Clean Development Mechanism South Africa
Designated National Authority

energy
Department:
Energy
REPUBLIC OF SOUTH AFRICA

Private Bag X 19 , Acardia ,Pretoria, 0007, Tel:012-444 4116, Fax: 012 341 5133
Private Bag X9111, Cape Town, 8000, Tel: 021-469 6412, Fax: 021-465 5980

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	**Landfill Gas Utilisation Programme of South Africa** Shongweni landfill gas to electricity CPA 001
Date of Submission of PDD	**26/03/2012**

Project Developer	
Name	ENER-G Systems (Pty) Ltd.
Organizational Category	Private Company
Legal Status	Limited Company
Street Address	Unit 2, The Firs, 5 Humber Street, Woodmead Johannesburg South Africa
Postal Address (if different from above)	See above
Website Address	http://www.energ.co.uk/energsystems
Main Activities	Design, construction, and operation of landfills and landfill gas to energy projects in South Africa
Summary of Financial Performance in last fiscal year	*Revenue R 8 921 507.00* *Assets R 14 806 080.00* *Liabilities R 8 744 035.00*

	Income R 2 175 210.00
Contact Person(s)	Mr David Cornish
Telephone	Phone: +27 (0) 31 564 0222; Mobile: +27 (0) 83 385 0661
Fax	+27 (0)31 564 3802
Email Address	dcornish@gessa.co.za
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	Do-inc
Nature of partner	Carbon Markets consultant
Organizational Category	Private Company
Legal Status (if private company)	Limited partnership
Street Address	Mauritskade 55-D 1092 AD Amsterdam Netherlands
Postal Address (if different to Street Address)	P.O. Box 94550 1090 GN Amsterdam Netherlands
Website Address	www.do-inc.net
Main Activities	Do-inc develops fair green business. Do-inc designs triple dividend solutions: Projects in which investors, the global environment and local population all make solid sustainable profits. Do-inc team members are experts on project management and greenhouse gas reduction projects, covering a range of environmental technologies: renewable energy, energy efficiency, waste management and forestry. Do-inc has been involved or responsible for over 20 successful CDM and Gold Standard project registrations.
Contact Person(s)	Geert Eenhoorn – General Manager
Telephone	Mobile: +31 6 5242 1926
Fax	+31 8 7784 2538
Email Address	g.eenhoorn@do-inc.net
Contractual Arrangements	
Contractual arrangements between various entities involved	ENER-G Systems will be the coordinating and managing entity (CME) of the proposed Programme of Activities (PoA) and PoA owner. Do-inc is in charge of the CDM PoA registration process.

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

Technical Summary of the project	
Objective of the Project	The goal of the proposed Programme of Activities (PoA) is to contribute to the sustainable development of South Africa and to reduce Greenhouse Gas (GHG) emissions and adverse environmental effects of landfill gas and to increase the use of renewable energy sources in the country.
Project Description	

Technical Summary of the project

The proposed PoA comprises the installation of systems for capturing landfill gas (LFG) at participating landfills located in South Africa. Captured LFG will be flared and/or used in energy generating units to produce electricity and therefore methane emissions will be reduced.

The technology installed under the project activity consists of:

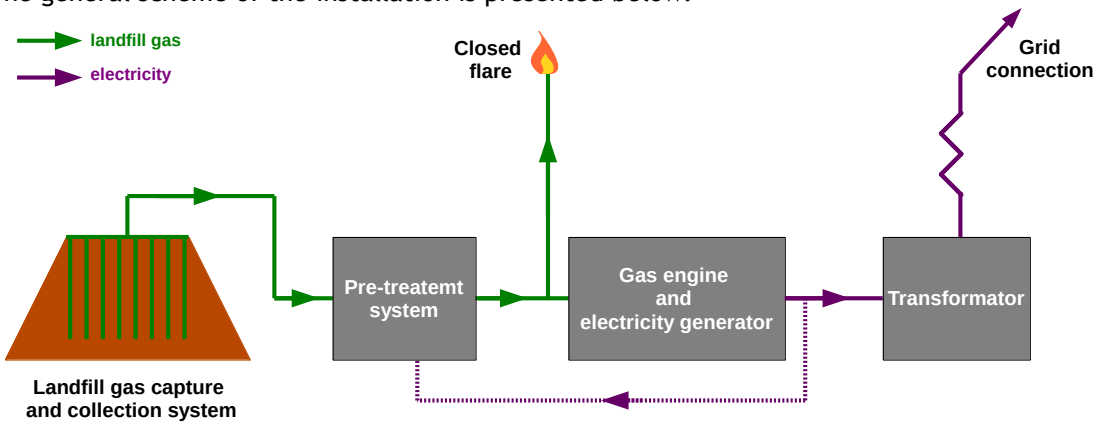
1) A network or grid of vertical and/or horizontal gas extraction wells/ drains made from HDPE slotted pipes/ drains;
2) Collection piping system consisting of HDPE pipes/ mats;
3) Gas pre-treatment system consisting of condensate Knock out pots, demisted elements and filters;
4) Enclosed high temperature environmental flare;
5) Internal spark ignition electricity generation unit (dependent on size, location and state of the respective landfill);
6) Sep up transformers and grid connection (dependent on size, location and state of the respective landfill).

