Monitoring report form for CDM programme of activities (Version 04.0)

Complete this form in accordance with the instructions attached at the end of this form.

MONITORING REPORT			
Title of the PoA	Solar Energy Programme for South Africa		
UNFCCC reference number of the PoA	8535		
Version numbers of the PoA-DD applicable to this monitoring report	09		
Version number of this monitoring report	Version 01		
Completion date of this monitoring report	22/04/2021		
Monitoring period number	Monitoring period: 01		
Duration of this monitoring period	01/02/2019 – 31/12/2020		
Monitoring report number for this monitoring period	01		
Coordinating/managing entity	Carbon Protocol of SA		
Host Parties	Host Party of the PoA	Is this the host Party of a CPA covered in this monitoring report? (yes/no)	
	Republic of South Africa	Yes	
	n/a	n/a	
Applied methodologies and standardized baselines	ACM0002: Consolidated baseline methodology for grid-connected electricity generation from renewable sources (Version 13.0.0) No standardised baseline was aused		
Sectoral scopes	Sectoral scope 01 : Energy industries (renewable - / non-renewable sources)		
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by all CPAs covered in this monitoring report in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013 until 31 December 2020	Amount achieved from 1 January 2021
	0	533,972 tCO_2e	0
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the CPA-DDs for the CPAs covered in this monitoring report	652,854 tCO_2e		

PART I Monitoring of programme of activities (PoA)

SECTION A. Description of PoA

A.1. General description of PoA

The Kathu Solar Park is the first CDM project activity (CPA) under the Solar Energy Programme for South Africa. The CSP plant is located near Kathu in the Northern Cape province of South Africa.

The goal of this project activity is to reduce greenhouse gas emissions by installing a greenfield, 100 MW grid-connected, renewable electricity generating facility using concentrated solar thermal power (CSP) technology. This type of technology is clean, safe, sound and environmentally friendly in comparison to conventional sources of fossil fuel power generation in South Africa.

The installation of solar power systems delivering electricity to the South African grid aids in increasing the currently low grid electricity reserve margin, as well as increases the renewable energy generation fraction, to help achieve the country's renewable energy and carbon emission reduction targets.

The power plant has a maximum capacity of 100 MW electrical energy which is generated through the use of parabolic troughs. In parabolic trough technology, thermal energy is captured by an absorber and used for steam generation within the power plant.

The Kathu Solar Park CSP energy facility started construction in 2017 and the plant has been under commercial operation since February 2019. This is the first monitoring report and issuance request. This monitoring report outlines the emission reductions accrued in the period which commenced on 01 February 2019 and concluded on 31 December 2020.

The total greenhouse emission reductions achieved in this monitoring period amounts to 533,972 metric tonnes CO_2 equivalent.

A.1.1. Corresponding generic component project activities (CPAs)

Title and reference number of the corresponding generic CPA	Version of the PoA-DD	Sectoral scopes	Applied methodologies and standardized baselines
Not applicable[1]	09	01: Energy industries (renewable/non-renewable sources)	ACM0002: Consolidated baseline methodology for grid-connected electricity generation from renewable sources (Version 13.0.0) Applicable Tools[2]: •TOOL01: Tool for the demonstration and assessment of additionality (Version 06.1.0) •TOOL07: Tool to calculate the emission factor for an electricity system (Version 02.2.1) •TOOL03: Tool to calculate project or leakage CO2 emissions from fossil fuel combustion (Version 02)

[1] The registered PoA-DD does not contain the requirement for a title for the generic CPAs, as this was not a requirement of the CDM template form used to complete the PoA-DD at the time of registration.

[2] The name of the Tools are according to the CDM website: https://cdm.unfccc.int/Reference/tools/index.html

A.1.2. CPAs included in the PoA

Title and UNFCCC reference number of the CPA	Version of the PoA-DD	Title and reference number of the corresponding generic CPA	Crediting period type and duration	Covered in this monitoring report? (yes/no)
Title: Solar Energy Programme for South Africa CPA 1. Reference: CPA 8535-P1-0001-CP1.	09	Not applicable[3]	Fixed: 01/02/2019 - 31/01/2029	Yes

A.2. Coordinating/managing entity

The coordinating/managing entity for this PoA and CPA is Carbon Protocol of South Africa.

