Monitoring report form for CDM project activity
(Version 06.0)

MONITORING REPORT

Title of the project activity	Use of waste gas at Namakwa Sands in South Africa	
UNFCCC reference number of the project activity	5884	
Version number of the PDD applicable to this monitoring report	Version: 09, Dated:13/11/2012	
Version number of this monitoring report	01	
Completion date of this monitoring report	27/11/2018	
Monitoring period number	01	
Duration of this monitoring period	31/12/2013 – 31/05/2018 (Inclusive of both the dates[1])	
Monitoring report number for this monitoring report	01	
Project participants	Tronox Mineral Sands (Pty) Ltd WeAct Pty Ltd	
Host Party	Republic of South Africa	
Sectoral scopes	1 : Energy industries (renewable - / non-renewable sources) 4 : Manufacturing industries	
Applied methodologies and standardized baselines	Applied Methodologies: ACM0012 Version 04, "Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects" Standard Baseline: Not Applicable	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	0	220,821[2]
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	372,888[3]	

[1] The monitoring period starts from the start date of crediting period, i.e. 31/12/2013. However, the actual monitoring period covered under this verification is from 01/01/2014 as project plant was commissioned on 01/01/2014 only, thus ERs are accounted from 01/01/2014.

[2] Detailed calculation is provided in the ER Sheet.

[3] Estimated ex-ante value is calculated in the ER Sheet.

SECTION A. Description of project activity

A.1. General description of project activity

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The purpose of project activity is to utilize waste gas generated from smelter operation for the generation of electricity. The electricity is generated using 8 internal combustion gas engines having electrical output of 1698 kW each. The generated electricity by the project activity is consumed by Tronox Mineral Sands (Pty) Ltd. furnace operations and thereby reducing its electricity consumption from the national grid. Thus, utilization of the furnace off-gas for electricity generation replaces the grid electricity utilization; which is predominantly based on fossil fuel.

The project activity is located at Namakwa Sands in South Africa, which is owned by Tronox Mineral Sands (Pty) Ltd. Tronox is having heavy minerals mining, and beneficiation business located in South Africa and is the project participant to the project activity[4]. Tronox Mineral Sands (Pty) Ltd smelting operation consists of two closed DC-arc furnaces:

i) Furnace 1 is having an electrical capacity of 25 MW and a tapping capacity of 20 tonnes of slag every 2 hours and 30 tonnes of metal every 4 hours and;

ii) Furnace 2 is having an electrical capacity of 35 MW and a tapping capacity of 25 tonnes of slag every 1.5 hours, and 30 tonnes of metal every 2.5 hours.

The waste gas from smelter comprises of CO and H_2 gas, which referred as furnace off-gas. Prior to project activity the furnace off-gas was cleaned and then flared. The flaring of the cleaned gas is a safety measure, as carbon monoxide is extremely poisonous. Cleaning of the gas prior to flaring is required to reduce the particulate emissions from the flares. However, the flaring of the off-gas means that the energy inherent in the gas is not utilised. The project activity uses this cleaned furnace off-gas (which was previously flared) to generate electricity using internal combustion engines. Thus, utilization of the amount of furnace off-gas for generation of electricity directly helps reducing the GHG gases emission by replacing an equivalent amount of electricity at gird.

Namakwa Sands used to purchase its electricity from Eskom. Eskom is physically connected to the Southern African Power Pool (SAPP). Electricity from the SAPP is predominantly generated from sub-bituminous coal, with a low heat value and a high ash content (83% of the electricity is from coal-fired power stations). Owing to the use of coal and, more specifically, low quality coal, the emission factor of the SAPP is 1.036 tonnes CO_2e/MWh. The total emission reductions achieved under this monitoring period "31/12/2013 – 31/05/2018" (inclusive of both the dates) is 220,821 tCO_2e.

A.2. Location of project activity

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(a) Host Party(ies);
Republic of South Africa

(b) Region/State/Province, etc:
Western Cape Province

(c) City/Town/Community, etc:
The project is located approximately 15km from the town of Saldanha Bay.

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[4] Exxaro Resources Limited was the project participant earlier, which was withdrawn via MOC dated 17/12/2013 and all required changes in MOC to nominate Tronox as project participant and focal point were done and approved by UNFCCC in subsequent MOCs.