The CPAs will be implemented within the PoA by the landfill owners/operators (end-users) who meet the eligibility criteria. These end-users will manage and/or operate the installed systems and will have signed agreements (contract) with coordinating and managing entity (CME) on the carbon finance transactions including their role in implementing the daily monitoring, quality control and reporting in accordance with the CDM rules.

Monitoring will be done at each CPA landfill. This will consist of measuring the amount of captured and utilised landfill gas, methane fraction as well as the amount of electricity generated and consumed (if applicable).

The PoA boundary is the Republic of South Africa. Each CPA that will participate in the PoA will be clearly defined in terms of geographical location.

The general scheme of the installation is presented below.



Project Constraints

Are there any constraints affecting project operations or commissioning?

Not all landfills in South Africa will be eligible to participate in the PoA due to e.g. low potential of landfill gas generation, specific site conditions and/or the fact that they are already registered as a stand alone CDM project.

Technology to be employed	The technology installed under the project activity consists of: 1) A network of vertical and/or horizontal gas extraction wells made from HDPE slotted pipes;

Technical Summary of the project	
	2) Collection piping system consisting of HDPE pipes; 3) Gas pre-treatment system consisting of condensate Knock out pots, demisted elements and filters; 4) Enclosed high temperature environmental flare; 5) Internal spark ignition electricity generation unit (dependent on size, location and state of the respective landfill); 6) Sep up transformers and grid connection (dependent on size, location and state of the respective landfill). The PoA is technology agnostic – all proven technologies, proven brands of equipment can participate as long as they comply with the eligibility criteria of the PoA *Is the technology one that has been previously tried and tested in South Africa or internationally? If yes, provide details* The technology for capturing and utilization is widespread around the world and is present in South Africa as well. *Have the project operators any previous experience or expertise with operating the technology?* Yes. Project operators (landfill owners/operators) can participate if they comply with the eligibility criteria set in the PoA. ENER-G Systems is specialized in design, construction, and operation of landfills and landfill gas to energy projects. Do-inc also has extensive international experience on landfill projects and has been involved in many landfill projects world-wide (China, India, Bangladesh, Turkey, Ukraine, Mexico, Peru, Argentina, Egypt, Sri Lanka and South Africa).
Greenhouse Gases Targeted	• CH_4 – due to reduction of landfill gas emissions (flaring and/or electricity production) • CO_2 – due to displacement of grid electricity
Emission reductions	Assuming 5 large landfills with an average of 80,000 tCO_{2e}/y and 10 smaller ones with an average of 40,000 tCO_{2e}/y the Programme could generate up to 800,000 tCO_{2e} per annum (8,000,000 tCO_{2e} in total assuming each CPA has life time of 10 years).
Baseline & Additionality Assessment	The baseline scenario is continuation of the current practice in terms of landfill gas handling in South Africa, i.e. atmospheric release or passive venting of landfill gas. This is in line with national legislation. Additionality will be demonstrated at CPA level. To do so, the Tool for the demonstration and assessment of additionality (Version 05.2.1) is used. According to the "Tool for demonstration and assessment of additionality" (Version 05.2) the CPA proponents have a choice to demonstrate that the proposed CPA is additional to the baseline scenario either by using a) investment analysis or b) barrier analysis. When opting investment analysis, the CPA is required to determine whether the proposed project activity is not: a) the most economically or financially attractive; or b) economically or financially feasible without the revenue from the sale of CERs.

