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	
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	ACP Thermal Harvesting™ Project
Date of Submission of PDD	07/12/2016

Project Developer	
Name	Vuselela Energy (Pty) Ltd (hereinafter referred to as Vuselela)
Organizational Category	Private company
Legal Status	Limited company
Street Address	Moorings 3, Portswood Ridge Portswood Road V&A Waterfront 8005
Postal Address (if different from above)	PO Box 50095 Waterfront

	8002
Website Address	www.vuselela-energy.com
Main Activities	Vuselela was conceived in 2009 to originate and develop clean energy projects based on capturing and utilization of waste heat sources and gearing these projects through incentives available under a number of "clean energy" initiatives
Summary of Financial Performance in last fiscal year	2015: Turnover R2,768,176.00 Profit after Tax R306,057.00
Contact Person(s)	Jacques Malan (Director, South Africa)
Telephone	Work: +27 (12) 345 3147 Cell: +27 (82) 568 6295
Fax	+27 (86) 527 0066
Email Address	JMalan@Vuselela-Energy.com
Project Partners 1 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	Eternity Power RF (Pty) Ltd (hereinafter referred to as Eternity)
Nature of partner	SPV under which Vuselela developed the proposed project activity
Organizational Category	Private company
Legal Status (if private company)	Limited company
Street Address	Moorings 3, Portswood Ridge Portswood Road V&A Waterfront 8005
Postal Address (if different to Street Address)	PO Box 50095 Waterfront 8002
Website Address	www.vuselela-energy.com
Main Activities	SPV under which Vuselela developed the proposed project activity
Contact Person(s)	Jacques Malan (Director, South Africa)
Telephone	Work: +27 (12) 345 3147 Cell: +27 (82) 568 6295
Fax	+27 (86) 527 0066
Email Address	JMalan@Vuselela-Energy.com

Project Partners 3 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	Blue World Carbon Asset Management (Pty) Ltd (hereinafter referred to as BWC)
Nature of partner	Carbon consultant
Organizational Category	Private Company
Legal Status (if private company)	Limited company
Street Address	Suite 109, Sovereign Quay, Somerset Road, De Waterkant Cape Town, 8001 Republic of South Africa
Postal Address (if different to Street Address)	
Website Address	www.blueworldcarbon.com
Main Activities	BWC is the leading international company that specializes in developing solutions and rendering professional services in the sphere of climate change, greenhouse gas management and energy consulting.
Contact Person(s)	Joost van Lier Managing Director, South Africa
Telephone	Work: +27 (0)82 607 1440 Cell: +27 (0)71 609 2276
Fax	+27 (0)86 609 2770
Email Address	joost.van.lier@blueworldcarbon.com
Contractual Arrangements	
Contractual arrangements between various entities involved	Vuselela is a project developer. Eternity is an SPV under which Vuselela developed the proposed project activity. BWC is the entity responsible for application of the selected methodology and the selected standardized baselines to the project activity.

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

Technical Summary of the project	
Objective of the Project	The aim of the project activity is to convert waste heat info electricity.
Project Description The ACP Thermal Harvesting™ Project envisages the construction and operation of a Waste Energy Recovery System (WERS) with the installed capacity of 5 MW that utilize waste heat of the hot water stream to the existing Anglo Converter Plant (ACP) High Pressure Cooling Water System for the generation of electricity. The WERS employs a purpose-designed integrated Organic Rankine Cycle (ORC) system supplied by Ormat. The generated electricity is delivered to the electricity distribution network of the Waterval Smelter Complex (WSC), where ACP and WERS are located. The WSC is connected to	

<table>
<tr><th colspan="2">Technical Summary of the project</th></tr>
<tr><td colspan="2">and is supplied from the Eskom electricity network (national grid of the RSA). The project implementation leads to the reduction of WSC electricity consumption from the grid.

The ACP is aimed at removal of excess iron sulphide from the matte product. The converting process is an exothermic process that produces a high temperature off-gas of approximately 1200°C. The ACP High Pressure Cooling System maintains the circulation of cooling water through membranes in order to remove the heat from the hot converter off gas.

