



**CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006**

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**SECTION A. General description of project activity****A.1 Title of the project activity:**

Durban Landfill-gas-to-electricity project – Bisasar Road Landfill

Version 2007-03-28

A.2. Description of the project activity:

Note: The project was originally conceived as a joint project with two other landfill sites in the eThekweni municipality, Mariannhill and LaMercy, under the Durban Landfill Gas to Electricity scheme. The project at the two other sites is currently undergoing validation. The same methodology applies to this project.

The project consists in an enhanced collection of landfill gas at the Bisasar Road landfill site of the municipality of Durban and the use of the recovered gas to produce electricity. The produced electricity will be fed into the municipal grid and replace electricity that the municipal electric company is currently buying from other suppliers.

The Bisasar Road landfill is an active landfill that will be operational at least until after 2020. Currently, the Bisasar Road landfill collects up to 2,500 tonnes of waste per day and flares only a portion of the methane generated for local, site-specific reasons. The proposed project will substantially upgrade the current low 7.4% efficiency of the collection system (only a partial collection system), increasing to about 83% collection efficiency at the peak in 2012, and dropping to about 45% collection efficiency at the end of the commercial project life.

Spark ignition engine generators (Jenbacher type 320) will be installed to generate electricity. Initially 3 MW will be installed expanding to 8MW by 2012. The gas fired engines have a conservatively projected useful life of 10 years; the engines may have to be replaced at around this time to permit a continuation of the commercial operations of the electricity generation activity. Over the course of the initial 7 year crediting period the generators are projected to produce nearly 350,000 MWh electricity amounting to an estimated CO₂ reduction of 340,000 tonnes of CO₂ reduced.

With regard to the local environment the project has positive effects on air and groundwater quality. By displacing electricity from the grid the project reduces emissions related to coal-fired power production which include sulphur oxides, nitrogen oxides, and particulates. It also reduces the adverse impacts related to transportation of coal and coal mining (dust and acid mine drainage). Near the landfill site the project improves the air quality by further reducing the amount of landfill gas released into the atmosphere and thus reducing the risk of exposure of neighbouring residents to odour. This is particularly relevant as the Bisasar Road landfill site is located close to a residential area. All gas capturing wells to be installed will be equipped for leachate removal which contributes to the protection of groundwater. With regard to local employment the project will result in a small increase in the area of skilled jobs for operation and maintenance of the equipment.

**A.3. Project participants:**

Name of Party Involved	Private and/ or public entity	Party wishes to be considered as project participant
Republic of South Africa (host)	<ul style="list-style-type: none">▪ Durban Solid Waste (DSW), project developer and operator▪ eThekweni municipality, formerly known as Durban, project sponsor	No

Please see Annex 1 for contact details.

Contact for the CDM project activity is Durban Solid Waste (see separate statement of Modalities of Communication).

A.4. Technical description of the project activity:**A.4.1. Location of the project activity:**

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A.4.1.1. Host Party(ies):

Republic of South Africa

A.4.1.2. Region/State/Province etc.:

KwaZulu Natal, South Africa

A.4.1.3. City/Town/Community etc:

Municipality of eThekweni, formerly known as Durban

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

The Bisasar Road landfill site is situated 7 km from the Durban CBD (Central Business District). Durban is geographically located in the southeast region of South Africa on the Indian Ocean coast

A.4.2. Category(ies) of project activity:

Sectoral Scope 13: Waste Handling and Disposal

Sectoral Scope 1: Renewable Energy

A.4.3. Technology to be employed by the project activity:

Durban Solid Waste (DSW) is the municipal agency responsible for the management and operation of multiple landfills in the Durban metropolitan area. Under the proposed project, DSW commissions the



installation of landfill gas extraction wells, flare units and landfill gas generators for the Bisasar Road landfill site. DSW will function as the technical advisor and operator of the project.

Specifically, the following technology will be installed:

- *Extraction wells:* Some 122 vertically driven gas wells will be constructed during phased restoration of the site to extract the landfill gas as it is produced.
- *Gas collection pipework:* These pipes collect and transport the gas from the wells to the extraction plant from where the gas will be used for electricity generation, with any surplus gas being flared.
- *Gas extraction plant (blower):* A centrifugal blower is required to extract landfill gas from the wells and supply this to either the generation engines or the flare unit. The blower creates lower pressure inside the wells than in the landfill, thereby sucking the gas from the landfill into the wells and from there to the extraction plant.
- *Flare units:* A landfill gas flare with minimum capacity of 1,000Nm³/hr will be installed at the site.
- *Landfill gas generators:* several 1MW spark ignition engine generators (Jenbacher type 320) will be provided at the site to utilise the energy from the gas and generate electricity (initially totalling 3 MW and expanding to 8 MW by 2012). The engines will be specified to the latest European Union design standards, notably for exhaust emissions.
- *Switch gears, transformers and cabling:* as needed for the interconnection with the eThekwin Electricity grid.

A.4.4 Estimated amount of emission reductions over the chosen crediting period:

This project is composed of two complementary components as follows:

- Collection, flaring, and combustion of landfill gas, thus converting its methane content into CO₂ and reducing its greenhouse gas effect; and,
- Generation and supply of electricity to the regional grid, thus displacing electricity generation from thermal (mainly coal) power plants.

It is estimated that the project will reduce an aggregated 2,466,957 tonnes of CO₂ in the first 7 year crediting period.

Years	Annual estimation of emission reductions in tonnes of CO₂e
2007*	107,363
2008	282,474
2009	283,134
2010	323,933
2011	337,123
2012	442,858
2013	458,290



2014*	231,783
Total estimated reductions (tonnes of CO ₂ e)	2,466,957
Total number of crediting years (First crediting period)	7
Annual average over the crediting period of estimated reductions (tonnes of CO ₂ e)	352,422

All values in tonnes of CO₂ equivalent

* As the starting period of the project activity is 1st July 2007. Years 2007 and 2014 cover 6 months only.

The estimated total annual emissions reductions break down into the two components as follows.

Years	Annual estimation of emissions reductions from methane (tCO₂e)	Annual estimation of emissions reductions from electricity (tCO₂e)
2007*	95,627	11,736
2008	243,354	39,120
2009	244,014	39,120
2010	276,989	46,944
2011	290,179	46,944
2012	380,266	62,592
2013	395,698	62,592
2014*	200,487	31,296

All values in tonnes of CO₂ equivalent

* As the starting period of the project activity is 1st July 2007. Years 2007 and 2014 cover 6 months only.

A.4.5. Public funding of the project activity:

This project will not be funded by international Official Development Assistance (ODA) or other sources earmarked for development assistance.

**SECTION B. Application of a baseline and monitoring methodology****B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:**

Approved baseline and monitoring methodology AM0010 “Landfill gas capture and electricity generation projects where landfill gas capture is not mandated by law”

B.2 Justification of the choice of the methodology and why it is applicable to the project activity:

The selected baseline methodology has been developed in the context of this project.

The project meets the application criteria that have been specified for the use of this methodology, namely:

- The landfill is subject to regulation of methane (CH₄) concentration but landfill gas capture is not mandated by law
- The captured gas is used to generate electricity and the CO₂ emissions intensity of this electricity is lower than the emissions intensity of the electricity displaced;

The electricity generation capacity of the project does not exceed 15MW.

B.3. Description of the sources and gases included in the project boundary

The boundary of the project is the site of the project activity where the gas is captured and destroyed, the Bisasar Road landfill site.

For assessment of the emission reductions from displaced grid-electricity, the system boundaries to be considered include the national grid, i.e. the power suppliers that deliver electricity to the city of Durban. The bulk of this supply is from South African regional coal-fired power plants located long distances from Durban. The interconnection is through high voltage transmission lines. EThekweni Electricity buys 99.99% of its power (approximately 10 000 GWh per year at a maximum demand of 1, 600 MVA) from Eskom. South Africa's national grid is partly interconnected with neighboring countries. Being a net exporter of power, the additional capacity generated through the project however mainly affects power generation in South Africa. Thus, the system boundary to be considered is the national grid only.

	Source	Gas	Included	Justification/ Explanation
BASELINE	Collection, flaring and venting of landfill gas	CO ₂	No	
		CH ₄	Yes	
		N ₂ O	No	
	Electricity generation (grid)	CO ₂	Yes	
		CH ₄	No	
		N ₂ O	No	



PROJECT ACTIVITY	Collection, flaring and venting of landfill gas	CO2	No	
		CH4	Yes	
		N2O	No	
	Electricity generation	CO2	Yes	
		CH4	No	
		N2O	No	

B.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

AM0010 defines the baseline as the scenario reflecting all actions that have to be implemented in order to meet the regulations on methane concentration, as well as good management practice to address safety and odour concerns. If these actions correspond to the establishment of several “baseline” wells, the quantity of methane collected via these wells shall be monitored, and it should be demonstrated that the quantity collected is sufficient to meet the regulation on methane concentration during the entire crediting period.

In the below paragraphs, the baseline scenario is determined following the four steps outlined in AM0010.

Step 1: Provide a convincing justification that there is no plausible baseline scenario except the project and the business as usual (BAU) scenario. If there is another plausible baseline scenario, this methodology cannot be used for the proposed project activity. The justification of the baseline scenario shall take into account whether national or local regulations require capture of landfill gas.

Several scenarios have been identified as possible future developments, namely:

- (a) Business-as-usual (BAU): There is no active landfill gas collection and utilization system in place. Landfill gas is currently vented to ensure that the concentration of methane in any particular area of the landfill stays below hazardous levels. In the past, collection wells were installed as a pilot to investigate the feasibility of landfill gas recovery for electricity generation. However, as it turned out that this option was uneconomical, DSW has abandoned all further activities. The BAU scenario is the continuation of passive venting and the operation of the test wells with declining efficiency.
- (b) The proposed project: collection of most landfill gas, its use for municipal power generation on the landfill site, and an equivalent reduction in power purchases from Eskom.
- (c) Collection and flaring of most of the landfill gas without use of the gas for power generation.

Existing landfill capacity, cost considerations and regulatory requirements governing waste management were identified as the key factors that influence the realization of the above scenarios. Based on these factors, scenario (c) was rejected as an implausible baseline alternative.



Currently no collection and flaring are required by South Africa's waste management regulations. The installation of a gas collection and flaring system in excess of current practice and legal requirements would result in unnecessary costs without associated income (or cost savings) to offset these costs.

The South African Department of Water Affairs & Forestry (DWAF) requires all landfill operators to monitor CO₂ and CH₄ concentrations. The DWAF specifies the requirements for landfill operators as follows:

"The Permit Holder shall implement adequate measures to the satisfaction of the Regional Director, to ventilate or to prevent lateral migration of CH₄ gas generated in the site so that build up of dangerous concentrations is prevented. The concentration of flammable gas outside the waste disposal area and inside the Site shall not exceed 1% by volume in air and the concentration of CO₂ should not exceed 0.5% by volume in air, amended for Standard Temperature and Pressure." (from Landfill Permit Requirements)

The minimum requirements for waste disposal by landfill in South Africa include gas monitoring at all hazardous and large landfills, reporting to the department if the concentration of soil gas exceeds 1%, and permanent venting systems if the methane concentration exceeds 5% in air (per Minimum Requirements for Waste Disposal by Landfill, Second Edition 1998.)

In the past, the environmental standards for landfills have been tightened on average every four years. New revised DWAF Minimum Requirements were issued on 21st October 2005. Currently, there is no indication that the DWAF will require gas capture and flaring from permit holders in the near future being aware of the high costs that such a requirement would incur on landfill operators. The Bisasar Road, the Mariannhill and the Durban Mobeni landfills are currently the only landfill sites in South Africa which have installed an active gas flaring system. Rather, ongoing discussions indicate that the upcoming revision of the permit requirements will loosen the acceptable standard for CO₂ concentration.

The landfill operates in compliance with the mandatory requirements. In the absence of further regulatory or economic incentives to collect and destroy landfill gas, the plausible baseline alternatives are reduced to the project and the BAU scenario.

Step 2: Calculate the cost of a kWh of electricity generated by the project using conservative assumptions. The calculation must include the incremental investment cost, the operations and maintenance costs, and all other costs of upgrading the BAU scenario to the proposed project activity. Assumptions are conservative if they tend to reduce the cost of the electricity generated. Conservatism of the assumptions should be ensured by obtaining expert opinions and by the Operational Entity validating the project.

