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:

IFM Integrated Clean Energy Project
PDD Version 11; 16 August 2011

Version History:

PDD Version 1;	Draft	09 June 2008
PDD Version 2;	Draft	10 June 2008
PDD Version 3;	Draft	19 June 2008
PDD Version 4;	Draft	19 June 2008
PDD Version 5;	Sent to validator	16 May 2010
PDD Version 6;	Draft	20 October 2010
PDD Version 7;	Sent to validator	22 November 2010
PDD Version 8;	Draft	10 May 2011
PDD Version 9;	Sent to validator	14 June 2011
PDD Version 10;	Sent to validator	11 July 2011
PDD Version 11;	Sent to validator	16 August 2011

A.2. Description of the project activity:

The purpose of the proposed project activity is to utilise waste furnace off-gas as a source of energy to generate clean electricity and contribute to lower greenhouse gas emissions by replacing fossil fuel-based electricity from the South African national grid.

International Ferro Metals SA (Pty) Ltd (IFM) operate a state-of-the art integrated chromite mine and processing facility to produce ferrochrome (FeCr) at the Buffelsfontein site located between Brits and Rustenburg in North-West Province, South Africa. The facility incorporates two closed electric furnaces, which are capable of producing approximately 260,000 tonnes of FeCr per year.

Inherent in the FeCr process is the generation of significant quantities of furnace off-gas, including a substantial percentage of carbon monoxide (based on historical data and depending on process conditions sometimes above 90% CO). In the current plant design this gas is flared and emitted to the atmosphere as carbon dioxide (CO2).

The project involves the diversion of the collected off-gas from the existing flaring system to a gas conditioning system at the new generation facility to smooth out inconsistencies in gas composition and volume fluctuations.

The gas will be fed from the gas conditioning system to a bank of ten internal combustion engines each capable of generating up to 2MWh of electrical power, depending on the relative levels of CO and H_2 present in the gas. The installed capacity of the combustion engines is therefore 20MW with an operational capacity of up to 19.06MWh, where approximately 0.94MWh is consumed by parasitic load of the project activity during stable operation.

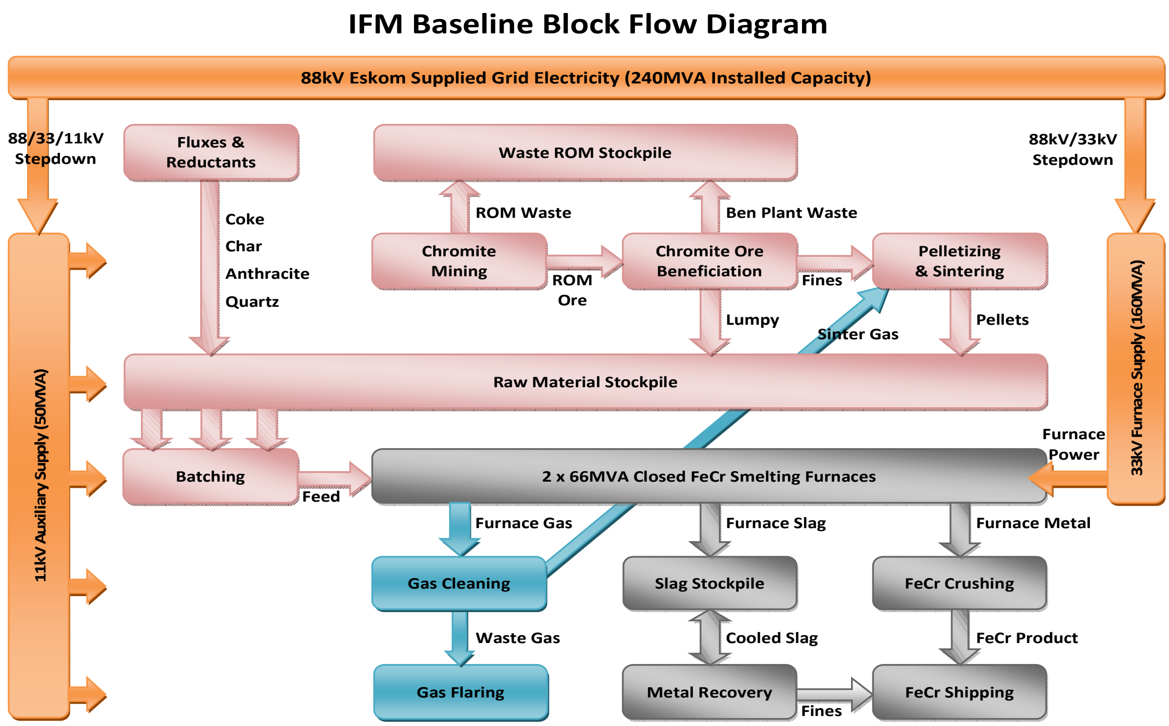


Figure A.2.1: IFM Baseline Block Flow Diagram

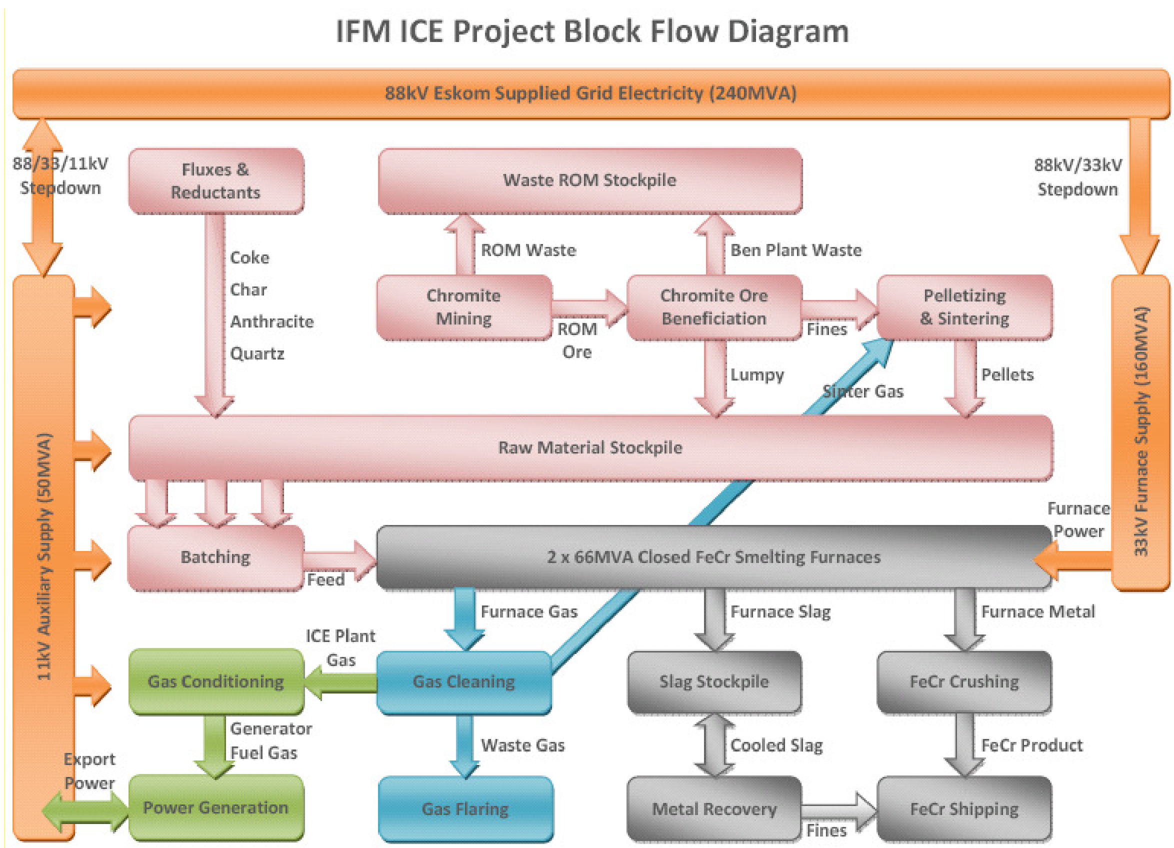


Figure A.2.2: IFM ICE Project Block Flow Diagram

Based on a guaranteed annual availability of 96% from GE Jenbacher (the OEM engine supplier), this will result in a maximum annual generation of approximately 160,287 MWh and a maximum annual CO_2 emission reduction of 175,731t. The latter is proposed by the project participants as a voluntary cap (maximum) for the project emission reduction potential of the project.

All electricity generated will be consumed on site, thereby substituting part of the electricity purchased from the South African National Grid for the FeCr process. The project activity will save fossil fuel sources and reduce emissions of harmful gases (e.g. CO2, SO2, NOx) and will therefore mitigate the negative impact that occurs by the excessive exploitation and depletion of natural resources like coal, which is predominant in South Africa.

In the view of the project participants the proposed project activity assists South Africa in achieving its sustainable development criteria by:

- Creating significant local employment opportunities, particularly during the construction phase, but also during the ten year operating period;
- Generating waste gas based electricity and consequently having a positive impact on the use of non-renewable resources by replacing fossil fuel based generation capacity;
- Lowering national green house gas emissions by displacing fossil-fuel based electricity generation from the national grid;
- Creating an Independent Power Producer and therefore providing diversity in electricity supply in accordance with the White Paper on Energy Policy of South Africa (1998);
- Transferring cutting edge modern technology to South Africa.

A.3. Project participants:

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 (Host)	• International Ferro Metals SA (Pty) Ltd. (private entity)	No
Hong Kong	• AAP Carbon Limited (private entity)	No
Switzerland	• South Pole Carbon Asset Management Ltd. (private entity)	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.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

The Republic of South Africa

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

North-West Province

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

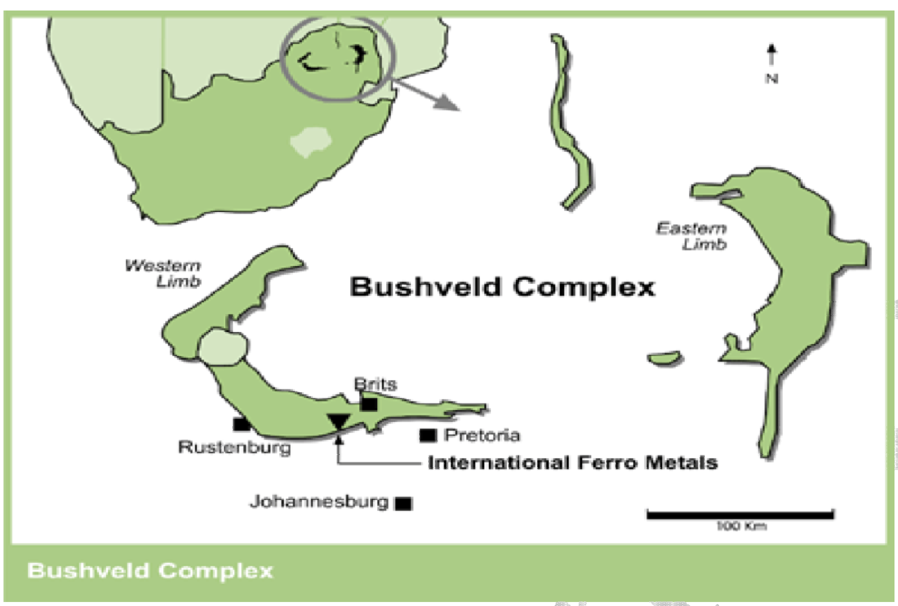
Buffelsfontein

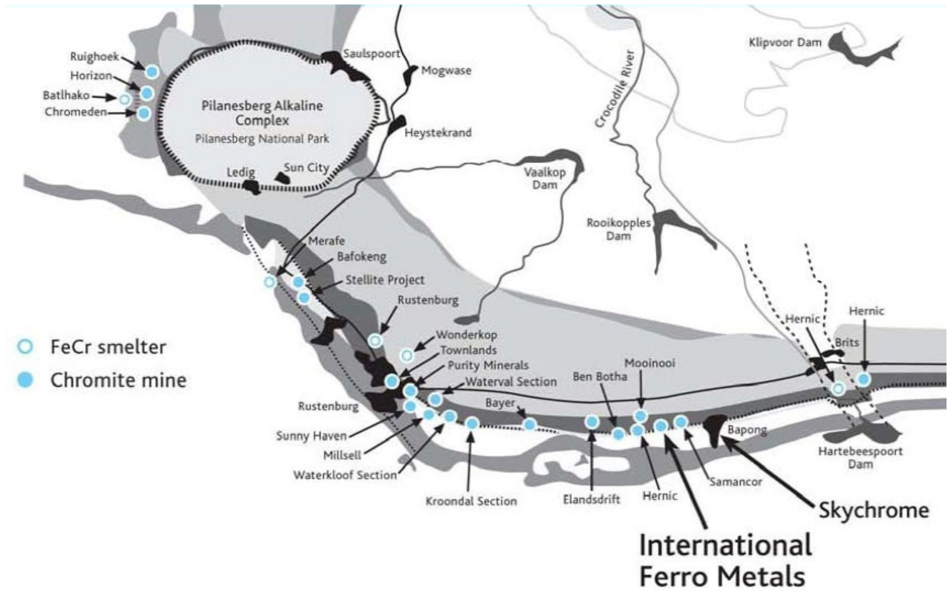
A.4.1.4. Details of physical location, including information allowing the unique identification of this project activity (maximum one page):

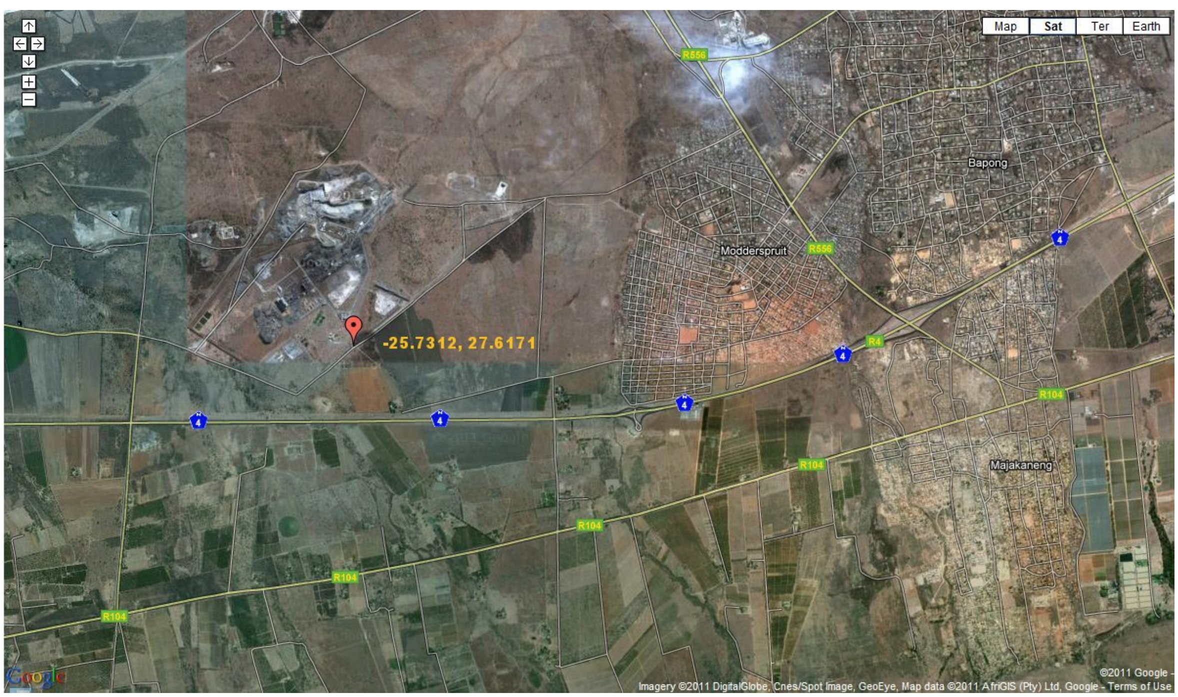
The proposed project activity will be constructed on unused open land within the existing industrial site of the International Ferro Metals Buffelsfontein Smelter. The IFM site is located approximately 10km east from Mooinooi close to the N4 highway linking Brits and Rustenburg.

The smelter falls within the western limb of the Bushveld complex, 100 km North West of Johannesburg. The specific site location is at longitude 26°47' E and 26°54' S.
The street address is: Buffelsfontein, JQ465, Mooinooi, South Africa

The location of the project activity is shown on the maps Figures A.4.1.4a, b and c.







Figures A.4.1.4a, b and c: Location of the Project Activity

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

Sectoral Scope 01 - Energy industries (renewable - / non-renewable sources) and
Sectoral Scope 04 - Manufacturing industries

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

IFM operates two closed 66MVA FeCr furnaces and an Outokumpu Pelletizing and Sintering plant. At normal operating conditions the furnaces produce approximately 24,000 Nm^3/h (design @ 30,000Nm^3/h) of waste gas, rich in Carbon Monoxide (CO) from the Smelting-Reduction of Chromite Ore. The Sinter Plant consumes approximately 2,400 Nm^3/h of this gas from a take-off point after the furnace scrubbers. The remaining gas, approximately 21,600 Nm^3/h is currently flared to atmosphere.

The IFM Integrated Clean Energy project involves the diversion of the waste off-gas from the existing flaring system through custom designed offtake systems, increasing the gas pressure through a booster station, conveying the gas approximately 500m to a gas conditioning system at the new generation facility and using this gas to produce electricity via internal combustion engines. Each unit area is described in more detail below and should be read in conjunction with the schematic in Figure.A.4.3.1 below.

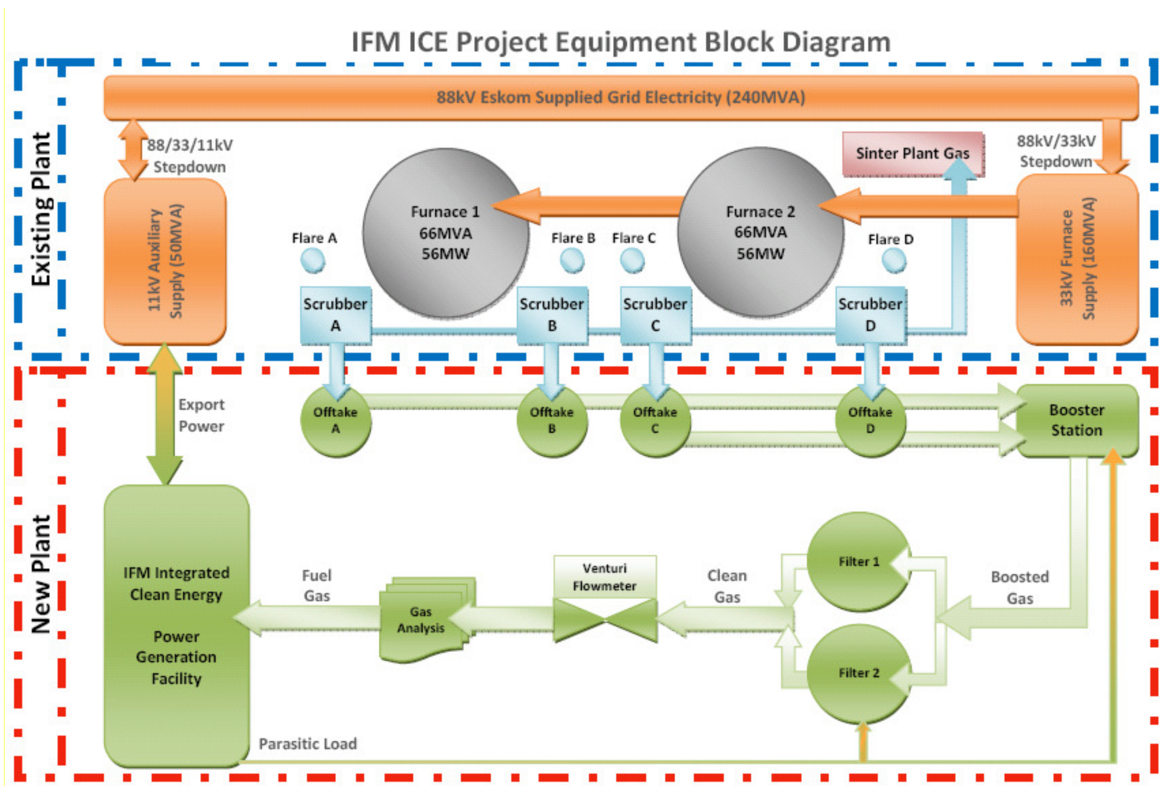


Figure A.4.3.1: Schematic overview of project activity.

Gas Offtake System:

The gas offtake system is specifically designed to eliminate any possibility of influencing the furnace operation, as this is core business for the project facility. Since the furnace gas is highly variable, there are four offtake systems, one per scrubber, enabling the operator to take gas from any or all of the scrubbers and blending these streams for optimal consistency. The offtake system specifically does not allow any gas to be "sucked" from the furnace, but relies on the existing furnace scrubber system to "push" the gas through the offtake from where it can be blended and boosted.

