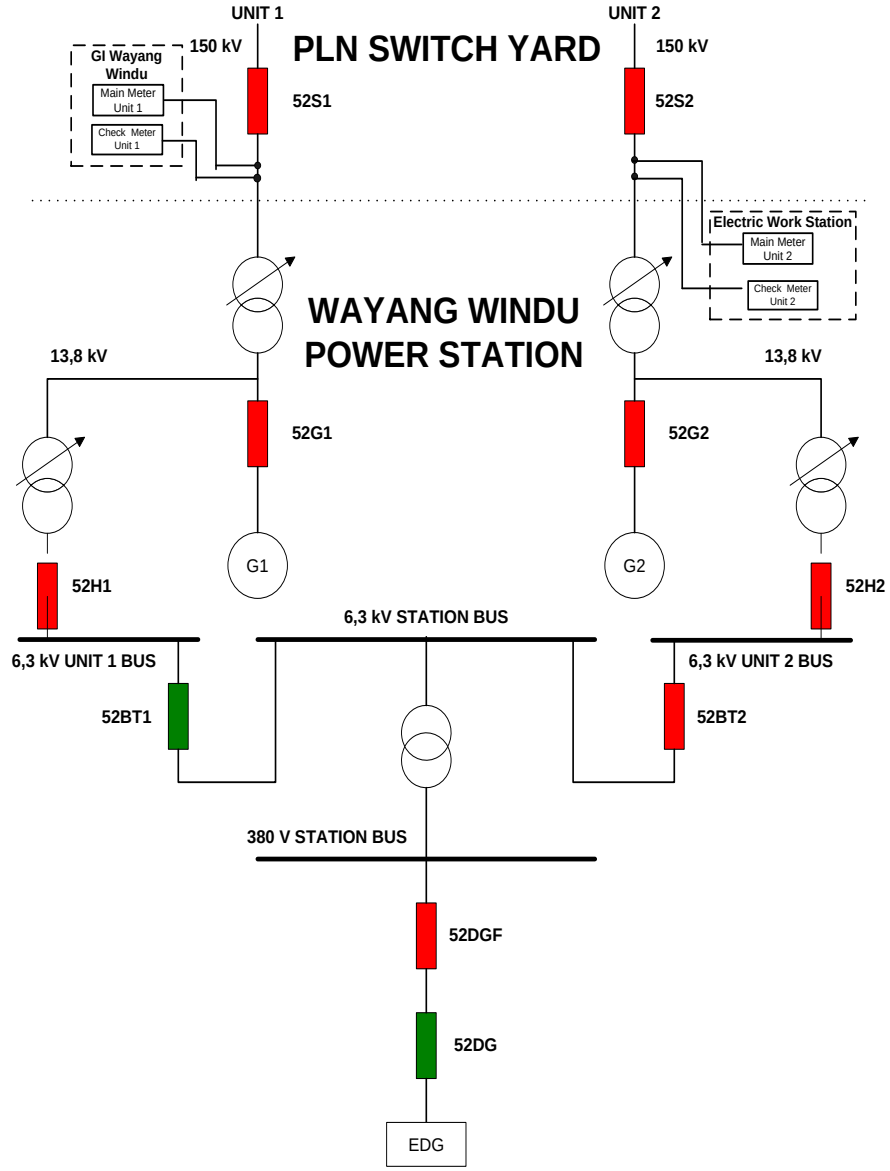


Figure 6 Electrical Layout Drawing

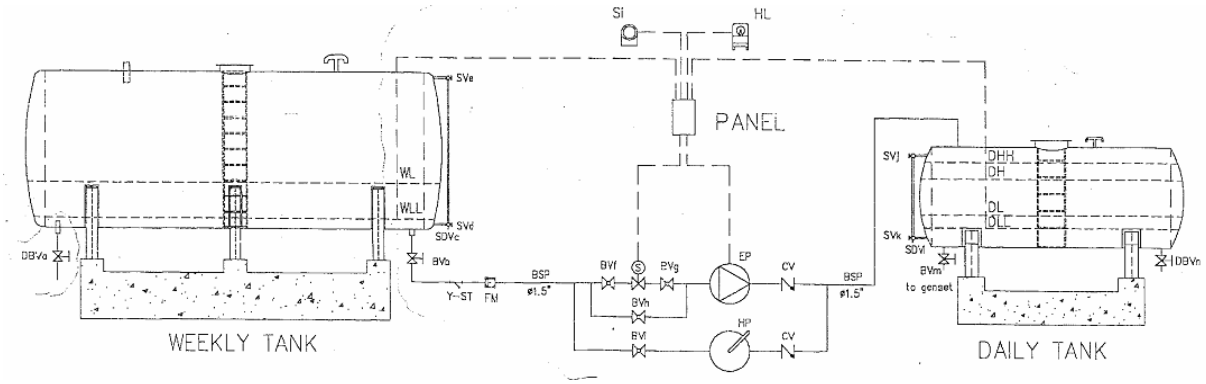


Figure 7 Fire Pump Fuel System

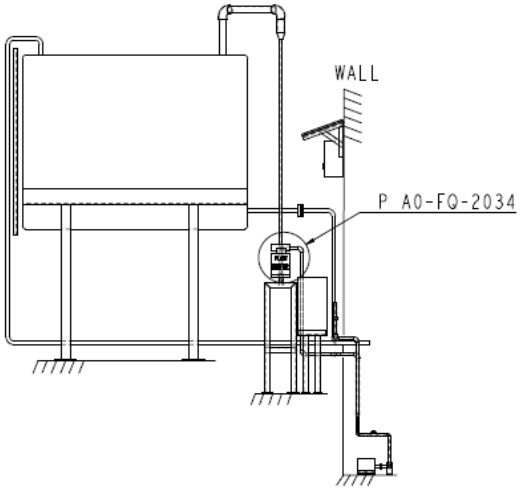


Figure 8 Diesel Generator Set Fuel System

In order to guarantee the quality of the data and data collection system, a detailed monitoring manual has been developed and implemented. This quality manual or monitoring plan (available for verification by a designated operational entity (DOE)) is based upon the requirements set in the registered PDD and addresses as a minimum the items listed below.

Other operation and maintenance procedures developed for the project activity that are related to the monitoring system will be available during verification. Refer to Annex 2 for the list of the procedures.

An overview of the data collection process is provided in table 1 underneath. Detailed formulas for the calculation of emissions are presented in Section E below.

Table 1 Data collection process

Parameter	Reference	Procedure / Frequency	Registration	Check and correct primary measurements
Baseline Emissions	The baseline emissions are calculated using the formulae described in the PDD, section B6.1 - using the CDM spreadsheet.	Primary data (weekly reports) are entered by the SCC officer in the CDM spreadsheet at the start of each month	CDM spreadsheet stored at SCC Project File S-Server	The SCC project officer performs a consistency check based upon previous months. In case of irregularities data is double checked with SEG(WW)L and if needed corrected
Leakage	= 0			
Project Emissions	The project emissions are calculated using the formulae described in the PDD, section B6.1 - using the CDM spreadsheet	Primary data are entered by the SCC officer in the CDM spreadsheet at the start of each month	CDM spreadsheet stored at SCC Project File S-Server	The SCC project officer performs a consistency check based upon previous months. In case of irregularities data is double checked with SEG(WW)L and if needed corrected

Emissions Reductions	The emission reductions are calculated using the formulae described in the PDD, section B6.1 - using the CDM spreadsheet	Primary data (weekly reports) are entered by the SCC officer in the CDM spreadsheet at start of each month	CDM spreadsheet stored at SCC Project File S-Server	The SCC project officer performs a consistency check based upon previous months. In case of irregularities data is double checked with SEG(WW)L and if needed corrected

Calculation of emissions reduction:
The data required to calculate baseline emissions and project emissions are fed into a protected spreadsheet which calculates the emission reductions according to the formulae described in section E. Access to the spreadsheet is controlled. The spreadsheet is regularly audited to ensure it is operating correctly.

Quality control
Data is compared from month to month using trend analysis to show where parameters have deviated significantly from preceding or following values. Any values identified as being unusual in this manner is rechecked. Where preceding or following values are not available, references values may be taken from published data as appropriate such as 2006 IPCC guideline.

Preparation of monitoring report
The data is used to prepare a periodic monitoring report to be submitted to the CDM EB for verification and issuance of CERs. A standard format for the monitoring report is prepared. Prior to the submission of the first monitoring report, an internal technical review process was conducted and documented before the report was submitted for verification.

Accuracy and calibration of instruments
All meters purchased are maintained to ensure a high level of accuracy. The exact specifications of each meter were determined during the detailed design of the project. Thereafter the meter accuracies are included in this procedure and steps taken to maintain those levels of accuracy. The accuracy levels and procedures are set out in detail on monitoring manual.

All key meters are subjected to a quality control regime that includes regular maintenance and calibration. A record is maintained showing the location and unique identification number of each meter, the calibration status of that meter (when last calibrated, when next due for calibration) and who performs the calibration service. Calibration certificates are retained for all meters until two years after the end of the crediting period.

Archiving of data
The monitoring team periodically archives data to a secure and retrievable storage format on a periodic e.g. weekly basis. Calibration records are archived by scanning and storage in an accessible electronic format. These data are stored until 2 years after the end of the crediting period.

Document Control
The Project Manager implements a document control system that ensures that the current versions of necessary documents are available at the point of use. All documents are maintained in English (with local translations if necessary).

Manual data recording system
The monitoring team implements a manual data recording system to act as a back-up for the online system. This involves completion of a daily log sheet that records electricity meter readings at the start of the day (which is also the end of the previous day).

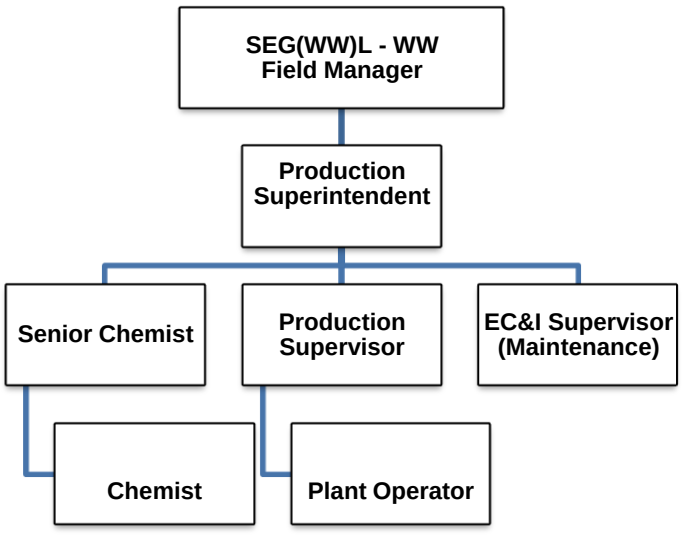
Treatment of missing or corrupted data
Where data are corrupted or missing whilst the plant is operating, the missing data can be estimated by taking the lower of the average value for the parameter before the error arose.

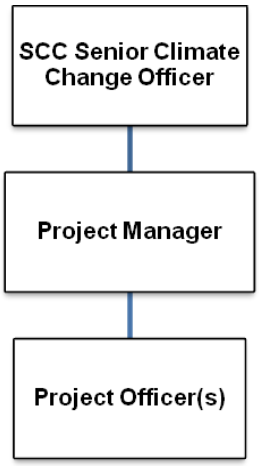
Audit function and management review
The Project Manager arranges for an audit of the management system periodically and at least once per year. The auditor is not involved in the daily operation of the project and if necessary, may be sourced from a third party. The auditor assesses the implementation of the monitoring procedure and the preparation of the monitoring report. Audit findings, and steps taken to address findings are recorded and reviewed by the management, which also reviews the effectiveness of these procedures and necessary changes implemented.

