

**CLEAN DEVELOPMENT MECHANISM  
SIMPLIFIED PROJECT DESIGN DOCUMENT  
FOR SMALL SCALE PROJECT ACTIVITIES (SSC-PDD)  
Version 01 (21 January, 2003)**

# Bethlehem Hydroelectric Project South Africa

September 15, 2005

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<sup>1</sup> This appendix has been developed in accordance with the simplified modalities and procedures for small-scale CDM project activities (contained in annex II to decision 21/CP.8, see document FCCC/CP/2002/7/Add.3) and it constitutes appendix A to that document. For the full text of the annex II **to decision 21/CP.8** please see <http://unfccc.int/cdm/ssc.htm>.

### Introductory Note

1. This document contains the clean development mechanism project design document for small-scale project activities (SSC-PDD). It elaborates on the outline of information in appendix B “Project Design Document” to the CDM modalities and procedures (annex to decision 17/CP.7 contained in document FCCC/CP/2001/13/Add.2) and reflects the simplified modalities and procedures (herewith referred as simplified M&P) for small-scale CDM project activities (annex II to decision 21/CP.8 contained in document FCCC/CP/2002/7/Add.3).
2. The SSC-PDD can be obtained electronically through the UNFCCC CDM web site (<http://unfccc.int/cdm/ssc.htm>), by e-mail ([cdm-info@unfccc.int](mailto:cdm-info@unfccc.int)) or in print from the UNFCCC secretariat (Fax: +49-228-8151999).
3. Explanations for project participants are in italicized font (*e.g. explanation*).
4. The Executive Board may revise the SSC-PDD if necessary. Revisions shall not affect small-scale CDM project activities validated prior to the date at which a revised version of the SSC-PDD enters into effect. Versions of the SSC-PDD shall be consecutively numbered and dated. The SSC-PDD will be available on the UNFCCC CDM web site in all six official languages of the United Nations.
5. In accordance with the CDM modalities and procedures, the working language of the Board is English. The completed SSC-PDD shall therefore be submitted to the Executive Board in English.
6. Small-scale activities submitted as a bundle, in accordance with paragraphs 9 (a) and 19 of the simplified M&P for small-scale CDM project activities, may complete a single SSC-PDD provided that information regarding A.3 (*Project participants*) and A.4.1 (*Location of the project activity*) is completed for each project activity and that an overall monitoring plan is provided in section D.
7. A small-scale project activity with different components eligible to be proposed<sup>2</sup> as a small-scale CDM project activity may submit one SSC-PDD, provided that information regarding subsections A.4.2 (*Type and category(ies) and technology of project activity*), and A.4.3 (*brief statement on how anthropogenic emissions of greenhouse gases (GHGs) by sources are to be reduced by the proposed CDM project activity*) and sections B (*Baseline methodology*), D (*Monitoring methodology and plan*) and E (*Calculation of GHG emission reductions by sources*) is provided separately for each of the components of the project activity.
8. If the project activity does not fit any of the project categories in appendix B of the simplified M&P for small-scale CDM project activities, project proponents may propose additional project categories for consideration by the Executive Board, in accordance to paragraphs 15 and 16 of the simplified M&P for small-scale CDM project activities. The project design document should, however, only be submitted to the Executive Board for consideration after it has amended appendix B as necessary.
9. A glossary of terms may be found on the UNFCCC CDM web site or from the UNFCCC secretariat by e-mail ([cdm-info@unfccc.int](mailto:cdm-info@unfccc.int)) or in print (Fax: +49-228-8151999).

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<sup>2</sup> In paragraph 7 of simplified M&P for small-scale CDM project activities, on clarifications by the Executive Board on small-scale CDM project activities, the Board agreed that in a project activity with more than one component that will benefit from simplified CDM modalities and procedures, each component shall meet the threshold criterion of each applicable type, e.g. for a project with both a renewable energy and an energy efficiency component, the renewable energy component shall meet the criterion for “renewable energy” and the energy efficiency component that for “energy efficiency”.



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### **Annexes**

Annex 1: Information on participants in the project activity

Annex 2: Information regarding public funding

## **A. General description of project activity**

### **A.1 Title of the project activity:**

Bethlehem Hydroelectric Project.

### **A.2 Description of the project activity:**

*(Please include in the description*

*- the purpose of the project activity*

*- the view of the project participants on the contribution of the project activity to sustainable development (max. one page).)*

The purpose of the project activity is to generate hydroelectricity, which will be distributed into the South African grid.

