



Tambun LPG Associated Gas Recovery and Utilization Project

Clean Development Mechanism (CDM)

CER Monitoring Report

(Certified) Emission Reductions

Monitoring Period: 1 June 2010 – 31 July 2010
CDM Registration No: 1144

Date: 5 August 2010
Version 01

A project designed to meet the baseline and monitoring requirements of UN CDM Approved
Methodology

AM0009 Version 2
“Recovery and Utilization of Gas from Oil Wells that would otherwise be flared”

**MONITORING REPORT FORM (CDM-MR)**
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**MONITORING REPORT****Version 01 – 05/08/2010****Tambun LPG Associated Gas Recovery and Utilization Project****Reference Number 1144****Ninth (9th) Monitoring Period: 01/06/2010 – 31/07/2010****SECTION A. General description of the project activity****A.1. Brief description of the project activity: >>**

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The purpose of the project activity is to reduce the greenhouse gas emissions by the recovery and utilization of gases produced as a by-product of oil production activities at the Tambun Fields. The project activity is the construction of the processing and transport infrastructure to take gas that would otherwise have been flared to the Cirebon to Cilegon pipeline.

The technology consists of a mini LPG extraction plant; condensate removal facilities and a 35 km 8" diameter steel pipeline, with associated compressors, metering stations and safety valves. The processing plant and pipeline were constructed in full compliance with environmental regulations and was subject to environmental appraisals as per Indonesian environmental regulations.

This project was registered as a UNFCCC CDM Project on 1 February 2008 (<http://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1180000727.07/view>) and subsequent Project Activity changes were validated and approved by the UNFCCC at EB54 on 28th May 2010.

This Monitoring Report 9 covers the monitoring period of 1 June 2010 – 31 July 2010. The total emission reductions achieved in this monitoring period is 90,394 tCO₂e.

A.2. Project Participants

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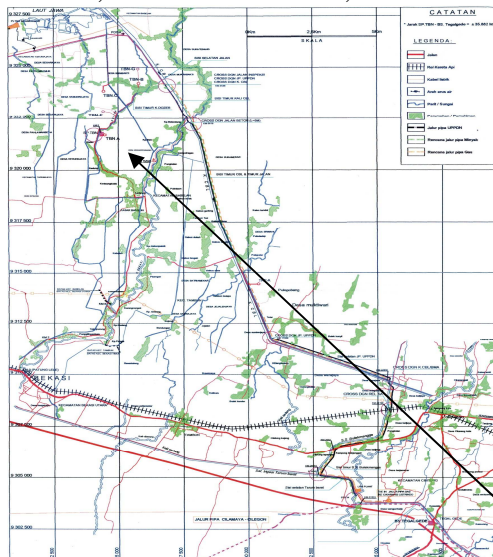
PT. Odira Energy Persada, an Indonesian private gas company which was established under the laws of Indonesia and having its registered office at Jl. Patal Senayan No.38, Jakarta 12210, Indonesia (hereinafter referred to as "Odira").

Sindicatum Carbon Capital Ltd, a company incorporated under the laws of England and having its registered office at 33 Duke Street, London, W1U 1JY, United Kingdom (hereinafter referred to as "SCC").

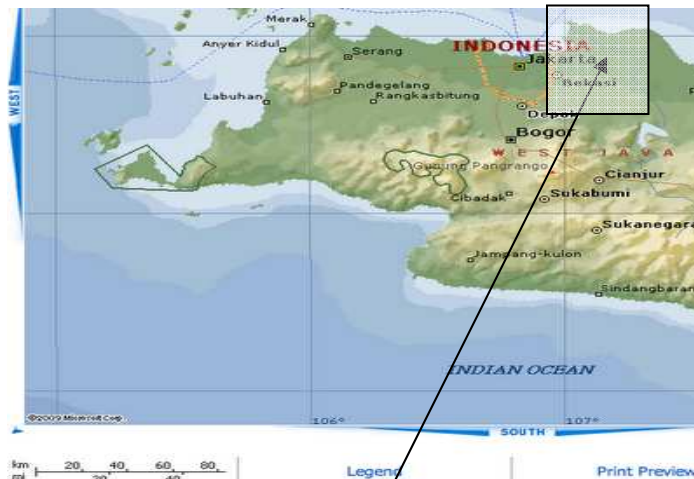
A.3. Location of the project activity:

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The LPG plant is located at 107° 01' 40" E, 06° 07' 55". It is about 40 km west of Jakarta in Bekasi District, West Java Province, Indonesia.



LPG Plant Location



Tambun site

A.4. Technical description of the project

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A.4.1 Project Description

The Tambun Oil Field is located about 40 km west of Jakarta in West Java Province. This field started production in 2003 at 4,000 barrels per day and had reached up to 8000 barrels per day in 2006. Initially the associated gas was flared. The project activity receives and processes the associated gas supplied from Tambun. A geographical overview of the project location is provided overleaf.

The technology consists of a mini Liquefied Petroleum Gas (LPG) plant with a designed input capacity of 15 mmscfd, condensate removal facilities, a 35 km 8" diameter steel pipeline and associated auxiliary equipment including compressors, metering stations and safety valves. The plant processes associated gas that is normally being flared from the neighbouring Pertamina company. The associated gas is being processed through a series of compressors, chillers and separators to remove the heavier condensate fractions, before being transferred to the mini LPG extraction plant. This mini LPG extraction unit strips out the LPG fraction and leaving the leaner gas and lighter condensate products.