Gas Boosting Station:

The new generation plant is situated approximately 500m from the offtake area at the furnaces. In order to convey the gas over this distance and to allow for various pressure drops experienced along the way, notably that of the gas conditioning system described below, a gas boosting station is required to supply the gas at a suitable pressure to the internal combustion engines. The gas boosting station consists of 4 fans (two trains of two fans in parallel) of approximately 2m in diameter.

The fans are fitted with electrical motors which are supplied from a dedicated MCC room nearby. The electricity consumption of these motors (circa 0.53MWh) constitutes the biggest single source of parasitic load during operation of the ICE plant. This parasitic load will be drawn from the IFM auxiliary bus for the first few seconds during startup and once overcome by the engine export power, will become true parasitic load. All electricity consumed during startup will be monitored and logged separately to account for project emissions.

Gas Conditioning:

The application of internal combustion engines in this project necessitates the use of extremely clean (particulate free) gas as fuel source. While the existing IFM scrubbers meet the legal requirements of 50mg/Nm3 at their flare stack, the Internal Combustion Engines require less than 5mg/Nm3. As a result, the project includes an additional custom designed filtration system to meet these requirements. In addition, allowance is made in the design for removal of volatile organic compounds by activated carbon if required. The design also allows for heating of the gas to adjust the relative humidity as required by the OEM engine manufacturer, prior to it being fed to the engines.

Gas Monitoring Equipment:

Metering and monitoring of the gas composition and flowrates is vitally important for optimum control of the fuel supply to the internal combustion engines. The plant design includes the use of a custom designed venturi flowmeter and a set of gas analyzers for real time data availability. A detail description of this equipment is contained in the monitoring plan further in this document.

Generation Plant:

The generation plant consists of a battery of 10 GE Jenbacher GEJ620GS internal combustion engines, each capable of producing 2MWh on the IFM waste gas, depending on the relative amounts of CO and H_2 contained in the gas. Figure A.4.3.2 below indicates the operational range from actual measurements made by GE Jenbacher personnel during January 2011.

Furnace operational data from 2007 to May 2011 indicate a slow increase in the amount of H_2 in the offgas, attributed both to higher levels of Anthracite being used as reductant (since 2010) and water leaks in the furnaces. H_2 measurements for the past 6 months indicate an average for blended furnace gas of around 10% H_2, right on target for production of 2MWh per engine.

Major operational parasitic loads at the Generation Plant (circa 0.41MWh) consist of the ventilation systems required for cooling of the engine rooms and various pumps and fans. This parasitic load will be drawn from the IFM auxiliary bus for the first few seconds during startup and once overcome by the engine export power, will become true parasitic load. All electricity consumed during startup will be monitored and logged separately to account for project emissions.

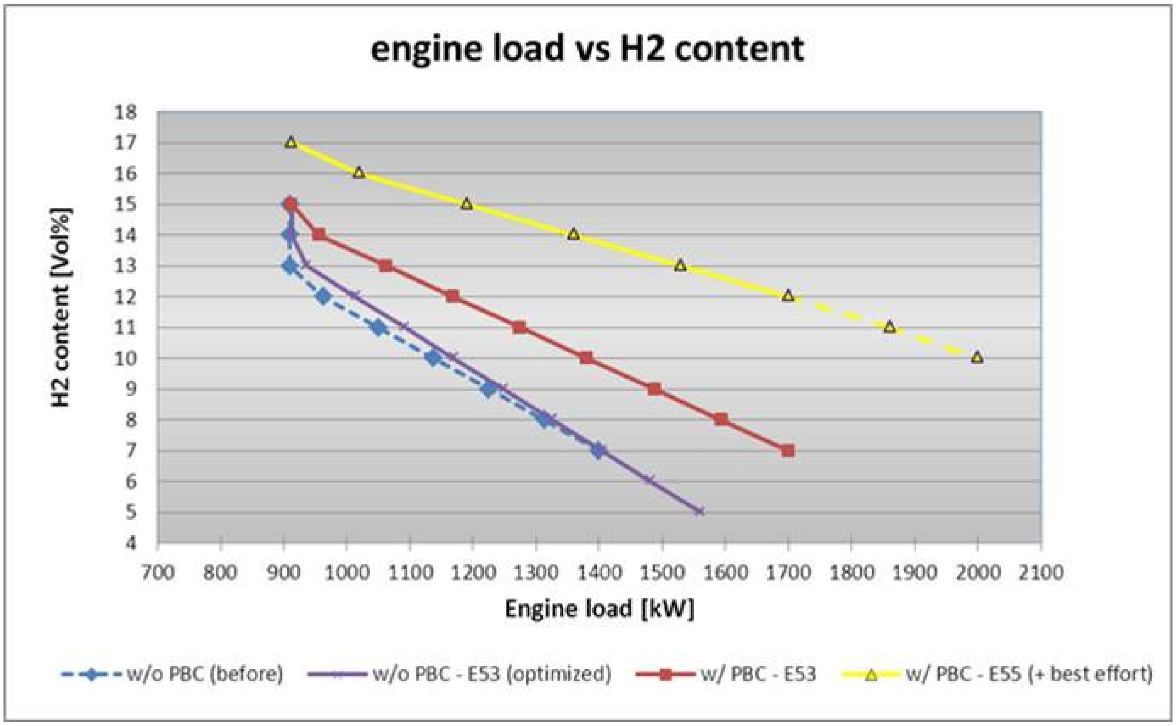


Figure A.4.3.2: Measured performance of engines on IFM waste gas.

Electricity Distribution:

The electrical distribution system consists of an 11kV distribution board at the generation plant which is connected via 3phase 11kV cables to the existing 11kV Auxiliary supply bus at the IFM substation. The generation plant supplies power to two MCC rooms from this distribution board for parasitic consumers required to operate the project. These consist of the Booster Station MCC and the Generation Plant Auxiliary MCC. During startup the power required for the auxiliary (parasitic) consumers such as the booster fans and various pumps is drawn from the IFM auxiliary supply line until such time as the first engine is running. This auxiliary consumption is monitored and logged by the electricity meter.

Once the plant is running and the auxiliary load is overcome, the electricity flows in the opposite direction through the same cables into the IFM auxiliary grid at 11kV. This flow of energy is net of parasitic load but not auxiliary load so this parameter is monitored and logged separately as gross exported electricity during operation for CDM purposes. Nevertheless, the meter also includes a totalizer which will automatically subtract the auxiliary consumption during startup from the gross exported electricity and log this figure as the Nett Exported Electricity.

Total (maximum) auxiliary load during startup, is expected to be circa 1.57MWh and total parasitic load during stable operation is expected to be circa 0.94MWh.

The feedback system for electricity generated is shown in the IFM single line diagrams below:

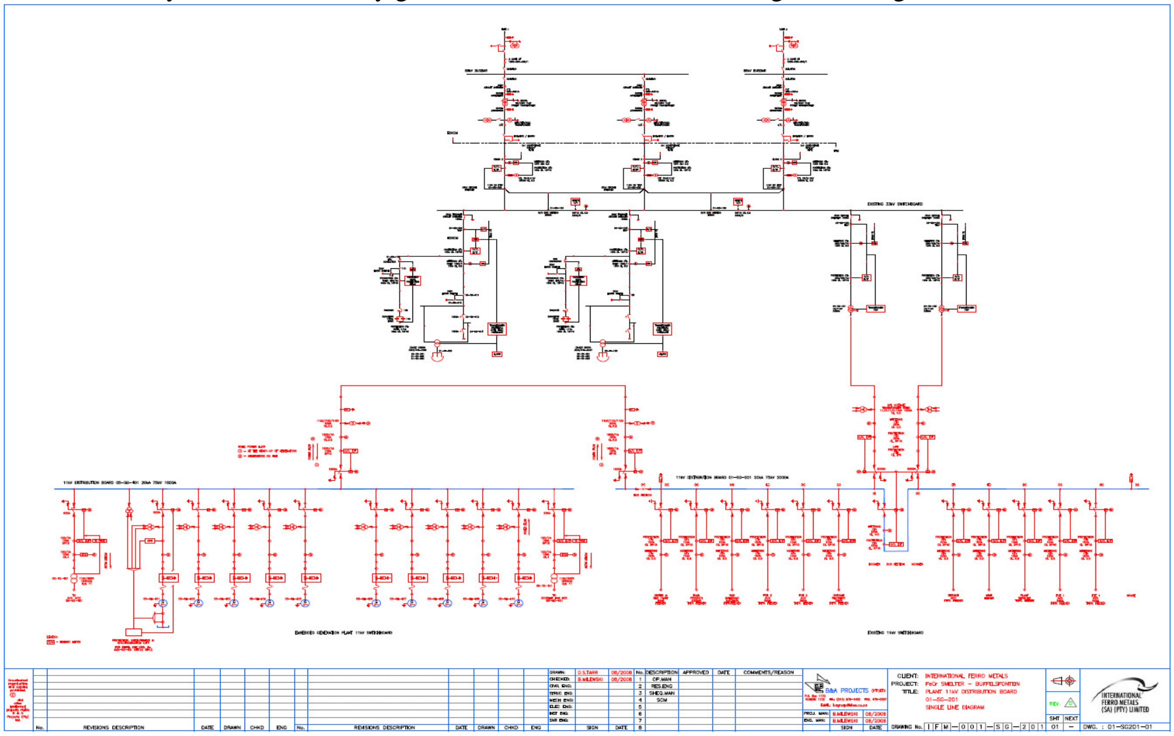


Figure A.4.3.3: 11kv Distribution Board

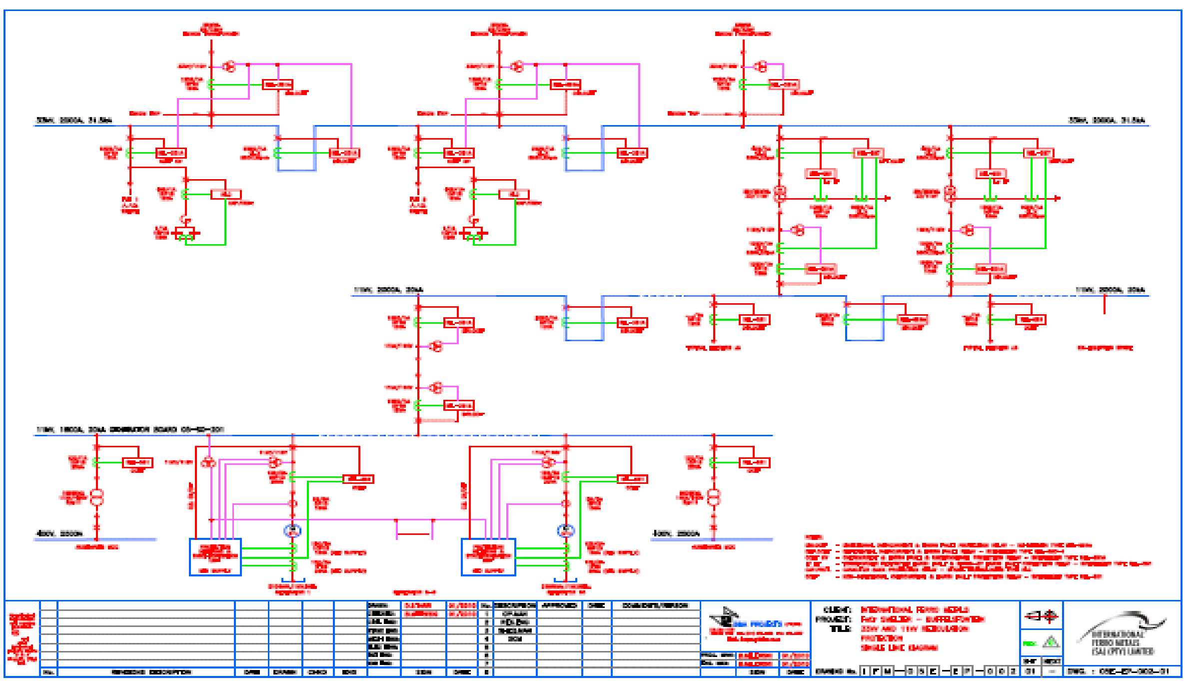


Figure A.4.3.4: 33kv and 11kv Reticulation Protection

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

The estimation of the emission reductions in the first crediting period is presented in table A.2.

Year	Estimation of overall emission reductions emissions (tonnes of CO_2e)
2011	43,933
2012	175,731
2013	175,731
2014	175,731
2015	175,731
2016	175,731
2017	175,731
2018	175,731
2019	175,731
2020	175,731
2021	131,798
The estimation of total emission reductions in the first crediting	**1,757,306**
Total number of crediting years	10
The estimation of annual average emission reductions in the first crediting period	159,755

Table A.2 The estimation of the emission reductions in the first crediting period

A.4.5. Public funding of the project activity:

The project will not receive any public funding.

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:

Methodology applied:

- Approved consolidated baseline and monitoring methodology ACM0012 (Version 04.0.0) *"Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects",* Version 04.0.0, Sectoral Scope:01 and 04, 04 December 2009

Tools referred:

- Tool to calculate the emission factor for an electricity system – version 2.1.0
- Tool for the demonstration and assessment of additionality – version 05.2

More information about the methodologies and the tool can be found on the following website: http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html

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

The chosen consolidated methodology **'ACM0012, version 04.0.0'** is a justifiable choice of methodology and applicable to the project activity::

The project is implemented at an existing facility, and will be converting waste energy carried in identified WECM stream(s) into useful energy.

The waste energy is an energy source for:

- **Generation of electricity;**
- Cogeneration;
- Direct use as process heat source;
- Generation of heat in element process;
- Generation of mechanical energy; or
- Supply of heat of reaction with or without process heating.

In the absence of the project activity, the WECM stream:

(a) Would not be recovered and therefore would be flared, released to atmosphere, or remain unutilized in the absence of the project activity at the existing or Greenfield project facility

(b) Would be partially recovered, and the unrecovered portion of WECM stream would be flared, vented or remained unutilised at the existing or Greenfield project facility.

The proposed project activity will generate electricity from the combustion of waste gases. Hence, the methodology is applicable to the project activity.

The applicability criteria which are met by the project activity are in the table B1 below.

Serial No.	Applicable Conditions of the Methodology	Conditions of the Proposed Project
1	The consolidated methodology is applicable to project activities implemented in an existing or Greenfield facility converting waste energy carried in identified WECM stream(s) into useful energy. The WECM stream may be an energy source for: Generation of electricity; Cogeneration; Direct use as process heat source; Generation of heat in element process; Generation of mechanical energy; or Supply of heat of reaction with or without process heating.	The proposed project activity will generate electricity from the combustion of waste gases.
2	In the absence of the project activity, the WECM stream:	

	(a) Would not be recovered and therefore would be flared, released to atmosphere, or remain unutilized in the absence of the project activity at the existing or Greenfield project facility; or (b) Would be partially recovered, and the unrecovered portion of WECM stream would be flared, vented or remained unutilised at the existing or Greenfield project facility.	In the absence of the project activity the waste gas would have been flared and released into the atmosphere.
3	Project activities improving the WECM recovery may (i) capture and utilise a larger quantity of WECM stream as compared to the historical situation in existing facility, or capture and utilise a larger quantity of WECM stream as compared to a "reference waste energy generating facility"; and/or (ii) apply more energy efficient equipment to replace/modify/expand[1] waste energy recovery equipment, or implement a more energy efficient equipment than the "reference waste energy generating facility".	Not applicable. No improvement of WECM as no prior project activity.
4	For project activities which recover waste pressure, the methodology is applicable where waste pressure is used to generate electricity only and the electricity generated from waste pressure is measurable	Not applicable. Project uses waste gas, not waste pressure.
5	Regulations do not require the project facility to recover and/or utilize the waste energy prior to the implementation of the project activity	At present, no regulations constrain the industrial facility generating waste gas or heat from using fossil fuels in South Africa.
6	The methodology is applicable to both Greenfield and existing waste energy generation facilities. If the production capacity of the project facility is expanded as a result of the project activity, the added production capacity must be treated as a Greenfield facility	The proposed project activity/facility is a planned new facility. The IFM furnaces are existing waste energy generation facilities. Production capacity of the project facility is not expanded. Please refer to monitoring parameter EC_{FT} included under section *B.7.1. Data and parameters monitored* to ensure this situation never occurs.

[1] The expansion of existing equipment also covers the situation where old equipment is maintained and new capacity is built up based on additional waste energy captured in the project scenario.

7	Waste energy that is released under abnormal operation (for example, emergencies, shut down) of the project facility shall not be included in the emission reduction calculations.	Only waste energy generated under normal conditions will be accounted for.
8	If multiple waste gas streams are available in the project facility and can be used interchangeably for various applications as part of the energy sources in the facility, the recovery of any waste gas stream, which would be totally or partially recovered in the absence of the project activity, shall not be reduced due to the implementation of CDM project activity.	Not Applicable. WECM stream in the absence of the CDM project is not partially recovered. Only 1 waste gas stream.
9	The methodology is **not** applicable to the cases where a WECM stream is partially recovered in the absence of the CDM project activity to supply the heat of reaction, and the recovery of this WECM stream is increased under the project activity to replace fossil fuels used for the purpose of supplying heat of reaction.	Not Applicable. WECM stream in the absence of the CDM project is not partially recovered.

Table B.1. Applicability of the Methodology to the Project

Hence, it is concluded that the project activity satisfies all the above mentioned conditions of the selected Approved Consolidated Methodology ACM0012 / Version 04.0.0.

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

According to the baseline methodology ACM0012, Version 04.0.0, the geographical extent project boundary shall include the relevant WECM stream(s), equipment and energy distribution system in the "project facility" and "recipient facility(ies)", which may be the same as the "project facility".

In this instance, the IFM Integrated Clean Energy Project, (the "project facility"), is located on the premises and is wholly owned by International Ferro Metals SA (Pty) Ltd, (the "recipient facility").

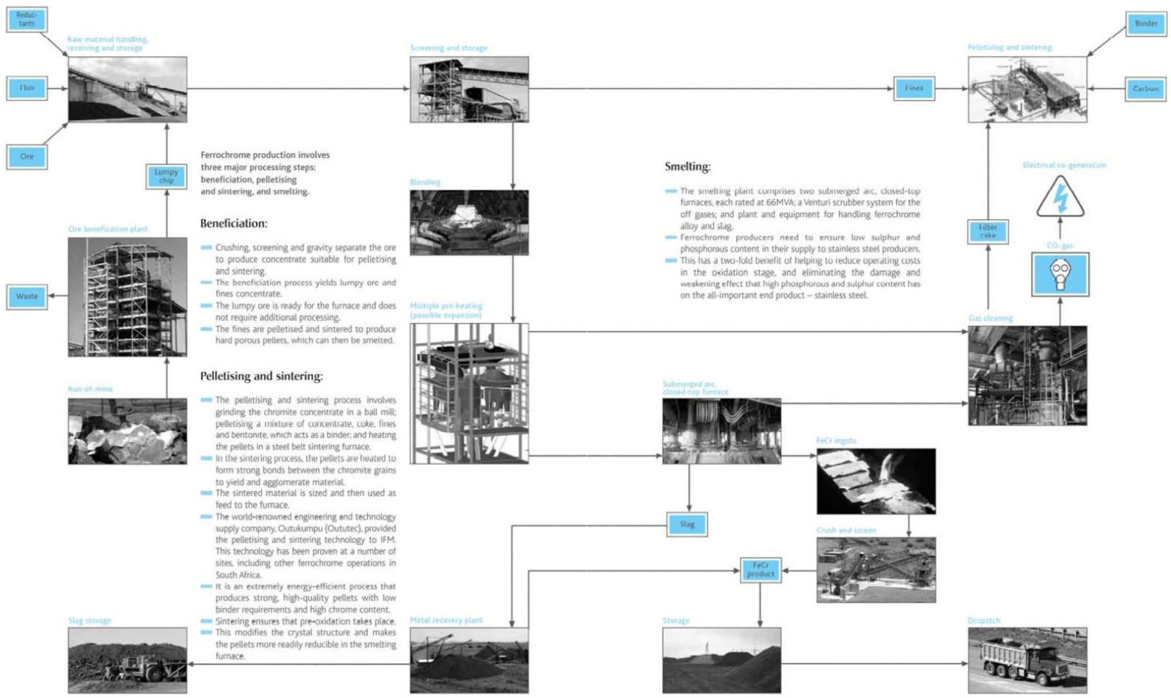


Figure B.3.1: Overview of the "Recipient Facility"

The IFM "recipient facility" is an integrated FeCr producer with its own mines on site and nearby. The IFM plant broadly consists of the following unit operations:

- Chromite Mining;
- Ore Beneficiation;
- Pelletizing & Sintering;
- Raw Material Handling;
- Smelting (Furnaces);
- Product Handling;
- Slag Handling; and
- Gas Cleaning.
- Electrical Distribution

Chromite Mining:

The IFM process starts with an opencast and underground mining operation. The mine produces a Chromite Ore containing complex compounds of Chrome and Iron Oxides, interspersed with gangue materials. The Chromite Ore is found in layers (seams) with waste rock above and below. When the seam is mined, the waste rock is diverted to stockpiling above ground, while the Chromite ore is conveyed to the beneficiation plant for processing.

