CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Annexes

SECTION A. General description of project activity

A.1. Title of the project activity:

>>
Use of waste gas at Namakwa Sands in South Africa
Version: 02
Date: 11/11/2010

A.2. Description of the project activity:

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(i) Purpose of the project

The purpose of the project is to reduce greenhouse gas emissions by utilising waste gas from a smelter operation. The waste gas will be primarily used for the generation of electricity.

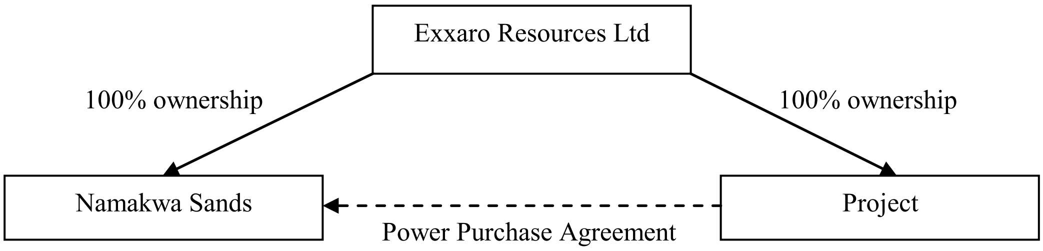
The Exxaro-owned Namakwa Sands Smelter (referred to from this point on as Namakwa Sands) is a heavy minerals mining and beneficiation business located in South Africa. This business encompasses mining, mineral concentration, separation, and smelting operations. The smelting operation commenced in 1994 in the Western Cape Province, near the town of Saldanha Bay. The smelting operation consists of two closed, DC-arc furnaces: Furnace 1 (currently operating at 25 MW) and Furnace 2 (currently operating at 35 MW). Plans are in place to upgrade these furnaces to 27 MW and 38 MW respectively. Inside these furnaces, the reduction of mined ilmenite to produce titania (TiO_2) slag and iron (Fe) occurs. The reduction of mined ilmenite requires the presence of a carbon-rich reductant. Typical reductants that are used by smelting operations are anthracite, char and/or coke.

The reduction of mined ilmenite is represented by reaction (1).

$$FeTiO_3 \rightarrow TiO_{2\,(slag)} + Fe_{\,(metal)} + CO_{\,(gas)} \qquad (1)$$

The carbon monoxide (CO) gas is formed as a result of the presence of the carbon in the reductant. If the reductant contains volatile hydrocarbons, as is the case at Namakwa Sands, hydrogen (H_2) gas is also formed. This CO and H_2 gas is referred to as furnace off-gas. Currently, the majority of the furnace off-gas is 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 will use this cleaned furnace off-gas, which was previously flared, to primarily generate electricity using internal combustion engines. The plant will be owned by Exxaro Resources Ltd (referred to from this point on as Exxaro Resources), and the electricity will be used by the Namakwa Sands smelting operation, thus resulting in a reduction of electricity imported from the national grid.



(ii) Greenhouse gas reduction:

The electricity generated from the furnace off-gas will displace electricity from the project electricity system. According to the 'Tool to calculate the emission factor for an electricity system' (Version 02), a project electricity system is defined by the power plants that are physically connected through transmission and distribution lines to the project activity and that can be displaced without significant transmission constraints. Therefore, for this project activity, the project electricity system comprises of all power plants within the Southern African Power Pool (SAPP). Electricity from the SAPP grid is predominantly generated from sub-bituminous coal of low quality, 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 for electricity sourced from the grid is 1.04 tonnes CO_2/MWh. These calculations will be provided during validation.

(iii) Contribution to sustainable development:

The project makes positive contributions to sustainable development. The South African Designated National Authority (DNA) evaluates sustainability in three categories: economic, environmental, and social. The contribution of the project towards sustainable development is discussed in terms of these three categories:

Economic

There will be a transfer of technology from a developed country in the northern hemisphere, to a developing country in the southern hemisphere. The internal combustion engines that are used to generate the electricity will be sourced from a European country and will be imported to South Africa.

Internal combustion engines are currently used in only five other South African registered CDM projects:

- The first of these projects is the 'PetroSA Biogas to Energy Project' (Project 0446), which was registered by the CDM EB on the 29/09/2006. In this project, the engines operate on biogas composed primarily of methane.

- In the second project, the engines run on landfill gas released from Durban's landfill sites. This project was registered as a CDM project by CDM EB on the 15/12/2006 and is titled 'Durban Landfill Gas-to-Electricity Project – Mariannhill and La Mercy' (Project 0545).

- The third project, titled 'Kanhym Farm manure to energy project' (registered under CDM on 18/07/2008 – project 1665), uses biogas from a piggery to generate electricity using an internal combustion engine.

- The fourth and fifth projects also use landfill gas to operate their internal combustion engines. These projects are titled 'Durban Landfill-Gas Bisaser Road' (registered under CDM on 26/03/2009 – project 1921), and 'Alton Landfill Gas to Energy Project' (registered under CDM on 24/08/2009 – project 2549).

These projects are all biogas projects, and differ fundamentally from the Namakwa Sands project. The main difference lies in the fact that the fuel gas of the proposed project does not contain any methane, but rather carbon monoxide and hydrogen.

In addition, the projects mentioned above operate the engines on gas with a significantly higher calorific value than the furnace off-gas that this project will use. This project aims to be the first-of-its-kind registered CDM project in South Africa to operate the selected internal combustion engines on such low calorific gas at a smelter.

There will be a transfer of knowledge as personnel responsible for the operation and maintenance of the engines will receive the necessary training.

The project will also contribute to foreign reserve earnings for South Africa via the carbon credit sales revenue.

Environmental

The proposed project activity will have a positive regional environmental impact. It will lower the environmental impacts of coal based power generation. This includes the amount of sulphur dioxide released due to the combustion of low grade coal, particulate emissions, water demand of coal based power generation, and the environmental impact of ash disposal.

The project will also have a positive local environmental impact. It will remove additional particulates from the furnace off gas. The gas, previously flared, will be filtered to minimise the particulate loading of the gas. The particulates trapped by the filters will be removed with water and be routed to the existing thickener. This will lead to improvements in the local air quality.

The proposed project will not change the current local water availability or access. Neither will the project have an impact on the current local water quality. The current soil condition at Namakwa Sands will not be affected by the project activity. The project will be located within an existing built up area at the Namakwa Sands Smelter, on already disturbed land. The project will, however, encourage more efficient use of natural resources and energy.

On a global scale, the project makes a contribution to greenhouse gas emission reduction.

Social

In the early months of 2008, South Africa's electricity generator and supplier (Eskom) carried out planned electricity supply interruptions. These interruptions were caused by the demand for electricity exceeding the supply of electricity. During the interruptions, grid electricity was not accessible. The generation of electricity from waste gas by the project will alleviate pressure from the national grid. The alleviation of pressure from the national grid will reduce the probability of electricity supply interruptions and increase the security of the electricity supply to the surrounding communities.

The project will create 11 jobs in the operations phase. The creation of jobs is important since the Namakwa Sands smelting operation is located in an area with very little established industries and, therefore, very few existing employment opportunities. The number of temporary jobs created in the construction phase has not been estimated, but similar projects estimate that the number of temporary jobs created is around 100 jobs. The creation of jobs is in line with the Saldanha Bay Municipality's Integrated Development Plan (IDP) for 2006-2011, which states that growing unemployment is one of the greatest challenges facing the municipality.

A.3. Project participants:

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Name of Party involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
Republic of South Africa	Exxaro Resources Ltd	No
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		
Note: *When the PDD is filled in support of a proposed new methodology (forms CDM-NBM and CDM-NMM),* at least the host Party(ies) and any known project participant (e.g. those proposing a new methodology) shall be identified.		

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

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The host party is the Republic of South Africa.

A.4.1.2. Region/State/Province etc.:

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The project is located in the Western Cape Province.

A.4.1.3. City/Town/Community etc.:

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The project is located approximately 15km from the town of Saldanha Bay.

A.4.1.4. Details of physical location, including information allowing the unique identification of this project activity (maximum one page):

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The project will be situated as near to the source of the furnace off-gas as possible in order to minimise the safety risks involved in transporting the off-gas. Therefore, the plant will be 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 location of the proposed project activity is shown below:

Figure 1: The provincial location of the project activity

Project Site

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

The new project facility will be located at the following GPS coordinates:
32°57'43" S
18°02'39" E

A.4.2. Category (ies) of project activity:

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

A.4.3. Technology to be employed by the project activity:

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Furnaces

Namakwa Sands operates two closed, DC-arc furnaces:

- Furnace 1 – 25 MW
- Furnace 2 – 35 MW

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 2	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 volume of the gas available per year for cogeneration varies between ± 82,000,000 Nm^3 and ± 90,000,000 Nm^3, with the average over the period 2011 – 2026 at 87,500,000 Nm^3. The average gas flow rate over the period 2011 – 2026 is 11,898 Nm^3/hr.

At present, the off-gas is collected from the furnaces and cleaned and conditioned in the gas cleaning plant. If the gas cleaning plant is down for planned or unplanned maintenance then the gas is flared in the raw gas stack. However, under normal operation, the particulates in the gas are removed and the gas is cooled in the gas cleaning plant and the resulting clean gas is then 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.

Currently, a small portion of the clean gas is 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 will still be used to dry the anthracite during the project activity. It is the rest of the gas, which was previously flared, that will be used in this project activity.

A portion of the previously flared waste gas may be combusted and fed to a slag dryer, thereby replacing the light fuel oil that is currently combusted. The remainder of the gas will be used to generate electricity. The gas that is used to generate electricity will be extracted from the gas buffer vessel and further cleaned and conditioned. The gas must be further cleaned in order to meet the gas requirements as specified by the engine manufacturers.

Internal combustion engines

The electricity will be generated using internal combustion engines. The internal combustion engines are spark ignition engines operating on the same principles as normal petrol engines. These engines have electrical outputs of between 1.5 MW and 2 MW. The project activity will use as much of the off-gas that is currently flared in the internal combustion engines as possible.

The internal combustion engines used in the project will be imported from Europe. Therefore, there will be a technology transfer from an industrialised country in the northern hemisphere to a developing country in the southern hemisphere. These engines have been used at five other registered CDM projects in South Africa. These projects are:

- PetroSA Biogas to Energy Project (project 0446)
- Durban Landfill Gas-to-Electricity Project – Mariannhill and La Mercy (project 0545)
- Kanhym Farm manure to energy project (project 1665)
- Durban Landfill-Gas Bisaser Road (project 1921)
- Alton Landfill Gas to Energy Project (project 2549)

These projects are all biogas projects and differ fundamentally from the Namakwa Sands project. The main difference lies in the fact that the fuel gas of this project does not contain any methane, but rather carbon monoxide and hydrogen.

This project also aims to be the first CDM registered project in South Africa to operate the engines on the low calorific value waste gas at a smelter. Therefore, there will be knowledge innovation from this project. Knowledge transfer will also take place as the relevant personnel will be trained in the operation of the engines.

The actual performance of the engines is still unknown as there is no reference plant running on gas with comparable hydrogen and carbon monoxide content. This technological risk will be addressed by installing a conservative amount of engines at the beginning of the project. Their electrical output will be closely monitored during the first months of operation. If the engines reach/are close to their maximum electrical output, no further engines will be installed. However, if they do not operate near their maximum expected electrical output; additional engines will be installed when required.