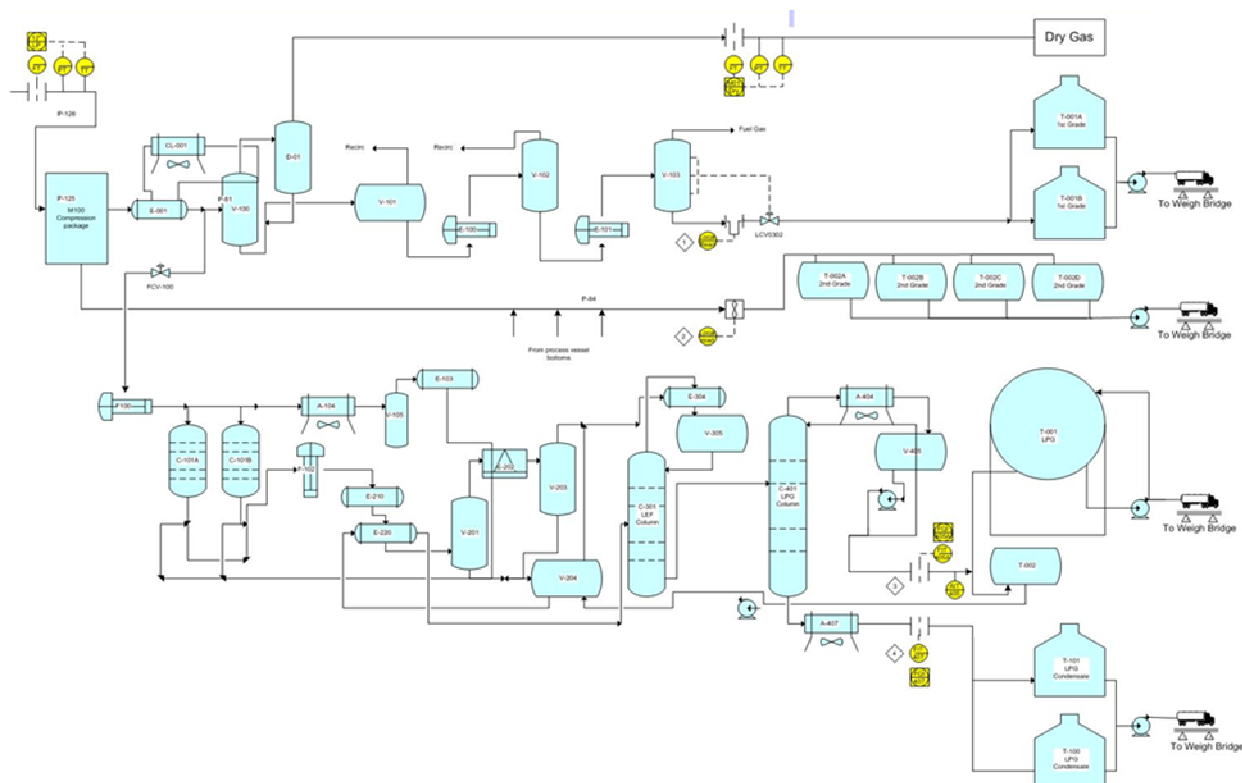
The processing plant and pipeline is constructed in full compliance with the local environmental regulations and was subject to environmental appraisals as per Indonesian environmental regulations. The processing plant is powered by the gas supply, with back-up diesel for generators and fire pumps. The supply pipeline runs 35 km to the main east-west supply line. The pipeline is constructed from carbon steel, with a mid-wall diameter of 8 inches.

Emergency shutdown valves are located at the start and finish of the pipeline and two line break control valves (LBCV) installed at approximately 12km and 24km from the start.

In December 2006 the back-up generators have been converted to run on gas. No diesel has been used for on-site power generation since then.

The location of measurement devices installed is presented in figure 2 below:

Figure 2 **Location of the measurement devices**



Remark:

Remark:
During this monitoring period no gas was supplied through the 4 inch line.
At the site one weighbridge is installed.

A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:

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Title : Tambun LPG Associated Gas Recovery & Utilization Project

Methodology : Recovery and Utilization of Gas From Oil Wells That Would Otherwise Be Flared (AM0009 version 02)

**A.6. Registration date of the project activity:**

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Registration Date: 01 Feb 2008.

A.7. Crediting period of the project activity and related information (start date and choice of crediting period):

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Crediting Period: 01 Feb 2008 – 31 Jan 2018 (fixed)

A.8. Name of responsible person(s)/entity(ies):

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Mr. Gareth Phillips	Sven JP Starckx
Chief Climate Change Officer	Senior Technical Advisor – Monitoring & Issuance
Sindicatum Carbon Capital (SCC)	Sindicatum Carbon Capital (SCC)
33 Duke Street	33 Duke Street
London, UK	London, UK
Tel. +44(0)207 224 7555	Tel. +44(0)207 224 7555

SECTION B. Implementation of the project activity**B.1. Implementation status of the project activity**

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Tambun Plant started operation on 27th December 2006 and the project activity was registered on 1 February 2008. The project activity has been implemented in accordance to registered PDD version 4.3, which is the revision of the previous PDD version 3.12. The PDD version 4.3 was approved at the EB 54 on the 28 May 2010, following the Validation on changes in PDD which was conducted by TUV Nord.

This Monitoring Report 8 covers the monitoring period of 1 June 2010 – 31 July 2010. During this period the plant has been processing on average 20 mmscf/d of associated gas to produce on average 100 tpd of LPG. The total emission reductions achieved in this monitoring period is 99,394 tCO₂e.

During this monitoring period no special event has taken place at the plant with respect to the CDM project activity. There are no shutdowns or equipment downtime at the plant during this monitoring period.

B.2. Revision of the monitoring plan

The monitoring plan for the project activity has been revised and approved by the UNFCCC on 8 June 2009. The revised monitoring plan is available at <http://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1180000727.07/view>

B.3. Request for deviation applied to this monitoring period



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There is no deviation in this project activity for this monitoring period.

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B.4. Notification or request of approval of changes

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The PDD has been revised following the procedures for notifying and requesting approval of changes from the project activity as described in the registered PDD (version 3.12) (Annex 66, at meeting EB48) and the guidelines on assessment of different types of changes from the project activity as described in the registered PDD (annex 67, EB 48.). The revised PDD (PDD ver 4.3) is available at <http://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1180000727.07/view>.

The project activity change has been approved at EB54 on 28th May 2010. The validation of project activity changes was carried out by TUV Nord and the report is available at <http://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1180000727.07/view>

SECTION C. Description of the monitoring system

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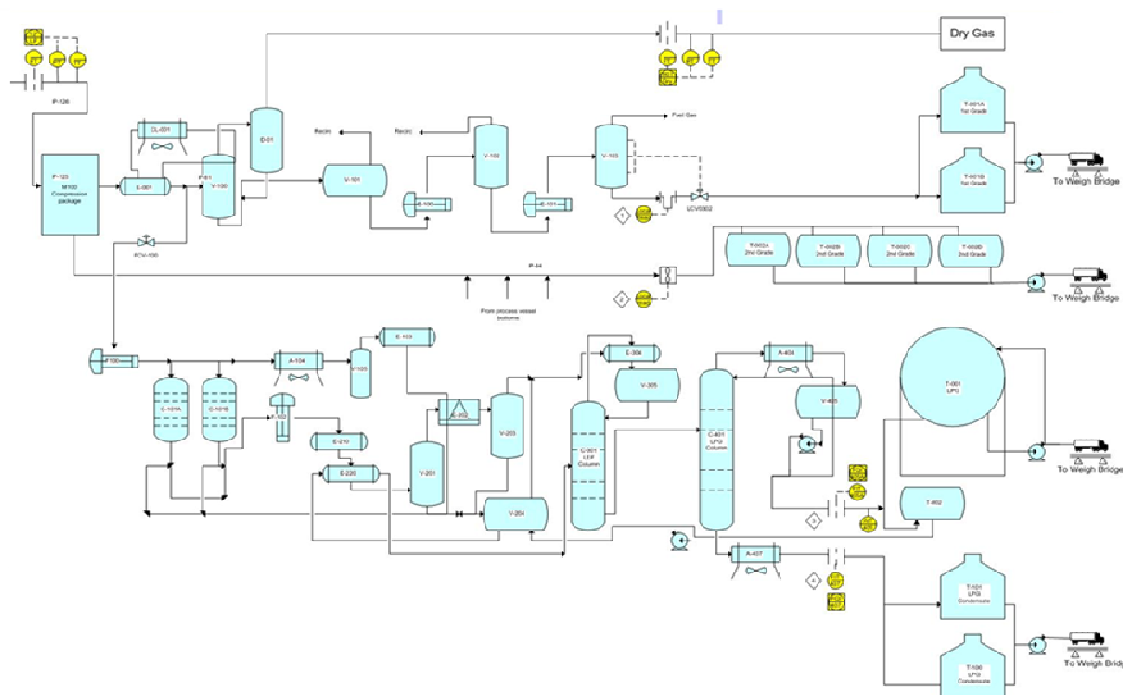
C.1. Parameters Monitored