SECTION B. Implementation of PoA

B.1. Description of implemented PoA

All the details regarding a management system are contained in the coordinating/ management entity (CME) contract that will be signed by each CPA. The contract includes:

- A clear definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of their competencies;
- Records of arrangements for training and capacity development for personnel;
- Procedures for technical review of inclusion of CPAs; and
- Measures for continuous improvements of the PoA management system.

Record keeping system for each CPA under the PoA

A CME database includes the following information for each CPA:

1)The name of the CPA implementer(s);
2)The name of the site where the solar facility is implemented;
3)The CPA site details, including street address (if available), meter numbers, and GPS co-ordinates as reference points for the delineation of the boundary of the CPA site;
4)The start date of the project and the start date of the crediting period; and
5)The monitoring period for each CPA.

The signed contract between the CME and the CPA implementers are recorded and stored by the CME.

Data will be archived for a minimum of two years after the 28 year crediting period of the programme has lapsed. Relevant data capture, verification and storage procedures will be followed in maintaining the data to ensure its accuracy, validity and completeness.

Procedure to avoid double counting

The CME database ensures that each CPA is uniquely defined and is included in one PoA only, thereby avoiding double counting of emissions reductions generated by the CPA. However, prior to the registration of each CPA under the PoA, the managing entity confirms that the proposed CPA is not registered, or in the process of being registered, as a CDM project activity.

Unique identification code(s) for the site and the CPA meter(s) that record the amount of electricity exported to the South African national grid are also be provided, as well as GPS co-ordinates as

[3] The registered PoA-DD does not contain the requirement for a title for the generic CPAs, as this was not a requirement of the CDM template form used to complete the PoA-DD at the time of registration.

reference points for the delineation of the boundary of the CPA site. The meter(s) must be situated within the site boundary. The installed capacity of the plant and the exact start date/ end date of the crediting period are also be defined for the CPA.

According to the applicable methodology (ACM0002), capacity additions may occur at the same site, as might be the case with subsequent tranches for solar installations. Each capacity addition will however be handled as a separate CPA to avoid double counting. Capacity additions will have to have separate meters with a unique identification code, which will fall within the specific capacity addition CPA boundary. This boundary will also require GPS co-ordinates as reference points for the delineation of the boundary of the CPA site.

No sampling occurs in this PoA.

B.2. Post-registration changes to PoA

B.2.1. Corrections

Not applicable.

B.2.2. Inclusion of monitoring plan

Not applicable.

B.2.3. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

Not applicable.

B.2.4. Changes to programme design

Not applicable.

B.2.5. Changes specific to afforestation or reforestation activities

Not applicable.

PART II Monitoring of CPAs

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SECTION C. Implementation of CPAs

C.1. Description of implemented CPAs

Only one CPA has been implemented under the PoA. Solar Energy Programme for South Africa CPA 1 (Reference: CPA 8535-P1-0001-CP1) is therefore the only CPA covered in this monitoring report.

The CPA1 CSP plant uses parabolic trough technology, which entails the use of parabolic shaped, sun-tracking mirrors to concentrate and collect sunlight on thermally efficient receiver tubes. The tubes are filled with a heat transfer fluid and run through the optical focal line of the parabolic mirror. The collected thermal energy is used to heat up water, producing medium/high-pressure superheated steam, which is used to move a turbine generator producing electricity. The power plant has an installed capacity of 100 MWe.

The plant includes a MWh_t molten salt thermal energy storage facility capable of delivering stored energy to meet peak demand. While the solar resource is available, the plant operator diverts a portion of the collected thermal energy to the thermal energy storage system for later deployment.

This optimization feature is inherent to CSP technology and not a system retrofit or electricity co-generation. Auxiliary heating, provided by a diesel-fired boiler and an HTF heater, heats the heat transfer fluid directly to maintain the temperature above its freezing point, and to prevent crystallisation of the molten salts.

The relevant data sets are monitored, namely electricity generated by the facility and project emissions associated with the combustion of diesel in auxiliary power units. All measurements are conducted with measurement equipment that are calibrated according to relevant industry standards or as specified by the manufacturer.