Ore Beneficiation:

At the Ore Beneficiation plant the ore is crushed, sized and washed. The undersize go directly to milling while the oversize is processed by Dense Media Separation to remove gangue (waste) materials. The product from DMS is "lumpy ore" which is stockpiled directly. The waste is sent back to ROM waste stockpiles. The milled undersize product is separated by a series spirals and stockpiled. The waste is sent to slurry ponds.

Pelletizing & Sintering:

The fines produced from the Ore Beneficiation plant is sent to the Pelletizing and Sintering plant where it is milled further, mixed with a binder, pelletized to ±20mm and sintered at 1200°C to obtain high strength. The sintering furnace is fuelled by CO rich furnace offgas and consumes ±2,400Nm3/h. After sintering, the pellets are stockpiled for feed to the furnaces.

Raw Material Handling:

The "recipe" for making FeCr is of critical importance with balanced amounts of Fixed Carbon, Fluxes and Ore of different compositions required to make an "optimal" product. The feed materials from various sources are stored in open bunkers, reclaimed and conveyed to closed "batching bins". The furnace operators can call for specific recipes depending on observed process conditions. The batching bins discharge requested quantities onto the furnace feed conveyor for transport to the furnaces.

Smelting (Furnaces):

Smelting is as much a black art as it is a science. Radical shifts in FeCr product, slag and offgas compositions are considered quite normal for this type of operation. FeCr production capacity is determined by many factors, including the raw material composition, the type of reductant used, the moisture content of the feed, the skill of the operators, scheduled and unscheduled maintenance downtime, etc. The average production output varies constantly from tap to tap, based on these factors.

However, the most significant constraints to achieve maximum capacity that exists are the physical size of the installed equipment. Maximum production is therefore physically constrained by a) furnace shell diameter, b) furnace electrode diameter, c) scrubber capacity, d) raw material handling capacity; and most significantly for this PDD, e) the installed furnace transformer capacity.

Due to difficult market conditions and some technical problems over the past few years, IFM's maximum FeCr production achieved since 2007 was just over 205,000tpa, falling short of its design capacity of 260,000tpa. Nevertheless, actual IFM operating data for MWh consumed during production since startup indicates that the maximum capacity reached since 2007 is 61.4MW for Furnace 1 and 62.1MW for Furnace 2.

On this basis, and to ensure that the production capacity of the project facility is not expanded as a result of the project activity, an additional cap of 124MW consumption for the furnaces is proposed by the project developer as described in the monitoring plan.

Product Handling:

The FeCr metal is tapped approximately every two hours and allowed to cool in casting pits. Thereafter it is broken by jackhammer and transported to the product crushing plant for sizing, packing and shipping.

Slag Handling:

The hot slag is tapped on the same cycle as the hot metal but is diverted based on density and allowed to cool in the slag pits. The cold slag is taken to the intermediate slag stockpile, where it is retrieved and reprocessed in a jigging plant to recover any entrained FeCr metal. The processed slag is permanently stockpiled thereafter while the recovered metal is sent to product handling to be sold.

Gas Cleaning:

The gas cleaning system at IFM consists of two venturi scrubbers per furnace, four in total, each capable of cleaning 15,000Nm^3/h furnace offgas at design capacity, and each with a dedicated flare to ensure safety compliance. Original design of the plant envisaged only one scrubber per furnace operating at a time, switching over from one to the other for maintenance requirements, but it is possible and desirable to run both scrubbers (per furnace) at certain times and for specific process conditions (for example with different ore type or different reductants).

Since the offgas volume is not used as a control parameter in FeCr production, it is not consistently monitored at the furnaces. We are therefore relying on the OEM Furnace Supplier's design calculations (12,008 Nm^3/h/furnace) to establish a baseline cap of 21,600 Nm^3/h after 2,400 Nm^3/h consumption for sintering. For CDM purposes the volume of gas used for electricity generation will be monitored at the generation plant with a dedicated venturi flowmeter as described in the monitoring plan.

Electrical Distribution:

IFM's electricity supply system consist of 2 x 88kV lines feeding into 3 x 88/33kV stepdown transformers all provided and owned by Eskom. From this battery limit under IFM ownership are three "internal" grids (busses), of which two are dedicated to a furnace each (at 33kV for the furnace transformers) and the third (with a stepdown from 33kV to 11kV) is dedicated to provide auxiliary power (at 11kV) to the IFM plant and the mine. Auxiliary consumers include the mine compressors, mills, crushers, baghouse fans, raw material conveyors, beneficiation plant, sinter plant etc. Please also refer to the single line diagram included as Fig.A.4.3.3.

In terms of ACM0012 version 04.0.0, the geographical extent of the project boundary comprises the waste gas supplied from the furnaces, the power generating equipment and the power plants connected physically to the electricity grid that the proposed project activity will affect. This project boundary is schematically indicated below:

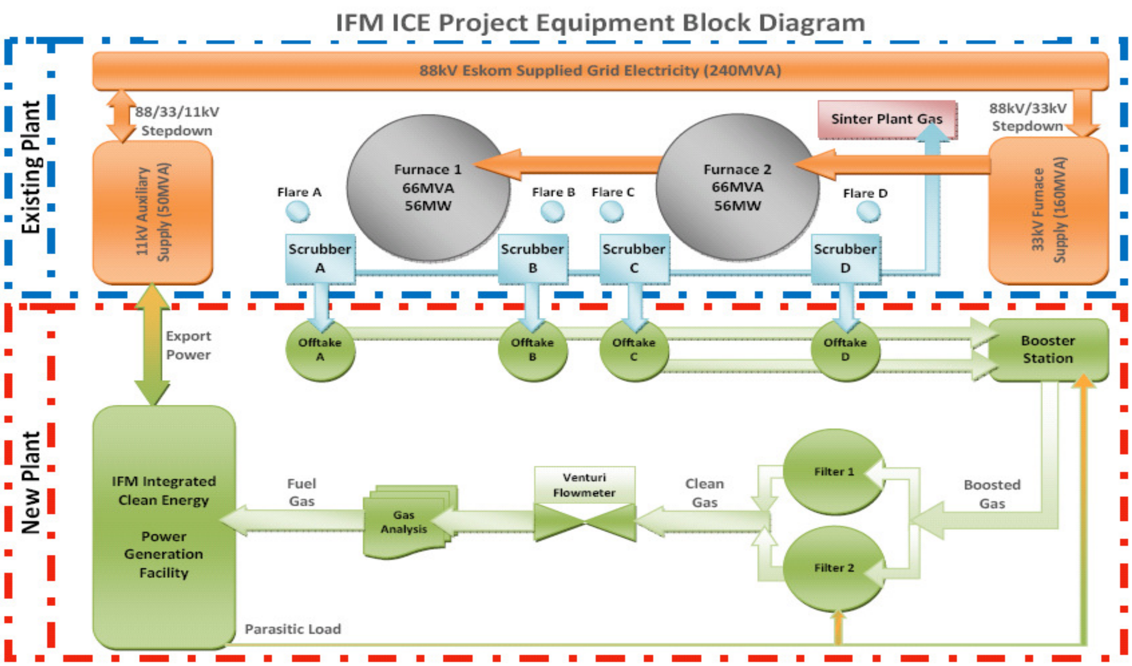


Figure B.3.2: Schematic of the defined project boundary.

The spatial extent of the grid is as defined in the "Tool to calculate the emission factor for an electricity system".

The following table illustrates gases and emissions sources that will be included in the project boundary:

	Source	Gas	Included?	Justification/Explanation
Baseline	**South African Grid electricity generation** ***(Electricity generation, grid or captive source)***	CO_2	Included	Main emission source
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
	Fossil fuel consumption in element process for thermal energy.	CO_2	Excluded	Excluded, as fossil fuel is not consumed in element process for thermal energy.
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
	Fossil fuel consumption in cogeneration plant	CO_2	Excluded	Excluded, as fossil fuel is not consumed in element process for thermal energy.
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
	Generation of steam used in the flaring process, if any	CO_2	Excluded	Excluded, as no steam is generated.
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
Project Acticity	**Fossil fuel consumption for supply of process heat and/or reaction heat**	CO_2	Excluded	No auxiliary fuels are utilised in the project activity.
		CH_4	Excluded	Excluded for simplification. This is conservative
		N_2O	Excluded	Excluded for simplification. This is conservative
	Supplemental fossil fuel consumption at the project plant	CO_2	Excluded	Excluded as there is no fossil fuel consumption at the project plant
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.
	Supplemental electricity consumption	CO_2	Included	Included as the project will use a small amount of electricity for auxiliaries (including gas cleaning equipment).
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.
	Electricity import to replace captive electricity, which was generated using waste energy in absence of project activity	CO_2	Excluded	Excluded, as IFM does not capture and utilises a portion of waste gas produced at the site for captive power generation in the absence of the project activity.
		CH_4	Excluded	Excluded for simplification

		N_2O	Excluded	Excluded for simplification
	Energy consumption for gas cleaning	CO_2	Excluded	Excluded as measurement of electricity used for gas cleaning is measured with the “supplemental electricity consumption”
		CH_4	Excluded	Excluded for simplification.
		N_2O	Excluded	Excluded for simplification.

Table B.2. Summary of gases and sources included in the project boundary

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

The baseline methodology ACM0012 (Version 04.0.0) identifies the following as the most plausible baseline scenarios among all realistic and credible alternative(s).

Realistic and credible alternatives should be determined for:

- Waste energy use in the absence of the project activity;
- Power generation in the absence of the project activity for each recipient facility if the project activity involves electricity generation for that recipient facility;
- Heat generation (process heat and/or heat of reaction) in the absence of the project activity, for each recipient facility if the project activity involves generation of useful heat for that recipient facility; and
- Mechanical energy generation in the absence of the project activity, for each recipient facility if the project activity involves generation of useful mechanical energy for that recipient facility.

The information on the utilization of heat, electricity and/or mechanical energy in the absence of the CDM project activity will be sourced from the recipient facility(ies) and the information on the utilization of the waste energy in the absence of the CDM project activity will be sourced from the project facility. Hence, the CDM project proponent shall determine baseline options, identify the most appropriate baseline scenario, determine the baseline fuel and demonstrate and assess additionality in consultation with the recipient facility(ies) and the project facility. For this purpose, the project facility and the recipient facility(ies) shall be identified when preparing the PDD.

Project Facility: IFM Integrated Clean Energy Project.

Recipient Facility: International Ferro Metals SA (Pty) Ltd (IFM)’s state-of-the art integrated chromite mine and processing facility at Buffelsfontein.

The project participant shall exclude baseline options that:

- Do not comply with legal and regulatory requirements; or
- Involve fuels (used for the generation of heat, power or mechanical energy), that are not produced or imported in the host country.

The project participant will provide evidence and supporting documents to exclude baseline options that meet the above-mentioned criteria.

All of the electricity to be generated by the proposed project activity is to be consumed on-site at International Ferro Metals SA (Pty) Ltd (IFM)’s state-of-the art integrated chromite mine and processing facility at Buffelsfontein. The following alternative baseline scenarios have been addressed in accordance with the requirements of Baseline methodology ACM0012 (Version 04.0.0).

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

The baseline candidates should be considered for following facilities:

- For the waste energy generation facility(ies) where the waste energy is generated; and
- For the recipient facility(ies) where the energy is consumed.

For the use of waste energy the realistic and credible alternative(s) may include, *inter alia*:

ID	Alternatives from ACM0012	Justification/Explanation	Plausible/ Not
W1	WECM is directly vented to the atmosphere without incineration	Waste gas is currently flared to the atmosphere, not incinerated, but in any event cannot be directly vented without flaring (combustion). Since the CO gas produced in the furnaces is both toxic and explosive, it is a safety requirement for the gas to be flared[2]. Therefore W1 cannot be a realistic and credible alternative	N
W2	WECM is released to the atmosphere (for example after incineration) or waste heat is released (or vented) to the atmosphere or waste pressure energy is not utilized	Waste gas being released to the atmosphere through a flare is the current situation. This is the original design of the process and the emission of the waste gas meets the national environmental standards. The original design documents of the plant with approval will be shown to DOE during site validation upon request. Hence, W2 is a plausible alternative.	Y
W3	Waste energy is sold as an energy source	There are no other potential users for the waste gas. Calorific value of waste gas (circa 8 to 10 MJ/Nm3) is too low to make economically competitive comparison to methane (circa 30 MJ/Nm3). The IFM facility is also geographically isolated. Closest industrial facility which may be able to use it is in Brits (circa 30km away) and this distance together with the low CV and liability associated with toxicity of CO gas does not make this a viable alternative. Therefore alternative W3 is not considered further.	N
W4	Waste energy is used for meeting energy demand at the recipient facility(ies)	Waste gas is converted to electricity to meet energy demand. All the energy required by the IFM Submerged-arc furnaces is provided by electricity from the grid under existing contract with Eskom. IFM do not have pre-heaters installed on their furnaces and the only other energy demand that can be served by the waste gas	N

[2] Please refer to: "Air Liquide CO MSDS"

		relates to the use of the gas as a fuel source for sintering. This is already standard practice at IFM and there is a small amount of waste gas consumed at the sintering facility on site (circa 2,400Nm3/h or roughly 10%) prior to flaring of the remaining 90% to atmosphere. The ICE plant will use this remaining 90% which is currently being flared for generation of circa 12% of IFM's total electricity requirement.W4 is not applicable.	
W5	A portion of the quantity or energy of WECM is recovered for generation of heat and/or electricity and/or mechanical energy, while the rest of the waste energy produced at the project facility is flared/released to atmosphere/ unutilised	This is the Project Scenario at IFM. The use of a small quantity of furnace waste gas as fuel source for sintering is standard practice at all FeCr production facilities which incorporate an Outokumpu Pelletizing and Sintering plant and where closed furnaces are present. W5 is therefore an alternative. (the project scenario presented in this PDD)	Y
W6	All the waste energy produced at the facility is captured and used for export electricity generation or steam.	IFM is a substantial net electricity consumer and the ICE plant is capable of producing only about 12% of the total electricity requirement of the complete IFM site at any given time. In addition, the ICE plant can only produce power while the furnaces are operated since the furnace offgas is the only fuel source for the ICE plant. Further, the ICE plant electricity output is directly related to the amount of offgas available from the furnaces, which in turn is directly dependent on furnace load. W6 is therefore not plausible as all electricity produced will at all times be consumed by IFM and there is no requirement for steam on site.	N

Table B.3. Discussion of Alternatives of Use of Waste Heat/Pressure

There are 8 power baselines detailed in the methodology, they are discussed below in table B.4.:

ID	Alternatives from ACM0012	Justification/Explanation	Plausible/ Not
P1	Proposed project activity not undertaken as a CDM project activity;	The proposed project activity not undertaken as a CDM project is not against any laws or regulations of South Africa. According to the *Feasibility Study Report*, the project activity is technically feasible (although poses technology risks associated with this first of its kind project). Hence, P1 is an alternative.	Y
P2	On-site or off-site existing fossil fuel fired cogeneration plant	The proposed project activity generates electricity only; it is not cogeneration.	N

		P2 is not parallel to the proposed project; hence this option is not applicable.	
P3	On-site or off-site Greenfield fossil fuel fired cogeneration plant	The proposed project activity generates electricity only; it is not cogeneration. P2 is not parallel to the proposed project; hence this option is not applicable.	N
P4	On-site or off-site existing renewable energy based cogeneration plant	There is no existing renewable energy based cogeneration plant in project site. And there is no need of thermal energy. Hence, installation of renewable energy based cogeneration plant is not an alternative option and is not considered as a baseline scenario.	N
P5	On-site or off-site Greenfield renewable energy based cogeneration plant	There is no existing renewable energy based cogeneration plant in project site. And there is no need of thermal energy. Hence, installation of renewable energy based cogeneration plant is not an alternative option and is not considered as a baseline scenario.	N
P6	On-site or off-site existing fossil fuel based existing identified captive power plant	There is no existing fossil fuel based captive plant or identified plant that can directly provide electricity to plant owner. Considering that the capacity of the proposed project is only 17 MW, the construction of a new fossil fuel based captive plant with equivalent amount of capacity is not financially plausible.	N
P7	On-site or off-site existing identified renewable energy or other waste energy based captive power plant	As mentioned previously in P5, there is no renewable energy resource available at the site of the proposed project. P7 is not plausible.	N
P8	On-site or off-site Greenfield fossil fuel based captive plant	As mentioned previously in P6, considering that the capacity of the proposed project is only 17 MW, the construction of a new fossil fuel based captive plant with equivalent amount of capacity is not financially plausible	N
P9	On-site or off-site Greenfield renewable energy or other waste energy based captive plant	As mentioned previously in P5, there is no renewable energy resource available at the site of the proposed project. P9 is not plausible.	N
P10	Sourced from grid-connected power plants	This is the current situation and is common practice. The grid is the South African National Electricity Grid. P10 is plausible.	Y
P11	Existing captive electricity generation using waste energy (if the project activity is captive generation using	Not Applicable. No existing power generating equipment is currently used at the IFM facility.	N

	waste energy, this scenario represents captive generation with lower efficiency or lower recovery than the project activity)		
P12	Existing cogeneration using waste energy, but at a lower efficiency or lower recovery	Not Applicable. No existing power generating equipment is currently used at the IFM facility.	N

Table B.4. Discussion of Alternatives of Power Generation

Realistic and credible alternatives for heat generation are not considered for the baseline scenario as the project activity will not result in heat generation.

ID	Alternatives from ACM0012	Justification/Explanation	Plausible/ Not
H1-H11	Alternatives from H1 to H11 in ACM0012 for heat generation	The proposed project activity does not involve heat generation; the alternatives for heat generation are not parallel to the project activity. As per ACM0012, if the methodology is to be applicable where the waste heat is used for generating one form of energy only (electricity or heat), then the baseline too should be only generation of one form of energy (electricity or heat respectively). Hence, alternatives from H1 to H11, which are for heat generation, are not plausible.	N

Table B.5. Discussion of alternatives of heat generation

Realistic and credible alternatives for mechanical energy are not considered for the baseline scenario as the project activity will not result in mechanical energy generation.

ID	Alternatives from ACM0012	Justification/Explanation	Plausible/ Not
M1-M8	Alternatives from M1 to M8 in ACM0012 for mechanical energy generation	The proposed project activity does not involve mechanical energy generation; the alternatives for mechanical energy generation are not parallel to the project activity. As per ACM0012, if the methodology is to be applicable where the waste heat is used for generating one form of energy only (electricity or heat), then the baseline too should be only generation of one form of energy (electricity or heat respectively). Hence, alternatives from M1 to M8, which are for mechanical energy generation, are not plausible.	N

Table B.6. Discussion of alternatives of mechanical energy generation

Based on discussion above, the plausible alternatives are:

- W2: WECM is released to the atmosphere (for example after incineration) or waste heat is released (or vented) to the atmosphere or waste pressure energy is not utilized
- W5: A portion of the quantity or energy of WECM is recovered for generation of heat and/or electricity and/or mechanical energy, while the rest of the waste energy produced at the project facility is flared/released to atmosphere/ unutilized

- P1: Proposed project activity not undertaken as a CDM project activity.
- P10: Sourced from grid-connected power plants.

The plausible combinations of baseline options are summarized in Table B.6 as following:

ID	Baseline Options			Description of Combinations
	Use of Waste Gas	Power Generation	Heat Generation	
Baseline Scenario1 (B1)	W2	P10	/	Waste gas is released to the atmosphere after incineration/flaring as usual; equivalent amount of electricity is supplied from National Power Grid.
Baseline Scenario2 (B2)	W5	P1	/	Proposed project activity not undertaken as a CDM project activity.

Table B.7 Plausible Combinations of Baseline Options

Both alternative B1 and alternative B2 from *STEP 1* does not involve any direct consumption of fossil fuels. For baseline scenario B1, there is no electricity supply constraint in South Africa Power Grid.

STEP 2 and/or STEP 3: of the latest approved version of the "Tool for the demonstration and assessment of additionality" shall be used to identify the most plausible baseline scenarios by eliminating non-feasible options (e.g. alternatives where barriers are prohibitive or which are clearly economically unattractive).

Version 5.2 of "**Tool for the demonstration and assessment of additionality**" is used for the proposed project.

Please refer to section B.5 for more details.

The project proponents are required to use economic analysis for the identification of the baseline scenario for the following three situations.