Test engine(s)

Test engine(s) from alternative technology suppliers may also be installed at the start of the project activity in order to evaluate the performance of the technology.

Existing and proposed furnace off-gas system

Below is a schematic of the existing (currently done at Namakwa Sands) and new (proposed by the project activity) furnace off-gas system:

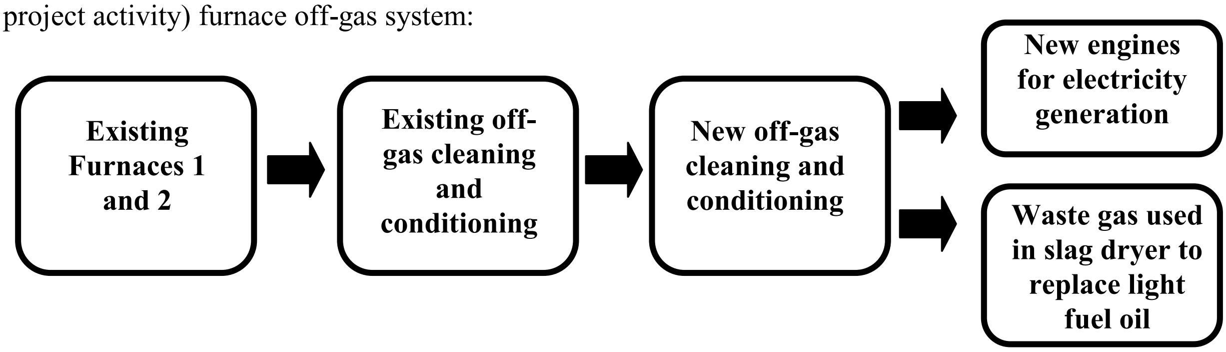

Figure 3: Schematic of furnace off-gas system

A.4.4. Estimated amount of emission reductions over the chosen crediting period:

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Year	Annual estimation of emission reductions in tonnes of CO_2e
1	34,655
2	91,580
3	91,580
4	91,580
5	91,580
6	91,580
7	91,580
8	91,580
9	91,580
10	91,580
Total estimated reductions (tonnes of CO_2e)	858,871
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO_2e)	85,887

A.4.5. Public funding of the project activity:

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No public funding has been used in the development of this project and no public funding will be used in its implementation. Official Development Assistance (ODA) has not and will not be used in the development and implementation of this project.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

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The approved baseline and monitoring methodology is ACM0012: 'Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects', Version 03.2, Sectoral Scopes 01 and 04, EB 51.

The following methodological tools were used:

- 'Tool to calculate the emission factor for an electricity system' (Version 02)
- 'Tool for the demonstration and assessment of additionality' (Version 05.2)

B.2. Justification of the choice of the methodology and why it is applicable to the project activity:

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The following table summarises the main applicability criteria's for projects using ACM0012 (version 03.2) is intended. This project activity meets all of the criteria – this is justified in the table below.

Item	ACM0012 (version 03.2)	Project Activity
1	*The consolidated methodology is for the following types of project activities:* Type-1: *All the waste energy in identified Waste Energy Carrying Medium (WECM) stream/s that will be utilized in the project activity is, or would be flared or released to atmosphere in the absence of the project activity at the existing or new facility. The waste energy is an energy source for:* • *Cogeneration; or* • *Generation of electricity; or* • *Direct use as process heat source; or* • *For generation of heat in element process (e.g. steam, hot water, hot oil, hot air);or*	Electricity will be generated from combustible waste gas at Namakwa Sands. A small portion of the waste energy may also be used as process heat source. The waste gas that will be used in the project activity was previously flared. Therefore, the Type-1 project activity is applicable in this case.

	• *For generation of mechanical energy.* *<u>Type-2:</u> An existing industrial facility, where the project activity is implemented, that captures and utilizes a portion of the waste gas stream(s) considered utilized in the project activity, and meet the following criteria:* • *The project activity is to increase the capture and utilization of waste gas for generation of electricity that is flared or vented in the absence of the project activity, and not only the replacement/modification/expansion of existing generation equipment with or to a more efficient equipment;* • *The portion of waste gas captured prior to implementation of the project activity is used for generation of captive electricity. The use of a portion of the waste gas in the baseline for the purpose of heat generation or other use prior to implementation of the project activity is also permitted under this methodology provided the generation of heat or other use in crediting period remain same as that in the baseline;* • *If the project participant uses a part of the electricity generated in the project activity onsite and exports the remainder, both shall be monitored. In such situations it shall be demonstrated that the electricity generated for own consumption from waste gas is not reduced in the project activity;* • *Emission reductions generated in the project activity are attributable to the amount of waste gas captured and utilized in the project activity that was flared or vented in the absence of the project activity and to the increase in energy efficiency of the new power generating facility;* • *No auxiliary fossil fuel (except start-up fuel) is used in the waste gas boiler for the generation of captive electricity in the absence of the project.* *For project activities that use waste pressure, the consolidated methodology is applicable where waste pressure is used to generate electricity only.*	

2	*If the project activity is based on the use of waste pressure to generate electricity, electricity generated using waste pressure should be measurable;*	Waste pressure will not be used to generate electricity at Namakwa Sands.
3	*Energy generated in the project activity may be used within the industrial facility or exported from the industrial facility;*	The energy generated in the project activity will be used at Namakwa Sands.
4	*The electricity generated in the project activity may be exported to the grid or used for captive purposes;*	The electricity generated by the project activity will be used at Namakwa Sands.
5	*Energy in the project activity can be generated by the owner of the industrial facility producing the waste energy or by a third party (e.g. ESCO) within the industrial facility;*	The energy will be generated by Exxaro Resources, the owner of Namakwa Sands.
6	*Regulations do not constrain the industrial facility that generates waste energy from using fossil fuels prior to the implementation of the project activity;*	Currently, fossil fuels are fed into the furnaces. The reaction in the furnaces leads to the generation of waste gas. There are no regulations constraining the generation of waste gas from fossil fuels.
7	*The methodology covers both new and existing facilities. For existing facilities, the methodology applies to existing capacity. If capacity expansion is planned, the added capacity must be treated as a new facility;*	Namakwa Sands is an existing facility.
8	*The emission reductions are claimed by the generator of energy using waste energy;*	The emission reductions will be claimed by the generator of energy using waste energy (Exxaro Resources).
9	*In cases where the energy is exported to other facilities, an official agreement exists between the owners of the project energy generation plant (henceforth referred to as generator, unless specified otherwise) with the recipient plant(s) that the emission reductions would not be claimed by recipient plant(s) for using a zero-emission energy source;*	The energy will be used at Namakwa Sands and not exported to other facilities. The emission reductions will be claimed by the generator of energy (Exxaro Resources).

10	*For those facilities and recipients included in the project boundary, that prior to implementation of the project activity (current situation) generated energy on-site (sources of energy in the baseline), the credits can be claimed for minimum of the following time periods:* • *The remaining lifetime of equipments currently being used* • *Credit period.*	Currently, there is no electricity generation on-site.
11	*Waste energy that is released under abnormal operation (for example, emergencies, shut down) of the plant shall not be accounted for.*	The waste gas released under abnormal operation of the plant will not be accounted for.
12	*Cogeneration of energy is from combined heat and power and not combined cycle mode of electricity generation.*	The project does not involve the construction of a combined cycle plant

B.3. Description of the sources and gases included in the project boundary:

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As per methodology ACM0012, the project boundary includes the sources related to project emission and baseline emission. Therefore, the project boundary is defined as:

- The facility generating the furnace off-gas;
- The proposed electricity generation plant, which will generate electricity from the furnace off-gas;
- The anthracite dryer at Namakwa Sands, to the extent of demonstrating that the same amount of furnace off-gas that was used by the dryer prior to the project activity will continue to be used by the dryer during the project activity;
- The slag dryer that may use a portion of the combusted furnace off gas;
- The facility using the electricity, which in this case is the same as the facility generating the furnace off-gas; and
- The electricity grid, to the extent of determining the grid emission factor.

	Source	Gas	Included?	Justification / Explanation
Baseline	Electricity generation, grid	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	Fossil fuel consumption in dryers	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification

		N_2O	Excluded	Excluded for simplification
Project Activity	Supplemental electricity consumption	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification
	Fossil fuel consumption in dryers	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification
		N_2O	Excluded	Excluded for simplification

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

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The baseline scenario was identified as the most plausible baseline scenario among all realistic and credible alternatives. A stepwise approach is used, as per methodology ACM0012.

Step 1: Define the most plausible baseline scenario for the generation of heat and electricity using the following baseline options and combinations

Realistic and credible alternatives were determined for:

- The use of the waste energy in the absence of the project activity;
- Power generation in the absence of the project activity; and
- Heat generation in the absence of the project activity.

Mechanical energy is not generated in the project activity and, therefore, realistic and credible alternatives for this need not be identified.

<u>The alternatives for the use of the waste energy in the absence of the project activity are:</u>

W1: WECM is directly vented to atmosphere without incineration or waste heat is released to the atmosphere or waste pressure energy is not utilized

This is not a feasible option since the waste gas cannot be directly vented to the atmosphere, and must be flared so as to prevent the accumulation of hazardous gas. Carbon monoxide is poisonous and extremely dangerous as it is a tasteless, odourless and invisible gas. Carbon monoxide can cause people to become unconscious and, if not given oxygen in time, it can cause death. The off-gas also contains hydrogen, which also forms an explosive mixture in air. Hence, W1 is not a feasible option, and is excluded from the realistic and credible alternatives.

W2: WECM is released to the atmosphere (for example after incineration) or waste heat is released to the atmosphere or waste pressure energy is not utilized

There are no barriers facing this alternative. The infrastructure and equipment necessary for flaring is already in place at Namakwa Sands for safety purposes, and therefore no additional capital expenditure would be required (no investment barrier). There are also no technological barriers to flaring the waste gas, as flares are available in South Africa. This is a realistic and credible alternative.

W3: Waste energy is sold as an energy source

The sale of the furnace off gas has been investigated, and preliminary negotiations were engaged with a potential buyer – a neighbouring steel mill. This is not a realistic and credible alternative due to the following:

- The potential buyer currently uses coal as a source of energy which is relatively cheap in South Africa.
- This company also generates its own waste gas of similar composition (carbon monoxide and hydrogen), which is currently flared and not used in their operation.
- The transport of waste gas to the buyer poses a significant safety risk. The gas would need to be piped over open land, thereby exposing members of the public to a potential safety hazard - the threshold limit value of carbon monoxide is 25ppm, and the explosion limits of carbon monoxide and hydrogen are 12% and 4% respectively.
- Namakwa Sands has also never had any other potential buyers for the furnace off-gas during the 15 years it has been in operation.

W3 also faces two prevailing practice barriers - it is not common practice to pipe gas of such hazardous composition, and it is also not common to use such a low calorific value waste gas in South Africa.