The main components of the system are listed in Table 1 below:

Table 1: Kathu Solar Park's major system components

Component	Specification/ equipment type	Value
Solar Collector Assembly	SenerTrough	1,152,000 m^2 field mirror area
Heat Receiver	Schott / Siemens-Solel	≥ 96.2 % solar absorptance
Heat Transfer Fluid	Dowtherm A	4,860 tonnes
HTF Heater	LFO Boiler System	1 x 6.9 MWth
Electrical Generation System	Siemens SST700	116 MWe gross rated capacity 100 MWe net power output
Cooling System	Esindus	182,800 kWth heat rejection
Thermal Storage System	Molten Nitrate Salts	1,474 MWh-t
Step-Up Transformer		15 kV – 132 kV 100/130 (ONAN/ONAF)

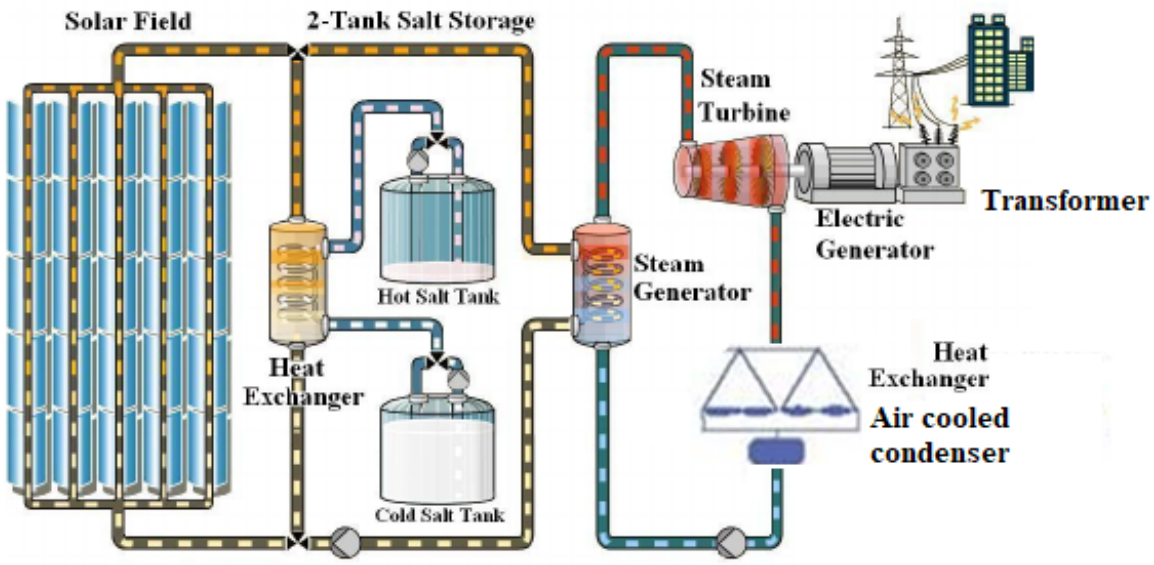

Figure 1: Schematic indicating the key features of Kathu Solar Park

Figure 1 above illustrates a high-level schematic diagram of the layout of Kathu Solar Park, while **Error! Reference source not found.** below represents a more detailed diagram of the components listed in Table 1.