(1) Where, for an existing project facility, the WECM utilised by the project activity was totally or partially recovered in the absence of the CDM project activity. ***– not applicable, as the project activity is a Greenfield project***

(2) Where the CDM waste energy recovery project is implemented in a Greenfield project facility. The investment analysis for the Greenfield projects include the cost of the fuel that would have been used by the recipient facility(ies) in the absence of the CDM project. The fuels for such analysis should include all the fuels available in the host country, including those which can be imported in the host country. ***– not applicable, as the project is being carried out on a Brownfield site.***

(3) Where the CDM waste energy recovery project is implemented in an existing facility to supply the useful energy generated to a Greenfield recipient, and therefore the likely baseline scenario is based on a "reference energy generation facility". The energy generation for such a reference facility, including the fuel (either available in host country or imported without any supply constraint), should be determined based on the investment analysis. ***– not applicable, as the project is being carried out in a existing facility to supply the useful energy generated to a Brownfield site.***

STEP 3: If more than one credible and plausible alternative scenario remain, the alternative with the lowest baseline emissions shall be considered as the baseline scenario.

Section B.5 will demonstrate that Scenario 2 (W5/P1) identified above is clearly not attractive to the project owner without the CDM due to the technology never having been used in the Ferrochrome Industry before. Please refer to Section B.5 Step 3.

Therefore Scenario 1 (W2/P10), power from the grid combined with the non-utilization of waste heat, is the only scenario that can be selected as the baseline scenario of the project.

As a result of the analysis in preceding steps (and section B.5), there is only one credible and plausible scenario remains, which is:

Baseline Scenario: Waste gas is released to the atmosphere after flaring and equivalent amount of electricity is obtained from South African National Power Grid.

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):

Early Consideration:

The Executive Board considers the issue of prior consideration of the CDM as a major element in assessing that the CDM benefits were considered necessary in the decision to undertake the project as a CDM project activity. According to EB41 project activities must asses and demonstrate prior consideration:

Project Milestone	Date
1) GE Energy quote for Jenbacher engines received	11-Dec-07
2) Project Idea Note submitted to the South African Designated National Authority	28-Feb-08
3) Signed Purchase Contract for Generators with GE (Start Date)	28-April-08
4) Letter of No Objection received from the South African Designated National Authority	05-May-08
5) First major payment made	05-May-08
6) Letter of Early Consideration sent to the South African DNA	25-June-08
7) ISC meeting held	27-August-08
8) Emission reduction purchase agreement offer for IFM Integrated Clean Energy Project	26-February-09
9) AAP Carbon – South Pole Carbon Asset Management Offer signed	December-09

The "start date" of the project activity is defined as 28 April 2008. This is the date upon which IFM gives a clear sign and commits itself to implement the project. The purchase contract for the generators with GE is signed and payment is made on 5 May 2008

Additionality:

According to the methodology ACM0012, version 04.0.0, "**Tool for the demonstration and assessment of additionality, Version 05.2**" is applied to demonstrate the additionality of the project activity.

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

Sub-step 1a: Identify realistic and credible alternative(s) available to the project participants or similar project developers[4] that provide outputs or services comparable with the proposed CDM project activity:

As stated in preceding section B.4, the alternatives to the project activity are combinations of options for using waste gas/heat and power generation. As a result, the plausible baseline scenario alternatives are:

Scenario B1: Waste gas is released to the atmosphere as usual; equivalent amount of electricity is supplied from South African National Power Grid;
Scenario B2: Implementation of the proposed project without consideration of CDM revenues.

B1 is also a continuation of current situation.

Outcome of Step 1a: The realistic and credible alternative scenarios to the project activity are scenario B1 and B2 stated above. Please refer to section B.4 for more details of options identification.

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

Scenario B1, current operation of the plant is in compliance with mandatory legislation and regulations applicable in South Africa. IFM has valid business license and tax registrations for operation of the ferrochrome plant. As mentioned in section B.4, atmospheric release of the waste heat is in compliance with existing policies and regulations.

Scenario B2, the proposed project activity undertaken without being registered as a CDM project is also in compliance with mandatory legislation and regulations.

All relevant documents and evidence are available to be shown to DOE by time of validation.

Step 2: Investment analysis

According to the investment analysis the project proponent is required to determine whether the project activity is not:

(a) The most economically or financially attractive; or
(b) Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs).

The project will demonstrate additionality based on barrier analysis. Step 2 in therefore excluded.

Step 3: Barrier analysis

If this Step is used, determine whether the proposed project activity faces barriers that:

(a) Prevent the implementation of this type of proposed project activity; and

(b) Do not prevent the implementation of at least one of the alternatives.

The identified barriers are only sufficient grounds for demonstration of additionality if they would prevent potential project proponents from carrying out the proposed project activity undertaken without being registered as a CDM project activity.

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

A number of barriers have been identified that would prevent the implementation of the proposed project activity as follows:

Technology Barrier:

State of the art technology – The IFM Integrated Clean Energy project is the first of its kind in Africa. There are no other similar installations in Africa[3].

The Metalloys plant of Samancor Manganese has attempted to utilize the offgas generated by closed furnaces for the purpose of electricity generation using a steam turbine (different technology), but the plant was not economically justifiable when it was constructed and was plagued by many technical problems due to the sophistication of the technology employed.[4]

None of the operating partners have any experience with this type of technology and as a result, a long-term maintenance contract, including intensive operational training, has been negotiated with GE Energy.

To give a further understanding of the risk associated with the project the following points are provided below:

1. There is a need for continuous power production, but the ICE plant is at the mercy of the FeCr plant since that is IFM's core business. The ICE plant cannot prescribe to the FeCr operation how to conduct its business and as a result has to follow the production and maintenance campaigns dictated by the core business. If the FeCr furnaces go down for any reason, the ICE plant needs to be shut down. The Engines do not like to be stopped and started. This brings a technological complication.

2. Additional uncertainty (a major downside) is that the Hydrogen content of the gas has a catastrophic effect on power production because of the "knocking" of the ICE engines. If the furnaces spring water leaks, the power output per engine can quickly drop to 1MW per engine (within a period of an hour) and remain at these levels until the leak is fixed. It needs to be understood that the FeCr production process is not a "stable" operation and fluctuates constantly all the time.

3. The furnaces dictate the gas quantity and quality, depending both on market conditions and technical problems, tracing as far back as the raw material compositions and whether it is a rainy day. The only parameters the ICE plant can control is a direct "conversion" of the chemical energy it receives to the electrical energy it exports.

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3 Please refer to document "Letter IFM" from G.E.

4 See http://home.pacific.net.au/~steamtech/PowerPlant.htm

4. Even with a high skills level in SA, there are no other plants like this in the ferro-alloy industry. Therefore, since the technology is completely imported (the engines being the heart of it), the plant is completely at the mercy of support from this international supplier to train the local operators and maintain the engines for maximum efficiency. This is expensive though, and even today, the benefits of the ICE plant is questioned by all the industry players because of this high cost of electricity that it translates to. The CDM helps to some extent to alleviate the high costs.

There is therefore technology risk associated with the project, as well as extra technology complications and increased uncertainty of the performance of the project as it is difficult to assess how the project will interface with the existing infrastructure. Furthermore, the project relies heavily on international expertise.

The project being registered as a CDM project has always been the key to getting approval for the projects financing and future operation.

Barriers due to prevailing practice:

There are no known installations anywhere in the world using this technology on ferro-alloy furnace offgas for electricity generation. However, there are several installations worldwide using this technology with different gas compositions. An example of such a plant is operated by Aceralia in Spain, using LD gas from a steel plant for electricity generation.

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):

The barriers identified above would not prevent the implementation of Alternative baseline scenario B1. The baseline scenario of procuring electricity from the grid does not face any barrier.

Step 4: Common practice analysis

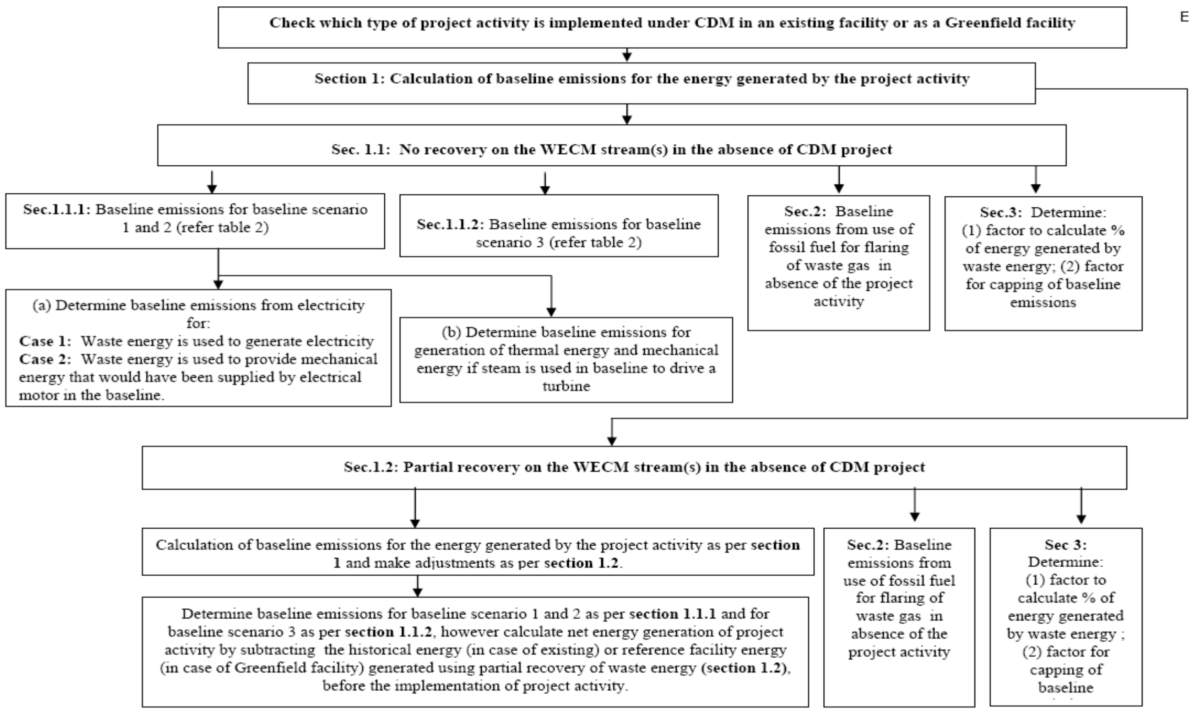
As per additionality tool v5.2, wherever project activities has been demonstrated as „first of its kind“, the elaborated common practice analysis would not be required.

The Project activity is therefore additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Flow chart for determination of baseline emissions:



From the above flowchart, it can be seen that baseline emissions must be calculated according to section 1.1.1

In accordance with the requirement of methodology ACM0012, baseline emissions of the project activity for the year *y* are calculated as:

$$BE_y = BE_{En,y} + BE_{flst,y} \qquad (1)$$

Where:

BE_y	total baseline emissions during the year *y* in tons of CO_2;
$BE_{En,y}$	baseline emissions from energy generated by the project activity during the year *y* in tons of CO_2;
$BE_{flst,y}$	Baseline emissions from fossil fuel combustion, if any, either directly for flaring of waste gas or for steam generation that would have been used for flaring the waste gas in the absence of the project activity (tCO_2), calculated as per equation 26. This is relevant for those project activities where in the baseline steam is used to flare the waste gas

The baseline emission from the generation of steam ($BE_{flst,y}$) is null for our project activity as it needs no complementary fossil fuel to flare waste gas in the absence of the project activity.

1. Baseline emissions from energy generated by the project activity ($BE_{En,y}$)

The calculation of baseline emissions ($BE_{En,y}$) depends on the type of project activity and applicable baseline scenarios from Table B.7 above.

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

1.1.1 Baseline emissions for baseline Scenarios 1 and 2

$$BE_{En,y} = BE_{Elec,y} + BE_{Ther,y} \quad (2)$$

$BE_{En,y}$	*baseline emissions from energy generated by the project activity during the year y in tons of CO_2;*
$BE_{Elec,y}$	*baseline emissions from electricity generated by the project activity 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) Baseline emissions from electricity ($BE_{Elec,y}$) generation

Case 1: Waste energy is used to generate electricity

$$BE_{Elec,y} = f_{cap} * f_{wcm} * \sum_j \sum_i (EG_{i,j,y} * EF_{Elec,i,j,y}) \quad (3)$$

Where:

$BE_{elec,y}$	=	Baseline emissions due to displacement of electricity during the year *y* (tCO_2)
$EG_{i,j,y}$	=	The quantity of electricity supplied to the recipient *j* by generator, which in the absence of the project activity would have been sourced from source *i* (the grid or an identified source) during the year *y* in MWh
$EF_{elec,i,j,y}$	=	The CO_2 emission factor for the electricity source *i* (gr for the grid, and is for an identified source), displaced due to the project activity, during the year *y* (tCO_2/MWh)
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. Depending upon the situation, this factor is estimated using the equations in section 3.1 Note: For a project activity using waste pressure to generate electricity, the electricity generated from waste pressure should be measurable and this fraction is 1
f_{cap}	=	Factor that determines the energy that would have been produced in project year *y* using waste energy generated at a historical level, expressed as a fraction of the total energy produced using waste source in year *y*. The ratio is 1 if the waste energy generated in project year *y* is the same or less than that generated at a historical level. The value is estimated using the equations in section 3.2. For Greenfield facilities, f_{cap} is 1. If the procedure in Annex 1 concludes that the waste energy would have been partially utilised in the "reference waste energy generating facilities" this fact will be captured in the factor $f_{practice}$

For the proposed project activity, the electricity generation is purely from use of waste gas. Therefore, f_{wcm} =1 and equation (1a-1) can be simplified as following:

$$BE_{Elec,y} = f_{cap} \times EG_y \times EF_{Grid,y} \quad \textbf{(3a)}$$

As per ACM0012, the CO2 emission factor of the National South African Power Grid, $EF_{Grid,y}$, will be determined following the guidance provided in the "*Tool to calculate the emission factor for an electricity system (version 2)*", as addressed in section 5 below.

As per ACM0012, following equation will be used for determination of f_{cap}.

$$f_{cap} = Q_{WCM,BL} / Q_{WCM,y} \quad (38)$$

Where:

f_{cap}	Capping factor of baseline emissions
$Q_{WCM,BL}$	Quantity of waste energy generated prior to the start of the project activity (kg or m^3 at NTP or TJ or MWh of WECM or other relevant unit)
$Q_{WCM,y}$	Quantity of WECM used for energy generation during year *y* (kg or m^3 at NTP or TJ or MWh of WECM or other relevant unit)

In case the calculated value of f_{cap} is higher than 1, f_{cap} is set to 1.

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

The proposed project activity generates electricity only; hence the baseline emissions from thermal energy are neglected.

$BE_{ther,y} = 0$

2. Project Emissions

Project Emissions include emissions due to combustion of auxiliary fuel to supplement waste gas and electricity emissions due to consumption of electricity for cleaning of gas before being used for generation of heat/energy/electricity.

$$PE_y = PE_{AF,y} + PE_{EL,y} \quad (41)$$

Where:

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

<u>(1) Project emissions due to auxiliary fossil fuel combusted to supplement waste energy in the project activity</u>

The proposed project does not involve any consumption of fossil fuel. Hence project emissions due to auxiliary fossil fuel combustion is neglected.

2) <u>Project emissions due to electricity consumption of gas cleaning equipment</u>

These project emissions are calculated by using latest approved tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption". Project emissions from consumption of additional electricity by the project are determined as follows:

$PE_{EL,y} = EC_{PJ,y} \times EF_{CO2,EL,y}$

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)
$EF_{CO2,EL,y}$	CO2 emission factor for electricity consumed by the project activity in year y (t CO2/MWh)

There is a single grid in South Africa supplying electricity. Therefore $\mathbf{EF_{CO2,EL,y}} = EF_{grid,BM,}$(calculated as per point 5 below)

3. Leakage

No leakage is considered according to the methodology ACM0012.

4. Emission Reduction

Emission reductions due to the project activity during the year y are calculated as follows (no capping is expected)[5]:

$$ER_y = BE_y - PE_y \quad (42)$$

Where:

ER_y	Total emissions reductions during the year *y* in tons of CO_2
BE_y	Emissions from the project activity during the year *y* in tons of CO_2
PE_y	Baseline emissions for the project activity during the year *y* in tons of CO_2, applicable for scenario 2.

MWh produced ($EG_{i,j,y}$):	160,287
Additional electricity consumed ECPJ,y	95
Grid Emissions Factor Applied ($EF_{grid,CM,y}$)	1.097
Therefore Annual Carbon Credits generated (($EG_{i,j,y}$)* ($EF_{grid,CM,y}$)):	175,731 tCO_2

5. Combined Baseline Emission Factor of the South African Power Grid

Application of the "Tool to calculate the emission factor for an electricity system" Version 02.1.0

[5] Please refer to "110708_IFM ER Calculation"

The methodological tool to calculate the emission factor for an electricity system determines the CO2 emission factor for the displacement of electricity generated by power plants in an electricity system, by calculating the "operating margin" (OM) and "build margin" (BM) as well as the "combined margin" (CM). The operating margin refers to existing power plants whose electricity generation would be affected by the proposed CDM project activity. The build margin reflect the power units whose construction would be affected by the proposed CDM project activity. The tool follows seven steps in order to calculate the operating margin, build margin and the combined margin:

Step 1: Identify the relevant electric power system
Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)
Step 3: Select a method to determine the operating margin (OM)
Step 4: Calculate the operating margin emission factor according to the selected method
Step 5: Identify the group of power units to be included in the build margin (BM)
Step 6: Calculate the build margin emission factor
Step 7: Calculate the combined margin (CM) emission factor

Step 1: Identify the relevant electric power system
The electric system of our project is the South African National grid.

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)
Option 1 was selected for the purposes of the calculation of the emission factor for this project. Hence, only grid power plants are included in the calculation. This is reflective of the project baseline where electricity was sourced from the national grid.

Step 3. Select a method to determine the operating margin (OM)
The calculation of the operating margin emission factor ($EF_{grid,OM,y}$) is based on one of the following methods:

(a) **Simple OM**, or
(b) Simple adjusted OM, or
(c) Dispatch data analysis OM, or
(d) Average OM.

According to the "Tool to calculate the emission factor for an electricity system" version 02, any of the four methods can be used.

The simple OM method (option A1) can only be used if low-cost/must-run resources[6] constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production.

In South Africa, the low-cost/must run resources in the last 5 years are less than 50% (around 8%[7]). So it is reasonable to use "option A" - the simple OM method to calculate the OM emission factor.

The simple OM can be calculated using either of the two following data vintages:

[6] Low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid: hydro, geothermal, wind, low-cost biomass, nuclear and solar generation

[7] http://www.financialresults.co.za/eskom_ar2009/ar_2009/corp_capacities.htm

i. Ex ante option: A 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation, without requirement to monitor and recalculate the emissions factor during the crediting period, or

ii. Ex post option: The year in which the project activity displaces grid electricity, required emissions factor to be updated annually during monitoring. If the data required calculating the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year (y-1) may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year (y-2) may be used. The same data vintage (y, y-1, or y-2) should be used throughout all crediting periods.

The latest data available from the Eskom website (May 2010) was the electricity generation and fuel consumption for 2007/2008 – 2009/2010. This data is available from the CDM calculations webpage found on the Eskom website[8].

Based on the most recent statistics available of the project activity at the time of PDD submission, the first data vintage (ex-ante) for the calculation of the OM emission factor was chosen for this project and will not be changed during the fixed crediting period of 10 years.

Step 4. Calculate the operating margin emission factor according to the selected method

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

Option A1. If for a power unit m data on fuel consumption and electricity generation is available, the emission factor ($EF_{EL,m,y}$) should be determined as follows:

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{EG_{m,y}} \quad (E.1)$$

Where:

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh)

$FC_{i,m,y}$ = Amount of fossil fuel type i consumed by power unit m in year y (Mass or volume unit)

$NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type i in year y (GJ/mass or volume unit)

$EF_{CO2,i,y}$ = CO_2 emission factor of fossil fuel type i in year y (tCO_2/GJ)

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

m = All power units serving the grid in year y except low-cost/must-run power units

i = All fossil fuel types combusted in power unit m in year y

y = The relevant year as per the data vintage chosen in Step 3

The simple operating margin was calculated based on the ex ante option. The information was available from the Eskom website[3] for 2007/2008 – 2009/2010 and the lower calorific values and emission

8 http://www.eskom.co.za/content/calculationTable.htm

factors were taken from the IPCC 2006 Guidelines. The power plants not included were low-cost/must-run which were identified as nuclear, hydro, low-cost biomass and solar generation.

Therefore the power plants evaluated to be included were coal-fired and liquid fuel OCGT power stations. The net energy generation and fuel consumption data were taken from the Eskom website.

The Operating Margin emission factors for 2007/8, 2008/9 and 2009/10 are calculated separately and then the three-year average is calculated as a full-generation-weighted average of the emission factors. For details please refer to "101012_GEF_IFM_bw_v2". The result of the Operation Margin Emission Factor calculation is:

$EF_{grid,OM,y}$ =1.155 tCO_2/MWh

Step 5: Identify the group of power units to be included in the build margin

The sample of power units *m* used to calculate the build margin costs of either:

Option 1: The set of five power units that have been built most recently, or

Option 2: The set of power capacity additions in the electricity system that comprise 20% of the system generation (in MWh) and have been built most recently.

