

**CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-SSC-PDD)
Version 03 - in effect as of: 22 December 2006**

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Revision history of this document

Version Number	Date	Description and reason of revision
01	21 January 2003	Initial adoption
02	8 July 2005	<ul style="list-style-type: none">• The Board agreed to revise the CDM SSC PDD to reflect guidance and clarifications provided by the Board since version 01 of this document.• As a consequence, the guidelines for completing CDM SSC PDD have been revised accordingly to version 2. The latest version can be found at http://cdm.unfccc.int/Reference/Documents.
03	22 December 2006	<ul style="list-style-type: none">• The Board agreed to revise the CDM project design document for small-scale activities (CDM-SSC-PDD), taking into account CDM-PDD and CDM-NM.

SECTION A. General description of small-scale project activity
A.1 Title of the small-scale project activity:

Title : Lomati Biomass Power Generation Project in Mpumalanga Province, South Africa
 Version: 01
 Date : February 10 2012

A.2. Description of the small-scale project activity:

A new biomass cogeneration power plant is proposed at Barberton, Mpumalanga, South African. The plant will be owned by Lomati Energy (Pty) Ltd, an independent energy company¹. The project site is adjacent to Lomati sawmill².

The power plant will have a net generating electrical capacity of 8.5 MWe. It will consist of a fuel handling system, a 50 TPH superheated steam boiler, a steam turbine generator (TG) set with gross generating capacity of 10,1 MWe, a cooling tower and a high voltage (HV) electrical system. It will produce steam and electricity by means of combustion of biomass.

On average, 16 TPH of biomass will be available as fuel feedstock for the power plant. All biomass fuel used in the project will be biomass residues. More than half of the total biomass fuel requirement will be sourced from the existing Lomati sawmill in the form of saw dust and shavings that are produced at wet and dry mill stages as well as stripped bark. The remainder of fuel requirement will be obtained from other sources such as forest slash, a residue from log harvesting in forests. Lomati sawmill will manage fuel collection from all sources and fuel handling with storage on premises of power plant.

Up to 14 TPH of saturated steam at 3 bar(a) will be provided to the adjacent saw mill as process steam to run existing drying kilns. No emission reductions will be claimed with regard to process steam, as drying kilns would continue to be supplied with steam from biomass-fired boilers in the absence of project.

The project will claim only emission reductions due to grid-connected renewable electricity generation, which in the absence of the project would have been generated from the carbon-intense power generation mix of the South African grid. It will supply around 56218³ MWh/yr of renewable electricity to the grid, resulting in annual carbon emission reductions of around 54925 tons/yr.

The project will contribute to sustainable development in the following ways⁴:

¹ Sources: Company registration document, Draft Basic Assessment report (~ EIA) Nov. 2011 p. 6
http://wsp.selesti.com/media/docs/ourlocations/africa/Draft_BAR_Consolidated_Final_Draft_to_client_2011-11-18.pdf

² Sources of technical and biomass related information in this chapter: please refer to PDD section A 4.2. “Technology/ measure” for detail on references)

³ Average over crediting period as in financial model

⁴ Source: Draft Basic Assessment Report Nov 2011 (~ EIA), p. 8, 57,
http://wsp.selesti.com/media/docs/ourlocations/africa/Draft_BAR_Consolidated_Final_Draft_to_client_2011-11-18.pdf

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Environmental benefits:

- Due to the project, fossil-fuel based power generation will be replaced with a clean, renewable source of energy.
- The project is expected to lead to a net decrease of vehicular traffic on the roads within and beyond Lomati due to the use/ processing of biomass residues (renewable energy source) at the boiler site which will reduce the need for removal of biomass residues.

Economic benefits:

- The project will set a pilot example for using forestry biomass resources for independent grid-connected power generation in South Africa, as no similar initiative is currently operating in South Africa⁵.
- The project will improve the availability of electricity in the South African grid, thus helping to secure the future energy supply for the South African economy.

Social benefits:

- Lomati Energy (Pty) Ltd will finance restoration of a water extraction station at Queens River, which will improve water supply to the municipality. Lomati Energy (Pty) Ltd will facilitate the supply of water which will supplement the existing capacity of the Lomati dam. This will help to stabilise the water level of the dam and in turn stabilise municipal water prices which depend on the water level of the dam.
- The project will create job opportunities with regard to construction works, the employment of skilled personnel to maintain the plant as well as job creation in the surrounding formal and informal sectors for the collection and transport of biomass and removal and disposal of ash.
- The project will contribute to Black Economic Empowerment (BEE) through a Broad Based Black Economic Empowerment (BBBEE) initiative being driven by Lomati Energy (Pty) Ltd: The Proposed Lomati Community Trust will be a BBBEE shareholder in the project on behalf of the community, where benefits from the trust will contribute to development programmes identified in the Municipal Integrated Development Plan (IDP).
- In addition, a share of the project turnover is to be spent on economic and enterprise development which will result in more support to SMMEs (Small, Medium and Micro Enterprises), investment into community health, education and infrastructure development, and general improvement in the economy of the Umjindi Municipality.

In conclusion, the project will have a very positive sustainable development impact due to its pilot initiative for using a clean energy source for independent power generation and the various initiatives of the project owner to support the communities within Barberton by providing opportunities for the generation of income and the improvement of social facilities and infrastructure.

⁵ The only other potentially comparable project is Boskor Renewable Electricity Plant BREP (under validation), the operational status of which is unclear. According to UNFCCC GSC PDD <http://cdm.unfccc.int/Projects/Validation/DB/LFDBN6SA3S7B3VA3NXXS4NZ9NU3XJU/view.html> it is designed for a much smaller generation capacity of 2.7 MWe, which is smaller than the CDM micro-scale limit of 5 MWe.

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A.3. Project participants:

Name of Party involved (host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
South Africa (Host Party)	Lomati Energy (Pty) Ltd ⁶ (Private entity)	No
Ireland	ESBI Contracting Ltd.	No

A.4. Technical description of the small-scale project activity:**A.4.1. Location of the small-scale project activity:****A.4.1.1. Host Party(ies):**

Host Party: South Africa

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

Province: Mpumalanga

A.4.1.3. City/Town/Community etc:

Municipality: Umjindi

Town: Barberton

A.4.1.4. Details of physical location, including information allowing the unique identification of this small-scale project activity :

The project is located in the town of Barberton, approximately 43km south of Nelspruit and 360km to the east of Johannesburg.

GPS coordinates of the project location are: 25° 46' 16.25" S and 31° 02' 19.91" E.

Postal address of project company: PO BOX 14195, LYTTELTON, GAUTENG, Gauteng 0157⁷

⁶ Sources: UNFCCC prior consideration forms of this project, company registration document

⁷ Source: company registration document.

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Fig. 1 Indicative map⁸:



⁸ Sources: Royalty free map <http://www.sa-venues.com/maps/south-africa.htm>; Draft Basic Assessment Report Nov 2011 (~ EIA), p. 8, 57), http://wsp.selesti.com/media/docs/ourlocations/africa/Draft_BAR_Consolidated_Final_Draft_to_client_2011-11-18.pdf

A.4.2. Type and category(ies) and technology/measure of the <u>small-scale project activity</u>:

Type and category:

With reference to Appendix B to the simplified modalities and procedures for small scale CDM project Activities, the project activity is classified as follows:

Type: I. Renewable Energy Projects
 Category: I.C. – Thermal energy production with or without electricity

Technology/measure:

The project activity involves installation of a biomass based cogeneration plant to generate steam and power. The cogeneration plant will consist of a fuel handling system, a 50 TPH superheated steam boiler, a steam turbine generator (TG) set with gross generating capacity of 10,1 MWe, a cooling tower and a high voltage (HV) electrical system⁹.

The power plant will operate on the conventional Rankine steam cycle, with heat input from boiler (direct combustion) and net generating electrical capacity of 8.5 MWe. The heat input will be provided by means of combustion of the biomass. On average, 16 TPH of biomass will be available as fuel feedstock for the power station. Up to 14 TPH of saturated steam at 3 bar(a) will be provided to the adjacent saw mill as process steam to run existing drying kilns¹⁰. The project will supply around 56218¹¹ MWh/yr of renewable electricity to the grid. An operational diagram is available from Fig. 2 below.

Design features of key components:

Boiler:

- Source: Technical design report, including detailed technical offer from Supplier.¹²
- 50 TPH superheated steam boiler designed to operate at steam conditions of 485°C and 66 bar(a) when firing woody biomass
- Continuous Ash Discharge (CAD) stoker
- Electrostatic Precipitator to ensure the flue gas emission requirements exiting the stack are less than 50mg/Nm³
- Mono drum boiler design. This design is especially suitable for high pressure steam generation.

Steam turbine generator (TG) set:

- Source: Technical design report¹³
- Type of steam turbine: extraction cum condensing
- Designed output: net generating electrical capacity of 8.5 MWe at 11kv and 50Hz, and maximum process steam requirement of 14 TPH saturated steam at 3 bar(a).
- Required gross generating electrical capacity: 10.1 MWe based on upper limit for parasitic load of 1.6 MWe

⁹ Source: technical design report, p. 4

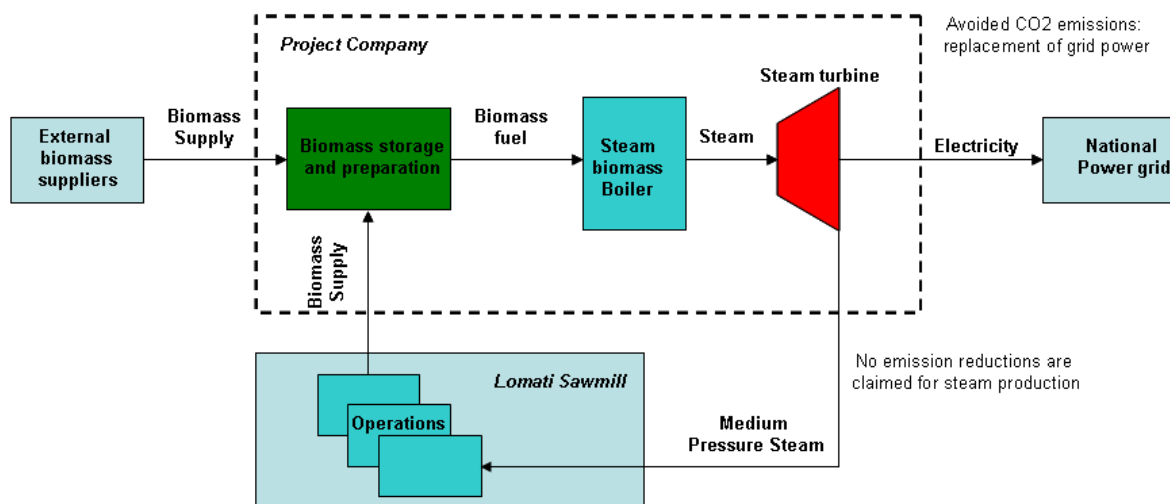
¹⁰ Source: technical design report, p. 2

¹¹ Average over crediting period as in financial model.

