

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: 012 444 4501
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	Hot Water Heating Programme for South Africa
Date of Submission of PDD	21/05/2012

Project Developer	
Name	Low E Solutions (Pty) Ltd t/a Low E Co [coordinating managing entity, CME]
Organizational Category	Private Company
Legal Status (if private company)	Limited Company
Street Address	284 Castellet, Syringa Avenue, Broadacres, 2020, Johannesburg, South Africa
Postal Address (if different to Street Address)	P.O. BOX 1903 Sunninghill, 2157, Johannesburg, South Africa
Website Address	www.low-eco.com/
Main Activities	A Special Purpose Vehicle established by International Carbon and the Industrial Development Cooperation (IDC), to

	facilitate installation, financing and maintenance of Solar Water Heaters (SWH) and Heat Pumps.
Summary of Financial Performance in last fiscal year	The company was established only in January 2012 and hence financial can only be provided by end of the financial year.
Contact Person(s)	Laura Lahti
Telephone	+27 7954 23553
Fax	n/a
Email Address	laura@low-eco.com

Project Partners	
Name	I Carbon (Pty) Ltd t/a International Carbon
Nature of partner	Project Participant CDM Cycle Management
Organizational Category	Private Company
Legal Status	Limited company
Street Address	284 Castellet, Syringa Avenue, Broadacres, 2020, Johannesburg, South Africa
Postal Address (if different from above)	P.O. BOX 1903 Sunninghill, 2157, Johannesburg, South Africa
Website Address	www.intlcarbon.com
Main Activities	<p>The business lines are: Advisory, Financial and Development services:</p> <p>Advisory</p> <ul style="list-style-type: none"> ▪ Strategy and Master Planning: Provide and evaluate clear choices for capturing opportunities and minimizing risk. ▪ Capacity Building: Provide knowledge and know-how. Contribute to sustainable development ▪ Technology Consultancy: Advise on technical options and provide specific know-how/ technologies for developers. <p>Financial</p> <ul style="list-style-type: none"> ▪ Work with financial institutions to provide financial solutions to the customer ▪ Brokerage/Trading: Provide project developers with access to a Primary and Secondary credit purchaser. <p>Development</p> <ul style="list-style-type: none"> ▪ CDM Cycle Management. (PINs, PDDs, Monitoring Reports and assistance of validation, registration, verification and issuance). ▪ Technology partners - established partnerships with recognized technology and equipment suppliers. ▪ CDM project development - origination and development of CDM

	projects in Africa.
Contact Person(s)	Laura Lahti
Telephone	+27 7954 23553
Fax	n/a
Email Address	laura.lahti@intlcarbon.com
Name	International Carbon Ltd
Nature of partner	Project Participant [Sister company to I Carbon (Pty) Ltd]
Organizational Category	Private Company
Legal Status (if private company)	Limited Company
Street Address	97 Ashley Road, Walton-on-Thames, KT12 1HH , United Kingdom
Postal Address (if different to Street Address)	As above.
Website Address	www.intlcarbon.com
Main Activities	<p>The business lines are: Advisory, Financial and Development services:</p> <p>Advisory</p> <ul style="list-style-type: none"> ▪ Strategy and Master Planning: Provide and evaluate clear choices for capturing opportunities and minimizing risk. ▪ Capacity Building: Provide knowledge and know-how. Contribute to sustainable development ▪ Technology Consultancy: Advise on technical options and provide specific know-how/ technologies for developers. <p>Financial</p> <ul style="list-style-type: none"> ▪ Work with financial institutions to provide financial solutions to the customer ▪ Brokerage/Trading: Provide project developers with access to a Primary and Secondary credit purchaser. <p>Development</p> <ul style="list-style-type: none"> ▪ CDM Cycle Management. (PINs, PDDs, Monitoring Reports and assistance of validation, registration, verification and issuance). ▪ Technology partners - established partnerships with recognized technology and equipment suppliers. ▪ CDM project development - origination and development of CDM projects in Africa.
Contact Person(s)	Laura Lahti
Telephone	+27 7954 23553

Fax	n/a
Email Address	laura.lahti@intlcarbon.com
Contractual Arrangements	
Contractual arrangements between various entities involved	<p>Low E Co is Special Purpose Vehicle established by I Carbon and the IDC to facilitate facilitate installation, financing and maintenance of Solar Water Heaters (SWH) and Heat Pumps.</p> <p>I Carbon (Pty) Ltd and International Carbon Ltd are sister companies and responsible for the CDM Cycle Management.</p> <p>Low E Co is the CME in this PoA. International Carbon and I Carbon are PPs.</p>

