MONITORING REPORT II

MEN-TANGERANG 13.6 MW NATURAL GAS COGENERATION PROJECT

This Report is prepared for purpose of Verification & Certification of resulting emission reduction from the project activity.

PROJECT DETAILS:

PROJECT REFERENCE ID	:	1313	
REGISTRATION DATE	:	26 FEBRUARY 2008	
PROJECT DEVELOPER	:	MANUNGGAL ENERGI NUSANTARA	
PROJECT PARTICIPANTS	:	▪ MANUNGGAL ENERGI NUSANTARA	INDONESIA
		▪ MITSUBISHI UFJ SECURITIES	JAPAN
		▪ DEUTSCHE BANK AG	UNITED KINGDOM
REPORTING PERIOD	:	01 SEPTEMBER 2008 to 31 AUGUST 2009	
MONITORING REPORT NO.	:	II	
ACCOMPANYING DOCUMENTS	:	**DOCUMENT TITLE**	**TYPE**
		▪ EMISSION REDUCTION DELIVERY REPORT II (Period: 01 September 2008 – 28 February 2009)	HARDCOPY REPORT
		▪ EMISSION REDUCTION DELIVERY REPORT III (Period: 1 March 2009 - 31 August 2009)	HARDCOPY REPORT
		▪ ERDR II CONSOLIDATED Version 1.0.0	SPREADSHEET
		▪ ERDR III CONSOLIDATED Version 1.0.0	SPREADSHEET
		▪ EF JAMALI 07 Version 1.4.0	SPREADSHEET

Zeus-Innavitas is a Carbon Asset Management Company and is commissioned by PT Manunggal Energi Nusantara to manage the Project's carbon asset portfolio.

This Monitoring Report is prepared based on operational data & information provided by the Project Developer/Operator. Zeus-Innavitas is not a Project Participant.

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DOCUMENT HISTORY

Version	Completion Date	Description	Note
Version 1.0.0	11 November 2009	Internal Review Completed	First Version submitted to DOE for publication

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1 PROJECT ACTIVITIES

1.1 BACKGROUND

PT Manunggal Energi Nusantara (hereafter referred as "MEN", "Project Developer", or "Project Operator") is an energy service company in the field of clean and renewable energy. The company entered into engagement to supply electricity and steam to its subscribers using natural gas cogeneration technology, all are located within the Argo Pantes Tangerang integrated textile industrial complex. The new supply of electricity and steam from the new installation effectively reduces (a) the amount of electricity the complex imports from PLN and (b) the amount of coal/residue that the complex needs to generate steam. The Project procures natural gas supply from PT Perusahaan Gas Negara ("PGN"), which is the state national gas distribution company.

The investment was proposed with application of Clean Development Mechanism under UNFCCC which mandated project activities and its emissions to be regularly reported post-registration. This report is the 2nd of such report to be submitted to CDM Executive Board.

1.2 IMPLEMENTATION TO DATE

Construction, Commissioning & Operation Status

The Project has been constructed and operated as planned. It's compliance against the Project Design Documentation was verified by a Designated Operational Entity (DOE) in the Project's first verification report. No physical changes had been carried out within this period of reporting.

Electricity Production and Distribution

The Project was proposed to deliver (a) electricity to three subscribers: PT Argo Pantes, PT. Argo Fajar and PT Argo Beni and (b) steam to PT Argo Pantes. Due to financial down-turn, PT Argo Fajar and PT Argo Beni officially withdrew its commitment to procure electricity from the Project, and leaving only PT Argo Pantes as the only remaining subscriber.

As consequence to such cancellation, the Project's utilization level and its subsequent CERs production are below expectation and likely to remain so in the coming months if no new subscribers are secured. In order to sustain business, the Project Developer considers exporting excess electricity to the PLN-operated national grid, and has commenced discussion with PLN for delivery sometimes in first half of 2010 (outside this reporting period). In view of grid-sales restriction in the underlying methodology, the project developer is also taking steps to preserve its CDM status by seeking guidance from the CDM Executive Board.

For clarity, no sales agreement has been concluded with PLN and no electricity had been exported to the grid within this reporting period.

CDM Process to Date

- **Registration** The Project was submitted for registration in 28 August 2007. Following corrections in its validation report, the Project was granted registration in 26 February 2008.
- **First Verification** The first verification took place in November 2008 by SGS United Kingdom in 17 November 2008, and a Request for Issuance was submitted in 08 December 2008, covering for period of 26 February 2008 to 31 August 2008. The board granted issuance in the amount of 17,154 tCO2 in 24 March 2009.
- **Other CDM Processes**. In order to pursue its intention to sell to the grid, Zeus-Innavitas on behalf of MEN has filed a Request of Clarification via TUV-SUD in December 2008 requesting guidance for this area, and upon recommendation by Secretariat, submitting a letter to the CDM Executive Board on 31st of March 2009.

1.3 Reporting Period

This Monitoring Report covers project activity for period starting 01st of September 2009 and ending 31st of August 2009. In accordance with its monitoring plan, the annual period is split into two half-year period reported in the following documents:

- Emission Reduction Delivery Report II (ERDR II) : for period of 1 September 2008 to 28 February 2009; and
- Emission Reduction Delivery Report III (ERDR III): for period of 1 March 2009 to 31 August 2009.

1.4 Description of Project Activity

The project implementation doesn't change from its original intention as described in the PDD. It covers the installations of five natural gas power generator coupled with waste heat boilers. It is designed with electrical generation capacity of 13.6 MW (gross) and steam generation capacity of 9.5 tonnes per hour, which can be varied depending on the required qualities. Simplified schematic diagram of the project activity is shown in the following figure.