For the purpose of calculating the emission factor, the five power units that have been built most recently were:

Build Margin power plants
Kendal
Matimba
Majuba
Tutuka
Palmiet

The generation of these power plants collectively is 287,938 GWh over 3 years (2007/2008 – 2009/2010). This is 22% of the total generation of the power plants connected to the grid. Hence, the build margin will be calculated using the fossil fuel consumption and generation of these power plants.

Option 1 was selected for the calculation of the build margin for the fixed crediting period.

Step 6. Calculate the build margin emission factor

The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \qquad (E.2)$$

Where:

$EF_{grid,BM,y}$	Build margin CO_2 emission factor in year *y* (tCO_2/MWh)
$EG_{m,y}$	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
$EF_{EL,m,y}$	CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
m	Power units included in the build margin
y	Most recent historical year for which power generation data is available

The emission factor of each power unit *m* is determined using option A1 from step 4:

Option A1. If for a power unit m data on fuel consumption and electricity generation is available, the emission factor ($EF_{EL,m,y}$) should be determined as follows:

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{EG_{m,y}}$$

Where:

$EF_{EL,m,y}$ =	CO_2 emission factor of power unit *m* in year *y* (tCO_2/MWh)
$FC_{i,m,y}$ =	Amount of fossil fuel type *i* consumed by power unit *m* in year *y* (Mass or volume unit)
$NCV_{i,y}$ =	Net calorific value (energy content) of fossil fuel type *i* in year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$ =	CO_2 emission factor of fossil fuel type *i* in year *y* (tCO_2/GJ)
$EG_{m,y}$ =	Net quantity of electricity generated and delivered to the grid by power unit *m* in year *y* (MWh)
m =	All power units serving the grid in year *y* except low-cost/must-run power units
i =	All fossil fuel types combusted in power unit *m* in year *y*
y =	The relevant year as per the data vintage chosen in Step 3

As we don't have the values of the production and of the fuel consumption for each unit but only for each plant, the values have been calculated based on the consumption of the plant considered and taking into account the capacity of each unit.

The following value is calculated with option 1:

$\mathbf{EF_{grid,BM,y} = 1.038\ tCO_2/MWh}$

Step 7. Calculate the combined margin emissions factor

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \qquad (E.4)$$

Where:

$EF_{grid,BM,y}$	Build margin CO2 emission factor in year *y* (tCO2/MWh)
$EF_{grid,OM,y}$	Operating margin CO2 emission factor in year *y* (tCO2/MWh)
w_{OM}	Weighting of operating margin emissions factor (%)
w_{BM}	Weighting of build margin emissions factor (%)

The following default values should be used for w_{OM} and w_{BM}:

- Wind and solar power generation project activities: w_{OM} = 0.75 and w_{BM} = 0.25 (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods.
- All other projects: w_{OM} = 0.5 and w_{BM} = 0.5 for the first crediting period , and w_{OM} = 0.25 and w_{BM} = 0.75 for the second and third crediting period,9 unless otherwise specified in the approved methodology which refers to this tool.

Inputs	**Units**	
Operating margin emissions factor	tCO2/MWh	1.155
Build margin emissions factor	tCO2/MWh	1.038
Weighting OM	%	0.5
Weighting BM	%	0.5
Overall emissions factor	**tCO2/MWh**	**1.097**

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

Data and Parameters related to capping of baseline emissions

Data / Parameter:	$Q_{WCM,BL}$
Data unit:	Nm^3/h
Description:	Average quantity of WECM released in atmosphere
Source of data:	In the case of Method-2 (to determine f_{cap}) source of data is manufacturer's specifications or an external expert to be used to determine $Q_{WCM,BL.}$
Value applied:	21,600 Nm^3/h
Measurement procedures (if any):	The IFM furnaces were designed for a maximum FeCr production capacity of 260,000 tpa FeCr product[9]. For this amount of FeCr, there is an agreement with Eskom to supply a certain amount of electricity, at present circa 135MVA. Nevertheless, all FeCr producers constantly strive to increase their production and optimize costs, within the physical constraints of their furnace parameters, such as the crucible diameter, electrode diameter and furnace transformer capacity. The amount of offgas (waste gas) produced varies with the type of reductant used in the process, as part of their cost optimization regimes, within pre-defined limits. As a result, the offgas cleaning equipment such as the scrubbers are sized for a maximum capacity of 30,000Nm3/h, although normal operation typically only produces circa 24,000Nm3/h[10]. Note that this is never a constant figure since the process itself is not a perfect constant operation, with continuous feed but batch tapping operations.
Any comment:	

[9] Please refer to: ""IFM ME Balance (High Anthracite)""

[10] Please refer to: "IFM Carbon Balance (High Anthracite)"

Data and Parameters related to baseline EF of the South African Power Grid

Data / Parameter:	$EF_{grid,OM,y}$
Data unit:	tCO2e/MWh
Description:	Operation margin baseline emission factor of the South African Power Grid
Source of data used:	ESKOM data: http://www.eskom.co.za/content/calculationTable.htm Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook Table 1.2 of Chapter 1 of Vol.2.
Value applied:	1.155 tCO2e/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated in compliance with the latest version of *"Tool to calculate the emission factor for an electricity system"* (Version 2). Please refer to Section B.6.1 and Annex III for more details.
Any comment:	

Data / Parameter:	$EF_{grid,BM,y}$
Data unit:	tCO2e/MWh
Description:	Build margin baseline emission factor of the South African Power Grid
Source of data used:	ESKOM data: http://www.eskom.co.za/content/calculationTable.htm Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook Table 1.2 of Chapter 1 of Vol.2.
Value applied:	1.038 tCO2e/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated in compliance with the latest version of *"Tool to calculate the emission factor for an electricity system"* (Version 2). Please refer to Section B.6.1 and Annex III for more details.
Any comment:	

Data / Parameter:	$EF_{grid,y}$
Data unit:	tCO2e/MWh
Description:	Combined margin baseline emission factor of the South African Power Grid
Source of data used:	ESKOM data: http://www.eskom.co.za/content/calculationTable.htm Revised 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Workbook Table 1.2 of Chapter 1 of Vol.2.
Value applied:	1.097 tCO2e/MWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated in compliance with the latest version of *"Tool to calculate the emission factor for an electricity system"* (Version 2). Please refer to Section B.6.1 and Annex III for more details.
Any comment:	

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

1. The calculation of baseline emission

As it is mentioned above, the baseline emissions of the project can be calculated as follows

$BE_y = BE_{En,y} + BE_{flst,y} = BE_{En,y} + 0 = BE_{En,y}$

$BE_{En,y} = BE_{Elec,y} + BE_{Ther,y} = BE_{Elec,y} + 0 = BE_{Elec,y}$

$BE_{Elec,y} = f_{cap} * f_{wg} * \Sigma_i \Sigma_j (EG_{i,j,y} * EF_{Elec,i,j,y})$ =1*1* 160,287 MWh* 1.097 tCO_2e/MWh = 175,835 tCO_2e

So, BE_y= 175,835 tCO_2e

2. The calculation of project emissions

Included as the project will use a small amount of electricity for auxiliaries (including gas cleaning equipment). These project emissions are calculated by using latest approved tool "Tool to calculate baseline, project and/or leakage emissions from electricity consumption". Project emissions from consumption of additional electricity by the project are determined as follows:

$PE_{EL,y} = EC_{PJ,y} \times EF_{CO2,EL,y}$
$PE_{EL,y}$ = 95MWh × 1.097 tCO_2e/MWh
$PE_{EL,y}$ = 104 tCO_2e

so PE_y = 104 tCO2e

3. The calculation leakage

According to the methodology, the leakage is zero, i.e., *Ly*= 0

4. The calculation of emission reduction

$ER_y = BE_y - PE_y$= 175,731 tCO_2e

To sum up, annual emission reduction generated by the project activity is estimated to be 175,731 tCO_2e

	Parameter	Unit	Applied Value
Emission Factor	$EF_{grid,OM,y}$	tCO_2e/MWh	1.155
	$EF_{grid,BM,y}$	tCO_2e/MWh	1.038
	$EF_{grid,y}$	tCO_2e/MWh	1.097
Baseline Emissions	EG_y	MWh/yr	160,287
	f_{cap}	-	1
	BE_y	tCO_2e/yr	175,835
Project Emissions	PE_y	tCO_2e/yr	104
Emission Reductions	ER_y	tCO_2e/yr	175,731

Table B.9. Ex-ante calculation of Emission Reductions

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

Year	Estimation of project activity emissions (tonnes of CO_2e)	Estimation of baseline emissions (tonnes of CO_2e)	Estimation of leakage (tonnes of CO_2e)	Estimation of overall emission reductions emissions (tonnes of CO_2e)
2011	26	43,959	0	43,933
2012	104	175,835	0	175,731
2013	104	175,835	0	175,731
2014	104	175,835	0	175,731
2015	104	175,835	0	175,731
2016	104	175,835	0	175,731
2017	104	175,835	0	175,731
2018	104	175,835	0	175,731
2019	104	175,835	0	175,731
2020	104	175,835	0	175,731
2021	78	131,876	0	131,798
Total	**1,040**	**1,758,348**	**0**	**1,757,306**

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

B.7.1. Data and parameters monitored:

Data / Parameter:	$Q_{WCM,y}$
Data unit:	Nm^3/h
Description:	Quantity of WECM/Waste gas used for energy generation during year *y*
Source of data:	Measurement records from a venturi flow meter
Value of data	18,600 Nm^3/h
Measurement procedures (if any):	The quantity of waste gas used for electricity generation, expressed in Nm^3 per time unit (Volumetric Flow Rate), will be monitored in real time at the generation plant and collated to provide hourly, daily, monthly and annual data. The Waste Gas flow will be measured with a dedicated venturi flow meter designed to ASME-MFC-3Ma-2007 specification and using proven instrumentation for the highest possible accuracy.
Monitoring frequency:	Continuously
QA/QC procedures:	Manuals and datasheets of all monitoring equipment used are available; maintenance and calibration records will be generated and archived. For reference to standard of the equipment used, please refer to: *"Flowmeter Specs.jpg"* *"Ultramat 23 Analyzer.pdf"*
Any comment:	

Data / Parameter:	$EG_{i,j,y}$
Data unit:	MWh
Description:	Quantity of electricity supplied to the IFM recipient by generator, which in the

	absence of the project activity would have sourced by the grid during the year *y* in MWh
Source of data to be used:	Measurement records from the electricity meters (standard 4-way Class 0.2 meter)
Value of data	160,287MWh
Description of measurement methods and procedures to be applied:	The quantity of electricity consumed during startup and generated during operation (expressed in kWh) will be monitored and logged in real time and collated to provide hourly, daily, monthly and annual data. The equipment employed is an industry standard 4-way Class 0.2 meter, with the highest accuracy obtainable, as used by utility companies for electricity revenue metering and billing. In addition, onboard processing provides for bi-directional flow measurement and aggregation of Nett Export Power by subtracting the Auxiliary Electricity Consumption from the Electricity Generated for direct verification of any chosen period if required.
QA/QC procedures to be applied:	Manuals and datasheets of all monitoring equipment used in the system are available for training of the maintenance personnel and maintenance and calibration records will be generated and archived. The verification and calibration of electricity meters will be carried out periodically according to relevant national electric industry standards and regulations, in addition to that of the manufacturer's recommendation. After verification and calibration, meters will be sealed. All the meters installed will be tested by the qualified metrical organization jointly authorized by IFM and AAP Carbon within 10 days after: • The detection of a difference larger than the allowable tolerance (0.5%) in the readings of the main meter and/or the backup meters; • Repair to the faulty meter caused by improper operation. IFM's staff will be trained regularly in order to satisfactorily fulfill their maintenance obligations. Backup meters are installed at the IFM recipient facility battery limit.(please refer to "AAPCDM001 - IFM Integrated Clean Energy Monotoring Plan - 110705 (Rev1)" For reference to standard of the equipment used, please refer to: *"Electricity Meter Specs.pdf"*
Any comment:	

Data / Parameter:	$NCV_{WCM,y}$
Data unit:	MJ/Nm^3
Description:	Net Calorific Value annual average for furnace waste gas (WECM)
Source of data:	NCV will be calculated based on gas analyser measurements.
Measurement procedures (if any):	In order to establish a correlation between the amount of energy provided to the plant in the form of the Waste Gas and the amount of electrical energy produced by the plant from this Waste Gas, it is necessary to monitor the composition of the Waste Gas in addition to the Volumetric Flow.

	Therefore two dedicated industry standard gas analysers are used at the generation plant to continuously monitor the composition of the waste gas in real time. The gas analysers will provide the volumetric percentage of each individual gas component to the data logger at the plant for storage, collation and onwards transmission. Gas components measured consist of %CO, %CO2, %H2 and %O2. Net Calorific Value of the Waste Gas can be calculated in the PLC from the %CO and %H2 for plant control purposes, but the raw data will be logged in % by dedicated connection for verification purposes.
Monitoring frequency:	Continuously
QA/QC procedures:	Manuals and datasheets of all monitoring equipment used are available; maintenance and calibration records will be generated and archived. For reference to standard of the equipment used, please refer to: *"Calomat 6 Analyzer - Gas Analyzer.pdf"*
Any comment:	

Data / Parameter:	$\mathbf{EC_{FT}}$
Data unit:	MWh
Description:	Additional monitoring parameter added to ensure that applicability condition serial number 6: "The methodology is applicable to both Greenfield and existing waste energy generation facilities. If the production capacity of the project facility is expanded as a result of the project activity, the added production capacity must be treated as a Greenfield facility" is met and production capacity of project facility is not increased as a result of the project activity.
Source of data:	Overall Furnace Power Consumption data
Measurement procedures (if any):	The furnace is designed to operate at 56MW over a large resistance range, but is capable of reaching 62MW at about 2.7mOhm. The actual IFM operating MW data since startup in 2007 confirms this and indicates that the maximum capacity reached on Furnace 1 to date was 61.4MW and on Furnace 2 it was 62.1MW[11]. The baseline cap is therefore defined based on furnace capacity at 62MW per furnace from OEM design parameters and the historical data. Should the overall furnace consumption ($\mathbf{EC_{F1} + EC_{F2} = EC_{FT}}$ for both furnaces) exceed 124MWh for any period, and provided the ICE plant is operating at the time, the claimed CER's will be reduced by an amount of $\mathbf{EF_{grid,y}}$ per MWh for every MWh over the cap.
Monitoring frequency:	Daily, aggregated annually

Data / Parameter:	Abnormal operation of the project facility including emergencies and shut down
Data unit:	Hours
Description:	The hours of abnormal operation of parts of project facility that can have an

[11] Please refer to: "IFM Transformer Data"

	impact on waste energy generation and recovery
Source of data:	Furnace and ICE plant power consumption data
Measurement procedures (if any):	The only fuel source available to the ICE plant consists of the excess waste gas, currently being flared at the IFM furnaces. If the furnaces are down for any reason, (e.g. driven by market conditions, planned or unplanned maintenance, safety trips), the gas evolution from the furnace burden stops very quickly, cutting off fuel supply from the furnaces to the ICE plant. However, the ICE plant's operational range is very wide – i.e. it can run anywhere from a single engine (10%) to 10 engines (100%). Therefore, the ICE plant will only stop if both furnaces are down completely. For purposes of the CDM, this situation (**$EC_{FT} = 0$**) is defined as "abnormal operation of project facility" which can be accurately represented by the "power-off-time" of the furnaces ($T_{0ff,F1}$ and $T_{0ff,F2}$) monitored daily and aggregated in hours per annum ($T_{0ff,FT}$) For comparison, the same "power-off-time" of the ICE plant ($T_{0ff,ICE}$), monitored daily and aggregated in hours per annum will be compared to that of the furnaces and defined as a cap where the latter cannot be less than the former. (i.e. ICE Plant power off-time >= IFM furnace power off-time)
Monitoring frequency:	Daily, aggregated annually
QA/QC procedures:	
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 (MWh)
Source of data:	Measurement records from the electricity meters (standard 4-way Class 0.2 meter)
Value of data	95 MWh[12]
Measurement procedures (if any):	The quantity of auxiliary electricity consumed during startup and during periods while the plant is idle, expressed in kWh, will be monitored and logged in real time and collated to provide hourly, daily, monthly and annual data. The equipment employed is an industry standard 4-way Class 0.2 meter, as used by utility companies for electricity revenue metering and billing.
Monitoring frequency:	Daily, aggregated annually
QA/QC procedures:	Manuals and datasheets of all monitoring equipment used are available; maintenance and calibration records will be generated and archived. Backup meters are installed at the IFM recipient facility battery limit.(please refer to "AAPCDM001 - IFM Integrated Clean Energy Monotoring Plan - 110705 (Rev1)"

[12] Please refer to "ICE Plant Aux Power Consumption"

	For reference to standard of the equipment used, please refer to: *"Electricity Meter Specs.pdf"*
Any comment:	

The below diagram shows the points at which the above parameters will be monitored:

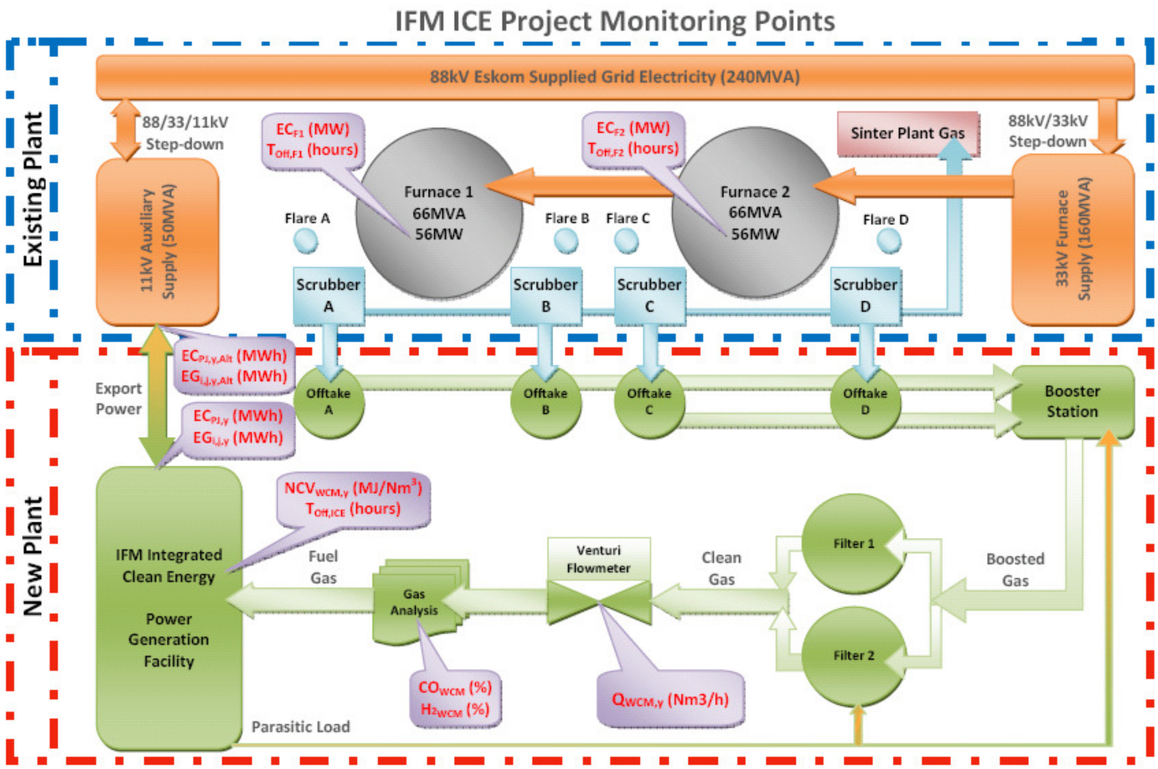


Figure B.7.1: Schematic of the defined monitoring parameters.

B.7.2. Description of the monitoring plan:

Monitoring Plan[13]

The proposed project applies approved consolidated baseline and monitoring methodology ACM0012 Version 04.0.0 for preparing the monitoring plan.

Purpose and Intent

The IFM Integrated Clean Energy plant was purposefully designed to be fed only by surplus waste gas from the existing smelting operation with no ability to accept any other fuel source.

It is the intent of this monitoring plan to establish the method and controls necessary to continuously measure the amount of electricity produced from this waste gas as a direct indication of the quantity of electricity displaced from the South African grid in real time, in order to quantify the Nett Emission Reduction achieved by this activity.

In addition to the quantity of electricity produced, the monitoring plan also caters for real time measurement of both the quantity and quality of the waste gas used to produce the clean electricity, as well as those parameters required to prove operation within the baseline caps as specified by the

[13] Please refer to: "AAPCDM001 - IFM Integrated Clean Energy Monotoring Plan - 110705 (Rev1) (4)"

methodology. The latter includes individual furnace power and availability of both furnaces and ICE plant.