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

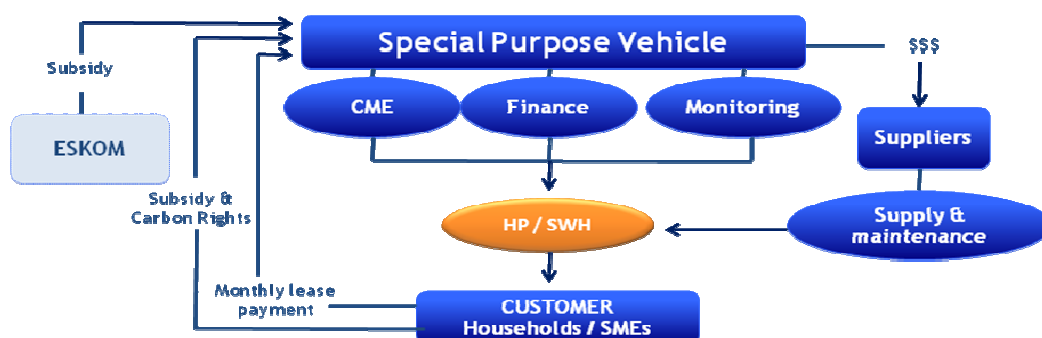
Technical Summary of the project

Objective of the Project	The objective of this small scale programme of activities (hereafter referred to as the "PoA") is to install heat pumps (hereafter referred to as "HP") and solar water heaters (hereafter referred to as "SWH") throughout South Africa. The solutions can be installed individually or as a combination of a heat pump and solar geyser (hereafter referred to as "hybrid solution"). The installations can take place in domestic or commercial buildings. The programme will replace exiting electric geysers and hence reduce CO ₂ emissions.
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Project Description

- Nationwide Heat Pump (HP), High Pressure Solar Water Heating (SWH) and Hybrid system roll out;
- First step will be Corporate rollouts with approximately 6,000 units mainly within Gauteng
- Installations done by preferred suppliers
- Installation volumes planned to increase with other corporate rollouts
- Installations for the first corporate rollout are estimated to start July 2012
- All installed units shall fulfil the criteria required for the Eskom subsidy (relevant SABS tests, registered supplier, etc)
- All building types: households and commercial/ industrial buildings can be included

The below diagram show the implementation and management structure for the project:



Project Constraints

n/a

Technical Summary of the project

<p>Technology to be employed</p>	<p><i>Heat Pumps:</i> A heat pump is an electrically-powered device that extracts available heat from one area (the heat source i.e. air) and transfers it to another (the heat sink i.e. water) to heat water. The most common type of heat pump is the air-source heat pump (also applied under this programme), which transfers heat between the outside air and water used inside the building.</p> <p>The working fluid, refrigerant, is pressurized and circulated through the system by a compressor. The heat pump heats water to temperatures in the region of 60°C.¹</p> <p>Electrical energy is used to drive the compressor. HPs typically consume 1 unit of electrical energy for every 2.5 - 3.5 units of heating produced i.e. only 30 - 40 kWh electrical energy is used to produce 100kWh thermal energy.² Hence, HPs realise an energy saving of 60 - 70% when compared to conventional electrical water heating systems.</p> <p><i>Solar Water Heaters:</i> SWH systems convert solar radiation into thermal energy for the heating of water. Both types of SWHs can be installed under this programme active (i.e. a pump to circulate water or heat transfer fluid [hereafter referred to as “HTF”] between the collector and the storage tank) high pressure systems, as well as passive systems. All types, vacuum tube collectors and flat plates as well as high and low pressure systems can be applied. The SWH system can be close-coupled, where the storage tank is horizontally mounted immediately above the solar collectors on the roof, or integrated collector storage, where the tank acts as both storage and solar collector. Both direct and indirect systems can be installed under this programme. The indirect system uses non-toxic antifreeze HTF in the collector, whereas in the direct system water from the main household water supply is circulate between the collector and the storage tank, and the water is heated directly without transfer fluids. The solar collector absorbs solar radiation, converts it into heat, and transfers it to the water or via HTF to water. Heated water is then held in the storage tank and is ready for use. Active SWHs rely on electric pumps, valves and controllers to circulate water, or other heat-transfer fluids through the collectors.</p> <p>There are a HP and SWH suppliers and manufactures (only for SWH currently) in South Africa. However, due to high upfront costs and cheap electricity the product hasn’t been able to gain momentum in the market. Since the initiation of the Eskom rebate programme in 2008 approximately 45,000 high pressure SWHs has been installed. The number of HPs is significantly less around couple</p>
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¹ Eskom 2009, Effective Water Heating, page 1; Rankin and & van Eldik 2010, An Investigation into the Energy Savings and Economic viability of Heat Pump Water Heaters applied in the residential sector, page iii.