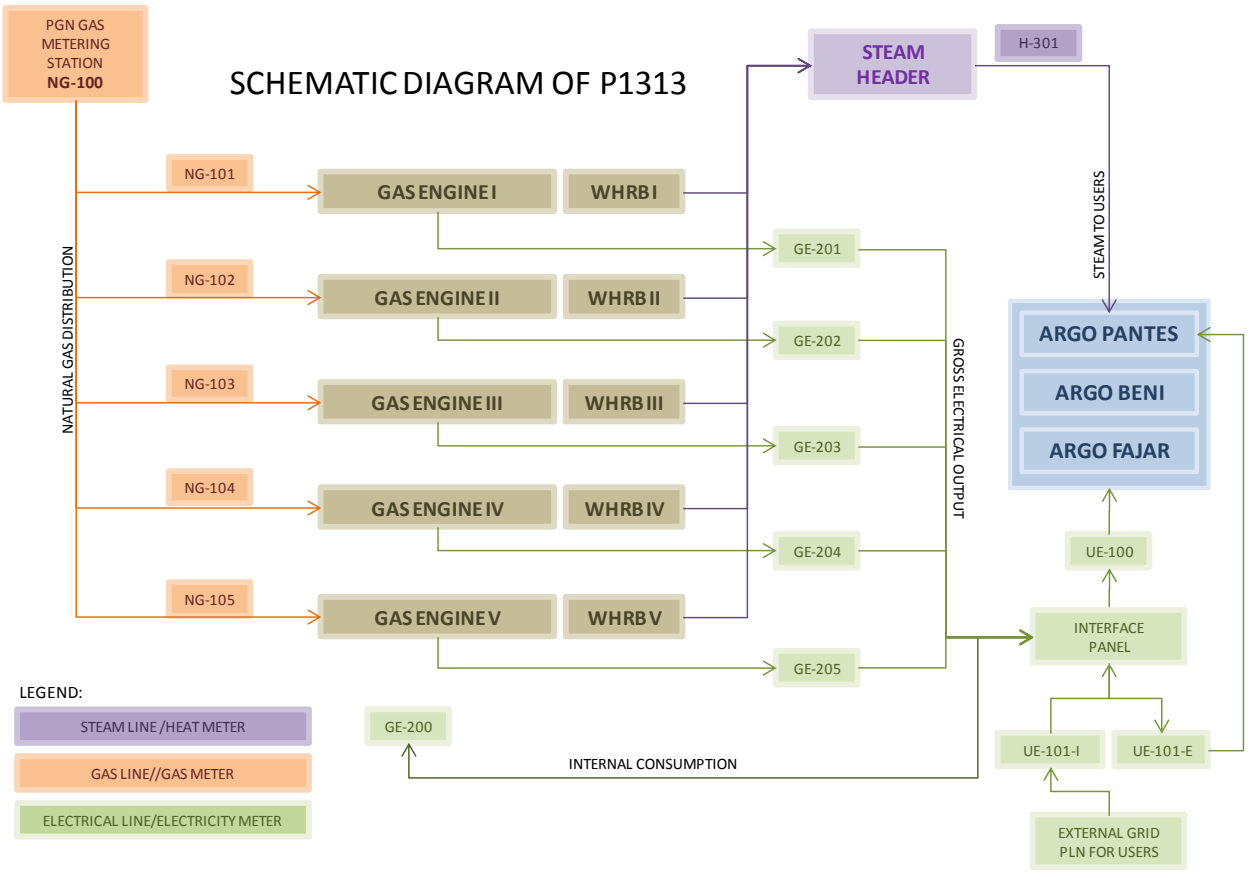

Figure 1. Project's Simplified Schematic Diagram, including position of its monitoring implements

Primary Instruments For purpose of this monitoring report, the primary instrument is defined as instrument which directly measures parameters that are specified in the Project Design Documents Section B.7.1. This includes:

- Gas flow meter **NG-100** belonging to PGN.
- Steam/heat meter **H-301** measuring aggregate flow-rate and conditions of steam delivered to the user.
- Eletricity meters **GE-201** to **GE-205** measuring gross electrical output from individual gas engine.
- Electricity meter **GE-200** measuring total electricity consumption of the project.

Compliance of these primary instruments relative to the PDD requirements is described in Table 1 in the ensuing Section 1.5.

Secondary Instruments The secondary instruments are instruments employed for purpose of safeguarding credibility of critical data. This includes:

- INTERFACE PANEL Eletricity Meters consisting of electricity meters: **UE-100** and **UE-101(I/E)**. Net electricity supplied to the user as measured by the primary instruments is compared against balance of readings from these meters.
- Gas flow-rate to the individual gas engines **NG-101 to NG-105.** Gas consumption as measured by the primary meter is compared against the aggregate readings from these instruments.

No secondary instrument is available for measurement of steam/heat to the user. However, during the second-half of the monitoring period, the client suggested installation of a secondary meter to ensure the accuracy of the reading. The installation of a secondary meter **(H-302)** is now incorporated in the project's planning, but is not yet effective within this period.

Emission reduction is calculated based on reading from the primary meter, except in situation where the magnitude of error is detected to be above the tolerance sets in the PDD.

1.5 KEY MONITORED PARAMETERS

Table 1 summarizes parameters that are monitored against requirement in the PDD. Readings from all instruments listed in this table are logged on daily basis as mandated by the PDD.

Table 1 – Key monitored parameters, its relevant instrument, and estimated values in the PDD.

PDD Ref.	Output of measurements	Source of Data as required in Section B.7.1 of PDD	Accuracy Mandated in PDD	Comparative Medium for Cross Checking
		Instruments Installed	*Instrument's Accuracy*	*Comparative Medium during Implementation.*
MCHO	Monthly heat recovered in the project waste heat boiler	Steam flow and heat metering device	4% or less	Sales Invoice to Argo Pantes
		H-301 *Heat Flow computer measuring steam flow-rate, temperature and pressure.*	*+/-0.5% at 95% confidence level.*	*Billing is based on measurement (mass flow-rate) of the same instrument.*
CEO	Amount of electricity generated by the Project net of its parasitic consumptions	Electricity meter measuring net delivery to individual users	4% or less	Sales Invoice to subscribers
		GE-201 to GE 205 *Built in gas-engine DIA.NXT System, metering (amongst others) electricity production from individual gas engines* **GE-200** *Independent electricity meter measuring parasitic consumptions.* *Calculated as aggregate readings of GE-201 to GE205 deducted by reading from GE-200.*	**GE-201 to GE-205**, *accuracy class of 0.5 or deviation of +/-0.1 at cosphi 1.* **GE-200** *+/-0.15% reading + 0.025% full scale at 95% confidence level.*	*Only 1 subscriber so far.* *Billing is based on the same instrument.* *However reading is compared with balance of electricity recorded by instruments* **UE-100** *and* **UE-101I/E**
VNG	Amount of natural gas consumed in Normalized Volume	Gas meter entering MEN facility	4% or less	PGN Gas Bill
		NG-100 Gas meter measuring incoming gas controlled by PGN.	**NG-100** is calibrated to error level of less than 0.5%. This flow-meter is equipped with volume corrector sets to 1 bar, 27 degC as specified in the gas contract. For purpose of reconciliation with the secondary meter, the	*NG-101 o NG-105* *Gas meters measuring gas input to individual gas engines.* *Calculated as aggregate reading of NG-101 to NG 105 in Normal Volume.*

PDD Ref.	Output of measurements	Source of Data as required in Section B.7.1 of PDD	Accuracy Mandated in PDD	Comparative Medium for Cross Checking
		Instruments Installed	*Instrument's Accuracy*	*Comparative Medium during Implementation.*
			volume is corrected to normal (1bar, 0 degC)	
NCV_{NG}	Net calorific value of natural gas	Periodic gas analysis from gas suppliers *Periodic gas analysis quoted only Gross Calorific Value. Thus, equivalent Net Calorific Value is re-calculated using ASTM-compliance method.*	N/A	IPCC 2006 Table 1.2
D_{NG}	Density of natural gas	Periodic gas analysis from gas suppliers *Periodic gas analysis quoted only Gross Calorific Value. Thus, equivalent Net Calorific Value is re-calculated using ASTM-compliance method.*	N/A	N/A

2 QUALITY CONTROL & MONITORING PROGRAM

2.1 STANDARD PROCEDURE FOR CDM MONITORING PROGRAM

In order to ensure consistency between monitoring implementation and the PDD, the Project Developer applies a CDM Standard Operating Procedure (SOP). The procedure was first tested for period of January 2008, and was fully implemented for month of February 2008 onward. The procedure provides interpretations of monitoring plan described in the PDD into actual step-by-step instructions/responsibilities for all members of CDM Team. It also designates the structure of monitoring implementations, reporting lines, consolidation process and internal evaluation process, and accompanied with pre-designed data collection forms.