The project involves the development and operation of 4.0MW of hydro generation capacity within the boundaries of the Dihlabeng Local Municipality (Free State Province, South Africa). The project will generate 28.6 GWH per annum and is comprised of two generation facilities i.e.

- A run of river site located on the As River (2.3 MW), midway between Bethlehem and Clarens; and,
- Facility to be located at the existing concrete wall of the Saulspoort Dam (1.7 MW), in the town of Bethlehem. The Saulspoort Dam supplies water to the town and is not used for hydropower generation so far.

The project will involve the construction of these facilities as well as a 5km transmission line at 11KV on wood poles to deliver 1.7 MW to the Panorama substation to link the project to the national grid. A step-up transformer will be required at the power station in order to deliver power at 11kVA. Existing access roads to the site will also be upgraded.

The water resource in the As River is artificially fed from the Lesotho Highlands Water Project (LHWP). Water from the project is currently transferred from the Katse Dam in Lesotho to South Africa via the transfer tunnel and the delivery tunnel. During the transfer it is used to generate electricity for Lesotho in the Muela hydropower plant situated between the two tunnels. After driving the turbines the water flows to South Africa via the delivery tunnel, the outfall of which is located in the upper reaches of the As River (a tributary of the Liebenbergsvlei River). The flow rate in the river is therefore not seasonally dependent and remains almost constant throughout the year and over time.

The project will contribute to sustainable development in South Africa through supporting the development of renewable energy in the country and assisting South Africa in the achievement of its renewable energy target of 10000 GWH renewable energy contribution to final energy consumption by 2013 (White Paper on Renewable Energy, Republic of South Africa, November 2003).

At a local level the project will lead to increased economic activity in the area. In terms of job creation the project will create 40 skilled and 100 to 160 unskilled job opportunities during the construction phase, which will last approximately 12 months. Three full-time permanent jobs will be created once the project goes into implementation.

As an important and additional benefit, part of the income from the ER sales will be used to support distinct community benefits.

### A.3 Project participants:

*(Please list Party(ies) and private and/or public entities involved in the project activity and provide contact information in annex 1 of this document.)*

*(Please designate one of the above as the official contact for the CDM project activity.)*

Name of Party Involved (*) ((host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
South Africa (host)	The Department of Minerals and Energy (DME)	No
	Bethlehem Hydro (Pty) Limited	
To be determined prior to the Registration with the CDM executive board	The International Bank for Reconstruction and Development (IBRD) acting as Trustee for the Community Development Carbon Fund ("CDCF")	To be determined prior to the Registration with the CDM executive board
(*) In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

South Africa's DNA is operational and is located in the DME. The IBRD, acting as Trustee for the CDCF, is the official contact for the CDM project activity.