² Rankin and & van Eldik 2010, An Investigation into the Energy Savings and Economic viability of Heat Pump Water Heaters applied in the residential sector, page iv.

Technical Summary of the project

	<p>thousands. The supplier selected for this project has several years experience in the industry.</p>																																										
<p>Greenhouse Gases Targeted</p>	<p>CO₂</p>																																										
<p>Emission reductions</p>	<p>The programme will make use of two CDM small scale methodologies AMS.II.C. "Demand-side energy efficiency activities for specific technologies" and AMS.I.C:"Thermal energy for the user with or without electricity" and emission reductions are calculated accordingly.</p> <p>The anticipated emission reductions for CPA001 for each year are presented below:</p> <table border="1" data-bbox="643 703 1128 1279"> <thead> <tr> <th>Year</th> <th colspan="2">Emission Reduction</th> </tr> </thead> <tbody> <tr> <td>2012</td> <td>1 644</td> <td>tCO₂</td> </tr> <tr> <td>2013</td> <td>13 448</td> <td>tCO₂</td> </tr> <tr> <td>2014</td> <td>11 662</td> <td>tCO₂</td> </tr> <tr> <td>2015</td> <td>11 662</td> <td>tCO₂</td> </tr> <tr> <td>2016</td> <td>11 662</td> <td>tCO₂</td> </tr> <tr> <td>2017</td> <td>11 662</td> <td>tCO₂</td> </tr> <tr> <td>2018</td> <td>11 662</td> <td>tCO₂</td> </tr> <tr> <td>2019</td> <td>11 662</td> <td>tCO₂</td> </tr> <tr> <td>2020</td> <td>11 662</td> <td>tCO₂</td> </tr> <tr> <td>2021</td> <td>11 662</td> <td>tCO₂</td> </tr> <tr> <td>2022</td> <td>11 207</td> <td>tCO₂</td> </tr> <tr> <td>Total</td> <td>119 595</td> <td>tCO₂</td> </tr> <tr> <td>Annual average</td> <td>11 959</td> <td>tCO₂</td> </tr> </tbody> </table>	Year	Emission Reduction		2012	1 644	tCO ₂	2013	13 448	tCO ₂	2014	11 662	tCO ₂	2015	11 662	tCO ₂	2016	11 662	tCO ₂	2017	11 662	tCO ₂	2018	11 662	tCO ₂	2019	11 662	tCO ₂	2020	11 662	tCO ₂	2021	11 662	tCO ₂	2022	11 207	tCO ₂	Total	119 595	tCO₂	Annual average	11 959	tCO₂
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<p>Baseline & Additionality Assessment</p>	<p>The installation of heat pumps is applicable under the approved methodologies for small scale CDM project, specifically the AMS.II.C. "Demand-side energy efficiency activities for specific technologies". AMS.I.C:"Thermal energy for the user with or without electricity" is applied in combination with AMS.II.C for the hybrid solutions. This category comprises renewable energy technologies that supply individual households or users with thermal energy that displaces fossil fuels. Further the programme will be installed under the Program of Activities (PoA) approach, which gives flexibility for crediting period and location of the installation.</p> <p>The programme is a voluntary action and will face clear barriers such as financial unattractiveness without the carbon revenue, as well as technical barriers and prevailing practice and lack of knowhow, which explains the extremely low penetration rates of heat pumps in the country.</p> <p>Furthermore the additionality can be justified in the individual CDM Project Activity (CPA) level, with financial additionality as</p>																																										