(d) Physical/ Geographical location:
The plant is located at the Namakwa Sands' smelting operations in South Africa. The site is located within the Saldanha Bay Local Municipality, which is one of the municipalities encompassed under the West Coast District Municipality in the Western Cape. The site is 15 km from the towns of Vredenburg and Saldanha and is off the coastal road the R27.

The new project facility will be located at the following GPS coordinates:

Latitude : 32° 57' 43" S
Longitude : 18° 02' 39" E

Figure 1: The provincial location of the project activity

Figure 2: The location of the project activity, which is at the Namakwa Sands smelting facility

A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of South Africa (host Party)	Tronox Mineral Sands (Pty) Ltd.	No
Australia	WeAct Pty Ltd	No

A.4. Reference to applied methodologies and standardized baselines

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Sectoral scope 01: Energy industries (renewable-/non-renewable sources)
Sectoral scope 04: Manufacturing industries

The approved baseline and monitoring methodology is ACM0012: ‘Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects’, Version 04.0.0,

The following methodological tools were used:
‘Tool to calculate the emission factor for an electricity system’ (Version 02.2.1)
‘Tool for the demonstration and assessment of additionality’ (Version 06.0.0)
‘Tool to determine the remaining lifetime of equipment’ (Version 01)
‘Tool to calculate baseline, project and/or leakage emissions from electricity consumption’ (Version 01)

A.5. Crediting period type and duration

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The length of the Crediting period of the project activity as per registered PDD is 10 years (Fixed). The crediting period start date is 31/12/2013 and duration of crediting period is from 31/12/2013[5] to 30/12/2023.

[5] Crediting period start date is 31/12/2013, however PP has calculated the emission reductions from the date of commissioning of the project activity, i.e. from 01/01/2014.

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

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The project activity involves the installation of 8 internal combustion gas engines to utilize the waste furnace off gas generated from the Namakawa Sands smelter operation within the premises of Namakwa sands smelting operation. The 8 gas engines for the project activity were supplied by GE Jenbacher.

The project activity was commissioned on 01/01/2014 and in operation since commissioning without any type of change in the installed capacity & technology measure. There is no change in the project activity capacity or equipment since commissioning.

Technical specifications:

Engine type	: J 620 GS-F57
Working Principle	: 4 – Stroke
Electric Output	: 1,698kW/engine
Bore	: 190 mm
Stroke	: 220 mm
Piston Displacement	: 124.75 lit
Nominal Speed	: 1,500 rpm
Mean Piston Speed	: 11 m/s
Length	: 5,542 mm
Width	: 1,900
Height	: 2,540

Namakwa Sands operates two closed, DC-arc furnaces that were built by Aesa Brown Boveri:

- Furnace 1
  - Electrical capacity: 25 MW.
  - Tapping capacity: 20 tonnes of slag every 2 hours and 30 tonnes of metal every 4 hours.

- Furnace 2
  - Electrical capacity: 35 MW.
  - Tapping capacity: 25 tonnes of slag every 1.5 hours and 30 tonnes of metal every 2.5 hours.

Inside these furnaces, ilmenite is reduced to produce titania slag and iron. Along with titania slag and iron, a gas (furnace off-gas) composed primarily of carbon monoxide and hydrogen is produced.

The composition of the furnace off-gas varies, but the table below presents the average composition of the gas based on information supplied by Namakwa Sands:

Furnace	Component	Composition (vol. %)
Furnace 1	CO	73.0
	H_2	14.5
Furnace 1	CO	75.5
	H_2	16.5

