COMPONENT PROJECT ACTIVITY DESIGN DOCUMENT FORM (F-CDM-CPA-DD)
Version 02.0

COMPONENT PROJECT ACTIVITIES DESIGN DOCUMENT (CPA-DD)

SECTION A. General description of CPA

A.1. Title of the proposed or registered PoA

Green Power for South Africa.
PoA reference number: 7167
http://cdm.unfccc.int/ProgrammeOfActivities/poa_db/J4PUOQ8AZNIS9V6F5RBGWTKHMD103X/view

A.2. Title of the CPA

Letsatsi 74.96 MW Solar PV Project CPA-009
Version 02
Date: 13/03/2013

A.3. Description of the CPA

The proposed Letsatsi 74.96 MW Solar Photovoltaic (PV) Project CPA-009 will participate in the Green Power for South Africa Programme of Activities (PoA) which will consist of a series of a renewable energy projects implemented by participating organisations. Standard Bank Plc will act as the Coordinating/Managing Entity (CME) for the PoA, and will provide an open platform for different solar technology and service suppliers to participate in the PoA by developing their own Clean Development Mechanism (CDM) Programme Activities (CPAs) such as the Letsatsi 74.96 MW Solar PV Project CPA-009.

Letsatsi 74.96 MW Solar PV Project CPA-009 will comprise of a 74.96 MW (peak capacity) solar PV plant located approximately 35km north-west of Bloemfontein in the Free State of South Africa.

While the region enjoys high solar radiation levels during the winter months as a result of its latitudinal position, by far the most significant factor affecting the generation of renewable energy resources in South Africa is the ability to feed the power generated by the facility into the national grid. The proposed solar PV project will have an installed capacity of 74.96 MW which will feed electricity into a 132 kV distribution line running between Southdrift 132/22 kV substation and Harvard substation 132 kV busbar.

The region is conductive to the establishment of solar projects on account of its abundant solar resources, land availability, ease of connection to the national grid, and suitability of the land which possesses favourable construction conditions such as being relatively flat and lacking rocky areas[1]. The surrounding landscape consists of open grasslands, the majority of which are used for agriculture and grazing cattle and game. No dwellings are located in the immediate area surrounding the proposed project site, with the closest farm house approximately 1 km away.

The establishment of a renewable energy project could greatly contribute to the economic development of the region. The proposed site has excellent solar irradiation levels[2] and for this reason the solar PV project has been determined to be ideal in providing consistent power into the national grid at a strategic

[1] Letsatsi EPC Schedule 2.2 - Statement of Work - Appendix 5 - Environmental Impact Report, pp. 36-37.
[2] Solar Resource Assessment Report Letsatsi, pp. 2-5.

location, enhancing grid stability, reducing losses, and contributing to the support of an economically disadvantaged area of South Africa.

The emission reductions in the programme arise from the substitution of electricity from centralised coal-fired power stations with the utilisation of solar energy. The plant in question will provide electricity into the national grid system. The emission reductions under this programme activity will therefore be calculated according to the consolidated CDM methodology "ACM0002: Baseline methodology for grid-connected electricity generation from renewable sources" (Version 12.3.0).

The proposed CPA is expected to reduce 1,346,901 tCO_2 over the selected 10 year crediting period.

The CPA fulfils further the national sustainable development criteria determined by the Department of Energy of South Africa and contributes to sustainable development as follows [3] :

- **Economic dimension:**

Load shedding is a major problem in South Africa. Current electricity supply is not enough to meet projected future demand and it is hindering the fast growing economy of the country. The efficient use of electricity has become a national priority, a necessity for the future development of the South African economy and effective provision of electricity. The proposed CPA will therefore provide sustainable, renewable energy generation capacity which will help the country correct the current energy mix. Furthermore the project will create much needed local job opportunities.

Solar energy sources are also free, and in abundance in certain areas.

- **Environmental dimension:**

By making use of solar energy, the CPA will contribute towards a sustainable low carbon economy by reducing the amount of GHG produced by fossil fuel combustion at the national electricity grid level. Furthermore the reduction of fossil fuel consumption will also mitigate the emission of pollutants such as sulphur dioxide and dust, which occur as a result of fossil fuel combustion.

To the degree that solar energy sources reduce the need for electricity generation using fossil fuel sources of energy, they can reduce the adverse environmental impacts of those sources, such as the production of atmospheric and water pollution, including greenhouse gases; production of nuclear wastes and the degradation of landscapes due to mining activity. The reason being is that the generation of electricity by solar sources does not result in air or water pollution, does not involve toxic or hazardous substances (other than those commonly found in large machines), and poses no threat to public safety.

[3] Sustainable development criteria for approval of Clean Development Mechanism projects by the Designated National Authority of the CDM 2004, Department of Minerals and Energy, pp. 3, available at: http://www.energy.gov.za/files/esources/hyoto/Web%20info/Annex%203%20SA%20Sustainable%20Development%20Criteria.pdf

- **Social dimension[4]:**

The District and Local Municipal areas have a high level of unemployment of 64%. This includes 40% of the local population that are economically inactive (including students, elderly, the sick, the differently-abled and those who choose not to participate in the working force). The proposed project activity will bring new employment opportunities to the area, and therefore increase the economic opportunities available to the local population. The construction phase in particular will provide the most significant positive economic impacts in the region.

It is expected that during the construction phase the Letsatsi 74.96 MW Solar PV Project will generate in between 100 and 250 new employment opportunities, excluding the jobs identified in other related sectors. Approximately 5% of these jobs will require highly skilled personnel and the remainder will consist of semi-skilled and unskilled workers.

During the operational phase of the project, it is expected that in between 10 and 30 full time employment opportunities will be generated, excluding those jobs identified in other related sectors. Employment opportunities created during the operational phase are expected to include semi-skilled and unskilled positions. Much of the training required will be provided on the job and it is envisaged that operations personnel will develop additional skills through training and on-site experience throughout the operational period.

Standard Bank and participating parties will ensure that all participating organisations/subcontractors and technologies meet the specified standards of the programme, thereby ensuring that the quality of both the systems and the installations are not compromised.

Confirmation that the proposed CPA is a voluntary action by the CME

This programme activity is a voluntary initiative coordinated by Standard Bank Plc. Standard Bank will be the coordinating and managing entity. There are no laws or regulations in South Africa requiring the use of renewable energy. The proposed CPA is a voluntary action by Letsatsi Power Company, which will market, supply and install the relevant solar technologies.

A.4. Entity/individual responsible for CPA

The entity responsible for the proposed CPA is Letsatsi Power Company. Standard Bank Plc is the coordinating and managing entity of the CPA, as indicated in the PoA-DD.

A.5. Technical description of the CPA

Project Components[5]

It is anticipated that, once operational, the facility will generate up to 74.96 MW of electricity which will be fed into the national power grid over a lifespan of 25 years[6]. The key components of the proposed solar power project include the following, which are discussed in more detail below:

- Photovoltaic arrays
- Electrical connections and metering
- Extended/upgraded existing Eskom substation

[4] Letsatsi EPC Schedule 2.2 – Statement of Work – Appendix 5 – Environmental Impact Report, pp. 73, 125-127.
[5] Letsatsi EPC Schedule 2.2 – Statement of Work – Appendix 5 – Environmental Impact Report, pp. 31-33.
[6] Letsatsi EPC Schedule 2.2 – Statement of Work – Appendix 5 – Environmental Impact Report, pp. 35.

Photovoltaic (PV) Arrays

The development will include PV solar panels that will occupy up to 300ha (3km^2) of the site area in total. The panels will be situated in rows extending across the site in lines. The collective term for a series of PV panels in rows is a PV array. PV panels are typically up to 15m^2 in size and the rows will be approximately 1km in length, made up of approximately 100m sections, depending on the final design and layout of the development. The panels will be mounted on metal frames with a maximum height of approximately 3m above the ground, supported by concrete or screw pile foundations, and they will face north in order to capture the maximum sunlight. A typical solar PV array is shown in Figure A.5.1 below.

Figure A.5.1: A typical solar PV array[7].

Electrical Connections

The rows of PV panels will be connected to an internal electrical collection system, which is likely to be a single transmission line slung overhead between each array. An inverter will connect to each row of PV panels to convert the direct current (DC) output to alternating current (AC). The inverters will connect to a number of step-up transformers, which will convert the low voltage AC to a medium voltage suitable for the internal collection system. Electricity will be metered and exported into the national grid.

Substation and Grid Connection

The existing substation (located in the north east of the site next to the transmission lines) would be used to connect the facility to the national grid. New transformer bays and associated switching facilities would be built, maintained and owned by Eskom as part of the development as an extension to the existing substation in order to accommodate the connection of the solar power project to the national grid. A typical electrical substation is shown in Figure A.5.2 below.

[7] Letsatsi EPC Schedule 2.2 – Statement of Work – Appendix 5 – Environmental Impact Report, pp. 32.

Figure A.5.2: A typical electrical substation[8].

Technical Specifications

The technical specifications of the Letsatsi 74.96 MW Solar PV Project are outlined in Table A.5.1 below:

Table A.5.1: Technical specifications of the Letsatsi 74.96 MW Solar PV Project[9,10,11].

Parameter	Value	Unit
Technology	-	Solar PV
Total Installed Capacity	74,960	kW
Total Inverter Capacity	64,000	kVA
Tilt Angle	30°	Degrees
Orientation	0° (North)	Degrees
P50 Solar Yield[12]	1,957.91	kWh/kWp
Plant Availability Factor	99	%
Transmission/Distribution Downtime	2.5	%
Losses to Internal Loads	1	%
Annual Efficiency Loss After Year 1	0.5	%
First Year Gross Capacity Factor	22.58	% (calculated)
First Year Average Achieved Capacity Factor	21.57	% (calculated)
Average Total Energy Output	144,992	MWh/annum
Average Electricity Imported From the Grid	1,450	MWh/annum
Average Net Energy Output After Losses	138,554	MWh/annum

[8] Letsatsi EPC Schedule 2.2 – Statement of Work – Appendix 5 – Environmental Impact Report, pp. 33.
[9] Solar Resource Assessment Report Letsatsi.
[10] 2.5.5.1.1 Letsatsi Power - Financial Model – Final.
[11] GPSA08_20121018_ER_Calcs_Letsatsi.
[12] 50% probability of exceedance.

Service of Electricity to the Grid

The project scenario will use renewable solar energy to displace greenhouse gas emissions that would otherwise be generated by fossil fuel fired power plants through the generation of electricity under the baseline scenario (Figure A.5.1).

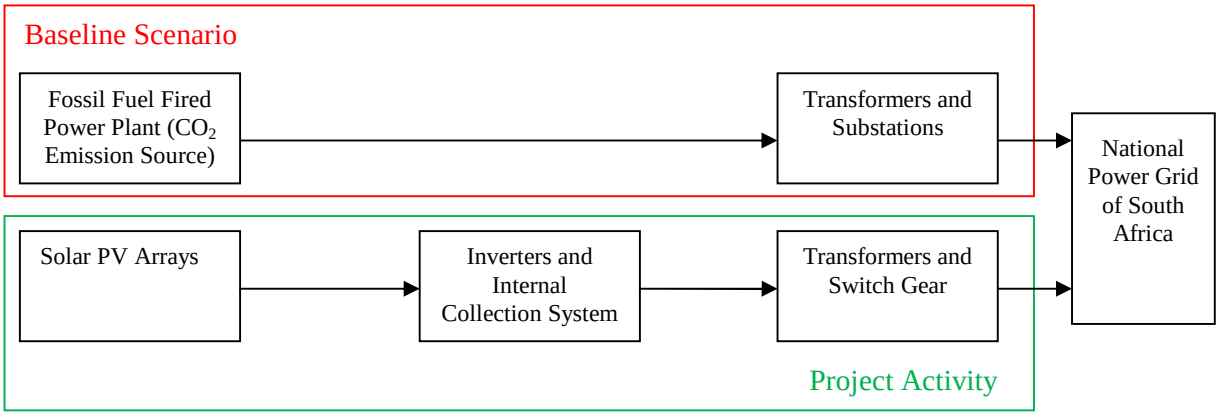

Figure A.5.3: The equipment, systems and flows of electricity in the baseline scenario and project activity.

