Clean Development Mechanism South Africa
Designated National Authority

energy
Department:
Energy
REPUBLIC OF SOUTH AFRICA

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Project Design Document (PDD)

Project reference number (office use only)	
Date received (office use only)	
NOTES ON COMPLETING THIS PROJECT DESIGN DOCUMENT 1. Please provide this PDD in both hard-copy	

Part A: Project Proponent Details

Project Name	Samancor Chrome Middelburg Electricity from Waste Gas
Date of Submission of PDD	13 June 2012

Project Developer	
Name	Exxaro On-Site (Pty) Ltd (Joint Venture between Exxaro Resources Ltd and Prana Energy (Pty) Ltd
Organizational Category	Private Company
Legal Status	Privately held company
Street Address	Prana Energy 1st floor, Coral House 20 Peter Place South Africa
Postal Address (if different from above)	PO Box 130950 Bryanston 2021 South Africa
Website Address	www.pranaenergy.co.za or www.exxaro.com
Main Activities	Clean energy project development
Summary of Financial Performance in last fiscal year	Exxaro Resources is the majority partner in the Exxaro on Site JV. Exxaro's financial reports are available on www.exxaro.com

Contact Person(s)	Johan Posthumus Brian van Oerle
Telephone	011 463 9718
Fax	086 524 1467
Email Address	johan@pranaenergy.com brian@pranaenergy.com

Project Partners Provide the following Information for **all** project partners (copy and paste relevant sections of the table if information is to be provided on more than one partner organisation)	
Name	Samancor Chrome
Nature of partner	Samancor owns and operates the furnaces where the gas that will be used for power generation is emitted
Organizational Category	Private company
Legal Status (if private company)	Private company
Street Address	Block B, Cullinan Close, Cullinan Place, Morningside, Sandton
Postal Address (if different to Street Address)	Postnet Suite 803, Private Bag X9, Benmore, 2010
Website Address	www.samancorcr.com
Main Activities	Chrome mining and smelting. Samancor Chrome is the second largest charge chrome producer in the world, producing, subject to market conditions, in excess of 1 Mt of charge chrome, approximately 70 Kt of medium carbon FeCr, and some 40 Kt of low carbon FeCr per annum. In addition, Samancor Chrome sells more than 700 Kt of chrome ore per annum, approximately 500 Kt of which is sold on the export market.
Contact Person(s)	Leon Cilliers
Telephone	013 249 4626
Fax	013 246 2283
Email Address	leon.cilliers@samancorcr.com

Project Partners	
Name	CDM Africa Climate Solutions (Pty) Ltd
Nature of partner	CDM Africa is Exxaro On-Site's project partner for the MFC energy recovery project from commencement of the CDM process to the first successful registration of the project with the CDM Executive Board.
Organizational Category	Private Company
Legal Status (if private company)	Limited company
Street Address	83 MacKay, Blairgowrie Johannesburg South Africa
Postal Address (if different to Street Address)	83 MacKay, Blairgowrie Johannesburg South Africa
Website Address	http://www.cdmafrica.com/
Main Activities	CDM Africa's understanding of the carbon market structure and design, regulatory incentives and the economic instruments relevant to the

	policies in question can form a key component of industry strategies for developing the potential of additional income for small and large capital projects. We assist project developers analyze the marginal costs or benefits of emissions reductions, determine optimal allocation mechanisms, examine program design issues, assess market position as a buyer or seller and design trading strategies.
Contact Person(s)	Name: Ciska Terblanche
Telephone	Cell: +27 (0)82 898 5750
Fax	0866908482
Email Address	Ciska@cdmafrica.com

Contractual Arrangements	
Contractual arrangements between various entities involved	Samancor and Exxaro On-Site have entered into a memorandum of understanding that allows Exxaro On-Site to develop the project. . CDM Africa and Exxaro On-Site have entered into a contract that allows CDM Africa to develop the CDM component of the project.

Part B: Project Overview (Technical Summary, Location and Schedule)

Technical Summary of the project	
Objective of the Project	Purpose of the project activity The objective of the project is to utilize furnace off-gas from the closed ferrochrome furnaces to generate electricity. The electricity will be for captive use by Samancor Chrome and will reduce the demand for Eskom generated electricity.

Project Description

At Middelburg Ferrochrome a 34 MW energy recovery plant is proposed.

