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	PoA title: Renewable energy generation through anaerobic digestion and biogas-based energy generation in South Africa. CPA1 title: CPA FSCAD001 – Under PoA "Renewable energy generation through anaerobic digestion and biogas-based energy generation in South Africa."
Date of Submission of PDD	1 August 2011

Project Developer	
Name	Farmsecure Carbon (Pty) Ltd
Organizational Category	Private Company
Legal Status	Limited Company
Street Address	350 Farm Wonderfontein Minaar Street Sasolburg 1947
Postal Address (if different from above)	P.O.Box 1033 Vanderbijlpark 1900

	RSA
Website Address	www.farmsecure.co.za
Main Activities	Farmsecure Carbon (Pty) Ltd is a company within the Farmsecure Technologies group of businesses, which is majority owned by the Farmsecure Group of Companies. Farmsecure Group is a multi-billion South African Rand Group of businesses operating in Sub-Saharan Africa. We are involved in creating profitable and sustainable enterprises in agriculture and the agri-processing value chain. Farmsecure Carbon is a project development and consultancy company in the greenhouse gas mitigation and renewable energy sectors. Our core business is the identification, design, financing, implementation and operation of economically viable projects under the Clean Development Mechanism (CDM) and in the areas of bio-energy production and carbon footprint reduction. This includes the provision of consulting/advisory services for project implementation and carbon-related services such as the compilation of carbon footprints, carbon reduction strategies, Environmental Life Cycle Assessments and feasibility studies.
Summary of Financial Performance in last fiscal year	Farmsecure Carbon (Pty) Ltd is a wholly owned subsidiary of Farmsecure Technologies (Pty) Ltd, which is a division of the Farmsecure Group of Companies. Farmsecure Technologies financial summary Assets end Dec: 20m Non-current assets end Nov: 60m Equity: -15m Revenue: 40m Gross profit: 20m Net profit: 16m Farmsecure Group financial summary Assets end Nov: 850m Non- current assets end Nov: 230m Equity: 320m Revenue: 403m Gross profit: 120m Net profit: 100m
Contact Person(s)	Isabelle Barnard
Telephone	Work: +27 (0) 83 657 8973 Cell: +27 (0) 86 677 1462
Fax	+27 (0) 16 970 8900
Email Address	Isabelle.barnard@farmsecure.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	Manjoh Ranch (Pty) Ltd
Nature of partner	The project is a joint venture between Farmsecure Carbon (Pty) Ltd

	and the farm Manjoh Ranch (Pty) Ltd. Farmsecure Carbon is the majority shareholder who will develop, implement, operate and maintain the project and will therefore also act as the CPA implementer. The Manjoh Ranch project is CPA1 under the PoA. Manjoh Ranch will supply the feedstock for the digester, namely manure form the feedlot and potato waste from the potato packing facility.
Organizational Category	Private Company
Legal Status (if private company)	Limited partnership
Street Address	Holgatfontein Nigel 1947 Gauteng
Postal Address (if different to Street Address)	P.O.Box 1052 Nigel 1490
Website Address	-
Main Activities	The main activities is the production of grain crops on 1087 ha, potato production of 300 ha and a feedlot of 9500 cattle.
Contact Person(s)	Tony da Costa
Telephone	+27 (0) 83 254 1847
Fax	
Email Address	tony@manjoh.co.za
Contractual Arrangements	
Contractual arrangements between various entities involved	The project is a joint venture between Farmsecure Carbon (Pty) Ltd and the farm Manjoh Ranch (Pty) Ltd. Shareholder and supply agreements are signed between the two companies.

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

Technical Summary of the project	
Objective of the Project	The PoA will involve renewable energy generation through anaerobic digestion and biogas-based energy generation. Some projects will also involve methane recovery from biomass that would otherwise have been left to decay anaerobically, thereby further mitigating GHG.

Project Description

The programme will involve renewable energy generation through anaerobic digestion and biogas-based energy generation. SSC-CPAs under the PoA will need to apply a methane avoidance methodology, AMS-III.AO or AMS-III.D, and the renewable energy methodology, AMS-I.C.