The parameters monitored and the monitoring procedure applied for determination of the emission reductions is described in section B.7.1 and more specific in section B.7.2 of the Project Design Document v4.3 dated 6 November 2009, and available upon the UNFCCC website (<http://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1180000727.07/view>)

The location of measurement devices installed is presented in figure 2 below:

The monitoring is carried out according the accepted revised monitoring plan in the Project Design Document v4.3. The PDD is validated by TUV Nord. The validation of project activity changes was carried out by TUV Nord and the report is available at <http://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1180000727.07/view>

Figure 2 Location of the measurement devices



C.2. Quality Assurance/ Quality Control

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.

All data is compared from month to month using trend analysis to show where parameters have deviated significantly from preceding values. Any values identified as being unusual in this manner are re-checked and corrected if necessary, following the procedures in the monitoring manual.

Fugitive emissions of methane from the processing plant and pipelines and from accidental releases of methane from the transmission pipelines are calculated using the EPA approach¹ as per AM0009v2.

Any significant differences between daily / weekly / monthly or periodic values will be reviewed. An overview of the data collection process is provided in table 1 underneath. Detailed formulas for the calculation of emissions are presented in Section 3 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 Odira and if needed corrected
Leakage	Leakage is 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 Odira and if needed corrected

¹ Document EPA-453/R-95-017 available at <http://www.epa.gov/ttnchie1/publications.html>.

Project Emissions	The project 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 Odira 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 Odira and if needed corrected

Accuracy and calibration of instruments

All measurement devices are maintained to ensure a high level of accuracy. All meters are subject to a quality control regime that includes a regular maintenance and calibration according to manufacturer's instructions.

A record is available showing the location and unique identification number of each meter, the calibration status of that meter (when last calibrated, when next due for calibration).

Annual calibrations of continuous flow meters and weighbridge are performed (as locally required) by the Indonesian 'Direktorat Metrologi' (State organization). All calibration records are retained for until two years after the end of the crediting period and are available for verification by the DOE. Additional instrument verification, flow calculation and configuration checks are carried out periodically by SCC staff.

Uncertainties for each flow metering point are calculated using ISO5167. Uncertainties in batch measurement and analysis are in accordance with ISO5168. A copy of the uncertainty calculation is available for the verifying DOE.

Archiving of data

Data is archived periodically to a secure and retrievable storage format for a period 2 years after crediting period (see also Annex A).

Document Control

A document control system has been introduced ensuring that the current versions of necessary documents are available at the point of use. An overview of type of data, location and storage means is provided in the table included in Annex A.

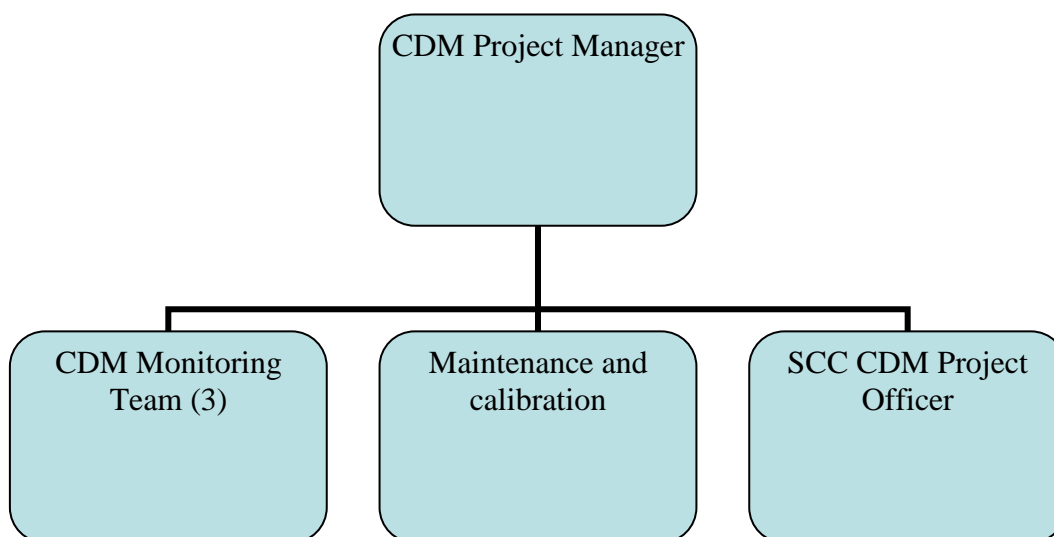
Treatment of missing or corrupted data

Where data in the on-line system 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 in question in the hour before the error arose or the hour immediately after the system came on-line again. If there is evidence to suggest that both of these values are un-representative, the average from the previous 24 hours will be used.

The error will be recorded in the daily log sheet and the occurrence of the error will be investigated and rectified as soon as possible. If the on-line system is compromised for more than 24 hours, data will be manually recorded..