The project involves the installation of gas conditioning equipment and gas engines to combust the carbon monoxide rich gas from the furnaces and produce electricity.

The electricity will be used by Samancor Chrome Middelburg to replace electricity purchased from the Eskom grid.

Waste gas from M3 and M4 furnaces, will be transferred into the proposed energy recovery plant in order to generate electricity. The proposed energy recovery plant will combust the gas in engines. Equipment required in the energy recovery plant will include: internal combustion engines with closed circuit radiators and exhaust silencers, CO fans, a flare, flame arrestors, gas filters, gas coolers, instrumentation and control equipment, piping to route the off-gas to the engines, a control room, ablution facilities and offices.

Energy generated in the energy recovery plant will supplement existing power consumption via the existing substation on the Samancor Chrome site.

The energy recovery plant requires a 16 month construction period.
The plant operates 24 hours a day, 7 days a week, 365 days a year.
Operational downtime is scheduled to facilitate repair and maintenance work on the furnaces.

Project Constraints

Are there any constraints affecting project operations or commissioning? *(Brief description: 1 paragraph or less)*
Note: these may be due to energy supply, infrastructure, other resources etc.
The project operates under a number of constraints:

Technical Summary of the project	
i.) **Prevailing practice**: It is standard practice to flare the furnace offgas from ferrochrome furnaces. Electricity generation has been implemented on only one furnace similar to those used in the ferrochrome industry (ferromanganese). This project operated at a loss for the first couple of years, and proved to suffer from significant operating problems. The problems experienced in this project are common knowledge in the ferrochrome industry, and has led to a significant resistance to power generation projects in the industry. **ii.)** **Marginal return:** The financial return of the project is marginal without the income arising from CDM. iii.) **Industry volatility:** The ferrochrome industry is very volatile, and there have been long periods in recent history when large numbers of ferrochrome furnaces in South Africa were shut down due to depressed market demand. Should this happen with a furnace that supplies off-gas to a generation plant, the very expensive capital from that plant will stand idle for as long as the furnace is not in operation. iv.) **Health, safety and operations**: Carbon monoxide is a poisonous and explosive gas – hence the current practice of flaring the gas. The project design and subsequent operation therefore have to ensure that the health and safety of the people involved with the project is not compromised in any way whatsoever. v.) **Technology**: The selection of power generation technology is constrained by the low calorific value of the gas.	
Technology to be employed	Reciprocating gas engines will be used for power generation from low calorific value gas. The low calorific value gas is the off-gas from the closed furnaces. Electricity will be utilized on site by Samancor Chrome to replace electricity normally purchased from Eskom.
Greenhouse Gases Targeted	*Identify which greenhouse gas(es) this project will target.* *CO_2*
Emission reductions	Average over one year: 210,138.7 tonnes CO_2e Total over 10 years: 2,101,387 tonnes CO_2e
Baseline & Additionality Assessment	**Methodology Applied:** 1. Approved consolidated baseline and monitoring methodology ACM0012 "Consolidated baseline methodology for GHG emission reductions from waste energy recovery projects", Version 4.0.0. **This methodology also refers to the latest approved versions of the following tools**: 2. "Tool to calculate the emission factor for an electricity system", Version 02.2.1; 3. "Tool for the demonstration and assessment of additionality", Version 06; 4. "Tool to determine the remaining lifetime of equipment", Version 01; Baseline: The development of the project is based on ACM0012. The baseline emission (BE) is calculated from the electricity generated by the

Technical Summary of the project	
	project. **Additionality** Additionality: The financial assessment will be conducted according to the procedures described in ACM0012.
Monitoring	Monitoring Equipment Electricity meters will measure the quantity of net electricity generated by the project activity and supplied to MFC. These meters are 4-quadrant billable class meters that are bi-directional – this means that they subtract any electricity used by the plant during start up, or when the plant is not producing electricity. (i) Data to be monitored during the crediting period The following data will be monitored by Exxaro On-Site: • Quantity of electricity supplied to MFC (MWh); • Electricity consumption (import) of additional plant equipment used in the project activity during start-up (MWh). • Quantity of actual energy output generated during year y (GJ or TJ); • F_{cap} will be determined for verification purposes; Abnormal conditions are monitored For more detail please refer to Section 7 of the PDD.
Type of project/activities	*Identify which type of activity is involved in this project – and for each, provide brief details*
a. Energy Supply	The generation of electricity from waste gas
b. Energy Demand	*NA*
c. Industrial Process	*NA*
d. Transport	*NA*
e. Waste Management	*NA*
f. Forestry/ land use	*NA*
g. Other	*NA*
Project Boundary The project boundary is the physical boundary of the site and the power stations making up the South African grid.	
Indicate Emissions outside the Project Boundary	There are no net emissions attributable to the proposed project activity outside the project boundary.

