Document Typology

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UNFCCC Project Reference

CDM Registration 1144

Project Title

Tambun LPG Associated Gas Recovery and Utilization Project

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

B.7.1 Data and parameters monitored:

Data / Parameter:	**V_{Ay}**
Data unit:	Mmscf
Description:	LPG plant wet gas input
Source of data to be used:	Continuous measurements at metering points 12" and 4" ~~and 6"~~ in Figures 2 and 4
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Tambun feed 12 mmscf/d forecast for years 1 to 5 and 10 mmscfd for years 6 to 10 When Pondok Tangah becomes offline excess associated gas at the Tambun field can be processed at Tambun LPG.
Description of measurement methods and procedures to be applied:	1. The 12" LP Tambun meter is a fiscal designed metering system on the 12" LP wet gas import line from Tambun. This meter is subject to government regulation and Metrology Department 'Directorat Metrologi' inspection and calibration. This is a pressure and temperature corrected orifice plate system utilising high quality transmitters and a dedicated flow computer. As such this system is capable of delivering measurement uncertainty less than 1%. 2. The 4" HP Tambun meter is a fiscal designed metering system on the 4" HP wet gas import line from Tambun. Tambun gas flows through this meter as a bypass when compression capacity is limited at the Condensate/LPG plant and the flow is included in baseline. This meter is subject to government regulation and Metrology Department 'Directorat Metrologi' inspection and calibration. This is a pressure and temperature corrected orifice plate system utilising high quality transmitters and a dedicated flow computer. As such this system is capable of delivering measurement uncertainty less than 1%. In case of shutdown or decommissioning of a pipeline the parameter will be 0. All shutdown (date/ period) will be recorded and to be made transparent in the monitoring report.
QA/QC procedures to be applied:	Ensure annual calibration is maintained throughout life of project Request calibration 'as-found' status to allow calibration errors to be assessed for materiality Ensure flow computer configured gas composition and or density values are

	updated monthly Data trend to be analysed in Monitoring Report Maintain calculation cell protection in Monitoring Report
Any comment:	No comment

Data / Parameter:	**$W_{A,carbon,y}$**
Data unit:	KgCO2/Sm3
Description:	Measured with gas chromatography
Source of data to be used:	Weekly samples taken manually from 12"and 4" sample points are measured by means of gas chromatography at an external laboratory analysis. Monthly average is used.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	12" LP Tambun feed - 3.1957 kgCO2/Sm3 from Q1 2007 analysis 4" HP Tambun bypass – not used in Ex Ante calculation as will be shut in.
Description of measurement methods and procedures to be applied:	Sample extraction and laboratory gas chromatograph analysis to international ASTM standards
QA/QC procedures to be applied:	Ensure sampling and analysis continue to be carried out in accordance with ASTM or equivalent standards Monthly data trend analysis in Monitoring Report Maintain calculation cell protection in Monitoring Report
Any comment:	No comment

Data / Parameter:	**$M_{A,carbon,y}$**
Data unit:	T CO2
Description:	Calculated from V_{Ay} * $W_{A.carbon,y}$
Source of data to be used:	Total metered volume from monthly sums of daily 00:00 – 00:00 metered volumes, manually transcribed from metering daily reports to Monthly Gas Report * Weighted average EF
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Tambun feed 380067 tCO2 in years 1 to 5, falling to 316723 tCO2 in years 6 to 10.
Description of measurement methods and procedures to be applied:	CO2 calculated monthly and summed annually
QA/QC procedures to be applied:	Monthly data trend analysis in Monitoring Report Maintain calculation cell protection in Monitoring Report
Any comment:	No comment