¹² Source: Appendix D p. 9 of technical design report

¹³ Source: Technical design report, p. 9-10, and chapters “plant performance” and Annex B. 2 “steam cycle calculations”

Fig. 2: Operational diagram of the project activity



Biomass supply:

The project plans to use only biomass residues, including the following sources (see Table 1 below):

- More than half of the total biomass fuel requirement will be sourced from the existing Lomati sawmill in the form of saw dust and shavings that are produced at wet and dry mill stages as well as other woody biomass waste products such as woody residue from tree log processing and stripped bark. These are direct residues from the mill operations.
- Collection of forest slash (pine slash) from plantations owned by Sappi. Forest slash is the residue biomass such as tree tops, branches and foliage after removing logs. Forest slash is the residue as a direct result of harvesting.
- Supply of bark from Ngodwana Pulp mill owned by Sappi. This is a residue of pulp mill operations.
- Other residues to be sourced from the municipality and employing small businesses, thus further enhancing the sustainable benefits of the project. This includes for example residues from alien vegetation clearing activities.

According to EB 20 Annex 8¹⁴, Biomass residues means biomass by-products, residues and waste streams from agriculture, forestry and related industries. It is noted that according to Draft Basic Assessment Report, p. 11¹⁵, “the biomass feedstock for the multi-fuel boiler has been determined by the Competent Authority to comprise a waste by definition contained in the NEMWA (see Section 3.3.1), and is therefore subject to the waste licensing provisions.” All biomass used by the project will be biomass residues as defined by EB 20 Annex 8.

¹⁴ <http://cdm.unfccc.int/EB/020/eb20repan08.pdf>

¹⁵ http://wsp.selesti.com/media/docs/ourlocations/africa/Draft_BAR_Consolidated_Final_Draft_to_client_2011-11-18.pdf

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With reference to para. 4 of EB 23, Annex 18 “Definition of Renewable Biomass”¹⁶, biomass residues as per EB 20 Annex 8 are a renewable type of biomass. In addition, it should be mentioned that Sappi has implemented FSC certification in the plantations which it owns and manages, and thus a significant share of the wood from which biomass residues originate would come from FSC certified sources¹⁷.

Lomati sawmill will manage fuel collection from all sources and fuel handling with storage on premises of power plant. There is no processing of biomass apart from chipping it into the required size (“conditioning”), which takes place directly on the site of power plant using energy from the power plant which is included in the estimates of parasitic load.

Table 1. Biomass supply¹⁸

Fuel source	Biomass residue	quantity [t/a]	%
Lomati sawmill	Saw dust & shavings wet mill	47025	37%
Lomati sawmill	Saw dust & shavings dry mill	16136	13%
Lomati sawmill	Pine bark	18514	15%
Sappi Pulp Mill (Ngodwana)	Other bark	13619	11%
Sappi Plantations	Pine slash	3390	3%
Lomati sawmill	Long end - off cuts tree logs	9346	7%
Other sources of biomass	e.g. alien vegetation disposal	17970	14%
Total		126000	100%

Description of how environmentally safe and sound technology and know how is being applied by the project activity inter alia technology transfer to the Host Party(ies) for application in the project activity:

The technology will be sourced from experienced suppliers. According to the Technical Design report, the boiler will represent high efficiency, low emission clean combustion technology, and cogeneration increases the efficiency of using primary energy sources. The project is undergoing an environmental approval process (Basic Assessment process) as part of the grid connected electricity license process, which will ensure that the project complies with applicable environmental regulation. Therefore, it can be concluded that the applied technology will be environmentally safe and sound. Project equipment such as the TG set is expected to be sourced from outside of South Africa (e.g. India or USA), resulting in a transfer of clean technology to South Africa.¹⁹

¹⁶ http://cdm.unfccc.int/EB/023/eb23_repan18.pdf

¹⁷ http://sappi.investoreports.com/sappi_sdr_2010/downloads/sappi_sdr_2010.pdf

¹⁸ Source: Technical design report, p. 6-7

¹⁹ Source: Technical design report p. 10, 2

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A.4.3 Estimated amount of emission reductions over the chosen crediting period:

Years	Annual estimation of emission reductions in tonnes of CO ₂ e
Year 1*	54295
Year 2	54295
Year 3	54295
Year 4	54295
Year 5	54295
Year 6	54295
Year 7	54295
Year 8	54295
Year 9	54295
Year 10	54295
Total estimated reductions (tonnes of CO₂ e)	542950
Total number of crediting years	10
Annual average over the crediting period of estimated reductions (tonnes of CO₂ e)	54295

* Year 1 starts by the starting date of crediting period as indicated in C.2.2.1.

A.4.4. Public funding of the small-scale project activity:

No public funding or ODA is involved in the project activity.

A.4.5. Confirmation that the small-scale project activity is not a debundled component of a large scale project activity:

As per Guidelines on assessment of de-bundling for SSC project activities, Version 03²⁰ 5 (EB 54, Annex 13),

a proposed small-scale project activity shall be deemed to be a de-bundled component of a large project activity if there is a registered small-scale CDM project activity or an application to register another small-scale CDM project activity:

- (a) With the same project participants
- (b) In the same project category and technology/measure
- (c) Registered within the previous 2 years
- (d) Whose project boundary is within 1 km of the project boundary of the proposed small scale activity at the closest point.

There is no registered project activity or application to register another CDM project activity with the same project participants. Sappi, whose operations provide a share of the biomass used by the project, has registered CDM project 0795²¹: Tugela Mill Fuel Switching Project on 12 Feb 2007. This can be

²⁰ http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid17.pdf

²¹ <http://cdm.unfccc.int/Projects/DB/DNV-CUK1165398206.69/view>

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excluded to represent any case of de-bundling based on the facts that it was registered more than 2 years ago and that it does not have the same Project Participants as the Lomati Biomass project.

Thus it can be concluded that the project activity is not a de-bundled component of another large scale project activity.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity:

With reference to the UNFCCC CDM website²², the approved baseline and monitoring methodology applied to the project activity is:

AMS-I.C. Thermal energy production with or without electricity, Version 19.0

In addition, the following tools and guidelines have been applied/referred to in the project activity:

- Guidelines for completing the Simplified Project Design Document (CDM-SSC-PDD) (Version 05)
- General Guidelines to SSC CDM methodologies (Version 17)
- Information on additionality (Attachment A to Appendix B of 4/CMP.1 Annex II) (Version 08)
- Non-binding best practice examples to demonstrate additionality for SSC project activities, (Version 01.0)
- Guidelines on the assessment of investment analysis (Version 05)
- Guidelines for objective demonstration and assessment of barriers (Version 01.0)
- General guidance on leakage in biomass project activities (Version 03)
- Clarifications on definition of biomass and consideration of changes in carbon pools due to a CDM project activity, EB 20 Annex 8
- Definition of renewable biomass (EB 23 Annex 18)
- Guidelines on assessment of de-bundling for SSC project activities (EB 54 Annex 13)
- Additional clarifications regarding the treatment of national/sectoral policies and Circumstances (EB 22, Annex 3 or its update)
- Tool to calculate the emission factor for an electricity system (Version 02.2.1)
- AMS I.D. [Grid connected renewable electricity generation](#), (Version 17.0)

B.2 Justification of the choice of the project category:

The methodology applicable to the project activity is AMS-I.C. Version 19.0.

The project activity complies with the technology/measure applicability criteria of the methodology AMS-I.C. Version 19.0.

²² <http://cdm.unfccc.int/methodologies/DB/6EL4AG49US2S1DNH55Y4S7GDOFA2JF>

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Justification for applicability of the technology/measure is provided in Table 2 below, referring to paragraphs (Para.) 1-14 of the applied methodology AMS-I.C. Version 19.0:

Table 2: Applicability

Paragraph No. / Applicability conditions	Justification	Applicable?
<p>1. This methodology comprises renewable energy technologies that supply users with thermal energy that displaces fossil fuel use. These units include technologies such as solar thermal water heaters and dryers, solar cookers, energy derived from renewable biomass and other technologies that provide thermal energy that displaces fossil fuel.</p> <p>2. Biomass-based cogeneration systems are included in this category. For the purpose of this Methodology, cogeneration shall mean the simultaneous generation of thermal energy and electrical energy in one process. Project activities that produce heat and power in separate element processes (for example heat from a boiler and electricity from a biogas engine) do not fit under the definition of cogeneration project.</p>	<p>The project activity is a biomass cogeneration project. Although this type of technology is not mentioned in paragraph 1, paragraph 2 specifically clarifies that the methodology is applicable to biomass-based co-generation systems.</p>	Yes
<p>3. Emission reductions from a biomass cogeneration system can accrue from one of the following activities:</p> <p>(a) Electricity supply to a grid;</p> <p>(b) Electricity and/or thermal energy (steam or heat) production for on-site consumption or for consumption by other facilities;</p> <p>(c) Combination of (a) and (b).</p>	<p>The project activity will claim only emission reductions to electricity supply to a grid. Therefore, option 3. (a) is applicable to the project.</p>	Yes
<p>4. The total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW thermal (see paragraph 6 for the applicable limits for cogeneration project activities).</p> <p>5. For co-fired systems, the total installed thermal energy generation capacity of the project equipment, when using both fossil and renewable fuel, shall not exceed 45 MW thermal (see paragraph 6 for the applicable limits for cogeneration project activities).</p> <p>6. The following capacity limits apply for biomass cogeneration units:</p> <p>(a) If the project activity includes emission</p>	<p>With regard to applicable capacity limits, both paragraphs 4 and 5 cross-refer to paragraph 6 for cogeneration project activities such as this biomass cogeneration project activity.</p>	Yes

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<p>reductions from both the thermal and electrical energy components, the total installed energy generation capacity (thermal and electrical) of the project equipment shall not exceed 45 MW thermal. For the purpose of calculating this capacity limit the conversion factor of 1:3 shall be used for converting electrical energy to thermal energy (i.e. for renewable energy project activities, the maximal limit of 15 MW(e) is equivalent to 45 MW thermal output of the equipment or the plant);</p> <p>(b) If the emission reductions of the cogeneration project activity are solely on account of thermal energy production (i.e. no emission reductions accrue from the electricity component), the total installed thermal energy production capacity of the project equipment of the cogeneration unit shall not exceed 45 MW thermal;</p> <p>(c) If the emission reductions of the cogeneration project activity are solely on account of electrical energy production (i.e. no emission reductions accrue from the thermal energy component), the total installed electrical energy generation capacity of the project equipment of the cogeneration unit shall not exceed 15 MW.</p> <p>7. The capacity limits specified in the above paragraphs apply to both new facilities and retrofit projects. In the case of project activities that involve the addition of renewable energy units at an existing renewable energy facility, the total capacity of the units added by the project should comply with capacity limits in paragraphs 4 to 6, and should be physically distinct from the existing units.</p>	<p>The project activity complies with paragraph 6 option (c): Emissions reductions of the project will be solely on account of electrical energy production, and total installed electrical energy generation capacity of the cogeneration unit will be a nominal 10.1 MWe, thus not exceeding the limit of 15 MWe.</p> <p>Further conditions of paragraph 7 are not relevant, as this project is a new facility and does not involve capacity additions to existing renewable energy generation facilities.</p>	
<p>8. Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category.</p>	<p>(Not relevant - the project activity does not seek to retrofit or modify an existing facility)</p>	<p>Yes</p>
<p>9. New Facilities (Greenfield projects) and project activities involving capacity additions compared to the baseline scenario are only eligible if they comply with the related and relevant requirements in the General Guidelines to SSC CDM methodologies.</p>	<p>The proposed CDM project activity is a new facility. It complies with all related and relevant requirements in the “General Guidelines to SSC CDM methodologies”, Version 17.</p>	<p>Yes</p>