W4: Waste energy is used for meeting energy demand

Using the waste gas to meet energy demand would require capital expenditure that would not be required if the waste gas was flared, as is currently the case at Namakwa Sands. The low calorific value of the furnace off-gas makes it difficult to meet the energy demand of Namakwa Sands. The technology required for the use of low calorific gas (like furnace off-gas) for energy generation is not common at smelters in South Africa. Barring potential CDM projects, only one smelter in the country has attempted to generate electricity from furnace off gas, without success. Two other similar projects are currently in the CDM validation phase - ‘BioTherm Hernic Ferrochrome Cogeneration Project’ and ‘Cogeneration from Waste Smelter Gas at Richards Bay Minerals in South Africa’. This illustrates a lack of prevailing practice and, for this reason; it is not a realistic and credible alternative.

W5: A portion of the waste gas produced at the facility is captured and used for captive electricity generation, while the rest of the waste gas produced at the facility is vented/flared

There is no existing power generation equipment at Namakwa Sands, and therefore using the waste gas to generate power would require a significant capital investment. The waste gas also has low calorific value, which means that a large amount of the gas would be required to generate a small amount of electricity or heat. As mentioned above, the technology required for the use of low calorific gas (like furnace off-gas) for energy generation, is not common at smelters in South Africa. The use of low calorific value waste gas is also not common at smelters in South Africa. Therefore, this is not a realistic and credible alternative.

W6: All the waste gas produced at the industrial facility is captured and used for export electricity generation

Due to the relatively cheap electricity price in South Africa, the price of the electricity produced from the waste gas is higher than the price of the electricity supplied by the national grid. Therefore, this is not a realistic and credible alternative.

The alternatives for heat and power generation in the absence of the project activity are:

P1 and H1: Proposed project activity not undertaken as a CDM project activity

A large amount of furnace off-gas is required to generate a small amount of electricity and heat, because the gas fluctuates in its supply and has a low calorific value. This, coupled with the significant capital investment of the project, makes the activity not feasible without the potential carbon credit revenue. Therefore, both P1 and H1 are not realistic and credible alternatives.

P2 and H2: On-site or off-site existing/new fossil fuel fired cogeneration plant

There is no existing cogeneration plant on-site. The installation of a new fossil fuel fired cogeneration plant, together with the purchase of fuel, would require a significant capital investment. This would not be the case if the waste gas is flared and electricity is imported from the grid (as is currently the case at Namakwa Sands).

The availability of these fossil fuels is also limited. For example, natural gas and coal are not available in the vicinity of the proposed project activity (Western Cape Province). Importing other fuels through shipping would require a considerable capital investment. Securing a cost effective supply of fossil fuel would be difficult considering the location of Namakwa Sands and the distance to transport these fuels. Therefore, P2 and H2 are not realistic and credible alternatives.

P3 and H3: On-site or off-site existing/new renewable energy based cogeneration plant

The cogeneration plant could involve a renewable energy such as biomass. This, however, is unlikely as the Namakwa Sands smelter is located in an arid region, which makes biomass not readily available in the vicinity of the proposed project activity. Purchasing and importing biomass to the site would require a considerable capital investment, which is not required if the: waste gas is flared; electricity is imported from the grid; and process heat is sourced from a light fuel oil boiler (as is currently the case at Namakwa Sands). Furthermore, the production of power from biomass would be more expensive than importing electricity from the national grid. This is not a realistic and credible alternative.

P4: On-site or off-site existing/new fossil fuel based existing captive or identified plant

As in P2 and H2, the availability of fossil fuel is limited. For example, natural gas and coal are not available in the vicinity of the proposed project activity (Western Cape Province). Importing other fuels through shipping would require a considerable capital investment. There is also no captive or identified plant at Namakwa Sands, and a new fossil fuel based captive or identified plant would require capital investment, which would not be required if the waste gas is flared and electricity is imported from the grid (as is currently the case at Namakwa Sands). This is not a realistic and credible alternative.

H4: An existing or new fossil fuel based boiler

There are no barriers facing this alternative. Process heat is currently supplied to Namakwa Sands by a light fuel oil boiler. This is a realistic and credible alternative.

P5: On-site or off-site existing/new renewable energy or other waste energy based existing captive or identified plant

The renewable energies employed would probably be wind, solar, hydro or waste energy. The production of electricity from these energies would be more expensive than purchasing it from the grid. A new hydro, wind, solar, or waste energy captive or identified plant would require capital investment, which is not required if the waste gas is flared and electricity is imported from the grid (as is currently the case at Namakwa Sands).

H5: An existing or new renewable energy or other waste energy based boiler

As in P3 and H3, the boiler could involve a renewable energy such as biomass. This, however, is unlikely as the Namakwa Sands smelter is located in an arid region. Namakwa Sands does not generate any other waste gas so other waste energy would need to be imported. This would require a significant capital investment. This is not a realistic and credible alternative.

P6: Sourced Grid-connected power plants

Namakwa Sands has the capacity to obtain all of its required electricity from the grid. This occurs currently, and is a realistic and credible alternative.

H6: Any other source such as district heat

Namakwa Sands is located in an area where no district heating network is available. For this reason, it is not a realistic and credible alternative.

P7: Captive Electricity generation using waste energy (if project activity is captive generation using waste energy, this scenario represents captive generation with lower efficiency than the project activity)

Captive electricity generation using waste energy is not common in South Africa. Installing a new captive electricity generation poses a significant investment barrier. This is not a realistic and credible alternative.

H7: Other heat generation technologies (e.g. heat pumps or solar energy)

Installing other heat generation technologies would require a significant capital investment that would not be required if the process heat was sourced from a light fuel oil boiler, as is currently the case at Namakwa Sands. This is not a realistic and credible alternative.

H8: Steam/process heat generation from waste energy, but with lower efficiency

As in P1 and H1, a large amount of furnace off-gas is required to generate a small amount of heat, because the gas fluctuates in its supply and has a low calorific value. For this reason, process heat generation from the waste energy, with a lower efficiency, is not a financially feasible. This is not a realistic and credible alternative.

P8 and H9: Cogeneration using waste energy (if project activity is cogeneration with waste energy, this scenario represents cogeneration with lower efficiency than the project activity)

Cogeneration with a lower efficiency than the project activity does not make this alternative financially feasible, and therefore it is not a realistic and credible alternative.

P9: *Existing power generating equipment (used previous to implementation of project activity for captive electricity generation from a captured portion of waste gas) is either decommissioned to build new more efficient and larger capacity plant or modified or expanded (by installing new equipment), and resulting in higher efficiency, to produce and only export electricity generated from waste gas. The electricity generated by existing equipment for captive consumption is now imported from the grid.*

This applies to alternatives P9, P10, and P11. There has been no existing power generating equipment that has been used previously at Namakwa Sands. Therefore, P9 to P11 are not realistic and credible alternatives for power generation in absence of the project activity.

P10: *Existing power generating equipment (used previous to implementation of project activity for captive electricity generation from* ***a captured portion*** *of waste gas) is either decommissioned to build new more efficient and larger capacity plant or modified or expanded (by installing new equipment), and resulting in higher efficiency, to produce electricity from waste gas (already utilized portion plus the portion flared/vented) for own consumption and for export*

Please refer to P9.

P11: *Existing power generating equipment is maintained and additional electricity generated by grid connected power plants*

Please refer to P9.

STEP 2: Identify the fuel for the baseline choice of energy source taking into account the national and/or sectoral policies as applicable.

The baseline scenario involves the consumption of electricity from the national grid, and the use of light fuel oil in the boiler. Since the South African grid is predominantly coal fired, the fuel for the baseline choice of energy source is fossil fuel.

STEP 3: Step 2 and/or step 3 of the latest approved version of the "Tool for the demonstration and assessment of additionality" shall be used.

Step 3 of the 'Tool for the demonstration and assessment of additionality' (Version 05.2) was used to identify the most plausible baseline scenarios by eliminating non-feasible options. This has been done above. Three realistic and credible alternatives remain:

- W2: WECM is released to the atmosphere (for example after incineration) or waste heat is released to the atmosphere or waste pressure energy is not utilized;
- P6: Sourced Grid-connected power plants;

- H4: An existing or new fossil fuel based boilers.

STEP 4: If more than one credible and plausible alternative scenario remain, the alternative with the lowest baseline emissions shall be considered as the most likely baseline scenario.

From step 3 above, it can be seen that the only alternatives that remain after an analysis of the investment, technological and common practice barriers, are W2, P6, and H4. Therefore, the baseline scenario is:

- The waste gas is released to the atmosphere after incineration (W2);
- The electricity is obtained from the South African Grid (P6);
- Fossil fuel is used in the boiler to supply process heat (H4).

The baseline scenario represents current practice or business as usual at Namakwa Sands.

National and Sectoral Policies and Regulations Relevant to the Project Activity

There are no policies that require Namakwa Sands to use the furnace off-gas that is currently being flared. Therefore, Namakwa Sands would continue to flare the gas if it were not for the proposed project activity. More relevant to the project activity is the Power Conservation Project (PCP), which, at the time of writing the PDD, is in the process of being developed by Eskom, in concert with Municipalities, Government, and customers.

The PCP is a demand side project aimed at stabilising the supply/demand balances in the system. According to Eskom, the details of the PCP are still being refined, but one of the criteria used in designing the PCP is to signal efficient use of electricity. Once the PCP is legislated, it will require Namakwa Sands to commit to reducing its grid electricity consumption. The relevance of the PCP, in the selection of the baseline scenario, is discussed below:

In EB 22 Annex 3, the Board differentiates between two types of national and/or sectoral policies that need to be taken into account when establishing the baseline scenario (paragraph 6). The second type is relevant to the PCP since it concerns energy efficiency:

Paragraph 6 (b): *National and/or sectoral policies or regulations that give comparative advantages to less emissions-intensive technologies over more emissions-intensive technologies (e.g. public subsidies to promote the diffusion of renewable energy or to finance energy efficiency programs). These policies are E- type policies that decrease GHG emissions.*

The Board then goes on to state that policies applicable under paragraph 6 (b) need not be taken into account when establishing the baseline scenario if they have been implemented since the adoption by the COP of the CDM M&P (decision 17/CP.7, 11 November 2001).

The PCP is still in development, but will, more than likely, be legislated before project implementation. However, this is after 11 November 2001 and, as such, the PCP need not be taken into account when establishing the baseline scenario for Namakwa Sands.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

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ACM0012 requires the project proponent to determine additionality based on 'Tool for demonstration and assessment of additionality' (Version 05.2).

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a: Define alternatives to the project activity:

Given that there is no mechanical energy generation, the list of possible alternatives for the use of the waste gas in the absence of the project activity is:

W1: WECM is directly vented to atmosphere without incineration or waste heat is released to the atmosphere or waste pressure energy is not utilized;
W2: WECM is released to the atmosphere (for example after incineration) or waste heat is released to the atmosphere or waste pressure energy is not utilized;
W3: Waste energy is sold as an energy source;
W4: Waste energy is used for meeting energy demand;
W5: A portion of the waste gas produced at the facility is captured and used for captive electricity generation, while the rest of the waste gas produced at the facility is vented/flared;
W6: All the waste gas produced at the industrial facility is captured and used for export electricity generation.