Technical Summary of the project	
	As to the barrier analysis, several barriers can be identified including barriers due to prevailing practice or due to geographical/ economical limitations of connecting to the grid (as can be the case for smaller landfills that do not generate sufficient gas to guarantee electricity deliveries at economical scale), unstable or low electricity tariffs for electricity produced from waste, etc. If the CPA opts to prove additionality through barrier analysis, but the proof is inconclusive, CPA will use investment analysis (Step 2 above) to prove additionality.
Monitoring	The coordinating entity will implement a verification system on the PoA level to determine the GHG abatement created by the PoA as a whole. The resulting programme database includes the data sets that can be directly attributed to each CPA within the PoA. Thereby it allows for unambiguous determination of the emission reductions achieved by each CPA. Monitoring reports will be prepared separately for each of the CPAs for the purpose of verification and request for issuance of CERs. The proposed PoA and CPAs will apply the approved large scale methodology ACM0001 "Consolidated baseline and monitoring methodology for landfill gas projects activities" (Version 11). The following parameters will be monitored (this list may vary depending on specific CPA): • $LFG_{total,y}$ - Total amount of landfill gas captured at Normal Temperature and Pressure; • $LFG_{flare,y}$ - Amount of landfill gas flared at Normal Temperature and Pressure; • $LFG_{electricity,y}$ - Amount of landfill gas combusted in power plant at Normal Temperature and Pressure; • w_{CH4} - Methane fraction in the landfill gas; • T_{flare} - Temperature in the exhaust gas of the flare • T - Temperature of the landfill gas; • P - Pressure of the landfill gas; • EL_{LFG} - Net amount of electricity generated using LFG; • $EC_{PJ,j,y}$ - Quantity of electricity consumed by the project electricity consumption source j in year y • $EF_{fuel,BL}$ - CO_2 emission factor of fossil fuel; • $NCV_{fuel,BL}$ - Net calorific value of fossil fuel; • $\varepsilon_{gen,BL}$ - Efficiency of the baseline captive power plant; • Operating time of the power plant; • $PE_{EC,y}$ - Project emissions from electricity consumption by the project activity during the year y; • $PE_{FC,j,y}$ - Project emissions from fossil fuel combustion in process j during the year y; • $TDL_{j,y}$ - Average technical transmission and distribution losses for providing electricity to source j in year y
Type of project/activities	*Identify which type of activity is involved in this project – and for each, provide brief details*
a. Energy Supply	Renewable energy (displacement of grid electricity with electricity

Technical Summary of the project	
	produced from combustion of landfill gas)
b. Energy Demand	*n.a.*
c. Industrial Process	*n.a.*
d. Transport	*n.a.*
e. Waste Management	*n.a.*
f. Forestry/ land use	*n.a.*
g. Other	*n.a.*
Project Boundary The boundary of the proposed PoA is the Republic of South Africa. Anywhere in the document where it is stated "Republic of South Africa" or "South Africa" as a reference to the geographic boundary of the PoA it could also mean "other countries added post registration" (according to EB60 Annex 26)	
Indicate Emissions outside the Project Boundary	n.a.

Location of the Project	
Province	POA- All provinces of the Republic of South Africa CPA- Kwa-Zulu Natal
Municipality	POA- n/a CPA- Ethewkeni
Nearest city/large town	POA- n/a CPA- Pinetown
Brief description of the location of the project site	POA- The Republic of South Africa CPA- The Shongweni landfill site is located in Shongweni just outside Hillcrest.

Project Schedule/Timetable	
Earliest Project Start Date	May 2012
When is the expected first year of CER delivery	2013
Project Lifetime	The lifetime of the PoA is 28 years.
Project End Date	April 2040
Crediting Period	The crediting period for each CPA will be 10 years (fixed)
Current Status or phase of the project	CDM programme is currently in validation. Global stakeholder Consultation and first validation round are closed.
DNA Approval	*Has this project been submitted to the DNA for approval previously?* *If yes - provide date of last submission and brief details of the response from the DNA (1 paragraph)* *Provide details of any other official response by the DNA regarding this project* No. Not submitted.
Approval by other bodies	*Has this project (or any elements of the project) been submitted to any other national, provincial or local government departments or agencies for regulatory or legal approval (excluding EIA process - see Part C). If so - provide brief details.* No.

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?

Please give details (1 paragraph)

Yes.

- The proposed PoA involves the transfer of technology and know-how from the UK and/ or other European countries on the efficient capture and utilisation of the LFG through importing mature technologies such as flares, generators, design philosophies and experience from the UK into South Africa. In addition, there will also be knowledge transfer and capacity building related to implementation of the proposed PoA through the design, build and operational phases of the projects as the technology providers provide onsite training and ongoing support to the local project developers and operators.
- Utilisation of the LFG for generation of electricity will increase the use of renewable sources in South Africa and will stimulate Economic development;

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

Please give details (1 paragraph)

Yes.