Following first verification, the standard procedure was reviewed and updated by the CDM team, resulted in some revisions in (a) the pre-designed Monitoring Forms and (b) improvement in the internal audit follow-up method based on input from various parties.

2.2 ORGANIZATION STRUCTURE

In order to distribute the monitoring & reporting load throughout the entire year, the monitoring implementation is structured around three functional roles: (a) Plant Operator, (b) a CDM Manager, and (c) one Member of Management, heading the CDM Activity. The reporting structure is split into four layers of daily report, monthly report, mid-term report and final monitoring report, all simplified and delegated. On six-monthly basis, the monitoring activity is audited by an external party (Zeus-Innavitas) for correctness and completeness, and the result is reported to the management team as an Emission Reduction Delivery Report (ERDR). Participants of the CDM Monitoring Program as well as their respective obligations are summarized in Figure 2 overleaf.

For quality control, each report produced is checked by functional group to which the report is submitted. For example, the CDM Manager evaluates the daily reports and the interim Emission Reduction Delivery Report prepared by the CDM Manager is audited by a representative member of management prior to its approval.

2.3 COMPLIANCE TO REPORTING OBLIGATIONS

This Monitoring Period comprise of two (2) half-yearly reports (ERDR I and ERDR II) containing the following information:

- Electricity & Steam Production Reports,
- Gas Consumption & Gas Analysis Report;
- Electricity Steam & Sales Invoices
- Gas Procurement Invoice.
- 6-monthly Consolidated Report,
- Calibration Activity Reports,
- Environmental Reports,
- (if applicable) Safety Permits,
- Results of Internal Audit.

The Project Operator has issued its first internal Emission Reduction Delivery Report (ERDR I) in October 2008 as basis of First Verification.

2.4 PREVENTION OF DATA LOSS

In order to prevent data loss, all reports are kept in both MEN's site office in Tangerang and it's headquarters in Jakarta. The minimum frequency of data transfer as defined in the Standard Monitoring Procedure is performed once per month and done in both hard copy and soft copy.

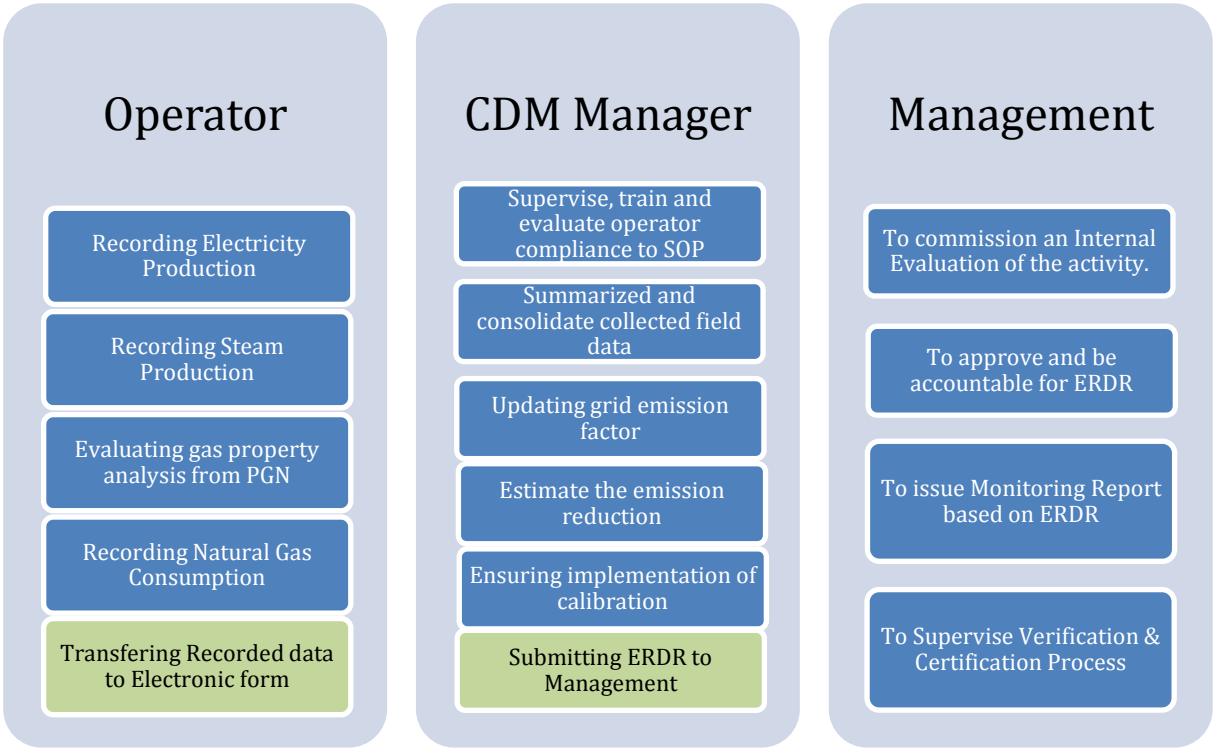

Figure 2 – Organization of the Monitoring Team

2.5 INSTRUMENTATION MAINTENANCE & CALIBRATION

Specification of the primary instruments is briefly detailed in Table 1, (Section 1.5). The PDD requires that all instruments must (a) have a valid calibration certificate and be regularly maintained and (b) meet the uncertainty range of +/- 4%.

The following is the calibration status of the monitoring equipment during this period:

	Instrument ID	**Group**	**Calibration Activity**
Primary	NG-100	Gas flow meter	The primary gas flow meter belonging to the gas supplier (PGN, National Gas Company) was calibrated within this period although 2 months lapse following the previous calibration period. Since this instrument is not owned by the developer, a reminder was sent to PGN on 25 June 2009. PGN responded in 26 June 2009 that the delay of calibration was pending due to unavailability of a replacement instrument.
	GE-200	Electricity meter	The 2 primary electricity meters are calibrated
	UE-100		
Secondary	NG-101 to NG-105	Gas flow meter	All 5 secondary gas flow meters are well within their calibration period.
Other	H-301	Steam flow meter	Due to the technical difficulty, the steam flow meter was only calibrated by beginning of September 2009. Delay arises due to lack of support from suppliers on appointing the party that can perform calibration.