### A.4 Technical description of the project activity:

#### A.4.1 Location of the project activity:

**A.4.1.1** Host country Party(ies):

South Africa

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

Free State Province

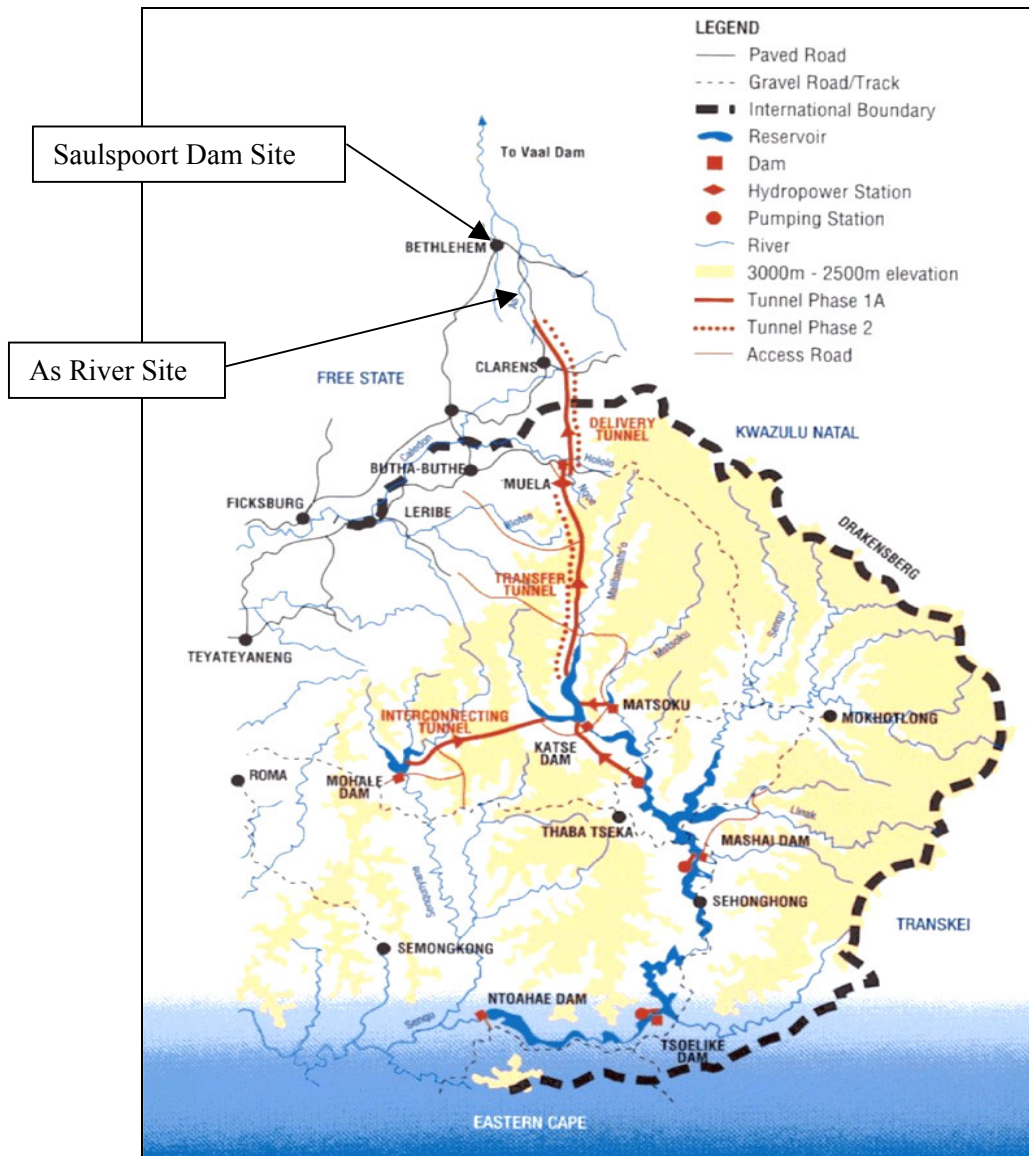
**A.4.1.3** City/Town/Community etc:

Bethlehem (Dihlabeng Local Municipality)

**A.4.1.4** Detailed description of the physical location, including information allowing the unique identification of this project activity (*max one page*):

The 1.7 MW facility will be located at the Saulspoort dam which is 5kms from the centre of Bethlehem. The actual location is at the existing concrete dam wall adjacent to a pumping station, which supplies the town of Bethlehem with water.

The 2.3 MW As River site is located on farmland on the As River on the farms ‘Merino’ and ‘De Burg Susan’, some 15 kms outside Bethlehem in the direction of the town of Clarens.



#### A.4.2 Type and category(ies) and technology of project activity

*(Please specify the type and category of the project activity using the categorization of appendix B to the simplified M&P for small-scale CDM project activities, hereafter referred to as appendix B. Note that appendix B may be revised over time and that the most recent version will be available on the UNFCCC CDM web site.*

*In this section you shall justify how the proposed project activity conforms with the project type and category selected (for simplicity, the rest of this document refers to “project category” rather than “project type and category”).*

*If your project activity does not fit any of the project categories in appendix B, you may propose additional project categories for consideration by the Executive Board, in accordance with paragraphs 15 and 16 of the simplified M&P for small-scale CDM project activities. The final SSC-PDD project design document shall, however, only be submitted to the Executive Board for consideration after the Board has amended appendix B as necessary.)*

*(This section should include a description of how environmentally safe and sound technology and know-how is transferred to the host Party, if such a transfer is part of the project.)*

#### *Type 1 – Renewable Energy Projects*

##### *1.D Renewable Electricity Generation for a Grid*

The project involves the development of two hydropower generating facilities that combined will have a capacity of 4.0 MW, which does not exceed the eligibility limit of 15MW.