- The implementation of the proposed PoA will require additional workforce, especially during the set-up of a particular CPA, but also during the construction phase and operation of the programme for monitoring and operation gas capture system and therefore will create new job opportunities. The project will also benefit the communities in an around the landfills as the project will reduce odours and green house gas emissions which will benefit all the surrounding communities.

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

Yes by producing electricity the project is able to ensure a sustainable future for the project beyond the crediting period.

- The programme will reduce greenhouse gas (GHG) emissions by avoiding emissions:
  - of landfill gas (LFG) to the atmosphere; and/or
  - through the substitution of grid electricity use.
- Apart from the greenhouse gas effect, uncontrolled landfill gas emissions are responsible for odour nuisance and create risk of explosion. By implementing the proposed PoA, odour nuisance and explosion probability will be significantly reduced and safety conditions will be improved;

i) That the **disturbance of ecosystems and loss of biological diversity** are avoided, or where they cannot be avoided, are minimised and remedied	The PoA reduces Greenhouse Gas (GHG) emissions and adverse environmental effects of landfill gas. It thus reduces the environmental impact of the landfills included under the PoA. An environmental analysis is undertaken for each CPA to analyse environmental impacts of the included sites and to ensure compliance with environmental regulations in place. An existing EIA, if required by South African legislation, is requirement for a CPA to be implemented under the programme. As the project are developed on landfill site there is no impact on the ecosystem or

	biological diversity as this has already taken place.
ii) That **pollution and degradation of the environment** are avoided, or where they cannot be altogether avoided, are minimised and remedied	The PoA reduces Greenhouse Gas (GHG) emissions and adverse environmental effects of landfill gas. It thus reduces the environmental impact of the landfills included under the PoA. An environmental analysis is undertaken for each CPA to analyse environmental impacts of the included sites and to ensure compliance with environmental regulations in place. An existing EIA, if required by South African legislation, is requirement for a CPA to be implemented under the programme.
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	The PoA reduces Greenhouse Gas (GHG) emissions and adverse environmental effects of landfill gas. It thus reduces the environmental impact of the landfills included under the PoA. The project area is already a landfill site and therefore it is anticipated that the activities will not trigger any requirements under the NHA. An environmental analysis is undertaken for each CPA to analyse environmental impacts of the included sites and to ensure compliance with environmental regulations in place. An existing EIA, if required by South African legislation, is requirement for a CPA to be implemented under the programme.
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 PoA reduces Greenhouse Gas (GHG) emissions and adverse environmental effects of landfill gas. It thus reduces the waste (in form of landfill gas) from the landfills included under the PoA. The principal waste minimisation will be adopted.
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	Electricity generated under the programme is produced from renewable sources (landfill gas extracted). Non-renewable energy sources are not used.
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.	Landfill gas is extracted as available. Landfill modelling is performed to give a reliable indication on the availability of landfill gas as a renewable energy carrier for power generation under the project.
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	Cautious approach is applied regarding the use of currently available technology and potential gas extraction activities. An environmental analysis is undertaken for each CPA to analyse environmental impacts of the included sites and to ensure compliance with environmental regulations in place. An existing EIA, if required by South African legislation, is requirement for a CPA to be implemented under the programme.
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	The PoA reduces Greenhouse Gas (GHG) emissions and adverse environmental effects of landfill gas. It thus reduces the environmental impact of the landfills included under the PoA. An environmental analysis is undertaken for each CPA to analyse environmental impacts of the included sites and to ensure compliance with environmental regulations in place. An existing EIA, if required by South African legislation, is requirement for a CPA to be implemented under the programme.
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)	Apart from the greenhouse gas effect, uncontrolled landfill gas emissions are responsible for odour nuisance and create risk of explosion (local impact). By implementing the proposed PoA, odour nuisance and explosion probability will be significantly reduced and safety conditions will be improved. By capturing the gas, the PoA reduces Greenhouse Gas (GHG) emissions and adverse environmental effects of landfill gas. It thus reduces the environmental impact of the landfills included under the PoA. An environmental analysis is undertaken for each CPA to analyse environmental impacts of the included sites and to ensure compliance with environmental regulations in place. An existing EIA, if required by South African legislation, is requirement for a CPA to be implemented under the programme.
	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	Programme is implemented on duly approved and authorised landfill sites. It therefore does not impact community access to natural resources, water use or non-renewable resource use.
	Impacts on biodiversity and ecosystems	• Changes in local or regional biodiversity arising from the project	Changes in local or regional biodiversity arising from the project will be minimised. An environmental analysis is undertaken for each CPA to analyse environmental impacts of the included sites and to ensure compliance with environmental regulations in place. An existing EIA, if required by South African legislation, is requirement for a CPA to be implemented under the programme.