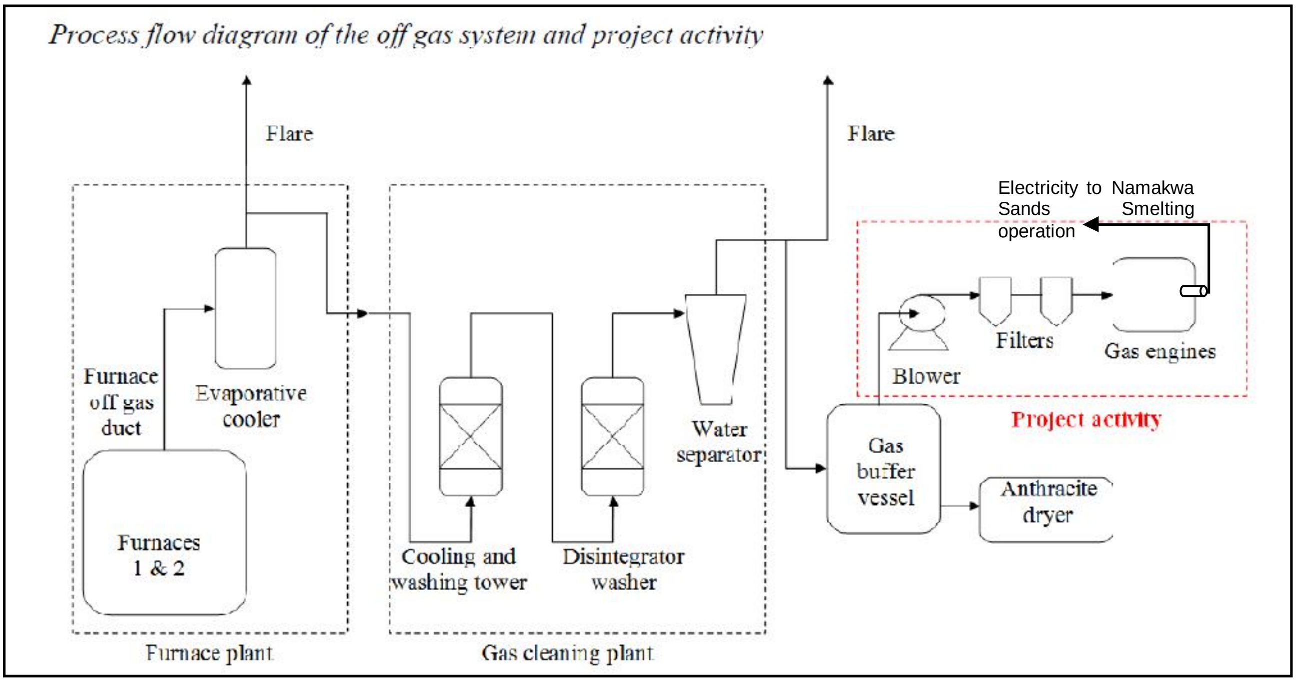
The remainder of the gas is predominantly nitrogen with a small amount of carbon dioxide. The oxygen content is negligible since the furnace is set to trip at an oxygen content of 0.5 vol. %.

The off-gas collected from the furnaces, cleaned & conditioned in the gas cleaning plant. If the gas cleaning plant is down for planned or unplanned maintenance then the entire gas flared in the raw

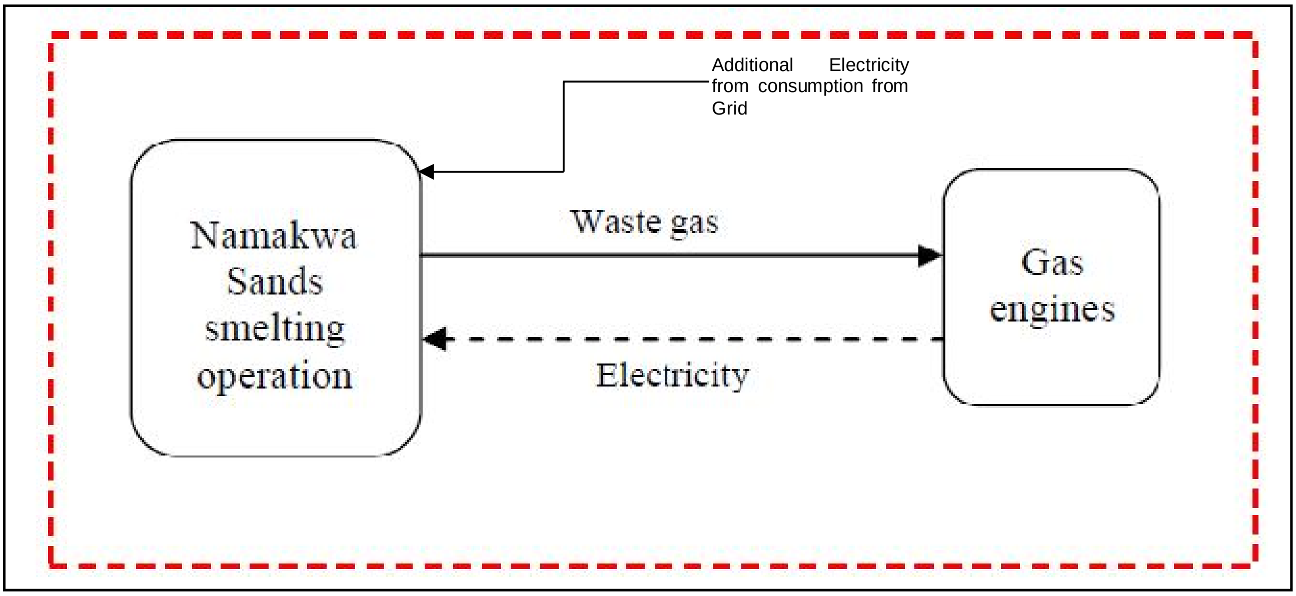
gas stack. However, under normal operation, the particulates in the gas removed and the gas is cooled in the gas cleaning plant and the resulting clean gas is routed to a gas buffer vessel. The clean gas is stored at 4.5kPa gauge in the gas buffer vessel. If the gas buffer vessel exceeds an upper limit of its maximum storage capacity, the clean gas is flared in the clean gas stack.