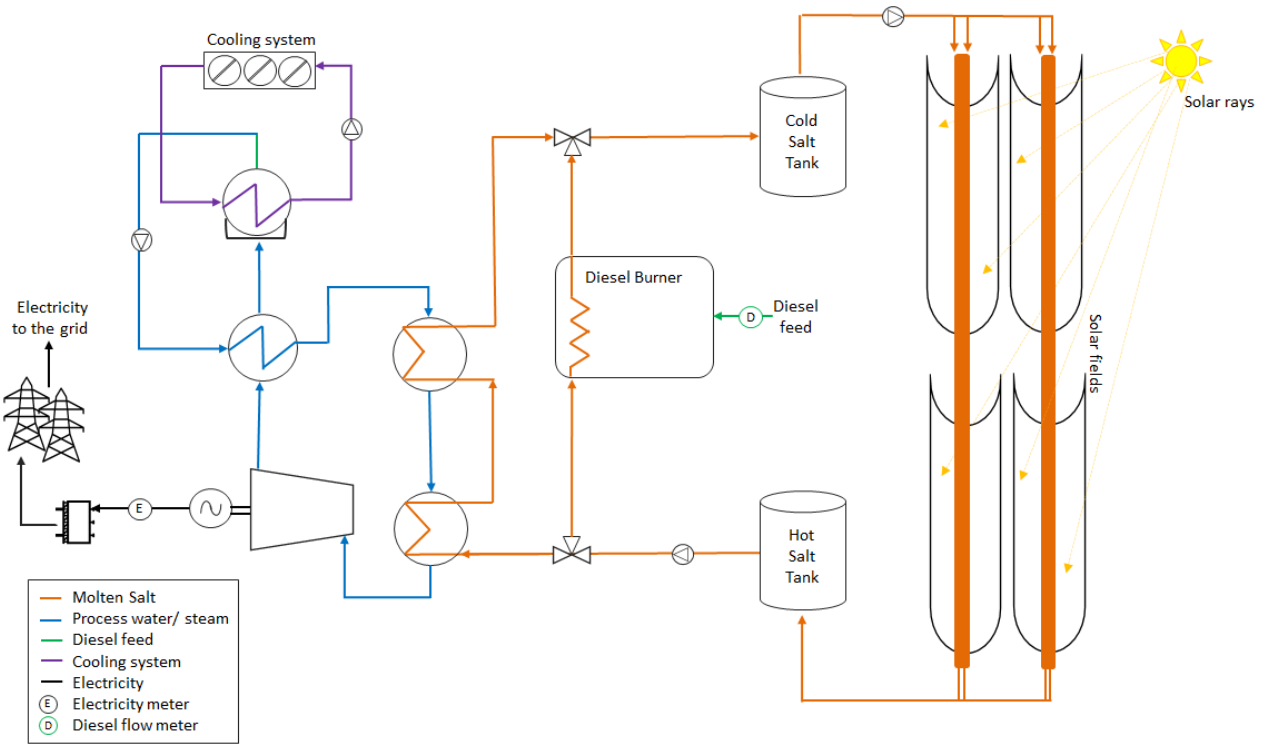

Figure 2: Kathu Solar Park process schematic diagram

The Kathu Solar Park facility manager is responsible for the effective implementation of the monitoring management plan elements with regard to metering. Kathu Solar Park facility manager is responsible for providing data sets to the PoA CME on a monthly basis.

All data collected is archived electronically onsite and by the CME's carbon specialist for security purposes. All data will be kept by the CPA and the CME for at least two years after the end of the crediting period.

During the monitored period there was downtime due to various planned maintenance and unplanned outages, such as load shedding by the national utility and repairs to the facility. The downtime summary is shown in the table below:

	Downtime days:		
Month	**2019**	**2020**	**Total**
January		0	0
February	2	0	2
March	1	0	1
April	0	1	1
May	1	0	1
June	7	0	7
July	31	18	31
August	0	0	0
September	0		0
October	0		0
November	3		3
December	0		0
Grand Total	**45**	**19**	**64**

No sampling is undertaken as part of the CPA.

C.2. Location of CPAs

The CPA 1 is located on the farm Kathu 465 which covers an area of 1,600 ha. The site is located in the Northern Cape Province in South Africa, approximately 10 km north-northwest of the mining town of Kathu, within the Gamagara Municipality.

GPS co-ordinates as reference points for the delineation of the boundary of the CPA site:
1. NW: 27° 36' 13.08" S + 23° 00' 57.08" E
2. SW: 27° 37' 09.58" S + 23° 00' 54.34" E
3. NE: 27° 36' 24.90" S + 23° 02' 24.76" E
4. SE: 27° 37' 17.95" S + 23° 02' 18.63" E