Technical Summary of the project	
	<p>well as using the CDM Executive Board’s new guidelines on micro scale projects “The Guidelines for Demonstrating Additionality of Renewable Energy Projects (EB 54, annex 15) paragraph 2 (c) will be applied for the additionalty argumentation“.</p> <p>Each CPA will respect the small-scale (SSC) limits (maximum 60 GWh 45 MW annual energy saving and maximum installed thermal capacity) and fulfils the debundling conditions of a PoA (applying EB 26, annex 27 decision which exempts independent system that are no greater than 1 % of the SSC threshold from performing de-bundling check).</p> <p>The baseline and emission reductions are calculated with a daily energy output. The installed heat pumps will use electricity and hence the programme emissions, which will constitute approximately 25 % of the energy production capacity, are reduced from the baseline to calculate the emission reductions.</p>
Monitoring	<p>The monitoring manual for the HPs and SWHs will guide the monitoring of each CPA. The following parameters are monitored:</p> <p>SWH:</p> <ol style="list-style-type: none"> 1. Operationally: annual sample 2. Inlet water temperature: continuously from a sample 3. Outlet water temperature: continuously from a sample 4. Water flow: continuously from a sample <p>HP:</p> <ol style="list-style-type: none"> 5. Operationally: annual sample 6. Electricity consumption: continuously from a sample <p>A monitoring report is produced for each monitoring period in order to verify the information related to the emission reductions contained in each CPA. Appropriate record keeping procedures will be implemented to ensure that each monitoring period data set can be transparently attributed to its corresponding CPA and SWH, preventing any occurrences of double counting.</p>
Type of project/activities	
a. Energy Supply	
b. Energy Demand	Renewable Energy (SWH) and Energy Efficiency (HP). Replacing electric geysers with SWHs and/or HPs.
c. Industrial Process	
d. Transport	
e. Waste Management	
f. Forestry/ land use	
g. Other	
Project Boundary	<p>The boundary of the PoA is defined as the geographical area within which all the implemented, small-scale, Clean Development Mechanism programme activities (hereafter referred to as “SSC-CPAs”) included in the PoA will occur. All HPs and SWHs in the CPAs included in the PoA will be installed in residential or commercial/industrial buildings within the borders of the Republic of South Africa. Therefore, the boundary of the PoA is defined as the Republic of South Africa.</p>

Technical Summary of the project	
Indicate Emissions outside the Project Boundary	n/a

Location of the Project	
Province	Gauteng (CPA001 installations are likely to take place only within Gauteng)
Municipality	n/a
Nearest city/large town	Johannesburg (CPA001 installations are likely to take place only within Gauteng)
Brief description of the location of the project site	The objective of this programme is to convert conventional electric geysers used to heat the water in <u>households</u> as well as <u>commercial and industrial buildings</u> to heat pump heating systems throughout South Africa.

Project Schedule/Timetable	
Earliest Project Start Date	1 July 2012
When is the expected first year of CER delivery	2013
Project Lifetime	10
Project End Date	2022 (for CPA001, the PoA however will have 28 year crediting period)
Crediting Period	Yes. 10 years fixed crediting period for the CPAs. The PoA will have 28 year crediting period.
Current Status or phase of the project	Under preparation. The SPV structure has been established (Low E Co) and the supplier selected. First installations are expected to take place in July 2012
DNA Approval	No
Approval by other bodies	No, not relevant.

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 programme 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?

Load shedding is one of major problems in South Africa and it is hindering the fast growing economy of the country. Efficient use of electricity is one important way to help sustaining electricity and its availability in supply to meet the growing electricity demand without more exploitation of non-renewable energy and bring the economy back to its normal growth in long term perspective. Furthermore the programme will contribute to national economic development by bringing foreign exchange into the country.

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

Although small but the project will create job opportunities. Manpower is required for installation, maintenance and monitoring of the program activity. Furthermore the programme is expected to activate the high pressure SWH and heat pump industry.

The programme will lead to reduced electricity bill (cost savings) in the target households and SMEs.

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

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 ecosystems as the programme is implemented on existing buildings.
ii) That pollution and degradation of the environment are avoided, or where they cannot be altogether avoided, are minimised and remedied	The pollution and degradation of the environment as a consequence of the programme is significantly lower than the 'business-as-usual' situation. The programme reduces electricity consumption and hence the consumption of non-renewable natural resources, such as coal, uranium and oil.
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 programme will not impact on landscapes or sites of cultural significance.
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	Waste will be generated only in the manufacturing and transport state of the activity and will be recycled. The production of thermal energy through solar radiation and ambient temperature will not generate any waste.
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 programme is a sustainable solution to optimize and reduce the use of fossil-based electricity and prevent electricity demand rapidly growing over available electricity supply which leads to exploitation of fossil fuel and depletion of natural resources. This is one way to sustain electricity supply for the economical growing country of South Africa.
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 programme will make use of renewable resources, more precisely of solar radiation and ambient air temperature to, to generate hot water for customers in NMBM and EMM areas. Hence the programme increases the availability of renewable resources in South Africa.
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	The programme will adopt a risk averse and cautious approach, if applicable.
vii) That negative impacts on the	There is no negative impact on environment or people's environmental