A small portion of the clean gas extracted from the gas buffer vessel and used to dry anthracite. Anthracite is the reductant used in the furnaces to reduce ilmenite to titania slag and iron. This small portion of clean gas used to dry the anthracite during the project activity.

The gas that is used to generate electricity is extracted from the gas buffer vessel and further cleaned & conditioned. The generated electricity is consumed in the Namakwa Sands smelting operations, thus resulting in a reduction of electricity purchased from Eskom (South Africa's national electricity provider).



Project Boundary:



B.2. Post-registration changes

B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies or standardized baselines

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Not Applicable

B.2.2. Corrections

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Not Applicable

B.2.3. Changes to the start date of the crediting period

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Not Applicable

B.2.4. Inclusion of monitoring plan

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Not Applicable

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other applied standards or tools

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Not Applicable

B.2.6. Changes to project design

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Not Applicable

SECTION C. Description of monitoring system

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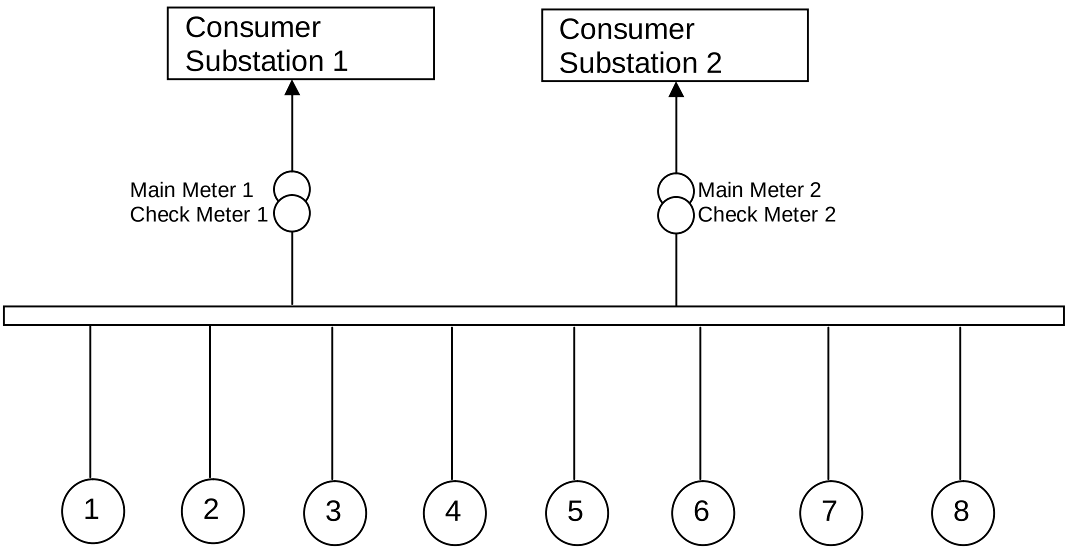
In line with the registered PDD monitoring plan parameters monitored in the project activity, as per the requirements in version 04.0.0 of methodology ACM0012:

1. **Baseline Emission:**
   - Quantity of electricity supplied to the recipient plant (Namakwa Sands).
   - Quantity of waste gas used for energy generation.