3 RESULTS OF MONITORING ACTIVITIES

3.1 CONSOLIDATED ELECTRICITY OUTPUTS

This monitoring outputs corresponds to the following:

- MCEO or monthly consolidated eletricity supplied to industrial users, referred in the methodology;
- CEO or amount of electricity generated by the project net of its parasitic consumption, referred in the PDD.

As explained earlier, electricity supplied to the subscribers is measured by 2 sets of instrumentations:

- **Primary** instruments: electricity meters **GE-201** to **GE-205,** and **GE-200**
- **Secondary** instruments: electricity meters **UE-100** and electricity Import/Export Meter **UE-101E**;

As electricity billing is based on the balances of primary meters, and comparison with sales invoice is less meaningful. Thus, for purpose of upholding the quality of data, the electrical reading is compared with balances from secondary instrument set.

Table 2 - Consolidated Electricity Deliveries as reported in ERDR II

Month	Reading of Primary Instrument (MWh)		Reading of Secondary Instruments (MWh)	Delta	
				MWh	%
September 08	001/IX/O-1/MEN-TNG/08	5,331.58	5,351.60	20.02	0.38%
October 08	001/X/O-1/MEN-TNG/08	3,322.20	3,326.40	4.20	0.13%
November 08	001/XI/O-1/MEN-TNG/08	4,331.68	4,356.98	25.30	0.58
December 08	001/XII/O-1/MEN-TNG/08	3,380.23	3,400.10	19.87	0.59%
January 09	001/I/O-1/MEN-TNG/09	3,754.12	3,774.80	20.68	0.55
February 09	001/II/O-1/MEN-TNG/09	3,883.00	3,904.30	21.30	0.55
Total		**24,002.81**	**24,114.18**	**111.37**	**0.46**

Table 3 - Consolidated Electricity Deliveries as reported in ERDR III

Month	Reading of Primary Instrument		Reading of Secondary Instruments (MWh)	Delta	
				MWh	%
March 09	001/III/O-1/MEN-TNG/09	4,254.01	4,275.10	21.09	0.50
April 09	001/IV/O-1/MEN-TNG/09	3,959.48	3,981.71	22.23	0.56
May 09	001/V/O-1/MEN-TNG/09	4,119.36	4,144.10	24.74	0.60
June 09	001/VI/O-1/MEN-TNG/09	4,380.35	4,403.70	23.35	0.53
July 09	001/VII/O-1/MEN-TNG/09	4,303.84	4,326.90	23.06	0.54
August 09	001/VIII/O-1/MEN-TNG/09	4,100.85	4,125.40	24.55	0.60
Total		**25,117.89**	**25,256.91**	**139.02**	**0.55**

Negligible differences are observed between net electricity recorded by primary instruments and those recorded by secondary instruments. Both sets of equipments show a start-to-end-of-period deviation of 0.46% and 0.55 % in ERDR II and ERDR III respectively or equivalent to 0.51% for the whole period.

Electrical outputs reported for both periods (ERDR II and ERDRIII) are totaled to 49,119MWh, or equivalent to 52% of that projected in the PDD. This amount represents a significant decline compared to generation of previous half-yearly period which was recorded at 43,226MWh[1].

[1] Reported in First Monitoring Report

3.2 CONSOLIDATED STEAM OUTPUT, CAHO

This monitoring output corresponds to the followings:

- MCHO or monthly consolidated heat supplied to industrial plant, referred in the methodology, and
- CAHO or annual amount of heat generated by the Project, referred in the PDD

The consolidated steam output within the reporting period is summarized in the following table. Data is reported in both mass unit (kg) and energy unit (MJ).

Table 4 – Consolidated Steam Output CAHO as Reported in ERDR II

Month	Source Report	Mass Recorded (kg)	Equivalent Energy MJ
September 08	004/IX/M-1/MEN-TNG/08	5,612,841	13,014,000
October 08	004/X/M-1/MEN-TNG/08	4,161,935	12,261,000
November 08	004/XI/M-1/MEN-TNG/08	6,431,830	14,273,000
December 08	004/XII/M-1/MEN-TNG/08	5,646,270	13,445,000
January 09	004/I/M-1/MEN-TNG/09	4,548,520	12,489,000
February 09	004/IIM-1/MEN-TNG/09	4,078,897	11,166,000
Total		**30,480,293**	**76,648,000**

Table 5 – Consolidated Steam Output CAHO as Reported in ERDR III

Month	Source Report	Mass Recorded (kg)	Equivalent Energy MJ
March 09	001/III/O-1/MEN-TNG/09	5,218,242	13,047,000
April 09	001/IV/O-1/MEN-TNG/09	4,973,765	12,681,000
May 09	001/V/O-1/MEN-TNG/09	4,825,372	12,842,000
June 09	001/VI/O-1/MEN-TNG/09	5,978,414	13,525,000
July 09	001/VII/O-1/MEN-TNG/09	5,882,305	13,879,000
August 09	001/VIII/O-1/MEN-TNG/09	3,186,908	11,179,000
Total		**30,065,006**	**77,153,000**

The consolidated thermal delivery suggests sizable decline of steam production compared to previous half-yearly period recorded 39,780,020 kg or equivalent to 86,070,188 MJ. In total, this monitoring period reported a full-year production of 153.8TJ or compared to 210TJ expected in PDD.

3.3 CONSOLIDATED NATURAL GAS CONSUMPTION (VOLUME)

This monitoring output correponds to the followings:

- MEC_{NG} for monthly consolidated volume of natural gas consumed, referred in the methodology, and
- VNG the amount of natural gas consumed for the project activity, referred in the PDD

Summary of readings of the primary gas meter (**NG-100**) as reflected in the monthly gas bills as well as aggregate readings from secondary gas meters (**NG-101** to **NG-105**) are summarized in the ensuing table. The primary gas meters reported volume at difference reference condition than the secondary meter, and thus is adjusted for purpose of this report.