The As River site will comprise an open canal leading to a penstock and powerhouse. This is a standard and well known design for an installation of this nature and similar to numerous other sites in and around South Africa including the Friedenheim Hydro Power plant near Nelspruit, Mpumalanga Province. South Africa. Three 0.763 MW axial flow turbines manufactured by UCM Rusita (Romania) have been selected in the feasibility design phase. The turbines will be connected to the transmission network through a dedicated power line.

The Saulspoort Dam site will involve the installation of three 0.564 MW axial flow turbines manufactured by UCM Rusita (Romania), which will be installed through a hole in the dam wall made specifically for this purpose. The turbines will be connected to the transmission network through a dedicated power line.

The electricity will be either sold to the local municipality and/or a trader in renewable energy for on-sale to one of their clients.

#### **A.4.3 Brief statement on how anthropogenic emissions of greenhouse gases (GHGs) by sources are to be reduced by the proposed CDM project activity:**

*(Please state briefly how anthropogenic greenhouse gas (GHG) emission reductions are to be achieved (detail to be provided in section B.) and provide the estimate of total anticipated reductions in tonnes of CO<sub>2</sub> equivalent as determined in section E. below.)*

The projects will result in a reduction of anthropogenic emissions of greenhouse gas by displacing an equivalent volume of electricity that would otherwise be generated by the South African national grid, which is in the majority fossil-fuel based (specifically coal). Over a 21 year period starting in July 2007, it is anticipated that the project will displace 527,608 tonnes of carbon dioxide equivalents. For details, please refer to Section E.

#### **A.4.4 Public funding of the project activity:**

*(Indicate whether public funding from Parties included in Annex I is involved in the proposed project activity. If public funding from one or more Annex I Parties is involved, please provide information on*



*sources of public funding for the project activity in annex 2, including an affirmation that such funding does not result in a diversion of official development assistance and is separate from and is not counted towards the financial obligations of those Parties.)*

Please see the attachments in Annex 2 regarding public funding in the Community Development Carbon Fund.

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

*(Please refer to appendix C to the simplified M&P for the small-scale CDM project activities for guidance on how to determine whether the proposed project activity is not a debundled component of a larger project activity.)*

This project is not a debundled component of a larger project activity, since the project participants have not registered or operated another project in the same project category and technology/measure as this project within 1 km of the project boundary of the proposed small-scale activity at the closest point.

**B. Baseline methodology**

**B.1 Title and reference of the project category applicable to the project activity:**

*(Please refer to the UNFCCC CDM web site for the most recent list of the small-scale CDM project activity categories contained in appendix B of the simplified M&P for small-scale CDM project activities.)*

Project category activity: Category *I.D.* Renewable electricity generation for a grid

Reference: Appendix B of the Simplified Modalities and Procedures for Small-Scale CDM project activities, category I.D taken from the document version dated February 25, 2005.

The specific technology for the CDM projects is hydropower as a substitute for existing fossil fuel power.

**B.2 Project category applicable to the project activity:**

*(Justify the choice of the applicable baseline calculation for the project category as provided for in appendix B of the simplified M&P for small-scale CDM project activities.)*

The project involves the sale of electricity into the national grid, which is the only option open to the project developer and corresponds with category I.D.

**B.3 Description of how the anthropogenic GHG emissions by sources are reduced below those that would have occurred in the absence of the proposed CDM project activity (i.e. explanation of how and why this project is additional and therefore not identical with the baseline scenario)**

*(Justify that the proposed project activity qualifies to use simplified methodologies and is additional using attachment A to appendix B of the simplified M&P for small-scale CDM project activities.)*

*(National policies and circumstances relevant to the baseline of the proposed project activity shall be summarized here as well.)*

According to Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities, the project is additional in terms of the following barriers:

**Barrier due to prevailing practice:** the entry of Independent Power Producers in the South African power market is a recent phenomenon, with ESKOM still playing the dominant role in terms of generation capacity. The ability of generators to break into this market is difficult as a result of a number of factors including the ability to negotiate access to the grid, the need for an Independent Power Producers license from the national regulator and the price paid for electricity. All of these requirements require resource levels that are generally beyond the capacity of producers. Therefore the grid contribution of hydro producers is currently extremely limited. In the case of Bethlehem this manifested itself in terms of the long lead time required to develop such a project (in the order of four years) as well as the time required to discuss and get agreement on the possibility of a power purchase agreement with the municipality.