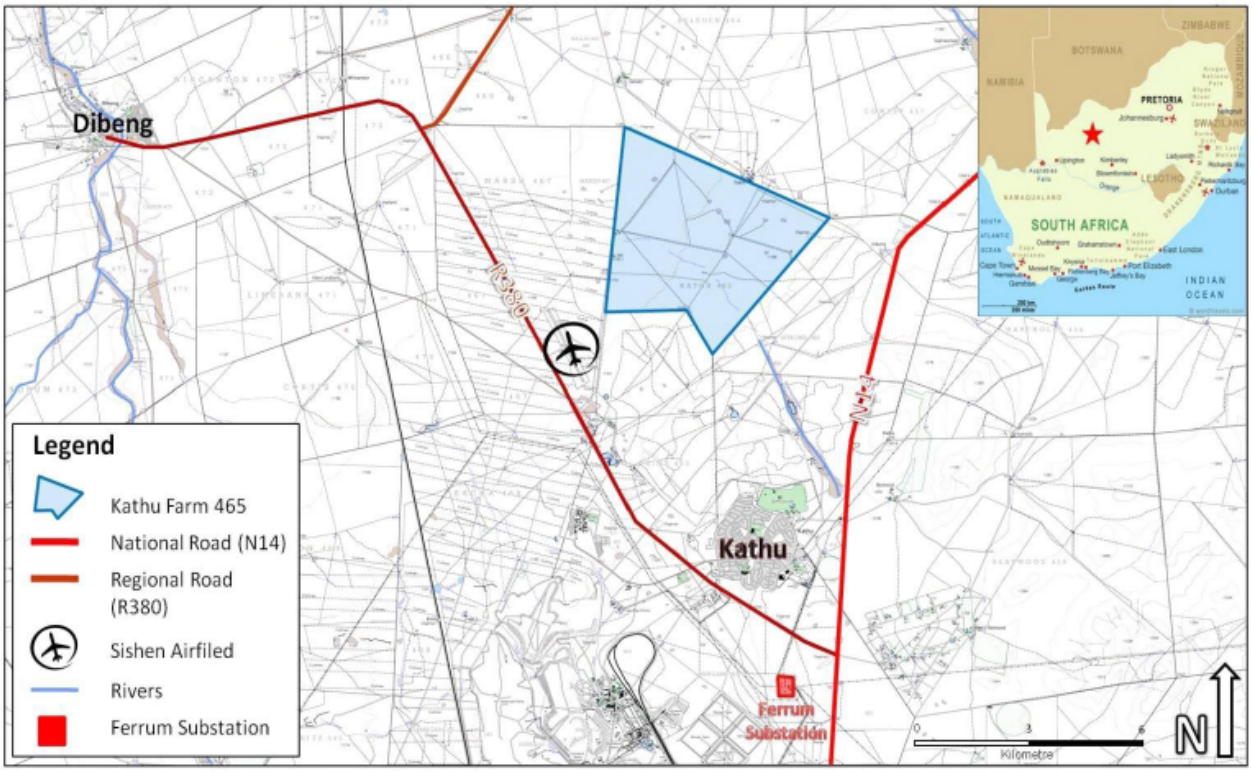

Figure 3: CPA 1 location

C.3. Post-registration changes to CPAs

C.3.1. Temporary deviations from the monitoring plans in the included CPA-DDs, applied methodologies, standardized baselines or other methodological regulatory documents

Not Applicable.

C.3.2. Corrections

Not Applicable.

C.3.3. Changes to the start date of the crediting period

Changes that have been notified to the secretariat and that do not affect the start of this monitoring period (i.e. any of the changed start dates are prior to the start of this monitoring period): none.

Changes that have been notified to the secretariat and that affect the start of this monitoring period (i.e. the changed start date is the start of this monitoring period):

Notification date: 20 April 2021.
Reference number: PRC-8535-001.

The previous CPA-DD v7 indicated that the crediting period was anticipated to start on 1 January 2016. However, the project activity was only commissioned on 1 February 2019 and hence could only start generating emission reduction credits from commissioning. The commissioning start date of 1 February 2019 is more than two years after the estimated date recorded in the CPA-01 DD v7. The start of CPA-01 was delayed on account of delays in the awarding of the preferred bidder status to provide power to Eskom and the finalisation of the Power Purchase Agreement with Eskom. Kathu Solar Park was awarded preferred bidder status during bid window 3.5 of the Renewable Energy Independent Power Producer Procurement Programme in December 2014. Kathu Solar Park only finalised the Power Purchase Agreement with Eskom in May 2016, whereupon construction commenced. These delays resulted in the commissioning of the facility in early 2019, instead of the anticipated date of 1 January 2016.

C.3.4. Inclusion of monitoring plan

Not Applicable.

C.3.5. Permanent changes to the included monitoring plans, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

Changes that have been notified to the secretariat as applicable from the period prior to this monitoring period: none.

Changes that have been notified to the secretariat as applicable from this monitoring period.

Notification date: 20 April 2021.
Reference number: PRC-8535-001.

A diesel-fired boiler, for auxiliary heating requirements and a diesel-powered burner are included in the CPA boundary, as provided for in the generic CPA DD in the registered PoA DD. The following monitored parameters were included in section B.5.1:

- $FC_{diesel,y}$;
- $NCV_{diesel,y}$; and
- $EF_{CO2,diesel,y}$.

The addition of a diesel component to the CPA resulted in an addition of Project Emissions to the ex ante calculations and associated Project Emissions deductions from the total Emission Reduction calculations.

C.3.6. Changes to project design

Not Applicable.

C.3.7. Changes specific to afforestation or reforestation CPA

Not Applicable.