Data / Parameter:	$V_{B,drygas,y}$
Data unit:	Mmscf
Description:	Dry gas output
Source of data to be used:	Continuous measured flow from M01 dry gas output. Note this will not include bypass flow from 4", but that this is not required for PE calculations
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0.75 mmscf/mmscf forecast. Actual 0.8 mmscf/mmscf used
Description of measurement methods and procedures to be applied:	M01 dry gas meter is a fiscal designed metering system at the exit from the LPG plant. This meter is subject to government regulation and Metrology Department 'Directorat Metrologi' inspection and calibration. This is a pressure and temperature corrected orifice plate system utilising high quality transmitters and a dedicated flow computer. As such this system is capable of delivering measurement uncertainty less than 1%.
QA/QC procedures to be applied:	Ensure annual calibration is maintained throughout life of project Request calibration 'as-found' status to allow calibration errors to be assessed for materiality Ensure flow computer configured gas composition and or density values are updated monthly Data trend to be analysed in Monitoring Report
Any comment:	No comment

Data / Parameter:	$W_{B,carbon,drygas,y}$
Data unit:	kgCO2/Sm3
Description:	Measurement with gas chromatography
Source of data to be used:	Samples taken manually from M01 sample point and external laboratory analysis on a weekly basis and averaged to give monthly emission factor.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	2.753 kgCO2/Sm3 from Q1 2007 analysis Dry gas EF is expected to change slightly when PDT 6" feed is flowing. For years 2 and 3 this is estimated as no analysis data is available at this time.
Description of measurement methods and procedures to be applied:	Sample extraction and laboratory gas chromatograph analysis to international ASTM standards
QA/QC procedures to be applied:	Ensure sampling and analysis continue to be carried out in accordance with ASTM or equivalent standards Monthly data trend analysis in Monitoring Report Maintain calculation cell protection in Monitoring Report

Any comment:	No comment

Data / Parameter:	$\mathbf{M_{B,carbon,dry\ gas,y}}$
Data unit:	T CO2 per year
Description:	Calculated from $V_{B,dry\ gas,y}$ * $W_{B.carbon,dry\ gas,y}$
Source of data to be used:	Monthly sums of daily 00:00 – 00:00 metered volumes manually transcribed from metering daily reports to Monthly Gas Report * Weighted average EF
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Tambun flow 261,933 tCO2 in years 1 to 5 and 218,278 t CO2 in years 6 to 10,
Description of measurement methods and procedures to be applied:	CO2 calculated monthly and summed annually
QA/QC procedures to be applied:	Monthly data trend analysis in Monitoring Report Maintain calculation cell protection in Monitoring Report
Any comment:	No comment

Data / Parameter:	$\mathbf{M_{LPG,B,y}}$
Data unit:	Tonnes per year
Description:	LPG produced
Source of data to be used:	The quantity of LPG produced is determined by a calibrated weighbridge.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	60 tonnes per day based on an average yield of 5 tonnes of LPG per mmscfd and 12 mmscfd, increasing / decreasing in line with the gas feed.
Description of measurement methods and procedures to be applied:	The quantity of LPG produced is determined by a calibrated weighbridge. Weighbridge is subject to inspection and calibration by government Metrology Department. Calibration records show typical measurement uncertainty less than 1% . The daily production is adjusted to take into account the change in stock tank volume at 00:00 each day. Daily production is calculated as follows: - M LPG (t) = Total product sales – opening stock + closing stock Where the tank stock is converted to mass terms using the weekly actual LPG density value. Weighbridge data is cross-checked with daily readings of continuous flow meter. Both quantification results are assessed and most accurate (lowest level of uncertainty) number will be used for reporting purposes.
QA/QC procedures to be applied:	Ensure weighbridge, under control of and subject to calibration by the Department Metrologi remains calibrated through life of project.

	Ensure the flow meter is regularly maintained and calibrated in accordance with the manufacturer's instructions. Ensure consistency checks on LPG production to be performed by comparison of metered production against sales, which are based on the weighbridge data. The weighbridge under control of, and subject to calibration by the Department Metrologi.
Any comment:	No comment

Data / Parameter:	**$W_{B,carbon,LPG,y}$**
Data unit:	TCO2 per tonne
Description:	Measurement with e.g. gas chromatography
Source of data to be used:	Samples taken manually from LPG sample point and external laboratory analysis on a monthly basis. Emission factor calculated and applied monthly
Value of data applied for the purpose of calculating expected emission reductions in section B.5	3.004 tCO2/tonne from Q1 2007 analysis
Description of measurement methods and procedures to be applied:	Sample extraction and laboratory gas chromatograph analysis to international ASTM standards
QA/QC procedures to be applied:	Ensure sampling and analysis continue to be carried out in accordance with ASTM or equivalent standards Monthly data trend analysis in Monitoring Report Maintain calculation cell protection in Monitoring Report
Any comment:	No comment