The CDM Project Manager is responsible for overseeing the implementation of this procedure. The CDM Project Manager will closely work with CDM Monitoring team, maintenance and calibration team and SCC CDM project officer. The CDM project manager will ensure that the data monitored are accurately recorded, properly archived, QA/QC procedure was timely carried out and the entire monitoring process is strictly in line with the CDM requirements

The organizational structure will be as follows:



**SECTION D. Data and parameters****D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors**

Data / Parameter:	EF_{CO₂,fuel,v}
Data unit:	Tonnes CO ₂ per tonne
Description:	Default factor for gas oil / diesel
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) :	3.211 tCO ₂ per tonne
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Typical default value
Additional comment:	tCO ₂ /t EF negates the requirement for NCV and energy conversion

Data / Parameter:	GWP_{CH₄}
Data unit:	T CO ₂ e
Description:	Global warming potential of methane
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) :	21
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	This is the default value applied under the Kyoto Protocol
Additional comment:	No comment

Data / Parameter:	EF_{equipment,plant}
Data unit:	kg CH ₄ per hour
Description:	Emission rates from leakage of methane from processing plant
Source of data used:	Processing plant design drawings and source list. AM0009 default emission factors



Value(s) :	Equip	kgCH ₄ /hr	Number
	Valves	4.50E-03	215
	Pump seals	2.40E-03	0
	Other	8.80E-03	229
	Connectors	2.00E-04	0
	Flanges	3.90E-04	64
	Open ended lines	2.00E-03	0
	Valves (light oil)	2.50E-03	444
	Pump seals (light oil)	1.30E-02	0
	Other (light oil)	7.50E-03	0
	Connectors (light oil)	2.10E-04	0
	Flanges (light oil)	1.10E-04	481
Open ended lines	1.40E-03	0	
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Calculated as the sum of methane emissions from all of the flanges, valves etc in the processing plant.		
Additional comment:	No Comment		

Data / Parameter:	EF _{equipment,pipeline}																					
Data unit:	kg CH ₄ per hour leaking from pipelines																					
Description:	Summation of emissions from leakage of methane from pipeline																					
Source of data used:	Pipeline design drawings and AM0009 default emission factors																					
Value(s) :	<table><tr><th>Equip</th><th>kgCH₄/hr</th><th>Number</th></tr><tr><td>Valves</td><td>4.50E-03</td><td>4</td></tr><tr><td>Pump seals</td><td>2.40E-03</td><td>0</td></tr><tr><td>Other</td><td>8.80E-03</td><td>2</td></tr><tr><td>Connectors</td><td>2.00E-04</td><td>0</td></tr><tr><td>Flanges</td><td>3.90E-04</td><td>20</td></tr><tr><td>Open ended lines</td><td>2.00E-03</td><td>0</td></tr></table>	Equip	kgCH ₄ /hr	Number	Valves	4.50E-03	4	Pump seals	2.40E-03	0	Other	8.80E-03	2	Connectors	2.00E-04	0	Flanges	3.90E-04	20	Open ended lines	2.00E-03	0
Equip	kgCH ₄ /hr	Number																				
Valves	4.50E-03	4																				
Pump seals	2.40E-03	0																				
Other	8.80E-03	2																				
Connectors	2.00E-04	0																				
Flanges	3.90E-04	20																				
Open ended lines	2.00E-03	0																				
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	<p>Calculated as the sum of methane emissions from all of the flanges, valves etc in the pipeline.</p> <p>The design drawings show the following numbers of flanges, valves etc:</p>																					
Additional comment:	No comment																					

**D.2. Data and parameters monitored**

Data / Parameter:	V_{Av}
Data unit:	mmscf
Description:	The volume of gas recovered from the oil field at point A in Figure 1 in AM0009 ver2 during the period y in m ³
Measured /Calculated /Default:	Measured
Source of data:	Continuous measurements at metering points 12" and 4"
Value(s) of monitored parameter:	1,183.5248 mmscf
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline emissions and project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Orifice Plate Flow Meter Serial Number : 91F637499 Calibration Frequency : Annually Date of last Calibration: 1 July 2010 Validity: 1 July 2011
Measuring/ Reading/ Recording frequency:	Continuously, recorded hourly
Calculation method (if applicable):	N/A
QA/QC procedures applied:	Detailed procedures are described in the CDM Monitoring Manual

Data / Parameter:	$W_{A,carbon,y}$
Data unit:	kg-C/m ³
Description:	Average content of carbon in the gas recovered at point A in figure 1 during the period y in kg-C/m ³
Measured /Calculated /Default:	Measured
Source of data:	Pertamina Laboratory test result (External Laboratory)
Value(s) of monitored parameter:	(see CER spreadsheet)
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline & project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Gas Chromatograph
Measuring/ Reading/ Recording frequency:	Weekly
Calculation method (if applicable):	N/A
QA/QC procedures applied:	N/A



Data / Parameter:	V_{B,drygas}
Data unit:	mmscf
Description:	Quantity of dry gas that is produced in the gas processing plant (point B figure 1 in AM0009 ver2) during the period y in m ³
Measured /Calculated /Default:	Measured
Source of data:	Continuous measuring at the measuring point
Value(s) of monitored parameter:	920.2223 mmscf
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline and project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Orifice Plate Flow meter Serial Number : 27E526207 Calibration frequency : annually Date of Last Calibration: 26 October 2009 Validity : 26 October 2010
Measuring/ Reading/ Recording frequency:	Measured continuously, recorded hourly
Calculation method (if applicable):	N/A
QA/QC procedures applied:	Detailed procedures are described in the CDM Monitoring Manual

Data / Parameter:	W_{B,carbon,drygas,y}
Data unit:	kg-C/m ³
Description:	Average content of carbon in the gas recovered at point B in figure 1 during the period y in kg-C/m ³
Measured /Calculated /Default:	Measured
Source of data:	Pertamina Laboratory test result (External Laboratory)
Value(s) of monitored parameter:	(see CER spreadsheet)
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Baseline & project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Gas Chromatograph
Measuring/ Reading/ Recording frequency:	Weekly
Calculation method (if applicable):	N/A
QA/QC procedures applied:	Detailed procedures are described in the CDM Monitoring Manual



Data / Parameter:	M_{LPG,B,y}
Data unit:	kg or tonnes
Description:	The quantity of LPG that is produced in the gas processing plant (point B Figure 1) during the period y in kg
Measured /Calculated /Default:	Measured
Source of data:	Measurement by calibrated weighbridge
Value(s) of monitored parameter:	5,493.495 tonnes
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Weighbridge Mettler Toledo Type IND310 Serial Number : 0029136-6DH Calibration frequency: annually Date of last calibration: 28 November 2009 Validity: 28 November 2010
Measuring/ Reading/ Recording frequency:	Daily
Calculation method (if applicable):	
QA/QC procedures applied:	Detailed procedures are described in the CDM Monitoring Manual