The expected cost of electricity generation by the project is calculated at US\$ 0.0422/kWh.

Details to the calculation are provided in Annex 3 (Baseline Information).

Step 3: Determine the long run marginal cost (LRMC) of continued electricity generation by the grid. The LRMC is expressed as a cost per kWh. To be conservative, assumptions used to calculate the LRMC should increase the cost per kWh.



Until the end of the project's first crediting period in 2014, the LRMC of electricity generation by the grid are conservatively estimated at US\$ 0.0225 per kWh. Over the project lifetime, the LRMC are expected not to exceed US\$ 0.0365 per kWh.

Details to the calculation are provided in Annex 3 (Baseline Information).

Step 4: Demonstrate that the cost of the electricity generated by the project (Step 2) is higher than the LRMC (Step 3). If that is the case, it can be assumed that generation by the grid (the baseline scenario) is financially more attractive than generation by the project and that the project is additional.

Based on current low power purchase prices and using the equally low LRMC for power production in South Africa as an approximation of future electricity prices charged to communities, it is concluded that, from an investment point of view, the auto-generation option using the landfill gas is not an economically attractive course of action for the municipality now or in any foreseeable future.

The baseline scenario, as determined above, is the continuation of the current practice of limited collection and flaring of methane from the landfills in compliance with applicable regulations. Given the long-run calculation performed in the baseline study, the BAU baseline is likely to be valid for the duration of the 21-year crediting period selected for this project. However, the BAU baseline includes the possibility that future South African waste management regulations will require the treatment of landfill gas, in which case the baseline scenario would have to reflect such new obligations. The baseline scenario therefore incorporates regulatory changes that would require a change in the current, business-as-usual operation of the landfill sites. The project will monitor any regulatory changes that impact waste management in South Africa and will adjust the baseline scenario by re-designating some landfill gas project wells to baseline wells. (see also attached Monitoring Plan)

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

The baseline is defined as the scenario, in which the currently existing wells continue to operate with a declining efficiency, but no further wells would be installed, unless national legislation tightens. The proposed project is additional because it reduces emissions relative to the projected emission level in the baseline scenario.

In the absence of the project, only about 7.4% of the gas produced in the landfill would be collected and flared. The project upgrades the methane recovery system to 83% in 2013, and thereafter progressively dropping in parallel to diminishing gas production to 44.3% in 2026 at the probable end of the commercial project life.

In addition, the displacement of mainly coal-based electricity with renewable energy from landfill gas would not take place in the absence of the CDM activity. As energy generation by the proposed project is more costly than the continued purchase of electricity from the national utility company, Eskom, it is unlikely that the project sponsor would invest in the project in the absence of carbon finance.

**B.6. Emission reductions:****B.6.1. Explanation of methodological choices:**

The selected methodology has been developed in the context of this activity.

According to AM0010, the greenhouse gas emission reduction achieved by the project activity during a given year (ER_y) is the difference between the amount of methane actually destroyed during the year (MD_{projecty}) and the amount of methane that would have been destroyed during the year in the absence of the project activity (MD_{baseliney}), times the approved Global Warming Potential value for methane (GWP_{CH4}) plus the quantity of electricity sold to the grid during the year (ES_y) multiplied by the CO₂ emissions intensity of the electricity displaced (EI_{gridy}).

$$ER_y = (MD_{projecty} - MD_{baseliney}) \times GWP_{CH4} + ES_y \times EI_{gridy}$$

Where:

ER_y are the emission reductions in a year (tCO₂e/year).

MD_{projecty} is the methane destroyed in a year (tCH₄/year).

MD_{baseliney} is the methane that would have been destroyed during a year in the absence of the project (tCH₄/year).

GWP is the approved Global Warming Potential for methane (21 tCO₂e/tCH₄)

ES_y is the quantity of electricity sold to the grid (MWh).

EI_{gridy}, is the CO₂ emissions intensity of the grid (tCO₂e/MWh).

Section B.6.3 contains a comprehensive step-by-step-diagram how the variables MD_{project} and MD_{baseline} are calculated from the measurements.

In order to estimate emission reductions *ex ante*, one has to calculate the prospective methane generation of the landfill site. The IPCC First Order Decay Model or other landfill gas models can be used to this effect. In this case, landfill gas generation has been simulated by the UK based company Enviros Ltd using the GasSim model.

The grid emission factor of the South African grid is not calculated by the project participants but by the South African national utility company Eskom (see below).

Furthermore, once the project is operating and directly monitoring the emission reductions, calculations are needed to translate the various data measurements into the parameter values needed in the above formula. A comprehensive description as to how the parameter values are obtained from the data measurements is provided in B.6.3 below.

Grid emission factor

In compliance with approved baseline methodology AM0010, the CO₂ emission intensity of the grid is calculated as the average annual CO₂ emission intensity of the grid, which is obtained from the grid operator. The use of an average annual emission rate for grid electricity is justified if it is determined in a conservative manner, i.e. it is very unlikely to overstate the emission reductions.



For this project, the grid emission rate is determined using Eskom's reported data for annual CO₂ emissions and power output. This method averages the coal-fired power plants and other less carbon intensive power sources in South Africa.

In its 2005 Annual Report (published in 2006) Eskom publicly reported that it emitted 0.978 kg of CO₂ per kWh of electricity produced. To calculate the emission reduction from displacement of grid electricity by the project, the project's annual power sales (in kWh) will be multiplied with the annual average emission rate for that year (as derived from Eskom's annual reports).

This methodology is adequate because it is highly improbable that the project will significantly affect the dispatch of peak load plants, but will primarily displace electricity from base load suppliers. Due to overcapacity in South Africa, peak load plants are mainly used as "shock absorbers". Because of the project's character as must-run-capacity and its very small contribution to meet the overall Durban metro area demand, it is expected that Eskom will reduce the generation of the base load power plant with the highest marginal costs in its regional supply mix to adjust for a reduced power purchase by eThekweni Electricity.

The methodology for the calculation of the emission factor is conservative for the following reasons:

- Averaging the emissions across all Eskom power plants includes the low emission intensity of more efficient coal-fired plants. The project however displaces the plant with highest marginal costs in its territory and hence is likely to displace the least efficient and most emission intensive coal power plant in that region.
- Being located close to the Durban municipality, the project feeds electricity directly into the low voltage municipal grid. Most of Durban's electricity is supplied from the high voltage system. By displacing electricity from the high voltage system the project also reduces the amount of transmission losses that occur over longer distances and at the substations where the voltages are reduced.
- The emissions from the Eskom power stations' parasitic load are not included in the Eskom data and are therefore not included in the emission rate.

B.6.2. Data and parameters that are available at validation:

No additional data or parameters identified.

B.6.3 Ex-ante calculation of emission reductions:
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Emissions reductions are estimated directly.

The greenhouse gas emission reduction achieved by the project activity during a given year (ER_y) is the difference between the amount of methane actually destroyed/combusted during the year (MD_{projecty}) and the amount of methane that would have been destroyed/combusted during the year in the absence of the project activity (MD_{baseliney}), times the approved Global Warming Potential value for methane (GWP_{CH4}) plus the quantity of electricity sold to the grid during the year (ES_y) multiplied by the CO₂ emissions intensity of the electricity displaced (EI_{gridy}).



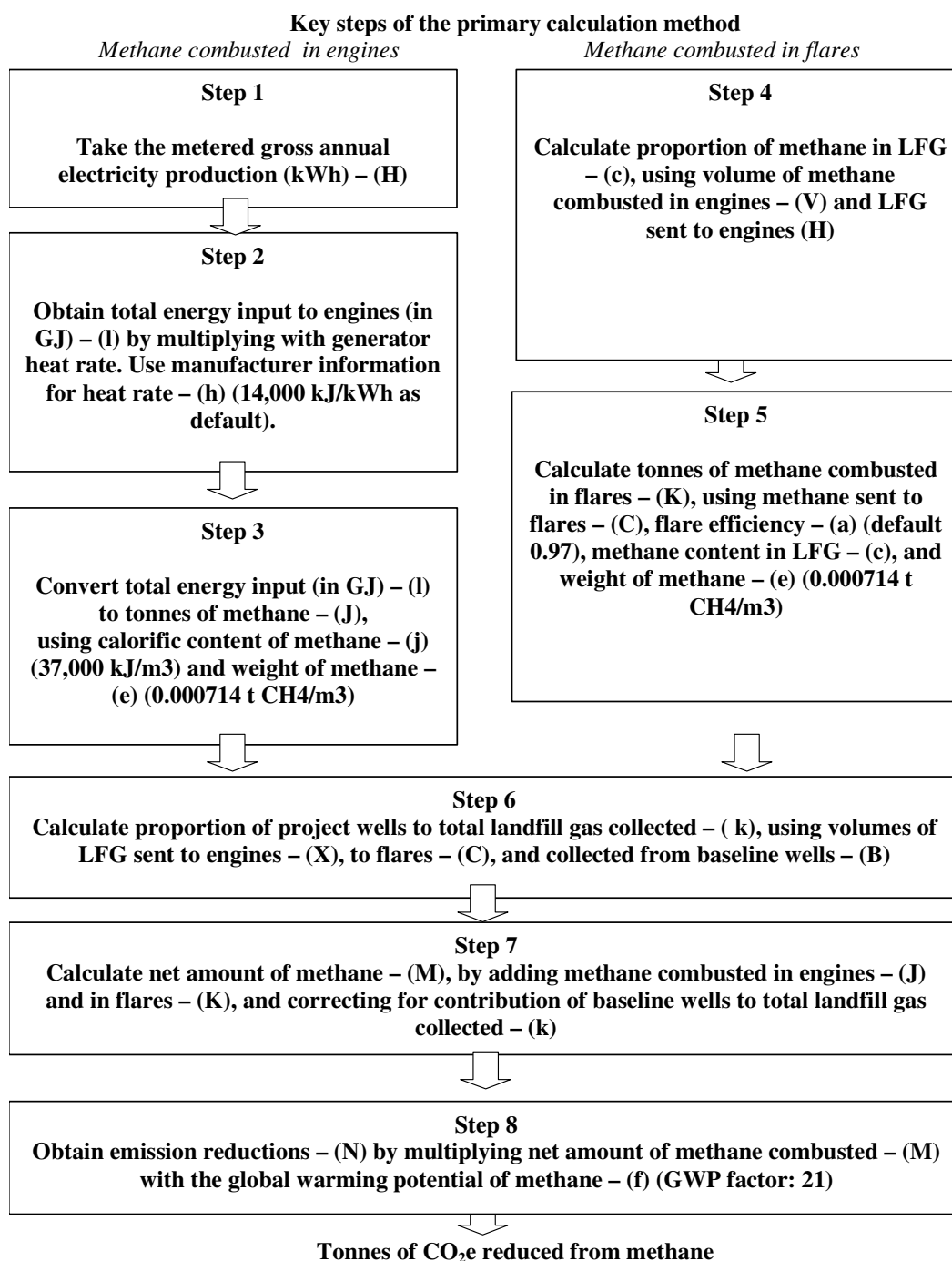
$$ER_y = (MD_{projecty} - MD_{baseliney}) \times GWP_{CH4} + ES_y \times EI_{gridy}$$

The monitoring plan provides for the calculation of emission reductions from avoided methane emissions and from displaced grid electricity. The calculation formulas are contained both explicit and programmed in the annexed self-calculating Excel spreadsheets. The calculations are done in the following ways (please refer to the Monitoring Plan and the spreadsheets for details):

(1) Calculation method for emission reductions from landfill gas combustion ($MD_{projecty} - MD_{baseliney}$) \times GWP_{CH4} :

Two methods are used for the calculation of emission reduction from landfills. The first is based on down stream metering wherever possible, i.e. meters are placed as closely as possible to the location of combustion of methane gas or measure minor quantities thus avoiding sources of error. The second method relies on up-stream metering and continuous analysis of the methane content in landfill gas. This method is used as backup and for quality control purposes.