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<p>10. If solid biomass fuel (e.g. briquette) is used, it shall be demonstrated that it has been produced using solely renewable biomass and all project or leakage emissions associated with its production shall be taken into account in the emissions reduction calculation.</p> <p>11. Where the project participant is not the producer of the processed solid biomass fuel, the project participant and the producer are bound by a contract that shall enable the project participant to monitor the source of the renewable biomass to account for any emissions associated with solid biomass fuel production. Such a contract shall also ensure that there is no double-counting of emission reductions.</p>	(not relevant - no solid biomass fuel such as briquette will be used by the project.)	Yes
<p>12. If electricity and/or steam/heat produced by the project activity is delivered to a third party i.e. another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered into that ensures there is no double-counting of emission reductions.</p>	The project will deliver steam to a third party, namely Lomati sawmill. A supply contract will exist between the project SPV and Lomati sawmill. The contract will include the relevant provisions to ensure that there is no double counting of emission reductions.	Yes
<p>13. If the project activity recovers and utilizes biogas for power/heat production and applies this methodology on a stand alone basis (...) i.e. without using a Type III component of a SSC methodology, any incremental emissions occurring due to the implementation of the project activity (e.g. physical leakage of the anaerobic digester, emissions due to inefficiency of the flaring), shall be taken into account either as project or leakage emissions.</p>	(not relevant - the project activity does not involve biogas)	Yes
<p>14. Charcoal based biomass energy generation project activities are eligible to apply the methodology only if the charcoal is produced from renewable biomass sources provided:</p> <p>(a) Charcoal is produced in kilns equipped with methane recovery and destruction facility; or</p> <p>(b) If charcoal is produced in kilns not equipped with a methane recovery and destruction facility, methane emissions from the production of charcoal shall be considered. (...)</p>	(not relevant - the project activity does not involve charcoal)	Yes

B.3. Description of the project boundary:

Table 3 below provides an overview of the definition of the project boundary as per paragraph 15 of the methodology AMS-I.C. Version 19.0, and its application to the project activity. The spacial extent of the project boundary of this project thus encompasses:

- The cogeneration plant (see section A.2. and A. 4.2.)
- the power plants connected physically to the South African electricity grid system, and
- Lomati sawmill, being the consumer of steam provided by the project.

Table 3: Project boundary

Definition of project boundary	Include into project boundary?
As per paragraph 15 of the methodology AMS-I.C. Version 19.0, the spatial extent of the project boundary encompasses:	
(a) All plants generating power and/or heat located at the project site, whether fired with biomass, fossil fuels or a combination of both;	Yes - Cogeneration plant (see section A.2 and A.4.2)
(b) All power plants connected physically to the electricity system (grid) that the project plant is connected to;	Yes - power plants connected physically to the South African electricity grid system
(c) Industrial, commercial or residential facility, or facilities, consuming energy generated by the system and the processes or equipment affected by the project activity;	Yes - Lomati sawmill, being the consumer of steam provided by the proposed project activity
(d) The processing plant of biomass residues, for project activities using solid biomass fuel (e.g. briquette), unless all associated emissions are accounted for as leakage emissions;	No – the proposed project activity does not involve solid biomass fuel such as briquette
(e) The transportation itineraries, if the biomass is transported over distances greater than 200 kilometres, unless all associated emissions are accounted for as leakage emissions;	No - transport distances will not exceed 200 km. The expected maximum distance will be 30km and in the worst case 85km ²³ . There is only one small forest more than 200km distant from the plant which in any case would be too costly for consideration.
(f) The site of the anaerobic digester in the case of project activity that recovers and utilizes biogas for power/heat production and applies this methodology on a stand alone basis i.e. without using a Type III component of a SSC methodology.”	No - project activity does not involve anaerobic digester.

²³ Source: Information from biomass provider (Lomati Sawmill)

B.4. Description of <u>baseline and its development</u>:

Baseline scenario for power and heat production:

According to of the methodology AMS I.C (Version 19), project activities shall use one of the baseline scenarios indicated in paragraph 19. of AMS I.C (see Table 4 below).

The applicable baseline scenario is:

(e) Electricity is imported from a grid and/or produced in an on-site captive power plant using fossil fuels (with a possibility of export to the grid); steam/heat is produced from biomass. Applied to the project activity, the specification of this baseline scenario is that in the baseline the local user (Lomati sawmill) would continue to generate process steam for drying kilns in biomass-fired boilers, and continue to import electricity from the South African grid, and no grid connected renewable electricity would be produced from biomass.

Justification of applicable baseline scenario is provided through the following steps of argumentation²⁴

Step 0: Compliance with local regulations

- The selected baseline scenario is in compliance with local regulations. There are no local regulations that would prevent the selected baseline alternative from being implemented or mandate a different baseline scenario (including the project without CERs).

Step 1 - Electricity imports: The project does not displace of electricity imports from a grid.

- As per technical design report and as the PPA will be signed with the South African Central Buyer (in future to be known as the Independent Systems and Market Operator)²⁵ as the sole counterparty, and the cogeneration plant will not deliver power to the sawmill. Both in the baseline and in the project scenario, the sawmill would continue to purchase power from the grid. Therefore, the project would not involve any displacement of electricity imports from a grid, and the consideration of electricity imports to sawmill from grid as baseline emissions is not applicable.
 - Therefore, scenarios (a) and (i) do not apply.

Step 2 - Electricity generation alternatives: There is no need to invest into power generation. There are no realistic electricity generation scenarios other than the proposed project opportunity.

²⁴ With regard to selection of baseline scenario, the current VVM (EB 55) states that “The DOE shall confirm that any procedure contained in the methodology to identify the most reasonable baseline scenario has been correctly applied”. However, in the case of type I. projects using Methodology AMS I.C, neither General Guidelines to SSC CDM Methodologies nor the methodology itself specify requirements for justification of selection of baseline scenarios. As an indicative information source, also the new CDM Project Standard (EB 65) was checked which states that “Project participants shall establish the baseline scenario for the proposed CDM project activity (...) in accordance with the selected methodology(ies)” which does not involve a change as compared to current VVM.

²⁵ Source: Draft Basic Assessment Report Nov 2011 (~ EIA), p. 23

http://wsp.selesti.com/media/docs/ourlocations/africa/Draft_BAR_Consolidated_Final_Draft_to_client_2011-11-18.pdf

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Step 2a - There is no operational or technical need for the local steam user (Lomati sawmill) to establish a power generation plant

- Lomati sawmill has entered into an agreement with the municipality providing Lomati sawmill with preferential energy supply (i.e. in case of any grid instability, Lomati sawmill would be the last user to be cut from power supply). Lomati sawmill has thus comfortably secured its grid power imports, and there would not be any reason to instead invest into a power plant. This is reinforced by the fact that in the project scenario, Lomati sawmill will continue to import power from the grid.
- There is also not any technical need for considering changes to the pre-project energy supply situation at Lomati sawmill, as the existing steam boilers can be operated and maintained throughout the crediting period.

Step 2b - The independent power generation opportunity is based on unused energetic potential of locally available biomass

- The reason why a concrete multi-shareholder investment opportunity for independent power generation (the proposed project) is presenting itself is because local circumstances offer an excess availability of biomass with so far unused energetic potential. In comparison, there would not be a concrete motivation to pursue development of an independent multi-shareholder fossil-fuel based power plant for the purpose of independent energy generation.
- Based on step 2 a and 2b, all power generation alternatives including captive power generation alternatives do not apply to the project (i.e. scenarios (b), (d), (f), (g), (h)).

Step 3: Steam/Heat generation: No CERs claimed for displacement of heat/steam. The project does not displace steam/heat generation from fossil fuels.

Step3a - No CERs claimed for displacement of heat/steam

- The project does not claim emission reductions with regard to steam/heat production. In the pre-project situation and the most realistic baseline scenario, steam/heat for drying kilns is generated in biomass-fired boilers. All scenarios where steam/heat would be produced using any kind of fossil fuel in the baseline ((a), (b), (d), (f)) could be excluded based on the fact alone that they would represent a less conservative choice as compared to the existing pre-project heat situation. Moreover, generation of steam/heat from fossil fuels in the baseline is not a realistic scenario for the following reasons:

Step3b - Company policy to reduce GHG emissions:

- Lomati sawmill operates under a corporate sustainability goal to reduce GHG emissions, and would therefore not pursue investments into GHG intense fossil fuels.

Step 3c - No technical or operational need for Lomati sawmill to change pre-project energy supply situation:

- As already discussed under Steps 2a above, there is no technical or operational need for Lomati sawmill to change the source of its steam supply. According to step 2b above also the sourcing of steam from an independent power plant other than the present project activity can be excluded.
- Step 3 therefore further supports the exclusion of alternatives (a), (b), (d), (f), (h), (i) which were already discarded through steps 1 and 2 above.

In summary, it can be concluded that the chosen baseline alternative (e) is applicable and is the most realistic baseline scenario.

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Table 4. Choice from baseline scenarios in AMS I.C. (Version 19.0) para. 19

Baseline scenario	Applicable?	Justification through steps No.:
(a) <u>Electricity is imported from a grid</u> and thermal energy (steam/heat) is produced using <u>fossil fuel</u> ;	No	1.; 3.
(b) <u>Electricity is produced in an on-site captive power plant using fossil fuel</u> (with a possibility of export to the grid) and thermal energy (steam/heat) is produced using fossil fuel;	No	2. ; 3.
(c) A combination of (a) and (b);	No	a combination of (a) and (b) above
(d) <u>Electricity and thermal energy (steam/heat) are produced in a cogeneration unit using fossil fuel</u> (with a possibility of export of electricity to a grid/other facilities and/or thermal energy to other facilities);		2.; 3.
(e) <u>Electricity is imported from a grid and/or produced in an on-site captive power plant using fossil fuels</u> (with a possibility of export to the grid); steam/heat is produced from biomass;		Applicable: in the baseline, the local user (Lomati sawmill) would continue to generate steam from biomass , and continue to import electricity from the South African grid, and no grid connected renewable electricity would be produced from biomass.
(f) <u>Electricity is produced in an on-site captive power plant using biomass</u> (with a possibility of export to a grid) and/or <u>imported from a grid</u> ; steam/heat is produced using fossil fuel;	No	2.; 3.
(g) <u>Electricity and thermal energy (steam/heat) are produced in a biomass fired cogeneration unit</u> (without a possibility of export of electricity either to a grid or to other facilities and without a possibility of export of thermal energy to other facilities*. This scenario applies to a project activity that installs a new grid connected biomass cogeneration system that produces surplus electricity and this surplus electricity is exported to a grid. The baseline scenario is that the electricity would otherwise have been generated by the operation of grid-connected power. * All the services provided in pre-project scenario baseline i.e. energy supply (process heat and electricity) are maintained at the same level or improved during the crediting period. This shall be demonstrated using the most recent three years of historical data. (see also paragraph 36 of AMS I.C).		2.
(h) <u>Electricity and/or thermal energy produced in a co-fired system</u> ;		2.; 3.

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<p>(i) <u>Electricity is imported from a grid and/or produced in a biomass fired cogeneration unit (without a possibility of export of electricity either to the grid or to other facilities); steam/heat is produced in a biomass fired cogeneration unit and/or a biomass fired boiler (without a possibility of export of thermal energy to other facilities). This scenario applies to a project activity that installs a new biomass cogeneration system that displaces electricity which otherwise would have been imported from a grid.*</u></p> <p>*It shall be demonstrated using the three most recent years of historical data that electricity imported from the grid is more than captive electricity generated using biomass. All the services provided in pre-project scenario i.e. energy supply (process heat and electricity) are maintained at the same level or improved during the crediting period (see also paragraph 36 of AMS I.C).</p>	No	1,; 2
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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 small-scale CDM project activity:

CDM consideration:

As per “Guidelines on the demonstration and assessment of prior consideration of the CDM”, Version 4.0, EB 62 Annex 13, for project activities with a start date after 02nd Aug, 2008, the standardized form F-CDM-Prior Consideration must be submitted to the Host Country DNA and the UNFCCC secretariat within 6 months of the project start date.