Data / Parameter:	W_{B,carbon,LPG,y}
Data unit:	tCO ₂ /tonne
Description:	Carbon composition of LPG
Measured /Calculated /Default:	Measured
Source of data:	On-line Gas Chromatograph
Value(s) of monitored parameter:	See CER spreadsheet
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Gas Chromatograph Galvanic Applied Model: PLGC-GC-6C Serial Number: SN0622GC2115 Calibration frequency: monthly against standard gas
Measuring/ Reading/ Recording frequency:	Weekly
Calculation method (if applicable):	N/A
QA/QC procedures applied:	Following GPA Std 2216-95 Analysis for natural gas and similar gas mixtures by chromatography and GPA Std 2172 Natural Gas Analysis by Gas Chromatograph



Data / Parameter:	$M_{B,condensate,y}$
Data unit:	kg or tonnes
Description:	The quantity of condensate that is produced in the gas processing plant (point B figure 1) during the period y in kg.
Measured /Calculated /Default:	Measured
Source of data:	Calibrated weighbridge. All 3 quantification results (continuous flow metered data, calibrated weighbridge and calibrated road tanker information) are assessed (comparative analysis). Most accurate (lowest level of uncertainty) data set is used for reporting purposes.
Value(s) of monitored parameter:	Condensate : 1,499.095 tonnes 1 st Grade Condensate: 982.616 tonnes 2 nd Grade Condensate: 870.120 tonnes
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Weighbridge Mettler Toledo Type IND310 Serial Number : 0029136-6DH Calibration frequency: annually Date of last calibration: 28 November 2009 Validity: 28 November 2010
Measuring/ Reading/ Recording frequency:	Daily
Calculation method (if applicable):	N/A
QA/QC procedures applied:	Detailed procedures are described in the CDM Monitoring Manual

Data / Parameter:	$W_{B,carbon,condensate,y}$
Data unit:	tCO ₂ /tonne
Description:	Carbon composition of condensates
Measured /Calculated /Default:	Measured
Source of data:	Lemigas Laboratory (external) analysis results
Value(s) of monitored parameter:	See CER spreadsheets
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	N/A
Measuring/ Reading/ Recording frequency:	Monthly



Recording frequency:	
Calculation method (if applicable):	N/A
QA/QC procedures applied:	Detailed procedures are described in the CDM Monitoring Manual

Data / Parameter:	W_{CH₄,plant}
Data unit:	kg CH ₄ / kg
Description:	The average methane weight fraction in the respective stream in kg CH ₄ /kg
Measured /Calculated /Default:	Measured
Source of data:	Flow weighted average CH ₄ of all feed and dry gas streams derived from CH ₄ content of each of the following streams:- <ul style="list-style-type: none"> • 12” LP Input • M01 Dry gas Data are taken from Pertamina laboratory (external) analysis result
Value(s) of monitored parameter:	See CER spreadsheets
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project emission calculations
Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	N/A
Measuring/ Reading/ Recording frequency:	<i>The AM0009/VERSION 02.1 (DD. 13 MAY 2005) is not specific on frequency of calculation.</i> Monthly sampling, analysis calculation and application of emission factor is applied.
Calculation method (if applicable):	CH ₄ emission factor is calculated using the stoichiometric (vol) equation within the CER spreadsheet
QA/QC procedures applied:	Detailed procedures are described in the CDM Monitoring Manual

Data / Parameter:	W_{CH₄,pipeline}
Data unit:	kg CH ₄ / kg
Description:	The average methane weight fraction in the pipeline in kg-CH ₄ /kg
Measured /Calculated /Default:	
Source of data:	CH ₄ content of the M01 flow to pipeline Pertamina laboratory (external) results
Value(s) of monitored parameter:	See CER spreadsheets
Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations)	Project Emission calculations

Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity)	Gas Chromatograph
Measuring/ Reading/ Recording frequency:	<i>The AM0009/VERSION 02.1 (DD. 13 MAY 2005) is not specific on frequency of calculation.</i> Monthly sampling, analysis calculation and application of emission factor is applied.
Calculation method (if applicable):	CH ₄ emission factor is calculated using the stoichiometric (vol) equation within the CER Spreadsheet
QA/QC procedures applied:	Detailed procedures are described in the CDM Monitoring Manual

The input parameters are summarized in the following table

Data Input

			Condensate						
Date		Month	12" LP Gas	4" HP Gas	M01 Dry Gas	LPG	LPG	1st Grad	2nd Grad
From	To		mmscf	mmscf	mmscf	t	t	t	t
1	30	June	553.362	0.0000	432.767	2,688.499	714.434	472.836	404.564
1	31	July	630.163	0.0000	487.455	2,804.996	784.661	509.780	465.556
Total			1,183.5248	0.000000	920.2223	5,493.495	1,499.095	982.616	870.120

SECTION E. Emission reductions calculation

E.1. Baseline emissions calculation

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The formula used for determination of the baseline emissions are described in section B.6.1 of the Project Design Document v4.3 dated 6 November 2009, and available upon the UNFCCC website (<http://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1180000727.07/view>)

Baseline emissions are calculated as follows:

$$BL_y = V_{A,y} \cdot W_{carbon,A,y} \cdot \frac{44}{12} \cdot \frac{1}{1000}$$

where:

BL_y Are the baseline emissions during the period y in tons of CO₂ equivalents.

$V_{A,y}$ Is the volume of gas recovered from the oil field during the period y in m³.

$W_{carbon,A,y}$ Is the average content of carbon in the gas recovered during the period y in kg-C/m³.

The average methane content in the gas $w_{CH_4,A,y}$ is determined from regular measurements of the composition of the gas, taking into account the molecular weight of all fractions of the gas.

Baseline Emission Calculations

			12"LP Gas			4"HP Gas		
From	To	Month	Sm3	kgCO2/Sm3	tCO2	Sm3	kgCO2/Sm3	tCO2
1	30	June	15,669,458.878	3.047	47,747.866	-	-	-
1	31	July	17,844,233.978	3.092	55,182.590	-	-	-
Total			33,513,692.857		102,930.457	-	-	-

E.2. Project emissions calculation

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The formulas used for determination of the project emissions are described in section B.6.1 of the Project Design Document v4.3 dated 6 November 2009 and available upon the UNFCCC website (<http://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1180000727.07/view>).