Methane avoidance methodology (AMS-III.AO or AMS-III.D):
All projects using anaerobic digestion technology (equipped with biogas recovery and combustion/flaring systems) need to apply a methane avoidance methodology for the purpose of calculating methane project emissions. Projects using biomass that would otherwise have been left to decay anaerobically in animal waste management systems (AWMS) and solid waste disposal sites (SWDS) may also use this methodology to claim methane emission reduction. One of the following methane avoidance

Technical Summary of the project

methodologies should be applied to each SSC-CPA:

- Methodology AMS-III.D applies under the following condition:
  a) Digestion of manure from AWMS as a single source of substrate, where this organic matter would otherwise have been left to decay anaerobically.
- Methodology AMS-III.AO applies under the following conditions:
  a) Digestion of waste from SWDS as a single source of substrate, where this organic matter would otherwise have been left to decay anaerobically.
  b) Co-digestion of waste from SWDS and manure from AWMS, where this organic matter waste would otherwise have been left to decay anaerobically.
  c) Digestion of substrates for which it cannot be demonstrated that the biomass would otherwise been left to decay anaerobically. Baseline emissions related to such biomass shall be accounted for as zero, whereas project emissions shall be calculated for all substrates.

Renewable energy methodology (AMS-I.C)

Biogas will be used as a fuel in a renewable energy facility in order to achieve one of the following project activities, applying methodology AMS-I.C:

a) Project activities that install biomass thermal energy plants that produce renewable thermal energy for on-site consumption or for consumption by other facilities.
b) Project activities that install biomass cogeneration plants that produce renewable electricity for supply to the grid or for captive use and renewable thermal energy for on-site consumption or for consumption by other facilities.
c) Project activities that involve the addition of renewable energy units at an existing renewable energy production facility.

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 is currently being developed by Farmsecure carbon, and the criteria that still needs to be met before project finance is available to start construction include:

- Positive RoD (record of decision) from the environmental impact assessment process – this process has commenced, and a specialist was appointed to manage it.
- Approval from Eskom regarding connection to their grid – this process is done in two phases and the application in this regard has been submitted to Eskom in April 2011. It is estimated that the process would take 6-8 months from start.
- Approval from NERSA i.e. an electricity generation license. This application process with NERSA has also commenced and based on their indications should take until November 2011 to complete.

Technology to be employed	**Technology employed in PoA:** <u>Anaerobic digestion process:</u> Anaerobic digestion is a biological process in which microorganisms break down biodegradable material through a series of processes in the absence of oxygen. Anaerobic Digestion consists of four key Biological and Chemical stages:

Technical Summary of the project	
	• Hydrolysis • Acidogenesis • Acetogenesis • Methanogenesis Biomass is mainly comprised of long organic polymer chains. In order for the bacteria in anaerobic digesters to access the energy potential of the material, these chains must first be broken down into their smaller constituent parts or monomers. The process of breaking the chains and dissolving the smaller molecules into solution is called hydrolysis. Therefore hydrolysis of these high molecular weight polymeric components is the necessary first step in anaerobic digestion. Through hydrolysis the complex organic molecules are broken down into simple sugars, amino acids, and fatty acids. Acetate and hydrogen produced in the first stages can be used directly by methanogens. Other molecules such as volatile fatty acids (VFA's) with a chain length that is greater than acetate must first be catabolised into compounds that can be directly utilised by methanogens. The biological process of acidogenesis is where there is further breakdown of the remaining components by Acidogenic bacteria. The third stage anaerobic digestion is Acetogenesis. Simple molecules created through the acidogenesis phase are further digested by acetogens to produce mainly acetic acid as well as carbon dioxide and hydrogen. The final stage of anaerobic digestion is the biological process of Methanogenesis. Methanogens utilise the intermediate products of the preceding stages and convert them into methane, carbon dioxide and water. The biogas that is emitted is largely made up of these components. Methanogenesis is sensitive to both high and low pH and occurs between pH 6.5 and pH 8. The remaining, non-digestible material which the microbes cannot feed upon, along with any dead bacterial remains constitutes the digestate. <u>Anaerobic digestion technology options:</u> Several technology options may be adopted under the PoA. The most suitable technology will be selected for each SSC-CPA. The most common technologies are: • *Covered Lagoon systems:* The covered lagoon consists of a lagoon that is covered by a flexible plastic membrane to contain the biogas produced by the digester while preventing outside air from leaking into it.