The primary method uses the monthly aggregates of the following four metered variables: Gross electricity production (kWh), volume of LFG sent to engines, volume of landfill gas flared, and volume of LFG extracted from baseline wells (all in m³). The method first calculates the quantity of methane combusted in engines using engine kWh output and technical parameters (Steps 1 – 3 in Figure 2). Step 4 calculates the methane content in LFG using the quantity of LFG sent to engines, which is then used in Step 5 to derive methane combusted in flares from LFG quantity sent to flares. Step 6 calculates the proportion of LFG collected from project wells using the above information about LFG sent to engines and flares as well as LFG collected from baseline wells. This proportion is used in Step 7 to calculate the net amount of methane combusted by the project activity and for which credits can be claimed. Step 8 concludes the calculation by multiplying with the global warming potential of methane.



The confirmation method uses the monthly aggregates of the following three metered variables: Volume of landfill gas flared, volume of gas extracted from baseline wells, and volume of gas extracted from project wells (all in m³). The method also uses continuous analysis of the methane content in landfill gas. The method first calculates the proportion of LFG combusted using the above gas flow information together with the flare efficiency (Step 2). In Step 3, this proportion is used to derive the volume of

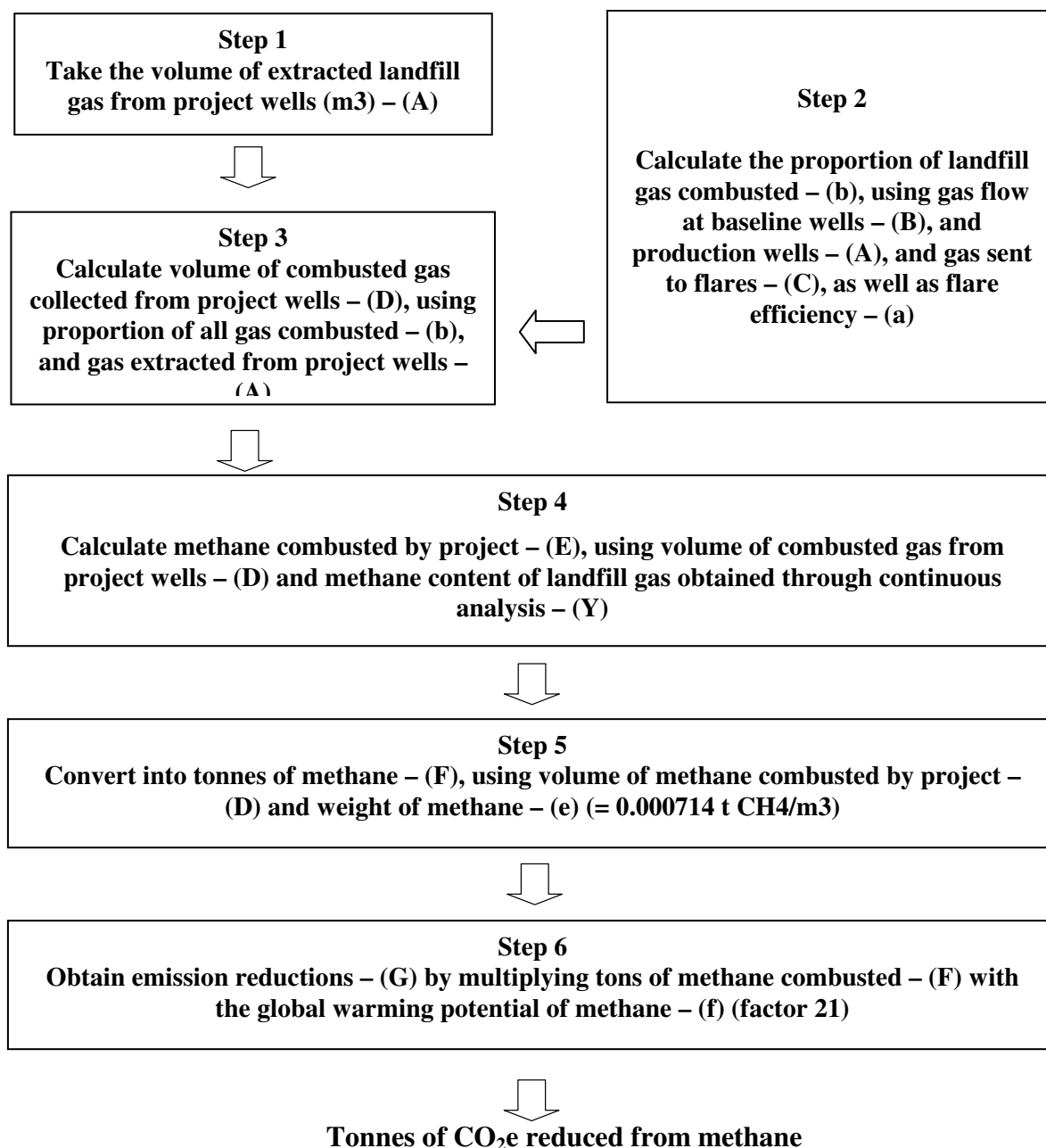


combusted gas that is collected from project wells. Step 4 calculates the volume of methane combusted from the volume of combusted gas using continuous measurement of the methane content in LFG. Step 5 and 6 complete the calculation of emission reductions (CO₂equiv) by converting methane volume into tonnes of methane and multiplication with the global warming potential.

Key steps of the quality assurance method

from flow meters at project wells

from flow meters at project wells, baseline wells and flares





(2) Calculation method for emission reductions from grid electricity displacement (ESy x EIgridy):

The project operator determines the applicable annual grid carbon emission factor based on Eskom reports and multiplies with the metered electricity delivered to the grid.

B.6.4 Summary of the ex-ante estimation of emission reductions:

The following projection of emission reductions is based on a variety of assumptions regarding waste volume and deposition rates, methane generation profile, LFG collection efficiency, methane content in LFG, flare efficiency, engine heat rates, and so forth. The generation of landfill gas at the site has been estimated by the UK based company Enviros Consulting Limited. The full report is made available to the validator.

Emission reductions from Bisasar Road site (tonnes CO₂e)

Year	Estimation of project activity emission reductions (tonnes of CO ₂ e) ^b	Estimation of baseline emission reductions (tonnes of CO ₂ e) ^b	Estimation of leakage (tonnes of CO ₂ e)	Estimation of emission reductions (tonnes of CO ₂ e)
2007 ^a	107,363	0	0	107,363
2008	282,474	0	0	282,474
2009	283,134	0	0	283,134
2010	323,933	0	0	323,933
2011	337,123	0	0	337,123
2012	442,858	0	0	442,858
2013	458,290	0	0	458,290
2014 ^a	231,783	0	0	231,783
Total (tonnes of CO₂e)	2,466,957	0	0	2,466,957

^a As the starting period of the project activity is 1st July 2007. Years 2007 and 2014 cover 6 months only.

^b Emission reductions are estimated directly; no breakdown available.

B.7 Application of the monitoring methodology and description of the monitoring plan:**B.7.1 Data and parameters monitored:**

B.7.1 Data and parameters monitored:	
Data / Parameter:	Landfill gas from baseline wells (MV baseline_v)
Data unit:	m ³
Description:	Amount of landfill gas collected from baseline wells
Source of data to be used:	Measured by flow meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Global Warming Potential of CH ₄ using the original, IPCC factor of 21 as determined by the CDM EB.
Description of measurement	Gas flows will be monitored on a continuous basis. Data will be



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methods and procedures to be applied:	aggregated monthly and yearly. Temperature and pressure will also be measured with volume adjusted to standard temperature and pressure.
QA/QC procedures to be applied:	Flow meters are subject to a regular maintenance regime to ensure accuracy. Data will be kept electronically for the duration of the project crediting period.
Any comment:	

Data / Parameter:	Landfill Gas from project wells (MV_{project})
Data unit:	m ³
Description:	Amount of gas collected from project wells
Source of data to be used:	Measured by flow meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Global Warming Potential of CH ₄ using the original, IPCC factor of 21 as determined by the CDM EB.
Description of measurement methods and procedures to be applied:	Gas flows will be monitored on a continuous basis. Total gas used for power generation, plus gas flared (extracted from the field) minus gas collected from the baseline wells. Data will be aggregated monthly and yearly. Temperature and pressure will also be measured with volume adjusted to standard temperature and pressure.
QA/QC procedures to be applied:	Flow meters are subject to a regular maintenance regime to ensure accuracy. Data will be kept electronically for the duration of the project crediting period.
Any comment:	

Data / Parameter:	Methane Content
Data unit:	%
Description:	Methane content of landfill gas
Source of data to be used:	Measured and calculated
Value of data applied for the purpose of calculating expected emission reductions in section B.5	n/a
Description of measurement methods and procedures to be applied:	The monitoring of methane content will be continuous for the duration of the project crediting period. The monitoring of the methane content in the baseline will be periodic. The methane content is also calculated using generator output and gas input to engines.
QA/QC procedures to be applied:	Data will be kept electronically for the duration of the project crediting period.
Any comment:	

Data / Parameter:	Electricity sold to grid (ES_y)
Data unit:	MWh
Description:	Amount of electricity sold to the grid (net)
Source of data to be used:	Measured by kWh meter
Value of data applied for the	CO ₂ factor derived from data reported by Eskom



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purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	Measured on a continuous basis. Data will be aggregated monthly and yearly. Three electricity meters to be installed: outgoing before transformer (1), outgoing exported electricity (2) and incoming imported 400V electricity for the operation of the extraction equipment (3).
QA/QC procedures to be applied:	Electricity meters will be subject to a regular maintenance and testing regime to ensure accuracy. Their reading will be checked by the electricity distribution company. Data will be kept electronically for the duration of the project crediting period.
Any comment:	

Data / Parameter:	Electricity generated (EGy)
Data unit:	MWh
Description:	Amount of electricity generated (gross generator output)
Source of data to be used:	Measured by kWh meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	n/a
Description of measurement methods and procedures to be applied:	Measured on a continuous basis. Data will be aggregated monthly and yearly. Three electricity meters to be installed: outgoing before transformer (1), outgoing exported electricity (2) and incoming imported 400V electricity for the operation of the extraction equipment (3).
QA/QC procedures to be applied:	Electricity meters will be subject to a regular maintenance and testing regime to ensure accuracy. Data will be kept electronically for the duration of the project crediting period.
Any comment:	The difference between gross and net electricity production equals the parasitic losses of the power plant. Since parasitic consumption is predictable based on manufacturers data, comparing gross and net meter readings adjusted from parasitic losses serves as a confirmation procedure.

Data / Parameter:	Combustion efficiency
Data unit:	%
Description:	Combustion efficiency of the gas generators
Source of data to be used:	Methane content of engine/ boiler gas
Value of data applied for the purpose of calculating expected emission reductions in section B.5	n/a
Description of measurement methods and procedures to be applied:	Measured semi-annual and monthly if unstable.



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applied:	
QA/QC procedures to be applied:	Data will be kept electronically for the duration of the project crediting period.
Any comment:	

Data / Parameter:	LFG temperature and pressure
Data unit:	°C/ Pa
Description:	Temperature and pressure of the landfill gas
Source of data to be used:	Daily monitoring
Value of data applied for the purpose of calculating expected emission reductions in section B.5	n/a
Description of measurement methods and procedures to be applied:	Device that provides data that can be used to determine the density of methane or provides for integration of measurement of temperature and pressure in order to provide a direct reading of the normalised gas flow.
QA/QC procedures to be applied:	Monitoring of statistically significant samples delivering a confidence level of 95%. Data will be kept electronically for the duration of the project crediting period.
Any comment:	

Data / Parameter:	Flare working hours
Data unit:	Hours/ %
Description:	
Source of data to be used:	Measured
Value of data applied for the purpose of calculating expected emission reductions in section B.5	n/a
Description of measurement methods and procedures to be applied:	Flare working hours will be measured during periods when recovered landfill gas is diverted from power generation.
QA/QC procedures to be applied:	Data will be kept electronically for the duration of the project crediting period.
Any comment:	

Data / Parameter:	Flare temperature
Data unit:	°C
Description:	
Source of data to be used:	Measured and calculated
Value of data applied for the purpose of calculating expected emission reductions in section B.5	n/a
Description of measurement methods and procedures to be applied:	Continuous measurement of operating hours based on measured flare temperature using a device such as a thermocouple.



applied:	
QA/QC procedures to be applied:	Data will be kept electronically for the duration of the project crediting period.
Any comment:	

Data / Parameter:	Heat rate (HRy)
Data unit:	GJ/ MWh
Description:	Heat rate of the generator(s)
Source of data to be used:	Measured and calculated
Value of data applied for the purpose of calculating expected emission reductions in section B.5	n/a
Description of measurement methods and procedures to be applied:	Regular maintenance will ensure optimal operation of engines and generators. The heat rate will be checked semi-annually, with monthly checks if the heat rate shows significant deviation from previous. Data will be used to test and if necessary correct the generator's name plate heat rate.
QA/QC procedures to be applied:	Data to be kept electronically for the duration of the project crediting period.
Any comment:	

Maintenance and instrumentation calibration will be carried out in accordance with manufacturer's requirements.