Organisation & Responsibilities
SEG(WW)L
- Wayang Windu Field Manager is responsible for supervision of overall plant operations and management responsibilities
- Production Superintendent is responsible for the preparation of monthly CDM report and supervision of plant productions
- EC&I Supervisor is responsible for maintaining the measurement devices and ensuring calibration of the measurement devices
- Senior Chemist is responsible for checking steam quality information for CDM and submission to SCC
- Chemist is responsible for steam sampling and analysis, checking and recording of steam quality
- Production Supervisor is responsible for external data collection, checking CDM information (excluding steam quality data) and weekly spreadsheet and submission to SCC
- Plant Operators are responsible for meter readings, data recording and other roles as specified by the supervisors

SCC
- Senior Climate Change Officer is responsible for the supervision of overall climate change monitoring of the project, initiate verification with DOE, and conducts internal audit on correct implementation MP
- Project Manager is responsible for management and checking of CDM information and reporting
- Project Officer is responsible for project coordination, implementation and liaison, data gathering and retention, completion of the CDM spreadsheet, calculation of emission reductions, preparation of monitoring report

The organizational structure will be as follows:





SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

Data/Parameter	GWP_{CH4}
Unit	tCO_2/tCH_4
Description	Global warming potential of methane valid for the relevant commitment period
Source of data	IPCC
Value(s) applied	Default value for the first commitment period = 21 tCO_2/tCH_4
Purpose of data	Project emission calculations
Additional comment	-

Data/Parameter	$EG_{historical}$
Unit	MWh
Description	Average of historical electricity delivered by the existing facility to the grid
Source of data	Project activity site.
Value(s) applied	912,476
Purpose of data	Baseline emission calculations
Additional comment	The average of historical electricity delivered by the existing facility (Wayang Windu Phase 1) to the grid, spanning all data from the most recent available month (February 2009) to the time at which the facility was operated (June 2000) expressed in MWh per year. Data is based on invoices from net electricity sales to the grid operator.

Data/Parameter	$DATE_{BaselineRetrofit}$
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	Project activity site.
Value(s) applied	01 June 2030
Purpose of data	Baseline emission calculations
Additional comment	The technical lifetime of the existing facility, i.e. Wayang Windu Phase 1, in the absence of the project activity is taken to be 30 years. This is a

	conservative number, considering many of the power plants in Indonesia are operated even after its technical lifetime. Wayang Windu 1 started operation in June 2000, hence the $DATE_{BaselineRetrofit}$ is 01 June 2030.

Data/Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	Grid emission factor for JAMALI
Source of data	Grid calculation published by Department of Energy and Mineral Resources of Indonesia - Directorate General of Electricity and Energy Utilization and endorsed by Indonesia DNA on 19 January 2009.
Value(s) applied	0.891
Purpose of data	Baseline emission calculations
Additional comment	Calculated with "tool to calculate the emission factor for an electricity system version 01.1". Calculated once ex-ante at the start of the crediting period, using the most recent three historical years for which data is available at the time of submission of the CDM-PDD to the DOE for validation

D.2. Data and parameters monitored

Data/Parameter	$\omega_{main,}\ CO_2$
Unit	tCO_2/t steam
Description	Average mass fraction of CO_2 in the produced steam
Measured/Calculated /Default	Measured
Source of data	The mass fraction of CO_2 in the produced steam at the production wells and at the steam field-power plant interface by the external laboratory.
Value(s) of monitored parameter	**CO_2 (tCO_2 /t steam) / Wells / Main Steam** 14-Sep-11 / 0.00706 / 0.01311 7-Dec-11 / 0.00547 / 0.00950 9-Mar-12 / 0.00630 / 0.00996
Monitoring equipment	The CO_2 monitoring equipment consists of gas flasks, filled with sodium hydroxide solution and additional chemicals to prevent oxidation. The gas sampling is carried out using ASTM Standard Practice E1675 for Sampling 2-Phase Geothermal Fluid for Purposes of Chemical Analysis (as applicable to sampling single phase steam only). The analysis is carried out by an external laboratory accredited under ISO 17025 by the National Accreditation Committee (KAN - Komite Akreditasi Nasional).
Measuring/Reading/ Recording frequency	Sampling, analysis, and recording are performed every 3 months.
Calculation method (if applicable)	N/A
QA/QC procedures	Detailed procedures are described in the CDM Monitoring Manual
Purpose of data	Project emission calculation
Additional comment	-

Data/Parameter	**ω_{main}, CH_4**
Unit	tCH_4/t steam
Description	Average mass fraction of CH_4 in the produced steam
Measured/Calculated /Default	Measured
Source of data	The mass fraction of CH4 in the produced steam at the production wells and at the steam field-power plant interface by the external laboratory.
Value(s) of monitored parameter	**CH_4 (tCH_4 /t steam)** / **Wells** / **Main Steam** 14-Sep-11 / 4.18E-07 / 9.35E-07 7-Dec-11 / 2.94E-07 / 6.13E-07 9-Mar-12 / 4.18E-07 / 9.35E-07
Monitoring equipment	The C_xH_y monitoring equipment consists of gas flasks, filled with sodium hydroxide solution and additional chemicals to prevent oxidation. The as sampling is carried out using ASTM Standard Practice E1675 for Sampling 2-Phase Geothermal Fluid for Purposes of Chemical Analysis (as applicable to sampling single phase steam only). The analysis is carried out by an external laboratory accredited under ISO 17025 by the National Accreditation Committee (KAN - Komite Akreditasi Nasional).
Measuring/Reading/ Recording frequency	Sampling, analysis, and recording are performed every 3 months.
Calculation method (if applicable)	N/A
QA/QC procedures	Detailed procedures are described in the CDM Monitoring Manual
Purpose of data	Project emission calculation
Additional comment	-

Data/Parameter	**$M_{S,y}$**
Unit	Tonnes
Description	Quantity of steam produced during the year y
Measured/Calculated /Default	Measured
Source of data	Continuous measurement by a Venturi flow meter ($M_{sv,y}$) located at the upstream of the Wayang Windu Unit 2 turbine and which is adjusted for losses of brine at the steam separator ($M_{sb,y}$) as well as Orifice Plates ($M_{so,i,y}$) located at the Wayang Windu Unit 2 well heads.
Value(s) of monitored parameter	Refer to Annex 3 Daily Steam Data Wayang Windu Phase 2
Monitoring equipment	Steam flow to WW-2 turbine Tag number: A2-FIT-0106 Serial number: 91L410293 Accuracy class: 0.04% Calibration frequency: Biannually Last calibration: 8-Feb-12 Validity: 8-Aug-12 MBB-1 Well steam flow Tag number: FIT-2301 / PIT-2302 Serial number: 01830354 / 01830135 Accuracy class: 0.04% / 0.04%

Calibration frequency	Biannually	
Last calibration	9-Mar-12	5-Dec-11
Validity	9-Sept-12	5-Jun-12

MBA-1 Well steam flow

Tag number	FIT-2501	PIT-2502
Serial number	01830374	01830130
Accuracy class	0.065%	0.065%
Calibration frequency	Biannually	
Last calibration	7-Dec-11	1-Dec-11
Validity	7-Jun-12	1-Jun12

MBA-2 Well steam flow

Tag number	FIT-2502	PIT-2504
Serial number	02065517	01830131
Accuracy class	0.065%	0.065%
Calibration frequency	Biannually	
Last calibration	7-Dec-11	1-Dec-11
Validity	7-Jun-12	1-Jun-12

MBA-3 Well steam flow

Tag number	FIT-2503	PIT-2506
Serial number	01830360	01830132
Accuracy class	0.065%	0.065%
Calibration frequency	Biannually	
Last calibration	8-Dec-11	1-Dec-11
Validity	8-Jun-12	1-Jun-12

MBA-4 Well steam flow

Tag number	FIT-2504	PIT-2508
Serial number	01830361	01830133
Accuracy class	0.065%	0.065%
Calibration frequency	Biannually	
Last calibration	8-Dec-11	1-Dec-11
Validity	8-Jun-12	1-Jun-12

MBA-5 Well steam flow

Tag number	FIT-2505	PIT-2510
Serial number	01830359	01830134
Accuracy class	0.065%	0.065%
Calibration frequency	Biannually	
Last calibration	8-Dec-11	1-Dec-11
Validity	8-Jun-12	1-Jun-12

MBD-5 Well steam flow

Tag number	FIT-501	PIT-506
Serial number	01845811	01593780
Accuracy class	0.065%	0.065%
Calibration frequency	Biannually	
Last calibration	12-Dec-11	5-Dec-11
Validity	12-Jun-12	5-Jun-12

<table>
<tr><td></td><td>WWW-1 Brine injection well
<table>
<tr><td>Tag number</td><td>FIT-984</td><td>PIT-918</td></tr>
<tr><td>Serial number</td><td>02061116</td><td>8F196683</td></tr>
<tr><td>Accuracy class</td><td>0.08%</td><td>0.08%</td></tr>
<tr><td>Calibration frequency</td><td colspan="2">Biannually</td></tr>
<tr><td>Last calibration</td><td>9-Jan-12</td><td>5-Jan-12</td></tr>
<tr><td>Validity</td><td>9-Jul-12</td><td>5-Jul-12</td></tr>
</table>
Flow meters are calibrated using internal calibrator.
The internal calibrator is calibrated every 2 years by accredited laboratory.

Refer to Annex 4 Monitoring Equipments for further details.</td></tr>
<tr><td>Measuring/Reading/ Recording frequency</td><td>Data is monitored continuously (polling of at least every second) and condensed to half hour values. Daily figures will be built according to the methodology by accumulation of data.</td></tr>
<tr><td>Calculation method (if applicable)</td><td>In order to be conservative, the primary data will be taken from the higher values from either the upstream metering points or the downstream metering. In case steam is transferred from unit 1 steam fields for power generation at unit 2 the upstream figure will higher. In case steam from the new steam fields at unit 2 will be transferred to the power generator of unit 1 the downfield figure will be higher. Using the higher one of the two values ensures that project emissions which are attributable to the capacity addition by unit 2 are clearly identified and accounted. Thus, the quantity of steam ($M_{S,y}$) is given by:

$$M_{S,y} = \max((M_{sv,y} + M_{sb,y}), \sum_i M_{so,y})$$</td></tr>
<tr><td>QA/QC procedures</td><td>Flow meters’ instruments are calibrated using internal calibrator by SEG(WW)L EC&I Supervisor. The internal calibrator is calibrated every 2 years by accredited laboratory.
In accordance to the SEG(WW)L internal procedure, calibration is to be conducted every 6 months
Following the industry’s practice, it is acceptable for the calibration to be conducted between 6 months to 1 year period from the last calibration date, as long as the result of the calibration does not show any error in the measuring instrument, or if the error is smaller than the maximum permissible error. If the calibration result shows error in the measuring instrument, or if the error is larger than the maximum permissible error, error calculation would be applied during the affected period between the scheduled date of calibration based on the internal procedure (6 months from the last calibration date) and the actual date of calibration.
It is considered unacceptable for the calibration to be conducted after the 1 year period from the last calibration date. Error calculation would be applied during the affected period between the scheduled date of calibration based on the industry’s practice (1 year from the last calibration date) and the actual date of calibration.
Error calculation applied in the above cases would be the conservative figures from the following:
- Applying the maximum permissible error of the instrument to the measured values, if the results of the delayed calibration do not show any errors in the measuring equipment, or if the error is smaller than the maximum permissible error</td></tr>
</table>