Data / Parameter:	**$M_{B,carbon,LPG,y}$**
Data unit:	T CO2 per year
Description:	Calculated from $V_{B,LPG,y}$ * $W_{B.carbon,LPG,y}$
Source of data to be used:	Annual sum of: - Monthly LPG production * Monthly CO2 content
Value of data applied for the purpose of calculating expected emission reductions in section B.5	63084 tCO2 in years 1 to 5 and 52570 t CO2 in years 6 to 10
Description of measurement methods and procedures to be applied:	CO2 calculated monthly and summed annually
QA/QC procedures to be applied:	Monthly data trend analysis in Monitoring Report Maintain calculation cell protection in Monitoring Report
Any comment:	No comment

Data / Parameter:	$M_{B,condensate,y}$
Data unit:	Sm3
Description:	Condensate Produced
Source of data to be used:	The quantity of condensate produced is measured continuously by means of calibrated flow meters, calibrated weighbridge including stock levels as well as road tanker volumes using the calibrated weigh bridge. All quantification results are assessed and most accurate (lowest level of uncertainty) number will be used for reporting purposes.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	22.5 bbl/mmscf feed. Converted to mass terms using monthly Standard Density value from compositional analysis. 0.667 kg/lit applied for forecast data. Actual achieved to date is close at 21.3 bbl/mmscf
Description of measurement methods and procedures to be applied:	Each of the condensate products- LPG condensate, 1st Grade and 2nd Grade, production is monitored by measuring the quantities produces using the calibrated weighbridge under control of Indonesia's Department Metrologi. The daily production is adjusted to take into account the change in stock tank volume at 00:00 each day. Daily production is calculated as follows: - M condensate (t) = Total product sales – opening stock + closing stock In addition the condensates produced are monitored using continuous flowmeters: <u>1st Grade Condensate</u> The quantity of condensate produced is measured continuously by a Venturi type flow meter annually calibrated by Indonesia's Department Metrologi a more realistic value than the plant capacity of 100 TPD, reflecting the lower LPG content of the gas from Tambun field. This reduction is address further in the sensitivity analysis The fluid flowing in the pipe is led through a contraction section to a throat, which has a smaller cross-sectional area than the pipe, so that the velocity of the fluid through the throat is higher than that in the pipe. This increase of velocity is accompanied by a fall in pressure, the magnitude of which depends on the rate of flow, so that by measuring the pressure drop, the discharge may be calculated. This volume is converted to mass terms using monthly Standard Density value from compositional analysis. <u>2nd Grade Condensate</u> The quantity of condensate if measured continuously using a turbine flow meter calibrated (annually) by Indonesia's Department Metrologi . The flow meter is of volumetric type and measures the rate of flow via a rotor that spins as the liquid passes through its blades where the rotational speed is a direct function of flow rate. This is converted to mass terms using monthly

	Standard Density value from compositional analysis. LPG Condensate The quantity of condensate is measured continuously using a differential pressure orifice flow meter calibrated (annually) by Indonesia's Department Metrologi . The fluid flowing in the pipe is led through a contraction section to a throat, which has a smaller cross-sectional area than the pipe, so that the velocity of the fluid through the throat is higher than that in the pipe. This increase of velocity is accompanied by a fall in pressure, the magnitude of which depends on the rate of flow, so that by measuring the pressure drop, the discharge may be calculated. This volume is converted to mass terms using monthly Standard Density value from compositional analysis. 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 will be used for reporting purposes.
QA/QC procedures to be applied:	The weighbridge under control of, and subject to calibration by the Department Metrologi. Ensure the flow meter is regularly maintained and calibrated in accordance with the manufacturer's instructions. A consistency check on condensate production may be performed by comparison of metered production against sales, which are based on the weighbridge data. Road tanker volumes are controlled and subject to calibration by the Department Metrologi. This is the basis for custody transfer. The road tankers are also weighed across calibrated weighbridge for cross checking. All 3 quantification results (continuous flow metered data, calibrated weighbridge and calibrated road tanker information) are assessed and most accurate (lowest level of uncertainty) data will be used for reporting purposes. Ensure all road tanker calibration certificates remain valid through life of project. Ensure weighbridge calibration remains valid for life of project Ensure correct transcription to Monitoring report Data trend to be analysed in Monitoring Report
Any comment:	No comment