All instrumentation will be supplied and calibrated in accordance with South African and/or other recognised international standards including calibration frequency and accuracy.

The gas flowmeter details are as follows:

Manufacturer: Kurz Instruments Inc. Model: 454FT-08-MT

Accuracy: $\pm[(1\% + 0.025\%/^{\circ}\text{C}) \text{ reading} + (20 \text{ SFPM} + 0.25 \text{ SFPM}/^{\circ}\text{C})]$ Above or below 25°C.

The electricity meters are supplied by eThekweni Electricity in accordance to RSA national requirements and are considered fully accurate in recording the net electricity exported. There will be 3 sets of meters:

1. export, upstream of the transformer to record the electricity generated
2. export, downstream of the transformer to record the electricity exported to the grid
3. import, for the operation of the gas extraction equipment

The net renewable electricity generated and t CO₂ saved is calculated by taking 3. from 2.

B.7.2 Description of the monitoring plan:

The Department of Cleansing and Solid Waste (DSW) of the eThekweni municipality is the project operator. To ensure effective monitoring of the emission reductions, DSW will implement a well-defined management and operational system which includes data handling, staff training, reporting and quality assurance. Specifics of the management system are provided in the attached Monitoring Plan. In addition



to this management system, it is currently planned to employ an external consultancy to provide continued assistance throughout the project.

B.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

The baseline study and monitoring methodology were originally completed by Carbon Finance Business of the World Bank for the combined Durban Landfill Gas to Electricity project including Bisasar Road, Mariannhill and LaMercy landfill sites. Both were completed in September 2005. The Prototype Carbon Fund is no longer a project participant.

The baseline study and monitoring methodology have been reviewed and updated where appropriate by Enviros Consulting Ltd and SLR Consulting in February 2007. The relevant contacts are:

Enviros Consulting
Frauke Roeser
20-23 Greville Street
London
EC1N 8SS
UK
Tel. +44 20 7421 6340

SLR Consulting Ltd
Bob Couth
Mytton Mill
Forton Heath
Montford Bridge
Shrewsbury
SY4 1HA
Shropshire
UK
Tel. +44 (0) 1743 850170

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

1st July 2007

C.1.2. Expected operational lifetime of the project activity:

21 Years

**C.2 Choice of the crediting period and related information:****C.2.1. Renewable crediting period**

Chosen

C.2.1.1. Starting date of the first crediting period:1st July 2007**C.2.1.2. Length of the first crediting period:**

7 Years

C.2.2. Fixed crediting period:

Not Chosen

C.2.2.1. Starting date:

Not applicable

C.2.2.2. Length:

Not applicable

SECTION D. Environmental impacts

This section D uses the term “project proponent” to refer to the eThekweni Metropolitan Municipality. Durban solid Waste (DSW) is an operational division of the project proponent.

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

Two studies were undertaken within the context of analysing and assessing the environmental impacts (including transboundary impacts) of the proposed project activity, namely:

- an Environmental Scoping Study (informing an Environmental Scoping Report), dealing with impacts over a number of environmental and documenting a stakeholder participation process; and,
- an Air Quality Impact Assessment.

Environmental Scoping Study

A preliminary legal and technical assessment of the potential environmental impacts (social and biophysical) for the proposed project was undertaken in accordance with Environmental Impact Assessment (EIA) Regulations, published in GNR1182 to GNR1184, dated 5 September 1997, in terms of the Environment Conservation Act 73 of 1989. This assessment determined that the proposed project activity included activities for which an environmental authorisation is required and consequently triggering the South African legal requirement to undertake EIA. The EIA legal requirement contemplates three phases, namely the application, scoping and the environmental impact reporting phases. The environmental authorisation may be granted after the scoping or environmental impact



reporting phases (or after submission of an exemption application, which is not relevant in the case of proposed project).

The application and scoping phases commenced in October 2003 with the submission of an Application Form and Plan of Study for Scoping to the KwaZulu-Natal Department of Agriculture and Environmental Affairs (DAEA). The DAEA is the competent authority to grant the required environmental authorisation. To ensure that all possible impacts, both environmental and socio-economic, were addressed the environmental scoping study included both a structured public participation process and an assessment of potential impacts on environmental media. The public participation process was initiated in November 2003 and included identifying Interested and Affected Parties (I&APs), informing I&APs about the project through the distribution of a Background Information Document, placing advertisements in the local press and opportunity for I&APs to provide input into the environmental scoping process, including during two public meetings and additional focus group meetings with key stakeholders. Potential impacts were identified through an assessment of issues raised by stakeholders and through specialist environmental assessment and technical review of the project proposal. A draft Environmental Scoping Report was provided to I&APs, for their comments, prior to the finalisation thereof. The final Environmental Scoping Report makes Recommendations to mitigate potential negative impacts and concludes that, providing that all mitigatory recommendations are implemented and adhered to, the proposed project will have an overall positive environmental effect, both globally and locally.

The final Environmental Scoping Report was submitted to the DAEA during August 2004. On 7 October 2004 the DAEA granted the required environmental authorisation (reference number: DAEA EIA/4366), in respect of the proposed project. DAEA EIA/4366 was granted on the basis of the information and recommendations in the Environmental Scoping Report, and is subject to certain conditions for the implementation of the proposed project. DAEA EIA/4366 was subjected to an appeal by a single I&AP, to which appeal the project proponent was permitted to respond. In so responding the project proponent provided the DAEA and the appellant with the Enviro Report mentioned below. On 30 November 2005 the authority empowered to deliberate on the appeal granted an “Appeal Decision on the Authorisation of the Bisasar Road (EIA/4366) Landfill Gas” (the Appeal Decision). The Appeal Decision *inter alia* rejected the grounds of the appeal and confirmed DAEA EIA/4366, subject to certain conditions for the implementation of the proposed project.

Air quality standards

In order to assess the air quality impacts of the proposed project activity, the independent consultant for EIA appointed Enviro Consulting Ltd. (United Kingdom), to undertake an atmospheric dispersion modelling study of emissions from the Bisasar Road landfill site. The results of the study are contained in a report entitled: *Durban Landfill Gas Utilisation Project: Air Quality Impact Assessment of Bisasar Road Landfill*, Enviro Consulting, September 2004 (the Enviro Report).

The Enviro Report adopts a conservative approach and assesses two modelling scenarios in order to determine whether the proposed project activity would be acceptable to the environment. The “do-nothing” option (Scenario 1) was assessed against the proposed project “landfill gas utilization” option (Scenario 2). The South African air quality guidelines for pollutants, set by the Department of Environmental Affairs and Tourism (DEAT), were the benchmark against which air quality was assessed. Where no South Africa air quality guidelines were available reference was made to other internationally accepted air quality assessment criteria, including the World Health Organisation, the World Bank and the United Kingdom air quality standards and guidelines. On this basis, the modelled



ground-level concentrations of released substances were compared with the above-mentioned air quality guidelines to establish the significance of any air quality impacts. The forecast levels of pollutants were based on UK data and baseline air quality information was taken from actual monitoring data, where this was available.

The assessment indicated that, in Scenario 1, the predicted concentrations of hydrogen sulphide from fugitive releases, during typical operations of the Bisasar Road landfill site, exceeded the relevant air quality assessment criteria. It was concluded that all other forecast landfill gas substances would not exceed emissions standards and that emissions would be acceptable from the perspective of air quality. No air quality benchmarks were forecast to be exceeded for Scenario 2 and it was concluded that emissions from the proposed landfill gas combustion plant (landfill gas engines and flares) would be acceptable from the perspective of air quality and that emissions of these substances were predicted to have no significant effects on human health. Furthermore, it was found that the Scenario 2 utilisation of landfill gas to generate electricity (thus displacing fossil fuel as a power generation source) would achieve a wider reduction in air pollution. The modelling study further indicated that, in Scenario 2, the levels of hydrogen sulphide will be reduced by a significant margin and that the project would have a positive impact on odours. With respect to the construction of the proposed landfill gas engines for Scenario 2 it was concluded that, providing good housekeeping measures were adopted for potentially dust-generating activities, it was unlikely that emissions from the site will give rise to dust nuisance at off-site locations.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

South Africa has a well elaborated EIA regime and considerable in-country, legal, environmental and scientific expertise required for the performance of EIA. Until 1 July 2006, and at all material times during the undertaking of the scoping process, there were two national statutes governing EIA in South Africa, namely the:

- Environment Conservation Act 73 of 1989 (ECA); and,
- National Environmental Management Act 107 of 1998 as amended (NEMA).

Upon taking specialist environmental legal advice (provided by IMBEWU Enviro-Legal Specialists (Pty) Ltd), the project proponent:

- determined that the undertaking of the proposed project activity was subject to the EIA requirements provided for in the ECA (the ECA EIA requirements); and,
- proceeded to make the necessary arrangements to comply with the ECA EIA requirements.

It should be noted that the ECA EIA requirements were repealed during July 2006. However, environmental authorisations for the undertaking of project activities, granted in terms of the ECA EIA requirements, remain valid. As is explained below, the proposed project activity received the requisite environmental authorisations in terms of the ECA EIA requirements. Consequently the environmental authorisation to undertake the project remains valid, subject to any conditions imposed by such environmental authorisations.



For the Reader's reference, the following is a brief overview of the essential elements of the ECA EIA requirements:

- The ECA empowered the national Minister of the Department of Environmental Affairs and Tourism (DEAT) to identify those activities which, in his opinion, may have a substantial detrimental effect on the environment.
- No person was permitted to undertake an identified activity, or cause such activity to be undertaken, except by virtue of a written authorization issued by a competent authority.
- The environmental authorization could only be issued after consideration of reports concerning the impact of the proposed activity on the environment
- The competent authority had discretion either to grant, or to refuse to grant, the environmental authorization. The environmental authorization could be granted subject to conditions, e.g., the compilation and implementation of an environmental management plan for undertaking the activity.
 - If a condition imposed upon a project activity is not complied with then the environmental authorisation may, after at least 30 days written notice, in respect of which such condition was imposed may be withdrawn. Continued undertaking of the project activity, after withdrawal of the environmental authorization, will be unauthorized and the project activity/project implementer subject to closure and/or sanction.
- The DEAT Minister did, by way of Regulations made under the ECA (the ECA EIA Regulations), identify certain activities which may have a substantial detrimental effect on the environment and provided a list of such activities (hence "listed activities").
- The ECA EIA Regulations prescribed the manner of application for an environmental authorization and the process to be followed in the compilation of written Environmental Impact Reports.
- Once the listed activity requirement was triggered a three-phase environmental impact assessment process was provided for by the EIA Regulations, namely: an application phase; a scoping phase; and, an environmental impact report phase.
- The Application Phase consisted of the following general steps:
 - the appointment by the Applicant for the environmental authorisation of an independent consultant who was responsible for complying with the ECA EIA Regulations on behalf of the Applicant;
 - the assessment of the scope of the application of the ECA EIA Regulations to the proposed project activity;
 - the conducting of a pre-application consultation with the competent authority;
 - the advertising of the Applicant's intention to undertake the proposed project activity; and,
 - the submission of an application for environmental authorization to the competent authority.
- The Scoping Phase consisted of the following general steps:
 - the preparation of the Plan of Study for Scoping and the submission thereof to the competent authority for approval;
 - the undertaking of the actions described in the Plan of Study for Scoping, e.g., specialist studies of the impact of the proposed project activity on various environmental media and/or communities in the vicinity of the location of the proposed project activity;



- the preparation of a Draft Scoping Report recording the findings of the actions undertaken in terms of the Plan of Study for Scoping, including reporting on the potential environmental impact of the proposed project activity, recommendations and options for the implementation of the proposed project activity (specifically including the “no-go” option), and recommendations for mitigation of any potential environmental impacts identified;
- the making available of a Draft Scoping Report for public comment - usually on an appropriate website and at appropriate venues (in hard copy) in the vicinity of the proposed location of the proposed project activity;
- the preparation and submission to the competent authority of a Final Scoping Report incorporating relevant public comments received; and,
- the possible granting of an environmental authorization on the basis of the Final Scoping Report, failing which the environmental impact report phase was embarked upon.