Accordingly, prior CDM consideration has been intimated to the Host Country DNA on Dec 19 2011 and to the UNFCCC secretariat on Dec 12 2011²⁶, which is prior to the expected project start date (Table 5) .

Table 5: Prior CDM consideration

No.	Date	Activity
1	12 Dec 2011	Intimation of prior consideration of CDM to UNFCCC
2	19 Dec 2011	Intimation of prior consideration of CDM to host country DNA
3	23 Jan 2012	CDM Local stakeholder consultation meeting
4	Quarter 3 2012	Expected project start date (EPC contract)

²⁶ Supporting emails & communication documents; project is listed on UNFCCC website http://cdm.unfccc.int/Projects/PriorCDM/notifications/index_html, Lomati Biomass Power Generation Project in Mpumalanga.

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Investment Barrier:

In line with paragraph 7. of General Guidelines to SSC CDM methodologies and related guidelines referenced in section B.1. above, the project proponent demonstrates additionality with reference to Investment Barrier, using benchmark analysis.

Benchmark analysis and IRR calculations are taking into account Guidelines on the assessment of investment analysis (Version 05) and “EB guidance on the consideration of national/local/sectoral policies and measures for the baseline setting” (“E”-policies” implemented after Nov 11 2001).

Benchmark analysis is appropriate as the project investors have a choice to not invest into the project (see section B.4).

Benchmark analysis is conducted comparing real term post-tax equity IRR indicator with the corresponding standardised benchmark (10,9%) provided in the Appendix to Guidelines on the assessment of investment analysis (Version 05).

The selection of this standardised benchmark represents a conservative choice made for the purpose of CDM registration. The corresponding equity IRR benchmark for renewable energy investments in South Africa is actually higher (17%), as reflected in a recent widely publicised document of the South African central regulatory authority for the energy industry, National Energy Regulator of South Africa (NERSA)²⁷: As apparent from page 22 of the document, a Real Return on Equity ROE after Tax of 17% was consistently applied by the national authority throughout 2009-2011 to determine the proposed feed-in tariffs for renewable energy projects in South Africa.

Assumptions and input parameters of the investment analysis are provided to the assigned Designated Operational Entity (DOE) within the terms of a confidentiality agreement due to respecting the confidentiality provisions applicable under the South African 2011 IPP procurement programme’s tender process which prevent the disclosure of financial data.

With reference to “EB guidance on the consideration of national/local/sectoral policies and measures for the baseline setting” (“E”-policies” implemented after Nov 11 2001), IRR calculations apply an “E” power price” which represents the “hypothetical situation without the national and/or sectoral policies or regulations being in place” (please refer to the below section on “Consideration of “E”-policies” implemented after Nov 11 2001”).

Sensitivity analysis is applied to support benchmark analysis.

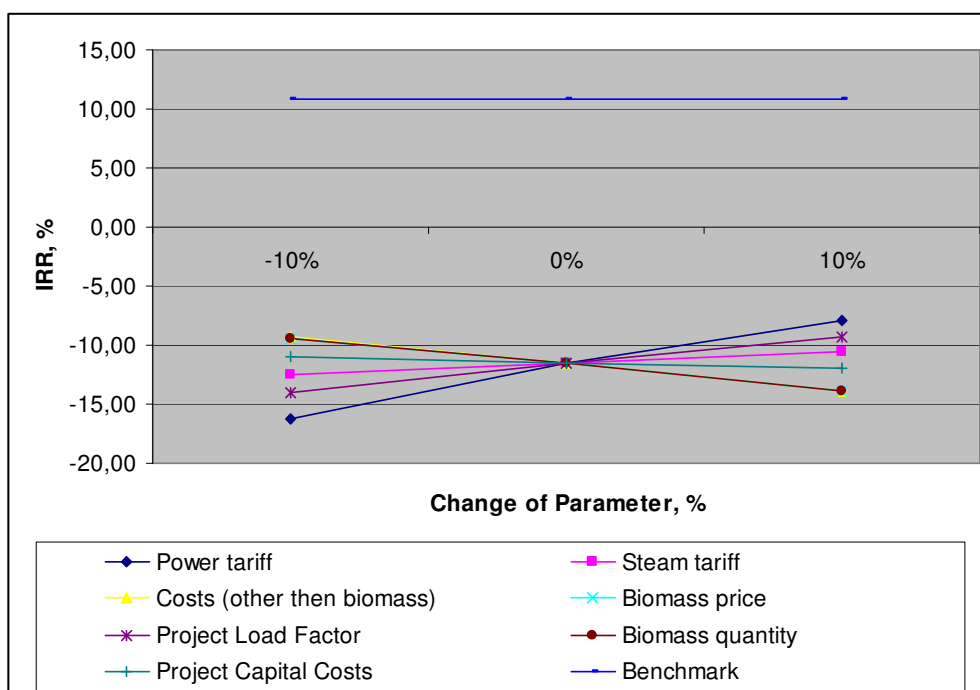
Results of the IRR analysis and sensitivity analysis are provided in Table 6 and Fig.3 below.

²⁷ NERSA Consultation Paper, Review of Renewable Energy Feed - In Tariffs. March 2011
<http://www.ameu.co.za/library/industry-documents/nersa/NERSA%20Consultation%20Paper%20Review%20of%20Renewable%20Energy%20Feed%20-In%20Tarrifs.pdf>

Table 6 Sensitivity analysis of real term equity IRR, applying E- approach

Parameter	Change of the parameter, %		
	-10%	0%	10%
Power tariff	-16,22	-11,47	-7,93
Steam tariff	-12,49	-11,47	-10,51
Costs (other then biomass)	-9,35	-11,47	-13,95
Biomass price	-9,41	-11,47	-13,88
Project Load Factor	-14,06	-11,47	-9,27
Biomass quantity	-9,38	-11,47	-13,92
Project Capital Costs	-10,94	-11,47	-11,91

Fig. 3 Sensitivity analysis of real term equity IRR, applying E- approach



The real term equity IRR is negative (-11,47 %) and thus lower than the corresponding standardised benchmark of 10,9%. When applying sensitivities of +/- 10 %, the IRR remains negative and below the benchmark.

It can thus be concluded that the project is not financially attractive in the absence of CDM. The project company needs the additional stream of income from the CDM to realise the project and the sustainable benefits which it provides.

Consideration of “E⁻-policies” implemented after Nov 11 2001

E⁻-policy

Type “E⁻-policies“ are being considered based on para. 24. of General Guidelines to SSC CDM Methodologies, and para. 6 (b) and 7 (b) of “EB guidance on the consideration of national/local/sectoral policies and measures for the baseline setting”²⁸:

According to para. 6 (b), so-called type “E⁻-policies” are “National and/or sectoral policies or regulations that give comparative advantages to less emissions-intensive technologies over more emissions-intensive technologies (e.g. public subsidies to promote the diffusion of renewable energy or to finance energy efficiency programs)”. According to para. 7. (b), E⁻-policies “that have been implemented since the adoption by the COP of the CDM M&P (decision 17/CP.7, 11 November 2001) need not be taken into account in developing a baseline scenario (i.e. the baseline scenario could refer to a hypothetical situation without the national and/or sectoral policies or regulations being in place).” Indication on the application of E⁻-policy rule in the context of the investment analysis is provided in para. 31. of “Tool for the demonstration and assessment of additionality”(Version 06): “Calculate the suitable financial indicator for the proposed CDM project activity (...) excluding CER revenues, but possibly including inter alia subsidies/fiscal incentives (see EB guidance on the consideration of national/local/sectoral policies and measures for the baseline setting)”.

In November 2003, the South African Department of Minerals and Energy released its White Paper on Renewable Energy (White Paper)²⁹, where it sets out the Government’s vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. According to the White Paper, page i, “it is in this context that the Ministry is committed to this policy document which is intended to give much needed thrust to renewable energy; a policy that envisages a range of measures to bring about integration of renewable energies into the mainstream energy economy. To achieve this aim Government is setting as its target 10 000 GWh (0.8 Mtoe) renewable energy contribution to final energy consumption by 2013, to be produced mainly from biomass, wind, solar and small-scale hydro”.

In March 2009 the National Energy Regulator of South Africa (NERSA) approved the Renewable Energy Feed - In Tariff (REFIT) to meet the government target of 10 000 GWh renewable energy generation³⁰. However, initially approved REFITs were not implemented³¹ but replaced by the RFP tender No DOE/001/2011/2012 issued by the Department of Energy (DOE) on 3rd August 2011³² (“IPP procurement programme”), again making reference to implementation of the renewable energy policy target³³.

²⁸ http://cdm.unfccc.int/EB/022/eb22_repan3.pdf

²⁹ http://unfccc.int/files/meetings/seminar/application/pdf/sem_sup1_south_africa.pdf ;
http://www.energy.gov.za/files/policies/whitepaper_renewables_2003.pdf

³⁰ <http://www.energy.gov.za/files/esources/renewables/Department%20of%20Energy%20REFIT%20RFI%20for%20IPPs.%2027%20September%202010.pdf> p. 6

³¹ <http://www.nersa.org.za/Admin/Document/Editor/file/Electricity/Consultation/Documents/Review%20of%20Renewable%20Energy%20Feed-In%20Tariffs%20Consultation%20Paper.pdf> p. 2

³² Source: Draft Basic Assessment Report Nov 2011 (~ EIA), p. 23

http://wsp.selesti.com/media/docs/ourlocations/africa/Draft_BAR_Consolidated_Final_Draft_to_client_2011-11-18.pdf

³³ <http://www.ipp-renewables.co.za/>

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In this tender process, renewable energy feed - in tariffs (REFITs) will be determined through a competitive bidding process which provides maximum price caps for different renewable energy technologies³⁴.

The 2011 IPP procurement programme has been “designed to start and stimulate the renewable industry in South Africa”³⁵ to contribute to implementing the renewable energy policy target set in 2003 by providing specific incentives (REFITs) to promote the implementation of renewable energy projects. The policy target and related REFITs implementation programmes are thus identified as a type E⁻ policy.

Therefore, the additional fiscal incentive received due to REFIT as compared to the situation in the absence of the E⁻ policy can be excluded in the calculation of financial indicator.

“E⁻ power price”

The additional fiscal incentive due to E⁻ policy is demonstrated by the difference of REFIT price caps and current average standard electricity prices in South Africa. As per the latest official price approval by the National Energy Regulator of South Africa (NERSA), the approved standard average electricity price for 2012/2013 is 65.85 c/kWh (i.e. 658.5 R/MWh)³⁶. This is lower than the maximum price caps for renewable energy projects available under the IPP procurement programme³⁷.

The approved average standard electricity price of 658.5 R/MWh is therefore assumed to reasonably represent the “hypothetical situation without the national and/or sectoral policies or regulations being in place” (“E⁻ power price”), thereby excluding in the calculation of the financial indicator the additional fiscal incentive that could be made available through implementation of the E⁻ policy. The selected E⁻ power price” is conservative given that this price also reflects transmission costs and transmission losses.