Data / Parameter:	$\mathbf{W_{B,carbon,condensate,y}}$
Data unit:	TCO2 per tonne
Description:	Measurement with e.g. gas chromatography
Source of data to be used:	Samples taken manually from-condensate storage tanks and external laboratory analysis on a monthly basis. Emission factor calculated and applied monthly
Value of data applied for the purpose of calculating expected	3.044 tCO2/tonne from Feb 2007 analysis

emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Sample extraction and laboratory gas chromatograph analysis to international ASTM standards
QA/QC procedures to be applied:	Ensure sampling and analysis continue to be carried out in accordance with ASTM or equivalent standards Monthly data trend analysis in Monitoring Report Maintain calculation cell protection in Monitoring Report
Any comment:	No comment

Data / Parameter:	**$M_{B,carbon,condensate,,y}$**
Data unit:	T CO2 per year
Description:	Calculated from $M_{B,condensate,y}$ * $W_{B.carbon,condensate,y}$
Source of data to be used:	Annual sum of: - Monthly LPG condensate production * Monthly LPG condensate CO2 content + Monthly 1st Grade condensate production * Monthly 1st Grade CO2 content + Monthly 2nd Grade condensate production * Monthly 2nd Grade CO2 content
Value of data applied for the purpose of calculating expected emission reductions in section B.5	30465 tCO2 in years 1 to 5 and 25387 in years 6 to 10
Description of measurement methods and procedures to be applied:	CO2 calculated monthly and summed annually
QA/QC procedures to be applied:	Monthly data trend analysis in Monitoring Report Maintain calculation cell protection in Monitoring Report
Any comment:	No comment

Data / Parameter:	**$M_{fuel,,y}$**
Data unit:	Tonnes
Description:	LPG plant use of diesel fuel for firepumps, compressors and standby generation
Source of data to be used:	Monthly diesel (gas oil) deliveries plus opening stock less closing stock from tank dips * Standard density
Value of data applied for the purpose of calculating expected	0.842 tonnes

emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Typical methodology for determining total consumption of liquid fuels. No assessment of accuracy applied as highly deminimus source of project emissions.
QA/QC procedures to be applied:	Stock take carried out to recognised standard Monthly Diesel Report total transcribed correctly to Monitoring Report
Any comment:	No comment

Data / Parameter:	$\mathbf{W_{CH4,plant}}$
Data unit:	Kg CH4 / Kg
Description:	CH4 content of plant gas
Source of data to be used:	Annual average methane content of dry and wet gas CH4 from compositional analysis
Value of data applied for the purpose of calculating expected emission reductions in section B.5	36.9%
Description of measurement methods and procedures to be applied:	CH4 content of dry gas from the previous 12 months, or if accident occurs within 12 months of start-up, best available average.
QA/QC procedures to be applied:	As per compositional analysis Monthly data trend analysis in Monitoring Report Maintain calculation cell protection in Monitoring Report
Any comment:	No comment

Data / Parameter:	$\mathbf{T_{equipment,plant}}$
Data unit:	Hrs
Description:	Plant annual running hours
Source of data to be used:	Forecast operating hours
Value of data applied for the purpose of calculating expected emission reductions in section B.5	8592 hours
Description of measurement methods and procedures to be applied:	358 days * 24 hours allowing for 7 days planned annual shutdown
QA/QC procedures to be applied:	Running hrs to be updated in the event of any unplanned shutdown
Any comment:	No comment