Technical Summary of the project	
	• *Mixed Reactor systems:* The mixed reactor blends manure to reach a homogenous concentration. Commonly used designs are a Completely Mixed Digester (Constantly Stirred Tank Reactor; CSTR) ; Anaerobic Sequencing Batch Reactor (ASBR) ; Up-flow Anaerobic Sludge Blanket Digester (UASB) ; Anaerobic Filter (Fixed Film Digester, Fix- Bed Anaerobic Reactor) ; Fluidized Bed Reactor (Expanded Bed Reactor, Moving Bed Bio-film Reactor). • *Plug-Flow Reactor systems:* A plug-flow reactor is a long tank through which manure moves during processing. These reactors are typically made of concrete or plastic. Commonly used systems include tubular polyethylene and concrete digesters. • *Dry fermentation reactor systems:* The dry fermentation anaerobic digester can be operated in either the mesophilic or thermophilic mode and process biomass having 15 to 45% dry matter. In the horizontal format, as offered by Linde, it operates similar to the plug flow reactor except that it is equipped with rotating mixers operating at right angles to the flow of the biomass within the reactor and a bottom conveyor to remove sand, gravel and other residue to the discharge end. The vertical unit, although not in full production yet, is available through Brainshell in Brandenburg Germany. This unit, termed the Upflow Anaerobic Solid State (UASS) Reactor feeds the biomass at the bottom of the reactor and relies on a fermented liquid and gravity to float the digested biomass upwards for removal at the top. Both systems offer the ability to anaerobically digest manure without dilution and very little use of external water. <u>Biogas recovery and combustion system:</u> Each SSC-CPA will include a system of collecting the biogas produced by the anaerobic reactor, treating it as required and combusting it, thus preventing its release to the atmosphere. The system used will depend upon the type of anaerobic digester used, quality of the biogas produced; and biogas engine or turbine that will be used to combust the gas and generate electricity. It will typically contain: • a blower & piping system to collect & transfer the gas, • scrubbers to purify the gas prior to combustion as may be required • biogas engine(s) or turbine to combust the biogas and generate electricity and thermal energy • a enclosed biogas flare to provide for auxiliary/standby combustion when the biogas has to be flared.

<table>
<tr><th colspan="2">Technical Summary of the project</th></tr>
<tr><td></td><td>Digestate (effluent) management system:
The anaerobic digestion treatment system will produce a stabilized digestate, the quantity dependent on the type of reactor used and the amount of biomass digested. In all SSC-CPAs the sludge will be applied to soil in a manner that ensures aerobic conditions and avoids methane emissions.

Other components:
Depending on the SSC-CPA, additional components may be added to enhance treatment including a nutrient recovery system, centrifuge for digestate thickening and polishing ponds after the anaerobic digester if further treatment is required of the effluent prior to application on land.

Technology employed in CPA1 – Manjoh Ranch

The technology choice is a Continuously Stirred Tank Reactor (CSTR) supplied by Highmark Renewables. A completely mixed reactor is known as a low rate digester technology and it is essentially a tank that is heated and mixed.

The CSTR technology is proven technology with many biogas plants in Europe and wastewater treatment facilities in the United States as reference. Highmark is supported by generations of agricultural, engineering and business acumen that has and continues to contribute to the successful implementation of Highmark's technologies.</td></tr>
<tr><td>Greenhouse Gases Targeted</td><td>CO_2 and CH_4</td></tr>
<tr><td>Emission reductions</td><td>CPA1 expected emission reductions 3 times 7 years