The realistic and credible alternatives for power generation in the absence of the project activity are:

P1: Proposed project activity not undertaken as a CDM project activity;
P2: On-site or off-site existing/new fossil fuel fired cogeneration plant;
P3: On-site or off-site existing/new renewable energy based cogeneration plant;
P4: On-site or off-site existing/new fossil fuel based existing captive or identified plant;
P5: On-site or off-site existing/new renewable energy or other waste energy based existing captive or identified plant;
P6: Sourced Grid-connected power plants;
P7: Captive Electricity generation using waste energy (if project activity is captive generation using waste energy, this scenario represents captive generation with lower efficiency than the project activity.);

P8: Cogeneration using waste energy (if project activity is cogeneration with waste energy, this scenario represents cogeneration with lower efficiency than the project activity);

P9: Existing power generating equipment (used previous to implementation of project activity for captive electricity generation from a captured portion of waste gas) is either decommissioned to build new more efficient and larger capacity plant or modified or expanded (by installing new equipment), and resulting in higher efficiency, to produce and only export electricity generated from waste gas. The electricity generated by existing equipment for captive consumption is now imported from the grid;

P10: Existing power generating equipment (used previous to implementation of project activity for captive electricity generation from a captured portion of waste gas) is either decommissioned to build new more efficient and larger capacity plant or modified or expanded (by installing new equipment), and resulting in higher efficiency, to produce electricity from waste gas (already utilized portion plus the portion flared/vented) for own consumption and for export;

P11: Existing power generating equipment is maintained and additional electricity generated by grid connected power plants.

The realistic and credible alternatives for heat generation in the absence of the project activity are:

H1: Proposed project activity not undertaken as a CDM project activity;
H2: On-site or off-site existing/new fossil fuel fired cogeneration plant;
H3: On-site or off-site existing/new renewable energy based cogeneration plant;
H4: An existing or new fossil fuel based boiler;
H5: An existing or new renewable energy or other waste energy based boiler;
H6: Any other source such as district heat;
H7: Other heat generation technologies (e.g. heat pumps or solar energy);
H8: Steam/process heat generation from waste energy, but with lower efficiency;
H9: Cogeneration with waste energy, but at lower efficiency.

Sub-step 1b: Consistency with mandatory laws and regulations:

Aside from W1, which will contravene health and safety regulations, the above alternatives meet all legal and regulatory requirements of the host country South Africa. W1 is, therefore, excluded from further consideration as a possible alternative.

Investment analysis is used to demonstrate additionality. A barrier analysis is also included.

Step 2: Investment analysis

Sub-step 2a: Determine appropriate analysis method

A benchmark analysis (Option III) is applied.

Sub-step 2b: Option III. Apply benchmark analysis

Financial/economic indicator

IRR has been identified as the most suitable financial/economic indicator for this project type. This is because it is Exxaro Resources' company policy to make investment decisions based on IRR.

Selection of an appropriate benchmark

According to the 'Guidelines on the Assessment of Investment Analysis' (Version 03.1, EB 51 Annex 58), *an internal company benchmark should only be applied in cases where (a) there is only one possible project developer and (b) should be demonstrated to have been used for similar projects with similar risks, developed by the same company*.

(a) Exxaro Resources is the only possible project developer. This is because the project activity is located on its site, and forms an integral part of its gas system. The project activity also poses a potential health and safety risk, for which Exxaro Resources is legally liable for.

(b) Exxaro Resources has used the same internal benchmark for similar projects with similar risks. This will be shown during validation.

Since the project fulfils both criteria (a) and (b), an internal benchmark can be applied.

Sub-step 2c: Calculation and comparison of financial indicators

The after-tax Weighted Average Cost of Capital (WACC) is 18.0%. The supporting documents and financial statements that substantiate this WACC will be made available at validation.

The after-tax project IRR is 1.7%. This IRR is not limited to proposed crediting period, but rather reflects the period of expected operation of the project activity (16 years). The IRR calculation includes the cost of major maintenance and rehabilitation, as these costs are expected to be incurred during the period of expected operation.

The CDM project activity has a less favourable IRR than the benchmark (1.7% as opposed to 18%). For this reason, the project cannot be considered as financially attractive in the absence of the CDM.

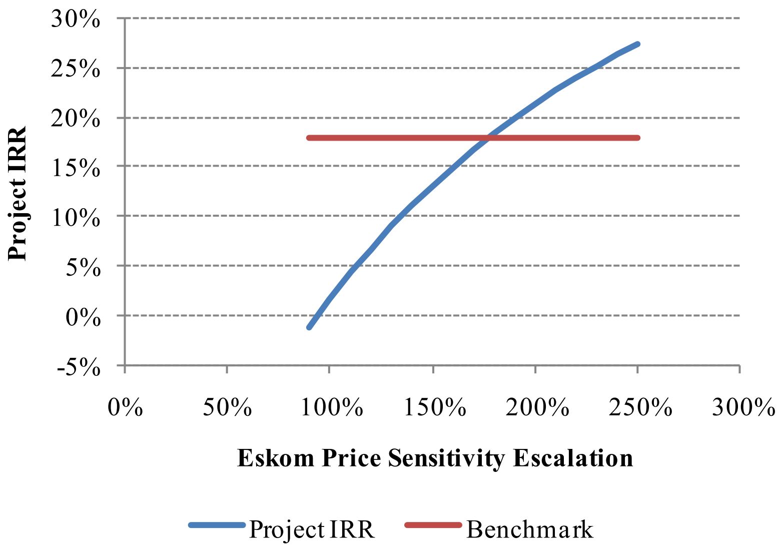
Sub-step 2d: Sensitivity analysis

The aim of the sensitivity analysis it to determine the likelihood of the occurrence of a scenario other than the scenario presented. Three types of cross-checks will be used to verify the suitability of the assumptions used in the investment analysis:

1. Electricity price variation
2. Rand/Euro variation
3. Capital expenditure variation

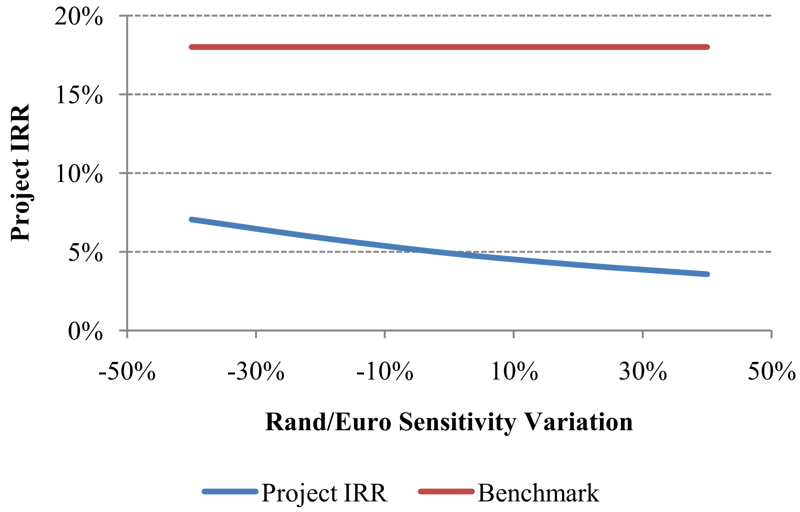
These variations are presented in detail below:

1. Electricity price variation



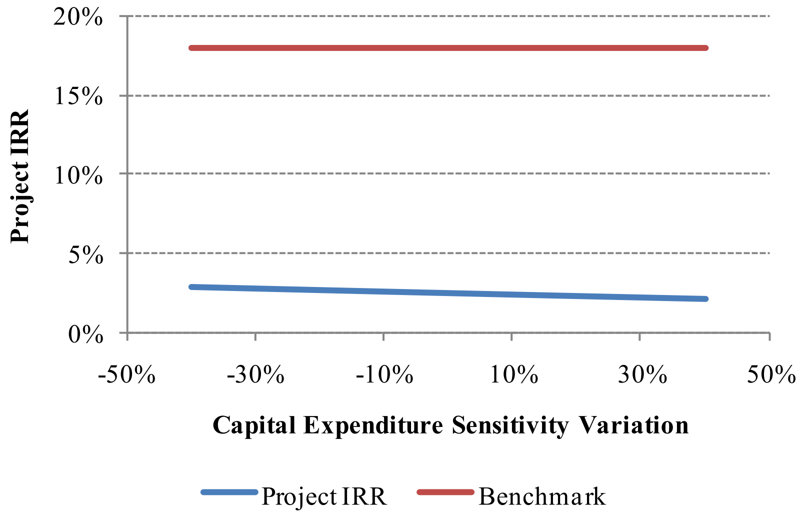
The above figure shows that additionality will only be compromised when Eskom's price escalation exceeds 180% (the point at which the IRR exceeds the benchmark). This is highly unlikely due to the current political dispensation of South Africa.

2. Rand/Euro variation



The above figure shows that additionality will not be compromised if the Rand/Euro exchange rate has a departure variation in the range of -40% and +40%.

3. Capital expenditure variation



The above figure shows that additionality will not be compromised if the capital expenditure of the project decreases by as much as 40%, or increases by more than 40%.

The results of the sensitivity analysis show that the conclusion regarding the financial/economic attractiveness (made in sub-set 2c above) is robust to reasonable variations in the critical assumptions.

Step 3: Barrier analysis

Sub-step 3a: Identify barriers that would prevent the implementation of the proposed CDM project activity:

(a) Investment Barriers

- The total capital investment of the project activity is significant – this investment includes construction, equipment, installation work and other costs. These funds would need to be raised in financial markets.

- The following are some of the financial barriers that the proposed project activity must overcome:
  - The economy of scale is a well known factor in electricity production. Funding small to medium size power generation projects such as the proposed project are difficult;
  - The low price of grid electricity further detracts from the economic attractiveness of such an endeavour as return on investment for electricity generation projects are low, particularly on a perceived risk-adjusted basis, compared to alternative uses of available capital. Financial projections for the project suggest that, even under optimistic assumptions, the cost to generate electricity will be higher than the average cost of electricity from the national provider (Eskom);
  - Maintenance costs for the internal combustion engines are much higher than simply using electricity from the national grid.

(b) Technological Barriers

Internal combustion engines require trained labour, which could lead to the following technological risks:

- A large pool of skilled and/or properly trained labour to operate and maintain the technology is not available in South Africa. This leads to an increased risk of equipment disrepair and malfunction.

- Generating electricity is not part of the normal skill set found at a smelter.

- The furnace off-gas has a low calorific value. The technology to generate electricity from low calorific gas is relatively new to South Africa.

- The selected engines have only been used in five other registered CDM projects. These projects, however, operate the engines on gas with a higher calorific value gas than the furnace off-gas that this proposed project will use.

(c) Barriers due to Prevailing Practice

- This project aims to be the first registered South African CDM project of its kind to generate a significant amount of electricity from a low calorific waste gas at a smelter in South Africa.

- Largely due to the historical low cost of electricity and technological barriers, most smelters in South Africa have not paid attention to the possibility of generating captive electricity from waste gases.

Sub-step 3 b: Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

Referring to the barrier analysis Step 3 in Section B.4, only the current practice (W2, P6 and H4) does not involve any risk or additional capital expenditure. This alternative has no technological or investment barriers. So the barriers identified in Sub-step 3a would not prevent the continuation of flaring the waste gas, importing electricity from the national electricity supplier Eskom, and using light fuel oil in the boiler.