SECTION D. Description of monitoring system of CPAs

For CPA 1, the data that is monitored onsite relates to the quantity of net electricity that is produced and fed into the grid. The metering setup is as follows:

- for the electricity exported to the grid, there is both an Eskom meter and a meter owned by the KSP power plant (which measures the electricity to the grid).
- for the electricity imported to the KSP power plant there is an Eskom-owned meter for which the project is invoiced on a monthly basis.

The data is monitored continuously and aggregated monthly. Data imported by Eskom is reported on monthly aggregated values. All measurements are conducted with calibrated measurement equipment according to relevant industry standards. The meters are calibrated in accordances with SANS 474, and thus have calibration intervals of 5 years.

The CPA facility manager is responsible for the effective implementation of the monitoring management plan elements, regarding metering. All elements of the monitoring plan are supported by formal procedures and regular training of delegated personnel, as appropriate.

All data collected is archived electronically in two places for security purposes. Data is submitted and consolidated in the CME database on a monthly basis. All data is kept by the CPA and the CME for at least two years after the end of the crediting period.

SECTION E. Data and parameters

E.1. Data and parameters fixed ex ante

Data/Parameter	$EF_{grid,CM,y}$
Unit	tCO_2/MWh
Description	The combined margin CO_2 emission factor for grid connected power generation in year y
Source of data	Calculation provided by the CME using the latest version of the "Tool to calculate the emission factor for an electricity system".
Value(s) applied	0.910
Choice of data or measurement methods and procedures	According to the "Tool to calculate the emission factor for an electricity system".
Purpose of data/parameter	Calculation of baseline emissions.
Additional comments	Not applicable

Data/Parameter	$NCV_{diesel,y}$
Unit	GJ/kg
Description	Weighted average net calorific value of diesel in year y.
Source of data	Data source "c" as per the *Tool to calculate project or leakage emissions from fossil fuel combustion*.
Value(s) applied	0.043
Choice of data or measurement methods and procedures	Makes use of the "South African Technical Guidelines for Monitoring Reporting and Verification of GHG Emissions by Industry: A companion to the South African National GHG Emissions Reporting Regulations", v TG-2019 April 2017 (Tables A.1).
Purpose of data/parameter	Calculation of project emissions.
Additional comments	Not applicable

Data/Parameter	$EF_{CO2,diesel,y}$
Unit	tCO_2/GJ
Description	Weighted average CO_2 emission factor of diesel in year y.
Source of data	Data source "d" as per the *Tool to calculate project or leakage emissions from fossil fuel combustion.* IPCC default value at the upper limit of uncertainty at a 95% confidence interval as provided in table 1.4 of Chapter 1 of Volume 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories.
Value(s) applied	0.0748

Choice of data or measurement methods and procedures	The IPCC default values were selected as a data source as values are not provided by the fuel supplier invoice, measurements will not be undertaken by the project participants and no regional or national default values are available. Any future revision of the IPCC Guidelines will be taken into account.
Purpose of data/parameter	Calculation of project emissions.
Additional comments	Not applicable

E.2. Data and parameters monitored

Data/Parameter	$EG_{facility,y}$
Unit	MWh/yr
Description	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CPA in year y
Measured/calculated/ default	Measured
Source of data	Data measured and recorded from the electricity meters.
Value(s) of monitored parameter	See table below
Monitoring equipment	Electricity meter is a bi-directional meter which measures the electricity generated by the CSP plant and the electricity which is purchased from the grid (from Eskom) for the project activity. Meter type: Elster A1700 Accuracy class: 0.2 Serial number: 3514 21116798 Calibration frequency: every five years in accordance with SANS 474 Date of last calibration (plant commissioning date): 31 January 2019. Validity: 1 February 2024
Measuring/reading/recording frequency	The parameter is monitored continuously. The data is logged electronically and aggregated monthly. Data from invoices related to electricity purchased from Eskom are monthly aggregated values. These values are also used for emission reduction calculations.
Calculation method (if applicable)	The net electricity is calculated by subtracting the electricity purchased from Eskom, from the electricity generated by the CSP plant (and sold to Eskom).