<table><tr><th>Year</th><th>tCO_2e/yr</th></tr><tr><td>2012</td><td>4 909</td></tr><tr><td>2013</td><td>4 909</td></tr><tr><td>2014</td><td>4 909</td></tr><tr><td>2015</td><td>4 909</td></tr><tr><td>2016</td><td>4 909</td></tr><tr><td>2017</td><td>4 909</td></tr><tr><td>2018</td><td>4 909</td></tr><tr><td>Total (7years)</td><td>34 363</td></tr></table></td></tr>
<tr><td>Baseline & Additionality Assessment</td><td><u>PoA additionality</u>

There are no regulations in South Africa that require the implementation of renewable energy projects or methane recovery in AWMS and SWDS. All the key players, including Farmsecure Carbon and the project participants, are voluntarily participants in the PoA.</td></tr>
</table>

Technical Summary of the project	
	Methane recovery and energy generation from biomass could not be successfully implemented in the past due to high investment cost compared the normal practise and the lack of technical skills to design and operate the systems. Without the PoA to provide additional financial incentives, Farmsecure Carbon to provide the technical skills and financing (were necessary), the potential participants would not be interested in pursuing such projects. Many of the potential participants in South Africa are too small to individually take part in the CDM process. The small quantity of potential CERs is not enough to justify the effort and cost associated with the normal CDM process. Through the PoA, Farmsecure hopes to reduce validation, registration and verification cost per SSC-CPA and in this way enable the inclusion of small to medium sized project in the CDM process. **<u>CPA1 additionality</u>** This section is completed with reference to "Tool for the demonstration and assessment of additionality, version 05.2". Either the investment barrier or the barrier analysis should be completed. The investment barrier is described in step 2 and the barrier analysis in step 3. The compulsory common practice analysis is described in step 4. See ***Step 2: Benchmark analysis:*** The project IRR is 12.8% which is below the benchmark and this indicate the need for CDM revenues for the implementation of the project. When CDM revenues are taken into account with a price of 13€/tCO_2e, the IRR increases to 16.34%. ***Step 3: Barrier analysis:*** *Technological Barrier:* Anaerobic biological treatment of biomass to produce biogas is a new and relatively unknown technology in South Africa. The lack of available knowledge and confidence in the technology makes this type of development difficult to establish. As a result, this technology is viewed as risky and this risk is reflected in the fact that there are not many projects of this type in South Africa. ***Step 4: Common practice analysis*** Anaerobic digester technology that will be utilized in the project activities is not a common practice in South Africa and, as

Technical Summary of the project

previously discussed, represents a higher risk alternative to the business-as-usual scenario. There is little experience in utilizing anaerobic digester technologies in South Africa and therefore, these are not considered a high management priority. In effect, there are only two economic anaerobic digesters (excluding industrial and municipal wastewater treatment anaerobic digesters) in South Africa. These two projects, the "Kanhym Farm manure to energy project" and "Humphries Boerdery (Edms) Bpk, piggery methane capture and electrical generation" are both CDM projects. There are only a few domestic scale projects where, for example, chicken manure is digested in polymer bladders.

The entry of Independent Power Producers in South Africa Power market is a recent phenomenon, with ESKOM still playing the dominant role in terms of generation capacity. Only a very small percentage of South Africa's generation capacity comes from non Eskom sources. These are all either municipally owned plants or generators imbedded in large industrial operations supplying primarily for own internal use. There are therefore almost no privately owned power plants in South Africa apart from co-generation plants owned by large industry. In fact, only as of April 15, 2011, Eskom had signed up with three IPPs (IPSA, Tanget Mining and Sappi) to supply it with373 MW of power and it is expects to increase its purchase to 400 MW by the end of 2011. Given that Eskom has a net maximum capacity of 40,870 MW, the purchase from IPPs represents less than 1% of the total. IPPs however are stymied by Eskom's reluctance to purchase power from IPPs.

The renewable energy from biomass projects will be some of the first Independent Power Plants to be constructed in South Arica for the purpose of selling power commercially. The process is further complicated and prolonged by the application for an Independent Power Producers license from the National Electricity Regulator of South Africa (NERSA). In this case, under the government's integrated resource plan (IRP)[1] Eskom is looking to purchase 1,025 MW of power from Renewable energy sources by 2013.