The facilities, systems and equipment under this CPA are new (with the exception of the substation which is to be extended), as the facility is a Greenfield project. The baseline scenario is therefore a continuation of current practice and identical to the scenario existing prior to the implementation of the CPA.

A.6. Party(ies)

Name of Party involved (host) indicates a host Party	Private and/or public entity(ies) CPA implementer(s) (as applicable)	Indicate if the Party involved wishes to be considered as CPA implementer (Yes/No)
Republic of South Africa (host)	The Standard Bank of South Africa Ltd	No
Republic of South Africa (host)	Letsatsi Power Company	No
United Kingdom of Great Britain and Northern Ireland	Standard Bank Plc	No

A.7. Geographic reference or other means of identification

CPA-009 will comprise a 74.96MW solar PV energy park in the Free State of South Africa (Figure A.7.1). The proposed site will be located approximately 35km north-west of Bloemfontein (Figure A.7.2; Figure A.7.3; Table A.7.1).

Figure A.7.1: Free State Province, South Africa[13].

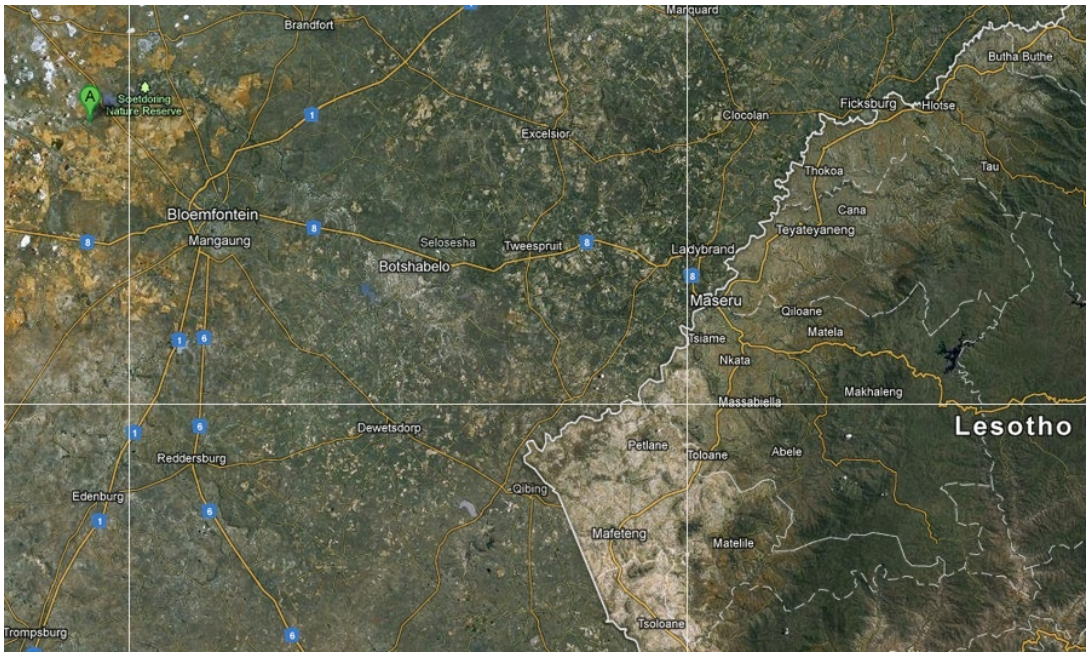

Figure A.7.2: Letsatsi 74.96MW Solar PV Project location (A) located approximately 35km north-west of Bloemfontein, South Africa[14].

[13] http://mapsof.net/map/south-africa-free-state-map
[14] https://maps.google.com.au.

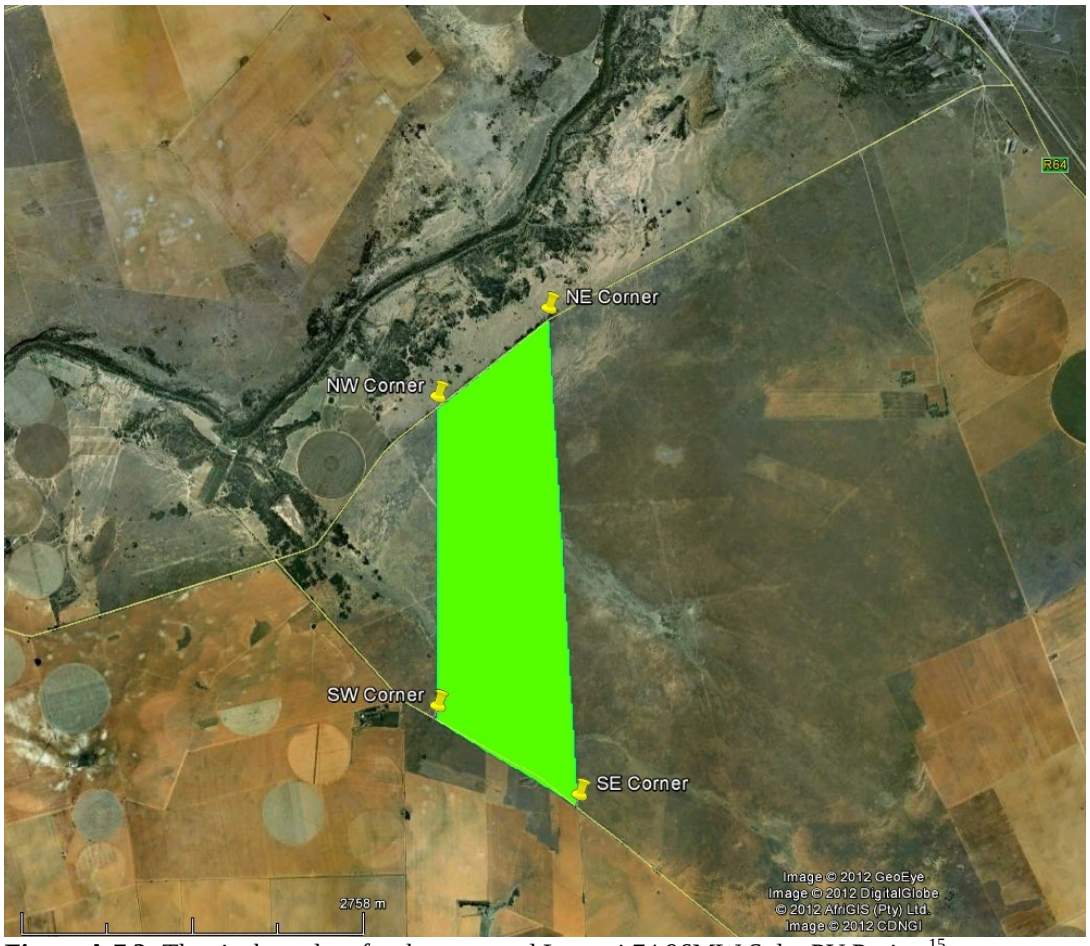

Figure A.7.2: The site boundary for the proposed Letsatsi 74.96MW Solar PV Project[15].

Table A.7.1. GPS coordinates of the proposed Letsatsi 74.96MW Solar PV Project[16].

	Latitude	**Longitude**
North East Corner	-28.90745947	25.92393499
North West Corner	-28.91388348	25.91474411
South West Corner	-28.93634071	25.91474418
South East Corner	-28.94283561	25.92646804

The site falls within the Free State Province's Motheo District Municipality and in the Mangaung Local Municipality[17]. It is located on part of Jedwater farm (Farm 2920) near the Krugersdrif Dam, approximately 5km west of the R64.

A.8. Duration of the CPA

A.8.1. Start date of the CPA

22 December 2011.

This is the date of which the preferred bidder bank guarantee of R12,800,000 was provided to the South African Department of Energy[18].

[15] Google Earth (see Table A.7.1 for GPS coordinates of site corners).
[16] Letsatsi EPC Schedule 2.2 - Statement of Work - Appendix 2 - Record of Decision.
[17] Letsatsi EPC Schedule 2.2 – Statement of Work – Appendix 5 – Environmental Impact Report, pp.52.
[18] Letsatsi - Preferred Bidder Guarantee, pp. 1.

A timeline of key project milestones is shown in Table A.8.1.1 below.

Table A.8.1.1: CPA-009 timeline[19].

Letsatsi 74.96MW Solar PV Project	Time lines
Response to RFP	04 November 2011
Announcement of Preferred Bidder Status	25 November 2011
Preferred Bidder Bank Guarantee	22 December 2011
Site Investigations and Preliminary Studies	21 June 2012 – 27 September 2012
Site Mobilisation and Preparation	05 July 2012 – 02 October 2012
Supplies and Long Lead Items	05 July 2012 – 03 July 2013
Civil, Electrical, Mechanical and Interconnection Works	09 August 2012 – 25 September 2013
Final Commissioning	28 June 2013 – 16 December 2013

A.8.2. Expected operational lifetime of the CPA

20 years.

Solar PV plants typically have a technical life in excess of 20 years, and the system in question is reported to have a lifespan of 25 years[20]. The Department of Energy's Renewable Energy Independent Power Producer (IPP) Procurement Programme requires a lifetime of 20 years, regulated by the Power Purchase Agreement[21].

A.9. Choice of the crediting period and related information

Fixed crediting period.

A.9.1. Start date of the crediting period

1 January 2014, approximately two weeks after the final commissioning of the project.

A.9.2. Length of the crediting period

10 years.

[19] 2.6.2.7 Letsatsi Form 5 Extract Schedule.
[20] Letsatsi EPC Schedule 2.2 - Statement of Work - Appendix 5 - Environmental Impact Report, pp. 35.
[21] APPENDIX K IPP PPA (PV) Final 20030811, pp. 7.

A.10. Estimated amount of GHG emission reductions

It is expected that CPA-009 will generate greenhouse gas emissions reductions of 1,346,901 tCO_2e over the crediting period. The table below shows the estimated annual emission reductions.

Emission reductions during the crediting period	
Years	**Annual GHG emission reductions (in tonnes of CO_2e) for each year**
2014	137,715
2015	137,026
2016	136,711
2017	135,649
2018	134,960
2019	134,272
2020	133,949
2021	132,895
2022	132,206
2023	131,518
Total number of crediting years	10
Annual average GHG emission reductions over the crediting period	134,690
Total estimated reductions (tonnes of CO_2e)	1,346,901

A.11. Public funding of the CPA

The proposed CPA will not receive any public funding from Parties included in Annex I of the UNFCCC.

A.12. Confirmation for CPA

CPA-009 has not been registered as an individual CDM project activity. Prior to inclusion of the CPA, the coordinating entity has checked and confirmed that the CDM project is not a part of another PoA. As the coordinating entity, Standard Bank has signed an emissions reduction purchase agreement (ERPA) with the project developer, Letsatsi Power Company, which will ensure that the solar installation has not been registered as part of another PoA.