**Other barriers (financial resources):** the ability of hydro power plants to be financially viable is constrained by their ability to compete with the prices of ESKOM electricity. ESKOM is one of the lowest cost producers in the world as a result of the historically subsidised investment in generation capacity. The effect of this is that income stream from electricity sales for hydropower projects is strongly influenced by the wholesale prices ESKOM charges to its customers, rather than being directly related to the cost of production of hydro facilities. The lower prices make hydropower financially unattractive as investments as measured by their returns for investors. The general price paid to such facilities is usually in the range 12 – 14 South African cents (approximately 2 US cents based on an exchange rate of R6 to the dollar) depending of course what the results of the power purchase agreement with a local municipality are. Generally if the power is being supplied to existing customers of ESKOM they are unwilling to pay higher prices than which they are being charged by ESKOM.

Without the income from the carbon revenue, the project would not generate sufficient cash flow to meet the minimum debt service coverage ratio requirements of the Development Bank of Southern Africa (DBSA). The carbon revenue is an essential component of the project's income in order to meet its debt payment requirements. The DBSA has therefore included a signed sales agreement for the emission reductions as a suspensive condition for its loan disbursement.

This barrier applies specifically to the proposed project activity; it is not necessary for thermal power plants to meet this requirement.

**B.4 Description of the project boundary for the project activity:**

*(Define the project boundary for the project activity using the guidance specified in the applicable project category for small-scale CDM project activities contained in appendix B of the simplified M&P for small-scale CDM project activities.)*

The baseline encompasses the physical, geographical site of the two renewable generation facilities included in this project.

## **B.5 Details of the baseline and its development:**

**B.5.1** Specify the baseline for the proposed project activity using a methodology specified in the applicable project category for small-scale CDM project activities contained in appendix B of the simplified M&P for small-scale CDM project activities:

In accordance with the simplified M&P for small-scale CDM project activities, the baseline for the project is the kWh produced by the renewable generating unit multiplied by the weighted average emissions (in kg CO<sub>2</sub>equ/kWh) of the current generation mix.

The baseline calculation is using data with regard to ESKOM's current generation mix and the emissions associated with its generation output. The data from ESKOM is produced for their publicly available annual report and is therefore audited. The calculation is made on the basis of the information received from their generation facilities which supply in the region of 95+% of the kWh generated for the South African grid.. The ESKOM website can be found at [www.eskom.co.za](http://www.eskom.co.za).

The latest figures regarding the CO<sub>2</sub> intensity of the grid are from ESKOM's 2003 and 2005 annual reports. They both give a value of 0.90 kg CO<sub>2</sub>equ/kWh for the respective reporting years. There is no reason to believe there has been any material change to this value since these reports were published. The 0.90 value is calculated from the gross kWh per year generated by all of the ESKOM power stations and the CO<sub>2</sub> produced in aggregate by those stations. ESKOM also publishes the annual kWh sold and the total annual kWh generated plus purchased by ESKOM. Of the total kWh generated plus purchased by ESKOM less than 5% is purchased from sources inside and outside of South Africa.

Information is not readily available for a calculation to be made in order to determine the CO<sub>2</sub> emissions associated with the remaining <5% of the annual generation that is not generated by ESKOM. However, qualitatively this will consist of kWh produced from coal-fired facilities, co-generation facilities (e.g. those using oil, gas, bagasse or other biomass fuels) and some hydro facilities. It would appear reasonable to assume that the emission factor that could be applied to the <5% of annual kWh purchased by ESKOM would not be radically different than the 0.90 Kg CO<sub>2</sub>equ/kWh quoted for ESKOM's own generation mix in 2003 and 2004 (in the 2005 annual report). It is possible that it could at most only very slightly reduce the overall ESKOM's emission factor.

It is also important here to note that ESKOM reported 8.3% kWh total system losses in the 2005 annual report. The proposed project annual kWh would be generated and used for local supply via the ESKOM grid hence there will be transmission and distribution loss reduction impacts for ESKOM that should also be taken into account in estimating the emission rate of the ESKOM grid.

Considering the small magnitude and the nature of the two factors discussed above it is justified to use the figure derived for ESKOM's own generation mix as a reasonable and conservative emission factor figure since the ESKOM system losses are already built into this number. It is also highly probable that ESKOM, from an ease of control and response, will reduce its own generation to compensate for the kWh put into the grid by the project.

**B.5.2** Date of completing the final draft of this baseline section (DD/MM/YYYY):

01/05/2005

**B.5.3** Name of person/entity determining the baseline:

*(Please provide contact information and indicate if the person/entity is also a project participant listed in annex 1 of this document.)*

Rob Short, Sustainable Transactions cc.