Note:

- The record of the written environmental authorisation is called the “Record of Decision” (RoD). The term “positive RoD” denotes that the environmental authorisation had been granted, with the term “negative RoD” denoting the opposite.
- The competent authority was empowered, in terms of the ECA EIA Regulations, to make a decision in regard to granting (or not granting) the environmental authorisation, at various stages of the process including at the conclusion of the Scoping Phase.
- In the particular instance of the proposed project activity, the competent authority found the information provided in the Environmental Scoping Report sufficient for it to grant a positive RoD in respect of the proposed activity. Consequently the environmental impact report phase became unnecessary and is therefore not dealt with herein.

Any person who felt aggrieved at any decision made in terms of the ECA, including the decision to grant an environmental authorisation, was entitled to appeal against the decision, in a prescribed manner and within thirty days from the date of issuance of the RoD. This factor is important because the positive RoD for the proposed project activity was subjected to an appeal process which confirmed the environmental authorisation, subject to certain conditions. These matters are described in more detail below.

SECTION E. Stakeholders’ comments

This section E uses the term “project proponent” to refer to the eThekweni Metropolitan Municipality. Durban solid Waste (DSW) is an operational division of the project proponent.

The ECA EIA Regulations provide for specific opportunities for public participation by Interested and Affected Parties (I&APs). It is also practice for competent authorities to require applicants for environmental authorisations to solicit comments from I&APs in respect of the proposed project activity and to report on comments received.



Furthermore the National Environmental Management Principles set out in the National Environmental Management Act 108 of 1998 (NEMA) specifically require that the needs, interests and opinions of I&APs must be considered when decisions are made that affect the management of the environment.

In the context of the implementation of CDM projects in South Africa these stakeholder participation processes provide a unique opportunity to address not only stakeholders' concerns over the environmental impacts of a proposed CDM project activity, but also concerns in respect of the CDM project activity itself. Consequently this opportunity to address both the environmental and CDM aspects of the proposed project activity during a single stakeholder participation process, during the scoping phase described in section F.

The stakeholder participation processes undertaken in compiling the Environmental Scoping Report were initiated in November 2003 and involved a number of communicative and participatory techniques aimed at establishing contact with, and raising awareness among, relevant I&APs - particularly among the communities living in the vicinity of the Bisasar Road landfill site.

E.1. Brief description how comments by local stakeholders have been invited and compiled:

Identification of Interested and Affected Parties: I&APs with an interest in the proposed project activity continued to be identified throughout the scoping process. Specific attention was paid to residents and resident associations in close proximity to the Bisasar Road landfill site, Local Councillors (political leaders), environmental interest groups and relevant authorities. Names and contact details of all identified persons, groups, organisations and institutions were entered into an electronic database, which also records issues or concerns raised by a specific group or individual.

Background Information Document: A Background Information Document (BID) in respect of the proposed project activity was compiled and distributed to I&APs. The BID describes the key aspects of the project, including the CDM component, contained information regarding the scoping and public participation processes and provided the contact details of the consultants involved. The BID also contained a registration sheet which enabled I&APs to register their interest in the project, and to indicate issues of concern and comments. The BID was drafted in English and was translated into *isiZulu* in order to allow easy access to information by I&APs who are speakers of *isiZulu*. The BID was posted to all I&APs who registered in response to the advertisements placed, as well as to all individuals and organizations identified at the outset of the process. The BID was made available at focus group meetings and at the public meetings and was delivered to residents in a zone of 200 metres from the boundaries of the Bisasar Road landfill. The purpose of such distribution was to increase awareness of the scoping process and the project within the communities living in the vicinity of the landfill site.

Advertising and Media Coverage: In accordance with the ECA EIA Regulations, advertisements were placed in a number of national, regional and local newspapers in October and November 2003 requesting I&APs to register their interest in the project and the in the scoping process.

In addition, a media conference was held on 19 November 2003 at the Durban Botanical Gardens. The purpose of the media conference was to communicate information regarding the proposed project activity and the scoping process as widely as possible - through the media. A media release was issued to national, regional and local newspapers, and television and community radio stations.



Focus Group Meetings: Formal meetings were conducted with specific groups of key I&APs who were grouped according to formal associations or their specific interests in the proposed project activity. These meetings permitted I&APs to raise specific issues and concerns, and/or obtain more information regarding the proposed project activity and the scoping process. Minutes of the meetings were made and included in the Environmental Scoping Report. A list of the focus group meetings that were held during the scoping phase is tabled below.

Association	Date
Springfield Business Park	17 November 2003
Durban Chamber of Commerce	17 November 2003
Botanic Society	18-November-2003
Durban Chamber of Commerce (Environmental Committee)	18 November 2003
Clare Estate Development Forum	18-November-2003
Ward Councilors (Mariannhill and Clare Estates)	19 November 2003
DWAF	20-November 2003
Ezemvelo KZN Wildlife	20-November 2003
Eskom	27-November-2003
Trade unions	4 December 2003
The Informal Settlement Association (Kennedy Road)	4 December 2003
Earthlife Africa	20 January 2004
Ms. S Khan	16 March 2004
Mr. A Singh	16 March 2004

Public Meetings: Two public meetings were held in February and April 2004.:

Invitations were mailed to all I&APs on the database and advertisements regarding the public meetings were placed in four local newspapers in February 2004.

The objective of the public meetings was to provide feedback to I&APs on the results of the environmental scoping studies and to present the draft Environmental Scoping Report. I&APs had further opportunity to clarify information, ask questions and raise issues and concerns in respect of the proposed project activity and the CDM component. Following the initial public meeting and subsequent focus group meetings, a number of new issues were raised by I&APs. These issues were considered by the project proponent following which a second feedback meeting was convened on 21 April 2004. Invitations regarding the second public meeting were mailed to all I&APs on the database and posters were erected in Clare Road and at the Salligram Temple. In addition, registered stakeholders assisted with the distribution of leaflets advertising the meeting in a zone of 200m from the boundaries of Bisasar Road. An advertisement regarding the second public meeting was placed in the following local newspaper in April 2004.

Minutes of both public meetings were made and included in the Environmental Scoping Report.

Public Review of draft Environmental Scoping Report: The draft Environmental Scoping Report was made publicly available for a thirty-day review period from 30 April 2004 to 30 May 2004 at various libraries and public venues within the Durban Metropolitan area. The draft Environmental Scoping Report was also placed on the internet at www.felehetsa.co.za for review and comment. I&APs were



notified in writing of the availability of the Environmental Scoping Report and the availability thereof was advertised in local, regional and national newspapers, together with the notification of the second public meeting.

E.2. Summary of the comments received:

Please see the Table below for a summary of comments received and the responses provided thereto. References to “sections” in the Table refer to sections of the Environmental Scoping Report.

Note that the Table deals with comments received during the stakeholder participation process undertaken during the scoping phase, which comments were required to be captured in the Environmental Scoping Report. The Table is, therefore, extracted from the Environmental Scoping Report and the information contained in the Table is part of the domestic public record for the proposed project activity. The information contained in the Table was subjected to the stakeholder comment period, mandated by the ECA EIA Regulations, to which the entire Environmental Scoping Report was subjected.

The proposed project activity was originally conceived of as part of a larger landfill gas to power generation project intended to involve the implementation of identical activities at two other landfill sites, in addition to the Bisasar Road site. This larger project was intended to be undertaken by the project proponent in conjunction with the World Bank. Comments received during the scoping processes undertaken at all three landfill sites were captured in the table format found overleaf. Given that the project activity was intended to be identical at all three sites the Environmental Scoping Reports for all three sites contained similar elements. Circumstances dictated that the proposed project activity be separated into two individual projects and at time of compilation of this PDD the proposed project activity at the other two sites, namely the Mariannhill and La Mercy landfill sites, is progressing toward registration as a separate CDM project activity.

However, comments received from stakeholders at all three sites are considered, by the project proponent, to be relevant for the implementation of the proposed project activity at the Bisasar Road site. Consequently, for completeness sake, and for the information of the wider group of international stakeholders, comments received during the scoping processes undertaken at all three sites are presented in the Table found overleaf. For this reason some references in the Table mention the Mariannhil and La Mercy landfill sites, their associated stakeholders and the World Bank.

It should further be noted that references in the Table to an anticipated environmental impact report phase were relevant at the time of compilation of the Table. However, the competent authority granted the necessary environmental authorisation after the scoping phase – as it is empowered to do. Consequently the environmental impact report phase became unnecessary.

Issue/Concern	Raised by	Response
Biophysical (LFG = landfill gas)		



Issue/Concern	Raised by	Response
Would the flaring unit on the landfill on the generation facility be emitting other gasses into the atmosphere?	Chamber of Commerce, Environmental Committee	Emissions from the combustion process are discussed in Section 8.6 – Emissions from LFG Combustion Process.
Indigenous species such as the sacred ibis and gulls feed around the landfill sites.	Ezemvelo KZN Wildlife	The presence of indigenous species on the landfill site is discussed in Section 9.8 - Fauna
The proposed project activity would avoid burning of coal, which will impact on the biodiversity impact of mining and power generation elsewhere	Ezemvelo KZN Wildlife	Displacement of coal generated electricity is discussed in Section 4 –Assessment of Alternatives, and Section 11.2 – Identified impacts and Mitigation Measures
What type of noise could be expected?	Mariannhill Conservancy	Noise levels associated with the Generator Sets is discussed in Section 8.7 - Noise
What would the air quality impact be on communities?	Mariannhill landfill Conservancy	Air Quality is discussed in Section 9.4 – Air Quality Potential Impacts are evaluated in Section 11.2
The reduction in odour compound migration should be investigated.	Mr Paul de Mattos	Odour management is discussed in Section 5.1.6 – Odour Management, Section 9.1 – Climate, Section 9.10 – Odour, and Section 11.2 – Identified Impacts and Mitigation Measures
Odour management has not improved at all. Not sure which individuals are chosen to report on this in the surrounding community as most, if not all, residents are not aware of this. There are fine spray nozzles only on one side of Clare and Kennedy Roads and not around the dump site.	Mrs Sureka Narotam, Clare Estates – Comments on Draft SR	The information provided is background only. Comprehensive documentation pertaining to the Odour Management System is available through DSW. It is worth noting that the project will have positive implications on baseline odour conditions as it involves the extraction and combustion of the odorous component of LFG.