³⁴ <http://www.nortonrose.com/knowledge/publications/54959/south-africa-renewable-energy-ipp-request-for-proposals>

³⁵ <http://www.ipp-renewables.co.za/>

³⁶ Media Statement: NERSA’s Decision on Eskom’s Required Revenue Application – Multi-Year Price Determination 2010/11 to 2012/13 (MYPD 2) <http://www.eskom.co.za/content/MediaStatementMYPD2~1.pdf>. Eskom generates approximately 95% of the electricity used in South Africa and approximately 45% of the electricity used in Africa, <http://www.eskom.co.za/c/40/company-information/>

³⁷ wind – R1 150/MWh; solar PV – R2 850/MWh; CSP – R2 850/MWh; biomass – R1 070/MWh; biogas – R800/MWh; landfill gas – R600/MWh; small hydro – R1 030/MWh, Source: <http://www.nortonrose.com/knowledge/publications/54959/south-africa-renewable-energy-ipp-request-for-proposals>

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B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Explanation on methodological choices and relevant equations are provided as follows:

Baseline emissions:

The applicable baseline scenario is para 19. (e) in AMS I.C (Version 19.0). According to para 32. and 21. of the methodology, for case 19 (e) and concerning the supply of electricity to and/or displacement of electricity from a grid, baseline emissions shall be calculated as per the procedures detailed in AMS-I.D or AMS-I.F as applicable. Emission reductions from heat generation are not eligible.

AMS –I.F does not apply due to no mini-grid being involved. According to AMS I.D (Version 17.0) para 11., the relevant equation for calculating baseline emissions is:

“The baseline emissions are the product of electrical energy baseline $EG_{BL,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor.

$$BE_y = EG_{BL,y} * EF_{CO_2,grid,y} \quad (1)$$

Where:

BE_y Baseline Emissions in year y (t CO₂)

$EG_{BL,y}$ Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)

$EF_{CO_2,grid,y}$ CO₂ emission factor of the grid in year y (t CO₂/MWh)”.

Grid emission factor:

As per para. 25. of AMS I.C (Version 19.0), for project activities that do not displace captive electricity generated by an existing plant but displace grid electricity import and/or supply electricity to a grid, the emission factor of the grid shall be calculated as per the procedures detailed in AMS-I.D. As per AMS-I.D., the grid emission factor was calculated using the latest approved version of “Tool to calculate the emission factor for an electricity system” (Version 0.2.2.1). Methodological steps and equations applied for determination of the grid emission factor are presented in Annex 3.

Project emissions:

Project emissions to be considered as per para. 45. of AMS I.C (Version 19.0) and discussion of their relevance for the project are presented in Table 7 below.

As a result, the project does not involve project emissions as per AMS I.C. Project emissions are thus zero tons of Co2e, and no relevant formulas need to be considered.

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Table 7: Overview of project emissions as per para. 45. of AMS I.C (Version 19.0) and their relevance for the project

Para 45. of AMS I.C (Version 19.0): Project emissions include:	Relevant for project activity?
CO ₂ emissions from on-site consumption of fossil fuels due to the project activity shall be calculated using the latest version of the “Tool to calculate project or leakage CO ₂ emissions from fossil fuel combustion”;	No. The project will not use fossil fuels.
CO ₂ emissions from electricity consumption by the project activity using the latest version of the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”;	No. The project will consume electricity (“parasitic load”) for the purpose of its own operations. In addition, a limited amount of electricity will be used for on-site chipping of biomass into the required size (“conditioning”). Both of these consumptions are included in the estimates for parasitic load, and the required energy will be sourced from the own energy production of the plant. Therefore, baseline emissions will always be calculated only based on the measured net electricity generation supplied to the grid, which already excludes the own consumption of the project activity. Therefore, no further project emissions need to be accounted for.
Any other significant emissions associated with project activity within the project boundary;	No. There are no significant emissions associated with the project activity within the project boundary, apart from the own consumption of electricity already discussed above.
For geothermal project activities, project participants shall account for the following emission sources, where applicable: fugitive emissions of carbon dioxide and methane due to release of non-condensable gases from produced steam; and carbon dioxide emissions resulting from combustion of fossil fuels related to the operation of the geothermal power plant.	No. The project is not a geothermal activity.

Leakage emissions:Leakage emissions as per AMS I.C (Version 19.0):

Leakage emissions to be considered as per Section “Leakage” (para 47. and 48.) of AMS I.C (Version 19) and discussion of their relevance for the project are presented in Table 8 below.

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Table 8: Leakage emissions as per AMS I.C (Version 19.0)

Para 47. and 48. AMS I.C (Version 19): Leakage emissions include:	Relevant for project activity?
47. If the energy generating equipment currently being utilised is transferred from outside the boundary to the project activity, leakage is to be considered.	No. The project will not apply used equipment.
48. In cases where the collection/processing/transportation of biomass residues is outside the project boundary CO ₂ emissions from the collection/processing/transportation of biomass residues to the project site shall be taken into account as leakage. (If biomass residues are transported over a distance of more than 200 kilometres due to the implementation of the project activity then this leakage source attributed to transportation shall be considered, otherwise it can be neglected.)	No. As discussed in section B.3., transportation distances will be lower than 200 km. Related leakage can thus be neglected.

Other leakage provisions included in AMS I.C. (Version 19.0) applicability conditions do not apply to the project, as already discussed in section B.2 of this PDD.

As a result, the project does not involve leakage emissions as per AMS I.C. Leakage emissions are thus zero tons of Co₂e, and no relevant formulas need to be considered.

Leakage emissions as per “General guidance on leakage in biomass project activities (Version 03)

As per paragraph 2 table 1 and section C. of “General guidance on leakage in biomass project activities” (Version 03), the potentially relevant source of leakage for this type of biomass is “C. Competing Uses”.

As per paragraph 18. of “General guidance on leakage in biomass project activities”, the project participant shall evaluate ex ante if there is a surplus of the biomass in the region of the project activity, which is not utilised. If it is demonstrated (e.g., using published literature, official reports, surveys etc.) at the beginning of each crediting period that the quantity of available biomass in the region (e.g., 50 km radius), is at least 25% larger than the quantity of biomass that is utilised including the project activity, then this source of leakage can be neglected otherwise this leakage shall be estimated and deducted from the emission reductions. In the present project activity, there is a surplus of biomass. Therefore, this type of leakage is not applicable.

As a result, the project does not involve leakage emissions as per General guidance on leakage in biomass project activities. Leakage emissions are thus zero tons of CO₂e, and no relevant formulas need to be considered.

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B.6.2. Data and parameters that are available at validation:*(Copy this table for each data and parameter)*

Data / Parameter:	EFCO2
Data unit:	tCO2/MWh
Description:	CO2 emission factor for the grid electricity in year y
Source of data used:	Calculated and determined ex-ante based on the requirements of AMS-I.D. For more details on how grid emission factor was determined, please refer to the Annex 3.
Value applied:	0,977
Justification of the choice of data or description of measurement methods and procedures actually applied :	The grid emission factor was calculated according to the requirements set in methodology AMS-I.D using open sources on operation of grid connected power plants in the region.
Any comment:	

Data / Parameter:	EFF
Data unit:	% (none)
Description:	Electric efficiency of the electricity generation by the project biomass power plant on a net electricity generation basis and based on NCV of the fuel
Source of data used:	Technical design report of the biomass power plant: "Technical Overview", p. 16, table 6 "Performance summary"
Value applied:	0.19
Justification of the choice of data or description of measurement methods and procedures actually applied :	As both net electricity generation and NCV of the fuels will be monitored in the project, the corresponding value for electric efficiency based on NCV and based on net electricity generated was selected from the data source.
Any comment:	

Data / Parameter:	WBk
Data unit:	(%)
Description:	Moisture content of type k biomass (wet basis)
Source of data used:	Measurements undertaken in the course of technical project design.
Value applied:	Please refer to Table 10 below.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Measurements undertaken in the course of technical project design.
Any comment:	

B.6.3 Ex-ante calculation of emission reductions:
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Ex-ante calculation of expected project emissions, baseline emissions (or, where applicable, direct calculation of emission reductions) and leakage emissions expected during the crediting period is provided below.

In line with the equation provided in section 6.1 above, baseline emissions are calculated as follows:

$$BE_y = EG_{BL,y} * EF_{CO_2,grid,y}$$

$$= 56218 \text{ MWh/year} * 0,977 \text{ t Co}_2/\text{MWh} = 54925 \text{ t CO}_2 \quad (1)$$

Where:

BE_y	Baseline Emissions in year y (t CO ₂)
$EG_{BL,y}$	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)
$EF_{CO_2,grid,y}$	CO ₂ emission factor of the grid in year y (t CO ₂ /MWh)

As explained in chapter 6.1 above, project emission and leakage emissions are zero. Resulting emission reductions are thus 555430 ton CO₂ per annum (see section B 6.4.).

B.6.4 Summary of the ex-ante estimation of emission reductions:
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Year	Estimation of project activity emissions (tCO ₂ e)	Estimation of baseline emissions (tCO ₂ e)	Estimation of leakage (tCO ₂ e)	Estimation of overall emission reductions (tCO ₂ e)
Year 1	0	54925	0	54925
Year 2	0	54925	0	54925
Year 3	0	54925	0	54925
Year 4	0	54925	0	54925
Year 5	0	54925	0	54925
Year 6	0	54925	0	54925
Year 7	0	54925	0	54925
Year 8	0	54925	0	54925
Year 9	0	54925	0	54925
Year 10	0	54925	0	54925
Total (tonnes of CO ₂ e)	0	549250	0	542950

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

Data / Parameter:	EGy
Data unit:	MWh/year
Description:	Quantity of net electricity displaced from the grid as a result of the implementation of the proposed project activity in the year y
Source of data to be used:	This parameter will be continuously monitored and recorded
Value of data	56218 (Average over crediting period as in financial model)
Description of measurement methods and procedures to be applied:	This parameter will be continuously monitored by project participants, and results will be integrated on an hourly basis. The results will be recorded on a daily basis into the log-book and will be stored both electronically and in the log-books. Monthly, quarterly and annual values will be aggregated. Type and producer of metering device will be determined at a later stage of the project development. The meters will be calibrated annually by the respective external agency.
QA/QC procedures to be applied:	Energy meter will be calibrated annually by an external agency. The measured and recorded values will be cross-checked with the invoices/receipts of the grid operator to which the produced electricity will be sold.
Any comment:	Data monitored and required for verification and issuance would be archived for a minimum of two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later ³⁸ .

Data / Parameter:	BBiomass, k, y
Data unit:	t/year
Description:	Net quantity of biomass type k consumed in year y
Source of data to be used:	This parameter will be monitored by project participants
Value of data	There are different types of biomass which are going to be used in the proposed project activity. Approximate distribution of biomass types to be utilized by the proposed project activity are available from Table 9 below.
Description of measurement methods and procedures to be applied:	Measurements of each type k of biomass will be done on wet basis, and then the “wet basis” values will be adjusted to “dry values” as necessary based on the moisture content of each type k of biomass. The recorded values will be aggregated on a monthly, quarterly and annual basis.
QA/QC procedures to be applied:	Measured and recorded values will be cross-checked with an annual energy balance that is on the one hand based on generated electricity and on the other hand based on purchased quantities of biomass and stock changes.
Any comment:	Data monitored and required for verification and issuance would be archived for a minimum of two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

³⁸ SSC PDD guidelines

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Data / Parameter:	NCV_k
Data unit:	GJ/t
Description:	Net calorific value of type k biomass utilized in the proposed project activity
Source of data to be used:	NCV reports from external laboratory
Value of data	For ex-ante calculations, the project participants have applied a weighted average NCV value of 10,8 MJ/kg (as is) based on the following individual NCV values presented in Table 9 below.
Description of measurement methods and procedures to be applied:	In the project, the NCV values for each type k of biomass will be measured once per quarter during the first year of project operation, taking at least 3 samples for each measurement, and then the average annual values will be used for the rest of crediting period. NCV values will be measured based on dry biomass.
QA/QC procedures to be applied:	The consistency of the measurements will be checked by comparing the measurement results with relevant data sources (e.g. values in the literature, values used in the national GHG inventory) and default values by the IPCC. (If the measurement results differ significantly from previous measurements or other relevant data sources, additional measurements shall be conducted.)
Any comment:	Data monitored and required for verification and issuance would be archived for a minimum of two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.