Project emissions are calculated as follows:

$$PE_{CO_2, gas, y} = \frac{m_{carbon, A, y}}{m_{carbon, A, y} + m_{carbon, X, y}} \cdot (m_{carbon, A, y} + m_{carbon, X, y} - m_{carbon, B, y}) \cdot \frac{44}{12} \cdot \frac{1}{1000}$$

with

$$m_{carbon, A, y} = V_{A, y} \cdot W_{Carbon, A, y}$$

$$m_{carbon, B, y} = V_{B, dry\ gas, y} \cdot W_{carbon, dry\ gas, B, y} + m_{LPG, B, y} \cdot W_{carbon, LPG, B, y} + m_{condensate, B, y} \cdot W_{carbon, condensate, B, y}$$

$$m_{carbon, X, y} = \sum_i V_{Xi, y} \cdot W_{Carbon, Xi, y}$$

where:

$PE_{CO_2, gas, y}$	Are the CO ₂ emissions from the project activity due to combustion, flaring or venting of recovered gas during the period y in tons of CO ₂ .
$M_{carbon, A, y}$	Is the quantity of carbon in the recovered gas from the project area in during the period y in kg.
$m_{carbon, B, y}$	Is the quantity of carbon in the products (dry gas, LPG, condensate) leaving the gas processing plant during the period y in kg.
$m_{carbon, X, y}$	Is the quantity of carbon in recovered gas from other oil wells at all points Xi during the period y in kg.
$V_{B, dry\ gas, y}$	Is the quantity of dry gas that is produced in the gas processing plant during the period y in m ³ .
$m_{LPG, B, y}$	Is the quantity of LPG that is produced in the gas processing plant during the period y in kg.
$m_{condensate, B, y}$	Is the quantity of condensate that is produced in the gas processing plant during the period y in kg.
$V_{A, y}$	Is the volume of gas recovered during the period y in m ³ .
$V_{Xi, y}$	Is the volume of gas recovered from oil well I during the period y in m ³ .
$W_{carbon, A, y}$	Is the average content of carbon in the gas recovered during the period y in kg-C/m ³ .
$W_{carbon, dry\ gas, B, y}$	Is the average content of carbon in dry gas during the period y in kg-C/m ³ .
$W_{carbon, LPG, B, y}$	Is the average content of carbon in LPG during the period y in kg-C/kg.
$W_{carbon, condensate, B, y}$	Is the average content of carbon in condensate during the period y in kg-C/kg.
$W_{carbon, Xi, y}$	Is the average content of carbon in the gas recovered from oil well i during the period y in kg-C/m ³ .

The calculations are summarized in the tables below:

Project Emission Calculations

Date			V _A (Import)	W _{carbonA} (CO ₂)	M _{carbonA}	V _{drygas} Dry Gas	W _{carbondrygas} Dry Gas	M _{carbondrygas} Dry Gas
From	To	Month	Sm ³	kgC/Sm ³	tCO ₂	Sm ³	kgCO ₂ /Sm ³	tCO ₂
1	30	June	15,669,458.878	3.047	47,747.866	12,254,605.869	2.415	29,590.584
1	31	July	17,844,233.978	3.092	55,182.590	13,803,189.842	2.469	34,082.466
Total			33,513,692.857		102,930.457	26,057,795.712		63,673.051

Date			MLPG LPG	W _{carbonLPG} LPG	M _{carbonLPG} LPG	M _{carboncondensate} Cond	M _{carbonB} tCO ₂
From	To	Month	t	tCO ₂ /t	tCO ₂	tCO ₂	tCO ₂
1	30	June	2,688.499	3.012	8,096.700	4,854.433	42,541.717
1	31	July	2,804.996	3.011	8,446.220	5,378.731	47,907.418
Total			5,493.495		16,542.920	10,233.164	90,449.135

Date			V _{condLPG} Cond	SG _{CondLPG} Cond	M _{condLPG} Cond	W _{carboncondLPG} Cond	M _{carboncondLPG} Cond
From	To	Month	Sm ³	kg/lit	t	tCO ₂ /t	tCO ₂
1	30	June	1,099.13	0.65	714.43	3.05	2,178.12
1	31	July	1,210.58	0.65	786.88	3.05	2,398.54
Total			2,309.71		1,501.31		4,576.66

Date			V _{conde1stGrad} Cond	SG _{Cond1stGrad} Cond	M _{cond1stGrad} Cond	W _{carboncond1stGrad} Cond	M _{carboncond1stGrad} Cond
From	To	Month	Sm ³	kg/lit	t	tCO ₂ /t	tCO ₂
1	30	June	695.35	0.68	472.84	3.05	1,442.30
1	31	July	749.68	0.68	509.78	3.05	1,554.68
		August					
Total			1,445.02		982.62		2,996.98

Date			V _{cond2ndGrad} Cond	SG _{Cond2ndGrad} Cond	M _{cond2ndGrad} Cond	W _{carboncond2ndGrad} Cond	M _{carboncond2ndGrad} Cond
From	To	Month	Sm ³	kg/lit	t	tCO ₂ /t	tCO ₂
1	30	June	570.02	0.71	404.53	3.05	1,234.01
1	31	July	657.82	0.71	467.05	3.05	1,425.51
Total			1,227.84		871.58		2,659.53

If other fossil fuels than the recovered gas are consumed at the oil well and if this consumption is a result of the project activity (e.g. substitution of gas for on-site generation or use in the compressor station), CO₂ emissions from combustion of these fuels should also be accounted.

$$PE_{CO_2, other\ fuels, y} = \frac{1}{1000} \cdot \sum_{Fuels} m_{fuel, y} \cdot NCV_{fuel} \cdot EF_{CO_2, fuel}$$

where:

PE_{CO₂, other fuels, y} Are the CO₂ emissions due to consumption of other fuels than the recovered gas due to the project activity during the period y in tons of CO₂.

m_{fuel, y} Is the quantity of a specific fuel type that is consumed due to the project activity during the period y in kg.

NCV_{fuel} Is the net calorific value of the respective fuel type in kJ/kg.

EF_{CO₂, fuel} Is the CO₂ emission factor of the respective fuel type in kg CO₂/kJ.

Project Emissions (other)

	Volume	Mass	Mass	Mass
Period	liter	kg	kgCO2	tCO2e
June	80.00	67.40	214.75	0.21
July	595.00	501.26	1,597.18	1.60
Total	675.00	568.66	1,811.92	1.81

CH₄ emissions from recovery and processing the gas

Fugitive CH₄ emissions occurring during the recovery and processing of gas may in some projects be small, but should be estimated as a conservative approach. Emission factors are taken from the IPCC Good Practice Guidance and/or from the 1995 Protocol for Equipment Leak Emission Estimates, published by EPA2. Emissions are determined for all relevant activities and all equipment (such as valves, pump seals, connectors, flanges, open-ended lines, etc.)