Data / Parameter:	$W_{CH4,pipeline}$
Data unit:	Kg CH4 / kg
Description:	CH4 content of pipeline gas
Source of data to be used:	Annual average methane content of dry gas CH4 from compositional analysis
Value of data applied for the purpose of calculating expected emission reductions in section B.5	43.53%
Description of measurement methods and procedures to be applied:	CH4 content of dry gas from the previous 12 months, or if accident occurs within 12 months of start-up, best available average.
QA/QC procedures to be applied:	As per compositional analysis Monthly data trend analysis in Monitoring Report Maintain calculation cell protection in Monitoring Report
Any comment:	No comment

Data / Parameter:	$T_{equipment,pipeline}$
Data unit:	Hours
Description:	Annual operating hours
Source of data to be used:	Forecast operating data
Value of data applied for the purpose of calculating expected emission reductions in section B.5	8592 hours
Description of measurement methods and procedures to be applied:	As above 358 days allowing for an 7 day planned shutdown
QA/QC procedures to be applied:	Monitoring report to be updated following any unplanned shutdown
Any comment:	No comment

Data / Parameter:	T1 and T2
Data unit:	Time
Description:	Time between 1st evidence of leak and shutdown valves closing
Source of data to be used:	Pressure, temperature and flowrate trends
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Nil

Description of measurement methods and procedures to be applied:	AM0009 methodology Required for calculation of $V_{A,accident}$
QA/QC procedures to be applied:	Appropriate to incident
Any comment:	No comment

Data / Parameter:	**F**
Data unit:	Sm3 per hour
Description:	Pipeline entry flow rate
Source of data to be used:	Sum of M1 and 4" HP bypass metered data. (Please refer to figure 2)
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Nil
Description of measurement methods and procedures to be applied:	Metering points as used for baseline flow data Required for calculation of $V_{A,accident}$
QA/QC procedures to be applied:	Meters used as per baseline determination. Metering QA/QC assured through calibration program.
Any comment:	No comment

Data / Parameter:	**$P_{pipeline}$**
Data unit:	Bara
Description:	Pressure in pipeline at time of valve closure
Source of data to be used:	Pipeline section pressure transmitter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Nil
Description of measurement methods and procedures to be applied:	Required for calculation of $V_{remain,accident}$
QA/QC procedures to be applied:	Appropriate to incident
Any comment:	No comment

Data / Parameter:	**$T_{pipeline}$**
Data unit:	Degrees Centigrade
Description:	Temperature in pipeline at time of valve closure

Source of data to be used:	Pipeline section temperature transmitter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Nil
Description of measurement methods and procedures to be applied:	Required for calculation of $V_{remain,accident}$
QA/QC procedures to be applied:	Appropriate to incident
Any comment:	No comment

B.7.2 Description of the monitoring plan:

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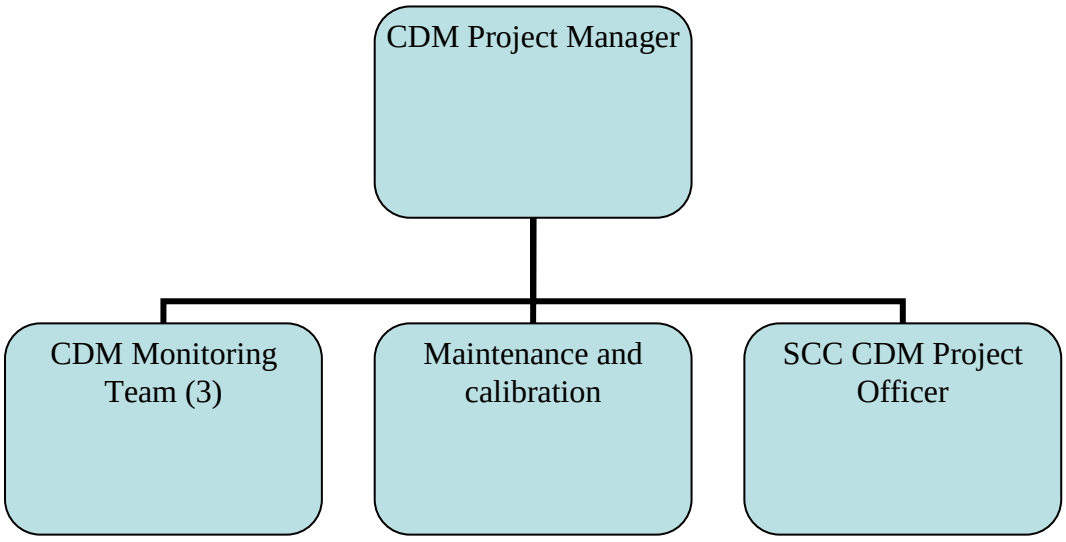
Draft Procedure for implementation of Tambun LPG Associated Gas Recovery and Utilization Project Monitoring Plan