Step 4: Common practice analysis

Sub-step 4a: Analyze other activities similar to the proposed project activity:

Currently in South Africa, waste furnace off-gases are flared to atmosphere for safety reasons.

Sub-step 4b: Discuss any similar Options that are occurring:

The project activity aims to be the first registered South African CDM project of its kind in South Africa to generate a significant amount of electricity from low calorific value off-gas at a smelter. Therefore, as demonstrated above, the project activity is additional.

Notice of prior consideration

The project start date is 31/03/2011. The milestones in the project development are provided in the timeline below:

Date	Milestone
08/03/2006	Proposal for an evaluation study into the use of furnace off-gas at Namakwa Sands.
24/07/2006	Boiler quotation from Babcock Africa Services (Pty) Ltd.
07/08/2006	Engine quotation from GE Jenbacher.
31/08/2006	Promethium Carbon (Pty) Ltd completes prefeasibility study on proposed project activity.
19/01/2007	Exxaro acquires the Namakwa Sands business

16/01/2008	Eskom Transmission feasibility quotation for connection of 9 x 2.097 MVA generators at Exxaro Namakwa Sands Project.
04/03/2008	South African DNA letter of no objection for the Namakwa waste gas utilisation project.
11/04/2008	Memorandum of Understanding between Exxaro Coal (Pty) Ltd, Promethium Carbon (Pty) Ltd, and Group Five Energy (Pty) Ltd.
24/06/2008	Steering committee shows prior consideration of the CDM.
22/10/2008	Application notice for a basic assessment for a cogeneration plant at the Namakwa Sands Smelter, Saldanha Bay.
06/11/2008	A Background Information Document (BID) is released for a 30-day public comment period in order to provide interested and affected parties an opportunity to comment on the proposed project.
20/11/2008	An open day is held at the Skilpadsaal in Vredenburg, which provided the public with an opportunity to get more information regarding the proposed project.
11/06/2009	Request submitted to the Department of Environmental Affairs & Development Planning (DEA&DP) for an extension to the submission timeframe for the final basic assessment report.
03/03/2010	Request submitted to the Department of Environmental Affairs & Development Planning (DEA&DP) for a further six month extension to the submission timeframe for the final basic assessment report.
27/08/2010	Notice of prior consideration submitted to the UNFCCC and South African DNA.
11/11/2010	PDD completed by Promethium Carbon (Pty) Ltd.
31/03/2011	Expected financial close of project.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

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The emission reductions were calculated in accordance with ACM0012 version 03.2: 'Consolidated baseline methodology for GHG emission reductions from waste energy projects', Version 03.2, Sectoral Scopes 01 and 04, EB 51.

Baseline Emissions

The baseline emissions were determined as follows:

$$BE_y = BE_{EN,y} + BE_{flst,y} \quad (1)$$

Where:

BE_y The total baseline emissions during the year *y* in tons of CO_2

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

$BE_{flst,y}$	Baseline emissions from generation of steam, if any, using fossil fuel, that would have been used for flaring the waste gas in absence of the project activity (tCO_2e per year), calculated as per Equation 1c. 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:

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

The calculation of baseline emissions ($BE_{EN,y}$) depends on the identified baseline scenario. Scenario 1 was identified as applicable to the proposed project activity as electricity is obtained from the grid in the baseline. Therefore, the baseline emissions from the energy generated by the project activity ($BE_{EN,y}$) were determined as follows:

$$BE_{EN,y} = BE_{Elec,y} + BE_{Ther,y} \quad (1a)$$

$BE_{Elec,y}$	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 process) during the year *y* in tons of CO_2

(a.i) Baseline emissions from electricity ($BE_{Elec,y}$) Type-1 activities:

<u>Case-1: Waste energy is used to generate electricity</u>

The baseline emissions from electricity that is displaced by the project activity ($BE_{Elec,y}$) were determined as follows:

$$BE_{Elec,y} = f_{cap} \times f_{wcm} \times \sum_j \sum_i (EG_{i,j,y} \times EF_{Elec,i,j,y}) \quad (1a\text{-}1)$$

Where:

$BE_{Elec,y}$	Baseline emissions due to displacement of electricity during the year y in tons of CO_2
$EG_{i,j,y}$	The quantity of electricity supplied to the recipient j by generator, that in the absence of the project activity would have been sourced from i^{th} source (i can be either grid or identified source) during the year *y* in MWh, and
$EF_{Elec,i,j,y}$	The CO_2 emission factor for the electricity source i (i=gr (grid) or i=is (identified source)), displaced due to the project activity, during the year *y* in tons CO_2/MWh. The calculations for the CO_2 emission factor of the Southern African Power Pool will be made available at validation.

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.
f_{cap}	Energy that would have been produced in project year *y* using waste energy generated in base year expressed as a fraction of 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 in base year. The value is estimated using equations (1f), or (1f-1) or (1f-2), or (1g), (1g-1) or (1h).

$f_{wcm} = 1$, since the electricity generation is purely from the use of waste gas.

(b) Baseline emissions from thermal energy ($BE_{Ther,y}$)

The baseline emissions from thermal energy were determined as follows:

$$BE_{Ther,y} = f_{cap} \times f_{wcm} \times \sum_i \sum_j ((HG_{j,y}) + (MG_{i,j,y,tur}/n_{mech,tur})) \times EF_{heat,j,y} \qquad (1a\text{-}2)$$

Where:

$BE_{Ther,y}$	Baseline emissions from thermal energy during year *y* (tCO_2)
$HG_{j,y}$	Net quantity of heat supplied to the recipient plant *j* by the project activity in year *y* in TJ
f_{wcm}	Fraction of total heat generated by the project activity using waste energy. This fraction is 1 if the heat generation is purely from use of waste energy.
f_{cap}	Energy that would have been produced in project year *y* using waste energy generated in base year expressed as a fraction of 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 in base year. The value is estimated using equations (1f), or (1f-1) or (1f-2), or (1g), (1g-1) or (1h).
$EF_{heat,j,y}$	The CO_2 emission factor of the element process supplying heat that would have supplied the recipient plant *j* in the absence of the project activity, expressed in tCO_2/TJ.
$MG_{i,j,y,tur}$	Mechanical energy generated and supplied to the recipient *j*, which in the absence of the project activity would receive power from steam turbine *i*, driven by steam generated in a fossil fuel boiler.
$n_{mech,tur}$	The efficiency of the baseline equipment (steam turbine) that would provide mechanical power in the absence of the project activity.

$f_{wcm} = 1$, since the heat generation is purely from the use of waste gas.

$MG_{i,j,y,tur} = 0$, since no mechanical energy is generated.

The CO_2 emission factor of the element process supplying heat was calculated as follows:

$$EF_{heat,j,y} = \sum_i ws_{i,j} \frac{EF_{CO2,i,j}}{n_{EP,i,j}} \quad (1a\text{-}22)$$

Where:

$EF_{CO2,i,j}$	The CO_2 emission factor per unit of energy of the baseline fuel used in the i^{th} boiler used by recipient j, in tCO_2/TJ, in the absence of the project activity.
$n_{EP,i,j}$	Efficiency of the i^{th} element process that would have supplied heat to the j^{th} recipient in the absence of the project activity.
$ws_{i,j}$	Fraction of total heat that is used by recipient j in the project that in the absence of the project activity would have been supplied by the i^{th} boiler.

A conservative approach was taken, and the efficiency of the element process ($n_{EP,i,j}$) was assumed to be 100%.

$ws_{i,j} = 1$, since all of the heat that is used in the absence of the project activity would have been supplied by the i^{th} boiler.

ACM0012 requires that the baseline emissions should be capped in order to introduce an element of conservativeness. Three methods of capping are available to project developers. The capping of the baseline emissions for this project case will be done by applying Method 3. Method 3 is suitable as it allows for circumstances where the waste energy was not measured and, hence, there is no historic data available to be used for capping the baseline emissions. Historically, Namakwa Sands have not measured the furnace off-gas flow rate or calorific value as there has been no need to do so. Therefore, Method 3 will be applied.

Method 3 states that the project may conform to two types (Cases 1 or Case 2). Case 1 is applicable to projects where energy is recovered and converted into final output energy through waste heat recovery equipment. The project activity converts the energy recovered from the furnace off-gas into electricity (the final output energy) by utilising internal combustion engines (waste heat recovery equipment). Therefore, the proposed project fits into Case 1 and the baseline emissions (f_{cap}) will be capped in the following manner:

As per ACM0012, in order to cap the baseline emissions, f_{cap} will be calculated using the ratio of the maximum theoretical energy recoverable using the project activity waste heat recovery equipment ($Q_{OE,BL}$) and actual energy recovered under the project activity (using direct measurement) ($Q_{OE,y}$). For estimating the theoretical recoverable energy, manufacturer's specifications will be used.

$f_{cap} = 1$ if the waste energy generated in the project year is the same as or less than that generated in the base year.

Project Emissions

Project emissions are calculated as per equation (2) below:

$$PE_y = PE_{AF,y} + PE_{EL,y} + PE_{EL,import,y} \quad (2)$$

Where:

PE_y	Project emissions due to project activity
$PE_{AF,y}$	Project activity emissions from on-site consumption of fossil fuels by the cogeneration plant(s), in case they are used as supplementary fuels, due to non-availability of waste gas to the project activity or due to any other reason.
$PE_{EL,y}$	Project activity emissions from on-site consumption of electricity for gas cleaning and conditioning equipment
$PE_{EL,import,y}$	Project activity emissions from import of electricity replacing captive electricity generated in the absence of the project activity for Type-2 project activities

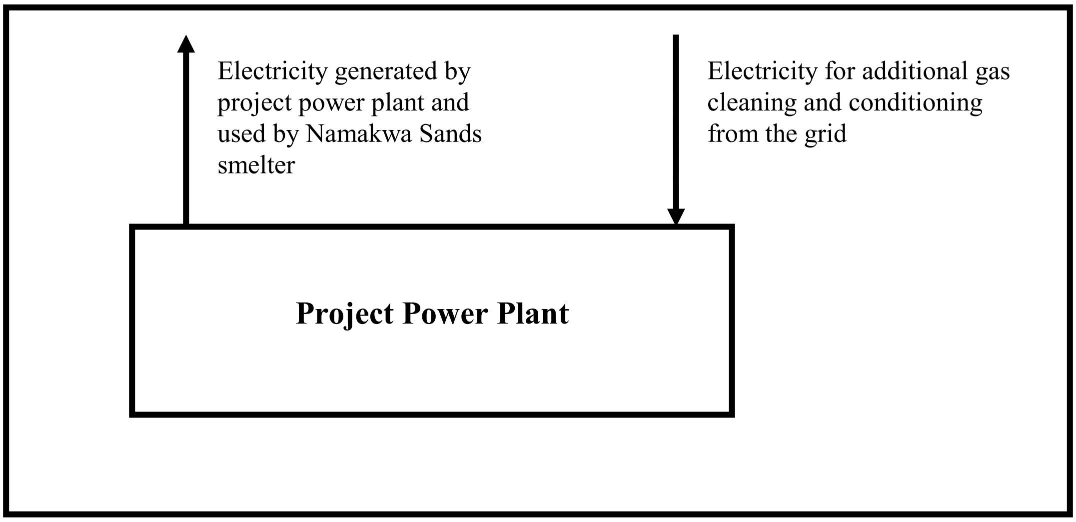
The proposed project is a Type-1 project and, therefore, the project activity emissions from import of electricity replacing captive electricity are not applicable. Furthermore, no auxiliary fuel is used when combusting the waste furnace off-gas. Therefore:

$$PE_{AF,y} = PE_{EL,import,y} = 0$$

Therefore, equation (2) simplifies to:

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

There will be electricity used in the additional gas cleaning and conditioning. Project emissions due to electricity consumption of gas preparation equipment ($PE_{EL,y}$) were calculated by multiplying the CO_2 emission factor for electricity ($EF_{CO_2,EL,y}$) by the total amount of electricity used as a result of the project activity ($EC_{PJ,y}$). During plant maintenance, the source of electricity for the proposed project plant will be the grid.