Monitoring

Parameter	Unit	Description
f	-	Fraction of methane captured at the SWDS and flared, combusted or used in another manner
W_x	ton	Total amount of organic waste prevented from disposal in year x
$p_{n,j,x}$	%	Weight fraction of the waste type *j* in the sample n collected during the year *x*
z	Number	Number of samples collected during the year x

[1] Integrated resource plan for electricity, available under: http://www.doe-irp.co.za/content/IRP2010_2030_ Final_Report_20110325.pdf)

Technical Summary of the project		
W_{site}	Kg	Average animal weight of a defined livestock population at the project site.
nd_y	Days/yr	The number of days that the animal manure management system capturing methane and flaring/combusting using methane was operational.
$N_{da,y}$	Days	Number of days animals are alive in the farm in the year *y*
$N_{p,y}$	Number	Number of animals produced/bought annually of type *LT* for the year *y*
$MS\%_{i,y}$	Fraction	Fraction of manure handled in baseline animal manure management system *j*
Application	-	Soil application of the compost or slurry in agriculture or related activities.
$BG_{flare,y}$	Nm^3/yr	Biogas flow to the flare
$BG_{elec,y}$	Nm^3/yr	Biogas flow to the electricity generation system
$BG_{heat,y}$	Nm^3/yr	Biogas flow to the thermal energy generation system
T_{biogas}	^oC	Temperature of the biogas
P_{biogas}	kPa	Biogas pressure
$B_{WT,y}$	kgWW/yr	Net quantity from each waste type from the SWDS in year *y*
$B_{BT,y}$	kgWW/yr	Net quantity of each biomass type in year *y*
$\%water_{WT}$	%	Moisture content from each waste type from the SWDS
$\%water_{BT}$	%	Moisture content of each biomass type
$\%VS_{WT}$	%	% Volatile solids in the total solids from each waste type
$\%VS_{BT}$	%	% Volatile solids in the total solids of each biomass type
$EG_{gross,y}$	MWh/yr	Gross amount of electricity generated from biomass
$EG_{aux,y}$	MWh/yr	Auxiliary electricity consumption
$EG_{import,y}$	MWh/yr	Electricity import from the grid to the project power plant
$EG_{elec,PJ,y}$	MWh/yr	The total net electrical energy supplied to a grid or displaced from the grid in year y by all units, existing and new
$EG_{elec,actual,y}$	MWh/yr	The actual, measured net electrical energy supplied to the grid or displaced from the grid by the existing units in year *y*
$HG_{thermal,y}$	TJ/yr	Net quantity of thermal energy supplied by the project activity during the year *y*
$HG_{cogen,thermal,y}$	TJ/yr	Net quantity of cogeneration thermal energy supplied by the project activity during the year *y*
$HG_{thermal,PJ,y}$	TJ/yr	Total actual thermal energy produced in year *y* by all units, existing and new project units
$HG_{thermal,actual,y}$	TJ/yr	The actual, measured thermal energy production of the existing units in year *y*
M	kg/hr	Mass or volume flows of all relevant streams (hot air and/or hot steam)
T	°C	Temperature of all relevant streams
P_{steam}	kPa	Steam pressure
T_{flare}	^oC	Temperature in the exhaust gas of the flare
P_{flare}	kPa	Pressure in the exhaust gas of the flare
w_{CH4}	%	Methane content in the biogas
$\eta_{flare,h}$	Fraction	Flare efficiency in hour *h*
$FV_{RG,h}$	m^3/h	Volumetric flow rate of the residual gas in dry basis at normal conditions in hour h
$MS\%_l$	%	Fraction of volatile solids handled by storage device *l*
AI_l	days	Annual average interval between manure collection and delivery for treatment at a given storage
f_{RW}	%	Fraction of methane captured at the SWDS and flared, combusted or used in another manner
$W_{RW,j,x}$	ton	Total amount of sludge disposed in SWDS in year x
$Q_{y,WT}$	ton or m^3	Quantity of waste transported in the year y