2. **Project Emission:**
   - Quantity of electricity consumed by the project operations.

Monitoring equipment:
Electricity meters measures the quantity of electricity supplied to the recipient plant. These meters are 4-quadrant billable class meters that are bi-directional – this means that they subtract any electricity used by the plant during start up, or when the plant is not producing electricity. These meters are also able to measure and record the quantity of electricity consumed by the project activity from the grid.

Four electricity meters have been installed on the feeds to the recipient plant – two main meters and two check meters. The metering setup is illustrated in the diagram below.



Meter Details:

Parameter	Main Meter 1	Check Meter 1	Main Meter 2	Check Meter 2
Make	Elster	Elster	Elster	Elster
Type	PB3KAAGWTPNN-3GIFGN0 A1700	PB3KAAGWTPNN-3GIFGN0 A1700	PB3KAGGWTPNN-3KIFGN0 A1700	PB3KAGGWTPNN-3KIFGN0 A1700
Accuracy Class	0.5s	0.5s	0.2s	0.2s
Meter Serial No.	81120018	81120019	81120020	81120021

Monitoring accuracy:
The electricity meters are fitted with a telemetry system, and the data is fed into the plant control system on a daily basis. The main and check meters reconciled daily to check if their readings are within a pre-defined accuracy band. If there are discrepancies, a notification will be sent to the control room to advise the operator to attend to a problem with the meters.

There was delay in calibration of energy meters during the current monitoring period. Therefore, as per guideline VVS (CDM-EB93-A05-STAN) para 369 (a) & APPENDIX – CALIBRATION para 2 Table 1, PP has applied maximum permissible error to the monthly electricity measured values across the complete monitoring period. Detail calculation provided in ER sheet.

Data collection and storage
On a monthly basis, the Namakwa Sands plant manager (or other designated employee) and a representative from Namakwa Sands read the two main electricity meters to determine the quantity of electricity produced by the plant. The electricity readings are used for billing purposes and logged electronically for the purposes of calculating emission reductions.

This information's are saved onto the Supervisory Control and Data Acquisition (SCADA) system. Backups will be kept both on- and off-site, and all of the data will be available for CDM verification.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data/Parameter	**$EF_{Elec,gr,y}$**
Unit	tCO_2 /MWh
Description	CO_2 emission factor for grid electricity displaced by the project activity during year *y*
Source of data	The combined margin emission factor, determined according to version 02.2.1 of the 'Tool to calculate emission factor for an electricity system'
Value(s) applied	1.036
Choice of data or measurement methods and procedures	As per applied tool, this value is calculated ex-ante.
Purpose of data/parameter	Calculation of Baseline emission
Additional comments	The emission factor is determined only once at the validation stage, thus no monitoring and recalculation is required during the crediting period.

Data/Parameter	**$EF_{El,gr,y}$**
Unit	tCO_2 /MWh
Description	CO_2 emission factor for electricity consumed by the project activity in year *y* (electricity is sourced from the grid).
Source of data	The combined margin emission factor, determined according to version 02.2.1 of the 'Tool to calculate emission factor for an electricity system'
Value(s) applied	1.036
Choice of data or measurement methods and procedures	As per applied tool, this value was calculated ex-ante during validation.
Purpose of data/parameter	Calculation of Baseline emission
Additional comments	The emission factor is determined only once at the validation stage, thus no monitoring and recalculation is required during the crediting period.

Data/Parameter	**$Q_{BL,product}$**
Unit	ton slag/year
Description	Production associated with the relevant waste energy generation as it occurs in the baseline scenario
Source of data	Project participant
Value(s) applied	169,242 (considered average of2008 – 2010):
Choice of data or measurement methods and procedures	The main product of the ilmenite smelter is titanium dioxide slag. The production of slag was calculated from the energy balance, which was verified by an independent professionally registered engineer. . Refer to Registered PDD Annex 3.
Purpose of data/parameter	Calculation of Baseline emission
Additional comments	Parameter fixed during validation for baseline emission estimation

Data/Parameter	**$q_{wcm,product}$**
Unit	Nm^3 waste energy/ton slag
Description	Specific waste energy production per unit of product generated
Source of data	Project participant