SECTION B. Environmental analysis

B.1. Analysis of the environmental impacts[22]

The Environmental Impact Analysis (EIA) has been completed for this CPA and a copy of the final Environmental Impact Report (EIR) will be provided to the DOE for validation purposes.

The following summaries of impacts before and after mitigation measures have been enacted are discussed in detail in the final Environmental Impact Assessment Report.

[22] Letsatsi EPC Schedule 2.2 - Statement of Work - Appendix 5 - Environmental Impact Report, pp. 21-24, 83-156.

The risk matrix in Table B.1.1 below shows how the significance of each impact was classified based on the likelihood of occurrence and magnitude of the impact.

Table B.1.1: Significance rating matrix used for the Lesedi EIA.

Significance Rating					
		Likelihood			
		Negligible	**Unlikely**	**Likely**	**Definite**
Magnitude	**Negligible**	Negligible	Negligible	Minor	Minor
	Low	Negligible	Negligible	Minor	Minor
	Medium	Negligible	Minor	Moderate	Moderate
	High	Minor	Moderate	Major	Major

The likelihood of each impact occurring is classified as follows:

- **Negligible:** The impact is very unlikely to occur.
- **Unlikely:** The impact is unlikely to occur.
- **Likely:** The impact is likely to occur under most conditions.
- **Definite:** The impact will occur.

The magnitude of each impact is classified as a function of extent, duration and intensity.

Extent:

- **On-site:** Impacts are limited to the boundaries of the Solar PV site.
- **Local:** Impacts that affect an area in a radius of 20 km around the development site.
- **Regional:** Impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries, habitat type or ecosystem.
- **National:** Impacts that affect nationally important environmental resources or affect an area that is nationally important / or have macro-economic consequences.

Duration:

- **Temporary:** Impacts are predicted to be of short duration and intermittent/occasional.
- **Short-term:** Impacts that are predicted to last only for the duration of the construction period.
- **Long-term:** Impacts that will continue for the life of the project, but ceases when the project stops operating.
- **Permanent:** Impacts that cause a permanent change in the affected receptor or resource (e.g. removal or destruction of ecological habitat) that endures substantially beyond the project life time.

Intensity:

- **Negligible:** The impact upon the environment is not detectable, or there is no perceptible change to people's livelihood.
- **Low:** The impact affects the environment in such a way that natural processes and functions are not affected, or people/communities are able to adapt with relative ease and maintain pre-impact livelihoods.

- **Medium:** Where the affected environment is altered but natural functions and processes continue, albeit in a modified way, or people/communities are able to adapt with some difficulty and maintain pre-impact livelihoods but only with a degree of support.
- **High:** Where natural processes or functions are altered to the extent that it will temporarily or permanently cease, or those affected will not be able to adapt to changes and continue to maintain pre-impact livelihoods.

Impacts on Flora, Fauna, Avifauna and Habitat

The impact of the proposed project activity on flora, habitat, fauna and avifauna has been assessed for the construction and operational phases through the EIA process. The final EIR employs a number of mitigation strategies that have been developed to reduce the significance of each impact. All impacts have been reduced to minor negative or negligible as a result of utilising these mitigation strategies. A summary outlining the significance of pre-mitigation and post-mitigation impacts upon flora, fauna, avifauna and habitat can be seen in Table B.1.2 below.

Table B.1.2: Impacts on Flora, Fauna, Avifauna and Habitat.

Impact Area	Section of EIR	Project Phase	Pre-Mitigation Significance	Post-Mitigation Significance
Flora	7.1	Construction	Moderate (-ve)	Minor (-ve)
		Operation	Minor (-ve)	Negligible
Habitat	7.2	Construction	Low-Moderate (-ve)	Minor (-ve)
		Operation	Minor (-ve)	Negligible
Fauna	7.3	Construction	Moderate (-ve)	Minor (-ve)
		Operation	Minor (-ve)	Negligible
Avifauna	7.4	Construction	N/A	N/A
		Operation	Moderate (-ve)	Minor (-ve)

Impacts on Soil, Surface Water and Groundwater

The impact of the proposed project activity on soil, surface water and groundwater has been assessed for the construction and operational phases through the EIA process. The final EIR employs a number of mitigation strategies that have been developed to reduce the significance of each impact. All impacts have been reduced to minor negative as a result of utilising these mitigation strategies. A summary outlining the significance of pre-mitigation and post-mitigation impacts upon soil, surface water and groundwater can be seen in Table B.1.3 below.

Table B.1.3: Impacts on Soil, Surface Water and Groundwater.

Impact Area	Section of EIR	Project Phase	Pre-Mitigation Significance	Post-Mitigation Significance
Loss of Topsoil, Soil Compaction and Erosion	8.1	Construction	Moderate (-ve)	Minor (-ve)
		Operation	Minor (-ve)	Minor (-ve)
Surface Water and Groundwater	8.2	Construction	Minor (-ve)	Minor (-ve)
		Operation	Minor (-ve)	Minor (-ve)

Noise Impacts

The impact of noise during the construction phase of the proposed project activity has been assessed through the EIA process. Noise during the operational phase will be negligible, and is therefore considered not applicable. The final EIR employs a number of mitigation strategies that have been developed to reduce the impact of noise during the construction phase from moderate negative to

minor/moderate negative. A summary outlining the significance of pre-mitigation and post-mitigation noise impacts can be seen in Table B.1.4 below.

Table B.1.4: Noise Impacts.

Impact Area	Section of EIR	Project Phase	Pre-Mitigation Significance	Post-Mitigation Significance
Noise Impact	9.1	Construction	Moderate (-ve)	Minor-Moderate (-ve)
		Operation	N/A	N/A

Visual Impacts

The visual impact of the proposed project activity has been assessed for the operational phase through the EIA process. The final EIR employs a number of mitigation strategies that have been developed to reduce the significance of the visual impact of the project activity during the operational phase, reducing the impacts from moderate/major negative to moderate negative. A summary outlining the significance of pre-mitigation and post-mitigation visual impacts can be seen in Table B.1.5 below.

Table B.1.5: Visual Impacts.

Impact Area	Section of EIR	Project Phase	Pre-Mitigation Significance	Post-Mitigation Significance
Visual Impact	10.1	Operation	Moderate-Major (-ve)	Moderate (-ve)

The proposed solar PV park will be marginally visible from over 2.5km away. While visible from the local S327 and S264 roads, the solar PV park will be hardly visible from the R64 route to the east. It should also be noted that some visual intrusion already occurs in this landscape due to an existing Eskom power line and substation.

Impacts of the Loss or Damage to Archaeological or Cultural Heritage and Paleontological Resources

The impact of the proposed project activity on loss or damage to archaeological or cultural heritage and paleontological resources has been assessed for the construction and operational phases through the EIA process. The final EIR employs a number of mitigation strategies that have been developed to reduce the significance of each impact. The impact upon the cultural landscape and built environment and graves has been reduced to minor negative and negligible, respectively, through these mitigation strategies. The impact of disturbance or damage to archaeology and palaeontology has been reversed from a minor negative impact to a minor positive impact, as the mitigation strategy mandates that any discoveries need to be reported. Such a discovery would increase the body of knowledge related to these fields, and therefore create a positive impact. A summary outlining the significance of pre-mitigation and post-mitigation impacts upon loss or damage to archaeological or cultural heritage and paleontological resources can be seen in Table B.1.6 below.

Table B.1.6: Impacts of the Loss or Damage to Archaeological or Cultural Heritage and Paleontological Resources.

Impact Area	Section of EIR	Project Phase	Pre-Mitigation Significance	Post-Mitigation Significance
Disturbance or Damage to Archaeology and Palaeontology	11.1	Construction	Minor (-ve)	Minor (+ve)
		Operation	N/A	N/A
Cultural Landscape Impact	11.2	Construction	N/A	N/A
		Operation	Minor (-ve)	Minor (-ve)

Built Environment and Graves	11.3	Construction	Minor (-ve)	Negligible
		Operation	N/A	N/A

Socio-Economic Impacts

The impact of the proposed project activity on socio-economic conditions has been assessed for the construction and operational phases through the EIA process. The final EIR employs a number of mitigation strategies that have been developed to reduce the significance of each impact. All minor negative impacts have been reduced to negligible through the utilisation of these mitigation strategies. The pre-mitigation moderate negative impacts upon loss of agricultural land and sense of place have been reduced to minor negative impacts with the utilisation of mitigation strategies. Minor positive impacts upon the local economy during the construction and operational phases, and moderate positive impacts upon tourism activities during the construction phase are expected post-mitigation. A summary outlining the significance of pre-mitigation and post-mitigation socio-economic impacts can be seen in Table B.1.7 below.

Table B.1.7: Socio-Economic Impacts.

Impact Area	**Section of EIR**	**Project Phase**	**Pre-Mitigation Significance**	**Post-Mitigation Significance**
Benefits to the Local Economy	12.1	Construction	Minor (+ve)	Minor (+ve)
		Operation	Minor (+ve)	Minor (+ve)
Social Ills Linked to Influx of Workers and Job-Seekers	12.2	Construction	Minor (-ve)	Negligible
		Operation	Negligible	Negligible
Disruption to Agricultural Activities	12.3	Construction	Minor (-ve)	Negligible
		Operation	Minor (-ve)	Negligible
Loss of Agricultural Land	12.4	Construction	Moderate (-ve)	Minor (-ve)
		Operation	Moderate (-ve)	Minor (-ve)
Tourism Activities	12.5	Construction	Minor (+ve)	Moderate (+ve)
		Operation	Minor (-ve)	Negligible
Property Prices and Desirability of Property	12.6	Construction	Minor (-ve)	Negligible
		Operation	Minor (-ve)	Negligible
Sense of Place	12.7	Construction	Moderate (-ve)	Minor (-ve)
		Operation	Minor (-ve)	Negligible

The benefits to the local economy and tourism activities are highlighted as being significant on account of the expected increase in job opportunities and the expected local economic development linkages that will be created as a result of the proposed development. Such impacts can be considered as “positive impacts” with positive externalities.

Other Impacts

The impact of the proposed project activity on air quality, traffic, waste and effluent, health and safety, and electromagnetic interference has been assessed for the construction and operational phases through the EIA process. The final EIR employs a number of mitigation strategies that have been developed to reduce the significance of each impact. All impacts have been reduced to minor negative or negligible as a result of utilising these mitigation strategies. A summary outlining the significance of pre-mitigation and post-mitigation impacts upon air quality, traffic, waste and effluent, health and safety, and electromagnetic interference can be seen in Table B.1.8 below.

Table B.1.8: Other Impacts

Impact Area	Section of EIR	Project Phase	Pre-Mitigation Significance	Post-Mitigation Significance
Air Quality	13.1	Construction	Minor (-ve)	Minor (-ve)
		Operation	Minor (-ve)	Minor (-ve)
Traffic Impact	13.2	Construction	Moderate (-ve)	Minor (-ve)
		Operation	Minor (-ve)	Negligible
Waste and Effluent	13.3	Construction	Minor (-ve)	Minor (-ve)
		Operation	Minor (-ve)	Negligible
Health and Safety Linked to Construction Activities	13.4	Construction	Minor (-ve)	Negligible
Electromagnetic Interference	13.5	Operation	Minor - Negligible	Minor - Negligible

B.2. Environmental impact assessment

The proposed solar energy facility in CPA-009 is subject to the requirements of the Environmental Impact Assessment Regulations (2010 EIA Regulations) in terms of the National Environmental Management Act (NEMA, Act 107 of 1998, as amended)[23]. This Act makes provision for the identification and assessment of activities that are potentially detrimental to the environment and which require authorisation from the competent authority (in this case, the national Department of Environmental Affairs, DEA) based on the findings on an EIA.