Table 9: Biomass values used in plant design³⁹

Fuel source	Biomass residue	quantity [t (as is)/a]	%	Moisture content (%)	NCV [MJ/kg (as is)]	MJ/kg (BD)
Lomati sawmill	Saw dust & shavings wet mill	47025	37%	48	8,5	17,7
Lomati sawmill	Saw dust & shavings dry mill	16136	13%	11	16,5	18,9
Lomati sawmill	Pine bark	18514	15%	46	9,7	19,2
Sappi Pulp Mill (Ngodwana)	Other bark	13619	11%	25	13,6	18,8
Sappi Plantations	Pine slash	3390	3%	30	11,3	17,0
Lomati sawmill	Long end - off cuts tree logs	9346	7%	52	7,8	17,8

³⁹ Source: Technical design study p. 7 and 12; and p. 2 of Appendix D to technical design study; MJ kg (BD): information from biomass provider (Sappi).

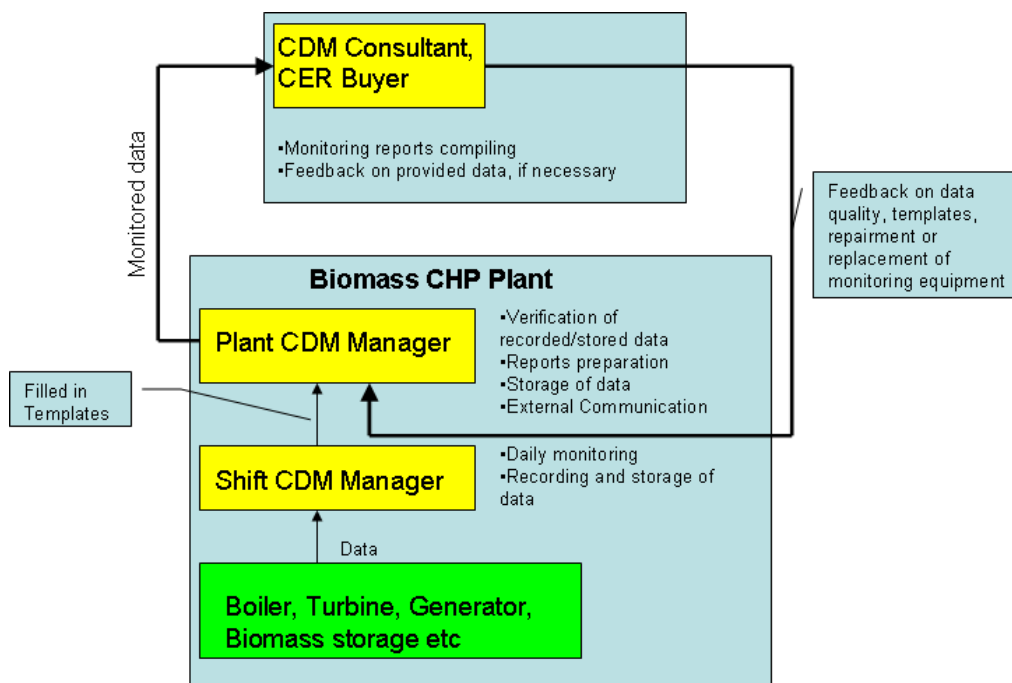
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Fuel source	Biomass residue	quantity [t (as is)/a]	%	Moisture content (%)	NCV [MJ/kg (as is)]	MJ/kg (BD)
Other sources	e.g. alien vegetation disposal	17970	14%	Weighted average of above (39%)	Weighted average of above (10,8)	-
Total		126000	100%	Average: 39	Average: 10,8	-

B.7.2 Description of the monitoring plan:

The scheme proposed by project proponents for data monitoring, collection, recording and storage is presented in the figure below:

Fig. 4: Organisational scheme for monitoring



Roles and responsibilities

The Shift CDM Manager will be responsible for the daily monitoring and collection of monitoring data. The Shift CDM Manager will thus be responsible for collection of operational data on amount of power supplied (EGy) and amount of biomass consumed in the project biomass plant (BBiomass, k, y). The Shift CDM Manager will make sure that all monitoring equipment is operational and in case of any damages of the equipment will notify the Plant CDM Manager. The Shift CDM Manager records the monitored data into the log-books and provides the logs books (with aggregated parameters) to the Plant CDM Manager at least once per month or upon request of the Plant CDM Manager.

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The Plant CDM Manager's task is to ensure a proper functioning of the monitoring equipment within the proposed project activity, and a proper and timely monitoring of emission reductions. The Plant CDM Manager will process and verify the data collected and provided by the Shift CDM Manager, and will make sure that monitoring equipment is being calibrated, maintained and (if necessary) replaced in a timely manner. The Plant CDM Manager will communicate to the CDM Consultant/CER buyer at least on a quarterly basis in order to inform them about the performance of the project and the emission reductions generated. The Plant CDM Manager will be also responsible for organizing the external laboratory tests (for determination of moisture content and net calorific value of biomass, WBk and NCVk), and will be an interface regarding any CDM-related questions associated with the supply and sources of biomass.

Qualification and training

In order to ensure proper operation of the project monitoring equipment and timely recording and processing of the monitored data, as well as to ensure the saving and reliable storage of the data, all personnel that occupy the positions of Plant CDM Manager and Shift CDM Manager shall be trained. The personnel shall be trained with regard to operation of monitoring equipment operation, operation of main project equipment, manual and electronic recording of data using templates, and emergency procedures in compliance with the monitoring plan.

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

Date of completion of the application of the baseline and monitoring methodology: 09/02/2012

Entity responsible for completing the baseline and monitoring methodology:

First Climate (Switzerland) AG
Stauffacherstr. 45
8004 Zurich
Switzerland
Phone: +41 (0)44 298 28 11
Fax: +41 (0)44 298 28 99
Email: jutta.rothe@firstclimate.com; konstantin.drozd@firstclimate.com
Website: www.firstclimate.com

First Climate (Switzerland) AG is not a project participant.

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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:

Starting date of the project activity: Quarter 3 2012, which corresponds to the expected date of signature of EPC contract and/or fuel supply agreement.

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

20 years

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

Fixed crediting period of 10 years 00 months is chosen for the proposed project activity.

C.2.1. Renewable crediting period
C.2.1.1. Starting date of the first crediting period:

Not applicable.

C.2.1.2. Length of the first crediting period:

Not applicable.

C.2.2. Fixed crediting period:
C.2.2.1. Starting date:

Starting date of crediting period: Nov 5, 2014 (expected commissioning date) or the date of registration, whichever is later

C.2.2.2. Length:

10 years 00 months

SECTION D. Environmental impacts
D.1. If required by the host Party, documentation on the analysis of the environmental impacts of the project activity:

Activities associated with the proposed Lomati Power Generation Project are scheduled activities in terms GN: R718 (July 2009) of the National Environmental Management Waste Act (Act 59 of 2008) (NEMWA). In order for the project to proceed, a Basic Assessment (BA) procedure to obtain a waste management licence (WML) from the Mpumalanga Department of Economic Development, Environment and Tourism (DEDET): Pollution and Waste Division is required⁴⁰.

⁴⁰ Source: EIA (= Draft Basic Assessment Report) p. 11-12, 6.

http://wsp.selesti.com/media/docs/ourlocations/africa/Draft_BAR_Consolidated_Final_Draft_to_client_2011-11-18.pdf. Page 11-12 also includes information why other types of licenses are not required.

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Basic Assessment (BA) is the environmental assessment applied to smaller scale activities, the impacts of which are generally known and can be easily managed. Typically, these activities are considered less likely to have significant environmental impacts and, therefore, do not require a full-blown and detailed Environmental Impact Assessment. Basic Assessment involves public participation and provides an analysis of the potential environmental impacts of the proposed activity and possible mitigation measures, and an assessment of whether there are any significant issues or impacts that might require further investigation.⁴¹ A Basic Assessment Report is available for the proposed project activity.

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:

Based on the findings of the Basic Assessment,⁴² the construction and operation of the project will not result in any significant impacts. The project would in general have few potential impacts, and any potential impact can be controlled or reduced to result in impacts of low significance through measures such as normal technical methods of noise control or discharging of effluents to the municipal system. Both construction and operational phases will be subject to an environmental management programme to ensure all impacts remain of low significance. The overall process will be supervised by the responsible authority. Details on impacts are available from Annex 5 below.

SECTION E. Stakeholders' comments

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

Local stakeholders have been informed about the CDM stakeholder consultation meeting in advance by means of announcements on notice boards in public places and by advertising in the local newspaper.

The CDM stakeholder Consultation Meeting for “Lomati Biomass Power Generation Project in, Mpumalanga Province, South Africa” was held in Barberton, Lomati Sawmill office building on 23/01/2012 from 11.00 until 13.30. Stakeholders confirmed their participation in the meeting by signing the attendance list.

The meeting started with an opening speech of Mr. Wohlgemuth representing the PDD consultant, who introduced the parties involved in the project. Mr. Myburgh representing the project company Lomati Energy (Pty) Ltd. presented the proposed project activity, focusing on the background of the project developer and the project, technical details of the project, milestones achieved and further planning, presentation of environmental impacts and side effects of the project. Mr. Weinberg from ESBI introduced the CER buyer and explained its role in the project. Mr. Wohlgemuth explained the CDM mechanism and its important role for the Lomati Biomass Project and presented the expected emission reductions. A question & answer session was conducted with stakeholders and documented in the form of meeting minutes.

⁴¹ Source: The Endangered Wildlife Trust, http://www.eiatoolkit.ewt.org.za/faq/index.html#general_q3

⁴² Source: Draft Basic Assessment Report, Nov 2011, p.7-8, 60-61, 52 (noise control). The “Draft Basic Assessment Report” contains the results of the expert assessment, and publishes them for commenting by stakeholders. http://wsp.selesti.com/media/docs/ourlocations/africa/Draft_BAR_Consolidated_Final_Draft_to_client_2011-11-18.pdf.

E.2. Summary of the comments received:

Comments were received from Mr. Nuns, Mr. Jones, Ms. Coetzee and Dr. Vawda.

These included clarifications on the CDM process and on the project design, e.g. concerning potential supply of biomass from the municipality and the social benefits of the project. The project participants replied by providing relevant clarifications.

Mr. Nuns inquired about the amount of biomass to be sourced from the Ngodwana area, and whether related biomass transport would influence road conditions. The project participant provided clarification that biomass from Ngodwana will primarily remain in this area, and that the project would source only a limited amount of biomass from this area.

Mr. Jones inquired about the level of NO_x emissions and was concerned about a possible increase. In reply, the project participant clarified that all emissions will stay below threshold values required, NO_x emissions will be extremely low⁴³, and particular matter emissions will be reduced due to the project.