Tel +27 11 486 3220  
E-mail rob.short@telkomsa.net

This person is not a project participant listed in annex 1 of this document.

## **C. Duration of the project activity and crediting period**

### **C.1 Duration of the project activity:**

**C.1.1** Starting date of the project activity:

*(For a definition of the term "starting date", please refer to the UNFCCC CDM web site.)*

The expected starting date of the project (i.e. when the plant is commissioned) is 1<sup>st</sup> July 2007.

**C.1.2** Expected operational lifetime of the project activity: *(in years and months, e.g. two years and four months would be shown as: 2y-4m.)*

21 years

**C.2 Choice of the crediting period and related information:** *(Please underline the selected option (C.2.1 or C.2.2) and provide the necessary information for that option.)*

*(Note that the crediting period may only start after the date of registration of the proposed activity as a CDM project activity. In exceptional cases, the starting date of the crediting period can be prior to the date of registration of the project activity as provided for in paragraphs 12 and 13 of decision 17/CP.7 and in any guidance by the Executive Board, available on the UNFCCC CDM web site.)*

### **C.2.1 Renewable crediting period (at most seven (7) years per crediting period)**

**C.2.1.1** Starting date of the first crediting period (DD/MM/YYYY):

**(01\07\07)**

**C.2.1.2** Length of the first crediting period *(in years and months, e.g. two years and four months would be shown as: 2y-4m.):*

**7y-0m**

## **C.2.2 Fixed crediting period (at most ten (10) years):**

**C.2.2.1** Starting date (DD/MM/YYYY):

**C.2.2.2** Length (max 10 years): (in years and months, e.g. two years and four months would be shown as: 2y-4m.)

## **D. Monitoring methodology and plan**

*(The monitoring plan shall incorporate a monitoring methodology specified for the applicable project category for small-scale CDM project activities contained in appendix B of the simplified M&P for small-scale CDM project activities and represent good monitoring practice appropriate to the type of project activity.*

*The monitoring plan shall also provide information on the collection and archiving of the data specified in appendix B of the simplified M&P for small-scale CDM project activities to:*

- Estimate or measure emissions occurring within the project boundary;
- Determine the baseline, as applicable;
- Estimate leakage, where this needs to be considered.

*Project participants shall implement the registered monitoring plan and provide data, in accordance with the plan, through their monitoring reports.*

*Operational entities will verify that the monitoring methodology and plan have been implemented correctly and check the information in accordance with the provisions on verification. This section shall provide a detailed description of the monitoring plan, including an identification of the data to be collected, its quality with regard to accuracy, comparability, completeness and validity, taking into consideration any guidance contained in the methodology, and archiving of the data collected.*

*Please note that monitoring data required for verification and issuance are to be kept for two years after the end of the crediting period or the last issuance of CERs for this project activity, whichever occurs later.*

*An overall monitoring plan that monitors performance of the constituent project activities on a sample basis may be proposed for bundled project activities. If bundled project activities are registered with an overall monitoring plan, this monitoring plan shall be implemented and each verification/certification of the emission reductions achieved shall cover all of the bundled project activities.)*

### **D.1 Name and reference of approved methodology applied to the project activity:**

*(Please refer to the UNFCCC CDM web site for the most recent version of the indicative list of small-scale CDM project activities contained in appendix B of the simplified M&P for small-scale CDM project activities.)*

*(If a national or international monitoring standard has to be applied to monitor certain aspects of the project activity, please identify this standard and provide a reference to the source where a detailed description of the standard can be found.)*

The approved monitoring methodology for category Type I.D, renewable electricity generation for a grid is described as follows in appendix B of the simplified M&P for CDM small-scale project activities:

“Monitoring shall consist of metering the electricity generated by the renewable technology.”

This methodology will be applied to the two hydropower generating facilities that constitute the project.

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

*(Justify the choice of the monitoring methodology applicable to the project category as provided for in appendix B.)*

The choice of methodology reflects the exact recommendations of appendix B for projects that generate renewable energy for use by the grid. The hydropower project as a substitute for existing fossil fuel power will generate energy that will service the national grid in South Africa.