Issue/Concern	Raised by	Response
Which emissions would increase as a result of combustion and what are the potential health risks from this?	Mrs Sureka Narotam, Clare Estates – Comments on Draft SR	<p>Emissions from spark-ignition engines can vary depending on the manufacturer. The composition of the exhaust from the LFG engines will also depend on a variety of factors including:</p> <ul style="list-style-type: none">• composition of the raw gas;• pre-treatment of the raw gas;• combustion conditions; and• potential post-combustion systems. <p>As part of the air quality investigation recommended to be undertaken during the Impact Assessment Phase, the modelling of emissions will be conducted on the assumption that emissions will be at the maximum permitted limits. This will be a conservative (i.e. worst-case) assessment since emissions in reality are likely to be below this level.</p>
This electricity generation plant will be located in the valley if and when the project is approved. This will create a major problem for the residents living around the dumpsite. Proper diffusion of the gasses will not take place	Ms S Khan – Comments on Draft SR	Air dispersion modelling is intended to be undertaken during the EIA phase of the investigation. This will take into account topographic and meteorological conditions



Issue/Concern	Raised by	Response
<p>The utilisation of landfill gas to generate electricity at Bisasar Road Landfill Site will save the burning of approximately 783 tons of coal per day.</p> <p>±783 tons of coal produces ± 134 247 tons of CO₂</p>	Ms S Khan – Comments on Draft SR	<p>Producing 1MWh of electricity from renewable energy prevents approximately 5.44 tons of coal from being burned, and approximately 0.9327 tons CO₂. The utilisation of landfill gas to generate electricity at Bisasar will save the burning of approximately 134.3088 tonnes of CO₂ per day (i.e. 6MWh x 24hours x 0.9327 tons). This varies slightly from the figure presented by Ms Khan due to the carbon content (coal grade) and calorific values of the coal reserves from where our power is ultimately derived</p> <p>Section E of the PDD provides a detailed description of the methods used to calculate emissions reductions. When combusted, methane is converted into CO₂, however as the methane is organic in nature these emissions are not taken into account when determining the project emissions reductions i.e. they are not deducted from the CO₂ emissions reductions achieved by the destruction of methane and the replacement of coal fired electricity</p>
Would methane still be produced if the landfill were closed?	Raised at Public Meeting, Tongaat (La Mercy)	<p>The landfill would continue to produce methane if the landfill were closed. Landfill gas is generated through the waste decomposition process which continues after closure.</p> <p>See Section 11.3 – Closure Implications</p>
Will gas extraction impact on the decomposition of waste?	Raised at Public Meeting, Tongaat (La Mercy)	Landfill gas extraction will accelerate the waste decomposition process.
The benefits derived from accelerated waste stabilisation should be considered	Mr Paul de Mattos	Waste consolidation and landfill stability is discussed in Section 5.1.2 & 8.3.
What would the visual impact be on communities?	Mariannhill Landfill Conservancy	Visual impact is evaluated in Section 11.2 - Identified Impacts and Mitigation Measures



Issue/Concern	Raised by	Response
Health impacts in the surrounding community.	Ms. S Khan – Focus Meeting 16 March (Bisasar Road)	See Section 5.1.5 – Health Risk Management / Section 9.4 – Air Quality
Economic		
Is the project financially viable?	Mr Wally Menne Earthlife Africa Keep Tongaat Beautiful Association	Financial viability of the project is discussed in Section 6.2.5 – Funding and Financial Synopsis
Who would be funding the project?	Keep Tongaat Beautiful Association Pinetown Ratepayers Association Springfield Business Park	Project funding is discussed in Section 6.2.5 – Funding and Financial Synopsis
What amount will eThekweni Municipality receive per tonne?	Raised at Public Meeting, Tonga	Revenue for the sale emissions reductions is discussed in Section 6.2.5 – Funding and Financial Synopsis
Will Social Benefit Fund be applied to local communities or city-wide?	Raised at Public Meeting, Tonga	The spending of social application funds derived from this project will be driven through ongoing stakeholder engagement
Communities need to be given a level of subsistence development	Mr Wally Menne	See Section 6.2.6 – Social Application Fund
Rebate of rates for the directly affected communities for the period concerned should be considered	Mr Wally Menne	



Issue/Concern	Raised by	Response
Concern was expressed that a loan by the municipality would imply that the ratepayers' base would in effect pay for this project. Would rates be affected by the implementation of this project? The project would not be supported if the ratepayers would be negatively affected by this	Pinetown Ratepayers Association	Rates would not be affected by the project – project See Section 6.2.5 – Funding and Financial Synopsis / Appendix H – Project Financial Summary.
Information regarding the cost-benefit analysis of the project should be included in the Environmental Scoping Report	Keep Tongaat Beautiful Association Springfield Business Park	See Section 6.2.5 – Funding and Financial Synopsis / Appendix I – Project Financial Summary. Environmental / social benefits are discussed in Section 11.2 – Identified impacts and Mitigation Measures
There are cheaper alternatives for removing the methane.	Ms. S Khan – Focus Meeting 16 March	See Section 4 – Assessment of Alternative Project Options
Social		
Daily complaints regarding smells from teachers and pupils in the area surrounding Bisasar Road landfill.	Clare Estate Development Forum	Odour is discussed in Section 5.1.6 – Background Information, and Section 9.10 - Odour Air Quality is discussed in Section 9.4 – Air Quality
Air quality and odour should be improved in the area. This has been an active concern for more than 5 years.	Ezemvelo KZN Wildlife	
Health and safety with regard to methane was a concern. Chemical reactions where methane was involved, take place at high temperatures which could lead to possible explosions.	Keep Tongaat Beautiful Association	Fire and Explosion Risk is discussed in Section 4 - Assessment of Project Alternatives, and Section 8.4 – Fire and Explosion Risk



Issue/Concern	Raised by	Response
Proof of information regarding previous health risk assessments should be supplied. None of the residents can recall being part of any survey/filling in a questionnaire etc.	Mrs Sureka Narotam, Clare Estates – Comments on Draft SR Clare Estate Development Forum	Information contained in this section of the Draft ESR is intended to provide background to the operation of the site. The underlying documentation pertaining to the summary made in this section is supported by a number of studies (Margot Saner and Associates ref: 15 January 1999, 15 May 2000, and July 2001).
There is a concern that methane and related chemicals reactions could affect the scavengers and informal settlements around the landfills.		Air Quality is discussed in Section 9.4 – Air Quality
The risk of fire and explosions should be considered as cane fires were a problem around the La Mercy landfill.	Raised at Public Meeting, Tongaat	Fire and explosion risk id discussed in Section 8.4.
There is a concern that methane and related chemicals reactions could affect the scavengers and informal settlements around the landfills.	Keep Tongaat Beautiful Association	Fire and explosion risk is discussed in Section 8.4. The spending of social application funds derived from this project will be driven through ongoing stakeholder engagement
How will the community benefit from this project?	Mr Wally Menne Kennedy Road Informal Settlement Association	The spending of social application funds derived from this project will be driven through ongoing stakeholder engagement
The landfill has contributed to the livelihoods of the community through scavenging and collection for recycling opportunities.	Kennedy Road Informal Settlement Association.	The project will not affect scavenging and collection for recycling opportunities.
The presence of informal residents around the landfill site is a concern. Explosion on site due to their negligence and theft of equipment is a concern	Mrs S Narotam, Clare Estates – Comments on Draft SR	Residents from informal settlements adjacent to the site are not permitted on the working face or in close proximity to the extraction system. The landfill gas to electricity project will not cause risks to the residents of Claire Estate due to the presence of the adjacent informal settlement or people on site.



Issue/Concern	Raised by	Response
It is not mentioned in the SR that the landfill is situated in a residential area.	Clare Estate Development Forum – Comments on Draft SR	The identification and evaluation of potential environmental impacts in the Environmental Scoping Report takes due consideration of the close proximity of residential areas to the site. Maps included in the Environmental Scoping Report also reflect this situation
Engineering/Infrastructure		
Could the equipment used be transferred to another site after the landfill had closed and the generation of methane ceases?	Chamber of Commerce, Environmental Committee Mr Wally Menne Keep Tongaat Beautiful Association Pinetown Ratepayers Association	The possibility is being considered by eThekwin.
What would happen to the landfill once the project was finished?	Mr Wally Menne Kennedy Road Informal Settlement Association	The area will be rehabilitated. However, final plans for rehabilitation have not been compiled yet.
The landfill should be used for good purposes like recreational areas once the landfill has reached the end of its life.	Mr Jogi, Clare Estates	eThekwin is investigating possibilities in terms of post rehabilitation land use.
eThekwin investigated the possibility of piping gas across the Umgeni River to NCP. When was this investigation done and was this checked out recently again?	Mrs Sureka Narotam, Clare Estates – Comments on Draft SR	DSW carried the investigation with AA Loudon & Partners with Lombard & Associates. The investigation is described in Section 4.



Issue/Concern	Raised by	Response
The utilisation of the Petronet pipeline would present problems to DSW if LFG was piped through the pipeline. Petronet surely runs this pipeline with the authorisation and possibly pays rental income to the municipality for this. For DSW to utilise this option is very risky and what happens at present if this pipeline explodes. Is this not risky for us residents?	Mrs Sureka Narotam, Clare Estates – Comments on Draft SR	The pipeline is managed by Petronet and is not related to DSW or the landfill site. The pipeline is not being utilised by DSW. Perceived risks associated with the Petronet pipeline cannot be commented on in the context of the current EIA process as they non-related.
If the project requires more land -where would this be sourced from?	Mrs Sureka Narotam, Clare Estates – Comments on Draft SR	All infrastructure relating to the proposed project will be located within the confines of the existing landfill site. No additional land will be required in order to facilitate the project.
What are the plans for the municipal nursery in Burnwood Road? Is this land going to be used for the project?	Mrs Sureka Narotam, Clare Estates – Comments on Draft SR	The project will not be located on this site. Future plans for the nursery are not related to the current scoping process.
Process Issues		
What does the pre-application consultation involve?	Clare Estate Development Forum	This was a legal requirement to determine the DAEA's procedure for the scoping phase. It was agreed that an EIA would be undertaken. A plan of study for scoping was presented to and agreed upon with DAEA.
The independence of the EIA consultant is questioned	Clare Estate Development Forum	In terms of Regulations Regarding Activities Identified under Section 21(1) (3 - Responsibilities in terms of regulations), eThekweni has acted within its legal obligations by appointing an independent consultant who will comply with these regulations on behalf of the applicant.
Further discussions between Eskom and the Electricity Utility Company of eThekweni Municipality to be undertaken.	Mr Troy Govender, Eskom	Noted.



Issue/Concern	Raised by	Response
The Member of the Executive Council (MEC - a political office) should have taken responsibility for the project.	Clare Estate Development Forum	The EIA process will inform the MEC to make an appropriate decision.
The community had to be consulted and they had to feel that they would benefit from the project.	Mariannhill Conservancy	The community is being consulted as part of the EIA process.
There was a need for the distribution of background information to the areas around the Mariannhill landfill, including the Nazareth community. There was a need for consultation with the community leaders in the surrounding areas.	Mariannhill Conservancy	See Public Participation Process – Section 2.4
The Clare Estate Development Forum is fully represented at the monitoring committee and the matter should be discussed there.	Clare Estate Development Forum	Comment noted
A newspaper notice will suffice to inform the general community, however, the community organisations and members of the monitoring committee should receive personal notifications and automatically be identified as I&APs.	Clare Estate Development Forum	See Public Participation Process – Section 2.4
Notification of meetings should be sent to all residents, and should not just be informed by adverts.	Mr Trevor Snyman, Mariannhill	Comment noted



Issue/Concern	Raised by	Response
Minutes of the Focus Group meeting with the Clare Estate Development Forum were not distributed	Clare Estate Development Forum	See response to CEDF contained in Appendix M to the Environmental Scoping Report. CEDF had in fact received the minutes and Felehetsa Environmental confirmed that both the minutes and CEDFs comments on the minutes would form part of the record of this process. It was communicated to CEDF (telephonically) that the authors of the minutes were of the opinion that they were not comfortable changing the contents of the minutes as requested as this was not their interpretation of what was said at the meeting.
Concerns regarding consultation during the Project Design Stage	Clare Estate Development Forum	The process of approval of the project design document falls outside of the scope of this Environmental Impact Assessment.
Comments should be made about the disadvantages of the project	Clare Estate Development Forum – Comments on Draft SR	Overall disadvantages relate to potential negative environmental impacts. It is our professional opinion that these are adequately represented in the Environmental Scoping Report .
General		
The Clare Estate Development Forum had expressed their dissatisfaction to the World Bank regarding the continued operation of the landfill within the community. They feel that it is not acceptable that the landfill will be kept open for 17 years to produce gas.	Clare Estate Development Forum	It is not eThekweni's intention to keep the site open solely for support to the project.