Month	Net electricity generated (MWh)
February 2019	22,118
March 2019	26,664
April 2019	19,338
May 2019	20,208
June 2019	13,271
July 2019	-1,426
August 2019	25,062
September 2019	34,616
October 2019	40,541
November 2019	33,117
December 2019	26,388
January 2020	37,183
February 2020	23,283
March 2020	27,010
April 2020	24,494
May 2020	25,568
June 2020	19,127
July 2020	8,194
August 2020	33,127
September 2020	26,049
October 2020	26,347
November 2020	38,841
December 2020	39,746

QA/QC procedures	The monthly MWh data sets contained in the invoices relating to electricity purchased by Eskom are cross-checked with metered values on the Kathu Solar Plant site. Discrepancies are discussed and resolved at internal meetings, and the results reported. Kathu Solar Plant does not have direct access to any data on any Eskom meter but is able to request a copy of the historical data on any Eskom meter from the Eskom data warehouse via an Eskom Customer Services representative if this is required for conflict resolution. Electricity tariff meters are calibrated in line with SANS 474 Standard (every five years).
Purpose of data/parameter	Calculation of baseline emissions.
Additional comments	The negative value for net electricity generation in July 2019 is due to an unplanned shutdown which resulted in 0 MWh generation in the entire month. The negative value refers to the amount of grid electricity that was consumed in the month and hence the net electricity generation figure is negative.

Data/Parameter	$FC_{diesel,CSP,y}$
Unit	kg/yr
Description	The quantity of diesel combusted in the CSP plant during the year y.
Measured/calculated/ default	Onsite measurements
Source of data	Measured via flow meters to both the auxiliary boiler as well as the HTF heater.
Value(s) of monitored parameter	The following diesel consumption values are derived from the flow meter measuring diesel combusted in the auxiliary boiler. No values were derived from the meter measuring diesel consumed by the HTF, as the HFT heater did not receive diesel flow during the monitoring period.

Month	Diesel consumption (kg)
February 2019	22,088
March 2019	27,629
April 2019	19,951
May 2019	31,970
June 2019	33,141
July 2019	10,735
August 2019	979
September 2019	27,194
October 2019	27,938
November 2019	26,591
December 2019	38,013
January 2020	36,989
February 2020	36,941
March 2020	29,761
April 2020	26,354
May 2020	27,266
June 2020	21,279
July 2020	11,237
August 2020	32,026
September 2020	-
October 2020	31,516
November 2020	32,155
December 2020	33,900

Monitoring equipment	*Auxilary boiler flow meter:* Meter type: Contoil VZ0 15 Accuracy class (maximum permissible error): +/- 1 % of actual value Serial number: 15 QHH10 CF101 Calibration frequency: as per manufacturer's specifications Date of last calibration: to be confirmed Validity: to be confirmed *HTF heater flow meter:* Meter type: Contoil VZ0 20 Accuracy class(maximum permissible error): +/- 1 % of actual value Serial number: 12 EGD13 CF001 JT01 Calibration frequency: as per manufacturer's specifications Date of last calibration: to be confirmed Validity: to be confirmed
Measuring/reading/recording frequency	The diesel consumption is monitored continuously and the data is aggregated monthly.
Calculation method (if applicable)	Not applicable
QA/QC procedures	The consistency of metered fuel consumption quantities should be cross-checked by an annual energy balance that is based on purchased quantities and stock changes. Where the purchased fuel invoices can be identified specifically for the CDM project, the metered fuel consumption quantities should also be cross-checked with available purchase invoices from the financial records.
Purpose of data/parameter	Calculation of project emissions
Additional comments	Not applicable

E.3. Implementation of sampling plan

Not applicable.

SECTION F. Calculation of emission reductions or net anthropogenic removals

F.1. Calculation of baseline emissions or baseline net removals

As per ACM0002, Version 13.0.0, the baseline emissions, BE_y, are calculated using equation 6 below:

$$BE_y = EG_{PJ,y} * EF_{GRID,CM,y}$$

(AMC0002, Version 13.0.0, Equation 6)

Where:

BE_y = Baseline emissions in year y (tCO_2)

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the Tool to calculate the emission factor for an electricity system. (tCO_2/MWh)

$EG_{PJ,y}$ = 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)

$EF_{grid,CM,y}$ was fixed ex-ante. $EF_{grid,CM,y}$ = 0.910 tCO_2e/MWh

According to ACM0002, Version 13.0.0 for Greenfield renewable energy power plants: "If the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, then:"

$$EG_{PJ,y} = EG_{facility,y}$$
(AMC0002, Version 13.0.0, Equation 7)

Where:
$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh)
$EG_{PJ,y}$ = 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)

A sample calculation of $EG_{PJ,y}$ for February 2019 is presented below.

$EG_{PJ,y} = EG_{facility,y} = 22{,}118$ MWh

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/yr)

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

With this value BE_y was then calculated using Equation 6.