The baseline emission factor of the South African Power Grid is fixed during the 10 year crediting period by ex-ante calculations as indicated in the Project Design Document and the monitoring plan therefore does not establish further monitoring requirements for the grid emission factor.

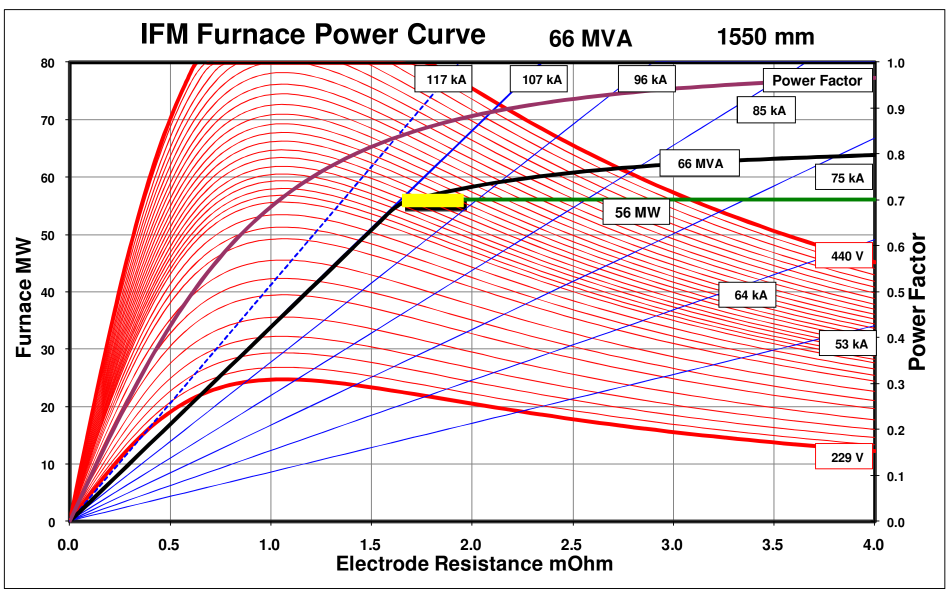
Also, as per ACM0012, there is no need of leakage calculation or monitoring for this kind of activity.

Baseline Capping Measures:
In compliance to the requirements of the methodology, baseline capping is applied to the project activity (the IFM ICE plant) to:

- Ensure that the production from the IFM FeCr Smelter is not expanded as a result of the project activity; and
- Prove that the ICE Pant positively contributes to the lowering of the IFM FeCr Smelter's overall Carbon Footprint.

Operating Furnace Power Consumption per Furnace
FeCr production capacity is determined by many factors, including the raw material composition, the type of reductant used, the moisture content of the feed, the skill of the operators, scheduled and unscheduled maintenance downtime, etc. The average production output and indeed the power consumption per ton of FeCr product vary constantly from tap to tap, based on these factors. As a result, this is not considered an accurate or verifiable parameter for establishing a cap.

However, the most significant constraints to achieve maximum capacity that exists at any FeCr Smelter are the physical size of the installed equipment. Production is therefore physically constrained by shell, crucible and electrode diameter, and of specific relevance to this project, by the installed furnace transformer capacity which at the IFM furnaces is 66MVA each. The OEM transformer graph below indicates these constraints:



From the above graph of the installed transformers, it is clear that the furnace is designed to operate at 56MW over a large resistance range, but is capable of reaching 62MW at about 2.7mOhm. The actual

IFM operating MW data since startup in 2007 confirms this and indicates that the maximum capacity reached on Furnace 1 to date was 61.4MW and on Furnace 2 it was 62.1MW.

The baseline cap ($EC_{FT,Cap}$ = 124MW) is therefore defined based on furnace capacity at 62MW per furnace from OEM design parameters and the historical data. Should the overall furnace consumption (EC_{FT} for both furnaces) exceed 124MWh for any period, and provided the ICE plant is operating at the time, the claimed CER's will be reduced by an amount of 1.097t per MWh for every MWh over the cap.

Abnormal Operation of IFM Furnaces and ICE Plant

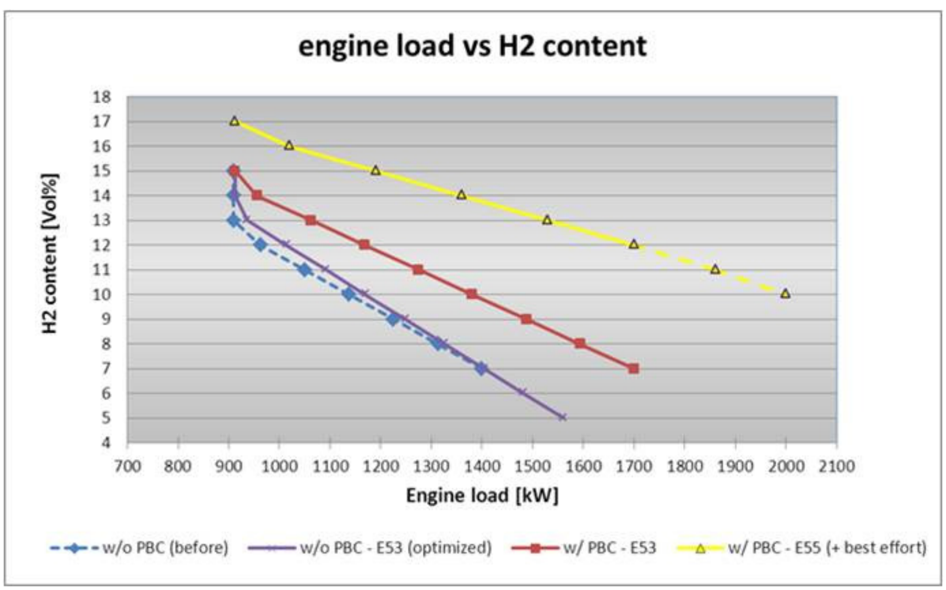
As stated previously, the only fuel source available to the ICE plant consists of the excess waste gas, currently being flared at the IFM furnaces. If the furnaces are down for any reason, (e.g. planned or unplanned maintenance, safety trips), the gas evolution from the furnace burden stops very quickly, cutting off fuel supply from the furnaces to the ICE plant.

However, the ICE plant's operational range is very wide – i.e. it can run anywhere from a single engine (10%) to 10 engines (100%). Therefore, the ICE plant will only stop if both furnaces are down completely (e.g. driven by market conditions or electricity supply interruptions to the furnaces).
For purposes of the CDM, this situation is defined as "abnormal operation of project facility" which can be accurately represented by the "power-off-time" of the furnaces ($T_{Off,FT}$), monitored daily and aggregated in hours per annum.

For comparison, the same "power-off-time" of the ICE plant ($T_{Off,ICE}$), monitored daily and aggregated in hours per annum will be compared to that of the furnaces and defined as a cap where the latter cannot be less than the former.

ICE Plant Installed and Operating Capacity

The installed capacity of the ICE plant is 20MW (10 x 2MW Engines) and therefore the total generation capacity and associated Emission Reductions could be capped on this basis, but is not considered transparent enough.



In addition and besides this physical capacity constraint indicated above, the ICE plant could also be capped at 20MW by the Environmental Licence obtained from the Basic Assessment Report process, but once again is not considered suitable.

Therefore, the ICE plant power capacity cap $EG_{i,j,y,Cap}$ is based on the operational capacity, operational parasitic load and availability factors for the ICE Plant as defined in the PDD. This provides a transparent and conservative capping mechanism for CDM purposes.

Based on these parameters the cap for export electricity is defined as $EG_{i,j,y,Cap}$ = 160,287 MWh/annum and therefore the cap for associated Emission Reductions after parasitic load is $BE_{ICE,Cap}$ = 175,731 tCO_2e/annum.

Monitoring Philosophy
All parameters required for verification will be monitored in real time at the generation plant via dedicated Modbus connections to the measurement instrumentation and collated to provide hourly, daily, monthly and annual data.

The raw time-stamped data collected from the monitoring instruments will be stored on a dedicated data logger at the generation plant for a period of at least 14 months and transmitted via internet on a daily basis to a dedicated offsite server provided by a secure data storage solution provider as used by international banks.

The data on the dedicated secure server will additionally be backed up every day as part of this service to ensure no loss occurs at any point in time.

Extreme care has been taken in the monitoring plan and equipment design that no data manipulation will be possible anywhere in the system and the data which the DOE sees at verification, will be actual operating data of unquestionable integrity.

Data and parameters monitored:
The parameters monitored consist of the following:

- Furnace operating power consumption for each furnace.
- Power-off-time of the ICE plant and both furnaces.
- Quantity of waste gas used for electricity generation.
- Composition of the waste gas used for electricity generation.
- Quantity of auxiliary electricity used during startup and idle periods.
- Nett quantity of electricity exported to the IFM auxiliary grid.

Furnace Operating Power Consumption

Each furnace PLC monitors and logs the raw data for furnace power consumption continuously in MW. This data is defined as monitoring parameter EC_{F1} and EC_{F2} and will be used to calculate EC_{FT}. The baseline cap $EC_{FT,Cap}$ has previously been established from design parameters and historical data as 124MW. For baseline capping purposes, if $EC_{FT} > EC_{FT,Cap}$ at any time during the verification period, and $EG_{i,j} > 0$ MW for the corresponding period, the claimed CER's will be reduced by an amount of 1.097t per MWh for every MWh over $EC_{FT,Cap}$.

Power-Off-Time of ICE Plant and Furnaces

Power-off-time for the furnaces ($T_{Off,FT}$) is calculated from the power consumption data monitored and logged by the furnace PLC. When $EC_{FT} = 0$, the furnace power is off and the total time that $EC_{FT} = 0$ is aggregated in hours to give $T_{Off,FT}$. Similarly, $T_{Off,ICE}$ is aggregated in hours for the total time that $EG_{i,j} \leq 0$ MW.

Quantity of Waste Gas used for generation

The quantity of waste gas used for electricity generation (Q_{WCM}), expressed in Nm^3 per time unit (Volumetric Flow Rate), will be monitored in real time at the generation plant and collated to provide hourly, daily, monthly and annual data.

The Waste Gas flow will be measured with a dedicated venturi flow meter designed to ASME-MFC-3Ma-2007 specification and using proven instrumentation for the highest possible accuracy.
Composition of Waste Gas used for generation

In order to establish a correlation between the amount of energy provided to the plant in the form of the Waste Gas (EP_{WCM}) and the amount of electrical energy produced by the plant from this Waste Gas, it is necessary to monitor the composition of the Waste Gas in addition to the Volumetric Flow.
Therefore two dedicated industry standard gas analysers are used at the generation plant to continuously monitor the composition of the waste gas in real time. The gas analysers will provide the volumetric percentage of each individual gas component to the data logger at the plant for storage, collation and onwards transmission.

Gas components measured consist of %CO, %CO2, %H2 and %O2. Net Calorific Value of the Waste Gas (NCV_{WCM}) can be calculated in the PLC from the %CO (CO_{WCM}) and %H2 ($H2_{WCM}$) for plant control purposes, but the raw data will be logged in % by dedicated connection for verification purposes.

Quantity of Auxiliary Electricity Consumption

The quantity of auxiliary electricity consumed during startup and during periods while the plant is idle ($EC_{PJ,y}$), expressed in kWh, will be monitored and logged in real time and collated to provide hourly, daily, monthly and annual data.

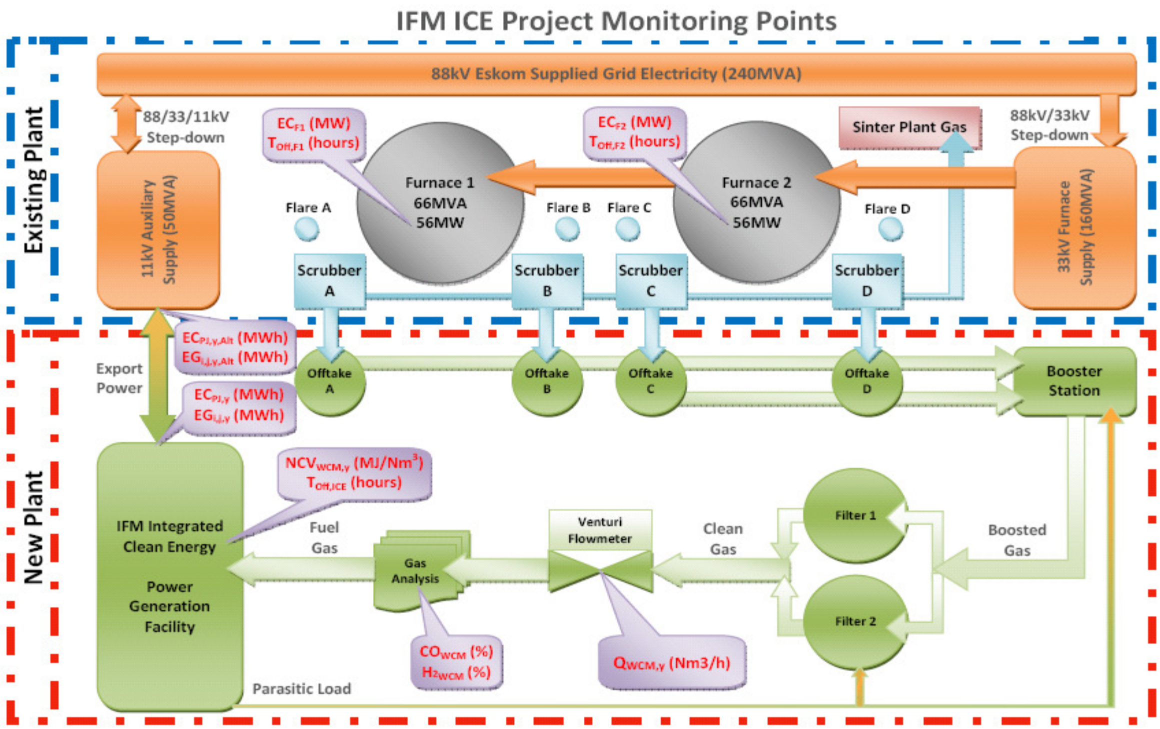
The equipment employed is an industry standard 4-way Class 0.2 meter, as used by utility companies for electricity revenue metering and billing.

Quantity of Generated and Export Electricity

The quantity of electricity generated during operation (EG_{ICE}), expressed in kWh will be monitored and logged in real time and collated to provide hourly, daily, monthly and annual data.
The same industry standard 4-way Class 0.2 meter described for the auxiliary power consumption is used for $EG_{i,j,y}$. Backup meters are installed at the IFM battery limit.

In addition, onboard processing provides for bi-directional flow measurement and aggregation of Nett Export Power (EG_{ICE}) by subtracting the Auxiliary Electricity Consumption ($EC_{PJ,y}$) from the Electricity Generated ($EG_{i,j,y}$) for direct verification of any chosen period if required.

Monitoring Positions



Monitoring Equipment
The following provides a description of the equipment used for each of the parameters monitored

Venturi Flow Meter

Because of the size of the duct supplying the Waste Gas to the power plant and the envisaged operating range, it was not possible to use turbine, annubar or orifice type flow-meters directly as none of these were considered to be accurate enough for CDM monitoring purposes over the complete range of operation.

A specialist company was therefore contracted to design and build a Venturi-type Flowmeter suitable for this application that has been certified to the ASME-MFC-3Ma-2007 specification to suit the requirements of the industrial gas industry.

The Venturi Flowmeter uses Rosemount differential pressure (3051 series) and temperature (248 series) transmitters in conjunction with a Siemens PAC 353 (Design B) Process Controller to provide real-time data in pre-defined engineering units (Nm^3/h).

The raw data is polled and stored by the data-logger via dedicated Modbus connection to ensure data integrity and eliminate external manipulation.

The venturi itself, being a metal construction with certified design, does not require calibration but the Rousemount instrumentation associated with the flow measurement will be calibrated during commissioning and thereafter per the manufacturer's recommendation.

Gas Analyzers

In order to establish the calorific value of the Waste Gas in real time (and therefore the associated energy content), it is necessary to obtain an analysis of the gas composition in conjunction with the gas flowrate. This is necessary since the Waste Gas composition changes constantly with the conditions prevailing in the smelting furnaces and the %CO and %H2 are both required for calorific value calculation.
The monitoring system therefore makes use of two different gas analyzers to obtain an accurate analysis of the gas composition. This is a function of the gas itself since Hydrogen and Carbon Monoxide cannot be analyzed with the same system.

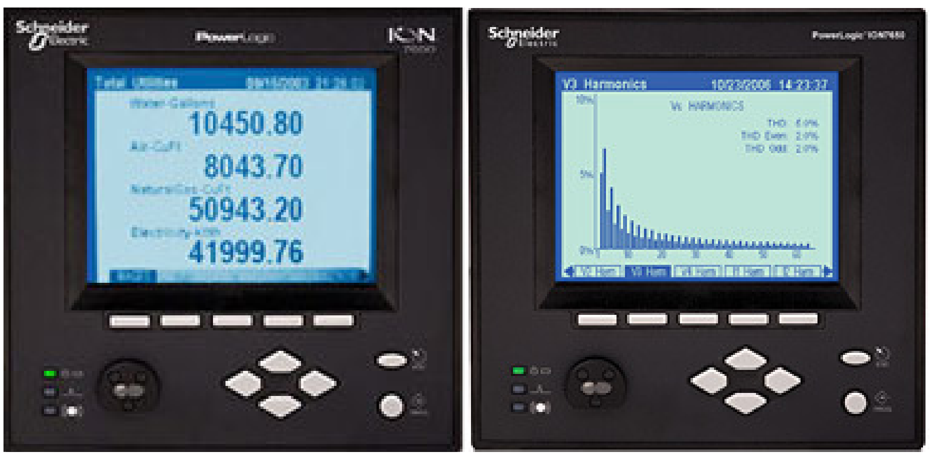
The analyzers used are a Siemens Calomat 23 (top in picture above) and Calomat 6 (bottom in picture above), for the %CO and %H2 respectively.

No conversion is done on-board and the raw data in engineering units (%) is polled and logged by the data-logger via dedicated Modbus connection to ensure data integrity and to eliminate external manipulation.

While the units are capable of self-calibrating at selectable intervals, manual calibration of these units will be performed during commissioning and thereafter as per the manufacturer's recommendation (every 6 to 12 months).

Nevertheless, in order to maintain the highest possible accuracy, this manual calibration check will be performed during planned shutdown as close to the 6 month interval as possible.

Electricity Meter



According to the South African national standard "The Code of Electricity Metering" (NRS 057), the electricity metering equipment will be properly configured and the metering equipment will be checked by both the project owner and qualified entity before the project is in operation.

A Power Logic ION7550 has been selected for monitoring of the Nett Export Power produced by the plant. The ION7550 is a utility standard 4-way Class 0.2 metering system with a separate set of voltage transmitters and current transmitters, capable of monitoring and logging both the outgoing power produced and the auxiliary power consumed during startup.

The data for bi-directional power flow (in kWh) will be polled and the raw data logged by the data-logger via a dedicated Modbus connection at pre-set intervals No external manipulation is possible to ensure the highest data integrity.

The ION7550 unit does not require any calibration, as per the manufacturer's recommendation but periodic maintenance inspection will be carried out on the system during annual planned shutdowns.

Data Management
AAP Carbon as appointed Carbon Asset Manager is responsible for data collection and management during the CDM crediting period. For this purpose a comprehensive set of tools from Dexdyne is employed with a proven track record of application in CDM projects.

Data Collection

Each monitoring system has been specified and designed with a dedicated Modbus connection which enables it to provide raw data to a dedicated Netrix Series 7000 Controller, acting as a data-logger, without any possibility of external manipulation.

The raw data from the monitoring equipment in engineering units will be logged locally on the Netrix data-logger with local storage capability of at least 14 months for all data points.
The Netrix Series 7000 unit has been successfully employed in registered CDM projects at several reference installations.

If inaccuracy of the data from the monitored instruments exceeds the allowable tolerance (e.g. 0.5% for the electricity meters, or as specified by the manufacturer) when the instrumentation operates abnormally during a month or any other unexpected problems occur, the net amount of electricity exported by the IFM devices will be calculated with lowest monthly historical data, adjusted with number of days when the IFM devices and furnaces were normally operated.

Data Storage

All raw data collected from the monitoring instruments will be stored locally on the Netrix Controller itself for a period of at least 14 months as a secondary verification solution.

As a primary verification source, the raw data will be sent via internet from the Netrix Controller to an off-site secure SQL server on a daily basis where it is kept live for later retrieval during verification.
In addition, the off-site server is backed up through a data storage solution provider similar to those used by major international banks to ensure no data loss occurs at any point in time.

After each verification period the electronic files will be archived on hard disk and CD-ROM at the data centre and a hard copy printout together with CD-ROM will be archived by IFM at their head office in Johannesburg.