Location of the Project	
Province	Mpumalanga province
Municipality	Nkangala District Municipality in Middelburg
Nearest city/large town	

	Middelburg
Brief description of the location of the project site	The Middelburg Ferrochrome operation lies approximately 4.5 km southeast of the centre of Middelburg on the eastern bank of the Vaalbankspruit, and covers approximately 362 ha. The plant boundary traverses the farm Townlands Farm No 287, Portion 155. The nearest residential area is Nazareth which falls on the eastern boundary of the site and within 1 km of the closest Middelburg Ferrochrome installations. The suburbs of Middelburg are 2 km north and 2.5 km west of the site. The N4 national road runs approximately 2 km south of the area. This area falls under the jurisdiction of the Steve Tshwete Local Municipality.

Project Schedule/Timetable	
Earliest Project Start Date	October 2012 – note that here the strict definition of start date of the CDM is applied
When is the expected first year of CER delivery	One year after commissioning of the project (2014)
Project Lifetime	18+ years
Project End Date	
Crediting Period	10 years
Current Status or phase of the project	Feasibility Study
DNA Approval	A PIN was submitted for the project activity and a Letter of No objection was received on 1 March 2012.
Approval by other bodies	An Environmental Impact Assessment (EIA) will be required which will be approved by the Department of Environmental Affairs. Status of the EIA as of 4 May 2012: The EIA is in the finalisation of scoping report following public comment phase. **NEAS Reference:** DEAT/EIA/0000548/2011 **DEA Reference:** 12/12/20/2455 **Enquiries:** Nyiko Ngoveni

Part C: Performance Against the DNA's Sustainable Development Criteria

South Africa has identified the following sustainable development criteria and indicators against which each CDM project will be assessed. Please provide your interpretation of how this project will address each of these **criteria and indicators** where they are relevant to the project. If the space provided is not sufficient please append additional information as required.

NOTE: For all indicators which are of relevance to the project show how the performance of the project against these indicators can be objectively monitored and measured on an ongoing basis.

1. Economic: Does the project contribute to national economic development?

The project will contribute to the much needed expansion in electricity generation capacity. This will have a positive impact on the short term availability of electricity on the national grid.

The generation of electricity from renewable energy resources offers a number of socio-economic benefits to South Africa as identified in the Environmental Impact Assessment conducted:

- Increased energy security
- Resource saving (coal)
- Exploitation of a renewable energy resource
- Climate friendly development
- Employment creation
- Support to new industry sector

2. Social: Does the project contribute to social development in South Africa?

Yes, the project contributes to the social development of South Africa in a number of ways:

- The project is strongly aligned with Government's developmental agenda with respect to renewable energy targets. This project will generate electricity from energy which has previously simply been vented into the air as waste.
- Job creation: Approximately 90 jobs will be created during construction; and 15 jobs during operation.
- The ferrochrome industry is very cyclical in nature. Over the past decade Samancor has been forced to shut down sections of its operation due to low ferrochrome prices on a number of occasions. In such times the job security of the workers on the plant is very low. The implementation of this project will make a positive contribution towards the profitably of the company, and therefore have a positive impact on the job security of the workers.

3. Environmental: Does the project conform to the National Environmental Management Act principles of sustainable development?

Please provide brief comment for each of these below.