	- Applying the error identified in the delayed calibration test, if the error is beyond the maximum permissible error of the measuring equipment Based on the operational requirement from Wayang Windu, the maximum permissible error for the flow meters' instruments is 0.1%. Detailed procedures are described in the CDM Monitoring Manual.
Purpose of data	Project emission calculation
Additional comment	-

Data/Parameter	**EG_y**
Unit	MWh
Description	Electricity supplied by the project activity to the grid (total of net electricity generated by Wayang Windu Unit 1 and Unit 2)
Measured/Calculated /Default	Measured
Source of data	The reading of the electricity from the transaction meters from Wayang Windu Unit 1 and Unit 2. Primary data is sourced from the check kWh meters.
Value(s) of monitored parameter	Refer to Annex 5 Daily Data Wayang Windu Unit 1 and Unit 2
Monitoring equipment	Wayang Windu 1 main kWh meter which is owned by PLN Serial number: MT-0809A063-01 Accuracy class: 0.2% Calibration frequency: Every 5 years Last calibration: 10-Oct-08 Validity: 10-Oct-13 Wayang Windu 1 check kWh meter which is owned by SEG(WW)L (primary data): Serial number: PT-0807A249-01 Accuracy class: 0.2% Calibration frequency: Every 2 years Last calibration: 6-Jan-11 Validity: 6-Jan-13 Wayang Windu 2 main kWh meter which is owned by PLN: Serial number: PT-0807A249-01 Accuracy class: 0.2% Calibration frequency: Every 5 years Last calibration: 10-Oct-08 Validity: 10-Oct-13

	Wayang Windu 2 check kWh meter which is owned by SEG(WW)L (primary data): Serial number: PT-0802A194-01 Accuracy class: 0.2% Calibration frequency: Every 2 years Last calibration: 6-Jan-11 Validity: 6-Jan-13 Refer to Annex 4 Monitoring Equipments for further details
Measuring/Reading/ Recording frequency	The meter reading is recorded every half hourly and recorded automatically at load profile at the transaction kWh meters.
Calculation method (if applicable)	N/A
QA/QC procedures	Based on the Standard Operating Procedure of Metering System of PT PLN (Persero) P3B – Jawa Bali revision A, the data from the main meter and the check meter are compared on the monthly basis and any differences greater than 0.4% (the maximum difference of the main meter of 0.2 class and check meter of 0.2 class) will be investigated further. During this monitoring period, the difference between the data from main meter and check meter has never achieved a difference exceeding 0.4% and therefore is considered acceptable. Primary data (data applied to the CERs calculation) is sourced from the check meter. Refer to Annex 6 Main Meter and Check Meter Measurement. The data is double-checked with the records of the electricity transaction. Detailed procedures are described in the CDM Monitoring Manual.
Purpose of data	Baseline emission calculation
Additional comment	-

Data/Parameter	$\mathbf{PE_{FC,j,y}}$
Unit	tCO_2/yr
Description	CO_2 emissions from fossil fuel combustion in the operation of the power plant (diesel genset and fire pump) in year y
Measured/Calculated /Default	Calculated
Source of data	Calculated according to procedure outlined in the 'Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion'
Value(s) of monitored parameter	5.55
Monitoring equipment	N/A
Measuring/Reading/ Recording frequency	Calculated on the monthly basis
Calculation method (if applicable)	N/A
QA/QC procedures	Detailed procedures are described in the CDM Monitoring Manual
Purpose of data	Project emission calculation
Additional comment	-

Data/Parameter	$FC_{i,j,y}$
Unit	ton/yr
Description	Quantity of diesel fuel combusted in power plant operation during the year y
Measured/Calculated /Default	Measurement

Source of data	Measurement of diesel fuel consumption for emergency genset and fire pump multiplied with the national data of the diesel fuel density. Readings from the flowmeter at the inlet of the daily tank for emergency genset and readings from the flowmeter at the inlet diesel tank for the fire pump are recorded during the first week of the month.
Value(s) of monitored parameter	1.74
Monitoring equipment	Flowmeter at the inlet of the daily tank for the diesel fuel consumption for emergency genset Tag number: AO-FQ-2033 Accuracy class: 2% Calibration frequency: Annually Last calibration: 25-Jan-12 Validity: 25-Jan-13 Flowmeter at the inlet diesel tank for the fire pump Tag Number: AO-FQ-2032 Accuracy class: 1% Calibration frequency: Annually Last calibration: 25-Jan-12 Validity: 25-Jan-13
Measuring/Reading/ Recording frequency	The data is collected monthly
Calculation method (if applicable)	N/A
QA/QC procedures	The consistency of measured diesel fuel consumption quantities was cross-checked by an annual energy balance that was based on engine specification fuel consumption (emergency genset and fire pump) and the working hour
Purpose of data	Project emission calculation
Additional comment	-

Data/Parameter	$NCV_{i,y}$
Unit	GJ/ton
Description	Weighted average net calorific value of diesel fuel in year y
Measured/Calculated /Default	Default
Source of data	National value (Pertamina handbook – Bahan Bakar Minyak Elpiji dan BBG)
Value(s) of monitored parameter	42.73

Monitoring equipment	N/A
Measuring/Reading/ Recording frequency	The value is recorded annually
Calculation method (if applicable)	N/A
QA/QC procedures	Detailed procedures are described in the CDM Monitoring Manual
Purpose of data	Project emission calculation
Additional comment	-

Data/Parameter	**$EF_{CO2,i,y}$**
Unit	tCO_2/GJ
Description	Weighted average CO_2 emission factor of diesel fuel in year y
Measured/Calculated /Default	Default
Source of data	IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories
Value(s) of monitored parameter	0.0748
Monitoring equipment	N/A
Measuring/Reading/ Recording frequency	The value is recorded annually
Calculation method (if applicable)	N/A
QA/QC procedures	Detailed procedures are described in the CDM Monitoring Manual
Purpose of data	Project emission calculation
Additional comment	-

TEG_y (Total electricity produced by the project activity, including the electricity supplied to the grid and the electricity supplied to internal loads, in year *y)* is not monitored for the project activity. Based on ACM0002 ver 9, TEG_y is only applicable to be monitored for hydro power plants and is not a requirement for geothermal power plants.

D.3. Implementation of sampling plan

>>

Not applicable for this project activity.

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

>>

The formula used for determination of the baseline emissions are described in section B.6.1 of the Project Design Document v3 dated 2 December 2010, and available upon the UNFCCC website (http://cdm.unfccc.int/Projects/DB/TUEV-SUED1260194062.48/view).

Baseline emissions are calculated as follows:

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

Where:

BE_y = Baseline emission 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 by using "tool to calculate the emission factor for an electricity system version 01.1")

The project activity is the installation of additional power units at an existing grid-connected renewable power plant:

$EG_{baseline} = MAX\ (EG_{historical}\ ,\ EG_{existing,y})$, *until* $DATE_{BaselineRetrofit}$

$EG_{baseline} = EG_y$, *on/after* $DATE_{BaselineRetrofit}$

Where:

$EG_{baseline}$ = Baseline electricity supplied to the grid in the case of modified or retrofit facilities (MWh)
$EG_{historical}$ = Average of historical electricity delivered by the existing facility to the grid (MWh)
$EG_{existing,y}$ = Electricity supplied by the existing grid-connected power plant (MWh)
$DATE_{BaselineRetrofit}$ = Point in time when the existing equipment would need to be replaced in the absence of the project activity (date)

Calculation of $EG_{historical}$

$EG_{historical}$ was calculated based on the historical electricity delivered by Wayang Windu Phase 1 from the start of its operation in June 2000 up to February 2009, i.e. 912,476 MWh/year

Calculation of $DATE_{BaselineRetrofit}$

The technical lifetime of the existing facility, i.e. Wayang Windu Phase 1, in the absence of the project activity is taken to be 30 years. This is a conservative number, considering many of the power plants in Indonesia are operated even after its technical lifetime.

Wayang Windu 1 started operation in June 2000, hence the $DATE_{BaselineRetrofit}$ is 01 June 2030.

$EF_{grid,CM,y}$

The value applied is 0.891 tCO_2/yr based on ex-ante calculation in the registered PDD.

Monitored Baseline Emission Calculation

EG[1]	Electricity supplied by the project activity to the grid	1,115,954	MWh
$EG_{existing}$[2]	Monitored	550,919	MWh
Duration Monitoring Period	01/11/2011 – 31/05/2012	213	Days
$EG_{historical,y}$	Yearly average of historical electricity delivered by the existing facility to the grid	912,476	MWh

[1] Refer to Annex 5 for daily generation data from Wayang Windu Phase 1 and Wayang Windu Phase 2 geothermal power project
[2] Refer to Annex 5 for daily generation data from Wayang Windu Phase 1 geothermal power project

$EG_{historical,MP}$	213/365*912,476	532,486	MWh
$EG_{baseline}$	MAX ($EG_{historical,MP}$, $EG_{existing,MP}$)	550,919	MWh
$EG - EG_{baseline}$		565,035	MWh
BE	$(EG - EG_{baseline}) . EF_{grid,CM,y}$	**503,163**	**t CO2e**

E.2. Calculation of project emissions or actual net GHG removals by sinks

>>

The formula used for determination of the project emissions are described in section B.6.1 of the Project Design Document v3 dated 2 December 2010, and available upon the UNFCCC website (http://cdm.unfccc.int/Projects/DB/TUEV-SUED1260194062.48/view).

Project emissions are calculated as follows:

$PE_y = PES_y + PEFF_y$

Where:

PE_y = Project emission in year y (tCO_2/yr)

PES_y = Project emission of CH_4 and CO_2 due to the release of non-condensable gases from the stream produced in geothermal power plant in year y (tCO_2/yr)

$PEFF_y$ = Project emission from combustion of fossil fuels related to the operation of the geothermal power plant in year y (tCO_2/yr)

Project emission of CO_2 and CH_4 due to the release of non-condensable gases from the steam produced in the geothermal power plant is calculated as:

$PES_y = (\omega_{main,CO2} + \omega_{main,CH4} . GWP_{CH4}) . M_{S,y}$

Where:

PES_y = Project emission of CH_4 and CO_2 due to the release of non-condensable gases from the stream produced in geothermal power plant in year y (tCO_2/yr)

$\omega_{main,CO2}$ = Average mass fraction of CO_2 in the produced steam (non-dimensional)

$\omega_{main,CH4}$ = Average mass fraction of CH_4 in the produced steam (non-dimensional)

GWP_{CH4} = Global warming potential of CH_4 valid for the relevant commitment period (tCO_2/tCH_4)

$M_{S,y}$ = Quantity of steam produced during the year y (tonnes)

Project emissions from combustion of fossil fuel related to the operation of geothermal power plant is calculated as:

$PEFF_y = PE_{FC,j,y}$

Where:

$PEFF_y$ = Project emission from combustion of fossil fuels related to the operation of the geothermal power plant in year y (tCO_2/yr)

$PE_{FC,j,y}$ = CO_2 emissions from fossil fuel combustion in process j during the year y (tCO_2/yr). This parameter will be calculated by the "tool to calculate project or leakage CO_2 emissions from fossil fuel combustion version 02"

$PE_{FC,j,y} = \sum FC_{diesel,j,y} . COEF_{i,y}$

Where:

$FC_{diesel,j,y}$ = Quantity of diesel combusted in emergency genset and fire pump multiplied with the national data of the diesel fuel density (ton)

$COEF_{i,y}$ = CO_2 emission coefficient of diesel fuel (tCO_2/ton)

$COEF_{i,y}$ is calculated based on net calorific value and CO_2 emission factor of diesel fuel, as follows:

$COEF_{i,y} = NCV_{diesel,y} . EF_{CO2,diesel,y}$

Where:

$NCV_{diesel,y}$ = Weighted average net calorific value of diesel fuel in year y (Values provided by the fuel supplier, or regional or national average default values, or IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories) (GJ/ton)

$EF_{CO2,diesel,y}$ = Weighted average CO_2 emission factor of diesel fuel in year y (Values provided by the fuel supplier, or regional or national average default values, or IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories) (tCO_2/GJ)

Monitored Project Emission

Period	Diesel Consumption [liters]
01/11/2011 – 30/11/2011	326
01/12/2011 – 31/12/2011	394
01/01/2012 – 31/01/2012	286
01/02/2012 – 29/02/2012	0
01/03/2012 – 31/03/2012	350
01/04/2012 – 30/04/2012	264
01/05/2012 – 31/05/2012	376

$\sum FC_{diesel}$	$\sum FC_{diesel,j} . \rho_{diesel,j}$ [3]	1.74	t
PEFF	$\sum FC_{diesel,j,y} . NCV_{diesel,y} . EF_{CO2,diesel,y}$ [4]	5.55	t CO2e
PES_y	$(\omega_{main,CO2} + \omega_{main,CH4} . GWP_{CH4}) . M_{S,y}$ [5]	58,902	t CO2e
PE	***PES_y + $PEFF_y$***	**58,908**	**t CO2e**

E.3. Calculation of leakage

>>

Since ACM0002 version 9 does not consider the emission due to power plant construction and fuel handlings, no leakage is considered (L_y = 0).