Ms. Coetzee commented very positively on the project owner's plans to finance restoration of a water extraction station at Queens River to supplement the existing capacity of the Lomati dam and improve the supply to the municipality. She pointed out that this is a very good initiative by the project owner, because prices for water are increased by the municipality if the level of the dam drops, which is not acceptable.

Dr. Vawda specifically inquired about the possibility in making use of the project in view of establishing an International University in Barberton, and the project participants indicated their willingness to make the project accessible for site visits from university departments.

In summary, stakeholders supported the implementation of the project. Stakeholders were interested in the project, and no stakeholder was objecting to the implementation of the project activity.

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

As there were neither comments that would oppose the project nor requests for any design changes received from stakeholders, the design of the proposed project was not considered to be changed by the project proponents.

⁴³ Compare also Draft Basic Assessment Report, p. 45

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

Organization:	Lomati Energy (Pty) Ltd
Street/P.O.Box:	48 Ameshoff Street
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City:	Braamfontein
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Country:	South Africa
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FAX:	
E-Mail:	
URL:	
Represented by:	Johan Myburgh
Title:	Process Development Manager
Salutation:	
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State/Region:	
Postcode/ZIP:	
Country:	Ireland
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FAX:	
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URL:	www.esbi.ie
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Mobile:	
Direct FAX:	+353 1 638 4546
Direct tel:	+3531 703 8000
Personal e-mail:	edward.weinberg@esbi.ie

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

- Not applicable (see A.4.4.) -

Annex 3

BASELINE INFORMATION

Grid Emission Factor as per Methodological “Tool to calculate the emission factor for an electricity system”, Version 02.2.1

STEP 1. Identify the relevant electricity systems

As per methodological “Tool to calculate the emission factor for an electricity system”, v. 02.2.1, “the Tool”,

a grid/project electricity system is defined by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity (e.g. the renewable power plant location or the consumers where electricity is being saved) and that can be dispatched without significant transmission constraints.

The first two options for delineation of electricity system are not applicable, as the DNA of South Africa has not published a delineation of the project electricity system. Also due to a lack of public data on transmission constraints, the analysis of transmission constraints is not feasible and thus would not result in a clear grid boundary. Therefore, in line with p. 4 of the Tool, a national grid definition should be used by default. This seems especially appropriate given that the South African power sector is strongly centralised on a national level.

The project electricity system is thus identified as the **national grid of Republic of South Africa**.

Recent and publicly available data on power plants connected to the electricity system is published by the South African central utility Eskom. Eskom generates approximately 95% of the electricity used in South Africa and also operates the grid⁴⁴. Eskom data therefore appropriately represents the project electricity system. The Eskom data sources that have been used are :

- Calculation table on Eskom Website⁴⁵
- Eskom Annual Report 2010⁴⁶
- Eskom Fact Sheet Port Rex and Acacia Gas Turbine Stations⁴⁷
- Eskom Fact Sheet Ankerlig and Gourikwa Gas Turbine Power Stations⁴⁸
- Eskom Fact Sheet Klipheuwel Wind Energy Facility⁴⁹

For detail on compilation of data set for grid emission factor calculation and assumptions made, reference is made to the “Appendix: Sources of data set for grid emission factor calculation” below.

In line with the “Tool to calculate the emission factor for an electricity system”, v. 02.2.1, to ensure that calculations are conservative, exports have not been deducted from generation in the electricity system, while generation related to imports has been included assuming an emission factor of 0 t CO₂/MWh.

⁴⁴ <http://www.eskom.co.za/c/40/company-information/>

⁴⁵ <http://www.eskom.co.za/content/calculationTable.htm>

⁴⁶ http://financialresults.co.za/2010/eskom_ar2010/downloads/eskom_ar2010.pdf

⁴⁷ http://www.eskom.co.za/content/GS_0001GasTurbAcaciaPortRexRev6~1~1.pdf

⁴⁸ http://www.eskom.co.za/content/GS_0003AnkerlGouriTechBrochRev1~1~1.pdf

⁴⁹ http://www.eskom.co.za/content/RW_0002KliphWindfRev5~2.pdf

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STEP 2. Choose whether to include off-grid power plants in the project electricity system (optional)

This choice is optional. The project participants chose to not include off-grid power plants in the project electricity system.

STEP 3. Select a method to determine the operating margin (OM)

Option (a) Simple OM is chosen to determine the operating margin (OM).

As per the tool, the simple OM method (Option a) can only be used if low-cost/must-run resources⁵⁰ constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production. The South African electricity system, low cost/must-run resources constitute less than 50% of total grid generation in average of the five most recent years, thus option (a) Simple OM is applicable.

Ex ante option is chosen for calculation of Simple OM emission factor, i.e. it is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. Methodological requirements for selection of data vintage are being followed (for grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation.)

STEP 4. Calculate the operating margin emission factor according to the selected method

As per the tool, Simple OM emission factor (selected as per Step 3 above) is calculated as the generation-weighted average CO₂ emissions per unit net electricity generation (tCO₂ /MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units. For this calculation, the following option is chosen:

Option A: Based on the net electricity generation and a CO₂ emission factor of each power unit,

Under this option A, the simple OM emission factor is calculated based on the net electricity generation of each power unit and an emission factor for each power unit, as follows:

⁵⁰ As per “Tool to calculate the emission factor for an electricity system”, Version 02.2, “low-cost/must-run resources are defined as power plants with low marginal generation costs or power plants that are dispatched independently of the daily or seasonal load of the grid. They typically include hydro, geothermal, wind, low-cost biomass, nuclear and solar generation. If coal is obviously used as must-run, it should also be included in this list, i.e. excluded from the set of plants.”

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$$EF_{\text{grid,OMsimple},y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}} \quad (1)$$

Where:

- $EF_{\text{grid,OMsimple},y}$ = Simple operating margin CO₂ emission factor in year y (tCO₂/MWh)
 $EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
 $EF_{EL,m,y}$ = CO₂ emission factor of power unit m in year y (tCO₂/MWh)
 m = All power units serving the grid in year y except low-cost/must-run power units
 y = The relevant year as per the data vintage chosen in Step 3

Within in this option A, several options are available for calculating $EF_{EL,m,y}$, the emission factor of each power unit:

- For the majority of power units in the electricity system, data on fuel consumption and electricity generation is available. For these units, $EF_{EL,m,y}$ is thus determined using:

Option A.1.

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{EG_{m,y}} \quad (2)$$

Where:

- $EF_{EL,m,y}$ = CO₂ emission factor of power unit m in year y (tCO₂/MWh)
 $FC_{i,m,y}$ = Amount of fossil fuel type i consumed by power unit m in year y (Mass or volume unit)
 $NCV_{i,y}$ = Net calorific value (energy content) of fossil fuel type i in year y (GJ/mass or volume unit)
 $EF_{CO_2,i,y}$ = CO₂ emission factor of fossil fuel type i in year y (tCO₂/GJ)
 $EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
 m = All power units serving the grid in year y except low-cost/must-run power units
 i = All fossil fuel types combusted in power unit m in year y
 y = The relevant year as per the data vintage chosen in Step 3

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- For a small subset of gas/liquid fuel fired plants, only data on electricity generation and the fuel types used is available. For these units, the $EF_{EL,m,y}$ is thus determined using:

Option A.2

$$EF_{EL,m,y} = \frac{EF_{CO_2,m,i,y} \times 3.6}{\eta_{m,y}} \quad (3)$$

Where:

$EF_{EL,m,y}$	=	CO ₂ emission factor of power unit m in year y (tCO ₂ /MWh)
$EF_{CO_2,m,i,y}$	=	Average CO ₂ emission factor of fuel type i used in power unit m in year y (tCO ₂ /GJ)
$\eta_{m,y}$	=	Average net energy conversion efficiency of power unit m in year y (ratio)
m	=	All power units serving the grid in year y except low-cost/must-run power units
y	=	The relevant year as per the data vintage chosen in Step 3

Where several fuel types are used in the power unit, use the fuel type with the lowest CO₂ emission factor for $EF_{CO_2,m,i,y}$.

Applying the above equations, the Simple OM emission factor is calculated as: **0,967 t CO₂/MWh**.

STEP 5. Calculate the build margin (BM) emission factor

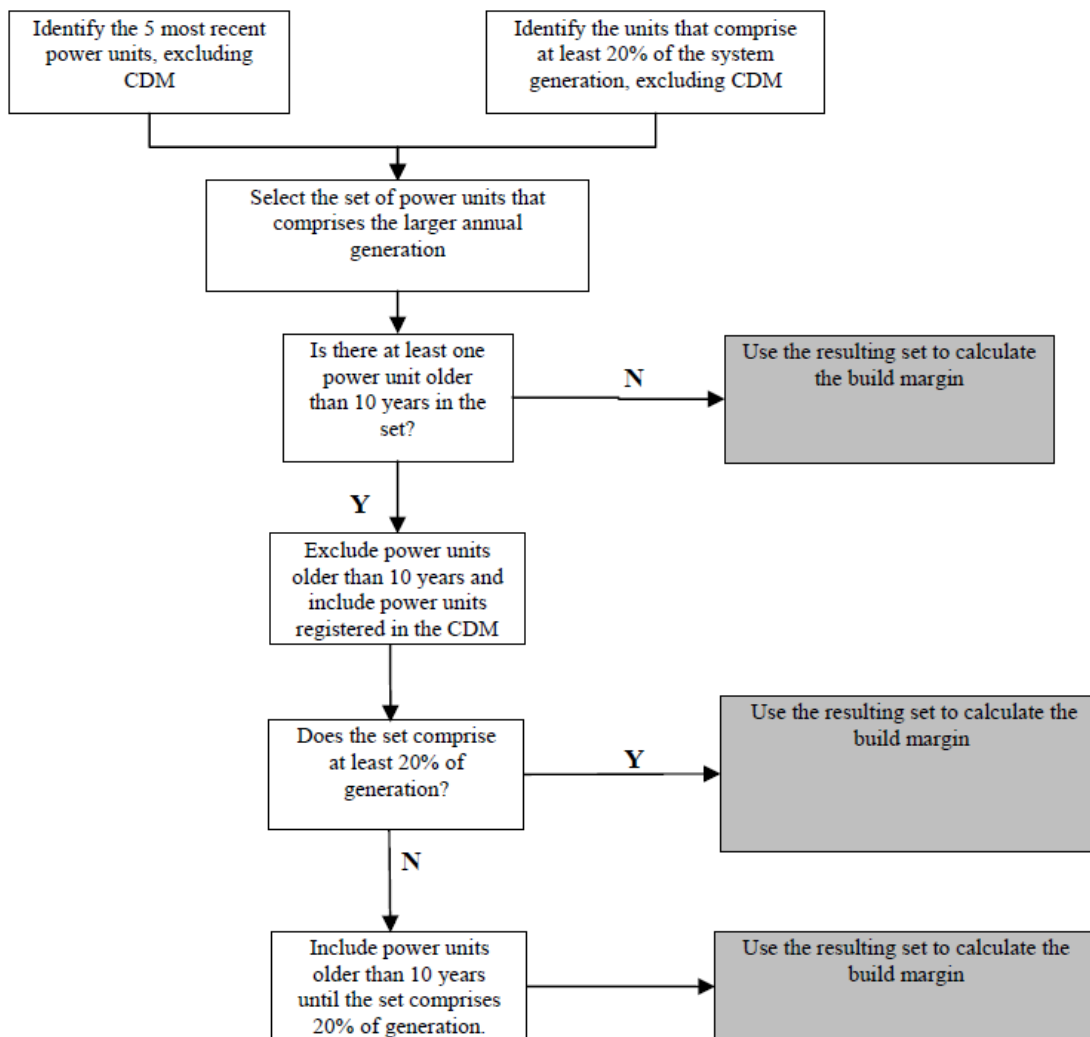
In terms of vintage of data, project participants choose the following options:

Option 1, ex ante:

For the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

The sample group of power units m used to calculate the build margin was selected in line with the procedures provided by the Tool (see Fig. 5 below).