The reduction of GHG emissions as a result of the implementation of project activity will be achieved due to reduction of CO_2 emissions from combustion of fossil fuel at the existing grid-connected power plants and plants which would likely be built in the absence of the CPAs.</td></tr>
<tr><td colspan="2">Project Constraints:

There are no constraints</td></tr>
<tr><td>Technology to be employed</td><td>The WERS employs a purpose-designed integrated Organic Rankine Cycle system supplied by Ormat.

The Organic Rankine Cycle is a thermodynamic process where heat is transferred to a fluid at a constant pressure. The fluid is vaporized and then expanded in a vapour turbine that drives a generator, producing electricity. The spent vapour is condensed to liquid and recycled back through the cycle.

The Organic Rankine Cycle makes use of an organic fluid with a boiling point lower than water. The fluid enables recovery of heat from lower temperature sources such as industrial waste heat. The low temperature heat is used to drive a turbine and create electricity.

Ormat technology involves original designs of turbines, pumps and heat exchangers.

The generated electricity is delivered to the electricity distribution network of the Waterval Smelter Complex.

The proposed technology is well-proven and widely used internationally. Nevertheless the proposed project is the first-of-its kind project in South Africa.

Vuselela does now has experience with operating the proposed technology. Ormat also has expertise in this field.</td></tr>
<tr><td>Greenhouse Gases Targeted</td><td>The implementation of the programme leads to reduction of greenhouse gas (GHG) emissions from combustion of fossil fuel for electricity generation at grid connected power plants. The principal GHG released during combustion of fossil fuel is CO_2. Emissions of CH_4 and N_2O from combustion of fossil fuel are negligibly small as compared with CO_2 emissions and excluded for simplification.</td></tr>
<tr><td>Emission reductions</td><td>The starting date of the crediting period specified in the first version of the PDD submitted for validation is 01/09/2014. The total emission reductions at the end of the fixed 10-year crediting period are expected to be 206,080 tCO_2.

<table><tr><th>Year</th><th>ER, tCO_2 /yr</th></tr><tr><td>1</td><td>20,608</td></tr></table></td></tr>
</table>

Technical Summary of the project	
	2 | 20,608 3 | 20,608 4 | 20,608 5 | 20,608 6 | 20,608 7 | 20,608 8 | 20,608 9 | 20,608 10 | 20,608
Baseline & Additionality Assessment	AMS-III.Q.: "Small-scale Methodology: Waste energy recovery" (Version 5) and ASB0001: "Standardized baseline: Grid emission factor for the Southern African power pool" (Version 01.0) are applicable to the proposed project activity. AMS-III.Q is applicable to project activities implemented in an existing or greenfield waste energy generation facility converting waste energy carried in the identified waste energy carrying medium streams into useful energy that is consumed in an existing and/or greenfield recipient facility. ASB0001 is applicable to the CDM projects in the SAPP member countries. The additionality of the project activity is demonstrated and assessed using the Guidelines on the demonstration of additionality of small-scale project activities and Guidelines on additionality of first-of-its-kind project activities. The proposed project activity is the first-of-its-kind in South Africa.
Monitoring	This project will be monitored according to the monitoring rules provided in AMS-III.Q. The parameters to be monitored are: • The quantity of electricity supplied by the project to the grid of the WSC; and • Abnormal operation of the project facility including emergencies and shut down.
Type of project/activities	Energy Supply
a. Energy Supply	The project uses waste energy to generate power. The produced electricity will be supplied to the grid of the WSC.
b. Energy Demand	Not Applicable
c. Industrial Process	Not Applicable
d. Transport	Not Applicable
e. Waste Management	Not Applicable
f. Forestry/ land use	Not Applicable

Technical Summary of the project	
g. Other	Not Applicable
Project Boundary The geographical extent of the project boundary includes: • Anglo Converter Plant; • Hot water streams; • ACP High Pressure Cooling Water System; • Electricity consumers of the WSC; • Electricity distribution network of Waterval Smelter Complex; • Waste Energy Recovery System proposed by the project activity; and • All power plants physically connected to the electricity system of the SAPP.	
Indicate Emissions outside the Project Boundary	Not Applicable

Location of the Project	
Province	North West Province
Municipality	Rustenburg Local Municipality
Nearest city/large town	The city of Rustenburg
Brief description of the location of the project site	The project activity is located within the Waterval Smelter Complex situated south-west of Rustenburg. Geographical latitude: - 25.6753 (Decimal Degrees). Geographical longitude: 27.3291 (Decimal Degrees). Time zone: GMT +02:00.