[3] Diesel density, Source: national value of 0.87 kg/Litre (Pertamina handbook – Bahan Bakar Minyak Elpiji dan BBG). Fossil fuel consumption is recorded on the monthly basis.

[4] Diesel net calorific value, Source: Source: Bahan Bakar Minyak ELPIJI dan BBG of 42.73 GJ/ton. Diesel effective CO_2 emission factor, Source: IPCC default values at the upper limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol.2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories of 0.0748 tCO_2/GJ

[5] Refer to Annex 5 for daily steam data from Wayang Windu Phase 2 geothermal power project. PES is recorded on the daily basis

E.4. Summary of calculation of emission reductions or net anthropogenic GHG removals by sinks

Time Period	Baseline emissions or baseline net GHG removals by sinks (tCO_2e)	Project emissions or actual net GHG removals by sinks (tCO_{2e})	Leakage (tCO_2e)	Emission reductions or net anthropogenic GHG removals by sinks (tCO_2e)
Total	503,163	58,908	-	444,255

E.5. Comparison of actual emission reductions or net anthropogenic GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex-ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (tCO_2e)	463,833	444,255

* The value applied in the *ex ante* calculation of the PDD provided here is calculated by pro-rating the annual estimated emission reductions: Values Applied in the Ex-ante Calculation of the PDD for the Monitoring Period = Annual Estimation of Emission reductions in the PDD × Number of Days in the Monitoring Period / Number of Days per Year = 794,832 tCO_2e/year × 213 Days in the Monitoring Period / 365 days per year = 463,833 tCO_2e.

E.6. Remarks on difference from estimated value in registered PDD

>>

The maximum emission reduction generated by this project activity within the proposed Monitoring period is 463,833 tonnes of CO_2e and the actual emission reduction is 444,255 tonnes of CO_2e. The actual CER generation is 4.22 % lower than the values applied in ex-ante estimation of the registered PDD. This is because of the wells performance which was subjected to depletion.

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Annex 1

Downtime and Shutdown Records

No Downtime and Shutdown in both Units Wayang Windu Unit 1 and Unit 2 during this monitoring period 01/11/2011 – 31/05/2012 (first and last days included).

Annex 2

List of Relevant Operation and Maintenance Procedures

FIT Routine & Venture Inspection Procedures
Routine Operation Procedures
Metering System Operation, Maintenance and Calibration
QA/QC Laboratory Analysis & Utilities Procedures
Gas Sampling Procedures

Annex 3

Daily steam production data from Wayang Windu Phase 2 geothermal power project (M_s), Daily steam generation data measured by Venturi flowmeter ($M_{sv,y}$), Daily losses of brine at the steam separator ($M_{sb,y}$), Daily steam generation data measured by Orifice plates ($M_{so,y}$) during Monitoring Period

Date	$M_{so,i,y}$	$M_{sb,y}$	$M_{sv,y}$	$M_{sb,y} + M_{sv,y}$	$M_{s,conservative}$	M_s
	Wells	Brine	Main Steam	**Brine+Main Steam**	**Wells/Brine+Main Steam**	Tons
1-Nov-11	18,982.00	551.00	18,846.00	19,397.00	Brine+Main Steam	19,397.00
2-Nov-11	18,972.00	551.00	18,846.00	19,397.00	Brine+Main Steam	19,397.00
3-Nov-11	18,890.00	548.00	18,846.00	19,394.00	Brine+Main Steam	19,394.00
4-Nov-11	18,819.00	528.00	18,846.00	19,374.00	Brine+Main Steam	19,374.00
5-Nov-11	18,840.00	543.00	18,846.00	19,389.00	Brine+Main Steam	19,389.00
6-Nov-11	18,941.00	533.00	18,707.00	19,240.00	Brine+Main Steam	19,240.00
7-Nov-11	18,880.00	558.00	18,636.00	19,194.00	Brine+Main Steam	19,194.00
8-Nov-11	18,779.00	541.00	18,846.00	19,387.00	Brine+Main Steam	19,387.00
9-Nov-11	18,770.00	543.00	18,846.00	19,389.00	Brine+Main Steam	19,389.00
10-Nov-11	18,738.00	556.00	18,846.00	19,402.00	Brine+Main Steam	19,402.00
11-Nov-11	18,705.00	562.00	18,695.00	19,257.00	Brine+Main Steam	19,257.00
12-Nov-11	18,684.00	569.00	18,845.00	19,414.00	Brine+Main Steam	19,414.00
13-Nov-11	18,647.00	554.00	18,794.00	19,348.00	Brine+Main Steam	19,348.00
14-Nov-11	18,616.00	541.00	18,011.00	18,552.00	Wells	18,616.00
15-Nov-11	18,611.00	558.00	18,846.00	19,404.00	Brine+Main Steam	19,404.00
16-Nov-11	18,625.00	564.00	18,846.00	19,410.00	Brine+Main Steam	19,410.00
17-Nov-11	18,601.00	561.00	18,845.00	19,406.00	Brine+Main Steam	19,406.00
18-Nov-11	18,596.00	550.00	18,846.00	19,396.00	Brine+Main Steam	19,396.00
19-Nov-11	18,586.00	557.00	18,848.00	19,405.00	Brine+Main Steam	19,405.00
20-Nov-11	18,353.00	546.00	18,830.00	19,376.00	Brine+Main Steam	19,376.00
21-Nov-11	18,570.00	550.00	18,840.00	19,390.00	Brine+Main Steam	19,390.00
22-Nov-11	18,322.00	739.00	18,850.00	19,589.00	Brine+Main Steam	19,589.00
23-Nov-11	18,255.00	2,436.00	18,840.00	21,276.00	Brine+Main Steam	21,276.00
24-Nov-11	18,242.00	2,866.00	18,850.00	21,716.00	Brine+Main Steam	21,716.00
25-Nov-11	18,422.00	2,803.00	18,850.00	21,653.00	Brine+Main Steam	21,653.00
26-Nov-11	18,399.00	2,771.00	18,840.00	21,611.00	Brine+Main Steam	21,611.00
27-Nov-11	18,429.00	2,733.00	18,820.00	21,553.00	Brine+Main Steam	21,553.00
28-Nov-11	18,384.00	2,789.00	18,840.00	21,629.00	Brine+Main Steam	21,629.00
29-Nov-11	18,523.00	2,736.00	18,840.00	21,576.00	Brine+Main Steam	21,576.00
30-Nov-11	18,508.00	2,692.00	18,850.00	21,542.00	Brine+Main Steam	21,542.00
1-Dec-11	18,565.00	2,742.00	18,840.00	21,582.00	Brine+Main Steam	21,582.00
2-Dec-11	18,680.00	2,781.00	18,850.00	21,631.00	Brine+Main Steam	21,631.00
3-Dec-11	18,613.00	2,716.00	18,840.00	21,556.00	Brine+Main Steam	21,556.00
4-Dec-11	18,594.00	2,757.00	18,820.00	21,577.00	Brine+Main Steam	21,577.00
5-Dec-11	18,154.00	2,728.00	18,850.00	21,578.00	Brine+Main Steam	21,578.00
6-Dec-11	18,101.00	2,664.00	18,840.00	21,504.00	Brine+Main Steam	21,504.00
7-Dec-11	18,121.00	2,681.00	18,850.00	21,531.00	Brine+Main Steam	21,531.00
8-Dec-11	18,325.00	2,689.00	18,850.00	21,539.00	Brine+Main Steam	21,539.00
9-Dec-11	18,600.00	2,630.00	18,840.00	21,470.00	Brine+Main Steam	21,470.00
10-Dec-11	18,558.00	2,621.00	18,850.00	21,471.00	Brine+Main Steam	21,471.00
11-Dec-11	18,574.00	2,614.00	18,810.00	21,424.00	Brine+Main Steam	21,424.00
12-Dec-11	18,523.00	2,557.00	18,850.00	21,407.00	Brine+Main Steam	21,407.00
13-Dec-11	18,567.00	2,529.00	18,840.00	21,369.00	Brine+Main Steam	21,369.00
14-Dec-11	18,570.00	2,536.00	18,850.00	21,386.00	Brine+Main Steam	21,386.00
15-Dec-11	18,554.00	2,561.00	18,850.00	21,411.00	Brine+Main Steam	21,411.00
16-Dec-11	18,551.00	2,557.00	18,840.00	21,397.00	Brine+Main Steam	21,397.00