**D.3 Data to be monitored:**

*(The table below specifies the minimum information to be provided for monitored data. Please complete the table for the monitoring methodology chosen for the proposed project activity from the simplified monitoring methodologies for the applicable small-scale CDM project activity category contained in appendix B of the simplified M&P for small-scale CDM project activities.*

*Please note that for some project categories it may be necessary to monitor the implementation of the project activity and/or activity levels for the calculation of emission reductions achieved.*

*Please add rows or columns to the table below, as needed)*

ID number	Data type	Data variable	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/paper)	For how long is archived data to be kept?	Comment
<i>B1 – mmyy-kWh</i>	<i>As River facility electricity output</i>	<i>Metered electricity output</i>	<i>kWh</i>	<i>M</i>	<i>continuous</i>	<i>All</i>	<i>Electronic and paper</i>	<i>2 years beyond the crediting period</i>	
<i>B2 – mmyy – kWh</i>	<i>Saulspoort Dam facility electricity output</i>	<i>Metered electricity output</i>	<i>kWh</i>	<i>M</i>	<i>continuous</i>	<i>All</i>	<i>Electronic and paper</i>	<i>2 years beyond the crediting period</i>	
<i>B3 CO<sub>2</sub> EF</i>	<i>CO<sub>2</sub> Emission Factor</i>	<i>Number</i>	<i>Kg CO<sub>2</sub>equ/kWh</i>	<i>C</i>	<i>When the crediting period is renewed at 7-year intervals</i>	<i>All</i>	<i>Electronic and paper</i>	<i>2 years beyond the crediting period</i>	<i>The Data will be obtained from ESKOM’s annual report. The value is calculated from the gross kWh per year generated by all of the ESKOM power stations and the CO<sub>2</sub> produced in aggregate by those stations.</i>

**D.4 Name of person/entity determining the monitoring methodology:**

*(Please provide contact information and indicate if the person/entity is also a project participant listed in annex 1 of this document.)*

Rob Short, Sustainable Transactions cc.

Tel +27 11 486 3220  
E-mail [rob.short@telkomsa.net](mailto:rob.short@telkomsa.net)

This person is not a project participant listed in annex 1 of this document.



## **E. Calculation of GHG emission reductions by sources**

### **E.1 Formulae used:**

*(In E.1.1 please provide the formula used to calculate the GHG emission reductions by sources in accordance with the applicable project category of small-scale CDM project activities contained in appendix B of the simplified M&P for small-scale CDM project activities.*

*In case the applicable project category from appendix B does not indicate a specific formula to calculate the GHG emission reductions by sources, please complete E.1.2 below.)*

#### **E.1.1 Selected formulae as provided in appendix B:**

*(Describe the calculation of GHG emission reductions in accordance with the formula specified for the applicable project category of small-scale CDM project activities contained in appendix B of the simplified M&P for small-scale CDM project activities.)*

The calculation of the GHG emissions reductions for this project uses the weighted average emissions factor for ESKOM's plants that are operational on the national grid i.e. the current generation mix. This is then multiplied by the total kWhs produced by the project to give the total emission reductions delivered by the project.

#### **E.1.2 Description of formulae when not provided in appendix B:**

**E.1.2.1** Describe the formulae used to estimate anthropogenic emissions by sources of GHGs due to the project activity within the project boundary: *(for each gas, source, formulae/algorithm, emissions in units of CO<sub>2</sub> equivalent)*

Not applicable for hydropower project.

**E.1.2.2** Describe the formulae used to estimate leakage due to the project activity, where required, for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities *(for each gas, source, formulae/algorithm, emissions in units of CO<sub>2</sub> equivalent)*

Not applicable as the renewable energy technology used is not equipment transferred from another activity.

**E.1.2.3** The sum of E.1.2.1 and E.1.2.2 represents the project activity emissions:

Not applicable.

**E.1.2.4** Describe the formulae used to estimate the anthropogenic emissions by sources of GHG's in the baseline using the baseline methodology for the applicable project category in appendix B of the simplified modalities and procedures for small-scale CDM project activities: *(for each gas, source, formulae/algorithm, emissions in units of CO<sub>2</sub> equivalent)*

Baseline emissions, E<sub>baseline</sub>, are given by:

$$E_{\text{baseline}} (\text{tCO}_2/\text{y}) = \langle E \rangle_{\text{baseline}} (\text{kgCO}_2\text{equ/kWh}) * [\text{EG}_a (\text{kWh/y}) + \text{EG}_s (\text{kWh/y})] / 1000$$

where,

$\langle E \rangle_{\text{baseline mix}}$  = the weighted average emissions of the ESKOM's current generation mix

$EG_a$  = As River site's facility electricity output

$EG_s$  = Saulspoort Dam facility electricity output.