Plant maintenance situation

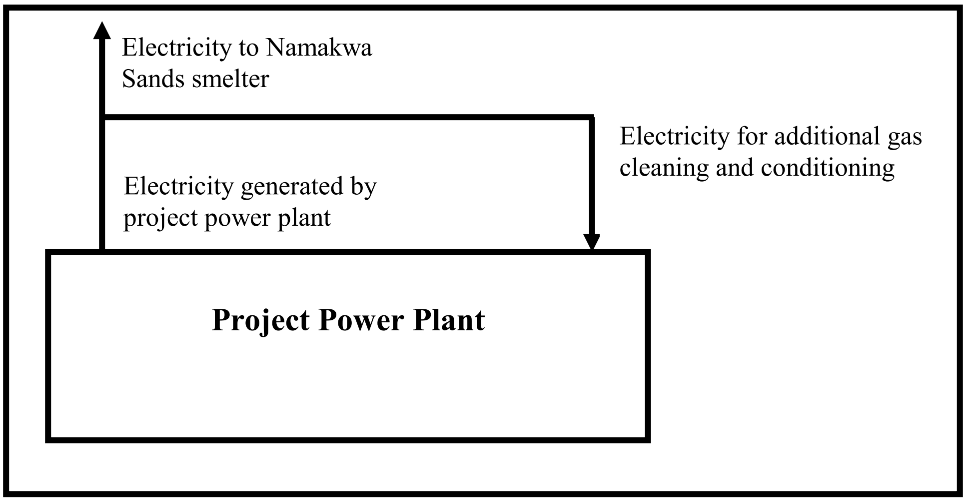
The calculation is presented below:

$$PE_{EL,y} = EC_{PJ,y} \times EF_{CO_2,EL,y} \quad (2b)$$

Where:

$PE_{EL,y}$	Project emissions from consumption of electricity in gas cleaning equipment of project activity (tCO_2/yr)
$EC_{PJ,y}$	Additional electricity consumed in year *y* as a result of the implementation of the project activity (MWh)
$EF_{CO_2,EL,y}$	CO_2 emission factor for electricity consumed by the project activity in year *y* (tCO_2/MWh)

During operation, the source of the electricity will be the proposed project plant. A small portion of the electricity produced by the project activity will be used to supply the gas cleaning and conditioning equipment with electricity. This will decrease the amount of electricity supplied to the Namakwa Sands smelter.



Operation situation

In the case above, the baseline emissions change since the net amount of electricity supplied to Namakwa Sands smelter decreases. The project emissions also change as the electricity required for additional gas cleaning and conditioning is sourced from the electricity generated by the project activity and not from the grid. Hence, the project emissions from electricity consumption become:

$$PE_{EL,y} = EC_{PJ,y} \times EF_{CO_2,EL,y} \quad (2b)$$

Where:

$PE_{EL,y}$	Project emissions from consumption of electricity in gas cleaning equipment of project activity (tCO_2/yr)
$EC_{PJ,y}$	Additional electricity consumed in year y as a result of the implementation of the project activity (MWh)
$EF_{CO_2,EL,y}$	CO_2 emission factor for electricity consumed by the project activity in year *y* (t CO_2/MWh)

The CO_2 emission factor for the electricity consumed was calculated by using equation 2b-1.

$$EF_{CO_2,EL,y} = \frac{\sum_k FC_{EL,CP,k,y} \times NCV_k \times EF_{CO_2,k}}{EC_{CP,y}} \quad (2b\text{-}1)$$

Where:

$EF_{CO_2,EL,y}$	CO_2 emission factor for electricity consumed by the project activity in year *y* (CO_2/MWh)

$FC_{EL,CP,k,y}$	Quantity of fuel type k combusted in the captive power plant at the project site in year y (mass or volume unit)
NCV_k	Net calorific value of fuel type k (GJ/mass or volume unit)
$EF_{CO_2,k}$	Emission factor of fuel type k (tCO_2/GJ)
$EC_{CP,y}$	Quantity of electricity generated in the captive power plant at the project site in year y (MWh)
k	Fuel types fired in the captive power plant at the project site in year y

However, no fossil fuel is used in the production of the electricity by the proposed project plant. Hence, the CO_2 emission factor for the electricity consumed by the proposed project plant becomes zero. Therefore, $PE_{EL,y} = 0$.

Leakage

No leakage is applicable under this methodology.

Emission Reductions

Emission reductions due to the project activity during the year *y* were calculated as follows:

$$ER_y = BE_y - PE_y \qquad (3)$$

Where:

ER_y	Total emissions reductions during the year *y* in tons of CO_2
PE_y	Emissions from the project activity during the year *y* in tons of CO_2
BE_y	Baseline emissions for the project activity during the year *y* in tons of CO_2

B.6.2. Data and parameters that are available at validation:

Data / Parameter:	$EF_{Elec,i,j,y}$ *and* $EF_{CO_2,EL,y}$
Data unit:	tCO_2 / MWh
Description:	CO_2 emission factor for grid electricity displaced by the project activity during year *y*
Source of data to be used:	The combined margin emission factor, determined according to version 2 of the ‘Tool to calculate emission factor for an electricity system’
Value of data applied for the purpose of calculating expected emission reductions in	1.04

section B.5	
Description of measurement methods and procedures to be applied:	As per applied tool, this value will be calculated ex-ante. The calculations for the tool will be made available during validation.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$Q_{OE,BL}$
Data unit:	MWh
Description:	Output energy that can theoretically be produced by the project activity waste heat recovery equipment.
Source of data used:	Manufacturer's specifications
Value applied:	2012: 44,867 2013: 118,966 2014: 118,966 2015: 118,966 2016: 118,966 2017: 118,966 2018: 118,966 2019: 118,966 2020: 118,996 2021: 118,966
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per methodology ACM0012, manufacturer's specifications can be used to estimate the theoretical energy.
Any comment:	

B.6.3. Ex-ante calculation of emission reductions:

The following assumptions were used to calculate the ex-ante emissions reductions:

- The proposed start of the crediting period is 1 July 2012. Hence, the emissions reductions are calculated on the basis that the plant is operational for six months in 2012.
- Six internal combustion engines are fully operational at the start of the proposed crediting period (1 July 2012).
- A further two internal combustions are installed and are fully operational on 1 January 2013.
- A portion of the waste gas is fed to the slag dryer (to replace the light fuel oil that is currently used) – this activity will be in place at the start of the crediting period.

The baseline emissions (BE_y) were calculated using equation (1):

$$BE_y = BE_{EN,y} + BE_{flst,y} \quad (1)$$

Year	BE_y	$BE_{EN,y}$	$BE_{flst,y}$
	tCO_2/y	tCO_2/y	tCO_2/y
2012	34,685	34,685	0
2013	91,649	91,649	0
2014	91,649	91,649	0
2015	91,649	91,649	0
2016	91,649	91,649	0
2017	91,649	91,649	0
2018	91,649	91,649	0
2019	91,649	91,649	0
2020	91,649	91,649	0
2021	91,649	91,649	0

The baseline emissions from the energy generated by the project activity ($BE_{EN,y}$) were calculated using equation (1a):

$$BE_{EN,y} = BE_{Elec,y} + BE_{Ther,y} \quad (1a)$$

Year	$BE_{EN,y}$	$BE_{Elec,y}$	$BE_{Ther,y}$
	tCO_2/y	tCO_2/y	tCO_2/y
2012	34,685	33,284	1,401
2013	91,649	88,862	2,787
2014	91,649	88,862	2,787
2015	91,649	88,862	2,787
2016	91,649	88,862	2,787
2017	91,649	88,862	2,787
2018	91,649	88,862	2,787
2019	91,649	88,862	2,787
2020	91,649	88,862	2,787
2021	91,649	88,862	2,787

The baseline emissions from electricity that is displaced by the project activity ($BE_{Elec,y}$) were calculated using equation (1a-1):

$$BE_{Elec,y} = f_{cap} \times f_{wcm} \times \sum_j \sum_i (EG_{i,j,y} \times EF_{Elec,i,j,y}) \qquad (1a\text{-}1)$$

Year	$BE_{Elec,y}$	$EG_{i,j,y}$	$EF_{Elec,i,j,y}$	f_{wcm}	f_{cap}
	tCO_2/y	MWh	tCO_2/MWh	-	-
2012	33,284	32,004	1.04	1	1.00
2013	88,862	85,444	1.04	1	1.00
2014	88,862	85,444	1.04	1	1.00
2015	88,862	85,444	1.04	1	1.00
2016	88,862	85,444	1.04	1	1.00
2017	88,862	85,444	1.04	1	1.00
2018	88,862	85,444	1.04	1	1.00
2019	88,862	85,444	1.04	1	1.00
2020	88,862	85,444	1.04	1	1.00
2021	88,862	85,444	1.04	1	1.00

The baseline emissions from thermal energy were calculated using equation (1a-2):

$$BE_{Ther,y} = f_{cap} \times f_{wcm} \times \sum_i \sum_j ((HG_{j,y}) + (MG_{i,j,y,tur}/n_{mech,tur})) \times EF_{heat,j,y} \qquad (1a\text{-}2)$$

Year	$BE_{Ther,y}$	f_{cap}	f_{wcm}	$HG_{j,y}$	$MG_{i,j,y}$	$n_{mech,tur}$	$EF_{heat,j,y}$
	tCO_2/y	-	-	TJ/y	TJ	-	tCO_2/TJ
2012	1,401	1	1	18.9	0	-	74.1
2013	2,787	1	1	37.6	0	-	74.1
2014	2,787	1	1	37.6	0	-	74.1
2015	2,787	1	1	37.6	0	-	74.1
2016	2,787	1	1	37.6	0	-	74.1
2017	2,787	1	1	37.6	0	-	74.1
2018	2,787	1	1	37.6	0	-	74.1
2019	2,787	1	1	37.6	0	-	74.1
2020	2,787	1	1	37.6	0	-	74.1
2021	2,787	1	1	37.6	0	-	74.1

The CO_2 emission factor of the element process supplying heat was calculated using equation (1a-22):

$$EF_{heat,j,y} = \sum_i ws_{i,j} \frac{EF_{CO2,i,j}}{n_{EP,i,j}} \quad (1a\text{-}22)$$