Date	$M_{so,i,y}$ Wells	$M_{sb,y}$ Brine	$M_{sv,y}$ Main Steam	$M_{sb,y} + M_{sv,y}$ Brine+Main Steam	$M_{s,conservative}$ Wells/Brine+Main Steam	M_s Tons
17-Dec-11	18,522.00	2,512.00	18,850.00	21,362.00	Brine+Main Steam	21,362.00
18-Dec-11	18,500.00	2,479.00	18,830.00	21,309.00	Brine+Main Steam	21,309.00
19-Dec-11	18,513.00	2,481.00	18,840.00	21,321.00	Brine+Main Steam	21,321.00
20-Dec-11	17,885.00	2,557.00	18,850.00	21,407.00	Brine+Main Steam	21,407.00
21-Dec-11	17,814.00	2,450.00	18,850.00	21,300.00	Brine+Main Steam	21,300.00
22-Dec-11	17,881.00	2,450.00	18,840.00	21,290.00	Brine+Main Steam	21,290.00
23-Dec-11	18,034.00	2,401.00	18,850.00	21,251.00	Brine+Main Steam	21,251.00
24-Dec-11	18,088.00	2,516.00	18,840.00	21,356.00	Brine+Main Steam	21,356.00
25-Dec-11	18,155.00	2,420.00	18,850.00	21,270.00	Brine+Main Steam	21,270.00
26-Dec-11	18,102.00	2,354.00	18,850.00	21,204.00	Brine+Main Steam	21,204.00
27-Dec-11	18,177.00	2,244.00	18,840.00	21,084.00	Brine+Main Steam	21,084.00
28-Dec-11	18,065.00	2,627.00	18,850.00	21,477.00	Brine+Main Steam	21,477.00
29-Dec-11	18,103.00	2,689.00	18,840.00	21,529.00	Brine+Main Steam	21,529.00
30-Dec-11	18,140.00	2,648.00	18,850.00	21,498.00	Brine+Main Steam	21,498.00
31-Dec-11	18,067.00	2,635.00	18,850.00	21,485.00	Brine+Main Steam	21,485.00
1-Jan-12	18,123.00	2,611.00	18,840.00	21,451.00	Brine+Main Steam	21,451.00
2-Jan-12	18,234.00	2,642.00	18,850.00	21,492.00	Brine+Main Steam	21,492.00
3-Jan-12	18,151.00	2,655.00	18,840.00	21,495.00	Brine+Main Steam	21,495.00
4-Jan-12	18,472.00	2,643.00	18,850.00	21,493.00	Brine+Main Steam	21,493.00
5-Jan-12	18,475.00	2,456.00	18,850.00	21,306.00	Brine+Main Steam	21,306.00
6-Jan-12	18,492.00	2,523.00	18,840.00	21,363.00	Brine+Main Steam	21,363.00
7-Jan-12	18,497.00	2,528.00	18,850.00	21,378.00	Brine+Main Steam	21,378.00
8-Jan-12	16,124.00	2,601.00	18,810.00	21,411.00	Brine+Main Steam	21,411.00
9-Jan-12	15,704.00	2,698.00	18,850.00	21,548.00	Brine+Main Steam	21,548.00
10-Jan-12	17,462.00	2,683.00	18,850.00	21,533.00	Brine+Main Steam	21,533.00
11-Jan-12	18,600.00	2,614.00	18,840.00	21,454.00	Brine+Main Steam	21,454.00
12-Jan-12	17,945.00	2,570.00	18,850.00	21,420.00	Brine+Main Steam	21,420.00
13-Jan-12	14,150.00	2,502.00	18,840.00	21,342.00	Brine+Main Steam	21,342.00
14-Jan-12	17,759.00	2,481.00	18,850.00	21,331.00	Brine+Main Steam	21,331.00
15-Jan-12	17,784.00	2,421.00	18,820.00	21,241.00	Brine+Main Steam	21,241.00
16-Jan-12	18,418.00	2,238.00	18,850.00	21,088.00	Brine+Main Steam	21,088.00
17-Jan-12	18,018.00	2,192.00	18,850.00	21,042.00	Brine+Main Steam	21,042.00
18-Jan-12	18,070.00	2,184.00	18,850.00	21,034.00	Brine+Main Steam	21,034.00
19-Jan-12	18,518.00	2,261.00	18,850.00	21,111.00	Brine+Main Steam	21,111.00
20-Jan-12	18,512.00	2,126.00	18,840.00	20,966.00	Brine+Main Steam	20,966.00
21-Jan-12	18,457.00	2,089.00	18,850.00	20,939.00	Brine+Main Steam	20,939.00
22-Jan-12	18,298.00	2,174.00	18,810.00	20,984.00	Brine+Main Steam	20,984.00
23-Jan-12	18,270.00	2,353.00	18,850.00	21,203.00	Brine+Main Steam	21,203.00
24-Jan-12	18,470.00	2,336.00	18,840.00	21,176.00	Brine+Main Steam	21,176.00
25-Jan-12	17,992.00	2,337.00	18,850.00	21,187.00	Brine+Main Steam	21,187.00
26-Jan-12	17,784.00	2,438.00	18,850.00	21,288.00	Brine+Main Steam	21,288.00
27-Jan-12	17,930.00	2,329.00	18,840.00	21,169.00	Brine+Main Steam	21,169.00
28-Jan-12	18,088.00	2,251.00	18,850.00	21,101.00	Brine+Main Steam	21,101.00
29-Jan-12	18,104.00	2,262.00	18,830.00	21,092.00	Brine+Main Steam	21,092.00
30-Jan-12	18,166.00	2,231.00	18,840.00	21,071.00	Brine+Main Steam	21,071.00
1-Feb-12	18,157.00	2,128.00	18,840.00	20,968.00	Brine+Main Steam	20,968.00
2-Feb-12	18,198.00	2,115.00	18,850.00	20,965.00	Brine+Main Steam	20,965.00
3-Feb-12	18,235.00	2,129.00	18,850.00	20,979.00	Brine+Main Steam	20,979.00
4-Feb-12	18,108.00	2,339.00	18,840.00	21,179.00	Brine+Main Steam	21,179.00
5-Feb-12	18,170.00	2,352.00	18,820.00	21,172.00	Brine+Main Steam	21,172.00
6-Feb-12	18,188.00	2,330.00	18,840.00	21,170.00	Brine+Main Steam	21,170.00
7-Feb-12	18,205.00	2,281.00	18,850.00	21,131.00	Brine+Main Steam	21,131.00
8-Feb-12	18,275.00	2,267.00	13,870.00	16,137.00	Wells	18,275.00

Date	$M_{so,i,y}$	$M_{sb,y}$	$M_{sv,y}$	$M_{sb,y} + M_{sv,y}$	$M_{s,conservative}$	M_s
	Wells	Brine	Main Steam	**Brine+Main Steam**	**Wells/Brine+Main Steam**	Tons
9-Feb-12	18,236.00	2,212.00	18,840.00	21,052.00	Brine+Main Steam	21,052.00
10-Feb-12	18,273.00	2,203.00	18,840.00	21,043.00	Brine+Main Steam	21,043.00
11-Feb-12	18,247.00	2,153.00	18,850.00	21,003.00	Brine+Main Steam	21,003.00
12-Feb-12	18,273.00	2,156.00	18,820.00	20,976.00	Brine+Main Steam	20,976.00
13-Feb-12	18,314.00	2,114.00	18,850.00	20,964.00	Brine+Main Steam	20,964.00
14-Feb-12	18,253.00	2,088.00	18,840.00	20,928.00	Brine+Main Steam	20,928.00
15-Feb-12	18,122.00	2,053.00	18,850.00	20,903.00	Brine+Main Steam	20,903.00
16-Feb-12	18,117.00	2,163.00	18,850.00	21,013.00	Brine+Main Steam	21,013.00
17-Feb-12	18,060.00	2,208.00	18,840.00	21,048.00	Brine+Main Steam	21,048.00
18-Feb-12	18,124.00	2,180.00	18,850.00	21,030.00	Brine+Main Steam	21,030.00
19-Feb-12	18,058.00	2,192.00	18,830.00	21,022.00	Brine+Main Steam	21,022.00
20-Feb-12	18,174.00	2,213.00	18,850.00	21,063.00	Brine+Main Steam	21,063.00
21-Feb-12	18,218.00	2,103.00	18,840.00	20,943.00	Brine+Main Steam	20,943.00
22-Feb-12	18,231.00	2,175.00	18,850.00	21,025.00	Brine+Main Steam	21,025.00
23-Feb-12	16,611.00	2,145.00	18,850.00	20,995.00	Brine+Main Steam	20,995.00
24-Feb-12	17,742.00	2,067.00	18,850.00	20,917.00	Brine+Main Steam	20,917.00
25-Feb-12	16,132.00	2,120.00	18,850.00	20,970.00	Brine+Main Steam	20,970.00
26-Feb-12	16,184.00	2,190.00	18,820.00	21,010.00	Brine+Main Steam	21,010.00
27-Feb-12	16,213.00	2,148.00	18,850.00	20,998.00	Brine+Main Steam	20,998.00
28-Feb-12	16,156.00	2,300.00	18,840.00	21,140.00	Brine+Main Steam	21,140.00
29-Feb-12	16,116.00	2,474.00	18,850.00	21,324.00	Brine+Main Steam	21,324.00
01-Mar-12	16,079.00	2,445.00	18,840.00	21,285.00	Brine+Main Steam	21,285.00
02-Mar-12	16,070.00	2,490.00	18,850.00	21,340.00	Brine+Main Steam	21,340.00
03-Mar-12	16,059.00	2,435.00	18,850.00	21,285.00	Brine+Main Steam	21,285.00
04-Mar-12	16,059.00	2,429.00	18,820.00	21,249.00	Brine+Main Steam	21,249.00
05-Mar-12	16,035.00	2,257.00	18,850.00	21,107.00	Brine+Main Steam	21,107.00
06-Mar-12	16,023.00	2,284.00	18,850.00	21,134.00	Brine+Main Steam	21,134.00
07-Mar-12	15,985.00	2,328.00	18,840.00	21,168.00	Brine+Main Steam	21,168.00
08-Mar-12	15,947.00	2,332.00	18,850.00	21,182.00	Brine+Main Steam	21,182.00
09-Mar-12	15,659.00	2,199.00	18,840.00	21,039.00	Brine+Main Steam	21,039.00
10-Mar-12	15,984.00	2,237.00	18,850.00	21,087.00	Brine+Main Steam	21,087.00
11-Mar-12	15,974.00	2,207.00	18,810.00	21,017.00	Brine+Main Steam	21,017.00
12-Mar-12	15,982.00	2,114.00	18,710.00	20,824.00	Brine+Main Steam	20,824.00
13-Mar-12	15,977.00	2,072.00	17,500.00	19,572.00	Brine+Main Steam	19,572.00
14-Mar-12	15,934.00	2,032.00	18,080.00	20,112.00	Brine+Main Steam	20,112.00
15-Mar-12	15,913.00	1,992.00	18,350.00	20,342.00	Brine+Main Steam	20,342.00
16-Mar-12	15,930.00	1,932.00	17,500.00	19,432.00	Brine+Main Steam	19,432.00
17-Mar-12	15,928.00	1,920.00	17,500.00	19,420.00	Brine+Main Steam	19,420.00
18-Mar-12	15,912.00	1,917.00	17,500.00	19,417.00	Brine+Main Steam	19,417.00
19-Mar-12	15,909.00	1,914.00	17,500.00	19,414.00	Brine+Main Steam	19,414.00
20-Mar-12	15,889.00	1,891.00	17,500.00	19,391.00	Brine+Main Steam	19,391.00
21-Mar-12	15,878.00	1,849.00	17,500.00	19,349.00	Brine+Main Steam	19,349.00
22-Mar-12	15,879.00	1,827.00	17,500.00	19,327.00	Brine+Main Steam	19,327.00
23-Mar-12	18,525.00	1,816.00	17,500.00	19,316.00	Brine+Main Steam	19,316.00
24-Mar-12	19,135.00	1,792.00	17,500.00	19,292.00	Brine+Main Steam	19,292.00
25-Mar-12	18,842.00	1,810.00	18,570.00	20,380.00	Brine+Main Steam	20,380.00
26-Mar-12	18,364.00	1,910.00	18,850.00	20,760.00	Brine+Main Steam	20,760.00
27-Mar-12	18,826.00	1,908.00	18,840.00	20,748.00	Brine+Main Steam	20,748.00
28-Mar-12	18,818.00	2,461.00	18,850.00	21,311.00	Brine+Main Steam	21,311.00
29-Mar-12	18,818.00	2,643.00	18,840.00	21,483.00	Brine+Main Steam	21,483.00
30-Mar-12	18,033.00	5,631.00	18,850.00	24,481.00	Brine+Main Steam	24,481.00
31-Mar-12	17,779.00	5,063.00	18,860.00	23,923.00	Brine+Main Steam	23,923.00
01-Apr-12	18,328.00	4,679.00	18,830.00	23,509.00	Brine+Main Steam	23,509.00