Table 6 – Consolidated Gas Consumption in Volumetric Unit as reported in ERDR II

Month	Source Report	PGN Gas Meter/Billing (Primary Meter)		Aggregate of Secondary Meters	Observed Delta*
		m^3 (1 bar, 27 degC)	Nm^3	Nm^3	
September 08	004/IX/M-1/MEN-TNG/08	1,529,280	1,391,714	1,329,890	4.44%
October 08	004/X/M-1/MEN-TNG/08	917,118	834,619	876,610	-5.03%
November 08	004/XI/M-1/MEN-TNG/08	1,295,444	1,178,912	1,176,675	0.19%

December 08	004/XII/M-1/MEN-TNG/08	1,044,847	950,858	951,650	-0.08%
January 09	004/I/M-1/MEN-TNG/09	1,063,583	967,908	1,002,699	-3.59%
February 09	004/II/M-1/MEN-TNG/09	1,111,986	1,011,957	1,020,844	-0.88%
Total		**6,962,258**	**6,335,968**	**6,358,368**	**-0.35%**

*relative to primary meter

Table 7 – Consolidated Gas Consumption in Volumetric Unit as reported in ERDR III

Month	Source Report	PGN Gas Meter/Billing (Primary Meter)		Aggregate of Secondary Meters	Observed Delta*
		m^3 (1 bar, 27 degC)	Nm^3	Nm^3	
March 09	001/III/O-1/MEN-TNG/09	1,224,148	1,114,030	1,122,854	-0.79
April 09	001/IV/O-1/MEN-TNG/09	1,127,650	1,026,212	1,036,614	-1.01
May 09	001/V/O-1/MEN-TNG/09	1,191,438	1,084,262	1,089,556	-0.49
June 09	001/VI/O-1/MEN-TNG/09	1,261,415	1,147,944	1,171,171	-2.02
July 09	001/VII/O-1/MEN-TNG/09	1,263,345	1,149,701	1,161,634	-1.04
August 09	001/VIII/O-1/MEN-TNG/09	1,236,322	1,125,109	1,124,364	0.07
Total		**7,304,318**	**6,647,258**	**6,706,193**	**-0.88**

*relative to primary meter

The month of September 2008 and October 2008 reported more than 4% deviation in the gas consumption. This deviation is due to confusion on the part of project developer related to the reference volume adopted by PGN. It was earlier thought that PGN's 'Normal Volume' made reference to the internationally accepted 0degC, and thus comparable to readings from the secondary meter.

When continuous differences were discovered during an internal audit for the first reporting period, it was erroneously thought that the error was on the part of the secondary instruments and repairs were ordered. Further investigations later conclude that the differences were not due to error in the reading, but merely due to differences in reference conditions applied, and the secondary meters were again reinstated to its original settings.

The gap in time for noting the gas volume of primary and secondary meters also contributes to the differences in the readings of both instruments, such as those observed in January 2009 and June 2009. Nevertheless, the aggregate discrepancies for each of the start-to-end period are well below tolerance, or equivalent to 0.63% throughout the whole reporting period.

This monitoring period recorded combustion of 12,983,226Nm^3 of natural gas or equivalent to 53% of the total projection in the PDD.

3.4 Consolidated Natural Gas Consumption (Energy)

This parameter corresponds to parameter AEC_{NG} in the methodology, which is annual natural gas consumption of the cogeneration facility in energy unit. The conversion of natural gas consumptions from primary meter's Normal Volume (Table 6 and Table 7, Section 3.3) into its energy equivalent is based upon calculated gas properties (NCV and Density) as described in the ensuing Section 3.5.

Table 8 - Consolidated Gas Consumption in Energy Unit, AEC_{NG} as reported in ERDR II

Month	Source Report	Eqv. Energy (MJ)
September 08	Derivative Parameter calculated from: ▪ Monthly Gas Consumptions, ▪ Monthly Evaluated Density and ▪ Monthly Evaluated NCV	50,964,934
October 08		30,337,050
November 08		42,588,443
December 08		35,376,064
January 09		35,610,663
February 09		36,984,377
Total		231,861,531

Table 9 - Consolidated Gas Consumption in Energy Unit, AEC_{NG} as reported in ERDR III

Month	Source Report	Eqv. Energy (MJ)
March 09	Derivative Parameter calculated from: ▪ Monthly Gas Consumptions, ▪ Monthly Evaluated Density and ▪ Monthly Evaluated NCV	40,390,707
April 09		37,105,760
May 09		40,046,760
June 09		42,464,404
July 09		42,152,519
August 09		41,056,151
Total		243,216,301

3.5 GAS PROPERTIES: NCV AND D_{NG}

The PDD requires Net Calorific Value (TJ/kt) and density (kg/Nm3) of the natural gas used is to be analyzed on monthly basis. PGN had been able to supply monthly compositional analysis of its gas for all months reported in this period. The report comprise of (a) the compositional molar fraction and (b) compressibility factor of the gas. Based on these factors, the gas net calorific value and density are derived using method complies with industry standard (ASTM). The results are summarized in the following tables.

Table 10 – Natural Gas Properties: Net Calorific Value and Density as reported in ERDR II

Month	Source Report	LHV/NCV (TJ/kt)	Density (kg/Nm³)
September 08	004/IX/M-1/MEN-TNG/08	48.22	0.75946
October 08	004/X/M-1/MEN-TNG/08	48.43	0.75051
November 08	004/XI/M-1/MEN-TNG/08	47.66	0.75792
December 08	004/XII/M-1/MEN-TNG/08	48.42	0.76832
January 09	004/I/M-1/MEN-TNG/09	48.56	0.75762
February 09	004/II/M-1/MEN-TNG/09	48.36	0.75577
Average		**48.28**	**0.75827**

Table 11 – Natural Gas Properties: Net Calorific Value and Density as reported in ERDR III

Month	Source Report	LHV/NCV (TJ/kt)	Density (kg/Nm³)
March 09	001/III/O-1/MEN-TNG/09	48.41	0.74887
April 09	001/IV/O-1/MEN-TNG/09	48.79	0.74110
May 09	001/V/O-1/MEN-TNG/09	48.13	0.76744
June 09	001/VI/O-1/MEN-TNG/09	48.14	0.76849
July 09	001/VII/O-1/MEN-TNG/09	48.28	0.75939
August 09	001/VIII/O-1/MEN-TNG/09	48.40	0.75397
Average		**48.36**	**0.75654**

The net calorific value of 48.28 TJ/kt reported above is within the range reported in Table 1.2 of 2006 IPCC for natural gas (46.5TJ/kt-50.4TJ/kt). There is no available national literature data to reliably benchmark the gas density. For comparison, the first monitoring reported an average NCV of 47.66 TJ/kt and average density of 0.76534 kg/Nm³.

3.6 GRID EMISSION FACTOR

The project proponent chose *ex-post* approach for emission factor and thus required to annually update the emission factor of the electricity system. For the **first** monitoring period, emission reduction occurred in year 2008 and grid emission factor calculated from data vintage 2006 (y-2) were applied.

For **this** reporting period, emission reduction occurred in the last 4 months of 2008 and the first 8 months of 2009, thus the emission factor needs to be updated with vintage data 2007. The update results in a combined margin emission factor of 0.951tCO_2/MWh for 2007 compared to 0.901tCO_2/MWh applied for the previous year. The increase is largely due to the increased activities of the newer large power plants commissioned in 2006: Tanjung Jati

B (coal), Cilacap SSP (coal), and Cilegon (gas). The approach of calculation is detailed in Appendix A, and accompanying spreadsheet titled: EF JAMALI 07 Version 1.4.0.