Scoping and EIA processes are required in terms of NEMA, 2010. The listed activities associated with the proposed developments, as stipulated under Regulations 386, 387, 544, 545 and 546, are as follows:

- Regulation 386: Activity 1(m), 12, 15 and 16(b).
- Regulation 387: Activity 1 (a)(l) and 2.
- Regulation 544: Activity 10(i) and 11(i)(ii)(iii)(iv)(v)(vi)(vii)(viii)(ix)(x)(xi).
- Regulation 545: Activity 1 and 15
- Regulation 546: Activity 14 (a)(i)

The Final Environmental Impact Report was compiled by Environmental Resources Management (ERM) and was approved by the government on 19 March, 2012. The Environmental Authorisation has this been received and the project developers have been permitted to initiate construction and operations as outlined in the Final Environmental Impact Report.

SECTION C. Local stakeholder comments

C.1. Solicitation of comments from local stakeholders

As per the local EIA stakeholder processes for the proposed Letsatsi 74.96MW Solar PV Project CPA-009, comments and queries were invited via the following avenues:

- Interested and affected parties were notified directly via email to provide comments. An invitation to the public stakeholder meeting to be conducted on 12 October 2010 was also included in the email.

[23] On 18 June 2010 the Minister of Water and Environmental Affairs promulgated new regulations in terms of Chapter 5 of the National Environmental Management Act (NEMA, Act 107 of 1998), viz, the Environmental Impact Assessment (EIA) Regulations 2010. These regulations came into effect on 2 August 2010 and replace the EIA regulations promulgated in 2006.

- An advertisement in English was placed in the "*Express*" newspaper on 28 July 2010, inviting input from members of the public.
- An advertisement in Afrikaans was placed in the "*Volksblad*" Newspaper on 28 July 2010, inviting input from members of the public.
- Advertisements in both English and Afrikaans were placed in the "*Diamond Fields Advertiser*" newspaper on 28 July 2010, inviting input from members of the public.
- Site notices in English and Afrikaans were placed on the boundary fence of the development property.
- Notices in English and Afrikaans were placed in the nearby town of Bainsvlei.
- Notices in English and Afrikaans were placed in the window of a nearby BKB shop.

Comments and concerns relating to the proposed development were considered minimal, and were collated by ERM as detailed in Section C.2 below.

C.2. Summary of comments received

Two written responses to the initial notification of the project activity were received from local individual stakeholders. The following list details the concerns raised in response to the proposed project activity:

- A local farmer raised concerns about the visual impact of the solar park upon the landscape
- A local landowner also raised concerns about the visual impact of the solar park upon the landscape. In addition, concerns were raised about the impact of increased traffic on the surrounding roads.

The public stakeholder consultation meeting was conducted on 12 October 2010. One stakeholder, from Free State Agriculture, was present for the discussion. The following table outlines the questions and comments that were raised and the responses provided during the meeting.

No.	Question/Comment	Response
1.	More than 500,000 ha of land has been affected by veld fires recently. Will this facility increase the fire hazard/risk? The area has 62 fire protection units so it would be useful to have contact details for these units in the management plans for the project.	Fire management measures will be put in place, such as fire breaks around the facility. Vegetation will be kept short in the facility area as well.
2.	Will dust not then be an issue for the panels, especially if vegetation is removed? How will it be removed?	The vegetation will be kept short rather than removed it entirely, in order to reduce dust impacts. When there is dust build up the panels will be cleaned using a brush. At this stage it is understood that water will not be required for cleaning purposes but this will depend on manufacturing specifications.
3.	How is the land/permission obtained? Lease or subdivision?	The land will be leased and the owner will then be allowed to farm on the remainder of the farm as per the lease agreement.
4.	What is the lifespan of the project and what happens afterward?	The panels have a lifespan of approximately 20 years. At that stage the developer may decide to refurbish/replace the panels or to remove them and rehabilitate the site. This would depend on

		the project viability at that stage.
5.	There was an economic development summit recently in the province which focused on manufacturing largely. It would be good to get some of the manufacturing done locally if possible. Maybe this could be subsidised by the government/Eskom initially in order to grow the industry.	-
6.	At this stage can any components or materials be sourced locally?	The panels will be made by overseas manufacturers so it will depend on those manufacturers. The manufacturers have indicated the possibility of establishing a manufacturing facility in South Africa in the future, depending on the requirements. There would then be the possibility of sourcing silica and metals in South Africa.
7.	How does this project affect the neighbouring land owners? Is there a visual impact and is glare an issue?	There could be a potential visual impact to neighbouring farms, this will be assessed by a specialist study during the EIA phase. Glare is not anticipated to be an issue associated with these types of panels as there is limited reflection from the panels.
8.	Will there be housing/accommodation on site?	No, there won't be any on the site itself but some people will have to be accommodated in the local area.

C.3. Report on consideration of comments received

The written comments received by local stakeholders regarding the impact of visual intrusion and increased traffic were specifically addressed in detail in the final Environmental Impact Report and therefore have been considered.

The Environmental Impact Assessment practitioner was responsible for considering the comments received and made responses during the public stakeholder consultation meeting where appropriate as outlined in Section C.2 above.

SECTION D. Eligibility of CPA and estimation of emissions reductions
D.1. Title and reference of the approved baseline and monitoring methodology(ies) selected:

This CPA will use the large scale approved methodology "ACM0002: Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (Version 12.3.0)[24], and as such, will assess additionality against barriers listed in the "Tool for the demonstration and assessment of additionality" (Version 06.1.0)[25], as well as the "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 04.0.0)[26].

In addition, the following tools are referred to in this CPA in conjunction with the baseline methodology:

[24] http://cdm.unfccc.int/methodologies/DB/UB3431UT9I5KN2MUL2FGZXZ6CV71LT
[25] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.1.0.pdf
[26] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-02-v4.0.0.pdf

- "Tool to calculate the emission factor for an electricity system" (Version 02.2.1)[27].
- "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (Version 02)[28].

D.2. Application of methodology(ies)

CPA-009 will meet the requirements set out in the methodology because it is comprised of a new renewable energy technology (i.e. the installation of a new solar PV power plant) that will supply electricity into the national grid system.

The CPA satisfies all of the eligibility criteria outlined in the PoA-DD (see section D.5 below) and is therefore considered eligible for inclusion under the PoA.

D.3. Sources and GHGs

As the programme will replace grid electricity, the project boundary will include the physical installation of the solar PV project connected to the national grid system in South Africa. The GHG reduced through CPA-009 under this PoA is CO_2. The reduction takes place through the avoidance of fossil fuels (predominantly coal) consumed in the production of electricity, which would otherwise occur in the absence of the CPA.

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project scenario	For geothermal power plants, fugitive emissions of CH_4 and CO_2 from non-condensable gases contained in geothermal steam	CO_2	No	Not relevant to CPA-009 which utilises solar PV power
		CH_4	No	Not relevant to CPA-009 which utilises solar PV power
		N_2O	No	Not relevant to CPA-009 which utilises solar PV power
	CO_2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	Not relevant to CPA-009 which utilises solar PV power
		CH_4	No	Not relevant to CPA-009 which utilises solar PV power
		N_2O	No	Not relevant to CPA-009 which utilises solar PV power
	For hydro power plants, emissions of CH_4 from the reservoir	CO_2	No	Not relevant to CPA-009 which utilises solar PV power
		CH_4	No	Not relevant to CPA-009 which utilises solar PV power
		N_2O	No	Not relevant to CPA-009 which utilises solar PV power

The project scenario will use renewable solar energy to displace greenhouse gas emissions that would otherwise be generated by fossil fuel fired power plants through the generation of electricity under the

[27] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf
[28] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf

baseline scenario (Figure D.3.1). The electricity supplied to the grid ($EG_{facility,y}$) will be recorded by monitoring equipment for the purposes of calculating total emissions reductions.

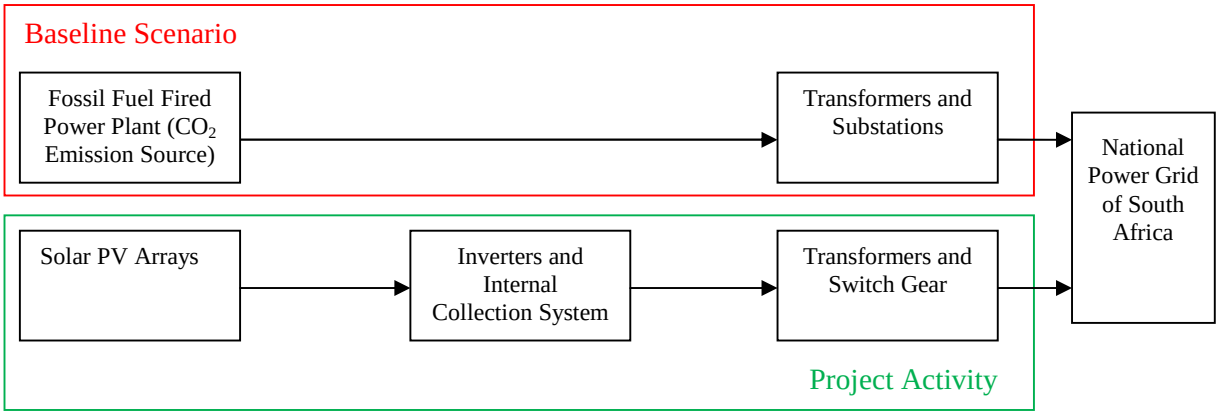

Figure D.3.1: The equipment, systems and flows of electricity in the baseline scenario and project activity.

D.4. Description of the baseline scenario

As per the application of "ACM0002: Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (Version 12.3.0), the "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 04.0.0) is used to identify and determine the characteristics of the baseline scenario.

As per the analysis in Part I Section B of the PoA-DD, the alternative baseline scenario is the development of similar renewable energy projects (based on technology, size etc.) without application to the CDM and the resultant carbon revenues. As revealed, this scenario is unlikely as even though there are some incentive mechanisms now available in South Africa, carbon revenues are widely considered to be an integral part of increasing the competitive nature of bids submitted in tending for the Department of Energy's Renewable Energy Independent Power Producer (IPP) tariff.

The alternative renewable energy technologies applicable to the IPP bid include[29]:

- Onshore wind
- Concentrated solar thermal
- Solar photovoltaic
- Biomass
- Biogas
- Landfill gas
- Small hydro

In reference to the EB 22 Annex 3 decision[30], the Department of Energy's Renewable Energy IPP procurement programme is however excluded when identifying alternative scenarios for baseline because this E-type policy (that aims to decrease GHG emissions) was only implemented in 2011, after the adoption by the COP of the CDM M&P (decision 17/CP.7, 11 November 2001).

The following were therefore identified as possible alternatives to the project activities in the PoA-DD:

[29] http://www.ipp-renewables.co.za/
[30] EB 22 Annex 3, Clarifications on the Consideration of National and/or Sectoral Policies and Circumstances in Baseline Scenarios (Version 02), paragraph 7.

Scenario 1: *The proposed project activity undertaken without being registered as a CDM project activity.*

In 2003, the South African government approved private-sector participation in the electricity industry and decided that future power generation capacity will be divided between Eskom (70%) and IPPs (30%)[31].