Purpose: To ensure that the approved monitoring methodology is correctly implemented in order to enable the accurate and transparent determination of avoided emissions.

Scope: This procedure covers the project activity described in the CDM project entitled Tambun LPG Associated Gas Recovery and Utilization Project.

Responsibility: The CDM Project Manager is responsible for overseeing the implementation of this procedure. Competency requirements for the position of Project Manager will be defined and applied to ensure that the Project Manager is able to implement this procedure. Additional competencies e.g. for the maintenance and calibration of the meters and online reporting system will be sourced externally where necessary. The organisational structure will be as follows:



Wet gas Import and Dry Gas Export Measurement - On-line live metering systems

All key meters required to determine GHG emissions and emission reductions will be monitored on a daily basis. For the gas import and export metering, flow rate is calculated using orifice plate differential pressure metering systems. Each system comprises of an industry standard dedicated flow computer, calculating standard (normalised) volume flow rate to AGA3 standard from live field instrument 4-20mA inputs and manually configured gas property values.

The field instruments are dual range differential pressure, line pressure and temperature transmitters. The flow computers calculate flow rate typically on a 5 second cycle and calculate hourly and daily totalised flow. Daily reports are printed automatically showing the 00:00- 00:00 total flow, pressure, temperature and density values.

The flow calculation requires line (flowing) density at the meter and standard density values and these are calculated within the flow computer to AGA8 standard from the gas composition mole %. The composition is updated on a weekly basis from the analysis results for each stream.

These daily report totals are transcribed manually to the Monthly Gas Report, and from there to the CDM Monitoring Report.

The gas is sampled and analysed at each metering point on a weekly basis for molar composition using gas chromatographs, with the analytical services being provided by an approved third party. The results (examples of which are shown in Annex 3) provide the % molar composition of the different fractions of carbohydrates, from which the carbon content may be determined. The average CO2 content is calculated and applied to monthly total flow.

LPG and Condensate Production

In addition to calibrated weighbridge the quantities of LPG and Condensate produced are being measured continuously by means of flow meters . Determination methodologies are assessed and for reporting purposes most accurate (lowest level of uncertainty) result is applied.

The LPG and LPG condensate are measured continuously via Orifice meter installed upstream of LPG and LPG condensate tanks. This meter is set up to provide continuous measurements electronically to the plant control room and also has a local readout display.

The 1st Grade Condensate is measured continuously via a micro motion-type meter installed upstream of the condensate tank.

The 2nd Grade Condensate is continuously monitored by means of a turbine flow meter. This meter is of volumetric type is set up to provide continuous measurements electronically to the plant control room and also has a local readout display

The composition of the LPG is measured on a weekly basis by means of a gas chromatograph.

The composition of the condensate is sampled on a monthly basis and measured using gas a chromatograph, with the analytical services being provided by an approved third party.

LPG Production - Batch measurement

LPG production is monitored by measuring the weight of product using the on-site weighbridge under control of Indonesia's Department Metrologi. The daily production balance is adjusted to take into account the change in stock held at the start and end of each day. The stock is measured continuously by the LPG tank level instruments. Total daily production is calculated in the Daily Report as follows: -

M LPG (t) = Total product export – opening stock + closing stock

Delivery records are summed and the balance calculated in each Daily Report. The Daily Report totals are then transcribed to the Monthly Production Report.

As indicated in parameter section continuous flow meter data is recorded and comparative analysis will be performed. Most accurate (lowest level of uncertainty) data set will be used for reporting purposes.