Value(s) applied	542 (Average 2008 – 2010)
Choice of data or measurement methods and procedures	WECM is measured in Nm3 and the main product of the ilmenite smelter is titanium dioxide slag. Calculated from energy balance which was verified by an independent professionally-registered engineer. Refer to Registered PDD Annex 3.
Purpose of data/parameter	Calculation of Baseline emission
Additional comments	Parameter fixed during validation for baseline emission estimation

D.2. Data and parameters monitored

Data/Parameter	$Q_{wcm,y}$
Unit	Nm^3/year
Description	Quantity of waste gas used for energy generation during year y
Measured/calculated/ Default	Measured continuously & aggregated monthly
Source of data	Plant measurement records.
Value(s) of monitored parameter	223,077,765.36 Nm3
Monitoring equipment	Gas flow rate is measured continuously with differential pressure flow meters
Measuring/reading/recording frequency	The waste gas flow rate is measured continuously with differential pressure flow meters. These readings will be aggregated monthly for use in the monitoring plan.
Calculation method (if applicable)	-
QA/QC procedures	The flow meters are prescribed for annual calibration by a Namakwa Sands plant operator during the week that the gas holder (the holder which feeds the gas engines) is maintained; and as per calibration procedure of national regulations and CDM guidelines on calibration. However, as there was delay in meter calibration as observed during the current monitoring period, therefore maximum permissible error factor has been applied to the ER calculation.
Purpose of data/parameter	Calculation of baseline emission
Additional comments	-

Data/Parameter	$EG_{GR,y}$
Unit	MWh
Description	Quantity of electricity supplied to Namakwa Sands, which in the absence of the project activity would have sourced from the grid during the year y
Measured/calculated/ Default	Measured
Source of data	Recipient plant and generation plant measurement records
Value(s) of monitored parameter	220,421.10
Monitoring equipment	Main meter and a check meter. The check meter ensures accurate readings, and serves as a backup meter. These meters are 4-quadrant billable class meters that are bi-directional.
Measuring/reading/recording frequency	The meter readings are measured continuously and are aggregated monthly.
Calculation method (if applicable)	The quantity of electricity supplied to the recipient plant is measured continuously using an electricity meter. The meter readings aggregated monthly for use in the emission reduction report.

QA/QC procedures	A set of meters has been installed on each feed from the plant. This set comprises of a main meter and a check meter. The check meter ensures accurate readings, and also serves as a backup meter. These meters are 4-quadrant billable class meters that are bi-directional. The electricity meters are fitted with a telemetry system, and the data is fed into the plant control system on a daily basis. The main and check meters reconciled daily to check if their readings are within a pre-defined accuracy band. If there are discrepancies, then a notification will be sent to the control room to advise the operator to attend to a problem with the meters. The electricity readings are used for billing purposes and logged electronically for the purpose of calculating emission reductions.
Purpose of data/parameter	Calculation of baseline emission
Additional comments	-

Data/Parameter	**$EC_{PJ,gr,y}$**
Unit	MWh
Description	Quantity of electricity consumed by the project from the grid in year y
Measured/calculated/ Default	Measured
Source of data	Actual measurements, plant operational records
Value(s) of monitored parameter	6,772.42
Monitoring equipment	Electricity meters
Measuring/reading/recording frequency	The meter readings are measured continuously and are aggregated monthly
Calculation method (if applicable)	The quantity of electricity consumed by the project from the grid is measured continuously using an electricity meter. The meter readings are aggregated monthly for use in the emission reduction report.
QA/QC procedures	A set of meters has been installed on each feed from the plant. This set comprises of a main meter and a check meter. The check meter ensures accurate readings, and also serves as a backup meter. These meters are 4-quadrant billable class meters that are bi-directional – this means that they subtract any electricity used by the plant during start up, or when the plant is not producing electricity. These meters are also able to measure and record the quantity of electricity consumed by the project activity from the grid. The electricity meters are fitted with a telemetry system, and the data is fed into the plant control system on a daily basis. The main and check meters are reconciled daily to check if their readings are within a pre-defined accuracy band. If there are discrepancies, a notification is sent to the control room to advise the operator to attend to a problem with the meters. The electricity readings are used for billing purposes and are logged electronically for the purposes of calculating emission reductions.
Purpose of data/parameter	Calculation of baseline emission
Additional comments	-

Data/Parameter	$TDL_{gr,y}$
Unit	-
Description	Average technical transmission and distribution losses for providing electricity to the grid in year y
Measured/calculated/ Default	Default Value