The Department of Energy's Renewable Energy IPP procurement programme was subsequently developed which will facilitate the development of renewable energy projects in South Africa without registration with the CDM. Prevailing barriers remain in this regard as in order to apply to the IPP bidding programme, significant development costs must be laid out (e.g. positively concluded EIAs; costly grid connection reviews, etc.) before the assurance of the receipt of the tariff is received. These can require equity or debt investment which is often problematic as the economic climate in South Africa does not encourage such capital outlays due to the perceived risk inherent in renewable energy projects. Significant development costs are therefore often undertaken at risk, before knowing whether or not submissions will be accepted into the IPP programme. For example, prospective bidders are required to pay a non-refundable fee of R15,000 to access the request for proposal (RFP) documentation, in addition to a bid bond of R100,000 for every megawatt of capacity bid[32].

The Department of Energy's IPP contractual agreements further require that the IPP take on the responsibility of certain risks, many of which are onerous and have potentially large repercussions, especially for smaller plants. Of note are the following requirements identified by an independent, third party technical advisor[33]

- Damages and liability of unavailable grid – lost benefits

Risks associated with Eskom's performance (e.g. connection delays and network failures) may result in grid unavailability which can lead to reduced revenues. Such losses cannot be passed-on to the operations and maintenance contractor and must be considered in the financial models.

- Timing of connection

A key risk associated with the distribution and transmission connection is associated with the timing of the connection – both in terms of works carried out by the distribution and network owner (likely to be Eskom), the EPC (engineering, procurement and construction) contractor, and availability of the connection in the case of premium connections. While the transmission network operator is responsible for any damages caused to the IPP due to delays in achieving connection to a max of 5% of the connection charge, the cost incurred to the IPP due to the delay of connecting the premium equipment may exceed this limit.

- Connection point

The connection point must be within the boundaries of the IPP and land must be owned and made available for the connection site. Lack of connection point access can endanger the whole permit of the Eskom licence. Land ownership must therefore be ascertained with provisional agreements from an early point in the planning stage.

- Construction risk

[31] http://www.energy.gov.za/files/electricity _frame.html

[32] http://www.engineeringnews.co.za/article/sa-unveils-the-names-of-first-28-preferred-renewables-bidders-2011-12-07

[33] ARUP Taaibos & Linde PV Projects: Revised Technical Due Diligence, Phase 1 Report, February 2012, page 64-67.

The IPP is obligated to commence the generation at the latest 18 months after the commercial operation date. While 18 months construction delay is generally more uncommon, with the main risk being supply chain, the Department of Energy's stipulated PPA requires that one day of project delay, beyond last commercial operation date, will reduce the operating period by two days.

These and other risks make the development of renewable energy projects under the Department of Energy's IPP programme an intensive process which requires guidance (and remuneration) of various specialists such as legal and engineering consultants.

The evaluation of bids considers the fulfilment or mitigation of the risks and other requirements stipulated in the formal Request for Proposals documentation. However, the financial competitiveness of the respective bids are by far the overwhelming consideration of a successful application because 70% of the final bidding evaluation is based on the cheapest tariff proposal (and the remaining 30% is based on performance on economic development obligations).

Investor/financier concerns in this regard often revolve around the unstable regulatory environment, technology barriers and the lack of large scale operational renewable energy facilities in the country compared to the prevailing practice which is the provision of cheaper and more convenient electricity supplies from Eskom. The inclusion therefore of a carbon revenue stream allows bidders to reduce the ultimate electricity selling price, thereby increasing the competitive strength of the respective bids.

Scenario 2: *Continuation of the current situation, not requiring any investment or expenses to maintain the current situation.*

The continuation of business-as-usual is the utilisation of electricity generated through the combustion of fossil fuels, largely coal. This is currently the most economically feasible source of electricity (due to plentiful, cheap coal supplies and the economies of scale that Eskom is able to provide) and carries the least risk in terms of barriers surrounding new technologies; skilled support personnel and existing markets and established distribution networks (the majority of which are owned by Eskom).

Scenario 3: *Other plausible and credible alternative scenarios to the project activity scenario, including the common practices in the relevant sector, which deliver outputs or services.*

Few large-scale renewable energy facilities are currently operational in South Africa. While the IPP procurement will assist in developing this industry, high barriers to entry into this market still prevail making the continuation of the current practice discussed above more attractive as an alternative scenario.

Furthermore Letsatsi Power Company's expertise lies in its ability to provide solar energy solutions as opposed to other renewable energy technologies.

Concluding remarks

While the development of large scale renewable energy projects will be driven by the Department of Energy's Renewable Energy IPP procurement programme, project developers in this regard face a great number of challenges and must tender bids in an environment characterised by intensive levels of competition. The provision of an additional revenue stream through the generation and sale of carbon credits will allow project developers to reduce their bid tariff prices, thus increasing their chances of becoming preferred bidders in the programme.

Once the programme has closed (it has a finite limit of five rounds, two of which were complete at the time of writing[34]), South Africa will have to look at other mechanisms to promote renewable energy. As no subsequent plan is in place yet, the continuation of the prevailing practice, the generation of electricity in South Africa from coal-fired power stations[35] largely owned by the parastal Eskom, is therefore the most likely long term alternative baseline scenario.

The development of such facilities do not face the barriers that renewable energy projects face due to the prevalence of plentiful, cheap coal supplies combined with more competitive development costs for new generation facilities as a result of Eskom's large economies of scale. The end result is the generation of electricity at vastly competitive rates compared to the existing and proven renewable energy alternatives.

The common practice of electricity production from coal-fired power stations is thus the most economically and practically viable alternative to the proposed programme activities, and will therefore be used as the baseline for calculating the emission reductions under this PoA.

CPA-009 will be applied in accordance with "ACM0002: Consolidated baseline methodology for grid-connected electricity generation from renewable sources" (Version 12.3.0), the "Combined tool to identify the baseline scenario and demonstrate additionality" (Version 04.0.0), as well as the "Tool for the demonstration and assessment of additionality" (Version 06.1.0).

Therefore in regards to CPA-009, the investment benchmark analysis (Option III of the "Tool for the demonstration and assessment of additionality" Version 06.1.0) is used to prove additionality because the most likely alternative scenarios identified above are the "business-as-usual" scenarios or the development of renewable energy projects without registration with the CDM. Furthermore, the CPA will produce revenues through the sale of renewable energy.

D.5. Demonstration of eligibility for a CPA

This large scale CPA meets all of the eligibility criteria for inclusion in the PoA, as per Section B.2. (Part I) of the PoA-DD.

No.	Criteria	Eligibility
1	All installation shall take place within the geographical boundaries of South Africa and shall be connected to the national grid electricity system.	Yes. The proposed site is located near to the town of Bloemfontein in the Free State of South Africa.
2	Conditions that avoid double counting of emissions reductions like unique identifications of plants and end-user locations.	Yes. CPA-09 has unique GPS coordinates and the CPA implementer complies with the procedure established by the CME as specified in PoA-DD Section C Part I to avoid double counting.
3	New wind or solar (PV and CSP) power plants that provide electricity into the national grid are eligible (i.e. no retrofits or capacity additions are included).	Yes. This programme activity is a new solar PV plant which will generate 74.96 MW of electricity which will be fed into the national grid.
4	The starting date of the CPA shall be earliest date at which the project implementation begins, which shall be determined based on the first signed major contract related to the CPA. The	Yes. The start date of CPA-09 is 22 December, 2011, which is the date when the Preferred Bidder Bank Guarantee was provided to the South African Department of

[34] http://www.info.gov.za/speech/DynamicAction?pageid=461&sid=30523&tid=82956
[35] Department of Energy: South African Energy Synopsys 2010.

	CPA starting date needs to be after 18 November 2011.	Energy.
5	The CPA to be included in this PoA shall meet the applicability requirements of the CDM methodology "ACM0002: Baseline methodology for grid-connected electricity generation from renewable sources" Version 12.3.0.	Yes. This programme activity will generate 74.96 MW of electricity from solar PV technology which will be fed into the national grid.
6	The CPA to be included in this PoA shall assess additionality against one or more of the barriers listed in the "Tool for the demonstration and assessment of additionality" (Version 06.0.0) as well as the "Combined tool to identify the baseline scenario and demonstrate additionality", Version 04.0.0 as per section B.5, and leakage rules as per section B.6.1 of the CPA document.	Yes. This programme activity meets the additionality and leakage requirements as proven in sections D.4 and D.6.1 of the CPA-DD.
7	The local stakeholder consultation (LSC) shall take place in CPA level and shall follow the EIA requirements. In case an EIA is not required for the specific CPA a separate LSC process shall take place. This process shall identify the key stakeholder and affected parties, which shall be informed in the most suitable way (e.g. public announcement via newspaper and/or personal invites, presentation and/or project summary and a minimum of 2 weeks commenting period from the announcement/invite.	Yes. Please refer to section C of the CPA-DD.
8	Wind or solar power plants must obtain the relevant environmental approvals in accordance with the National Environmental Management Act ("NEMA") Environmental Impact Assessment ("EIA") regulations.	Yes. The Environmental Authorisation was awarded by the Department of Environmental Affairs, Republic of South Africa on the 19th of March, 2012.
9	No CPAs under this programme will receive funding from Annex I parties.	Yes. CPA-09 is not publicly funded by an Annex I party.
10	Where applicable, target group (e.g. domestic/commercial/industrial, rural/urban, grid connected/off-grid) and distribution mechanisms (e.g. direct installation).	N/A. CPA-09 is a commercial renewable energy facility connected to the national grid system.
11	Where applicable, the conditions related to sampling requirements for a PoA in accordance with the approved guidelines/standard from the Board pertaining to sampling and surveys.	N/A. No sampling is applied under this PoA, and all CPAs/projects are monitored individually according to the requirements of the methodology ACM0002.
12	Where applicable, the conditions that ensure that every CPA in aggregate meets the small-scale or microscale threshold criteria and remains within those thresholds throughout the crediting period of the CPA.	N/A. CPA-09 applies the large scale methodology ACM0002 and will therefore not be eligible for small scale or microscale threshold criteria.
13	Where applicable, the requirements for the debundling check, in case CPAs belong to small-scale (SSC) or microscale project categories.	N/A. CPA-09 applies the large scale methodology ACM0002 and will therefore not be eligible for inclusion as a bundle of projects under the small scale or microscale project categories.

14	All power plants shall have a lifetime in excess of 10 years.	Yes. The project lifetime is over 10 years. Please see section A.8.2 of the CPA-DD.
15	Each CPA must be approved by the coordinating entity and DOE prior to its incorporation into the PoA.	Yes. The coordinating entity and DOE will approve the programme activity prior to the incorporation into the PoA.

This large scale CPA satisfies all of the eligibility criteria and is therefore considered eligible for inclusion under the PoA. The additionality assessment is undertaken below.

Assessment of additionality

The "Tool for the demonstration and assessment of additionality" (Version 06.1.0) has been selected to demonstrate and assess the additionality of Letsatsi 74.96MW Solar PV Project CPA-009, and therefore its eligibility to be included under the Green Power for South Africa PoA.

"Tool for the demonstration and assessment of additionality" (Version 06.1.0)	**Barrier**	**Criteria**
Sub-steps 2b (Option III), 2c and 2d	Financial analysis: benchmark analysis	A cash flow model comparing the project IRR to the selected relevant benchmark IRR shall be provided for the CPA.

Sub-step 2b: Option III. Benchmark analysis

As per the "Tool for the demonstration and assessment of additionality" (Version 06.1.0), the objective of this step is to compare the financial attractiveness of the alternative scenarios (in Section D.4 above) remaining after analysis of barriers by conducting an investment analysis.