Fig. 5: Procedure to identify set of power plants for build margin emission factor



The build margin emissions factor is the generation-weighted average emission factor (tCO₂/MWh) of all power units m during the most recent year y for which electricity generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

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Where:

- $EF_{grid,BM,y}$ = Build margin CO₂ emission factor in year y (tCO₂/MWh)
 $EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
 $EF_{EL,m,y}$ = CO₂ emission factor of power unit m in year y (tCO₂/MWh)
 m = Power units included in the build margin
 y = Most recent historical year for which electricity generation data is available

Applying the above equations, the built margin emission factor is calculated as: **0,986 tCO₂/MWh**.

STEP 6. Calculate the combined margin (CM) emission factor

As per the Tool, the following option should be used as the preferred option for calculation of CM, and is followed:

Option (a) Weighted average CM

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM} \quad (13)$$

Where:

- $EF_{grid,BM,y}$ = Build margin CO₂ emission factor in year y (tCO₂/MWh)
 $EF_{grid,OM,y}$ = Operating margin CO₂ emission factor in year y (tCO₂/MWh)
 w_{OM} = Weighting of operating margin emissions factor (%)
 w_{BM} = Weighting of build margin emissions factor (%)

As per the Tool, default values of $w_{OM} = 0.5$ and $w_{BM} = 0.5$ should be applied for the first crediting period.

Table 10 presents the resulting calculation of CM grid emission factor.

Table 10: CM emission factor

	(t CO ₂ /MWh)	Weighting
$EF_{grid,OM,y}$	0,967	$w_{OM} = 0,5$
$EF_{grid,BM,y}$	0,986	$w_{BM} = 0,5$
$EF_{grid,CM,y}$	0,977	$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$

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Appendix: SOURCES OF DATA SET FOR GRID EMISSION FACTOR CALCULATION**A) Data on a NVCs (OM option A.1 and A.2) and fuel conversion efficiency (OM option A.2)**

– default values for NCV and (if applicable) fuel conversion efficiency are selected as per the latest version of the CDM Grid Factor Tool. As per Sheet “Guidance”, the present excel tool is updated to the latest version, and relevant lists for default values for NCV and fuel conversion efficiency are provided in sheets DV and DV_ECE. NCV and efficiency values are automatically retrieved based on choice of fuel type and selection of “generation technology” in sheet “Base_data”.

B) Data on set of power plants and their electricity generation, fuel consumption, fuel types, commissioning years

- The data set in sheet Base_data is compiled from complementary data sources on the South African electricity system.
- The resulting input data matrix is presented in the sheet “Base_data”.
- Below, steps of data compilation are presented. Also, a color coding is presented in order to help relate the below choices to the data in the “Base_data” sheet.

1. Basic data source

Source 1.1 The basic data source is the CDM calculation sheet available from <http://www.eskom.co.za/content/calculationTable.htm>.

This source contains a list of grid connected power plants with commissioning dates, types of fuels used, specific electricity generation data and fuel consumption data per each power unit m.

- The list contains a full set of data on all coal based plants. In sheet “Base data”, these are shown without any further color code.
- With regard to other sources, the list contains data gaps in various places. Below is presented an overview of relevant data gaps and how to close them.

– Color code for sheet “Base_data”:

Blue Text = data gap filled in with data from other sources (see Table 1 below);
 Blue text *cursive* = data gap filled by taking conservative assumption (see Table 1 below);

2. Data gaps and how to address them

- for must run sources (which are excluded from OM calculations), data gaps would need to be addressed only with regard to being able to calculate the % must-run sources for applicability test simple OM, and with regard to determining built margin (generation data & commissioning year)
- for sources that are not must-run, data gap would need to be closed to the extent that data would be required for OM/BM calculations/identification.

The following sources are referred to for closing gaps:

Source 2.1. Eskom Annual Report 2010 http://financialresults.co.za/2010/eskom_ar2010/downloads/eskom_ar2010.pdf

Source 2.2. Eskom Fact Sheet PORT REX AND ACACIA GAS TURBINE STA http://www.eskom.co.za/content/GS_0001GasTurbAcaciaPortRexRev6~1~1.pdf

Source 2.3. Eskom Fact Sheet ANKERLIG AND GOURIKWA GAS TURBINE F http://www.eskom.co.za/content/GS_0003AnkerlGouriTechBrochRev1~1~1.pdf

Source 2.4 Eskom Fact Sheet KLIPHEUWEL WIND ENERGY FACILITY http://www.eskom.co.za/content/RW_0002KliphWindfRev5~2.pdf

(Source 2.5. Article “What is the carbon emission factor for the South African electricity grid?”, Randall Spalding-Fecher, Pöyry Management Consulting (Sweden) AB, Journal of Energy in Southern Africa · Vol 22 No 4 · November 2011, http://www.carbon.org.za/resources/docs/Spalding_FecherGEF_for_SA.pdf)

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Table 1 : Addressing data gaps

Plant/s	Relevant missing data in Eskom website	Why address gap	Data/method used to address gap	Source of data used to address gap
Imports into electricity system	imports not mentioned at all	OM	annual total (GWh) of imports into electricity system from Eskom Annual report 2010 Assuming EF of 0 ton/Mwh in line with CDM grid factor tool	2.1, p 296, Table I, “Total purchases for Eskom system, GWh” CDM tool to calculate the emission factor for an electricity system
Nuclear plant Koeberg	no generation data (see “NA” in column “UoM of source”)	% must-run, (BM?)	plant specific annual generation (GWh) from Eskom annual report 2010 (last 5 years, GWh), p 296. Table I	2.1, p 296, Table I.
Hydro	no generation data (see “NA” in column “UoM of source”)	% must-run	aggregated total annual generation (Sum of all hydro plants) (GWh) from Eskom annual report 2010 (last 5 years, GWh), p 296. Table I	2.1, p 296, Table I.
		(OM/BM n.a.)	Must run-sources do not influence OM anyways. The 6 Eskom Hydro plants are very old (1950-1977), thus they do not influence BM and lack of plant specific generation data does not matter.	
Wind (Klipheuwel Farm)	plant not mentioned at all	% must-run, (BM?)	plant specific annual generation (GWh) from Eskom annual report 2010 (last 5 years, GWh), p 296. Table I	2.1, p 296, Table I.
			information that generation data refers to Klipheuwel wind farm	2.1, p 298
			commissioning year of Klipheuwel wind farm (2002)	2.4

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Plant/s	Relevant missing data in Eskom website	Why address gap	Data/method used to address gap	Source of data used to address gap
4 Gas/liquid fuel power plants	there is only generation data for 2010 (plant specific)	% must run; OM (2008–2009)	aggregated total annual generation (Sum of all gas/liquid fuel plants) (GWh) from Eskom annual report 2010 (2006–2009)	2.1, p 296, Table I.
	The fuel type is mentioned only for Acacia and Port Rex (Kerosene)	OM/BM	Fuel type and technology of these plants are confirmed from public Eskom Fact Sheets: – Acacia and Port Rex – Kerosene – Turbine (other than open cycle or combined cycle). --> IPCC fuel type is selected as “Other Kerosene”. – Ankerlik and Gourikwa – “Open Cycle Gas Turbine, powered by liquid fuel (diesel)” --> IPCC fuel type selected as “Gas/Diesel Oil”. Where there is only aggregated generation data for all 4 plants, conservatively IPCC fuel type with lower NCV (Gas/Diesel Oil) is assumed.	2.2 p 2 2.3 p 1
	there is no fuel consumption data at all	for OM/BM (2010), OM 2008–2009	Based on the fuel types & generation technology identified above, emissions can be calculated from plant specific (2010) or annual aggregated (2008–2009) generation using Simple OM Option A.2, applying default values for fuel conversion efficiency from the Grid factor tool (39,5% for the new and 37,5% for old plants). Where there is only aggregated generation data for all 4 plants, conservatively the lower of the 2 values is assumed.	2.2 p 2 2.3 p 1 CDM tool to calculate the emission factor for an electricity system
Pumped storage plants	no generation data (see “NA” in column “UoM of source)	n.a.	According to Eskom annual report, pumped storage plants are net users of electricity. Because they store energy that has already been produced by other power plants, they are not true generation sources and are completely excluded from calculations.	2.4., p 298, footnote 8; 2.5
CDM projects	plants not mentioned at all	n.a.	neglected due to lack of public data and negligible size of Bethlehem Hydro project	2.5, p 9,11

Annex 4

MONITORING INFORMATION

- please refer to chapter B.7. -

**Annex 5:
Information on environmental impacts**

(Source: **Draft Basic Assessment Report, WSP, November 2011, Public, p. 7-8, 52, 60-62**
http://wsp.selesti.com/media/docs/ourlocations/africa/Draft_BAR_Consolidated_Final_Draft_to_client_2011-11-18.pdf)

“ASSESSMENT OF POTENTIAL IMPACTS

The potential impacts associated with the proposed project have been assessed and the significance of these potential impacts evaluated with and without consideration of proposed mitigation measures. The following key conclusions were reached:

Construction Phase Impacts

No significant impacts are anticipated. Impacts will be localised and will not impact on surrounding receptors. Measures contained within the construction EMPr (Environmental Management Programme) are to be strictly adhered to, to ensure that disturbance caused by construction activities remain as impacts of low significance.

Operational Phase Impacts

- The majority of the impacts are anticipated to have a rating of low significance. The following issues have been identified to have potential to result in more significant negative impacts:
- Deterioration in air quality – Low to medium impact is identified as it is probable that emissions from the pro-posed boiler and dust generated from the storage and handling of biomass and other related activities on site have the potential to decrease ambient air quality. The intensity associated with both sources however is considered low as all emissions do not exceed ambient air quality standards thereby not affecting biophysical and social functions and processes.
- Increase in Ambient Noise Levels - Medium impact is anticipated as disturbance intensity is not significant at 2 of the 3 site sensitive sound receptor sites. It is probable however that an audible variation of high intensity will occur at Tambotie Street during the night. “...with the inclusion of mitigation, audible disturbance to surroundings will result in an impact of low significance.”
- “Surface and Ground Water Contamination - Low to medium impact is anticipated due to a high potential intensity, and the regional nature of impacts downstream. Contamination however is improbable as effluent is to be discharged to the municipal system and a segregated flow system for stormwater control will be installed.
- Visual Disturbance - Low to medium impact is anticipated due to the fact that visual disturbance is probable to adjacent land users within the site viewshed. The intensity however can be considered as low due to local “functions and processes not being potentially affected”.
- Increased Vehicular Traffic – Low to medium impact is anticipated attributed to the probability of vehicular traffic increase delivering biomass to the saw mill for processing at the power generation site. This however is offset by a probable long term benefit of low to medium significance associated with the net decrease of vehicular traffic on the roads within and beyond Lomati due to the use/ processing of biomass (renewable energy source) at the boiler site which will reduce the need for removal of biomass from the saw mill.

Engineering solution recommendations and measures outlined in EMPr have been identified in order to minimise, as far as possible, potential impacts that the operational phase would have on the surrounding biophysical and socio-economic environment. As such all operational issues can be controlled or reduced to result in impacts of low significance.”