i) That the **disturbance of ecosystems and loss of biological diversity** are avoided, or where they cannot be avoided, are minimised and remedied	Yes, the disturbance of ecosystems and loss of biodiversity are avoided. The project will be implemented on a heavy industrial site. The project will have no additional impacts over and above the impacts already on site.
ii) That **pollution and degradation of the environment** are avoided, or where they cannot be altogether avoided, are minimised and remedied	Yes, pollution and degradation of the environment are avoided. The current flares will be replaced by a series of technologically advanced gas engines operating to European emission standards.
iii) That the **disturbance of landscapes and sites that constitute the nation's cultural heritage** is avoided, or where it cannot be altogether avoided, is minimised and remedied	Yes, the disturbance of landscapes and sites that constitute the nations cultural heritage is avoided as the project will be implemented on an existing heavy industrial site.
iv) That **waste is avoided**, or where it cannot be altogether avoided, minimised and reused or recycled where possible and otherwise disposed of in a responsible manner	Yes, waste is avoided. The main aim of the project is to utilise waste energy in the production of electricity
v) That **the use and exploitation of non-**	The project impacts positively on the exploitation of non-renewable

renewable resources is responsible and equitable, and takes into account the consequences of the depletion of the resource	resources by Eskom in the generation of electricity in the sense that for each 1MW of electricity generated, it enables Eskom to burn approximately 4,400 tons of coal per year less in future. As such, the exploitation of non-renewable resources is responsible and equitable.
vi) That the **development, use and exploitation of renewable resources is responsible and equitable**, and takes into account the consequences of the depletion of the resource.	Yes, the development, use and exploitation of renewable resources is responsible and equitable as the main purpose of the project is to utilise waste energy in a positive and productive manner.
vii) That **a risk averse and cautious approach** is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions	Yes, a risk averse and cautious approach is applied. Worker health and safety is one of the cornerstones of the design of the project.
viii) That **negative impacts on the environment and on people's environmental rights** be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied	An environmental impact assessment will be done aimed at identifying and mitigating negative environmental impacts associated with the project. In addition the CDM and EIA processes require a public stakeholder process, which will be performed as part of the EIA process. Surrounding communities and stakeholders will be actively encouraged to participate and contribute to the EIA and CDM.
Other comments **Please provide any other comments on how this project contributes to sustainable development in South Africa (**optional)	

Indicators in Support of the Project Approval Criteria			
Category		**Indicator**	**Comment**
Environmental	Impact on local environmental quality	• Impact of the project on air quality • Impact of the project on water pollution • Impact of the project on the generation or disposal of solid waste • Any other positive or negative environmental impacts of the project (such as impacts on noise, safety, visual impacts, or traffic)	Due to the nature of the project - re-routing the gas (that is currently flared) through an engine - there are no significant changes to the impact on air or water quality. There will be a closed circuit cooling water system to cool the engines. A very small amount of effluent will be generated by the gas conditioning equipment. The impact on the effluent treatment plants will be minimal. Air quality will be improved since the gas will be further cleaned in the gas conditioning equipment. The current flare has a visual and sound impact, which will be reduced when the project is implemented and the engines will use the gas. The technical specifications of the noise levels of the engines themselves are low, as they will be housed in an engine room in accordance with local noise regulations and will not make a difference on the industrial site. The project has a positive indirect impact on solid waste disposal due to reduced coal mining and reduced ash disposal associated with the Eskom power stations.
	Change in usage of natural resources	• Impact of the project on community access to natural resources • Impact of the project on the sustainability of use of water, minerals or other non renewable natural resources • Impact of the project on the efficiency of resource utilisation	The project will have **NO IMPACT** on community access to natural resources. The project will have a **POSITIVE** impact on the sustainability of mineral resources as the consumption of coal by Eskom will be reduced. The project will have a **POSITIVE** impact on the efficiency of resource utilisation as it is designed to capture and utilise waste energy that would normally have been released into the atmosphere.
	Impacts on biodiversity and ecosystems	• Changes in local or regional biodiversity arising from the project	The project will have **NO IMPACT** on local or regional biodiversity.

Indicators in Support of the Project Approval Criteria			
Category		**Indicator**	**Comment**
Economic	Economic impacts	• Impact of the project on foreign exchange requirements • Impact of the project on existing economic activity in the area • Impact of the project on the cost of energy • Impact of the project on foreign direct investment	The project will raise funding for the capital on the open market. The carbon credits will generate foreign direct investment. The engines will be bought from outside SA, this has a forex impact. Some maintenance costs will also be in foreign currency. This project will support economic development through the alleviation of the national grid as the current generation shortages negatively affect the local economy.
	Appropriate technology transfer	• Positive or negative implications for the transfer of technology to South Africa arising from the project • Impacts of the project on local skills development • Demonstration and replication potential of the project	This project will require technology import. The project will have a positive impact on the development of local skills as new power plant operators gain training and experience. In addition to this, specialist maintenance personnel will be trained to maintain the engines and they will be able to offer their skills to other plants with similar engines. The implementation of the project will therefore serve as an example for other projects which could trigger replication.