4 DELIVERED EMISSION REDUCTION

4.1 NON-MONITORED PARAMETERS

Non-monitored parameter adopted for calculation of emission reduction is summarized in the following table. These parameters are consistent with Section B.6.2 of the PDD.

Table 12 - Fixed Parameters for Calculation of Emission Reduction

Parameter	Green House Gas		
	CO_2	CH_4	N_2O
Global Warming Potential of GHG	1 tCO_2/tCO_2	21 tCO_2/tCH_4	310 tCO_2/tN_2O
Emission Factor of GHG from combustion of residue oil (displaced)	77.4 tCO_2/TJ	0.003 tCH_4/TJ	0.0006 tN_2O/TJ
Emission Factor of GHG from combustion of natural gas (Project)	56.1 tCO_2/TJ	0.001 tCH_4/TJ	0.0001tN_2O/TJ
Methane emission factor from activities related to the production of natural gas (Leakage)	0.0287518 Gg-CH4/10^6 m^3 or 0.0287518×10^3 tCH4/Nm^3		
Efficiency of Baseline (Residue oil) Boiler	90%		

4.2 CALCULATED EMISSION SOURCES

Based on the results of monitoring activity as outlined in Section 3, and the non-monitored parameter summarized in Table 12, each emission sources are calculated in accordance with method set-out in the PDD.

4.2.1 BASELINE EMISSIONS

Table 13 - Summary of Baseline Emissions

PDD Ref.	Grid Electricity Displacement (Equation 3 of PDD)	Unit	ERDR II	ERDR III
CEO	Total net consolidated electricity generated and supplied to the subscribers	MWh	24,002	25,117
$EF_{CM,2007}$	2007 Combined Margin emission factor for Jawa-Madura Bali grid	tCO_2/MWh	0.951	0.951
BE_{ELEC}	Baseline emission associated with grid-power displacement	tCO_2	22,826	23,886
PDD Ref.	Residue Oil Displacement (Equation 2 of PDD)			
CAHO	Total net consolidated steam supplied to Argo Pantes	MJ	76,648,000	77,153,000
E_B	Efficiency of displaced residual oil boiler	Unitless	0.900	0.900
ABEC	Energy baseline for thermal generation	TJ	85.16	85.73
EF_{CO2-R}	CO2 emission factor from combustion of residue oil	tCO2/TJ	77.4	77.4
EF_{CH4-R}	CH4 emission factor from combustion of residue oil (eqv. CO2)	tCO2/TJ	0.063	0.063
EF_{N2O-R}	N2O emission factor from combustion of residue oil (eqv. CO2)	tCO2/TJ	0.186	0.186
BE_R	Baseline emission associated with displacement of residue oil	tCO2	6,612	6,656

4.2.2 PROJECT & LEAKAGE EMISSIONS

Table 14 - Summary of Project & Leakage Emission

PDD Ref.	Natural Gas Combustion (Equation 7 of PDD)	Unit	ERDR II	ERDR III
AEC_{NG}	Consolidated Natural Gas Consumption (Table 8, p. 11)	TJ	231.9	243.2
EF_{CO2-NG}	CO_2 Emission factor from combustion of natural gas	tCO_2/TJ	56.10	56.10
EF_{CH4-NG}	CH_4 Emission factor from combustion of natural gas (eqv. CO2)	tCO_2/TJ	0.021	0.021
EF_{N2O-NG}	N_2O Emission factor from combustion of natural gas (eqv. CO_2)	tCO_2/TJ	0.031	0.031
PE_{NG}	Project emission from combustion of natural gas	tCO_2	13,019	13,657
PDD Ref.	Natural Gas Production & Distribution (Equation 9 of PDD)	Unit	Values	Values
AEC_{NG}	Consolidated Natural Gas Consumption (Table 8, p. 11)	TJ	231.9	243.2
ΣMEF_k	Total methane emission factor from gas production & distribution	tCH_4/Nm_3	2.87518E-05	2.87518E-05
GWP_{CH4}	Global Warming Potential of Methane	tCO_2/tCH_4	21	21
D_{NG}	Average Density of natural gas consumed	$tgas/Nm_3$	0.00076	0.0008
NCV_{NG}	Average Net Calorific Value of natural gas consumed	TJ/tgas	0.048275	0.0484
LE	Leakage emission associated with gas production & distribution	tCO_2	3,824	4,014

4.3 EMISSION AVOIDED DURING THIS MONITORING PERIOD

Table 15 -Delivered Emission Reduction for This Reporting Period

PDD Ref.	Project Activity Emission Reduction (Equation 10 of PDD)	Emission in tCO_2	
		ERDR II	ERDR III
BE_{ELEC}	Baseline emission from grid electricity displacement (Table 13, p. 13)	22,826	23,886
BE_R	Baseline emission from residue oil displacement (Table 13, p. 13)	6,612	6,656
PE_{NG}	Project emission from combustion of natural gas (Table 14, p. 14)	13,019	13,657
LE	Leakage emission from gas production & transportation (Table 14, p. 14)	3,824	4,014
ER	Emission Reduction	12,594	12,871
ER_Y	Aggregated Emission Reduction This Reporting Period	25,465	

5 ENVIRONMENTAL PERFORMANCE

Within this reporting period, two environmental assessments had been performed on the Project in the month of June 2008, and March 2009 by a third party laboratory. Results of these tests are summarized in the following table.

Table 16 - Results of Ambient Quality Monitoring

Major Gases	Ambient Quality			Applicable Standards
	13 June 2008	12 March 2009 North	12 March 2009 South	
SO_2 (Sulfur Dioxide)	20 µg/Nm³	24.01 µg/Nm³	25.22 µg/Nm³	900 µg/Nm³
CO (Carbon Monoxide)	208µg/Nm³	2,749µg/Nm³	2,864 µg/Nm³	26,000µg/Nm³
NO_X (Nitrous Oxide)	6 µg/Nm³	21.85 µg/Nm³	22.07 µg/Nm³	400µg/Nm³
O_3 (Oxidant)	200 µg/Nm³	26.87µg/Nm³	28.91 µg/Nm³	235µg/Nm³
Particulate	24 µg/Nm³	24 µg/Nm³	96 µg/Nm³	230µg/Nm³
Pb (Lead)	Not tested	-	-	2 µg/Nm³
Ammonia	Not tested	2 µg/Nm³	0.04445 µg/Nm³	2 µg/Nm³
Hydrogen Sulfide	Not tested	0.00130 µg/Nm³	<0.00072 µg/Nm³	0.02 µg/Nm³

Table 17 - Results of Noise Monitoring

Location	Noise		
	Project (13 June 2008)	12 March 2009	Applicable Standard
Project Site (K2)	82 dBA	83.0dBA	70 dBA
Parking Area of Complex	68 dBA	73.1 dBA	70 dBA

The results of the checks show that the exhausts of gas engine are well within the national standard, but noise resulting from its operation is still exceeding the required standard at the Project site, and marginally meets the standard if measured from the parking area of the complex. As consequence to this, the Project is recommended to set a green-belt area in the surrounding empty land.