According to ESKOM, the weighted average emissions for the current generation mix is 0.90(kgCO<sub>2</sub>equ/kWh).

Appendix B of the simplified modalities and procedures for small scale CDM projects do not define an explicit formula as such.

**E.1.2.5** Difference between E.1.2.4 and E.1.2.3 represents the emission reductions due to the project activity during a given period:

Given that E.1.2.3 is not applicable in the context of hydro power, E.1.2.5 is equal to E.1.2.4.

## **E.2 Table providing values obtained when applying formulae above:**

Based on Bethlehem Hydro's assumptions, the installed capacity will be 2,289 kW for As River site's facility and 1,692 kW for Saulspoort Dam facility and the plant operating capacity (load factor) is 82%. Therefore the project has an annual electricity generation of 28,631,193 kWh per year, calculated as follows:

$$(2,289\text{kW} + 1,692\text{kW}) * 8,760 \text{ hours/year} * 82\% = 28,596,319 \text{ kWh per year}$$

The baseline emissions are:

$$25,737 \text{ tCO}_2/\text{y} = 0.90 \text{ (kgCO}_2\text{equ/kWh)} * 28,596,319 \text{ kWh/y} / 1000$$

The table below shows the emission reductions in tons of CO<sub>2</sub> equivalent during the period from 2007 to 2014.

<b>Year</b>	<b>Emission Reductions (tCO<sub>2</sub>equ/yr)</b>	<b>Running Total</b>
2007 (six months)	12 868	12 868
2008	25 737	38 605
2009	25 737	64 342
2010	25 737	90 079
2011	25 737	115 816
2012	25 737	141 553
2013	25 737	167 290
2014 (six months)	12 868	180 158

## **F. Environmental impacts**

### **F.1 If required by the host Party, documentation on the analysis of the environmental impacts of the project activity: (if applicable, please provide a short summary and attach documentation)**

In terms of South Africa's Environmental Impact Assessment (EIA) Regulations the project had to undertake an EIA. and was given a positive Record of Decision authorisation by the Free State Provincial Authorities which will enable the project to go into operation, as no environmental flaws were identified.

The project is expected to be granted a water licence as required by the National Water Act (36 of 1998).

## **G. Stakeholders comments**

### **G.1 Brief description of the process by which comments by local stakeholders have been invited and compiled:**

Local stakeholders were invited to comment on the scoping report, produced for the EIA process through the following mechanisms:

- Scoping advertisements were released in the local press in May 2003.
- In May 2003, poster notices of the EIA process were erected.
- Letters including a background information document and response form were distributed to the identified stakeholders in May 2003. Moreover various authorities were consulted during the process.
- In June 2003, the public meeting was held in Bethlehem to provide the local stakeholders with an opportunity to meet with the consultants, project proponent and authorities and to comment on the proposed development and raise any issues and concerns.
- Following the completion of the draft scoping report in July 2003, the report was sent to the stakeholders and also lodged in the library in Bethlehem. The public was notified to the lodging of the draft report by means of letters to identified stakeholders and given a three week period in which to comment on the report. At the end of the comment period, all relevant issues and concerns raised by the public have been noted and incorporated into the final scoping report.

Further opportunity to comment will be given when the draft PDD is posted on the South African DNA web site.

**G.2 Summary of the comments received:**

The only comments that can be summarised are those associated with the EIA process. These included;

- The requirements that the project would be subject to in terms of the licensing requirements of the Department of Water Affairs and Forestry;
- The actual benefits that would accrue to the community from such a project;
- What employment opportunities would actually be created by the project;
- The nature of the diversions to be created as part of the project;
- A request for an archaeological impact assessment report; and,
- Discussions with regard to the alternatives associated with the project.

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

The comments received were incorporated into the final scoping report that was submitted to the Provincial Environmental Authorities, and was used by the authorities to give the record of decision. As a result of the comments received an archaeological impact assessment report was commissioned and used in the EIA process.

Annex 1

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## Annex 2

### **INFORMATION REGARDING PUBLIC FUNDING**

Any public funding to participate in the CDCF does not result in a diversion of ODA and is separate from and not counted towards its financial obligations as a Party included in Annex I. Confirmation of the non-diversion of this public funding from the ODA towards the host country will be delivered at a later stage.