Technical Summary of the project		
$Q_{y,BT}$	ton or m^3	Quantity of biomass transported in the year y
$Q_{y,LT}$	ton or m^3	Quantity of raw manure transported in the year y
$Q_{y,sludge}$	ton or m^3	Quantity of digester sludge transported in year y
$Q_{LE,y}$	ton or m^3	Quantity of biomass transported outside project boundary in yr y
$CT_{y,WT}$	m^3/truk	Average truck capacity for waste transportation from SWDS
$CT_{y,BT}$	m^3/truk	Average truck capacity for biomass transportation
$CT_{y,LT}$	m^3/truk	Average truck capacity for manure transportation
$CT_{y,sludge}$	m^3/truk	Average truck capacity for sludge transportation
$CT_{LE,y}$	m^3/truk	Average truck capacity for biomass transported outside boundary
$DAF_{w,WT}$	km/truck	Incremental distance for waste transportation from SWDS
$DAF_{w,BT}$	km/truck	Incremental distance for biomass transportation
$DAF_{w,LT}$	km/truck	Incremental distance for manure transportation
DAF_{sludge}	km/truck	Incremental distance for sludge transportation
$DAF_{LE,w}$	km/truck	$DAF_{LE,w}$: Incremental distance for biomass transportation outside boundary
$VF_{LE,cons}$	ℓ/km	Vehicle fuel consumption for transportation inside boundary
$VF_{LE,cons}$	ℓ/km	Vehicle fuel consumption for transportation outside boundary
$NCV_{i,y}$	TJ/kg	Net calorific value of the fossil fuel type *i* combusted in the project activity in year y
$NCV_{c,y}$	TJ/kg	Net calorific value of the fossil fuel type *c* combusted outside the project boundary in year y
$NCV_{fuel,y}$	TJ/kg	Netc calorific value of the fuel used for project activity transportation in year y
$NCV_{LE,fuel,y}$	TJ/kg	Net calorific value of the fuel used for transport outside the project boundary in year y
$EF_{CO2,i}$	tCO_2e/TJ	CO_2 emission factor of the fossil fuel type *i* used inside the project boundary
$EF_{CO2,c}$	tCO_2e/TJ	CO_2 emission factor of the fossil fuel type *c* used outside project boundary
$EF_{CO2,fuel}$	tCO_2e/TJ	CO_2 emission factor of the fossil fuel used for transport inside the project boundary
$EF_{LE,CO2,fuel}$	tCO_2e/TJ	CO_2 emission factor of the fossil fuel used for transport outside the project boundary
$FC_{i,y}$	Mass/yr	Quantity of fossil fuel type *i* combusted in the project boundary
$FC_{c,y}$	Mass/yr	Quantity of fossil fuel type *c* combusted outside project boundary
$M_{SFi,y}$	ton/yr	Mass of synthetic fertilizer type *i* applied in year *y*
$M_{OFj,y}$	ton/yr	Mass of organic fertilizer type *j* applied in year *y*
NC_{SFi}	gN/100g	Nitrogen content of synthetic fertilizer type *i* applied
NC_{OFj}	gN/100g	Nitrogen content of organic fertilizer type *j* applied

Type of project/activities	
a. Energy Supply	Renewable biomass. **PoA**: Renewable energy generation through anaerobic digestion and biogas-based energy generation in South Africa. **CPA1**: CPA1 involve the installation of a anaerobic digester and a biogas cogeneration plant that produce renewable electricity for supply to the grid and thermal energy for on-site use by the project activity (emission reduction not eligible), thereby mitigating GHG emissions.

Technical Summary of the project	
b. Energy Demand	-
c. Industrial Process	-
d. Transport	-
e. Waste Management	-
f. Forestry/ land use	-
g. Other	-

Project Boundary

The project boundary is the physical, geographical site:

(a) Where the solid waste (including animal manure, where applicable) would have been disposed and the methane emission occurs in absence of the proposed project activity;

(b) Where the treatment of biomass or other organic matters through anaerobic digestion takes place;

(c) Where the residual waste from biological treatment or products from those treatments, like slurry, are handled, disposed, submitted to soil application, or treated thermally/mechanically;

(d) Where biogas is burned/flared or gainfully used, including biogas sale points, if applicable, the boundary also extends to the industrial, commercial or residential facility, or facilities, consuming energy generated by the system and the processes or equipment that is affected by the project activity.