6 CONCLUSION

The management of PT Manunggal Energi Nusantara believes that it has operated and monitored the Project in accordance with the requirement of the registered Project Design Documentation (P1313). The company is also committed to meet all expected statutory requirements, including operation & safety permits, as well as its environmental obligations.

Within this reporting period, the steam and power generations activity reduces 25,465tCO_2 relative to the baseline case. Such delivery is still below expectation in the PDD, which was estimated to be 42,622 tCO_2 per year. The shortage is primarily due to under-utilization of the facility compared to its design capacity, as two subscribers eventually cancelled its contracts due to commercial matter. This situation is further exacerbated by the low productivity of the major (and only) subscriber due to poor export market.

Despite discouraging business environment, the company management is committed to keep the project afloat and continue to fulfill its responsibility as required as an operator of a CDM Project. The Project Proponent believes to have taken all reasonable efforts to maintain credibility of data through proper administration and supervision, and wishes to immediately expedite the verification process to certify the delivered emission reduction.

APPENDIX A - EMISSION FACTOR CALCULATION

The emission reduction reported in this monitoring period occurred between September 2008 and August 2009, or mostly 2009. Since the Project opted for an *ex-post* emission factor, the emission factor was updated with 2007 data vintage for this reporting period.

Boundary of Emission Factor

The boundary for emission factor calculations remains the same as per PDD. The plan to integrate the Java-Madura-Bali (JAMALI) grid to South Sumatra grid has not been realized, thus no electricity is imported or exported from the original grid delineation.

Method Applied for Calculations

The updated emission factor applies methods as stipulated in the PDD and made reference to latest *Tool to Calculate Emission Factor for an Electricity System* or 'Tool' for treatment of aspect not outlined in the PDD. Such aspect includes estimation of emissions from power plants of which the data is not complete.

Data Collection Process

With knowledge of Directorate General for Electricity (DJLPE) and National Committee for Clean Development Mechanism (KOMNAS MPB, DNA), Zeus-Innavitas on behalf of the project proponent, directly contacted various institutions and power-plant operators to obtain information of fuel consumptions and generations for 2007.

- **Net generations**. Statistical data published by the JAMALI's grid authority: PT PLN P3B for 2007 provides for complete net generation data from all power plants delivering electricity to the grid.

- **Fuel consumptions.** Fuel consumptions of connected power plants are requested via formal correspondence with individual operator. Major institutions responded by providing their annual statistical report (Indonesia Power, Pembangkit Jawa Bali) containing generation and fuel consumption data. Others simply responded to information requested in the correspondence. Information/publications exchanged are documented and will be provided to auditor.

    - Power plants of which both net generations and fuel consumptions are available is grouped as Group B1 Power Plant, and its aggregate CO_2 emission is calculated directly from the reported fuel consumptions.
    - A number of power plants decided not disclose its fuel consumption information: PT Paiton Energy Company, PT Jawa Power, PT Cikarang Listrindo. Since net generation data is available from other publications, these power plants are grouped as Group B2 Power Plants, and its CO_2 emissions are estimated in accordance with method outlined in Option B of the Tool by assigning an appropriate efficiency.

Information gathered during this process is compiled and consolidated in the subsequent table[2].

Table 18. 2007 Net Generation and Fuel Consumptions of Power Plants in JAMALI Grid in Subset Group B1

OWNER	FUEL TYPE	FUEL CONSUMPTION		NET GENERATION		TOTAL	
INDONESIA POWER	COAL	ton	12,448,426	GWh	21,842	GWh	43,134
	GAS	MMBTU	44,115,358	GWh	6,739		
	HSD	kL	2,184,035	GWh	6,329		
	MFO	kL	610,438	GWh	1,953		
	HYDRO			GWh	3,430		
	GEOTH			GWh	2,841		
PEMBANGKIT JAWA BALI	COAL	ton	3,040,419	GWh	5,645	GWh	27,171

[2] Fuel consumption and generation data from PT Krakatau Daya Listrik are excluded from this Table due to uncertainty of data provided. This power plant delivers only 1.7GWh in 2007 of 107,715 total generations and thus is considered as a minor omission.

	GAS	MMBTU	76,864,852	GWh	8,550		
	MFO	kL	1,311,828	GWh	5,723		
	HSD	kL	1,611,617	GWh	5,264		
	HYDRO			GWh	1,989		
MUARA TAWAR	HSD	kL	536,034	GWh	1,546	GWh	1,546
TANJUNG JATI B	COAL	ton	3,403,577	GWh	7,906	GWh	7,906
CILEGON	GAS	MMBTU	13,004,241	GWh	1,338	GWh	1,338
PERUM JASA TIRTA	HYDRO			GWh	511	GWh	511
GEO DIPA ENERGY	GEOTH			GWh	164	GWh	164
DSP SALAK	GEOTH			GWh	1,574	GWh	1,574
MNL WAYANG WINDU	GEOTH			GWh	938	GWh	938
CHEVRON GI DRAJAD	GEOTH			GWh	1,154	GWh	1,154
SSP CILACAP	COAL	ton	1,727,354	GWh	2,977	GWh	2,977
TOTAL				GWh	75,813	GWh	75,813

Table 19. 2007 Net Generation and Fuel Consumptions of Power Plants in JAMALI Grid in Subset Group B2

OWNER	FUEL TYPE	ASSIGNED EFFICIENCY & JUSTIFICATIONS		NET GENERATION	
PAITON ENERGY	COAL	31%	Calculated based on documented 2006 fuel consumption and generation data as provided by the operator	GWh	9,653
JAWA POWER	COAL	32%	Calculated based on documented 2006 fuel consumption and generation data as provided by the operator	GWh	9,162
CIKARANG LISTRINDO	GAS	60%	Default values efficiency as provided in the Annex of the Tool for gas power plant	GWh	467
INDORAMA	COAL	50%	Default values efficiency as provided in the Annex of the Tool for new coal power plant	GWh	20
TOTAL				GWh	19,301

Fuel Properties Applied

The following table summarizes the net calorific value (NCV) and CO_2 emission factor (EF_{CO2}) used to calculate emissions of power plants connected to the JAMALI grid. It is pertinent to note that the most recent publication of national communication does not cover emission factor or calorific values of fuel available in the country. As consequence, data is mostly obtained from reliable publications as justify below. Emission factor for all fuel type is obtained from Table 1.4 2006 IPCC Report representing Lower Limit.