Condensate Production – Batch Measurement

Condensate production is monitored by measuring the quantity of product produces using the calibrated weighbridge in addition to calibrated road tanker volumes (custody transfer). Both road tanker and weighbridge calibrations are under control of, and undertaken by Indonesia's Department Metrologi. The daily production balance is adjusted to take into account the change in volume of stock held at end of each day. Total daily production is calculated as follows: -

Mcondensate (t) = Total product export – opening stock + closing stock

In addition to calibrated weighbridge data the quantities of condensates produced are being measured continuously by means of flow meters

Delivery records are summed and the daily production calculated in each Daily Report. The Daily Report totals are then transcribed to the Monthly Production Report.

LPG is sampled weekly. Condensates are sampled and analysed on a monthly basis using an external accredited laboratory.

All 3 quantification results (continuous flow metered data, calibrated weighbridge and calibrated road tanker information) are assessed and most accurate (lowest level of uncertainty) number will be used for reporting purposes.

Calculation of avoided emissions:

The data required to calculate baseline emissions and project emissions will be fed into a protected CER/CDM spreadsheet which will calculate the emission reductions according to

the formulae described above, using the defined default values. Access to the spreadsheet will be controlled. The spreadsheet will be include various checks, such as a comparison of total methane consumed against total power generated and the spreadsheet will be regularly audited to ensure it is operating correctly.

The CER/CDM spreadsheet will be available for the DOE during verification purposes.

Uncertainty Analysis Meeting Requirements of EB23

Year	2007,2010, 2011 tCO2	2008-2009 tCO2	2012-2016 tCO2	Flow Uncertainty	EF Uncertainty	Combined Uncertainty
12" LP Feed	380067.06	380067.06	316722.55	2.07%	1.00%	2.30%
4" HP Bypass	0.00	0.00	0.00	1.95%	1.00%	2.19%
6" PDT Feed	0.00	393437.85	0.00	1.50%	1.00%	1.80%
Dry Gas M01	261933.13	535188.47	218277.61	1.65%	1.00%	1.93%
LPG	63084.00	131372.43	52570.00	1.00%	1.00%	1.41%
Cond	30464.47	68545.06	25387.06	1.00%	1.00%	1.41%
Baseline (BL)	380067.06	773504.92	316722.55			
Project Emissions (PECO2)	24585.46	38398.96	20487.88			
PE Other	387.49	387.49	387.49			5%
CER	355094.11	734718.47	295847.18			
BL Uncertainty	2.30%	1.45%	2.30%			
PECO2 Uncertainty	28.71%	10.30%	28.71%			
CER Uncertainty	1.45%	1.43%	1.45%			

Uncertainties for each flow metering point are calculated using ISO5167. Uncertainties in batch measurement and analysis are added subjectively and the overall uncertainties calculated in accordance with ISO 5168. A high uncertainty in PECO2gas is to be expected due to the by-difference calculation method. This is accepted within the AM0009 methodology. The overall uncertainty in CERs are calculated to be within typical verification materiality.

Quality control

Data will be compared from month to month using trend analysis to show where parameters have deviated significantly from preceding or following values. Any values identified as being unusual in this manner will be rechecked. Where preceding or following values are not available, references values may be taken from published data, other oil wells etc. as appropriate. Commercial data (i.e. invoices and delivery notes) will be used to corroborate total volumes of:

- incoming gas
- products including dry gas, condensate and LPG
- incoming fuels – i.e. fuel oil for standby engines

Fugitive emissions of methane from the processing plant and pipelines and from accidental releases of methane from the transmission pipelines will be checked against the IPCC Good Practice Guidelines Table 2.16 (page 2.86) available at the following link: http://www.ipcc-

nggip.iges.or.jp/public/gp/english/2_Energy.pdf
Any significant differences between these values will be reviewed, taking into consideration the overall magnitude of the emissions.

For condensates all 3 quantification results (continuous flow metered data, calibrated weighbridge and calibrated road tanker information) are assessed and most accurate (lowest level of uncertainty) number will be used for reporting purposes. An uncertainty assessment will be conducted each monitoring period to determine most accurate information. This assessment will be available for the DOE as part of the verification process.