(e) And the itineraries between them the above, where the transportation of waste

(f) , manure, residual waste after digestion, or biogas occurs.

Indicate Emissions outside the Project Boundary	**PoA**: Leakage emissions from the renewable energy project activity consist of: • Leakage emissions from collection/processing/transportation of biomass outside the project boundary • Leakage emissions from project activities involving renewable biomass **CPA1**: Leakage emissions for CPA1 was calculated as zero

Location of the Project	
Province	Gauteng
Municipality	Ekurhuleni
Nearest city/large town	Nigel
Brief description of the location of the project site	Manjoh Ranch is situated next to the R42, approximately eight km outside Nigel on the way to Delmas.

Project Schedule/Timetable	
Earliest Project Start Date	01/01/2012
When is the expected first year of CER delivery	Crediting period is expected to start 01/10/2012

Project Schedule/Timetable	
Project Lifetime	21 years
Project End Date	01/01/2033
Crediting Period	3 times 7 years, with reassessment of baseline for each 7 year renewal
Current Status or phase of the project	Preparation
DNA Approval	Project as not been submitted to the DNA previously
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.* Approval from NERSA is required for an electricity generation license. This application process with NERSA has also commenced and based on their indications should take until November 2011 to complete.

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 towards economic development in the following ways:

- Employment of several tens of local people during the design and construction phase.
- Full-time employment of several management, operating and maintenance staff after commissioning. Staff from formerly disadvantaged communities will be targeted.
- Full time employment of support staff
- Taxable income from the project over the project lifespan.

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

Over and above the employment opportunities mentioned above, management, operational and maintenance staff will receive internal and external training on the project that will increase their skill base and allow effective management, operation and maintenance of the project.

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	The project will be implemented on land zoned for agricultural use, but will be implemented on land not currently used for crop or livestock use. In addition, all applicable South African legislation will be adhered to (including specialist biodiversity studies).

ii) That **pollution and degradation of the environment** are avoided, or where they cannot be altogether avoided, are minimised and remedied	The inherent nature of the project is such that waste material is processed for the generation of energy and thus current potentially polluting practices are improved. In addition, all applicable South African legislation will be adhered to in terms of potential pollution, both during the construction phase and the operational phase. By-products (both solid and liquid) generated by the process will be handled and stored in such a way that pollution potential is minimized. Solid material will be stored on concrete areas, and liquid product will be stored in lined dams in accordance with legislation.
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 project will be implemented on land zoned for agricultural use, but will be implemented on land not currently used for crop or livestock use. In addition, all applicable South African legislation will be adhered to (including specialist heritage studies).
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 inherent nature of the project is such that waste material is processed for the generation of energy and thus current potentially polluting practices are improved. In addition, all applicable South African legislation will be adhered to in terms of potential pollution, both during the construction phase and the operational phase. By-products (both solid and liquid) generated by the process will be handled and stored in such a way that pollution potential is minimized. Solid material will be stored on concrete areas, and liquid product will be stored in lined dams in accordance with legislation. In order to minimize liquid waste, water needed for feedstock dilution will be recycled.
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	No non-renewable resources are used in the process. By the nature of the project, renewable resources (wastes) are used to generate renewable electricity. Power requirements for the project are generated by the project.
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 project utilizes waste biomass (a renewable resource) for the generation of renewable energy, which is aligned with the South African renewable energy policy and targets.
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	Established technology that has been implemented in numerous countries worldwide will be implemented in order to minimize not only the financial risks, but also the risk of pollution.
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 nature of the project is such that the negative impacts on the environment from current practices will be improved. Mitigating measures for the small risk of negative environmental impacts from the technology itself will be taken in accordance with South African legislation.
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)	Air quality: • Odour emanating from existing waste management practices will almost entirely be eliminated. Putrescible material in the raw waste will be removed by the digestion process and converted to methane and carbon dioxide. Sulphur containing compounds generated in the processes are converted to non-odorous compounds biologically. • Methane in the biogas is converted to carbon dioxide in the electricity generation process. • Greenhouse gas emissions from the raw manure are thus significantly reduced by the process. Water: • Potential water contamination by the raw wastes that are currently applied on land will be significantly reduced since the raw waste is stabilized during the process. • Solid material from the process (that has been stabilised) will be registered as a fertilizer, will be stored on concrete surfaces and will be applied to land as a fertilizer. • Liquid material from the process will registered as a fertilizer, will be stored in lined dams for land application as a fertilizer • The process removed >90% of the pathogens present in the raw waste, thus improving current microbial contamination. Other: • All applicable South African health and safety legislation will be adhered to • The project will be implemented in a rural area, where aesthetic effects will be minimal.