Issue/Concern	Raised by	Response
What is the lifespan of Bisasar Road landfill?	Clare Estate Development Forum	Mr. Strachan stated that he could not answer this question, but that there were a number of issues that need to be considered. There can be no indication of exact closure dates, as yet. However, it can be assured that dates will be set and implemented on sectional closure of the Bisasar Landfill. At the current waste stream tonnages received by Bisasar simple arithmetic will indicate that the lifespan of the Bisasar facility is no more than nine years (reaching a full design capacity by 2013). But, it is eThekweni's intention to enter into discussions with the community at the earliest practical date with a view to obtaining agreement with the community on the closure of the Bisasar landfill, as opposed to debating arguably non-realistic time-scale issues.
The community around Bisasar Road would support the removal of the landfill gas, but the community mandate is to request the immediate closure of the landfill. According to the CEDF, the landfill was supposed to be closed in 2000. The permit was extended without public consultation. This has caused major problems	Clare Estate Development Forum	Noted.
Request that the Bisasar Road landfill Site be closed, rehabilitated and the landfill gas extracted.	Clare Estate Development Forum	This is not a feasible option from a municipal waste management perspective. Ongoing rehabilitation is undertaken.
National Department of Water Affairs and Forestry was in the process of revising the permit conditions for Bisasar Road and will deal with better management and control regarding impacts on the public.	DWAF KwaZulu-Natal	Permit Conditions to be taken into consideration during compilation of the EMP.
The cumulative role of all CDM projects would probably have a positive effect.	Ezemvelo KZN Wildlife	Noted.



Issue/Concern	Raised by	Response
How does the project fit into the philosophy of minimization and recycling of waste?	Mariannhill Conservancy	The aim of the project was not to encourage the production and disposal of waste in order to allow eThekweni Municipality to harness methane gas. The principles of minimisation of waste and recycling are still being promoted.
It is a gross violation of constitutional rights that the community does not have a clean and healthy living environment.	Clare Estate Development Forum	Noted.
Is information available on similar projects overseas?	Raised at Public Meeting, Tongaat	See Section 8.4 – Fire and Explosion Risk
Is anyone else undertaking a similar project?	Raised at Public Meeting, Tongaat	
Does the project not aid the First World in polluting?	Raised at Public Meeting, Tongaat	The purchase of CERs in the international market allows developed countries some flexibility to meet their obligations in terms of the Kyoto Protocol.
Will other municipalities be selling their waste to eThekweni to produce gas?	Raised at Public Meeting, Tongaat	No.
The project must not be sold off to an International concern. If privatisation does take place, the local community should have first right of refusal.	Raised at Public Meeting, Tongaat	It is the intention of the eThekweni municipality to involve stakeholders in decisions relating to this possibility.
Strong winds cause dust and dirt problems around the site.	Ms. S Khan – Focus Meeting 16 March	See Section 9.4 – Air Quality / Section 10.1 – Issues Not Directly Related to the Project
Flies are a problem and chemicals are distributed to the community for the flies and these chemicals are poisonous.	Ms. S Khan – Focus Meeting 16 March	See Section 10.1 – Issues Not Directly Related to the Project



Issue/Concern	Raised by	Response
Buffer zone required around the landfill site.	Ms. S Khan – Focus Meeting 16 March	See Section 5.1.7 – Buffer Zone
Does this project not require a buffer zone? Is DSW going to meet the conditions of the buffer zone and move the residents out?	Mrs S Narotam, Clare Estates – Comments on Draft SR	<p>Matters relating to the buffer zone are not directly related to the proposed LFG to electricity project and are provided for background purposes only. It is made clear in the scoping report that progressive rehabilitation along the landfill site boundary has resulted in the development of an inward moving ‘buffer zone’ on the boundary of the landfill site. As at December 2002, the buffer zone was in excess of 200m wide in the vicinity of Clare road. Appendix 4.3 of the Minimum Requirements for Waste Disposal by Landfill (DWAF 1998), indicates the effectiveness of an inward moving buffer:</p> <p>“..... In certain cases, it may also be possible to meet buffer zone requirements by progressively moving the operation away from future residential or other sensitive developments. In this way, the required set back distance can be maintained, before the development occurs...”</p>
The term buffer zone is used to mislead people	Ms S Khan – Comments on Draft SR	<p>Information contained in this section of the Environmental Scoping Report is intended to provide background to the operation of the site. Matters relating to the buffer zone are not directly related to the proposed landfill gas to electricity project. However it is worth pointing out the following clause from Appendix 4.3 of the Minimum Requirements, which indicates the effectiveness of an inward moving buffer:</p> <p>“..... In certain cases, it may also be possible to meet buffer zone requirements by progressively moving the operation away from future residential or other sensitive developments. In this way, the required set back distance can be maintained, before the development occurs...”</p>



Issue/Concern	Raised by	Response
Disposal of non conforming hazardous waste at the landfill site.	Ms. S Khan – Focus Meeting 16 March	See Section 5.1.1 – Waste Class See Section 10.1 – Issues Not Directly Related to the Project
In 1987 it was stated that the life expectancy of the landfill was 13 years, but operations were still carrying on.	Ms. S Khan – Focus Meeting 16 March	See Section 5.1.8 – Landfill Site Lifespan
If the project goes ahead does dumping continue on site?	Mrs S Narotam, Clare Estates – Comments on Draft SR	The project is not related to whether or not the landfill site will continue to operate. The project will remain feasible even in the event of immediate closure - LFG will continue to be emitted for a considerable period of time after closure from the existing waste body.
Gasses could migrate along fault lines. A major part of the site was not lined and located on virgin soil.	Ms. S Khan – Focus Meeting 16 March	Gas extraction is undertaken to prevent gas migration.
Suspected that the landfill exacerbates the unstable conditions in the area.	Ms. S Khan – Focus Meeting 16 March	See Section 8.3 – Landfill Stability
Various residents have stated that there are problems with regards to stability of land.	Mrs Sureka Narotam, Clare Estates – Comments on Draft SR	See Section 8.3 – Landfill Stability
According to a gas expert it will take 5 years to extract the gas and that the project would only be viable after 15 years	Mr. A Singh – Focus Meeting 16 March	This advice is incorrect and unfounded.
Impact on the disadvantaged, crime and safety, illegal dumping and property values	Louis Pillay Phoenix Environmental Forum at the second Public Meeting, Bisasar	See Section 8.1 – Issues Not Directly Related to the Project See minutes to second public meeting – Bisasar Road – Appendix G.



Issue/Concern	Raised by	Response
Have any similar projects been done anywhere else in SA? How is it possible to bore through waste and how deep will the wells be?	Raised at the second Public Meeting, Bisasar	See minutes to second public meeting – Bisasar Road – Appendix G. See Appendix M – Similar Projects Undertaken in South Africa
Fatal flaws pertaining to the continued operation of the landfill site.	Raised at the second Public Meeting, Bisasar	See Section 10.1 – Issues not directly related to the project
A letter regarding the management of the landfill site has been sent to DWAF and cognisance should be taken thereof	Clare Estate Development Forum	These comments relate to issues surrounding the ongoing management at the landfill site and are not included in the scope of this project. These issues have been brought to the attention of DSW, eThekweni Municipality and the environmental authorities (DAEA).
The polluter pays principle would apply and all the dirt dumped on this site must be removed and the area re-habilitated to its original beauty	Ms S Khan – Comments on Draft SR	The Bisasar Road landfill site is permitted for waste disposal and is subject to the pollution prevention provisions set out in terms of the Water Act and other applicable legislation. The removal of all waste from the site is not a feasible option from an environmental and social perspective

E.3. Report on how due account was taken of any comments received:

Please note that the information at section E.2, above, presents stakeholder comments received with the responses provided to such comments. It is submitted that responses provided indicate how the comment was taken due account of, e.g., by providing an explanation for a particular course of action. Consequently the Table at section E.2 serves the purposes of both sections E.2 and E.3 of this PDD and the information is not repeated below.

However, as described at section D.1 above, a single appeal was lodged against the environmental authorisation granted for the proposed project activity. In providing a response to the appeal, as requested by DAEA, the project proponent was able to take account of particular concerns with regard to air quality. The grounds of the appellant's appeal included certain commentary with regard to the project's potential impact on local air quality. As part of its response to the appeal the project proponent released the report entitled: Durban Landfill Gas Utilisation Project: Air Quality Impact Assessment of Bisasar Road Landfill, compiled by Enviro Consulting (the Enviro Report). It should be noted that the detailed level of investigation undertaken in the Enviro Report is not a prerequisite for the scoping phase. The study had initially been commissioned in the expectation that the environmental impact report phase would be required by DAEA. As described above, DAEA granted environmental authorisation for the proposed project after the scoping phase, thus obviating the need to enter into the environmental impact



report phase. The robustness of the DAEA's decision is demonstrated by the fact that the environmental authorisation has withstood the appeal process. In addition to its value as an assessment tool the value of the Enviro Report lay in its contribution to the project proponent's internal information and environmental planning for the proposed project activity. However, it became clear during the appeal process that the information contained in the Enviro Report would enable the project proponent comprehensively to take due account of the appellant's concerns with regard to air quality impacts.

Consequently, in responding to the appeal, the project proponent provided the appellant with a copy of the Enviro Report, for her consideration. As mentioned previously the Appeal Decision comments that the information contained in the Enviro Report was an important contributing factor in the rejection of the appellant's grounds of appeal. The appellant had a further right of review to the South African High Court, should she have been dissatisfied with the outcome of the appeal. The appellant did not exercise this right of review.

A newspaper advertisement, giving notice of the outcome of the appeal process and offering copies of relevant documents and decisions was inserted into the Sunday Tribune, a Sunday, weekly, English-language newspaper circulating within the jurisdiction of the project proponent, on 15 January 2006.

Community Fund

A proportion of the revenue from the sale of carbon credits will be ring-fenced for community projects. A trust or other legal vehicle will be established by DSW to manage the revenue of up to 5% of the sale of carbon credits. The fund will be known as the "CDM Project Social Benefit Fund" and will be managed by a Committee of Stakeholders administered through the eThekweni municipality. The Committee will approve any project that has been put forward to ensure that it meets pre-defined criteria.

Activities that are eligible for funding are, for example, waste management and recycling programmes, vocational training and skill enhancement, energy efficiency projects, and the development and use of renewable energy sources. In addition, specific other requirements need to be met such as the necessity to benefit poorer residents within the eThekweni municipality.

**Annex 1****CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY**

Organization:	Durban Solid Waste
Street/P.O.Box:	17 Electron Road, Springfiled, PO Box 1038
Building:	
City:	Durban
State/Region:	Kwazulu-Natal
Postfix/ZIP:	4000
Country:	South Africa
Telephone:	27 (0)31 302 4821
FAX:	27 (0)31 263 1119
E-Mail:	
URL:	
Represented by:	
Title:	Project Manager
Salutation:	Mr
Last Name:	Strachan
Middle Name:	J
First Name:	Lindsay
Department:	Unicity Landfills
Mobile:	27 (0)83 631 2682
Direct FAX:	27 (0)31 263 13107
Direct tel:	27 (0)31 263 1371/2
Personal E-Mail:	Lindsay@dmws.durban.gov.za

Organization:	Ethekwini Municipality
Street/P.O.Box:	No address
Building:	
City:	
State/Region:	
Postfix/ZIP:	
Country:	South Africa
Telephone:	
FAX:	
E-Mail:	
URL:	
Represented by:	
Title:	Municipal Manager
Salutation:	Dr
Last Name:	Sutcliffe
Middle Name:	O
First Name:	Michael
Department:	



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Mobile:	
Direct FAX:	27 (0)31 311 2170
Direct tel:	27 (0)31 311 2100
Personal E-Mail:	msmdb@mweb.co.za



Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No ODA is involved in the project.

**Annex 3****BASELINE INFORMATION****A: Factor used for converting methane to carbon dioxide equivalents:**

Factor used (CO ₂ e/ CH ₄)	Period Applicable	Source
21	1996 - present	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories

B: Conversion volume of methane to weight of methane:

	Factor	Unit	Period Applicable	Description/ source
Methane Density	At standard temperature and pressure (0 degree Celsius and 1,0131 bar) the density of methane is 0.0007143 tCH ₄ /m ₃ CH ₄ tonnes	tCH ₄ /m ₃ CH ₄	Default	Mark's Standard Handbook for Mechanical Engineers Ninth Edition McGraw-Hill Book Company page 4-30, Table 4.1.7*

* The density of methane is given in that table as: 0.0416 pounds per cubic foot at 68 degrees F and 14.70 pounds per square inch. To convert that to kilograms per cubic meter at 1.013 bar and 0 degrees Centigrade: 293 degrees Kelvin/273 degrees Kelvin = 1.0732 which is the weight addition ratio at a constant volume, therefore 0.0416 x 1.0732 = 0.0446 pounds per cubic foot. 1 cubic meter = 35.31 cubic feet, therefore 0.446 x 35.31 = 1.5748 pounds per cubic meter / 2.2046 pounds per kilogram = 0.7143 kilograms per cubic meter.