Year	$EF_{heat,j,y}$	$ws_{i,j}$	$EF_{CO2,i,j}$	$n_{EP,i,j}$
	tCO_2/TJ	-	tCO_2/TJ	-
2012	74.1	1	74.1	1
2013	74.1	1	74.1	1
2014	74.1	1	74.1	1
2015	74.1	1	74.1	1
2016	74.1	1	74.1	1
2017	74.1	1	74.1	1
2018	74.1	1	74.1	1
2019	74.1	1	74.1	1
2020	74.1	1	74.1	1
2021	74.1	1	74.1	1

Project emissions were calculated using equation (2):

$$PE_y = PE_{AF,y} + PE_{EL,y} + PE_{EL,import,y} \quad (2)$$

Year	PE_y	$PE_{AF,y}$	$PE_{EL,y}$	$PE_{EL,import,y}$
	tCO_2	tCO_2	tCO_2	tCO_2
2012	30	0	30	0
2013	69	0	69	0
2014	69	0	69	0
2015	69	0	69	0
2016	69	0	69	0
2017	69	0	69	0
2018	69	0	69	0
2019	69	0	69	0
2020	69	0	69	0
2021	69	0	69	0

The project emissions from consumption of electricity in additional equipment were calculated using equation (2b):

$$PE_{EL,y} = EC_{PJ,y} \times EF_{CO_2,EL,y} \quad (2b)$$

Year	$PE_{EL,y}$	$EC_{PJ,y}$	$EF_{CO2,EL,y}$
	tCO_2	MWh	tCO_2/MWh
2012	30	29	1.04
2013	69	67	1.04
2014	69	67	1.04
2015	69	67	1.04
2016	69	67	1.04
2017	69	67	1.04
2018	69	67	1.04
2019	69	67	1.04
2020	69	67	1.04
2021	69	67	1.04

Emission reductions due to the project activity during the year *y* were calculated using equation (3):

$$ER_y = BE_y - PE_y \quad (3)$$

Year	ER_y	PE_y	BE_y
	tCO_2	tCO_2	tCO_2
2012	34,655	30	34,685
2013	91,580	69	91,649
2014	91,580	69	91,649
2015	91,580	69	91,649
2016	91,580	69	91,649
2017	91,580	69	91,649
2018	91,580	69	91,649
2019	91,580	69	91,649
2020	91,580	69	91,649
2021	91,580	69	91,649
Total	858,871	654	859,525

B.6.4 Summary of the ex-ante estimation of emission reductions:

>>

Year	Estimation of project activity emissions (tonnes of CO_2 e)	Estimation of baseline emissions (tonnes of CO_2 e)	Estimation of leakage (tonnes of CO_2 e)	Estimation of overall emission reductions (tonnes of CO_2 e)
2012	30	34,655	0	34,655
2013	69	91,580	0	91,580
2014	69	91,580	0	91,580
2015	69	91,580	0	91,580
2016	69	91,580	0	91,580
2017	69	91,580	0	91,580
2018	69	91,580	0	91,580
2019	69	91,580	0	91,580
2020	69	91,580	0	91,580
2021	69	91,580	0	91,580
Total (tonnes of CO_2 e)	654	859,525	0	858,871

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

B.7.1 Data and parameters monitored:

Data / Parameter:	$ws_{i,j}$
Data unit:	Fraction
Description:	Fraction of total heat that is used by the recipient *j* in the project that in the absence of the project activity would have been supplied by the i^{th} boiler
Source of data to be used:	Estimated from data on heat consumption used by the slag dryer
Value of data applied for the purpose of calculating expected emission reductions in section B.5	1
Description of measurement methods and procedures to be applied:	Yearly confirmation that all of the process heat which, in the absence of the project activity, would have been supplied by the light fuel oil boiler. This parameter will be only be monitored *if* a portion of the previously flared waste gas *is* combusted and fed to a slag dryer, thereby replacing the light fuel oil that is currently combusted.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$Q_{OE,y}$
Data unit:	MWh
Description:	Quantity of actual output energy during year *y*
Source of data to be used:	Generation plant measurement records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	2012: 33,764 2013: 89,547 2014: 89,547 2015: 89,547 2016: 89,547 2017: 89,547 2018: 89,547 2019: 89,547 2020: 89,547 2021: 89,547
Description of measurement methods and procedures to be applied:	The quantity of actual output energy will be measured continuously using the main electricity meter. The meter readings will be aggregated monthly for use in the emission reduction report.
QA/QC procedures to be applied:	A set of meters will be installed on the feed from the internal combustion engines. 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.
Any comment:	

Data / Parameter:	$EG_{i,j,y}$
Data unit:	MWh
Description:	Quantity of electricity supplied to the recipient *j* by generator, which in the absence of the project activity would have sourced from i^{th} source (*i* is the grid) during the year *y*
Source of data to be used:	Recipient plant(s) and generation plant measurement records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	2012: 32,004 2013: 85,444 2014: 85,444 2015: 85,444 2016: 85,444 2017: 85,444 2018: 85,444 2019: 85,444 2020: 85,444 2021: 85,444
Description of measurement methods	The quantity of electricity supplied to the recipient plant will be measured continuously using an electricity meter. The meter readings will be aggregated

and procedures to be applied:	monthly for use in the emission reduction report.
QA/QC procedures to be applied:	A set of meters will be 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.
Any comment:	

Data / Parameter:	$HG_{i,y}$
Data unit:	TJ/y
Description:	Net quantity of heat supplied to the recipient plant *j* by the project activity.
Source of data to be used:	Recipient plant(s) flow meter and NCV measurement records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	2012: 18.9 2013: 37.6 2014: 37.6 2015: 37.6 2016: 37.6 2017: 37.6 2018: 37.6 2019: 37.6 2020: 37.6 2021: 37.6
Description of measurement methods and procedures to be applied:	The enthalpy will be calculated by measuring the gas flow rate to the slag dryer, and multiplying it by the net calorific value of the gas. The gas flow rate will be measured continuously using a calibrated flow meter. The meter readings will be aggregated monthly for use in the emission reduction report. The flow rate will be only be monitored *if* a portion of the previously flared waste gas *is* combusted and fed to a slag dryer, thereby replacing the light fuel oil that is currently combusted.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$NCV_{WCM,y}$
Data unit:	MJ/Nm^3
Description:	Net Calorific Value annual average for WECM
Source of data to be used:	NCV is determined from laboratory tests. These laboratories are under the control of Namakwa Sands.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	2012: 11.11 2013: 11.11 2014: 11.11 2015: 11.11 2016: 11.11 2017: 11.11 2018: 11.11

	2019: 11.11 2020: 11.11 2021: 11.11
Description of measurement methods and procedures to be applied:	The NCV for WECM will be aggregated annually from laboratory tests.
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	$EC_{PJ,y}$
Data unit:	MWh
Description:	Additional electricity consumed in year *y* as a result of the implementation of the project activity. This electricity is consumed during plant start up.
Source of data to be used:	Actual measurements, plant operational records
Value of data applied for the purpose of calculating expected emission reductions in section B.5	2012: 29 2013: 67 2014: 67 2015: 67 2016: 67 2017: 67 2018: 67 2019: 67 2020: 67 2021: 67
Description of measurement methods and procedures to be applied:	The addition electricity consumed as a result of the implementation of the project activity will be measured continuously using the main electricity meter. The meter readings will be aggregated monthly for use in the emission reduction report.
QA/QC procedures to be applied:	A set of meters will be installed on the feed to the engines and auxiliary equipment. 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.
Any comment:	

B.7.2. Description of the monitoring plan:

>>
The monitoring plan will ensure that emission reductions are accurately monitored, recorded, and reported.

(i) Overall project management

Exxaro Resources has a clear and well defined management structure. This is illustrated in the operation organogram below.

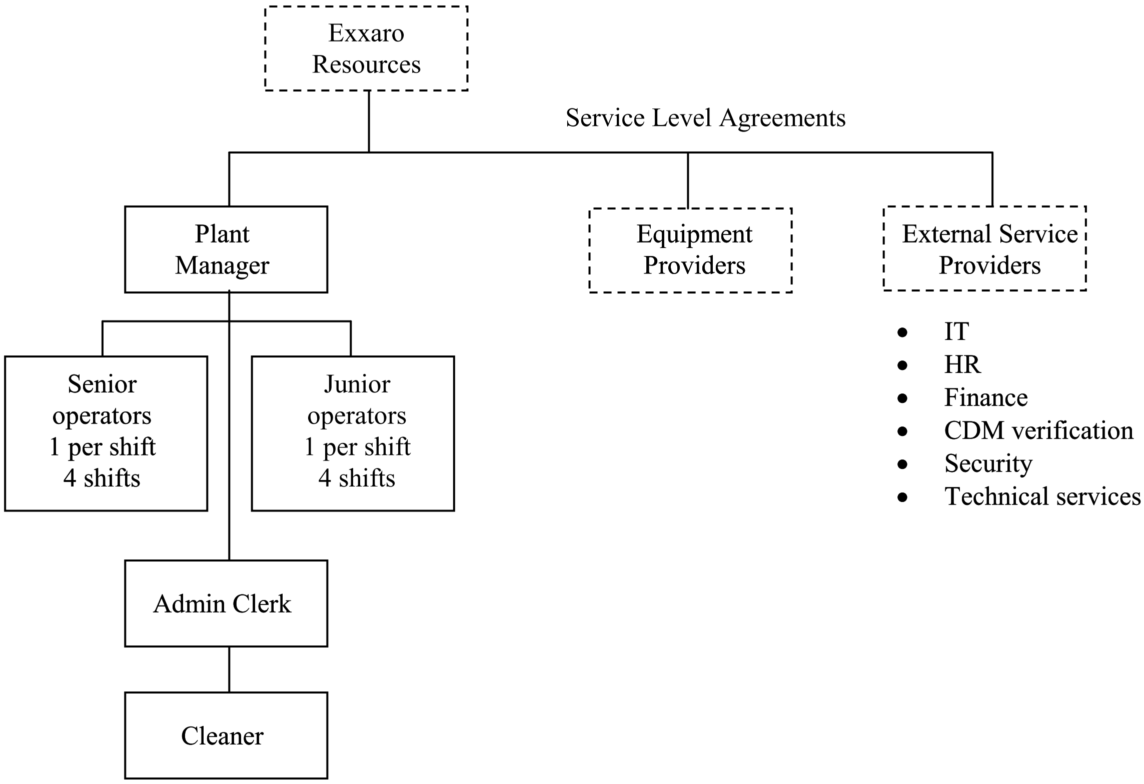


Figure 4: Operational organogram

(ii) Data to be monitored during the crediting period

The following data will be monitored by Exxaro Resources:

- Quantity of electricity supplied to the recipient plant;
- Actual plant electricity output;
- Electricity consumption of additional plant equipment used in the project activity;
- Gas flow rate to the slag dryer, provided that a portion of the waste gas is fed to this dryer.

(iii) Monitoring equipment

Electricity meters will measure 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.