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	• There will always be a requirement to be able to sell the CER abroad and in turn a requirement for foreign currency, however if the DOE implement the carbon tax then the project will be able to sell the CERs on the local market if the value is attractive enough. • The project will stimulate investment and economic development in the area both in the construction phase and in the operations phase. This will stimulate employment in the area. • The project will not have an impact on the cost of energy as the power will be sold under the Department of Energy's REBID program and the funds for the electricity are already being charged to end users by Eskom. • The project will stimulate foreign direct investment into South Africa in the development phase.
	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	• The proposed PoA involves the transfer of technology and know-how from the EU on the efficient capture and utilisation of the LFG through importing mature technologies such as flares, generators, design philosophies and experience from the EU into South Africa. • There will also be knowledge transfer and capacity building related to implementation of the proposed PoA through the design, build and operational phases of the projects as the technology providers provide onsite training and ongoing support to the local project developers and operators. • The implementation of the proposed PoA will require additional workforce, especially during the set-up of a particular CPA, but also during the operation of the programme for monitoring and operation gas capture system and therefore will create new job opportunities. • The PoA is will create positive first-hand experience with the implemented technologies which enables replication of the activities also beyond the scope of the PoA.

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 implementation of this PoA is a voluntary action by the coordinating entity. There are no mandatory requirements in South Africa stipulating capturing and utilisation of the landfill gas1,and the PoA requires interested parties to take voluntary action to participate in the programme activities. The PoA is in line with South African development princiles as stated in the National Environmental Management Act. The POA will stimulate the development of projects that will assist in the government objective of increasing employment and will stimulate social and economic development. The POA and these projects will not have any negative effects on access service delivery or require any relocation of any communities. The projects under the POA will contribute to the renewable targets set out in the IRP 2010 plan.
	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 implementation of the proposed PoA will require additional workforce, especially during the set-up of a particular CPA, but also during the operation of the programme for monitoring and operation gas capture system and therefore will create new job opportunities. • These employment positions will be office based administration positions and will require sector specific training. • Employment creation will include knowledge transfer and capacity building related to implementation of the proposed PoA through the design, build and operational phases of the projects as the technology providers provide onsite training and ongoing support to the local project developers and operators. • The bulk of the employment will happen at the project level and this will be site based employment and will stimulate employment at the sites.

[1] Department of Water Affairs and Forestry Republic of South Africa (1998): Minimum requirements for waste disposal by landfill, available at: http://www.sawic.org.za/documents/266.PDF

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 benefits not only accrue to the project in the form of income that is retained within South Africa and will contribute to increased revenue for the government through tax , but also to the environment and this benefit is shared by all.

Part D: Finance

Project Costs	
Development Costs (R's)	The development costs for the POA budgeted at R 1 285 175.00
Installed Costs (R's)	N/A for the POA as no plant is installed
Other Costs (R's)	TBE
Total Project Costs (R's)	TBE
Sources of Finance	
Equity	*Name of Organisation(s) and amount (R's) contributed by each* *ENER-G Systems (PTY) LTD 100%*
Debt (long term)	*Name of organization(s) and amount (R's) for each* *N/A*
Debt (short term)	N*ame of organization(s) and amount (R's) for each* N/A
Amount not identified (R's)	*Amount (R's) and a brief summary of the needs and any outstanding issues* *(1 paragraph or less)*
Total CDM Contribution sought	*Amount (R's) and a brief summary of the needs and any outstanding issues* *(1 paragraph or less)*
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)	 *Spot Market (R's)* *Spot Market (R's)* *Spot Market (R's)*
Indicate the **projected Internal Rate of Return** for the project with and without CER revenues.	*This is a POA and we are not able to calculate the return as the number of CPAs to be included is unknown and the volume of CERs for CPA in unknown.*

Constraints on tradability of carbon credits	*No trading arrangements have been entered into. The carbon credits may be subject to legislation regarding CER that is currently under development.*
Preliminary discussions with potential purchasers	*Have you had any preliminary discussions with any potential purchasers of the carbon credits (CERs)* *If yes, please give brief details.* *No we have used the spot market to calculate viability.*