Project Schedule/Timetable	
Earliest Project Start Date	22/11/2012 (the date of signing the supply contract)
When is the expected first year of CER delivery	2017
Project Lifetime	20 years (manufacturer information on the technical lifetime of equipment)
Project End Date	01/08/2035
Crediting Period	10 year fixed crediting period with no option of renewal has been chosen.
Current Status or phase of the project	The project was commissioned 10th June 2015
DNA Approval	The project has not been previously submitted to the DNA for approval.
Approval by other bodies	The project has not been submitted to any other national, provincial or local government departments or agencies for

Project Schedule/Timetable	
	regulatory or legal approval.

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?

Yes, the project activity has a robust economic dimension addressing the following in terms of national economic development:

•The project generated employment both during construction (22 civil resources, 50 mechanical resources and 26 electrical resources at peak loading) and operation (1 Operator Assistant and 4 Engineers in Training). The majority of these positions were filled from the local community of the Rustenburg district.

•All of the shares in the project are directly owned by South African entities and therefore will provide financial returns to these parties.

•There are no existing projects using the envisaged technology in South Africa and the project will provide an opportunity for technological interaction and knowledge transfer to local citizens.

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

Yes, the project contributes significantly to the social upliftment and development of the people of South Africa and particularly in the project area, through the following:

•Through the creation of jobs both temporary and permanent, most of which are from the local communities, the project activity contributes to alleviation of poverty in the project area.

•Because there are no similar technology installations in the area, the local people require education and training in the construction and maintenance of the plant. This enhances information sharing and skills transfer from foreign parties to the local community.

•The creation of jobs, together with the wider impact of poverty alleviation, creates a distribution of wealth within the local communities, with a direct and measurable improvement of health and quality of life for citizens of the local community.

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

The project activity took place on an existing industrial site, on unused open land within the greater plant operation covered by the original EIA. Therefore:

i) That the **disturbance of ecosystems and loss of biological diversity** are avoided, or where they cannot be avoided, are minimised and remedied	There is 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.
ii) That **pollution and degradation of the environment** are avoided, or where they cannot be altogether avoided, are minimised and remedied	By replacing fossil fuel based electricity from the national grid, the project activity has a positive impact on pollution by lowering national CO_2 emission levels. Therefore, there is no pollution or degradation of the environment through the project activity.
iii) That the **disturbance of landscapes and sites that constitute the nation's cultural heritage** is avoided, or where it	There is 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 Waterval Smelter Complex.

cannot be altogether avoided, is minimised and remedied	
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	The project activity does not generate any operating waste. A small quantity of inert building rubble was generated during construction, which is normal for this type of project. The building rubble was removed and used as filling materials or disposed in an approved landfill.
v) That **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 does not consume or exploit non-renewable resources. By generating electricity from a wasted thermal source, the project has a positive impact on the use of non-renewable resources by replacing fossil fuel based generation capacity.
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.	The electricity generated by the project is based on a waste thermal source from the converters at Waterval. Therefore the project activity by definition does not consume or exploit renewable resources but rather a waste source.
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	Prior to construction the project activity was scrutinized and monitored by the EIA consultants used by Rustenburg Platinum Mines 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.
vii) 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	By effectively replacing fossil fuel based electricity from the national grid, the project activity has a positive impact on the environment by lowering national CO_2 emission levels. Therefore, there is no negative impacts on the environment and on people's environmental rights through the project activity.
Other comments The RSA is anticipating another shortage of electricity supply due to the higher than anticipated economic growth combined with a number of technical factors such as overloaded electricity lines. The country is blessed with an abundance of fossil fuels, but the use of these resources in power production is becoming increasingly difficult as international pressure mounts against countries that do not comply with strict sustainable environmental policies. The proposed project does not only meet environmental requirements, but also provide a much needed additional source of electricity.	