In cases of uncertainty, the local data stored on the Netrix Controller will be readily accessible for the DOE for a period of 2 months after the selected verification period.

Physical documentation related to the calibration and maintenance of monitoring equipment will be collected and stored by IFM in a central place, together with the monitoring data and report generated each year.

In order to facilitate the auditor's reference, monitoring results will be indexed. All data records will be kept at IFM's head office in Johannesburg for a period of at least 2 years following the end of the crediting period.

Data Retrieval

The Netrix server through their Dashboard Interface is equipped with a set of tools for collation and data retrieval together with auditable calculation tools to provide both a completed Emission Reduction summary and the corresponding raw data for verification purposes.

AAP Carbon will on a monthly basis retrieve a verifiable report of all the data and the calculated Emission Reduction achieved for that month from the server and collate these monthly reports on an annual basis into a Monitoring Report ready for Verification by a recognized DOE.

At the election of the Verification DOE, it will be possible to remotely audit any point or period of time from raw data kept live on the SQL server. Data will only be archived annually after the Verification Report has been issued and Certification achieved.

Maintenance & Calibration

The project owner, in this instance IFM, is ultimately responsible for operation and maintenance of all the monitoring equipment to the manufacturer's specification and guarantee that the equipment remains in good working condition.

Manuals and datasheets of all monitoring equipment used in the system are available for training of the maintenance personnel and maintenance and calibration records will be generated and archived.

The verification and calibration of electricity meters will be carried out periodically according to relevant national electric industry standards and regulations, in addition to that of the manufacturer's recommendation. After verification and calibration, meters will be sealed.

All the meters installed will be tested by the qualified metrical organization jointly authorized by IFM and AAP Carbon within 10 days after:

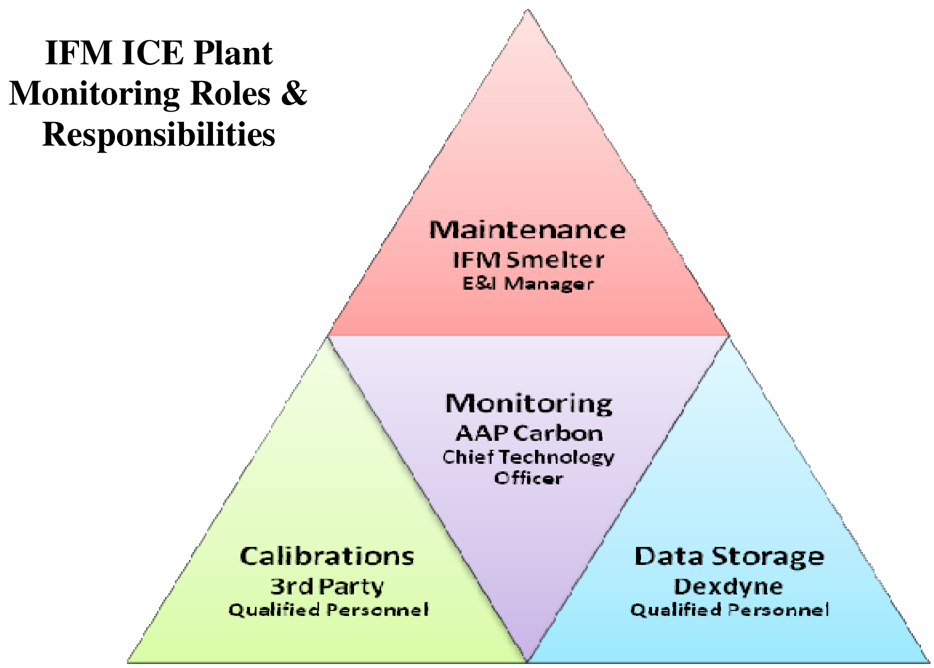
- The detection of a difference larger than the allowable tolerance (0.5%) in the readings of the main meter and/or the backup meters;
- Repair to the faulty meter caused by improper operation.

IFM's staff will be trained regularly in order to satisfactorily fulfill their maintenance obligations.

Monitoring Responsibility

AAP Carbon as project developer and Carbon Asset Manager will retain overall responsibility of collecting data, supervising storage and retrieval and verifying the procedure of measurement and control. The monitoring staff is responsible for recording and archiving the monitoring data in line with the monitoring plan and alerting IFM as project owner of any deviations from this plan that may negatively impact data integrity.

After verification AAP Carbon will provide copies of all data archives to IFM as specified by the monitoring plan for safekeeping.



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: 11 July 2011

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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 "start date" of the project activity is defined as 28 April 2008.

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

30 years plus (For Power generation)

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:

NA

C.2.1.2. Length of the first crediting period:

NA

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

1st of October 2011 or registration date whichever is the later

C.2.2.2. Length:

10 years (120 months)

SECTION D. Environmental impacts

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

As per Article 12 of the Kyoto Protocol CDM project activity should be contributed to the sustainable development of the host country. Hence assessment of project's impacts on the local environment and on society is key element of the project.

The project conforms to the National Environmental Management Act principles of sustainable development. Indeed, the project activity will take place on an existing industrial site, on unused open land within the greater plant operation covered by the original EIA.

No.	EIA requirements	Conditions of the Proposed Project
1	The **disturbance of ecosystems**	There will be no disturbance of any ecosystem

	and loss of biological diversity are avoided, are minimized and remedied.	or loss of biodiversity through the project activity. The selected site is on the existing industrial property between existing operational units with no active ecosystem or biodiversity constraints.
2	**Pollution and degradation of the environment are avoided**, or where they cannot be altogether avoided, are minimized and remedied.	By replacing fossil fuel based electricity from the national grid, the project activity will have a positive impact on pollution by lowering national CO_2 emission levels. Therefore, there will be no pollution or degradation of the environment through the project activity.
3	The **disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided**, or where it cannot be altogether avoided, is minimized and remedied.	There will be no disturbance of landscapes and sites that constitute the nation's cultural heritage through the project activity as the selected site is within the boundary of the existing IFM industrial complex.
4	That **waste is avoided**, or where it cannot be altogether avoided, minimized and reused or recycled where possible and otherwise disposed of in a responsible manner.	The project activity will not generate any operating waste. A small quantity of inert building rubble will be generated during construction, which is normal for this type of project. The building rubble will be removed and used as filling materials or disposed in an approved landfill.
5	The **use and exploitation of non-renewable resources is responsible and equitable**, and takes into account the consequences of the depletion of the resource.	The project activity will not consume or exploit non-renewable resources. By generating waste-gas based electricity, the project will have a positive impact on the use of non-renewable resources by replacing fossil fuel based generation capacity.
6	The **development, use and exploitation of renewable resources are responsible and equitable**, and take into account the consequences of the depletion of the resource.	The electricity generated by the project is based on a waste offgas from the furnaces at IFM. Therefore the project activity by definition will not consume or exploit renewable resources but rather a waste source.
7	**A risk averse and cautious approach is applied**, which takes into account the limits of current knowledge about the consequences of decisions and actions.	Prior to construction the project activity will be scrutinized and monitored by the EIA consultants used by IFM for the overall plant development. In addition, a monitoring methodology forming part of the UNFCCC criteria for CDM registration will be implemented and adhered to during operation.
8	**Negative impacts on the environment and on people's environmental rights be anticipated and prevented**, and where they cannot be altogether prevented, are minimized and remedied.	By effectively replacing fossil fuel based electricity from the national grid, the project activity will have a positive impact on the environment by lowering national CO2 emission levels.

Therefore, there will be no negative impacts on the environment and on people's environmental rights through the project activity.

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:

The project activity belongs to clean-production and environment-protection project with less environmental impact on the surroundings. The host Party and Project participate both think that the Project activity will have a positive significant environmental impact.

SECTION E. Stakeholders' comments

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

Invitation procedure

The Gold Standard Initial Stakeholder Consultation has been conducted by the project owner, International Ferro Metals Limited; with assistance from South Pole Carbon Asset Management Limited (Switzerland based company responsible for CDM project development) and AAP Carbon Limited (a Hong Kong based company responsible for implementation of the Waste-gas to Electricity plant).
Stakeholder groups as defined in the Gold Standard procedures were identified and informed about the ISC meeting by submitting the ISC Invitation via email and fax.

Stakeholder groups included[14]:

- Interested and Affected Parties (as defined by the EIA over IFM)
- Relevant Local Authorities
- Local Gold Standard Representatives

Place and date of the meetings

The Initial Stakeholder Consultation was held in the meeting room of the training centre of IFM SA on

[14] Please refer to: *"IAP Database.msw" and "080727 IFM ISC invite lis.xlst"*

August 27th 2008 at 9.30am. The Initial Stakeholder Consultation was integrated into the quarterly IFM Interested and Affected Parties Meeting which resulted in a good turnout of participants. All participants were communicated with as to the location of the meeting, and with the training center being located in Buffelsfontein, the participants were able to examine the location of the project.

E.2. Summary of the comments received:

The overall response to the Project, from 26 participating local stakeholders, was both encouraging and positive. The Initial Stakeholder Consultation was integrated into the quarterly IFM Interested and Affected Parties Meeting which resulted in a good turnout of participants. Stakeholders acknowledged that the decrease of emissions of carbon dioxide into the atmosphere is important for South Africa and the global environment. They also acknowledged that the project will help to relieve pressure on the South African electricity grid, by assisting in overcoming South Africa's current energy crisis.

The project is considered to be a first in the region and is one that the local community can be proud of. The implementation of this project will help unlock future potential installations of the waste gas to energy systems going forward.

In conclusion, the sustainability of the project leads to various benefits (as reported by local stakeholders):

• Creating significant local employment opportunities, particularly during the construction phase, but also during the ten year operating period;
• Generating waste gas based electricity and consequently having a positive impact on the use of nonrenewable resources by replacing fossil fuel based generation capacity;
• Lowering national green house gas emissions by displacing fossil-fuel based electricity generation from the national grid;
• Creating an Independent Power Producer and therefore providing diversity in the electricity supply in accordance with the White Paper on the Energy Policy of South Africa (1998)1; and
• Transferring cutting edge modern technology to South Africa.

The following concerns from participants relating to the project were recorded and will be taken into account in the mitigation procedures of the project going forward:

• A participant from a local ecoforum asked for more detailed information about the technical operation of the plant in order to give a more informed response;
• Local farmers were concerned about the noise levels which will be emitted as a result of the Jenbacher engines;
• Participants were also apprehensive about the gas emissions from the Jenbacher engines themselves.

Each of the comments above have been taken into account in the final section of this report: "Changes to project design based on comments received"

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

Only 2 environmental concerns were established from the Initial Stakeholder Consultation: the levels of noise emitted once the Jenbacher Engines are installed and running; and the levels of gas emissions resulting from the engines once operational.

Decibel recordings will be applied to the project design. These recordings will be measured at the nearest boundary of the IFM facility and recordings will be measured before and after the project activity to ensure the noise levels are not increased by the project activity.

Detailed records will be kept of the emissions from the Project and as stated by the project owner "There is essentially no difference whether the combustible gas is burned through a flare stack or used to fuel the Internal combustion engines (the Jenbachers), as the final "offgas" chemical composition is exactly the same."

Going forward, we see it as an option to include a full technical description of the project in the ISC Invitation in order for participants to give a more informative response regarding the sustainable development matrix and questionnaire.

It is evident from the stakeholder consultation process, that the project is perceived as a positive example for the ferro-chrome industry in South Africa and that it contributes to sustainable development in the region.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is involved in the project.

Annex 3

BASELINE INFORMATION

Please refer to *101012_GEF_IFM_bw_v2* for data clarification

Grid Emissions Factor Calculation data:

calculation	07/08 - 09/10
OM simple	1.155287057
Build Margin	1.038444721
CM	1.096865889

OM SIMPLE

EFgrid,OMsimple,y = Simple operating margin CO2 emission factor in year y (tCO2/MWh)
FCi,m,y = Amount of fossil fuel type i consumed by power plant/unit m in year y (mass or volume unit)
NCVi,y = Net calorific value (energy content) fossil fuel type i in year y (GJ/mass or volume)
EFCO2,i,y = CO2 emission factor of fossil fuel type i in year y (tCO2/GJ)
EGm,y = Net electricity generated and delivered to the grid by power plant/unit m in year y (MWh)m = All power plants/units se

$$EF_{grid,OMsimple,y} = \frac{\sum_{i,m} FC_{i,m,y} \cdot NCV_{i,y} \cdot EF_{CO2,i,y}}{\sum_{m} EG_{m,y}}$$

		2007/2008	2008/2009	2009/2010	
FCi,m,y	Coal	125,279,257.7	121,422,536.0	122,960,688.0	(tonnes)
NCVi,y	Coal	19.90	19.90	19.90	GJ.tonne
EFCO2,i,y	Coal	0.095	0.095	0.095	tCO2/GJ
EGm,y	Coal	174,734,102.0	211,690,925.0	215,939,904.0	MWh year
EFgrid,OMsimple,y	Coal	1.35	1.08	1.07	tCO2/MWh

BUILD MARGIN

$$EF_{grid,BM,y} = \frac{\sum_{m} EG_{m,y} \cdot EF_{EL,m,y}}{\sum_{m} EG_{m,y}}$$

EGm,y = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
EFEL,m,y = CO2 emission factor of power unit m in year y (tCO2/GJ)
EGm,y = Net electricity generated and delivered to the grid by power plant/unit m in year y (MWh)m = All power plants/units se

	2007/2008	2008/2009	2009/2010
EGm,y	100,200,375.00	94,278,515.00	93,459,147.00
EFEL,m,y	1.021	1.061	1.035

combined margin emission factor (CM)

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

Wom	0.5
Wbm	0.5
	1

OM power plants
Arnot
Duvha
Hendrina
Kendal
Kriel
Lethabo
Matimba
Majuba
Matla
Tutuka
Camden
Grootvlei
Komati

BM power plants
Kendal
Matimba
Majuba
Tutuka
Palmiet

Complete overview power plants and of the data used[15]:

Plant names	Arnot	Duvha	Hendrina	Kendal	Kriel	Lethabo	Matimba	Majuba	Matla	Tutuka	Koeberg	Acacia	Port Rex	Colley Wobbles	First Falls	Gariep	Ncora	Second Falls	Van Der Kloof	Drakensberg	Palmiet	Camden	Grootvlei	Komati
Installed capacity (MW)	1980	3450	1895	3840	2850	3558	3690	3843	3450	3510	1800	171	171	0	0	360	0	0	240	1000	400	1600	1200	1000
Commissioning date	1971/09/21	1980/01/18	1970/05/12	1988/10/01	1976/05/06	1985/12/22	1987/12/04	1996/04/01	1979/09/29	1985/06/01	1984/07/21	1976/05/13	1976/09/30	1900/01/01	1900/02/01	1971/09/08	1900/03/01	1900/04/01	1977/01/01	1981/06/17	1988/04/18	1966/12/21	1969/06/30	1969/06/30
Fuel type	Coal	Coal	Coal	Coal	Coal	Coal	Coal	Coal	Coal	Coal	Nuclear	Gas	Gas	Hydro	Hydro	Hydro	Hydro	Hydro	Hydro	Pump Storage	Pump Storage	Coal	Coal	Coal
Fuel consumption	30,114,258	54,903,663	32,986,509	74,010,300	49,175,255	79,732,564	62,281,318	31,204,762	65,352,916	35,024,656	0	17,628,065	11,133,861	0	0	0	0	0	0	0	0	390,000	0	0
UoM	tonnes/year	tonnes/year	tonnes/year	tonnes/year	tonnes/year	tonnes/year	tonnes/year	tonnes/year	tonnes/year	tonnes/year	NA	es kerosene/ye	es kerosene/ye	NA	NA	NA	NA	NA	NA	NA	NA	tonnes/year	tonnes/year	tonnes/year
2001	5,595,047	10,560,247	6,475,309	13,517,668	10,032,554	15,309,412	12,362,245	2,593,313	12,884,252	4,492,863	0	72,004	10,234	0	0	0	0	0	0	0	0	0	0	0
2002	5,799,406	10,681,500	6,551,254	14,156,009	10,019,981	15,368,207	12,960,435	2,370,339	12,924,369	5,628,669	0	6,579	731	0	0	0	0	0	0	0	0	0	0	0
2003	6,654,629	9,988,679	6,432,159	15,745,646	9,306,872	16,410,189	13,803,200	5,539,271	13,169,317	7,319,814	0	18,275	106,361	0	0	0	0	0	0	0	0	0	0	0
2004	6,608,536	11,907,947	6,644,412	15,429,638	9,297,070	17,041,971	13,786,063	6,363,395	13,445,117	8,983,951	0	42,764	17,179	0	0	0	0	0	0	0	0	0	0	0
2005	5,456,640	11,765,290	6,883,375	15,161,339	10,518,778	15,602,785	9,369,375	14,338,444	12,929,861	8,599,359	0	17,488,444	10,999,357	0	0	0	0	0	0	0	0	390,000	0	0
2006/7	8063020	15915147	8746546	20115835	11722579	22792396	18075673	11834508	16867123	11654556	0	0	0	0	0	0	0	0	0	0	0	1604548	0	0
2007/8	6210700	12425531	7794220	15986131	9059934	18314572	14862323	12853342	13795309	10627575	0	0	0	0	0	0	0	0	0	0	0	3218873	130747.7	0
2008/9	6,395,805	11,393,553	7,122,918	15,356,595	9,420,764	16,715,323	13,991,453	12,554,406	12,689,387	11,231,583	0	0	0	0	0	0	0	0	0	0	0	3,876,211	674,538	0
2009/10	6794134	11744606	6905917	13866514	8504715	18170227	14637481	12261833	12438391	10602839	0	0	0	0	0	0	0	0	0	0	0	4,732,163	1,637,371	664,497

Electricity generation MWh/ year	Arnot	Duvha	Hendrina	Kendal	Kriel	Lethabo	Matimba	Majuba	Matla	Tutuka	Koeberg	Acacia	Port Rex	Colley Wobbles	First Falls	Gariep	Ncora	Second Falls	Van Der Kloof	Drakensberg	Palmiet	Camden	Grootvlei	Komati
2001	11,390,033	22,616,252	12,460,428	24,326,123	19,428,746	21,907,040	23,822,748	5,616,086	25,256,641	8,398,787	10,718,623	197	28	0	0	1,018,403	0	0	1,042,426	1,038,583	548,918	0	0	0
2002	12,016,617	23,259,847	12,647,905	26,075,679	19,315,687	22,067,848	25,110,714	4,438,253	25,534,409	11,184,322	11,991,285	18	2	0	0	1,117,041	0	0	1,239,692	1,195,505	542,031	0	0	0
2003	14,135,237	21,384,335	12,329,325	27,820,202	18,347,304	23,505,543	26,510,802	10,015,560	25,802,219	14,195,963	12,662,591	50	291	0	0	357,076	0	0	419,965	1,932,587	799,735	0	0	0
2004	13,630,490	24,872,400	12,357,201	27,000,905	18,333,797	24,717,191	26,882,923	11,340,178	25,848,215	17,187,412	14,279,729	117	47	0	0	350,904	0	0	369,441	2,056,429	924,079	0	0	0
2005	11,495,036	24,479,488	12,410,151	26,461,793	20,510,202	22,498,940	28,401,085	17,620,119	23,782,480	16,500,638	0	47,848	30,094	0	0	402,432	0	0	322,928	1,818,463	796,020	756,540	0	0
2006/7	15938102	31550562	16083288	34164855	22468695	32052833	34983880	22828565	30864194	23389829												2815982	0	0
2007/8	11905060	23622732	13756351	26517420	17762398	25701723	29021742	23680971	24549833	20980242												5171057	237138	0
2008/9	11,987,281	21,769,489	12,296,687	23,841,401	18,156,686	23,580,232	26,256,068	22,676,924	21,863,400	21,504,122												6,509,079	1,249,556	0
2009/10	13,227,864	22,581,228	12,143,292	23,307,031	15,906,816	25,522,698	27,964,141	22,340,081	21,954,536	19,847,894												7,472,070	2,656,230	1,016,023

[15] Please refer to: http://www.eskom.co.za/content/calculationTable.htm

Annex 4

MONITORING INFORMATION

Please refer to section B.7.2 of PDD for full description of monitoring plan

Annex 5

IFM Integrated Clean Energy Project
Gold Standard PDD

Additional PDD Annex as required for Gold Standard validation

GS Annex Version: 1.0
Date: August 12nd 2008

Contact person: Bruce Wylie, South Pole Carbon Asset Management Ltd., b.wylie@southpolecarbon.com, +27 73 9918383

Introductory Notes

This document contains the PDD Annex to validate the IFM Integrated Clean Energy Project against the Gold Standard. Gold Standard validation shall be carried out in parallel with regular CDM validation.