Determining the appropriate benchmark

The post-tax return on equity (RoE) also known as the internal rate of return (IRR), has been identified as the financial indicator most suitable to benchmark CPA-009's project type and decision making context because this is a common criteria used by funders to compare various investment opportunities.

An equity RoE is calculated and compared to the expected general market return rate as a benchmark. The benchmark is determined using the Capital Asset Pricing Model. This model takes into account the non-diversifiable risk of the asset, the expected return of the market and the expected return of a risk-free asset using the following formula:

$$E(R_i) = R_f + \beta_i (E(R_m) - R_f) \quad \textbf{(1)}$$

Where:

$E(R_i)$	=	The expected return of the capital asset
R_f	=	The risk free rate of interest such as arising from government bonds
β_i	=	The sensitivity of the expected excess asset returns to the expected excess market returns
$E(R_m)$	=	The expected return of the market

The "Tool for the demonstration and assessment of additionality" (Version 06.1.0) advises that either the RoE benchmark for South African energy projects as given in the "Guidelines on the assessment of investment analysis" (Version 05) or a more appropriate benchmark can be applied. This analysis has chosen to use an alternative benchmark of 17.9%, which is the average value of the benchmark examples given as shown in the table below.

Table D.5.1: Examples of local benchmark equity IRR values

No.	Organisation	Real equity IRR
1	NERSA[36]	17%
2	Exxaro[37]	17%
3	Lereko Metier[38]	15 – 20%
4	Association for Savings and Investment SA[39]	18%
5	SAPVIA[40]	20%
	Average benchmark equity	**17.9%**

These figures better reflect the risk premium required by private investors in South Africa to participate in local projects.

The NERSA[41] benchmark of 17% taken from the REFIT (Renewable Energy Feed-in Tariff) consultation document (March 2011) is particularly relevant. Based on extensive research into renewable energy projects in South Africa, this RoE benchmark is one of the criteria for eligibility to the Department of Energy's Renewable Energy IPP procurement programme (that recently replaced the REFIT process, and is a non-mandatory process).

Potential applicants to the IPP programme must therefore present their renewable energy projects and bid on the basis of the lowest tariff required to ensure that their projects are feasible (in accordance with NERSA's stipulated guidelines e.g. the real equity rate noted above).

In addition, the real equity return rate of 20% proposed by SAPVIA (the South African Photovoltaic Industry Association) and the 15-20% rate provided by Lereko Metier (specific to the Solafrica CSP company) support the argument against benchmarking according to CDM "Guidelines on the assessment of investment analysis" (Version 05). Typically higher returns are clearly required for investor security in allocating funds to renewable energy projects in the South African context.

Using the RoE formula above and the parameters in the table below, the benchmark is therefore determined to be 17.9% based on the following parameters.

Table D.5.2: Benchmark calculation parameters

Parameter	Value	Reference
R_f	8%	RSA Retail Savings Bond[42]
β_i	1	Assumed 1 as no data available for South Africa
$E(R_m)$	17.9%	Average benchmark value as per the Table D.5.1

[36] NERSA Consultation Paper: Review of Renewable Energy Feed – In Tariffs, March 2011, page 22.
[37] Exxaro Group Interim Financial Results, 30 June 2011, page 24.
[38] Lereko Metier CSP finance presentation, September 2010, page 12.
[39] ASISA CIS stats, 30 June 2011.
[40] SAPVIA NERSA REFIT Public Consultation, March 2011, page 3.
[41] NERSA Consultation Paper: Review of Renewable Energy Feed – In Tariffs, March 2011, page 22.
[42] http://secure.rsaretailbonds.gov.za/

Sub-step 2c: Calculation and comparison of financial indicators

The Letsatsi 74.96 MW Solar PV Project has applied for the competitive bidding process because it cannot provide renewable electricity at competitive rates without a feed-in tariff or subsidy. Two financial scenarios were proposed in the financial model, based on the provision of two alternative tariff options. This is a requirement of the Department of Energy for all bidders in the Renewable Energy IPP programme, so that the Department of Energy may meet its own assumptions on inflation[43]. Tariff Option 1 is fully indexed to the Consumer Price Inflation (CPI) rate, whereas Tariff Option 2 is only partially indexed to the CPI rate.

The Department of Energy therefore has the right to choose one option over the other at financial closure, depending on whether they decide at the time to carry the risk of inflation or to opt for the tariff with less inflation risk. This flexibility mechanism will largely benefit the Department.

In the case of CPA-009, the South African Department of Energy is expected to indicate the preferred tariff at financial closure of the project, expected at the end of October 2012.

It is expected that the Department of energy will choose the fully indexed tariff, and therefore the calculation of financial indicators has been conducted with the final feed-in tariff of 2.763 ZAR/kWh. The sensitivity analysis is sub-step 2d has been conducted with both tariff options in order to demonstrate the financial attractiveness of the proposed project activity under both conditions in a conservative manner.

The inclusion of CER revenues will make the project more competitive and marketable while providing funders with the security of extra revenues and a project development process that must comply with stringent UNFCCC requirements.
The table below provides a summary of the project financials:

Table D.5.3: Summary of the Letsatsi 74.96MW Solar PV Project CPA-009 financials.

Letsatsi 74.96MW Solar PV Project CPA-009			
Parameter	**Unit**	**Value**	**Source**
Total capacity	MW	74.96	Solar Resource Assessment Report Letsatsi
P90 Energy Yield[44]	kWh/kW	1,543.07	2.5.5.1.1 Letsatsi Power – Financial Model – Final (Solar Yield P90 – General Assumptions).
Full bid tariff	ZAR/MWh	2,763	2.5.5.1.1 Letsatsi Power – Financial Model – Final (Fully indexed tariff – Control page).
Partial bid tariff	ZAR/MWh	2,850	2.5.5.1.1 Letsatsi Power – Financial Model – Final (Partially indexed tariff – Control page).
Capex	ZAR	2,379,527,000	2.5.5.1.1 Letsatsi Power – Financial Model – Final (Total sources of funds – Control page).
Operating costs	ZAR/yr	45,153,000	2.5.5.1.1 Letsatsi Power – Financial Model – Final (Total real OM costs for 2014 – Operations).
Debt : Equity ratio	%	69.62 : 30.38	2.5.5.1.1 Letsatsi Power – Financial Model – Final (Sources of funds – Control page).
Tax rate	%	28	http://www.lowtax.net/lowtax/html/offon/southafrica/sasummary.html

[43] The Department of Energy's RFP Part B Qualification Criteria (clause 2.5 Financial Criteria and Evaluation)
[44] 90% probability of exceedance.

VAT rate	%	14	http://www.lowtax.net/lowtax/html/south_africa/south_africa_domestic_corporate_taxation.asp#vat
Secondary tax rate	%	10	http://www.lowtax.net/lowtax/html/offon/southafrica/sasummary.html
Real equity IRR (after tax)	**%**	8.57	2.5.5.1.1 Letsatsi Power – Financial Model – Final (Equity IRR – Control page).

The carbon revenues therefore will allow the developer the opportunity of reducing the tariff prices, thus increasing the chances of winning the bid, while simultaneously allaying financiers' concerns that the investment in this CPA is worthwhile and will make acceptable returns.

Sub-step 2d: Sensitivity analysis

A sensitivity analysis was conducted assessing the main external parameters that drive the financial model. Each parameter listed below has been increased by 10% and decreased by 10%, with the effect on the equity IRR noted in Table D.5.4, D.5.5 and D.5.6 below.

Table D.5.4: Capex sensitivity.

Letsatsi 74.96 MW Solar PV Project CPA-009			
Based on fully indexed tariff of ZAR 2.763/kWh			
Capex (R'000 000)	**Real equity IRR**	**Variance**	**Above benchmark of 17.9%?**
2,617.480	6.98%	10%	No
2,379.527	8.57%	0%	No
2,141.574	10.73%	-10%	No
Based on partially indexed tariff of ZAR 2.850/kWh			
Capex (R'000 000)	**Real equity IRR**	**Variance**	**Above benchmark of 17.9%?**
2,612.451	7.75%	10%	No
2,374.955	9.56%	0%	No
2,137.460	11.81%	-10%	No

Table D.5.5: Opex sensitivity.

Letsatsi 74.96 MW Solar PV Project CPA-009			
Based on fully indexed tariff of ZAR 2.763/kWh			
Opex (R'000 000)	**Real equity IRR**	**Variance**	**Above benchmark of 17.9%?**
49.668	7.84%	10%	No
45.153	8.57%	0%	No
40.638	9.29%	-10%	No
Based on partially indexed tariff of ZAR 2.850/kWh			
Opex (R'000 000)	**Real equity IRR**	**Variance**	**Above benchmark of 17.9%?**
49.838	8.77%	10%	No
45.307	9.56%	0%	No
40.776	10.33%	-10%	No

Table D.5.6: Tariff sensitivity.

Letsatsi 74.96 MW Solar PV Project CPA-009			
Based on fully indexed tariff of ZAR 2.763/kWh			
Tariff (ZAR/kWh)	**Real equity IRR**	**Variance**	**Above benchmark of 17.9%?**
3.039	11.66%	10%	No
2.763	8.57%	0%	No
2.487	5.87%	-10%	No
Based on partially indexed tariff of ZAR 2.850/kWh			
Tariff (ZAR/kWh)	**Real equity IRR**	**Variance**	**Above benchmark of 17.9%?**
3.135	12.64%	10%	No
2.850	9.56%	0%	No
2.565	6.78%	-10%	No

The above analyses demonstrate that when applying a ±10% variance to the Capex, Opex and tariff parameters under the fully indexed tariff and partially indexed tariff options, the project IRR remains well below the benchmark IRR of 17.9%.

Concluding remarks

The financial analysis above supports the argument that CPA-009 is indeed additional.

While the Department of Energy's Renewable Energy IPP procurement programme has been initiated to mitigate challenges in this regard, the barriers to entry remain very high. The nature of the bidding/tendering process (whereupon the bidding tariff price carries a very high scoring factor in the final evaluation process) combined with the various high development costs and risks required as prerequisites to submission to tenders, do not reduce the barriers to developing such projects, unless an additional revenue stream (such as CERs) can be included to make the bids competitive.

The analyses have therefore been undertaken as per the guidelines in the "Tool for the demonstration and assessment of additionality" (Version 06.1.0), notably:

- Estimates of the required returns have been based on the views of bankers and private equity investors/funds and the required return on comparable projects
- The financial analyses are based on parameters that are standard in the market

Furthermore, the results of the sensitivity analyses indicate that changes to the Capex, Opex and bid-tariffs by either 10% or -10% will not increase the real return of equity above the identified benchmark for the South African market, further supporting the argument that CPA-009 is additional. The "Tool for the demonstration and assessment of additionality" (Version 06.1.0) thus advises that if after the sensitivity analysis it is concluded that the proposed CDM project activity is unlikely to be the most financially/economically attractive or is unlikely to be financially/economically attractive, then the analysis can immediately proceed to Step 4 (common practice analysis).

Step 4: Common practice analysis

Unless the proposed project activity is first-of-its-kind, the common practice analysis is to be undertaken to determine the extent to which the proposed project type has already diffused into the relevant sector and region in South Africa.

Sub-step 4.a: Analyse other activities similar to the proposed project activity

The "Tool for the demonstration and assessment of additionality" (Version 06.1.0) defines similar activities as those activities (i.e. technologies or practices) that are of similar scale, take place in a comparable environment, inter alia, with respect to the regulatory framework and are undertaken in the relevant geographical area.