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)	•On a national scale the project has a positive impact on air quality, as CO_2 emissions will be mitigated. •The project uses closed water-cooling circuits with low consumption and no effluent. Therefore, there is no negative impact on water pollution. •There is no solid waste generated by the project operation, save for minimal building rubble during construction. This was used on-site as filler material or disposed of in an approved dump site. •Since the site is part of an existing industrial site, no visual or traffic impacts are applicable. Noise pollution is mitigated by the design of the technology employed to adhere to national standards. •Safety was addressed both during construction and operation in line with the existing Anglo Platinum safety standards.
	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 makes use of a waste source (Thermal Energy from Hot Water) as fuel. Therefore, there is no effect on community access to natural resources. In addition, and for the same reason, the project has no impacts on any non-renewable resources at local level. •On a national level, the project has a positive impact on non-renewable resources by replacing fossil-fuel based power from the national grid. This lowers both coal and water consumption at source and improves the efficiency of resource utilization.
	Impacts on biodiversity and ecosystems	• Changes in local or regional biodiversity arising from the project	•Zero impact on ecosystems or biodiversity at site is envisaged since the selected location is part of an industrial site and there are no existing active ecosystems.

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 impacted on foreign exchange requirements as the main technological equipment was sourced from overseas suppliers. •Due to the additional employment opportunities created from the implementation of the project, areas such as Waterval and Rustenburg benefited from the increased spending power of such employees. •No significant cost benefit exists in terms of energy cost since the additional power produced from the project is very small compared to that supplied to the national grid from Eskom. The added electrical energy cost is on par with Eskom's future expanded capacity cost. •Although developed by locally incorporated entities, the bulk of the funding was sought through offshore entities tapping international capital markets.
	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	•Significant benefits exist in transfer of technology to South Africa since this type of technology has not been applied anywhere in South Africa as yet. •The power plant uses only local manpower for operation. The technology supplier, as part of its supply, trained these local operators in the required skills for reliable independent operation. It is further envisaged that as the population of this type of technology in SA grows, local teams will be trained up to maintain the equipment. •Because of the significant number of Smelter plants operational in South Africa, in conjunction with the modularity of the technology, there is potential to replicate the same configuration at every one of these plants, even if capacity differs between plants. Vuselela has set itself the goal of using this approach to enable an industry transformation throughout the Smelting Industry.

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)	•The project meets the National, Local and Provincial Governmental objectives and initiatives. The project contributes towards the provincial economy; creates sustainable employment opportunities; enhances profitability; ensures sustainable development and poverty eradication. It is also in line with both ASGI-SA and the Provincial Growth and Development Strategy (PGDS). •The project is expected to enhance the sustainability of access to, and provision of, basic services already established by the existing Waterval smelter. •No impact is expected in terms of relocation of communities. •The project positively impacts on the provision of alternative energy to displace demand from the country's national grid.

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	•The project generated employment both during construction (22 civil resources, 50 mechanical resources and 26 electrical resources at peak loading) and operation (1 Operator Assistant and 4 Engineers in Training). These construction opportunities consisted predominantly of unskilled and semi-skilled labour. These operation opportunities consist of predominantly skilled labour and qualified operational staff. •Because of the relatively small scale of the project no impacts are expected on the community social structures or social heritage. •The project forms part of the larger industrial development area dominated by various units of Anglo Platinum's Operations. No additional social amenities are envisaged. •The project enhances the development of the Waterval and Rustenburg areas in conjunction with the existing Waterval plant.

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 distribution of project benefits is deemed to be reasonable and fair. Additional support and guidance for this distribution was sought from the DME as well as from the DOE tasked with validation of the PDD submission.

Part D: Finance

Project Costs	
Development Costs (R's)	ZAR 1 million
Installed Costs (R's)	ZAR 87 million
Other Costs (R's)	ZAR 2 million
Total Project Costs (R's)	ZAR 90 million
Sources of Finance	
Equity	Investec, ZAR 8 million; Vuselela Energy, ZAR 2 million
Debt (long term)	ZAR 80 million
Debt (short term)	Not applicable
Amount not identified (R's)	Not applicable
Total CDM Contribution sought	ZAR 1.6 million per annum (over 10 year crediting period)
Expected Price of CER in case of a contract to purchase for: A period of 10 years	R 80
Indicate the **projected Internal Rate of Return** for the project with and without CER revenues.	IRR without CERs: 11% IRR with CERs: 15% @ ZAR 80 per CER.
Constraints on tradability of carbon credits	No commercial arrangements are currently in place that may place constraints on the CER tradability.
Preliminary discussions with potential purchasers	Preliminary discussions with several traders and compliance buyers are in progress but due to the uncertainty in the CDM system and European markets, no firm commitments have been made.