Date	$M_{so,i,y}$	$M_{sb,y}$	$M_{sv,y}$	$M_{sb,y} + M_{sv,y}$	$M_{s,conservative}$	M_s
	Wells	Brine	Main Steam	**Brine+Main Steam**	**Wells/Brine+Main Steam**	Tons
02-Apr-12	17,704.00	4,541.00	18,850.00	23,391.00	Brine+Main Steam	23,391.00
03-Apr-12	17,708.00	4,572.00	18,840.00	23,412.00	Brine+Main Steam	23,412.00
04-Apr-12	17,705.00	4,364.00	18,850.00	23,214.00	Brine+Main Steam	23,214.00
05-Apr-12	17,711.00	4,479.00	18,840.00	23,319.00	Brine+Main Steam	23,319.00
06-Apr-12	17,719.00	4,355.00	18,850.00	23,205.00	Brine+Main Steam	23,205.00
07-Apr-12	17,728.00	4,331.00	18,850.00	23,181.00	Brine+Main Steam	23,181.00
08-Apr-12	17,747.00	4,371.00	18,250.00	22,621.00	Brine+Main Steam	22,621.00
09-Apr-12	17,726.00	4,258.00	18,560.00	22,818.00	Brine+Main Steam	22,818.00
10-Apr-12	17,728.00	4,327.00	18,850.00	23,177.00	Brine+Main Steam	23,177.00
11-Apr-12	17,725.00	4,215.00	18,830.00	23,045.00	Brine+Main Steam	23,045.00
12-Apr-12	17,557.00	4,153.00	18,670.00	22,823.00	Brine+Main Steam	22,823.00
13-Apr-12	17,736.00	4,174.00	18,840.00	23,014.00	Brine+Main Steam	23,014.00
14-Apr-12	17,738.00	4,160.00	18,840.00	23,000.00	Brine+Main Steam	23,000.00
15-Apr-12	17,728.00	4,257.00	18,780.00	23,037.00	Brine+Main Steam	23,037.00
16-Apr-12	17,734.00	4,259.00	18,850.00	23,109.00	Brine+Main Steam	23,109.00
17-Apr-12	17,724.00	4,918.00	18,840.00	23,758.00	Brine+Main Steam	23,758.00
18-Apr-12	17,715.00	4,803.00	18,800.00	23,603.00	Brine+Main Steam	23,603.00
19-Apr-12	17,716.00	4,735.00	18,800.00	23,535.00	Brine+Main Steam	23,535.00
20-Apr-12	17,724.00	4,594.00	18,850.00	23,444.00	Brine+Main Steam	23,444.00
21-Apr-12	17,724.00	4,628.00	18,840.00	23,468.00	Brine+Main Steam	23,468.00
22-Apr-12	17,709.00	4,720.00	18,770.00	23,490.00	Brine+Main Steam	23,490.00
23-Apr-12	17,702.00	4,681.00	18,750.00	23,431.00	Brine+Main Steam	23,431.00
24-Apr-12	17,698.00	4,651.00	18,830.00	23,481.00	Brine+Main Steam	23,481.00
25-Apr-12	17,696.00	4,284.00	18,820.00	23,104.00	Brine+Main Steam	23,104.00
26-Apr-12	17,682.00	4,627.00	18,840.00	23,467.00	Brine+Main Steam	23,467.00
27-Apr-12	17,670.00	4,453.00	18,780.00	23,233.00	Brine+Main Steam	23,233.00
28-Apr-12	17,656.00	4,642.00	18,680.00	23,322.00	Brine+Main Steam	23,322.00
29-Apr-12	17,646.00	4,512.00	18,710.00	23,222.00	Brine+Main Steam	23,222.00
30-Apr-12	17,624.00	4,707.00	18,320.00	23,027.00	Brine+Main Steam	23,027.00
01-May-12	17,598.00	4,571.00	18,840.00	23,411.00	Brine+Main Steam	23,411.00
02-May-12	17,579.00	4,577.00	18,190.00	22,767.00	Brine+Main Steam	22,767.00
03-May-12	17,546.00	4,368.00	18,030.00	22,398.00	Brine+Main Steam	22,398.00
04-May-12	17,564.00	4,534.00	18,850.00	23,384.00	Brine+Main Steam	23,384.00
05-May-12	17,552.00	4,447.00	18,840.00	23,287.00	Brine+Main Steam	23,287.00
06-May-12	17,557.00	4,582.00	18,820.00	23,402.00	Brine+Main Steam	23,402.00
07-May-12	17,553.00	4,119.00	18,850.00	22,969.00	Brine+Main Steam	22,969.00
08-May-12	17,556.00	3,150.00	18,840.00	21,990.00	Brine+Main Steam	21,990.00
09-May-12	17,547.00	2,991.00	18,730.00	21,721.00	Brine+Main Steam	21,721.00
10-May-12	17,535.00	2,943.00	18,790.00	21,733.00	Brine+Main Steam	21,733.00
11-May-12	17,520.00	2,946.00	18,840.00	21,786.00	Brine+Main Steam	21,786.00
12-May-12	19,335.00	2,873.00	18,850.00	21,723.00	Brine+Main Steam	21,723.00
13-May-12	19,236.00	2,946.00	18,820.00	21,766.00	Brine+Main Steam	21,766.00
14-May-12	19,070.00	2,598.00	18,850.00	21,448.00	Brine+Main Steam	21,448.00
15-May-12	19,032.00	2,755.00	18,840.00	21,595.00	Brine+Main Steam	21,595.00
16-May-12	18,753.00	3,846.00	18,850.00	22,696.00	Brine+Main Steam	22,696.00
17-May-12	18,856.00	4,638.00	18,840.00	23,478.00	Brine+Main Steam	23,478.00
18-May-12	18,812.00	4,629.00	18,850.00	23,479.00	Brine+Main Steam	23,479.00
19-May-12	18,787.00	4,638.00	18,850.00	23,488.00	Brine+Main Steam	23,488.00
20-May-12	18,766.00	4,709.00	18,810.00	23,519.00	Brine+Main Steam	23,519.00
21-May-12	18,819.00	4,674.00	18,850.00	23,524.00	Brine+Main Steam	23,524.00
22-May-12	18,900.00	4,349.00	18,840.00	23,189.00	Brine+Main Steam	23,189.00
23-May-12	18,941.00	2,384.00	18,850.00	21,234.00	Brine+Main Steam	21,234.00
24-May-12	18,936.00	3,083.00	18,850.00	21,933.00	Brine+Main Steam	21,933.00

Date	$M_{so,i,y}$	$M_{sb,y}$	$M_{sv,y}$	$M_{sb,y} + M_{sv,y}$	$M_{s,conservative}$	M_s
	Wells	Brine	Main Steam	**Brine+Main Steam**	**Wells/Brine+Main Steam**	Tons
25-May-12	18,922.00	3,874.00	18,840.00	22,714.00	Brine+Main Steam	22,714.00
26-May-12	18,856.00	3,162.00	18,850.00	22,012.00	Brine+Main Steam	22,012.00
27-May-12	18,818.00	3,082.00	18,820.00	21,902.00	Brine+Main Steam	21,902.00
28-May-12	18,259.00	2,092.00	18,340.00	20,432.00	Brine+Main Steam	20,432.00
29-May-12	18,695.00	3,252.00	18,840.00	22,092.00	Brine+Main Steam	22,092.00
30-May-12	18,813.00	3,792.00	18,850.00	22,642.00	Brine+Main Steam	22,642.00
31-May-12	18,785.00	3,318.00	18,840.00	22,158.00	Brine+Main Steam	22,158.00

Annex 4
Monitoring Equipment

Legends

means historical calibration by Internal Lab
means historical calibration by External Lab
means future calibration to be conducted
means equipment replaced/installed

Parameter	Measurement Device	Tag Number	Brand (serial number)	Calib. Report VIII		Calib. Report IX		Remarks
				Calibration Date	Valid until	Calibration Date	Validity	
Msv,y (Ms,y in section D.2)	Multi Variable Transmitter	A2-FIT-0106	Yokogawa (S/N 91L410293)	08/08/2011	08/02/2012	08/02/2012	08/08/2012	Steam flow to WW-2 turbine
Mso,y (Ms,y in section D.2)	Differential Pressure Transmitter - Orifice Plate	FIT-2301	Rosemount (S/N 01830354)	10/09/2011	10/03/2012	09/03/2012	09/09/2012	MBB-1 Well steam flow
	Pressure Transmitter - Orifice Plate	PIT-2302	Rosemount (S/N 01830135)	14/06/2011	14/12/2011	05/12/2011	05/06/2012	
Mso,y (Ms,y in section D.2)	Differential Pressure Transmitter - Orifice Plate	FIT-2501	Rosemount (S/N 01830374)	13/06/2011	13/12/2011	07/12/2011	07/06/2012	MBA-1 Well steam flow
	Pressure Transmitter - Orifice Plate	PIT-2502	Rosemount (S/N 01830130)	06/06/2011	06/12/2011	01/12/2011	01/06/2012	
Mso,y (Ms,y in section D.2)	Differential Pressure Transmitter - Orifice Plate	FIT-2502	Rosemount (S/N 02065517)	08/07/2011	08/12/2011	07/12/2011	07/06/2012	MBA-2 Well steam flow
	Pressure Transmitter - Orifice Plate	PIT-2504	Rosemount (S/N 01830131)	06/06/2011	06/12/2011	01/12/2011	01/06/2012	
Mso,y (Ms,y in section D.2)	Differential Pressure Transmitter - Orifice Plate	FIT-2503	Rosemount (S/N 01830360)	13/06/2011	13/12/2011	08/12/2011	08/06/2012	MBA-3 Well steam flow
	Pressure Transmitter - Orifice Plate	PIT-2506	Rosemount (S/N 01830132)	07/06/2011	07/12/2011	01/12/2011	01/06/2012	

Parameter	Measurement Device	Tag Number	Brand (serial number)	Calib. Report VIII		Calib. Report IX		Remarks
				Calibration Date	Valid until	Calibration Date	Validity	
Mso,y (Ms,y in section D.2)	Differential Pressure Transmitter - Orifice Plate	FIT-2504	Rosemount (S/N 01830361)	10/06/2011	10/12/2011	08/12/2011	08/06/2012	MBA-4 Well steam flow
	Pressure Transmitter - Orifice Plate	PIT-2508	Rosemount (S/N 01830133)	07/06/2011	07/12/2011	01/12/2011	01/06/2012	
Mso,y (Ms,y in section D.2)	Differential Pressure Transmitter - Orifice Plate	FIT-2505	Rosemount (S/N 01830359)	09/06/2011	09/12/2011	08/12/2011	08/06/2012	MBA-5 Well steam flow
	Pressure Transmitter - Orifice Plate	PIT-2510	Rosemount (S/N 01830134)	07/06/2011	07/12/2011	01/12/2011	01/06/2012	
Mso,y (Ms,y in section D.2)	Differential Pressure Transmitter - Orifice Plate	FIT501	Rosemount (S/N 01845811)	16/06/2011	16/12/2011	12/12/2011	12/06/2012	MBD-5 Well steam flow
	Pressure Transmitter - Orifice Plate	PIT506	Rosemount (S/N 01593780)	13/06/2011	13/12/2011	05/12/2011	05/06/2012	
Msb,y (Ms,y in section D.2)	Differential Pressure Transmitter	FIT-984	Rosemount (S/N 02061116)	22/08/2011	22/02/2012	09/01/2012	09/07/2012	WWW-1 Brine Injection Well
	Pressure Transmitter	PIT-918	Bailey (S/N 8F196683)	31/05/2011	30/11/2011	Calibrated 05/01/2012 (instead of 30/11/2011). However, the calibration result shows a smaller error than the maximum permissible error of 0.1%.	05/07/2012	
$FC_{diesel,EDG}$ (FCi,j,y in section D.2)	Flow Totalizer	AO-FQ-2033	Fill Rite 900 Series (Y0194)	31/01/2011	31/01/2012	25/01/2012 EDG Fuel Flowmeter was uninstalled on 24 Jan 2012 for annual calibration and re-installed on 03 Feb 2012	25/01/2013	Emergency diesel generator

Parameter	Measurement Device	Tag Number	Brand (serial number)	Calib. Report VIII		Calib. Report IX		Remarks
				Calibration Date	Valid until	Calibration Date	Validity	
$FC_{diesel,fire\ pump}$ (FCi,j,y in section D.2)	Flow Totalizer	AO-FQ-2032	Fill Rite 800 Series (4905C)	31/01/2011	31/01/2012	25/01/2012 FP Fuel Flowmeter was uninstalled on 24 Jan 2012 for annual calibration and re-installed on 03 Feb 2012	25/01/2013	Fire pump
EG_y (Unit-1)	Unit-1, "Meter Utama" kWh meter reading (main meter owned by PLN)	-	Schneider ION8600 (MT-0809A063-01)	10/10/2008	10/10/2013	10/10/2013		WW-1 electricity meter
	Unit-1,"Meter Pembanding" kWh meter reading (check meter owned by SEG)	-	ION 8600 (PT-0807A249-01)	06/01/2011	06/01/2013	06/01/2013		
EG_y (Unit-2)	Unit-2, "Meter Utama" kWh meter reading (main meter owned by PLN)	-	Schneider ION8600 (MT-0806A388 - 01)	10/10/2008	10/10/2013	10/10/2013		WW-2 electricity meter
	Unit-2,"Meter Pembanding" kWh meter reading (check meter owned by SEG)	-	ION 8600 (PT-0802A194-01)	06/01/2011	06/01/2013	06/01/2013		

Note: No diesel filling activities were conducted during the period when EDG and Fuel pump flow meters were uninstalled for calibration.