The practical way to determine and assess the uncertainty (and decide on most accurate data for reporting purposes) associated to the amount of a stream consists of the following steps(specific reference is made to ISO-5168:2005 "Measurement of fluid flow – Procedures for the evaluation of uncertainties and Guide to the Expression of uncertainty in measurement, ISO/TAG 4. Published by ISO (1993; improved reprint, 1995) on behalf of BIPM, IEC, IFCC, ISO, IUPAC, IUPAP and OIML).:

Step 1: Assess the uncertainty of the measurement instrument;

This step concerns the instrument specific uncertainty that is linked to the measurement principle of a meter.

Step 2: Assess the additional uncertainty of "context specific" factors (i.e. how the measurement instrument is used in practice);

To assess the additional uncertainty the following questions we will assess:

- Is the measurement instrument installed according to the requirements of the manufacturer or, if those data are not available, according to general requirements that apply to that measurement principle?
- Is the medium (gas, fluid, solid substance) that is measured by the meter a medium for which the measurement instrument has been designed according to the requirements of the manufacturer or, if these data are not available, according to the general requirements applicable to that measurement principle?
- Are there no other factors that can have adverse consequences on the uncertainty of the measurement instrument?

Step 3: Assess the uncertainty of pressure and temperature corrections for gas meters;

Pressure and temperature corrections are only applicable to the determination of the amount of gas and not to the measurement of fluids or solid substances. Uncertainty is based upon manufacturers information.

Step 4: Sum up the uncertainties of steps 1, 2 and 3;

Steps 1, 2 and 3 lead to uncertainty levels that need to be summed up to determine the total uncertainty of the individual quantity measurement.

Accuracy and calibration of instruments

All meters will be purchased and maintained to ensure a high level of accuracy. The exact specifications of each meter will be determined during the detailed design of the project. Thereafter the meter accuracies will be included in this procedure and steps taken to maintain those levels of accuracy.
All key meters will be subject to a quality control regime that will include regular maintenance and calibration. A record will be maintained showing the location and unique identification number of each meter, the calibration status of that meter (when last calibrated, when next due for calibration) and who performs the calibration service. Calibration certificates will be retained for all meters until two years after the end of the crediting period.

Determination of carbon consumed on-site will be by mass balance and therefore accuracy is very important as small errors in large number (incoming wet gas and outgoing dry gas) will have a big impact upon the relatively small consumption of gas. Metering of gas consumption is being considered.

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

Document Control
The Project Manager will implement a document control system that ensures that the current versions of necessary documents are available at the point of use. All documents must be maintained in English with local translations because English is the formal language of the CDM.

Preparation of monitoring report
The archived / live data will be used to prepare a periodic monitoring report to be submitted to the CDM EB for verification and issuance of CERs. A standard format for the monitoring report will be prepared and prior to the submission of the first monitoring report.

Manual data recording system
The CDM Project Manager will implement a manual data recording system to act as a back-up for the on-line system. This will involve completion of a daily log sheet that records flow meter readings at the start of the day (which is also the end of the previous day). Spot readings of other values (temperature, pressure of gas, flow rate) will also be recorded periodically and at the times when flow meter readings are taken. At least one set of manual readings will be taken directly from the meters each day, and used to check the read-outs in the control room.
These log sheets will act as a back-up for total volume combusted and a means of estimating

other essential data in the event of a prolonged failure of the on-line system (prolonged failure will constitute more than 24 hours (uninterrupted) without on-line monitoring).

Treatment of missing or corrupted data

Where data in the on-line system are corrupted or missing whilst the plant is operating (as shown, for example, stock change records) 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.

Audit function and management review

The Project Manager will arrange for an audit of the management system periodically and at least once per year. The auditor will not be involved in the daily operation of the mine and if necessary, may be sourced from a third party. The auditor will assess the implementation of the monitoring procedure and the preparation of the monitoring report. Audit findings, and steps taken to address findings will be recorded and reviewed in a Management Review meeting (convened at least annually) at which time the effectiveness of these procedures will be reviewed and necessary changes implemented.

Please refer to Annex 4 for full details of the monitoring plan (available to DOE).