Methane emissions are calculated for each single equipment by multiplying the CH₄ concentration in the respective stream with the appropriate emission factor as indicated in Table 1 of AM0009/version02.1.

$$PE_{CH_4, plants, y} = GWP_{CH_4} \cdot \frac{1}{1000} \cdot \sum_{equipment} w_{CH_4, stream} \cdot EF_{equipment} \cdot T_{equipment}$$

where:

- $PE_{CH_4, plants, y}$ Are the CH₄ emissions from the project activity at the gas recovery facility and the gas processing plant during the period y in tons of CO₂ equivalents.
- GWP_{CH_4} Is the approved Global Warming Potential for methane.
- $T_{equipment}$ Is the operation time of the equipment in hours (in absence of further information, the monitoring period could be considered as a conservative approach).
- $w_{CH_4, A, y}$ Is the average methane weight fraction in the respective stream in kg-CH₄/kg.
- $EF_{equipment}$ Is the appropriate emission factor from Table 1 (AM0009/version02.1) in kg/hour/equipment.

Fugitive LPG plant emissions (PECH4Plant)

Equipment Type	Factor kg/hr	Number	CH ₄ ton	CO ₂ e ton
Valves	4.50E-03	215	3.42	71.92
Pump seals	2.40E-03	0	0.00	0.00
Other	8.80E-03	229	7.13	149.80
Connectors	2.00E-04	0	0.00	0.00
Flanges	3.90E-04	64	0.09	1.86
Open ended lines	2.00E-03	0	0.00	0.00
Valves (light oil)	2.50E-03	444	3.93	82.51
Pump seals (light oil)	1.30E-02	0	0.00	0.00
Other (light oil)	7.50E-03	0	0.00	0.00
Connectors (light oil)	2.10E-04	0	0.00	0.00
Flanges (light oil)	1.10E-04	481	0.19	3.93
Open ended lines	1.40E-03	0	0.00	0.00
Total			14.76	310.02
Total for current period				51.67

CH₄ emissions from transport of the gas in pipelines under the normal operation condition

Fugitive CH₄ emissions occurring during the transport of the gas in pipelines are estimated as the same approach as “CH₄ emissions from recovery and processing the gas”, explained above.

$$PE_{CH_4, pipeline, y} = GWP_{CH_4} \cdot \frac{1}{1000} \sum_{equipment} w_{CH_4, pipeline} \cdot EF_{pipeline} \cdot T_{equipment}$$

where:

- $PE_{CH_4, pipeline, y}$ Are the CH₄ emissions from the project activity during the transport of the gas in pipelines under the normal operation during the period y in tons of CO₂ equivalents.
- GWP_{CH_4} Is the approved Global Warming Potential for methane.
- $w_{CH_4, pipeline}$ Is the average methane weight fraction in the pipeline in kg-CH₄/kg.
- $EF_{pipeline}$ Is the appropriate emission factor from Table 1 (AM0009/version02.1) in kg/hour/pipeline
- $T_{equipment}$ Is the operation time of the equipment in hours (in absence of further information, the monitoring period could be considered as a conservative approach)

Fugitive emissions from pipeline (PECH4Pipeline)

Equipment Type	Factor kg/hr	Number	CH ₄ ton	CO ₂ e ton
Valves	4.50E-03	4	0.09	1.87
Pump seals	2.40E-03	0	0.00	0.00
Other	8.80E-03	2	0.09	1.83
Connectors	2.00E-04	0	0.00	0.00
Flanges	3.90E-04	20	0.04	0.81
Open ended lines	2.00E-03	0	0.00	0.00
Total			0.21	4.51
Total for current period				0.75

CH₄ emissions from transport of the gas in pipelines when accidental event occurred

When an accident causes gas leakage from a pipeline, the gas leakage volume is less than the sum of (1) the total amount of gas that flowed during the time the accident occurred until the gas flow is shut and (2) the total amount of gas remaining in the pipeline. In the interest of conservativeness, the volume set out above should be estimated as the gas leakage from a pipeline caused by an accident.

CH₄ emissions from the transport of the gas in pipelines when accidental event occurred can be calculated as:

$$PE_{CH_4, pipeline, accident} = GWP_{CH_4} \cdot \frac{1}{1000} (V_{A, accident} + V_{remain, accident}) \cdot W_{CH_4, pipeline, accident}$$

with:

$$V_{A, accident} = t_{accident} \cdot F = (t_2 - t_1) \cdot F$$

$$V_{remain, accident} = d^2 \cdot \pi \cdot L \cdot \frac{P_p}{P_s} \cdot \frac{T_s}{T_p} \cdot \frac{V_{A, d, accident}}{\sum_i V_{xi, d, accident}}$$

where:

$PE_{CH_4, pipeline, accident}$	Are the CH ₄ emissions from the project activity due to transport of the recovered gas in the pipeline when the accidental event happens in tons of CO ₂ equivalent.
GWP_{CH_4}	Is the approved Global Warming Potential for methane.
$V_{A, t, accident}$	Is the volume of gas supplied from the oil well from the time the gas leakage started until the shutdown valves closed the pipeline in m ³ .
$V_{remain, accident}$	Is the volume of gas remaining in the pipeline after the shutdown valves close the pipeline in m ³ .
$W_{CH_4, pipeline, accident}$	Is the average methane weight fraction in the gas recovered in kg-CH ₄ /m ³
$t_{accident}$	Is the time difference between t1 and t2 determined as “retention time” in seconds.
t1	Is the time the gas leakage caused by the accident occurred. “t1” is determined based on the continuous monitoring data such as pressure etc.
t2	Is the time that the shutdown valves closed both the upstream and downstream pipeline. “t2” is determined based on the operation data.
F	Is the flow rate of gas supplied from the oil well
d	Is the radius of the pipeline in meters. The data is derived from P & I (Piping and Instrument).
π	Is the ratio of the circumference of a circle to its diameter.
L	Is the length of the pipeline in meters. The data is derived from P & I (Piping and Instrument).
Pp	Is the pressure in the pipeline when the shutdown valves close both the upstream and downstream of the pipeline in atmospheres (atm).
Ps	Is the standard pressure in atm.
Tp	Is the temperature in the pipeline when the shutdown valves close both the upstream and downstream of the pipeline in degrees Centigrade.
Ts	Is the standard temperature in Centigrade.
$V_{A, d, accident}$	Is the volume of gas supplied to the pipeline from oil well before the accident occurs during the period day in m ³ .
$V_{xi, d, accident}$	Is the volume of gas supplied to the pipeline from oil well i before the accident occurs during the period day in m ³ .

During the monitoring period no accidental events occurred.

**E.3. Leakage calculation**

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N/A

E.4. Emission reductions calculation / table

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Date		Month	BL	PECO ₂ gas	PECO ₂ Other	PECH ₄ Plant	PECH ₄ Pipeline	PECH ₄ Accident	CER
From	To								
1	30	June	47,747.866	5,206.149	0.215	25.835	0.376	0.000	42,515.292
1	31	July	55,182.590	7,275.173	1.597	25.835	0.376	0.000	47,879.610
Total			102,930.457	12,481.322	1.812	51.670	0.752	0.000	90,394.90

Total CER 1 June 2010 – 31 July 2010 (inclusive) = 90,394 tCO₂eq.