Source of data	Eskom annual report
Value(s) of monitored parameter	2013 -14: 7.10% 2014 -15: 6.80% 2015 -16: 6.43% 2016 -17: 7.55% 2017 -18: 7.73%
Monitoring equipment	Not Applicable
Measuring/reading/recording frequency	-
Calculation method (if applicable)	-
QA/QC procedures	Not applicable. The average technical transmission and distribution losses sourced from Eskom's annual report.
Purpose of data/parameter	Calculation of Project emission
Additional comments	-

Data/Parameter	Abnormal operation of the project facility including emergencies and shutdown
Unit	Hours
Description	The hours of abnormal operation of parts of project facility that have can have an impact on waste energy generation and recovery
Measured/calculated/ Default	Measured/Recorded
Source of data	Operation of project facility.
Value(s) of monitored parameter	0
Monitoring equipment	-
Measuring/reading/recording frequency	The hours of abnormal operation at Namakwa Sands are recorded daily and aggregated annually.
Calculation method (if applicable)	The hours of abnormal operation at Namakwa Sands are recorded daily and aggregated annually
QA/QC procedures	-
Purpose of data/parameter	Calculation of Project Emission
Additional comments	This parameter has to be monitored to demonstrate that no emission reduction is claimed for the hours during abnormal operation of the part of the project facility which has an impact on waste energy generation and recovery. This abnormality can be in terms of violation of operational parameters, poor quality product, emergencies or shutdown.

D.3. Implementation of sampling plan

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Not Applicable.

SECTION E. Calculation of emission reductions or net anthropogenic removals

E.1. Calculation of baseline emissions or baseline net removals

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The baseline emissions were determined using equation (1) of the applied methodology:

$BE_y = BE_{EN,y} + BE_{flst,y}$

Where:

BE_y : The total baseline emissions during the year y in tons of CO2

$BE_{EN,Y}$: The baseline emissions from energy generated by project activity during the year y in tons of CO_2

$BE_{flst,y}$: Baseline emissions from fossil fuel combustion, if any, either directly for flaring of waste gas or for steam generation that would have been used for flaring the waste gas in the absence of the project activity (tCO_{2e}), calculated as per equation 26. This is relevant for those project activities where in the baseline steam is used to flare the waste gas

But, $BE_{flst,y} = 0$, since no additional fossil fuel is used in the baseline for waste furnace off-gas combustion because the gas is combustible. Therefore, equation (1) simplifies to:

$BE_y = BE_{EN,y}$

Baseline emissions from energy generated by the project activity ($BE_{EN,y}$) under the baseline scenario:

“No recovery on the WECM stream(s) in the absence of the CDM project activity”

The baseline emissions from the energy generated by the project activity ($BE_{EN,y}$) were calculated using equation (2) of the applied methodology:

$BE_{EN,y} = BE_{Elec,y} + BE_{Ther,y}$ ………………………….. (2)

$BE_{Elec,y}$ = Baseline emissions from electricity during the year y in tons of CO_2

$BE_{Ther,y}$ = Baseline emissions from thermal energy (due to heat generation by element processes) during the year y (tCO_2)

However, $BE_{Ther,y} = 0$ as thermal energy does not form part of the project activity. Therefore, equation (2) simplifies to:

$BE_{EN,y} = BE_{Elec,y}$

(a) Baseline emissions from electricity ($BE_{Elec,y}$) generation

Case 1: Waste energy is used to generate electricity

$BE_{Elec,y} = f_{cap} \text{ X } f_{wcm} \text{ X } \sum j \sum i \ (EG_{gr,y} \text{ X } EF_{Elec,gr,y})$

Where:

$BE_{Elec,y}$ = Baseline emissions due to displacement of electricity during the year y (tCO2)

$EG_{Gr,y}$ = The quantity of electricity supplied to Namakwa Sands, which in the absence of the project activity would have been sourced from the grid during the year y in MWh

$EF_{Elec,gr,y}$ = The CO_2 emission factor for the grid electricity displaced due to the project activity, during the year y (tCO_2/MWh). The calculations for the CO_2 emission factor of the Southern African Power Pool are provided below.

f_{wcm} = Fraction of total electricity generated by the project activity using waste energy. This fraction is 1 if the electricity generation is purely from use of waste energy, as in the case of this project activity.

f_{cap} = Factor that determines the energy that would have been produced in project year y using waste energy generated at a historical level, expressed as a fraction of the total energy produced using waste source in year y. The ratio is 1 if the waste energy generated in project year y is same or less than that generated at a historical level. The calculations for this factor are provided below.