C: Project power generation costs:

The total cost for the total integrated 3 site project¹ is estimated at US\$12.20 million based on adjusted budget quotes.² Because there are multiple sites in the integrated project this can be broken down to an estimated cost of US\$1.35 million per MW of electricity capacity installed at any of the 3 landfill sites. This total includes all development costs including the Environmental Impact Assessment (EIA) preparation, the generation system installed costs, the interconnection costs, the gas well costs (not including the baseline wells), the financing costs including interest during construction, and an appropriate contingency of less than 10%. The US\$ price per MW installed is an appropriate way to

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¹ The original investment plan includes landfill gas recovery at two other landfill sites managed by DSW, Mariannahill and LaMercy. These projects are currently under validation.

² As reported in the DWS project spreadsheets prepared by Engineer Lindsay Strachan. The budget quotes suggested a price of over US\$13 million but historically final prices have been lower than the budget quotes received from these suppliers, hence a small downward adjustment has been made.



budget this project by DSW since it is simply a staged procurement process for a multi-component integrated project.

The project is being structured to enable contracting for a firm annual delivery of 67.8 GWh from all 3 sites or 7.5GWh per MW installed. It is possible that the integrated project will deliver more MWh per year if the buyer will accept it, but the (maximum annual) guaranteed amount will be 67.8 GWh per year. The first order indicator of the cost of production per kWh in a case wherein the fuel is considered free (other than capital cost recovery for the wells) is the debt service requirement for 100% debt finance.

Assumptions:

1. The Power Purchase Agreement will be for 10 years with options for 2 additional 5 year extensions.
2. The debt period is assumed to be 8 years to meet risk management criteria of typical financing sources.
3. The interest rate is assumed as 10% in US\$ terms.

The annual debt service requirement (including repayment of principal) on a debt of US\$12.20 million with an 8 year loan at 10% interest would be US\$181,440 per million of debt or US\$2,213,568 per year. That translates into a debt service component in the cost of production of US\$0.0326 per kWh. A 10 year, 10% loan would reduce this down to US\$0.0283 per kWh for sensitivity purposes. Because the lifetime of the engines (which form the main component of investment costs) is around 10 years, it can be assumed that a new loan will come into effect to purchase replacement engines at about the time when the first loan is fully repaid. Alternatively, equity financing of continued operation (including replacement engines) would arrive at a similar result, when taking depreciation and a reasonable return on investment into account.

The O&M cost per long term use of the piston engine generators is estimated to be US\$0.008 per kWh produced including all labor and materials charges for routine maintenance and for major overhauls. Adding the O&M component cost to the debt service component cost results in an estimated cost of production of US\$0.0406 per kWh. Adding in an administrative and insurance burden of US\$0.0016 per kWh results in a total estimated cost of production of US\$0.0422 per kWh.

Since the project development process started there has been a significant change in the ratio of the South African Rand to the US\$. The August 15, 2005 value of 6.46 Rand = 1 US\$ has been used to re-evaluate the project costs and revenues. The majority of the generation equipment is imported but the majority of components for the gas side of the project are available locally. No expatriate expertise is required for the operations and maintenance of the equipment. A re-evaluation of the cost of generation shows an essentially equal projection under the revised monetary conditions, hence the above number remains valid.

While inputs such as equity can change the answer somewhat, this value is considered as an accurate, yet *conservative* indicator of the cost of production for the proposed facility. The cost calculation is considered conservative, in particular because it does not include considerations of risks associated with the operation of a landfill gas-to-electricity project such as technology and resource risks.



Cost Items	
Annual Generation (Gwh)	67.8 GWh
Estimated total cost of project (US\$ m)	12.2
	US\$/ kWh
Annual debt service payment (8-year loan, 10% interest) on a per kWh basis (US\$/ kWh)	0.0326
Operations & Maintenance (US\$/ kWh)	0.008
Administration & Insurance (US\$/ kWh)	0.0016
Total generation cost (US\$/ kWh)	0.0422

D. Current power prices and LRMC of South African grid

The municipal electric company, eThekweni Electricity, purchases its electricity primarily from Eskom, the national electricity utility company. Eskom electricity is among the lowest cost sources of electricity in the world, and the vast majority of Eskom generated electricity is derived from fully depreciated, minemouth coal-fired power stations. Ninety percent (90%) of the MWh generated by Eskom are derived from coal-steam power plants.

As of August 2005, the 24 hour weighted average tariff Eskom charges eThekweni Electricity is about 9.7 Rand cent (US\$0.0150) per kWh with off peak tariffs being as low as US\$0.0092 at 6.46 Rand per US\$ and after a total Eskom tariff structure revision lowering peak hour tariffs and raising off-peak tariffs. This compares with the initial PDD weighted average value of 13.7 Rand per kWh (US\$0.0156) at 8.78 Rand per US\$ under the old Eskom tariff regime.

Current tariff level (US\$/ kWh)

Off-Peak	0.0092
Weighted averaged	0.0150

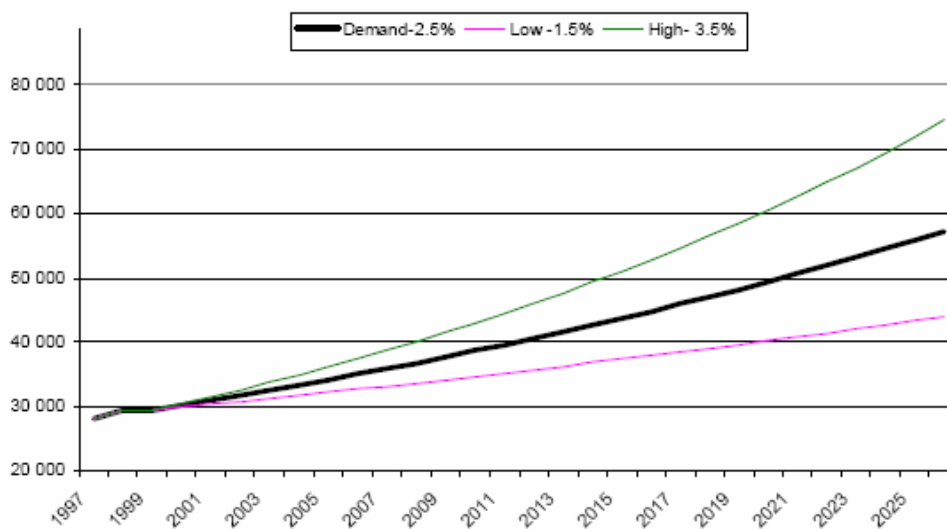
In order to estimate the long-term market price for electricity one needs to look at the development of the long run generation costs. If generation costs go up so will the price charged to customers. It is assumed, that Eskom will meet the demand for electricity at least cost. The least cost technology that can satisfy the projected demand over the project crediting period thus gives an indication for the development of the market price.

Supply and demand forecast

According to Eskom's annual reports and statistical reports the 4 year average electricity demand growth from 1996 –2000 was only 1.5%, but the 1 year growth between 1999-2000 was 2.8%. Eskom's forecast

of electricity demand is based on three scenarios of economic growth at 3.5%, 2.5% and 1.5%. With actual annual GDP growth of 2.7% (treasury department), the middle scenario was deemed the most likely for demand projections. Recent year (through 2004) growth statistics suggest that a middle to high range is more likely.

Electricity demand forecast, South Africa 1997 – 2025 (MW)



Source: NER

Long run marginal costs with excess supply

The long run marginal costs of the South African grid are determined by the generating costs of the existing capacity up to the point where investment in new capacity is required. That is, until existing capacity is exhausted and new capacity must be installed, the long-run marginal costs in South Africa are equivalent to the short-run marginal costs. The current generation costs per kWh in a fully depreciated Eskom power plant are estimated to be US\$0.004. Depending on coal price, heating content and plant efficiency this could range from US\$0.003 to US\$0.005 per kWh. The reactivation of the moth-balled power plants is not at this time leading to even slightly higher generation costs. For the World Bank Renewable Energy Program being developed in South Africa, the current Eskom generation costs are conservatively assumed to be US\$0.0105 per kWh rising to no more than US\$0.0225 – in 5 to 7 years at the soonest – including the reactivation of moth-balled capacity and some new gas-fired capacity.³

Long run marginal costs to meet growing future demand

Natural Gas from Mozambique is a possible least cost expansion option for Eskom to develop within South Africa after the electricity demand has outgrown existing capacity, including the moth-balled

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³ See World Bank (2002) South Africa: Renewable Energy Market Transformation, Project Concept Document (PCD) Africa Regional Office, AFTEG.



coalfired capacity. No political obstacles are to be expected since South African firms are already controlling many gas fields in Mozambique. This assumes that no new coal-fired capacity would be developed in South Africa. However, South Africa maintains the option to increase coal-fired power capacity and may pursue this option, if such coal-based capacity results in lower power generation costs than the use of pipeline gas. The coal-based option therefore serves as a low-cost fall back option, e.g. if gas prices increase significantly. Assuming gas-fired power expansion, with which landfill gas-derived electricity would have to compete, appears therefore as a conservative assumption.

The most likely US\$ value for the gas transmitted by pipeline from the relatively nearby gas fields would be in the vicinity of US\$2.00 – 2.50 per million Btu, before considering the petroleum product market price impact on gas pricing. At the value assumed that would put it close to the point where a Combined Cycle plant would be competitive with a Simple Cycle plant. For purposes herein, both cases will be considered as will gas prices of \$2.00 and \$2.50 per million Btu, based on the calculation given in the table below. The financing term is a 10 years period.

Generation costs of a simple and a combined cycle gas turbine

	Simple Cycle	Combined Cycle
Capital Cost – US\$/MW	0.55	0.85
Efficiency - %	38	49
Heat Rate – Btu/kWh	8,980	6,965
Fuel Cost/kWh (\$2 gas) - \$/kWh	0.0179	0.0139
Fuel Cost/kWh (\$2.5 gas) - \$/kWh	0.0224	0.0174
O&M + admin. Cost - \$/kWh	0.0025	0.0030
Debt Service - \$/kWh	0.0104	0.0161
Estimated LRM C	US\$0.0308 – 0.0353	US\$0.0330 – 0.0365

Source: Own calculation

The projected increase in power demand over time and the options to meet this demand results in an increase over time of generation costs in the South African power system (Table 3). The Table shows in Line (1) the current demand, which is met by existing mostly coal-based capacity in a situation of excess generation capacity, and the associated costs (mainly operating and maintenance costs). Line (2) shows the costs at a time when demand growth has caught up with existing capacity (projected in eight to nine years). And Line (3) shows the long-run marginal costs that include the addition of new capacity to the system in order to meet further growing demand.

LRMC in relation to MW demand

System condition	Demand	Tariff / LRMC (US\$ /per kWh)
(1) Current demand	Up to 30.000 MW	0.004-0.0105
(2) Demand catches up with existing capacity	Up to 40.000 MW	0.0225
(3) New capacity added	> 40.000 MW	0.0308-0.0365

Source: Own calculations based on World Bank (2002) South Africa: Renewable Energy Market Transformation, Project Concept Document (PCD) Africa Regional Office, AFTEG.



There seems to be no shortage with respect to South Africa's natural gas purchase from Mozambique and Namibia, and coal as a fall-back option is abundant and low cost in South Africa. It is thus safe to assume that over the project lifetime, long run marginal costs of the South African grid will not exceed US\$0.0365. For the period until 2013 the generation costs will not likely exceed US\$0.0225 and current Eskom tariff trends confirm this hypothesis.

E. Grid Emission Factor

0.978 kg of CO₂ per kWh (2005 Eskom Annual Report)

Annex 4**MONITORING INFORMATION**

Monitoring Plan attached to this document