Annex 5

Daily generation data from Wayang Windu Phase 1 and Wayang Windu Phase 2 geothermal power project (EG), Daily generation data from Wayang Windu Phase 1 ($EG_{existing}$), Quantity of steam produced (M_s), and Project emissions from steam produced (PES) during Monitoring Period.

Date	EG	EGexisting	M_s	PES
	MWh	MWh	Tons	tCO_2
01-Nov-11	5,047.44	2,400.00	19,397.00	275.28
02-Nov-11	5,057.88	2,410.19	19,397.00	275.28
03-Nov-11	5,136.13	2,463.31	19,394.00	275.23
04-Nov-11	5,224.75	2,593.56	19,374.00	274.95
05-Nov-11	5,170.13	2,542.13	19,389.00	275.16
06-Nov-11	5,016.44	2,430.13	19,240.00	273.05
07-Nov-11	5,099.13	2,506.56	19,194.00	272.40
08-Nov-11	5,176.00	2,489.31	19,387.00	275.13
09-Nov-11	5,191.25	2,497.00	19,389.00	275.16
10-Nov-11	5,195.00	2,495.13	19,402.00	275.35
11-Nov-11	5,174.94	2,502.25	19,257.00	273.29
12-Nov-11	5,159.63	2,470.13	19,414.00	275.52
13-Nov-11	5,191.31	2,511.63	19,348.00	274.58
14-Nov-11	5,162.19	2,604.75	18,616.00	264.19
15-Nov-11	5,115.44	2,420.94	19,404.00	275.38
16-Nov-11	5,251.50	2,552.50	19,410.00	275.46
17-Nov-11	5,316.88	2,645.06	19,406.00	275.40
18-Nov-11	5,306.13	2,668.25	19,396.00	275.26
19-Nov-11	5,287.38	2,604.56	19,405.00	275.39
20-Nov-11	5,248.19	2,569.69	19,376.00	274.98
21-Nov-11	5,306.69	2,621.00	19,390.00	275.18
22-Nov-11	5,296.94	2,616.94	19,589.00	278.00
23-Nov-11	5,311.69	2,634.31	21,276.00	301.94
24-Nov-11	5,306.94	2,628.19	21,716.00	308.19
25-Nov-11	5,334.56	2,625.56	21,653.00	307.29
26-Nov-11	5,349.94	2,647.75	21,611.00	306.70
27-Nov-11	5,339.81	2,647.75	21,553.00	305.87
28-Nov-11	5,328.31	2,625.00	21,629.00	306.95
29-Nov-11	5,345.13	2,645.44	21,576.00	306.20
30-Nov-11	5,324.69	2,654.56	21,542.00	305.72
01-Dec-11	5,363.13	2,665.81	21,582.00	306.28
02-Dec-11	5,364.75	2,656.19	21,631.00	306.98
03-Dec-11	5,392.81	2,669.50	21,556.00	305.92
04-Dec-11	5,371.06	2,663.25	21,577.00	306.21
05-Dec-11	5,353.19	2,644.69	21,578.00	306.23
06-Dec-11	5,367.81	2,655.31	21,504.00	305.18
07-Dec-11	5,395.94	2,681.25	21,531.00	305.56
08-Dec-11	5,398.06	2,685.50	21,539.00	305.67
09-Dec-11	5,393.13	2,681.50	21,470.00	304.70
10-Dec-11	5,378.13	2,678.25	21,471.00	304.71
11-Dec-11	5,370.25	2,683.75	21,424.00	304.04
12-Dec-11	5,375.75	2,683.50	21,407.00	303.80
13-Dec-11	5,326.19	2,647.44	21,369.00	303.26
14-Dec-11	5,332.31	2,649.00	21,386.00	303.50
15-Dec-11	5,355.69	2,674.50	21,411.00	303.86

Date	EG	EGexisting	M_s	PES
	MWh	MWh	Tons	tCO_2
16-Dec-11	5,352.50	2,679.56	21,397.00	303.66
17-Dec-11	5,342.31	2,670.31	21,362.00	303.16
18-Dec-11	5,332.94	2,675.44	21,309.00	302.41
19-Dec-11	5,329.69	2,676.19	21,321.00	302.58
20-Dec-11	5,358.56	2,671.00	21,407.00	303.80
21-Dec-11	5,385.13	2,675.19	21,300.00	302.28
22-Dec-11	5,361.69	2,665.13	21,290.00	302.14
23-Dec-11	5,373.88	2,668.06	21,251.00	301.59
24-Dec-11	5,374.81	2,672.31	21,356.00	303.08
25-Dec-11	5,388.81	2,676.31	21,270.00	301.86
26-Dec-11	5,373.00	2,670.00	21,204.00	300.92
27-Dec-11	5,364.19	2,663.50	21,084.00	299.22
28-Dec-11	5,380.56	2,672.56	21,477.00	304.79
29-Dec-11	5,379.38	2,668.94	21,529.00	305.53
30-Dec-11	5,365.69	2,661.19	21,498.00	305.09
31-Dec-11	5,366.81	2,666.13	21,485.00	304.91
01-Jan-12	5,385.13	2,673.00	21,451.00	304.43
02-Jan-12	5,373.25	2,668.00	21,492.00	305.01
03-Jan-12	5,347.50	2,654.56	21,495.00	305.05
04-Jan-12	5,247.81	2,611.00	21,493.00	305.02
05-Jan-12	5,217.56	2,598.69	21,306.00	302.37
06-Jan-12	5,223.31	2,608.50	21,363.00	303.18
07-Jan-12	5,204.13	2,597.31	21,378.00	303.39
08-Jan-12	5,216.44	2,601.44	21,411.00	303.86
09-Jan-12	5,141.44	2,558.19	21,548.00	305.80
10-Jan-12	5,258.13	2,581.19	21,533.00	305.59
11-Jan-12	5,139.25	2,438.88	21,454.00	304.47
12-Jan-12	5,292.81	2,587.63	21,420.00	303.99
13-Jan-12	4,920.81	2,212.31	21,342.00	302.88
14-Jan-12	5,284.50	2,575.19	21,331.00	302.72
15-Jan-12	5,387.06	2,677.13	21,241.00	301.45
16-Jan-12	5,374.88	2,669.88	21,088.00	299.27
17-Jan-12	5,318.56	2,615.38	21,042.00	298.62
18-Jan-12	5,318.94	2,617.25	21,034.00	298.51
19-Jan-12	5,389.13	2,675.00	21,111.00	299.60
20-Jan-12	5,401.38	2,682.19	20,966.00	297.54
21-Jan-12	5,389.50	2,674.19	20,939.00	297.16
22-Jan-12	5,380.06	2,676.31	20,984.00	297.80
23-Jan-12	5,378.31	2,672.56	21,203.00	300.91
24-Jan-12	5,355.00	2,658.63	21,176.00	300.52
25-Jan-12	5,360.44	2,659.81	21,187.00	300.68
26-Jan-12	5,358.81	2,659.81	21,288.00	302.11
27-Jan-12	5,382.94	2,671.69	21,169.00	300.42
28-Jan-12	5,379.63	2,669.50	21,101.00	299.46
29-Jan-12	5,375.06	2,667.38	21,092.00	299.33
30-Jan-12	5,374.75	2,666.94	21,071.00	299.03
31-Jan-12	5,384.44	2,674.56	20,981.00	297.76
01-Feb-12	5,371.75	2,667.50	20,968.00	297.57
02-Feb-12	5,378.38	2,671.19	20,965.00	297.53
03-Feb-12	5,381.50	2,670.00	20,979.00	297.73
04-Feb-12	5,392.56	2,673.00	21,179.00	300.57
05-Feb-12	5,380.06	2,671.25	21,172.00	300.47
06-Feb-12	5,388.88	2,672.25	21,170.00	300.44

Date	EG	EGexisting	M_s	PES
	MWh	MWh	Tons	tCO_2
07-Feb-12	5,375.75	2,667.94	21,131.00	299.88
08-Feb-12	5,367.19	2,661.31	18,275.00	259.35
09-Feb-12	5,366.19	2,659.88	21,052.00	298.76
10-Feb-12	5,372.63	2,660.13	21,043.00	298.64
11-Feb-12	5,358.63	2,651.56	21,003.00	298.07
12-Feb-12	5,350.38	2,647.94	20,976.00	297.68
13-Feb-12	5,338.50	2,635.69	20,964.00	297.51
14-Feb-12	5,334.69	2,628.81	20,928.00	297.00
15-Feb-12	5,360.88	2,652.75	20,903.00	296.65
16-Feb-12	5,365.48	2,659.13	21,013.00	298.21
17-Feb-12	5,367.59	2,668.38	21,048.00	298.71
18-Feb-12	5,373.30	2,666.31	21,030.00	298.45
19-Feb-12	5,349.07	2,652.94	21,022.00	298.34
20-Feb-12	5,363.31	2,651.19	21,063.00	298.92
21-Feb-12	5,366.37	2,655.56	20,943.00	297.22
22-Feb-12	5,343.45	2,639.94	21,025.00	298.38
23-Feb-12	5,341.95	2,638.50	20,995.00	297.95
24-Feb-12	5,278.32	2,577.88	20,917.00	296.85
25-Feb-12	5,080.13	2,420.63	20,970.00	297.60
26-Feb-12	5,068.76	2,430.00	21,010.00	298.17
27-Feb-12	5,081.98	2,430.00	20,998.00	298.00
28-Feb-12	5,077.49	2,427.31	21,140.00	300.01
29-Feb-12	5,044.81	2,414.25	21,324.00	302.62
01-Mar-12	5,096.80	2,428.13	21,285.00	302.07
02-Mar-12	5,060.88	2,414.81	21,340.00	302.85
03-Mar-12	5,047.14	2,411.88	21,285.00	302.07
04-Mar-12	5,024.26	2,410.44	21,249.00	301.56
05-Mar-12	5,021.85	2,406.50	21,107.00	299.54
06-Mar-12	5,012.38	2,392.75	21,134.00	299.93
07-Mar-12	4,989.39	2,396.94	21,168.00	300.41
08-Mar-12	4,989.63	2,393.00	21,182.00	300.61
09-Mar-12	4,975.43	2,391.50	21,039.00	298.58
10-Mar-12	4,978.79	2,394.88	21,087.00	299.26
11-Mar-12	4,979.84	2,395.69	21,017.00	298.27
12-Mar-12	4,913.04	2,348.25	20,824.00	295.53
13-Mar-12	4,874.89	2,406.88	19,572.00	277.76
14-Mar-12	4,880.16	2,301.38	20,112.00	285.42
15-Mar-12	4,869.25	2,250.44	20,342.00	288.69
16-Mar-12	4,877.70	2,425.06	19,432.00	275.77
17-Mar-12	4,890.20	2,424.25	19,420.00	275.60
18-Mar-12	4,875.80	2,426.69	19,417.00	275.56
19-Mar-12	4,864.16	2,420.00	19,414.00	275.52
20-Mar-12	4,870.96	2,414.31	19,391.00	275.19
21-Mar-12	4,853.47	2,418.69	19,349.00	274.59
22-Mar-12	4,856.42	2,414.88	19,327.00	274.28
23-Mar-12	4,862.93	2,416.13	19,316.00	274.13
24-Mar-12	4,856.67	2,411.19	19,292.00	273.79
25-Mar-12	5,187.30	2,547.13	20,380.00	289.23
26-Mar-12	5,283.60	2,655.06	20,760.00	294.62
27-Mar-12	5,282.34	2,660.94	20,748.00	294.45
28-Mar-12	5,270.96	2,657.56	21,311.00	302.44
29-Mar-12	5,286.91	2,657.31	21,483.00	304.88
30-Mar-12	5,366.67	2,666.88	24,481.00	347.43