Indicators in Support of the Project Approval Criteria		
Category	**Indicator**	**Comment**

Indicators in Support of the Project Approval Criteria			
Category		**Indicator**	**Comment**
Social	Alignment with national provincial and local development priorities	• How the project is aligned with provincial and national government objectives • How the project is aligned with local developmental objectives • Impact of the project on the provision of, or access to, basic services to the area • Impact of the project on the relocation of communities if applicable • Contribution of the project to a any specific sectoral objectives (for example, renewable energy targets)	Firstly, South African Government has recognised the country's high level of renewable energy potential and presently has in place targets of 10 000 GWh of renewable energy by 2013 (to be produced mainly from biomass, wind, solar and small-scale hydro). This project supports this initiative. The electricity supply to the grid will increase and therefore will contribute to the provision of basic electricity supply services to the country as a whole. The project will contribute towards the provincial economy; create sustainable employment opportunities; enhance profitability; ensure sustainable development and poverty eradication - in line with both ASGI-SA and the Provincial Growth and Development Strategy (PGDS). · There will be no impact in terms of relocation of communities. · The project will positively impact on the provision of alternative energy to the country's national grid and will support the National Energy Regulator of South Africa's (NERSA's) objectives for the supply of electricity from renewable sources.

Indicators in Support of the Project Approval Criteria			
Category		**Indicator**	**Comment**
	Social equity and poverty alleviation	• Impact of the project on employment levels? (specify the number of jobs created/lost; the duration of time employed, distribution of employment opportunities, types of employment, categories of employment changes in terms of skill levels and gender and racial equity) • Impact of the project on community social structures • Impact of the project on social heritage • Impact of the project on the provision of social amenities to the community in which the project is situated • Contribution of the project to the development of previously underdeveloped areas or specially designated development nodes	Job creation: Approximately 90 jobs will be created during construction; and 15 jobs during operation.The detailed feasibility studies will provide clarity around the skills levels required. There will be no adverse impacts on community social structures, social heritage or the provision of social amenities. The project will have a positive impact on development of underdeveloped areas due to reducing the load shedding frequencies negatively impacting communities.

Indicators in Support of the Project Approval Criteria			
Category		**Indicator**	**Comment**
General	General Project Acceptability	• Are the distribution of project benefits deemed to be reasonable and fair?	Yes. The benefit of reliable power will be appreciated by the communities and local business in the area. The additional generation capacity will alleviate the electricity shortages being experienced by the South African grid. In addition, newly appointed plant operators will benefit from fair wages, training and experience. The entity operating the plants, which is Exxaro On-Site, will comply with the labour law; ensuring fair wages will be paid.

Part D: Finance
Figure 1

Project Costs	
Capital Expenditure Costs (R's) Total Capital Expenditure (CAPEX) plus Mobilisation Cost	R 575m
Other Costs (R's) Annual Operation and Maintenance Cost estimate*	R50m / year
Total Project Costs (R's)	R575 million Capital and ongoing R50 million yearly for maintenance etc.
Sources of Finance	
Equity	Exxaro on Site
Senior Debt (long term)	Commercial Banks and Development Institutions
Subordinated Debt (long term)	Not envisaged at this stage
Total CDM Contribution sought	Not quantified yet, but the total amount of emission reductions x price.
Expected Price of CER in case of a contract to purchase for: A period of 7 years A period of 10 years A period of 14 years (2x7 years)	No contract exist at the moment. A 10 year crediting period is selected in the PDD and various models have been constructed. €7 - €20 (floor price of €7) €7 - €20 (floor price of €7) €7 - €20 (floor price of €7)
Indicate the **projected Internal Rate of Return** for the project with and without CER revenues.	*Note: Please indicate assumed price of CER as used in your calculation* 6.42% without CERs 12.5% with CERs at €12 Note that this is equity IRR as project IRR is not calculated.
Constraints on tradability of carbon credits	Have any commercial arrangements been made that may impact the tradability of the carbon emission reductions? If yes, please define. Note. Examples would be subjection to a mortgage, government tax etc. NA
Preliminary discussions with potential purchasers	Have you had any preliminary discussions with any potential purchasers of the carbon credits (CERs) No specific discussions have been held.