Table 20. Density data used for grid emission calculation

Conversion Data	Source	Value	Unit
Density of HSD	Publication by PERTAMINA (state oil company). This is reliable as PERTAMINA is the only operator of oil refinery in Indonesia.	0.880[3]	t/kL
Density of MFO		0.955	t/kL

Table 21. NCV and emission factor of fuels used by power plants in JAMALI grid

IPCC Data	Adopted Net Calorific Value		Emission Factor
	GJ/kt	Source/Justification	$kgCO_2/TJ$

[3] IDO is assumed to have similar properties as per HSD. The use of IDO is very small from total fuel consumption and thus represents a minor omission. The selected value here represent the mid-point of lower and upper limit.

HSD & IDO[4]	42,933	Publication by PERTAMINA (state oil company)[5]. This is reliable as PERTAMINA is the only operator of oil refinery in Indonesia.	72,600
MFO	40,992		75,500
Coal	23,811	Official statistics issued by Directorate Program Supervision for Mineral Coal and Geothermal[6] shows that major power plant procures coal with the rank between 5,500 - 6,500 kcal/kg (HHV) (medium rank). This corresponds with majority of coal produced in Indonesia. Since no exact data is available, mid-point of this range used. This is further corrected to LHV basis by applying ISO method using moisture contents, Hydrogen, and Oxygen content, analyzed from samples of coals obtained from various mining site across Indonesia by an independent study.	92,800
Natural Gas	-	All statistics reported natural gas in energy unit, thus conversion factor is not necessary.	54,300

2007 Simple OM Operating Margin

From fuel consumption and generation data contained in Table 18 and Table 19, and fuel properties as summarized in Table 20 and Table 21, the CO_2 emissions associated with each type of fuel are displayed in the subsequent table.

Table 22. CO_2 emission and Net Electricity Generation of the Project Electricity System from Group B1 Power Plants

Fuel Type	Consumption		Associated Net Generation		Associated CO_2 Emission	
COAL	ton	20,619,776	MWh	38,370,895	tCO2	45,562,777
GAS	MMBTU	133,984,451	MWh	16,627,027	tCO2	7,670,771
MFO	kL	1,922,266	MWh	7,676,000	tCO2	5,681,443
HSD	kL	4,331,686	MWh	13,138,860	tCO2	11,881,261
HYDRO			MWh	5,930,326	tCO2	-
GEOTH			MWh	6,671,240	tCO2	-
	TOTAL		MWh	88,414,348	tCO2	70,796,252
	TOTAL NON-LCMR		MWh	75,812,782		
OPERATING MARGIN CO2 EMISSION FACTOR FOR GROUP B1 POWER PLANTS					tCO2/MWh	0.933

Table 23. CO_2 emission and Net Electricity Generation of the Project Electricity System from Group B2 Power Plants

OWNER	FUEL TYPE	NET GENERATION		$3.6 \cdot [EG_m \cdot EF_{CO2}/\eta_m]$	
PAITON ENERGY	COAL	MWh	9,652,660	tCO2	10,381,458
JAWA POWER	COAL	MWh	9,161,566	tCO2	9,496,381
CIKARANG LISTRINDO	GAS	MWh	466,980	tCO2	152,142
INDORAMA	COAL	MWh	19,502	tCO2	13,030
TOTAL NON-LCMR		MWh	19,300,708	tCO2	20,043,012
OPERATING MARGIN CO2 EMISSION FACTOR FOR GROUP B2 POWER PLANTS				tCO2/MWh	1.038

CO_2 emission from Group B1 Power Plants is calculated to be 0.933 tCO_2/MWh. This group contributes to 79.7% of total Non-LCMR generations, with the remaining 20.3% is attributed to Group B2, with emission intensity of

[4] HSD: High Speed Diesel; IDO: Industrial Diesel Oil;

[5] Bahan Bakar Minyak, LPG and BBG, PERTAMINA

[6] Indonesia Mineral, Coal, Geothermal, Groundwater 2008, issued by Directorate General of Mineral Coal and Geothermal of the Ministry of Energy and Mineral Resources.

1.038tCO$_2$/MWh (see Table 23). Subsequently, the combined Group B1/B2 results in emission intensity of 0.954tCO$_2$/MWh as outlined in Table 24.

Table 24. Operating Margin CO$_2$ Emission Factor from Group B1 and Group B2 Power Plants

Power Plant Group	Non-LCMR Generation	% Generation	CO2 Emission Factor
Group B1	MWh 75,812,782	79.7%	tCO2/MWh 0.933
Group B2	MWh 19,300,708	20.3%	tCO2/MWh 1.038
Total non LCMR Generations	MWh 95,113,490		
Total Operating Margin CO2 Emission Factor			tCO2/MWh 0.954

2007 Simple OM Build Margin

The following table detailed net generation, fuel consumptions and associated CO$_2$ emissions from all Build Margin power plants, which comprise to 22.76% of total grid generation. Similar for the calculation of the Operating Margin, the calculation for Combined Margin is also segregated into Group B1 and Group B2 Power Plants. It is calculated that power plant in this group generates 23,213,967tCO$_2$ associated with production of 24,517,510MWh of electricity or equivalent to 0.947tCO$_2$/MWh

Table 25. Electricity Generation and Fuel Consumption of Power Plants identified in Sample Group m for 2007 Build Margin

Power Plants		Fuel Type	Net Generation	Fuel Consumptions /Assigned Efficiency	Associated Emission
B2: Indorama	2007	COAL	MWh 19,502	50%	tCO2 13,030
B1: Cilegon	2006	GAS	MWh 1,338,027	MMBTU 13,004,241	tCO2 744,508
B1: Tanjung Jati B	2006	COAL	MWh 7,906,449	ton 3,403,577	tCO2 7,520,762
B1: SSP Cilacap	2006	COAL	MWh 2,977,446	ton 1,727,354	tCO2 3,816,872
B1: Muara Tawar	2004	HSD	MWh 1,545,860	kL 536,034	tCO2 1,470,272
B2: Cikarang Listrindo	2003	GAS	MWh 466,980	60%	tCO2 152,142
B1: Geodipa Energy	2002	GEOTH	MWh 163,750	-	-
B1: Wayang Windhu	2000	GEOTH	MWh 937,930	-	-
B2: Jawa Power	2000	COAL	MWh 9,161,566	32%	tCO2 9,496,381
			MWh 24,517,510		tCO2 23,213,967
Total Operating Margin CO2 Emission Factor					tCO2/MWh 0.947

2007 Simple OM Combined Margin

Based on the above calculated 2007 Operating Margin of 0.954 tCO$_2$/MWh and 2007 Build Margin of 0.947tCO$_2$/MWh, the resulting Combined Margin Emission Factor for JAMALI Grid Power Plants is calculated to be 0.951tCO$_2$/MWh on Simple OM Basis.