Indicators in Support of the Project Approval Criteria			
Category		**Indicator**	**Comment**
	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 be implemented on private land in a rural/farming setting. • No water (other than a small amount for domestic use by operating staff) will be used in the process. No non-renewable resources will be used. • The project, by its nature, converts waste to energy, and thus efficiently utilizes resources.
	Impacts on biodiversity and ecosystems	• Changes in local or regional biodiversity arising from the project	The project will be implemented in a rural/farming setting on land that is currently zoned for agriculture, but not on land that is currently used for crop or livestock production. All applicable South African legislation will be adhered to – including heritage and biodiversity studies to ensure that impacts on biodiversity and heritage are minimised.

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 programme will provide business opportunities for biomass suppliers, local labour contractors and equipment suppliers which will help increase the income of these people who are directly or indirectly connected with the programme. • The programme provide the potential for new sources of revenue from renewable energy, raising the economic benefits from the agricultural industry
	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 technology employed by the project has been implemented widely in foreign countries, but not in South Africa. The local and global energy crisis and international and local government policy and legislation are driving the renewable energy market. The technology employed will enhance the capability and skill of South Africans to participate in this market, and contribute to national targets in this regard. • In addition to the above, local skills will be advanced in the understanding, operation and maintenance of the technology. These skills are transferrable. • The technology is replicable

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)	• National government has set objectives in terms of renewable energy generation and the reduction of greenhouse gases. The project aligns with these objectives. • The project will provide part-time as well as full-time employment to South Africans. • The project has the potential to provide electrical power to sections of the local area. • The project will not have an impact on the relocation of communities.
	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	• During the design and construction phase of the project (12-18 months), 50-100 skilled and semi-skilled people will be employed (the majority of which will be from previously disadvantaged communities). • During the operational phase of the project, approximately 4 management, operational and maintenance skilled and semi-skilled staff will be employed from previously disadvantaged communities. In addition, approximately 10 support staff will be employed. • The project will not have an impact on community social structures or on social heritage. • Besides the provision of employment, the project has the potential to provide electrical power to 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?	

Part D: Finance

Project Costs	
Development Costs (R's)	R 1 766 000
Installed Costs (R's)	Capital: R 23 216 00
Other Costs (R's)	Operating cost: R 1 396 352 (first year)
Total Project Costs (R's)	R 23 216 00
Sources of Finance	
Equity	*Name of Organisation(s) and amount (R's) contributed by each* *Farmsecure Technologies, 30% of Capital as Equity, R 6 964 900*
Debt (long term)	*Name of organization(s) and amount (R's) for each* *Nedbank, 70% of Capital as project finance, R 16 251 200*
Debt (short term)	N*ame of organization(s) and amount (R's) for each* None
Amount not identified (R's)	*Amount (R's) and a brief summary of the needs and any outstanding issues* *(1 paragraph or less)* None
Total CDM Contribution sought	*Amount (R's) and a brief summary of the needs and any outstanding issues* *(1 paragraph or less)* R 667 887 in 2013 @ R139.21/tCO2
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)	*Price? (R139/CER)* *Price? (R133/CER)* *Price? (R127/CER)*
Indicate the **projected Internal**	Without CERs: 12.81%

Rate of Return for the project with and without CER revenues.	With CERs: 15.61% CER price:€11.8/tCO2e
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. None
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.* Nedbank, as project financier would be interested in the CERs, and Evolution markets would also be willing to purchase the CERs.