There are various mechanisms aimed at facilitating the development of projects such as the Department of Energy's IPP procurement program and the Renewable Energy Market Transformation[45] (REMT). REMT is an example of a financial-incentive mechanism that was initiated in April 2008 by the Department of Energy, in partnership with the Development Bank of South Africa and World Bank acting as implementing agencies for the Global Environment Facility.

Even so, there are currently no large scale wind or solar plants operating in South Africa.

Sub-step 4b: Discuss any similar options that are occurring

There are a few small scale or pilot projects of similar technologies in operation in South Africa that are worth noting:

Solar

- The 60kW Cape Solar Plant[46] that powers the Aquila Private Game Reserve in the Western Cape was launched in 2010 by Germany's Concentrix Solar.
- 7kW PV facility in Copperton, Karoo[47] installed by Mulilo Renewable Energy (MRE) and its Chinese Shareholder Yingli Green Energy in April 2010 is producing 10 MWh/yr power.

Wind

- The Darling Wind Farm[48] has an installed capacity of 5.2 MW and is a national demonstration project funded in part by the state entity, CEF (Pty) Ltd and with the help of official development aid from the Danish Government.
- Eskom's test site at Klipheuwel[49] has a theoretical installed capacity of 3.2 MW. Three small wind turbines have been erected at this experimental wind energy farm so that Eskom can demonstrate and assess their different mechanical and electrical performances.
- Belgian developer Electrawinds installed a single 1.8 MW turbine at the Coega industrial development zone[50] as a public relations exercise ahead of the FIFA World Cup in South Africa in 2010. This was operational ahead of a large commercial development that is yet to be completed.

As per paragraph 47 of the "Tool for the demonstration and assessment of additionality" (Version 06.1.0), the following steps have been undertaken to determine whether or not the proposed project activity is considered common practice in South Africa:

Step 1: Calculate applicable output range as ± 50% of the design output or capacity of the proposed project activity

[45] http://www.remtproject.org/
[46] http://www.southafrica.info/business/investing/concentrix-080910.htm
[47] http://www.engineeringnews.co.za/article/big-scale-up-plans-for-grid-connected-karoo-microsolar-plant-2010-05-28
[48] http://www.darlingwindfarm.co.za/
[49] http://www.eskom.co.za/content/RW_0002KliphWindfRev5~2.pdf
[50] http://www.electrawinds.be/electrawinds_powered_by_nature-electrawinds_artikels.asp?artikelID=11521&taal=en

The output range of Letsatsi 74.96MW Solar PV Project CPA-009 ± 50% is shown below in Table D.5.7.

Table D.5.7: Output range of Letsatsi 74.96MW Solar PV Project CPA-009 ± 50%.

Output range	MW
+50%	112.44
CPA-009 total output capacity	74.96
-50%	37.48

Step 2: In the applicable geographical area, identify all plants that deliver the same output or capacity, within the applicable output range calculated in Step 1, as the proposed project activity and have started commercial operation before the start date of the project. Note their number N_{all}. *Registered CDM project activities and projects activities undergoing validation shall not be included in this step*

As discussed in sub-step 4b above, while there are a few small scale or pilot projects of similar technologies in operation in South Africa, there is not a single large scale facility in operation that is within the output ranges shown in Table D.5.7.

Step 3: Within plants identified in Step 2, identify those that apply technologies different than the technology applied in the proposed project activity. Note their number N_{diff}.

As discussed in sub-step 4b and Step 2 above, there are not any large scale renewable energy facilities in operation within the output range defined in Table D.5.7.

Step 4: Calculate factor $F = 1 - N_{diff} / N_{all}$ *representing the share of plants using technology similar to the technology used in the proposed project activity in all plants that deliver the same output or capacity as the proposed project activity. The proposed project activity is a common practice within a sector in the applicable geographic area if both the following conditions are fulfilled:*

a) The factor F *is greater than 0.2, and*
b) $N_{all} - N_{diff}$ *is greater than 3.*

As discussed in Steps 2 and 3 above, $N_{all} = 0$ and $N_{diff} = 0$. There is not a single large scale renewable energy facility in operation that is within the output range specified in Table D.5.7. Letsatsi 74.96MW Solar PV Project CPA-009 is therefore clearly not common practice in the South African context.

Concluding remarks

The evidence of few small scale solar projects and the total lack of large scale facilities lead to the conclusion that the development of renewable energy projects continue to face significant barriers in South Africa, proving the additional nature of Letsatsi 74.96MW Solar PV Project CPA-009 under the Green Power for South Africa Programme of Activities. The factors behind the slow growth of the renewables industry in South Africa can largely be attributed to the unstable regulatory environment which has imposed major barriers to the development of independent power producers, as well as the high capital outlays required during project development.

The barriers remain high, even with the introduction of the IPP procurement process, largely due to the high development costs which must be undertaken at risk before applying to the programme. Investor/finance risk-perceptions are not likely to be allayed by these requirements unless other financial

mechanisms (such as the inclusion of carbon revenues) can be included which will increase the competitive nature of the respective bid applications (by reducing the final electricity selling price). This being said, there are currently no large scale renewable energy facilities in operation that are within a comparable output or capacity range to this CPA.

It is clear that the business-as-usual scenarios, generation of electricity from coal-fired power stations, do not face the barriers that renewable energy projects face due to the prevalence of plentiful, cheap coal supplies combined with more competitive development costs for new coal-fired facilities as a result of Eskom's large economies of scale. The end result is the generation of electricity at vastly competitive rates compared to the renewable energy alternatives.

The additionality argument of this CPA is thus affirmed, as the common practice of electricity production from coal-fired power stations is clearly the most economically and practically viable alternative to the proposed activity. Eskom's generation of electricity from coal-fired facilities will therefore be used as the baseline for calculating the emission reductions in this CPA. All activities under the CPA will feed electricity into the national grid system and will therefore displace electricity created by the combustion of fossil fuels.

D.6. Estimation of emission reductions
D.6.1. Explanation of methodological choices

Baseline emissions
Baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants.

The baseline emissions will be calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} \quad \textbf{(2)}$$

Where:

BE_y	=	Baseline emissions in year *y* (tCO_2)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh)
$EF_{grid,CM,y}$	=	Combined margin CO_2 emission factor for grid connected power generation in year *y* (tCO_2/MWh)

$EG_{PJ,y}$ for Greenfield renewable energy power plants is calculated as follows:

$$EG_{PJ,y} = EG_{facility,y} \quad \textbf{(3)}$$

Where:

$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh)

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*

$EF_{grid,CM,y}$ is calculated using the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1) which is described as follows:

In South Africa, Eskom dominates the electricity supply market and only a few municipal and private generators exist. Public information on the Eskom power plants exists until 2008, and the private generators' information is available only partly until 2005. It is considered acceptable that Eskom represents the electricity production industry in South Africa, as it produces over 96% of electricity in South Africa. Only less that 4% comes from private and municipal generators[51].

In South Africa the grid system is nationwide, and the fuel consumption as well as net electricity generation data is available for all Eskom systems. The calculation has been provided in Grid Factor Calculation of the PoA-DD. The power plant data has been obtained from the Eskom website and the data for most recent years (2007/8, 2008/9, 2009/10) has been applied, available at: http://www.eskom.co.za/c/article/236/cdm-calculations/.

The grid system is part of the national grid system, and fuel consumption as well as net electricity generation data is available for all Eskom systems. However, as per the data provided by Eskom, only coal power plants are have been producing electricity in the last 5 years and hence it is assumed that coal forms part of low-cost/must-run resources, and hence average OM has been selected as suitable calculation method (Step 4d, Option A, Equation 1 and Option 1A, Equation 2 of the tool are applied). The operating margin has been calculated ex-ante based on 3-year generation-weighted average on the most recent publicly available data.

The build margin is calculated based on 20% generation capacity including grid connected CDM projects as well as plants older than 10 years, as the generation capacity of plants built within the last 10 years is marginal (<1%). Option 1 and Equation 12 are applied.

The combined margin is calculated based on weighted average (Step 6, Option a, applying the values given for wind and solar power generation (wOM = 0.75 and wBM = 0.25) owing to their intermittent and non-dispatchable nature.

The detailed calculation is presented in the Grid Factor Calculation document submitted to the DOE for validation[52].

Project emissions

For most of the renewable power generation CPA project activities, $PE_y = 0$. However, some CPAs may involve project emissions due to fossil fuel consumption. Where fossil fuels are used, the project emissions can be calculated as follows:

$$PE_y = PE_{ff,y} \quad \textbf{(4)}$$

Where:

[51] Electricity supply statistics of South Africa 2005, page 6-14. Available at: http://www.nersa.org.za/documents/ArchivedESSDocuments.aspx

[52] 030_PoA Grid Factor Calculation _2012 04 25.xls

PE_y	=	Project emissions in year *y* (tCO_2)
$PE_{ff,y}$	=	Project emissions from fossil fuel consumption in year *y* (tCO_2)

These emissions shall be calculated as per the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" (Version 02).

CO_2 emissions from fossil fuel combustion in process *j* are calculated based on the quantity of fuels combusted and the CO_2 emission coefficient of those fuels, as follows:

$$PE_{FC,j,y} = \sum FC_{i,j,y} \times COEF_{i,y} \quad \textbf{(5)}$$

Where:

$PE_{FC,j,y}$	=	Are the CO_2 emissions from fossil fuel combustion in process *j* during the year *y* (tCO_2)
$FC_{i,j,y}$	=	Is the quantity of fuel type *i* combusted in process *j* during the year *y* (mass or volume unit)
$COEF_{i,y}$	=	Is the CO_2 emission coefficient of fuel type *i* in year *y* (tCO_2/mass or volume unit)
i	=	Are the fuel types combusted in process *j* during the year *y*

The CO_2 emission coefficient $COEF_{i,y}$ can be calculated using one of the following two options, depending on the availability of data on fossil fuel type *i*, as follows:

Option A:

The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on the chemical composition of the fossil fuel type *i*, using the following approach:

If $FC_{i,j,y}$ is measured in a mass unit: $COEF_{i,y} = W_{C,i,y} \times 44/12$ **(6)**

If $FC_{i,j,y}$ is measured in a volume unit: $COEF_{i,y} = W_{C,i,y} \times \rho_{i,y} \times 44/12$ **(7)**

Where:

$COEF_{i,y}$	=	Is the CO_2 emission coefficient of fuel type *i* in year *y* (tCO_2/mass or volume unit)
$W_{C,i,y}$	=	Is the weighted average mass fraction of carbon in fuel type *i* in year *y* (tC/mass unit of the fuel)
$\rho_{i,y}$	=	Is the weighted average density of fuel type *i* in year *y* (mass unit/volume unit of the fuel)
i	=	Are the fuel types combusted in process *j* during the year *y*

Option B:

The CO_2 emission coefficient $COEF_{i,y}$ is calculated based on the net calorific value and CO_2 emission factor of fuel type *i*, as follows:

$$COEF_{i,y} = NCV_{i,y} \times EF_{CO2,i,y} \quad \textbf{(8)}$$

Where:

$COEF_{i,y}$	=	Is the CO_2 emission coefficient of fuel type *i* in year *y* (tCO_2/mass or volume unit)
$NCV_{i,y}$	=	Is the weighted average net calorific value of the fuel type *i* in the year *y* (GJ/mass or volume unit)
$EF_{CO2,i,y}$	=	Is the weighted average CO_2 emission factor of fuel type *i* in year *y* (tCO_2/GJ)
i	=	Are the fuel types combusted in process *j* during the year *y*

Leakage

There are no relevant leakage emissions and hence leakage is not considered.

Emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y \quad \textbf{(9)}$$

Where:

ER_y	=	Emission reductions in year *y* (tCO_2)
BE_y	=	Baseline emissions in year *y* (tCO_2)
PE_y	=	Project emissions in year *y* (tCO_2)

D.6.2. Data and parameters that are to be reported ex-ante

Data / Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	Combined margin CO2 emission factor for grid connected power generation in year *y*.
Source of data	Calculated using the "Tool to calculate the emission factor for an electricity system" (Version 02.2.1).
Value(s) applied	0.9721 tCO_2/MWh
Choice of data or Measurement methods and procedures	Based on the guidance of the methodology "ACM0002: Baseline methodology for grid-connected electricity generation from renewable sources" (Version 12.3.0) and the relevant power plant data provided by Eskom, available at: http://www.eskom.co.za/content/calculationTable.htm
Purpose of data	Calculation of baseline emissions
Additional comment	Please see the Grid Factor Calculation document submitted to the DOE for validation[53] for the detailed calculation. The Grid Factor Calculation document provides fuel use ($FC_{i,y}$), net electricity generation ($EG_{m,y}$) and CO_2 emission ($EF_{CO2,i,y}$) data for each power plant in each year.

D.6.3. Ex-ante calculation of emission reductions

Baseline emissions

Baseline emissions include only CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants.

The baseline emissions will be calculated as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y} \quad \textbf{(2)}$$

Where:

BE_y	=	Baseline emissions in year *y* (tCO_2)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh)
$EF_{grid,CM,y}$	=	Combined margin CO_2 emission factor for grid connected power generation in year *y* (tCO_2/MWh)

As Letsatsi 74.96 MW Solar PV Project CPA-009 is a Greenfield renewable energy power plant, $EG_{PJ,y}$ is calculated as follows:

[53] 030_PoA Grid Factor Calculation _2012 04 25.xls

$$EG_{PJ,y} = EG_{facility,y} \quad \textbf{(3)}$$

Where:

$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year *y* (MWh)
$EG_{facility,y}$	=	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*

The grid factor has been determined ex-ante and therefore the value applied is 0.9721 tCO_2/MWh. Please see Section D.6.2 above, Section B.6.2 of the PoA-DD and the Grid Factor Calculation document for more details.

The estimated average annual baseline emissions can therefore be calculated as:

$$BE_y = 138{,}544 \times 0.9721$$

$$BE_y = 134{,}690 \ tCO_2$$

Please note that the estimated value $EG_{facility,y}$ is based on the P50[54] scenario and therefore may change for the purposes of ex post calculations of BE_y.

Project emissions

As per "ACM0002: Baseline methodology for grid-connected electricity generation from renewable sources" (Version 12.3.0), project emissions are only considered from fossil fuel combustion, geothermal power plants and water reservoirs. As this CPA consists of a solar PV renewable energy park with no fossil fuel consumption, $PE_y = 0\,tCO_2$.

Leakage emissions

There are no relevant leakage emissions and hence leakage is not considered.

Emissions Reductions

The estimated annual average emissions reductions of this CPA are calculated as follows:

$$ER_y = BE_y - PE_y \quad \textbf{(9)}$$

Where:

ER_y	=	Emission reductions in year *y* (tCO_2)
BE_y	=	Baseline emissions in year *y* (tCO_2)
PE_y	=	Project emissions in year *y* (tCO_2)

[54] 50% probability of exceedance.

Therefore:

$$ER_y = 134{,}690 - 0$$

$$ER_y = 134{,}690\ \text{tCO}_2$$

D.6.4. Summary of the ex-ante estimates of emission reductions

It is expected that CPA-009 will generate greenhouse gas emission reductions of 1,346,901 tCO_2 over the crediting period. The table below shows the estimated annual emissions reductions.

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
2014	137,715	0	0	137,715
2015	137,026	0	0	137,026
2016	136,711	0	0	136,711
2017	135,649	0	0	135,649
2018	134,960	0	0	134,960
2019	134,272	0	0	134,272
2020	133,949	0	0	133,949
2021	132,895	0	0	132,895
2022	132,206	0	0	132,206
2023	131,518	0	0	131,518
Total	1,346,901	0	0	1,346,901
Total number of crediting years	10			
Annual average over the crediting period	134,690	0	0	134,690

D.7. Application of the monitoring methodology and description of the monitoring plan
D.7.1. Data and parameters to be monitored

Data / Parameter	$EG_{facility,y}$
Unit	MWh/y
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year *y*.
Source of data	Electricity meter at project site.
Value(s) applied	138,544 (estimated annual average).
Measurement methods and procedures	Direct, physical measurements as recorded by metering equipment (electricity meter).
Monitoring frequency	Continuous measurement and at least monthly recording.
QA/QC procedures	Cross check measurement results with records for sold electricity.
Purpose of data	Calculation of baseline emissions.
Additional comment	$EG_{facility,y}$ = Total electricity exported to the grid – $EG_{imported,y}$ For the purposes of ex ante calculations, estimated losses within the facility have been included in the calculation of $EG_{facility,y}$.

Data / Parameter	$EG_{imported,y}$
Unit	MWh/y
Description	Quantity of electricity imported into the power plant/used by the power plant and supplied by the grid in year *y*.
Source of data	Electricity meter at project site.
Value(s) applied	0
Measurement methods and procedures	Direct, physical measurements as recorded by metering equipment (electricity meter).
Monitoring frequency	Continuous measurement and at least monthly recording.
QA/QC procedures	-
Purpose of data	Calculation of baseline emissions.
Additional comment	In the case of this CPA, it is not expected that electricity imported from the grid will be required, therefore $EG_{imported,y} = 0$.

D.7.2. Description of the monitoring plan

All parameters included in B.7.1 will be monitored by the implementing entity of the CPA. The main parameter for the CPA is the measure of net electricity supplied to the grid and assuring the correct operation and maintenance of the measuring equipment.

The CPA will be verified in a transparent manner that ensures that no double counting occurs and that the status of verification can be determined at any time.

Management structure and responsibilities

The CME is responsible for obtaining the monitoring data from the CPA implementer and recording the data on the CME database. The CME will utilise the monitoring data for calculating emissions reductions and preparing monitoring reports for this CPA.

Data collection
The CME will establish and maintain a database for CPA-008 wherein the following data will be recorded:

- Name of the CPA
- Name of the implementing entity of the CPA
- Contact details of the implementing entity including contact person, address, telephone and email address
- Type of renewable energy technology
- Installed capacity and other relevant technical specifications of the CPA
- Location of the CPA (for example, GPS coordinates)
- Verification status and monitoring reports of each CPA

Monitoring of each individual measure implemented by this CPA will be conducted, and therefore no sampling plan is required. The CME will provide guidance to the CPA implementing entity on how the monitoring should be conducted and collected with regards to emission reduction calculations. The start and end dates of each monitoring period for this CPA, together with the emission reductions attributable to each monitoring period, will be recorded in an electronic database.

Data recording

All parameters included in B.7.1. of the PoA-DD will be monitored by the implementing entity of the CPA and recorded electronically. The CPA owners will provide data on monitored parameters included in Section B.7.1. of the PoA-DD to the CME for each monitoring period. The CME will store all data related to parameters included in Section B.7.1. of the PoA-DD in an electronic database. The CME will ensure that data is stored for a period of two years after the end of the relevant crediting period.

Data Calibration

The calibration frequency of monitoring equipment will be in accordance with the manufacturer's requirements. The CPA implementer will provide the CME with details of meter calibrations, which will also be stored in the electronic database.

Data reporting

The CME will be responsible for the preparation of the monitoring reports and communication with the DOE during verification activities. The monitoring report will compile all required monitoring information in order to allow the DOE to verify the emissions reductions for each monitoring period of each individual CPA. The monitoring report will unambiguously set out the data on emissions reductions generated by the CPA during the monitoring period consistent with the requirements of the PoA-DD and this CPA-DD. Record keeping procedures undertaken by the CME will ensure that the data attributed to a monitoring period can be clearly attributed to an individual CPA and will furthermore prevent double counting of emission reduction data.

Data archiving

The CME will be responsible for the management of records and data associated with each CPA and all records will be stored for a period of two years after the end of the relevant crediting period.

Data quality control

The CME will review the monitored data provided by the CPA implementer on a quarterly basis. The monitored data will be assessed based on the CME's internal data QA/QC procedure.

Training and monitoring personnel

The CME will ensure that personnel that participate in the monitoring process will be suitably qualified and trained. These persons will also receive training on the application of the monitoring plan.

SECTION E. Approval and authorization

The Letter of Approval from the Designated National Authority of South Africa was received on 11 June 2012. The Letter of Approval from the Designated National Authority of the United Kingdom of Great Britain and Northern Ireland (Annex I Party) was received on 30 July 2012.

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Appendix 1: Contact information on entity/individual responsible for the CPA

Organization	Standard Bank Plc
Street/P.O. Box	20 Gresham Street
Building	
City	London
State/Region	
Postcode	EC2V 7JE
Country	United Kingdom
Telephone	+44 20 3145 6890
Fax	+44 20 3189 6930
E-mail	co2@standardbank.com
Website	www.standardbank.com
Contact person	Geoff Sinclair
Title	Head of Carbon Sales & Trading
Salutation	Mr.
Last name	Sinclair
Middle name	
First name	Geoff
Department	Energy Trading and Marketing
Mobile	+44 7769 648 695
Direct fax	+44 20 3189 6930
Direct tel.	+44 20 3145 6893
Personal e-mail	geoff.sinclair@standardbank.com

Organization	The Standard Bank of South Africa Ltd
Street/P.O. Box	3 Simmonds Street / PO Box 58088
Building	
City	Marshalltown, Johannesburg / Newville
State/Region	
Postcode	2114
Country	South Africa
Telephone	+44 20 3145 6890
Fax	+44 20 3189 6930
E-mail	co2@standardbank.com
Website	www.standardbank.com
Contact person	Geoff Sinclair
Title	Head of Carbon Sales & Trading
Salutation	Mr.
Last name	Sinclair
Middle name	
First name	Geoff
Department	Energy Trading and Marketing
Mobile	+44 7769 648 695
Direct fax	+44 20 3189 6930
Direct tel.	+44 20 3145 6893
Personal e-mail	geoff.sinclair@standardbank.com

Organization	Letsatsi Power Company
Street/P.O. Box	2425 Olympic Blvd, Suite 500E, Santa Monica
Building	
City	Los Angeles
State/Region	California
Postcode	90404
Country	United States
Telephone	+1 310 315 2200
Fax	+1 310 315 2201
E-mail	info@solarreserve.com
Website	www.solar-reserve.com
Contact person	Chris Costanzo
Title	Legal Director
Salutation	Mr.
Last name	Costanzo
Middle name	
First name	Chris
Department	
Mobile	
Direct fax	
Direct tel.	+1 310 315 2285
Personal e-mail	Chris.Costanzo@solarreserve.com

Appendix 2: Affirmation regarding public funding

The proposed CPA will not receive any public funding from Parties included in Annex I of the UNFCCC.

Appendix 3: Applicability of the selected methodology(ies)

Not applicable.

Appendix 4: Further background information on ex ante calculation of emission reductions

Not applicable.

Appendix 5: Further background information on monitoring plan

Not applicable.

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History of the document

Version	Date	Nature of revision(s)
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the component project activity design document form" (EB 66, Annex 16).
01	EB33, Annex42 27 July 2007	Initial adoption.
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