<p>environment and on people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied</p>	<p>rights due to programme activity. The programme impacts on environment are in positive nature. The programme reduces electricity demand.</p>
<p>Other comments The programme will have significant positive effects on environment and people.</p>	

Indicators in Support of the Project Approval Criteria

Category	Indicator	Comment	
Environmental	Impact on local environmental quality	<ul style="list-style-type: none"> • 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) 	The programme does not cause negative environmental impacts on air quality, water pollution, waste management, noise, visual impacts, traffic, or safety. The programmes impacts on environment are rather on positive nature as the programme activity reduces the demand of fossil fuel based grid electricity.
	Change in usage of natural resources	<ul style="list-style-type: none"> • 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 programme reduces the need of grid electricity which is derived from combustion of fossil fuels at power plants. The programme uses the method to efficiently utilize electricity at its most efficient level. Although no direct effect on cutting down fossil exploitation but the programme contributes to preventing expansion of fossil exploitation due to the growing electricity demand by reducing electricity demand.
	Impacts on biodiversity and ecosystems	<ul style="list-style-type: none"> • Changes in local or regional biodiversity arising from the project 	The programme activity will replace exiting electric water heating systems in buildings and therefore does no harm or results in negative impacts to biodiversity and ecosystems.

Indicators in Support of the Project Approval Criteria

	Category	Indicator	Comment
Economic	Economic impacts	<ul style="list-style-type: none"> • 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 	<p>The Programme will not have an impact on foreign exchange requirements. However it will bring foreign currencies to South Africa through the sales of CERs.</p> <p>Equipment used in the programme is mainly produced locally (> 50 % of the parts) and hence will lead to increased job opportunities within the manufacturing.</p> <p>Programme activity's impact on energy costs is positive, if any. Without such a programme activity to well manage and reduce electricity consumption, the electricity demand in South Africa will continue its rapid growth and might increase electricity price by the provider as one solution to cut down the inclining demand that is over supply.</p>
	Appropriate technology transfer	<ul style="list-style-type: none"> • 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 	<p>Manufacturing and fabrication of equipment will receive prospect of technical and skill development as well as transfer of knowhow from one region to the others to supply and maintain the equipment.</p>

Indicators in Support of the Project Approval Criteria		
Category	Indicator	Comment
Social	Alignment with national provincial and local development priorities	<ul style="list-style-type: none"> • 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) <p>As a summary, the programme fulfills South African government objectives in the following area:</p> <ul style="list-style-type: none"> • Improve energy efficiency • Enhancing economic development • Reduction on reliance of fossil fuels • Job creation • Promotion of CDM • Green house gas reduction <p>No community will be relocated due to the programme activity.</p>
	Social equity and poverty alleviation	<ul style="list-style-type: none"> • 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 <p>The programme activity involves creation of job opportunities in manufacturing, installation and maintenance.</p> <p>Because the programme uses local products, distribution of ZAR will be made within South Africa, boosting of local economics.</p> <p>Furthermore, saving of electricity will lead to reduced electricity bill and cash savings by the end user.</p>

Indicators in Support of the Project Approval Criteria		
Category	Indicator	Comment
General	General Project Acceptability <ul style="list-style-type: none">• Are the distribution of project benefits deemed to be reasonable and fair?	Project will give benefits in all sustainable development aspects mentioned above. Hence, the programme activity generates benefits that are reasonable and fair.

Part D: Finance

Project Costs	
Development Costs (R's)	8.9 million
Installed Costs (R's)	1.4 million
Other Costs (R's)	30 million
Total Project Costs (R's)	40.3 million
Sources of Finance	
Equity	30 % (Eskom subsidy of the total price to customer)
Debt (long term)	n/a
Debt (short term)	70 % (Customer contribution/loan of the total cost)
Amount not identified (R's)	n/a
Total CDM Contribution sought	6 million ZAR (estimate)
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)	5 EUR/CER
Indicate the projected Internal Rate of Return for the project with and without CER revenues.	n/a
Constraints on tradability of carbon credits	No.
Preliminary discussions with potential purchasers	Yes.