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

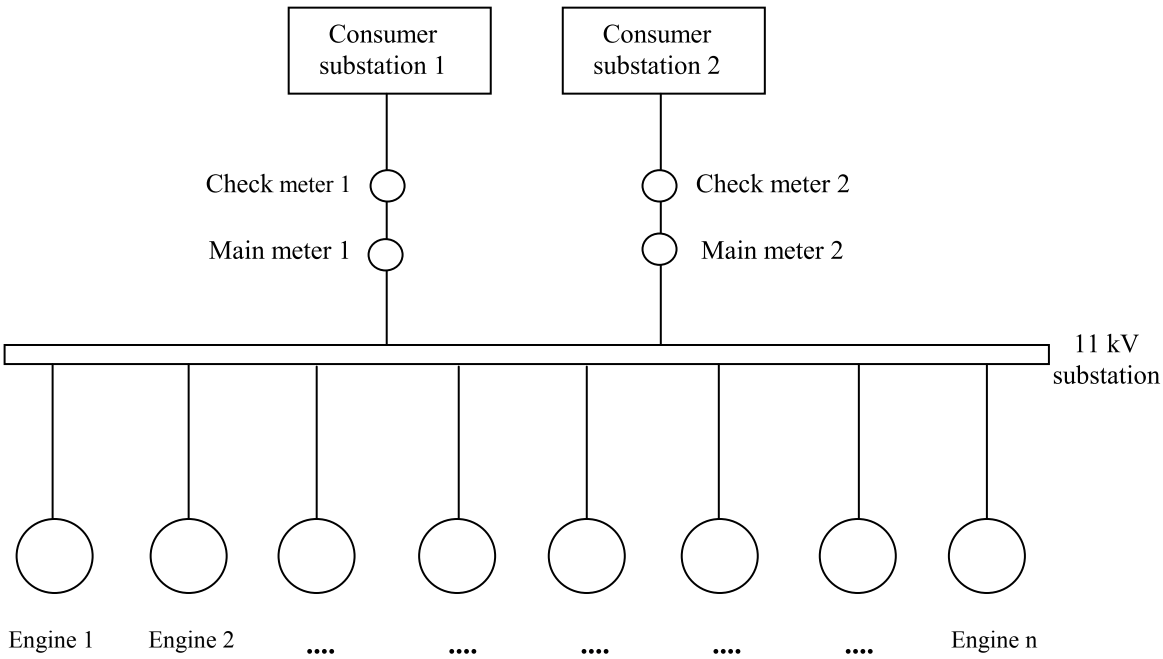


Figure 5: Metering setup

(iv) Monitoring accuracy

The electricity meters will be fitted with a telemetry system, and the data will be fed into the plant control system on a daily basis. The main and check meters will be 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.

(v) Data collection and storage

On a monthly basis, the Namakwa Sands plant manager (or other designated employee) and a representative from Namakwa Sands will read the two main electricity meters to determine the quantity of electricity produced by the plant. This will be done by adding the readings from the two main meters.

The electricity readings will be used for billing purposes and will be logged electronically for the purposes of calculating emission reductions.

The information will be saved onto the Exxaro Resources Supervisory Control and Data Acquisition (SCADA) system, as well as Exxaro Resources on-site financial systems. Backups will be kept both on- and off-site, and all of the data will be available for CDM verification.

As per methodology ACM0012, all data collected as part of the monitoring plan will be archived electronically, and will be kept for a minimum if two years at the end of the crediting period.

B.8. Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies):

>>
Date of completion of application: 11/11/2010

Contact information for the entity responsible for the application of the baseline and monitoring information:
Promethium Carbon (Pty) Ltd
Coral House
20 Peter Place
Bryanston 2021
Johannesburg
Telephone: +27 11 706 8185

This entity is not a project participant.

SECTION C. Duration of the project activity / crediting period

C.1. Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
The scheduled starting date of the project activity is 31/03/2011. This is the date of the financial close of the project.

C.1.2. Expected operational lifetime of the project activity:

>>
The expected operational lifetime of the project activity exceeds ten years 0 months. The expected life of the furnaces and internal combustion engines exceeds the operational lifetime of the project activity. The service level agreement with the engine manufacturers is for 15 years.

C.2. Choice of the crediting period and related information:

C.2.1. Renewable crediting period:

C.2.1.1. Starting date of the first crediting period:

>>

Not applicable

C.2.1.2. Length of the first crediting period:

>>

Not applicable

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>

The starting date of the fixed crediting period is 01/07/2012.

C.2.2.2. Length:

>>

10 years 0 months

SECTION D. Environmental impacts

>>

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

>>

An initial environmental screening report for this project was undertaken by independent consultants; Strategic Environmental Focus (Pty) Ltd. This screening report identified the need to conduct a basic environmental assessment to comply with the National Environmental Management Act, 1998 (Act No. 107 of 1998) [NEMA], and the EIA Regulations of 2006 (Government Notice No's R385, 386 and 387 of 2006). A basic environmental assessment is a requirement for any project which generates over 10 MW of electricity, but under 20 MW of electricity.

The basic assessment is being conducted by Arcus Gibb (Pty) Ltd.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>

An initial assessment of the project activity and its associated environmental impacts was carried out by Strategic Environmental Focus (Pty) Ltd. They were required to make recommendations on the appropriate environmental authorisation processes for the project, to identify any potential environmental issues or sensitivities at the existing site and to highlight any environmental risks.

The process followed to compile the screening report:

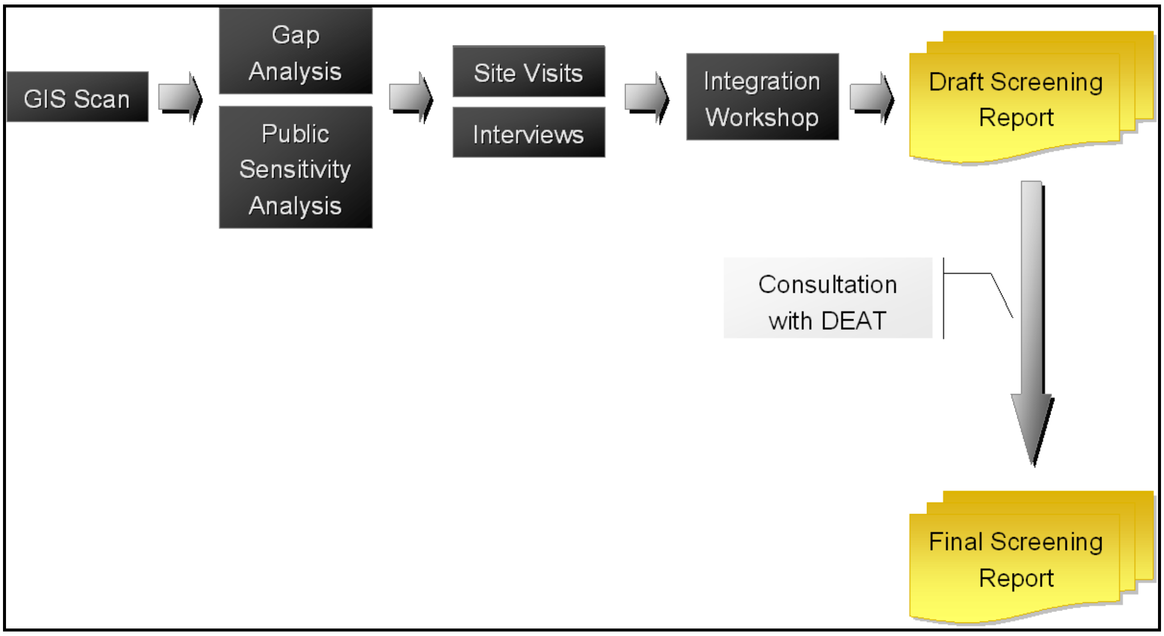


Figure 6: Screening report steps

The screening process determined that:

- A basic assessment process will be required for the proposed plant to fulfil the requirements of South African environmental legislation. The proposed development involves 'listed activities', as defined by the National Environmental Management Act, 1998 (Act No. 107 of 1998) [NEMA], and the EIA Regulations of 2006 (Government Notice No's R385, 386 and 387 of 2006):

  Government Notice R386 of 2006:

  - *1 The construction of facilities or infrastructure including associated structures or infrastructure, for: (a) the generation of electricity where the electricity output is more than 10 megawatts but less than 20 megawatts.*

- *25 The expansion of or changes to existing facilities for any process or activity, which requires an amendment of an existing permit or license or new permit or license in terms of legislation governing the release of emissions, pollution, effluent.*

- No water use license is required for the proposed plant. This is because the water will be supplied by Namakwa Sands who has sufficient headroom available on the water use permit;
- The proposed plant will result in an improved particulate removal system, which will result in a decrease in particulate matter released into the atmosphere (30 mg/Nm3 to below 15 mg/Nm3);
- The proposed plant on site may have a resultant increase in noise pollution on the site, but this has been addressed by housing the engines (equipped with exhaust silencers) in an engine room;

The basic assessment will be conducted by Arcus Gibb (Pty) Ltd.

SECTION E. Stakeholders' comments

>>

E.1. Brief description how comments by local stakeholders have been invited and compiled:

>>

- A Background Information Document (BID) was released on 06/11/08 for a 30-day public comment period in order to provide interested and affected parties (I & AP) an opportunity to comment on the proposed project. I & AP were invited to comment in writing during this period.

- A regular Saldanha Bay Forum was held on 19/11/2008 at which the project was presented to the forum

- An open day was held at the Skilpadsaal in Vredenburg on 20/11/2008. The open day provided the public with an opportunity to get more information regarding the proposed project, and to provide inputs on the proposed project and basic assessment process. All I & AP were invited to attend the open day.

- Public participation notifications:
  - Newspaper advertisements: Weslander on 06/11/2008, and Coastal News on 14/11/2008
  - 6 on-site notices (3 in English, 3 in Afrikaans)
  - 68 email notifications/ invitations
  - 101 letters

E.2. Summary of the comments received:

>>

Attendees were encouraged to verbally comment about the proposed project at the Saldanha Bay Forum. The following questions were received:

- *Question:* How are carbon dioxide emissions reduced if the carbon monoxide gas is still to be combusted on the same site?
  Answer: Carbon dioxide emissions are reduced since the electricity produced by the co-generation plant will be no longer be consumed from the grid.

- *Question:* When do we expect to see power rationing again?
  Answer: No one knows but it seems inevitable with the current growth in demand and lack of increase in supply.

- *Question:* Where are the engines made and what type of engines are they?
  Answer: They are made by Jenbacher in Austria (part of General Electric) and are spark ignition gas engines designed for this type of gas.

- *Question:* How soon can you implement the project?
  Answer: We need to complete the environmental and regulatory approvals as well as sign a PPA with Namakwa Sands. It could take from 6 months to many years depending on the cost of power from the plant and when we can sign a PPA with Namakwa Sands.

- *Question:* What effect do carbon credits have on the project and how do you go about getting carbon credits?
  Answer: They reduce the cost of the project significantly, thereby making the project viable. Carbon credits are obtained by registering the project with the UNFCCC and then getting CERs issued on a yearly basis thereafter.

E.3. Report on how due account was taken of any comments received:

>>

Since no negative comments were received, there was no need to make adjustments on the design, construction, or operation of the proposed project.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Exxaro Resources Ltd
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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Not applicable. No public funding was used in the development or implementation of the project activity.

Annex 3

BASELINE INFORMATION

The calculations for the grid emission factor of the Southern African Power Pool will be made available at validation.

Annex 4

MONITORING INFORMATION

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