Date	EG	EGexisting	M_s	PES
	MWh	MWh	Tons	tCO_2
31-Mar-12	5,358.60	2,657.00	23,923.00	339.51
01-Apr-12	5,371.51	2,664.81	23,509.00	304.61
02-Apr-12	5,282.02	2,643.22	23,391.00	303.08
03-Apr-12	5,262.81	2,648.91	23,412.00	303.35
04-Apr-12	5,263.82	2,650.32	23,214.00	300.79
05-Apr-12	5,288.03	2,661.43	23,319.00	302.15
06-Apr-12	5,274.83	2,653.13	23,205.00	300.67
07-Apr-12	5,261.43	2,646.13	23,181.00	300.36
08-Apr-12	5,204.88	2,660.77	22,621.00	293.10
09-Apr-12	5,201.62	2,651.62	22,818.00	295.66
10-Apr-12	5,268.60	2,656.90	23,177.00	300.31
11-Apr-12	5,257.21	2,655.52	23,045.00	298.60
12-Apr-12	5,226.48	2,651.37	22,823.00	295.72
13-Apr-12	5,220.56	2,637.47	23,014.00	298.20
14-Apr-12	5,224.50	2,632.30	23,000.00	298.01
15-Apr-12	5,225.49	2,645.79	23,037.00	298.49
16-Apr-12	5,219.18	2,642.08	23,109.00	299.43
17-Apr-12	5,223.12	2,647.92	23,758.00	307.84
18-Apr-12	5,202.35	2,633.94	23,603.00	305.83
19-Apr-12	5,207.67	2,637.58	23,535.00	304.95
20-Apr-12	5,208.36	2,636.36	23,444.00	303.77
21-Apr-12	5,209.07	2,632.07	23,468.00	304.08
22-Apr-12	5,217.47	2,646.57	23,490.00	304.36
23-Apr-12	5,227.08	2,646.89	23,431.00	303.60
24-Apr-12	5,218.90	2,648.79	23,481.00	304.25
25-Apr-12	5,205.42	2,631.33	23,104.00	299.36
26-Apr-12	5,178.06	2,626.45	23,467.00	304.06
27-Apr-12	5,182.55	2,631.37	23,233.00	301.03
28-Apr-12	5,176.09	2,623.59	23,322.00	302.19
29-Apr-12	5,171.92	2,624.31	23,222.00	300.89
30-Apr-12	5,182.19	2,639.48	23,027.00	298.36
01-May-12	5,169.44	2,485.25	23,411.00	303.34
02-May-12	5,138.63	2,574.31	22,767.00	294.99
03-May-12	5,116.73	2,587.13	22,398.00	290.21
04-May-12	5,195.71	2,495.71	23,384.00	302.99
05-May-12	5,155.77	2,472.98	23,287.00	301.73
06-May-12	5,157.30	2,481.09	23,402.00	303.22
07-May-12	5,127.51	2,452.71	22,969.00	297.61
08-May-12	5,082.46	2,400.66	21,990.00	284.93
09-May-12	5,069.11	2,449.11	21,721.00	281.44
10-May-12	5,078.34	2,400.34	21,733.00	281.60
11-May-12	5,093.61	2,390.30	21,786.00	282.28
12-May-12	5,096.51	2,393.80	21,723.00	281.47
13-May-12	5,055.90	2,379.10	21,766.00	282.02
14-May-12	5,258.60	2,569.40	21,448.00	277.90
15-May-12	5,252.70	2,560.40	21,595.00	279.81
16-May-12	5,330.20	2,634.60	22,696.00	294.07
17-May-12	5,347.50	2,648.50	23,478.00	304.21
18-May-12	5,334.90	2,640.70	23,479.00	304.22
19-May-12	5,331.91	2,637.80	23,488.00	304.34
20-May-12	5,341.39	2,647.00	23,519.00	304.74
21-May-12	5,355.41	2,650.80	23,524.00	304.80
22-May-12	5,339.49	2,630.40	23,189.00	300.46

Date	EG	EGexisting	M_s	PES
	MWh	MWh	Tons	tCO_2
23-May-12	5,286.70	2,590.20	21,234.00	275.13
24-May-12	5,309.20	2,602.20	21,933.00	284.19
25-May-12	5,306.00	2,600.09	22,714.00	294.31
26-May-12	5,302.61	2,598.70	22,012.00	285.21
27-May-12	5,276.50	2,582.00	21,902.00	283.79
28-May-12	5,185.28	2,635.09	20,432.00	264.74
29-May-12	5,247.22	2,622.91	22,092.00	286.25
30-May-12	5,228.98	2,609.70	22,642.00	293.38
31-May-12	5,239.50	2,619.09	22,158.00	287.10

Annex 6

Check meter and Main meter measurement

Date	Unit 1 Main Meter Downloaded monthly from kWh meter MWh	Unit 1 Check Meter Downloaded monthly from kWh meter MWh	Unit 1 Check Meter Downloaded daily from DCS MWh	Difference between Main meter and Check Meter (Downloaded monthly from kWh meter)	Difference between Main meter and Check Meter (Downloaded daily from DCS)	Difference between Check Meter (downloaded monthly from kWh meter) and Check Meter (downloaded daily
Nov-11	76,728.824	76,724.637	76,723.563	-0.005%	-0.007%	-0.001%
Dec-11	82,758.831	82,752.912	82,751.250	-0.007%	-0.009%	-0.002%
Jan-12	81,259.803	81,253.826	81,254.063	-0.007%	-0.007%	0.000%
Feb-12	75,828.779	75,824.759	75,823.188	-0.005%	-0.007%	-0.002%
Mar-12	76,018.371	76,013.941	76,016.500	-0.006%	-0.002%	0.003%
Apr-12	79,319.095	79,315.647	79,308.422	-0.004%	-0.013%	-0.009%
May-12	79,046.186	79,043.878	79,042.102	-0.003%	-0.005%	-0.002%

Date	Unit 2 Main Meter Downloaded monthly from kWh meter MWh	Unit 2 Check Meter Downloaded monthly from kWh meter MWh	Unit 2 Check Meter Downloaded daily from DCS MWh	Difference between Main meter and Check Meter (Downloaded monthly from meter)	Difference between Main meter and Check Meter (Downloaded daily from DCS)	Difference between Check Meter (downloaded monthly from kWh meter) and Check Meter (downloaded daily from DCS)
Nov-11	80,052.113	80,049.772	80,048.813	-0.003%	-0.004%	-0.001%
Dec-11	83,624.286	83,621.864	83,616.875	-0.003%	-0.009%	-0.006%
Jan-12	83,309.950	83,307.470	83,306.875	-0.003%	-0.004%	-0.001%
Feb-12	78,199.154	78,197.067	78,196.754	-0.003%	-0.003%	0.000%
Mar-12	79,546.682	79,544.618	79,541.941	-0.003%	-0.006%	-0.003%
Apr-12	77,555.555	77,553.142	77,554.805	-0.003%	-0.001%	0.002%
May-12	82,772.679	82,771.740	82,769.000	-0.001%	-0.004%	-0.003%

EG_v	Main meters Downloaded monthly from kWh meter MWh	Check meters Downloaded monthly from kWh meter MWh	Check meters Downloaded daily from DCS MWh	Difference between Main meter and Check Meter (Downloaded monthly from meter)	Difference between Main meter and Check Meter (Downloaded daily from DCS)	Difference between Check Meter (downloaded monthly from kWh meter) and Check Meter (downloaded daily from DCS)
Nov-11	156,780.937	156,774.409	156,772.375	-0.004%	-0.005%	-0.001%
Dec-11	166,383.117	166,374.776	166,368.125	-0.005%	-0.009%	-0.004%
Jan-12	164,569.752	164,561.297	164,560.938	-0.005%	-0.005%	0.000%
Feb-12	154,027.932	154,021.826	154,019.941	-0.004%	-0.005%	-0.001%
Mar-12	155,565.053	155,558.559	155,558.441	-0.004%	-0.004%	0.000%
Apr-12	156,874.650	156,868.790	156,863.227	-0.004%	-0.007%	-0.004%
May-12	161,818.865	161,815.618	161,811.102	-0.002%	-0.005%	-0.003%

$EG_{existing}$ MWh	Main meters Downloaded monthly from meter MWh	Check meters Downloaded monthly from meter MWh	Check meters Downloaded daily from DCS MWh	Difference between Main meter and Check Meter (Downloaded monthly from meter)	Difference between Main meter and Check Meter (Downloaded daily from DCS)	Difference between Check Meter (downloaded monthly from kWh meter) and Check Meter (downloaded daily from DCS)
Nov-11	76,728.82	76,724.64	76,723.56	-0.005%	-0.007%	-0.001%
Dec-11	82,758.83	82,752.91	82,751.25	-0.007%	-0.009%	-0.002%
Jan-12	81,259.80	81,253.83	81,254.06	-0.007%	-0.007%	0.000%
Feb-12	75,828.78	75,824.76	75,823.19	-0.005%	-0.007%	-0.002%
Mar-12	76,018.37	76,013.94	76,016.50	-0.006%	-0.002%	0.003%
Apr-12	79,319.10	79,315.65	79,308.42	-0.004%	-0.013%	-0.009%
May-12	79,046.19	79,043.88	79,042.10	-0.003%	-0.005%	-0.002%

It is to be noted that there is a slight difference between the check meter reading downloaded from the internal storage of the check kWh meter and the check meter reading from the DCS. However, both the check meter reading downloaded from the internal storage of the check kWh meter and the check meter reading from the DCS are within the tolerable 0.4% difference with the reading from the main kWh meter. Furthermore, the check meter reading from the DCS gives the lowest reading for both EG_y and $EG_{existing}$, and therefore this is considered conservative.

The slight difference between the check meter reading downloaded from the internal storage of the check kWh meter and the check meter reading from the DCS can be explained through the diagram below, i.e. the data from check kWh meter (figure B) is transmitted to DCS Process Control unit (DCS PCU) through serial communication protocol modbus and baudrate 9600 bps (figure V), which is then transmitted to PGP Server (DCS Human Machine Interface – figure D) through SCSI with baudrate 40 Mbps (figure W).