The proposed project is to utilise waste furnace off-gas as a source of energy to generate clean electricity. It will be implemented at the International Ferro Metals SA Ltd. The waste gas shall be used for power generation on-site, displacing part of the electricity requirement of IFM from the predominantly coal-fired South African National Grid. The project activity implies a series of sustainable development aspects including technological innovation, environmental and social benefits.

By substituting a part of the electricity supply from the South African National Grid, the Project Activity will save fossil fuel resources and reduce GHGs emissions, e.g. CO2, SO2, NOx, therby mitigating the negative impact that occurs by the excessive exploitation and depletion of natural resources like coal, predominant in South Africa. The project activity will also provide working places for skilled labour and professionals in the region by offering direct and indirect employment for power plant construction and operation. It is firmly believed by the project participants that the project activity will promote sustainable economic and industrial growth in the long run, help conserve natural resources, and consequently contribute to a cleaner and healthier environment.

Project Type Eligibility Screen

GS Manual for CDM Project Developers: **Section 3.2**

The project activity falls under category "A.2 Energy Efficiency", sub-category "Industry Energy Efficiency", as specified in Appendix A of the Gold Standard Manual for CDM Project Developers.

The proposed project is a large-scale project; hence methodology ACM0012 has been applied in this project. The project is located in South Africa.

Gold Standard Additionality Screen

Previously announced projects screen

GS Manual for CDM Project Developers: ***Section 3.3.1***

There has been no public announcement of the project going ahead without the CDM, prior to any payment being made for the implementation of the project.

On March 27th 2008, prior to the implementation of the project activity, a PIN was submitted to the South African DNA stating the intention to register the project activity under the CDM. On May 5th, 2008, the South African DNA responded with a "Letter of no objection" confirming that the project as specified in the PIN meets South Africa's sustainable development requirements. CDM funds are a key element in the finance structure of the project activity and it would not be implemented without CDM.

UNFCCC Additionality Tool (EB 36 Report Annex 13, Version 02)

GS Manual for CDM Project Developers: ***Section 3.3.2***

The Additionality Tool is featured in Section B.5 of the PDD.

ODA Additionality Screen

GS Manual for CDM Project Developers: ***Section 3.3.3***

Project financing for this project activity will not use Official Development Assistance (ODA) Funds as defined in the Gold Standard Manual for Project Developers. There are no loans or grants being provided by International Finance Institutions, which include ODA.

Conservative Approach

GS Manual for CDM Project Developers: ***Section 3.3.4***

The baseline scenario selection and the calculation of green house gas emission reductions have been carried out in a conservative manner:

- Project proponents have used an approved methodology by CDM Executive Board (ACM0012 – *Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects*, Version 04.0.0) in order to determine the baseline scenario and calculate emission reductions.
- Likely baseline scenarios have been developed and assessed using guidance provided by the methodology ACM0012 and the "Tool for the demonstration and assessment of additionality". A set of quantified scenarios has been described and the most conservative baseline scenario has been selected.
- Calculations have been done in a transparent manner providing full documentation and references to data sources to the DOE.

Technology Transfer

GS Manual for CDM Project Developers: ***Section 3.3.5***

The IFM project is the first of its kind in Africa. There are no other similar installations in Africa[16].

The Metalloys plant of Samancor Manganese has attempted to utilize the offgas generated by closed furnaces for the purpose of electricity generation, but the plant was not economically justifiable when it

[16] Please refer to document "Letter IFM" from G.E.

was constructed and was plagued by many technical problems due to the sophistication of the technology employed.[17]. In addition to this the gas used is different from the IFM project.

None of the operating partners have any experience with this type of technology and as a result, a long-term maintenance contract, including intensive operational training, has been negotiated with GE Energy.

Please refer to the PDD Sections B.3, B.4, B.5 and B.6 for more details on project boundary definition, baseline scenario selection and emission reductions calculation.

Sustainable Development

Sustainable Development Assessment

GS Manual for CDM Project Developers: **Section 3.4.1**

In the view of the project participants the proposed project activity assists South Africa in achieving its sustainable development criteria by:

- Creating significant local employment opportunities, particularly during the construction phase, but also during the ten year operating period;
- Generating waste gas based electricity and consequently having a positive impact on the use of non-renewable resources by replacing fossil fuel based generation capacity;
- Lowering national green house gas emissions by displacing fossil-fuel based electricity generation from the national grid;
- Creating an Independent Power Producer and therefore providing diversity in electricity supply in accordance with the White Paper on Energy Policy of South Africa (1998);
- Transferring cutting edge modern technology to South Africa.

1) We clean the gas even further by removing the particulates to <1mg/Nm3 as protection for the engines.

Both these factors have huge positive influences on both the local and national environmental targets.”

[17] See http://home.pacific.net.au/~steamtech/PowerPlant.htm

C. Sustainable Development Assessment Matrix

The sustainable development assessment matrix was also requested for completion by the stakeholders. The matrix was explained orally and included in the documents handed to participants was an introduction to the questionnaire and description of the scoring system:

The results of the matrix were extremely positive and are summarized as follows:

Component and indicators	Score Frequency					Rationale
	-2	-1	0	+1	+2	
Local/ regional/ global environment						
Water quality and quantity	0	0	12	1	0	The project activity will not affect the quality of water or contaminate any surface or ground water
Air quality (other than GHGs)	0	1	1	5	5	There will be a significant decrease in the amount of dust particles that would have been otherwise present in the air
Other pollutants	0	0	11	1	0	There will be no pollution or degradation of the environment through the project activity
Soil condition	0	0	12	1	0	The project activity will have no significant effect on the quality of the soil, considering that the activity will take place on an industrial site
Biodiversity	0	0	11	2	0	There are no active ecosystems or biodiversity on site as the selected site is an existing industrial property.
Subtotal	**0**	**1**	**47**	**10**	**5**	
Social Sustainability and development						
Employment	0	0	0	10	3	350 temporary and 10 permanent employment opportunities are envisaged during construction and development phases.
Livelihood of the poor	0	0	2	8	1	As result of the employment opportunities, there will be poverty alleviation in the local communities of the Majakaneng and Mooinooi districts.
Access to energy services	0	0	2	7	3	The local communities will not have direct access to the electricity, however, it is yet to be decided whether the electricity may be sold back to the national grid or consumed on site
Human and institutional capacity	0	0	3	9	0	The will be empowerment of local employees and further training of semi-skilled employees
Subtotal	**0**	**0**	**7**	**34**	**7**	
Economic and technological development						

Employment (numbers)	0	0	0	10	2	The expected current value of the employment opportunities will be R 1,940 000 per annum, of which 56% will accrue to previously disadvantaged individuals
Balance of payments	0	0	2	7	3	Most capital for the power generation facility which forms the basis of the CDM project will be provided by foreign entities, improving the foreign direct investment components of balance of payments. Furthermore, the inflow of Euro-denominated CER revenue will further improve the balance of payments.
Technological self reliance	0	0	1	10	1	There are no known installations anywhere in the world using this technology on ferro-alloy furnace offgas for electricity generation. However, there are several installations worldwide using this technology with similar gas compositions. An example of such a plant is operated by Aceralia in Spain, using LD-gas from a steel plant for electricity generation
Subtotal	**0**	**0**	**3**	**27**	**6**	

TOTAL	**0**	**1**	**57**	**71**	**18**	

As can be seen from the matrix above the project activity shows a positive performance in all sustainable development categories. The project activity fulfils all Gold Standard criteria since none of the indicators above have a score of -2, there is one negative sub-total. The total score is positive. No crucial indicator is identified.

Every category received positive ratings from the stakeholders and the average score from completed matrices was 7.85. 13 Persons out of the 26 attending completed the matrix. A single participant gave a -1 score for air quality due to concerns that the Jenbacher engines will result in more toxic emissions than the current gas flare.

The project owner has responded to this as follows:

"In the prevailing practice at IFM, the offgas from the furnace (consisting of approx 72% CO, 10%CO_2, 3%H_2, 5%H_2O and 10%N_2)[18] is combusted into the atmosphere through a flare stack. During combustion, the CO and H_2 reacts with Oxygen from the atmosphere to form CO_2 and H_2O. Particulate loading at <50mg/Nm3 meets all existing environmental requirements but still releases particulates into the atmosphere.

There is essentially no difference whether the combustible gas is burned through a flare stack or used to fuel the Internal combustion engines (the Jenbachers), as the final "offgas" chemical composition is exactly the same. The only significant differences are that:

1) We harness the chemical energy by using what is normally considered to be a waste stream as a fuel and

EIA requirements

GS Manual for CDM Project Developers: ***Section 3.4.2***

[18] This was the make-up of the gas as estimated at local stakeholder consultation.

EIA Gold Standard Requirements according to section 3.4.2 in the Gold Standard Manual apply to the project activity as follows:

1. Host country EIA requirements

It is mandatory in South Africa to conduct an EIA for this type of project activity. The EIA has been carried out and approved.

The project conforms to the National Environmental Management Act principles of sustainable development. Indeed, the project activity will take place on an existing industrial site, on unused open land within the greater plant operation covered by the original EIA.

No.	EIA requirements	Conditions of the Proposed Project
1	The **disturbance of ecosystems and loss of biological diversity are avoided**, are minimized and remedied.	There will be no disturbance of any ecosystem or loss of biodiversity through the project activity. The selected site is on the existing industrial property between existing operational units with no active ecosystem or biodiversity constraints.
2	**Pollution and degradation of the environment are avoided**, or where they cannot be altogether avoided, are minimized and remedied.	By replacing fossil fuel based electricity from the national grid, the project activity will have a positive impact on pollution by lowering national CO_2 emission levels. Therefore, there will be no pollution or degradation of the environment through the project activity.
3	The **disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided**, or where it cannot be altogether avoided, is minimized and remedied.	There will be no disturbance of landscapes and sites that constitute the nation's cultural heritage through the project activity as the selected site is within the boundary of the existing IFM industrial complex.
4	That **waste is avoided**, or where it cannot be altogether avoided, minimized and reused or recycled where possible and otherwise disposed of in a responsible manner.	The project activity will not generate any operating waste. A small quantity of inert building rubble will be generated during construction, which is normal for this type of project. The building rubble will be removed and used as filling materials or disposed in an approved landfill.
5	The **use and exploitation of non-renewable resources is responsible and equitable**, and takes into account the consequences of the depletion of the resource.	The project activity will not consume or exploit non-renewable resources. By generating waste-gas based electricity, the project will have a positive impact on the use of non-renewable resources by replacing fossil fuel based generation capacity.
6	The **development, use and exploitation of renewable resources are responsible and equitable**, and take into account the consequences of the depletion of the resource.	The electricity generated by the project is based on a waste offgas from the furnaces at IFM. Therefore the project activity by definition will not consume or exploit renewable resources but rather a waste source.
7	**A risk averse and cautious approach is applied**, which takes	Prior to construction the project activity will be scrutinized and monitored by the EIA

	into account the limits of current knowledge about the consequences of decisions and actions.	consultants used by IFM for the overall plant development. In addition, a monitoring methodology forming part of the UNFCCC criteria for CDM registration will be implemented and adhered to during operation.
8	**Negative impacts on the environment and on people's environmental rights be anticipated and prevented**, and where they cannot be altogether prevented, are minimized and remedied.	By effectively replacing fossil fuel based electricity from the national grid, the project activity will have a positive impact on the environment by lowering national CO2 emission levels.

Therefore, there will be no negative impacts on the environment and on people's environmental rights through the project activity.

2. Previous consultation activity

The Previous consultation activity was held in the meeting room of the training centre of IFM SA on August 27th 2008 at 9.30am. The Initial Stakeholder Consultation was integrated into the quarterly IFM Interested and Affected Parties Meeting which resulted in a good turnout of participants. All participants were communicated with as to the location of the meeting, and with the training center being located in Buffelsfontein, the participants were able to examine the location of the project.

3. One of the indicators in the Sustainable Development Assessment Matrix scores -1.

Public consultation procedures

GS Manual for CDM Project Developers: ***Section 3.4.3***

Initial Stakeholder Consultation

The Gold Standard Initial Stakeholder Consultation has been conducted by the project owner, International Ferro Metals Limited, with assistance from South Pole Carbon Asset Management Limited (Switzerland based company responsible for CDM project development) and AAP Carbon Limited (a Hong Kong based company responsible for implementation of the Waste-gas to Electricity plant).
Stakeholder groups as defined in the Gold Standard procedures were identified and informed about the ISC meeting by submitting the ISC Invitation via email and fax.

Place and date of the meetings

The Initial Stakeholder Consultation was held in the meeting room of the training centre of IFM SA on August 27th 2008 at 9.30am. The Initial Stakeholder Consultation was integrated into the quarterly IFM Interested and Affected Parties Meeting which resulted in a good turnout of participants. All participants were communicated with as to the location of the meeting, and with the training center being located in Buffelsfontein, the participants were able to examine the location of the project.

Summary of the comments received:

The overall response to the Project, from 26 participating local stakeholders, was both encouraging and positive. The Initial Stakeholder Consultation was integrated into the quarterly IFM Interested and Affected Parties Meeting which resulted in a good turnout of participants. Stakeholders acknowledged that the decrease of emissions of carbon dioxide into the atmosphere is important for South Africa and the global environment. They also acknowledged that the project will help to relieve pressure on the South African electricity grid, by assisting in overcoming South Africa's current energy crisis.

The project is considered to be a first in the region and is one that the local community can be proud of. The implementation of this project will help unlock future potential installations of the waste gas to energy systems going forward.

In conclusion, the sustainability of the project leads to various benefits (as reported by local stakeholders):
• Creating significant local employment opportunities, particularly during the construction phase, but also during the ten year operating period;
• Generating waste gas based electricity and consequently having a positive impact on the use of nonrenewable resources by replacing fossil fuel based generation capacity;
• Lowering national green house gas emissions by displacing fossil-fuel based electricity generation from the national grid;
• Creating an Independent Power Producer and therefore providing diversity in the electricity supply in accordance with the White Paper on the Energy Policy of South Africa (1998)1; and
• Transferring cutting edge modern technology to South Africa.

The following concerns from participants relating to the project were recorded and will be taken into account in the mitigation procedures of the project going forward:

• A participant from a local ecoforum asked for more detailed information about the technical operation of the plant in order to give a more informed response;
• Local farmers were concerned about the noise levels which will be emitted as a result of the Jenbacher engines;
• Participants were also apprehensive about the gas emissions from the Jenbacher engines themselves.
Each of the comments above have been taken into account in the final section of this report: "Changes to project design based on comments received"

Please refer to the ISC Report of the Project which has been uploaded onto the Gold Standard Database.

Main Stakeholder Consultation

The Gold Standard Main Stakeholder Consultation is based on a set of additional criteria in addition to UNFCCC requirements. Full documentation of the project activity will be made publicly available for two months prior to conclusion of validation at https://www.southpolecarbon.com/dev-gold.htm, including:

- The original and complete PDD
- A non-technical summary of the project design document (in appropriate local language)
- Relevant supporting information

During the consultation period, stakeholders are invited to submit their comments and questions related to the project activity. For this purpose an online comment form is available at https://gs1.apx.com/myModule/rpt/myrpt.asp

The report on the Main Stakeholder Consultation process will be made publicly available and sent to the DOE for validation

Gold Standard Monitoring Criteria

GS Manual for CDM Project Developers: Section 3.5.1

Changes to Project design based on comments received *(from ISC report)*

Only 1 environmental concern were established from the Initial Stakeholder Consultation: the levels of noise emitted once the Jenbacher Engines are installed and running.

No		1
Indicator		Decibel recordings
Mitigation measure		Decibel recordings will be applied to the project design. These recordings will be measured at the nearest boundary of the IFM facility and recordings will be measured before and after the project activity to ensure the noise levels are not increased by the project activity. In order to ensure that no increase in noise occurs the housing for the engines has been designed to comply fully with the Occupational, Heath and Safety Act of South Africa, which requires less than 65 decibels at 1meter from the co-generation plant.
Repeat for each parameter		
Chosen parameter		Decibel recordings
Current situation of parameter		n/a
Future target for parameter		Noise levels are not increased by the project activity.
Way of monitoring	How	Decibel recordings
	When	measured before and after the project activity construction
	By who	Project owner
Comment		This was a concern by the stakeholders during the SC and shall herewith be monitored in future.

Going forward, we see it as an option to include a full technical description of the project in the ISC Invitation in order for participants to give a more informative response regarding the sustainable development matrix and questionnaire.

It is evident from the stakeholder consultation process, that the project is perceived as a positive example for the ferro-chrome industry in South Africa and that it contributes to sustainable development in the region.

Attachment 1 - **B. Sustainable Development Assessment Questionnaire**

The Gold Standard questionnaires (Appendix E to the Gold Standard Manual for CDM Project Developers) were presented in the local language (English). It consisted of 23 questions and a matrix that were to be answered.

8 persons did not express any comments or reactions. One person refused to answer the questionnaire as he requested more information surrounding the project.

The following 10 questions out of the proposed 23 questions in the Sustainable Development Assessment Questionnaire were answered with "yes" by some of the participants:

<u>Environmental Impacts</u>

1. Question 1. Will construction, operation or decommissioning of the Project use or affect natural resources or ecosystems, such as land, water, forests, habitats, materials or, especially any resources which are non-renewable or in short supply?

2 "Yes" Answers Received. Concerns was expressed that the project activity will require extra land

Answer by project owner: The project activity will not exploit or consume non-renewables or disturb any ecosystem or biodiversity. The project itself will be implemented on the existing IFM industrial site and will therefore not require any additional land

2. Question 2. Will the Project involve use, storage, transport, handling, production or release of substances or materials (including solid waste) which could be harmful to the environment?

1 "yes" answer was received, with no specific comments attached.

Answer by project owner: Building rubble is normal for this kind of project especially during construction and operation of the project, but will be disposed of at an approved landfill or used as a filler in existing IFM opencast mines.

3. Question 4. Will the Project cause noise and vibration or release of light, heat energy or electromagnetic radiation?

6 "Yes" Answers Received. But it was recognized that it unlikely that the additional noise will have a significant affect for people outside the IFM complex. The additional noise produced cannot be heard if one is outside the IFM property.

Answer by project owner: The heat energy will be used in the gas cooling systems, creating noise. But noise caused by the project will be minimized as the project will be placed in a sound proof facility. The Jenbacher engines used have also been partly chosen because of how quiet they are during operation.

4. Question 5. Will the Project lead to risks of contamination of land or water from releases of pollutants onto the ground or into surface waters, groundwater, coastal wasters or the sea?

1 "yes" answer was received, with no specific comments attached.

Answer by project owner: There will be no effluent or seepage that can cause degradation of the environment or contamination thereof. There too are no active ecosystems or biodiversity constraints.

5. Question 6. Are there any areas on or around the location which are protected under international or national or local legislation for their ecological value, which could be affected by the project?

1 "yes" answer was received, and stated that a National Heritage site was situated +- 1 km from the site

Answer by project owner: The project activity will take place between existing operational units on a mining site and as such will not impact any protected sites.

Socioeconomic and health impacts

6. Question 13. Will the Project cause noise and vibration or release of light, heat energy or electromagnetic radiation that could adversely affect human health?

2 "Yes" answers received regarding the noise emitted from the engines, but it was acknowledged that this would be only for people working in close proximity to the project location

Answer by project owner: Noise caused by the project will be mitigated by the design of the technology employed to adhere to National standards. Decibel readings will be added to the project design and will be measured before and after the commencement of the project.

7. Question 15. Will there be any risk of accidents during construction or operation of the project which could affect human health?

8 "Yes" answers received, as this type of risk is associated with any type of construction. It was further acknowledged that this would be unlikely to cause a significant impact as the required monitoring and safety procedures will be put in place and IFM's SHEQ (Safety, Health, Environment and Quality) requirements applied.

Answer by project owner: The construction and operation of any industrial facility presents safety risks, but risk and hazardous assessments will be taken before project activity takes place and stringent health and safety standards will be implemented and monitored.

8. Question 16. Will the Project result in social changes, for example, in demography, traditional lifestyles, employment?

3 "Yes" answers received. As a result of the project employing over 350 temporary workers and 10 permanent employees the project will create employment and lead to more efficient use of electricity. One of the participants noted his concern regarding the housing of these new employees.

Answer by project owner: The project will present employment opportunities during construction and operational phases and the project will result in poverty alleviation and improvement in the quality of the lifestyle of citizens in the local community. Housing will not be a problem as predominantly local people will be employed.

9. Question 17. Are there any areas on or around the location, protected or not under international or national or local legislation, which are important for their landscape, historic, cultural or other value, which could be affected by the project?

1 "Yes' answer received. Concern was expressed about the small portion of land that will be used to construct the projects.

Answer by project owner: The project is located on an existing industrial site owned by IFM and will therefore not impact any areas which are important for their landscape, historic, cultural or other value.

10. Question 19. Is the project in a location where it is likely to be highly visible to many people?

1 "Yes" answer received, but respondents acknowledged that the visibility of the project is of no significant concern.

Answer by project owner: The project is within the boundaries of IFM industrial complex and is of a relatively small scale.