The combined margin factor ($EF_{Elec,gr,y}$) = 1.036 (tCO_2e/MWh)

The calculation of f_{cap} is provided in ER sheet :

Where,

$Q_{WCM,BL}$ = Quantity of waste energy generated prior to the start of the project activity (Nm3)

$Q_{WCM,y}$ = Quantity of WECM used for energy generation during year y (Nm3)

It is evident from the calculation in the ER sheet that the waste energy generated in project year y is same or less than that generated at a historical level. Therefore, f_{cap} ratio is equal to 1.

Also, f_{wcm} ratio is equal to 1. This fraction is 1 because the electricity generation is purely from use of waste energy, as in the case of this project activity.

Hence,

$BE_{elec,y}$ = 1 X 1 X 220,421 X 1.036

= 228,356 tCO_2e (Rounded down value has been considered)

E.2. Calculation of project emissions or actual net removals

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Project emissions include emissions due to the combustion of auxiliary fuel and emissions due to the consumption of electricity. The project emissions are calculated using equation (41) of the applied methodology:

$$PE_y = PE_{AF,y} + PE_{EL,y}$$

Where:

PE_y = Project emissions due to the project activity (tCO_2)

$PE_{AF,y}$ = Project activity emissions from on-site consumption of fossil fuels by the unit process(es) and/or cogeneration plant(s) if they are used as supplementary fuels due to non-availability of waste gas to the project activity or due to any other reason (tCO_2)

$PE_{EL,y}$ = Project activity emissions from on-site consumption of electricity for gas cleaning equipment or other supplementary electricity consumption (tCO_2)

The project emissions from the consumption of electricity are calculated using version 01 of the 'Tool to calculate baseline, project and/or leakage emissions from electricity consumption'. The emissions are determined using equation (1) of the applied tool:

$$PE_{EL,y} = EC_{pJ,gr,y} \text{ X } EF_{EL,gr,y} \text{ X } (1+TDL_{gr,y})$$

$PE_{EL,}$ = Project emissions from electricity consumption in year y (tCO_2/yr)

$EC_{pJ,gr,y}$ = Quantity of electricity consumed by the project from the grid in year y (MWh/yr)

$EF_{EL,gr,y}$ = Emission factor of the grid in year y (tCO_2/MWh)

$TDL_{gr,y}$ = Average technical transmission and distribution losses for providing electricity to the grid in year y

$PE_{EL,y}$ = 6772.42 X 1.036 X (1+ 7.395%[6])

= 7,535 tCO_2e

E.3. Calculation of leakage emissions

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No leakage is applicable under this methodology.

E.4. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or baseline net GHG removals (t CO_2e)	Project GHG emissions or actual net GHG removals (t CO_2e)	Leakage GHG emissions (t CO_2e)	GHG emission reductions or net anthropogenic GHG removals (t CO_2e)		
				Before 01/01/2013	From 01/01/2013	Total amount
Total	228,356	7,535	0	0	220,821	220,821

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period (tCO_2e)	Amount estimated ex ante (t CO_2e)
220,821	373,120

[6] Weighted average considered here just for calculation representation. PP has done the calculation in the ER sheet for clear understanding.

E.6. Remarks on increase in achieved emission reductions

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The annual estimated volume of CERs as per registered PDD is 84,432 tCO_{2e}. The total nos. of days included in this mentoring period (i.e. 31/12/2013 to 31/05/2018, inclusive of both the days) = 1613. Thus, to calculate the ex-ante estimated value corresponds to this monitoring period the value has been apportioned and made equivalent to 1613 days; it results into an emission reduction of 373,120 tCO_2e. The same has been referred under CER comparison workbook within ER excel sheet.

Thus, there is a variation of 40.8% (decrease) in actual achieved ERs as compared to the ERs expected for the same duration as per registered PDD. This has happened mainly due the low production requirement at plant as there was low market demand.

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Document information

Version	Date	Description
06.0	7 June 2017	Revision to: • Ensure consistency with version 01.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN); • Make editorial improvements.
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.

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