E.5. Comparison of actual emission reductions with estimates in the CDM-PDD

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This section shall include a comparison of actual values of the emission reductions achieved during the monitoring period with the estimations in the registered CDM-PDD.

Item	Values applied in ex-ante calculation of the registered CDM-PDD	Actual values reached during the monitoring period
Emission reductions (tCO ₂ e)	128,338	90,394

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

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As per registered PDD, the maximum CER generated by this project activity within the proposed Monitoring period is 128,338 ton of CO₂. The actual CER generation is 90,394 ton of CO₂. Hence, the actual CER generation is lower than the values applied in ex-ante calculation of the registered PDD.



CDM – Executive Board

Annex A Monitored Parameters

Parameter	Data Set / Document	Data	Format	Storage Location	Soft Copies		Retention Time
		Output			Transcribed to	Location	
V _{A,y}	Flow Meter 12" (Orifice Meter)	Hourly data, Flow Computer Pertamina	Soft/Hard copy (print out)	Pertamina Control Room /	Morning and Monthly Report	Odira Office, SCC Office	Crediting Period +2 year
		Barton charts	Hard copy (card read out)	Pertamina Control Room	Morning reports back-up	Odira Office, SCC Office	Crediting Period +2 year
	Flow Meter 4" (Orifice Meter)	Hourly data, Flow Computer Pertamina	Soft/Hard copy (print out)	Pertamina Control Room / Odira Plant	Morning and Monthly Report	Odira Office, SCC Office	Crediting Period +2 year
		Barton charts	Hard copy (card read out)	Pertamina Control Room	Morning reports back-up	Odira Office, SCC Office	Crediting Period +2 year
W _{carbon,A, y}	Pertamina Tegal Gede Gas Chromatograph (GC)	Weekly Composition	Hard copy	Pertamina Lab/ Odira Plant	CDM Monitoring Report Spreadsheet	Odira Office, SCC Office	Crediting Period +2 year
V _{B, dry gas,y}	Flow Meter M-01 (Orifice Meter)	Hourly data, Flow computer	Soft/Hard copy (print out)	Odira Plant	Morning and Monthly Report	Odira Office, SCC Office	Crediting Period +2 year
		Barton charts	Hard copy (card read out)	Odira Plant	Morning reports back-up	Odira Office, SCC Office	Crediting Period +2 year
W _{carbon, dry gas, B, y}	Pertamina GC	Weekly Composition	Hard copy	Pertamina Lab/ Odira Plant	CDM Monitoring Report Spreadsheet	Odira Office, SCC Office	Crediting Period +2 year
M _{LPG, B, y}	Orifice meter, weighbridge	Continuous Recording, Daily Aggregation	Hard copy	Odira Plant	Morning and Monthly Report	Odira Office, SCC Office	Crediting Period +2 year
W _{carbon, LPG, B, y}	Odira Gas Chromatograph	Weekly Composition	Hard copy	Odira Plant	CDM Monitoring Report Spreadsheet	Odira Office, SCC Office	Crediting Period +2 year
M _{Condensate, B, y}	Orifice meter, Micro meter, Turbine meter, weighbridge, roadtankers	Continuous Recording, Daily Aggregation	Hard copy	Odira Plant	Morning and Monthly Report	Odira Office, SCC Office	Crediting Period +2 year



Parameter	Data Set / Document	Data		Storage		Soft Copies		Retention Time
		Output	Format	Location		Transcribed to	Location	
W _{Carbon, Condensate, B, y}	Lemigas Lab Instruments	Monthly Composition	Hard copy	Lemigas/ Odira Plant		CDM Monitoring Report Spreadsheet	Odira Office, SCC Office	Crediting Period +2 year
M _{fuel, y}	Not applicable							
W _{carbon, IPCC}	Not applicable							
Fugitive Emissions	Plant Survey	Survey Report	Hard/Soft Copy	SCC Office (S server)		CDM Monitoring Report Spreadsheet	Odira Office, SCC Office	Crediting Period +2 year
T _{equipment}	Time recording	Operation Data	Hard Copy	Odira Operational Control Room		CDM Monitoring Report Spreadsheet	Odira Office, SCC Office	Crediting Period +2 year
W _{CH4, A, y}	Plant Survey	Survey Report	Hard/Soft Copy	SCC Office (S server)		CDM Monitoring Report Spreadsheet	Odira Office, SCC Office	Crediting Period +2 year
Fugitive Emissions	Plant Survey	Survey Report	Hard/Soft Copy	SCC Office (S server)		CDM Monitoring Report Spreadsheet	Odira Office, SCC Office	Crediting Period +2 year
T _{equipment, pipeline}	Time recording	Operation Data	Hard Copy	Odira Operational Control Room		CDM Monitoring Report Spreadsheet	Odira Office, SCC Office	Crediting Period +2 year
W _{CH4, pipeline}	Plant Survey	Survey Report	Hard/Soft Copy	SCC Office (S server)		CDM Monitoring Report Spreadsheet	Odira Office, SCC Office	Crediting Period +2 year
T1, T2	Time recording	Operation Data	Hard Copy	Odira Operational Control Room		CDM Monitoring Report Spreadsheet	Odira Office, SCC Office	Crediting Period +2 year
P	Pressure Pipeline	Operation Data	Hard Copy	Odira Operational Control Room		CDM Monitoring Report Spreadsheet	Odira Office, SCC Office	Crediting Period +2 year
T	Temperature Pipeline	Operation Data	Hard Copy	Odira Operational Control Room		CDM Monitoring Report Spreadsheet	Odira Office, SCC Office	Crediting Period +2 year
CER Calculation	CDM Monitoring Spreadsheet	Emission reduction data	Xls format	SCC Office (S-server)				Crediting Period +2 year
CDM Monitoring Report		Emission reduction data	Soft/hard Copy	SCC Office (S server)				Crediting Period +2 year
Internal Audit Report(s)		QC/QA	Soft Copy	SCC Office (S server)				Crediting Period +2 year
Maintenance Reports		QC/QA	Hard/soft copy	Odira Plant (Maintenance Dept)				Crediting Period +2 year
Calibration Records		QC/QA	Hard/soft copy	Odira Plant (Maintenance Dept)/SCC Office (S-server)				Crediting Period +2 year
Project Design Document				UNFCCC Website / SCC Office (S server)				Crediting Period +2 year
Approved Methodology				UNFCCC Website / SCC Office (S server)				Crediting Period +2 year
DOE verification reports				SCC Office (S server)				Crediting Period +2 year