A sample calculation of BE_y for February 2019 is presented below.
$BE_y = 22{,}118$ MWh x 0.910 tCO_2e/MWh
= 20,127 tCO_2e for February 2019

F.2. Calculation of project emissions or actual net removals

Diesel is utilised in CPA 1 for heating the heat transfer fluid directly to maintain the temperature above its freezing point, and to prevent crystallisation of the molten salts. There are thus project emissions due to fossil fuel consumption associated with this.

The project emissions were calculated according to the following formulae:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$$

Where:
PE_y = Project emissions in year y (tCO_2e/yr)
$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year y (tCO_2e/yr)
$PE_{GP,y}$ = Project emissions from operation of geothermal power plants due to the release of non-condensable gases in year y (tCO_2e/yr)
$PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants in year y (tCO_2e/yr)

But $PE_{GP,y}$ and $PE_{HP,y} = 0$ because emissions from this project activity do not include emissions arising from the operation of geothermal or hydro plants.

Therefore:

$$PE_y = PE_{FF,y}$$

For solar thermal projects, which also use fossil fuels for electricity generation, CO_2 emissions from the combustion of fossil fuels shall be accounted for as project emissions ($PE_{FF,y}$).

$PE_{FF,y}$ is calculated as per the latest version of the ”Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion” (Version 02).

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

$$PE_{FF,y} = FC_{diesel,y} * COEF_{diesel,y}$$

(Applied tool Equation 1)

Where:

$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year y (tCO_2e/yr)
$FC_{diesel,y}$ = Is the quantity of diesel fuel combusted during the year y (volume unit/yr)
$COEF_{diesel,y}$ = Is the CO_2 emission coefficient of diesel in year y (tCO_2/volume unit)

The CO_2 emission coefficient $COEF_{diesel,y}$ is calculated using option B of the applied tool, as follows:

$$COEF_{diesel,y} = NCV_{diesel} * EF_{CO2,diesel,y}$$

(Applied tool Equation 4)

With the NCV_{diesel} = 0.0430 GJ/kg and $EF_{CO2,diesel,y}$ = 0.0748 tCO_2e/GJ, then this results in:

*$COEF_{diesel,y}$ = 0.043 GJ/kg * 0.0748 tCO_2e/GJ = 0.00322 tCO_2e/kg*

A sample calculation of $PE_{FF,y}$ for the first month of the monitoring period (February 2019) is presented below.

*$PE_{FF,y}$ = 22,088 kg * 0.00322 tCO_2e/kg = 71 tCO_2e*

F.3. Calculation of leakage emissions

As per methodology ACM0002 version 13, no leakage emissions are considered.

F.4. Calculation of emission reductions or net anthropogenic removals

CPA UNFCCC reference number	Baseline GHG emissions or baseline net GHG removals (t CO_2e)	Project GHG emissions or actual net GHG removals (t CO_2e)	Leakage GHG emissions (t CO_2e)	GHG emission reductions or net anthropogenic GHG removals (t CO_2e)			
				Before 01/01/2013	From 01/01/2013 until 31/12/2020	From 01/01/ 2021	Total amount
CPA 8535-P1-0001-CP1	535,868	1,897	0	0	533,972	0	533,972
Total	535,868	1,897	0	0	533,972	0	533,972

F.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the included CPA-DDs

CPA UNFCCC reference number	Amount achieved during this monitoring period (t CO_2e)	Amount estimated ex ante for this monitoring period in the CPA-DD (t CO_2e)
CPA 8535-P1-0001-CP1	533,972	652,854
Total	533,972	652,854

F.5.1. Explanation of calculation of "amount estimated ex ante for this monitoring period in the CPA-DD"

The calculation entails the use of the actual number of days in which credits accrued applied to the periods recorded in the ex-ante calculations. For example, the ex ante credits estimated for the full first year (365 days) of the project, amounted to 328,430 tCO_2e and for the second year (366 days) of the project, amounts to 354,445 tCO_2e. However the actual days during this period amounted to 700 days, considering the whole of year 1 (i.e. 1 February 2019 to 31 January 2020). and only part of year 2 (i.e. 1 February 2020 to 31 December 2020). Therefore, for year 2, the full annual figure of 354,445 tCO_2e was divided by 366 days to get a daily figure which was then multiplied by the actual number of days (335 days of year 2) to get a total figure of 652,854 tCO_2e over the whole first monitoring period.

F.6. Remarks on increase in achieved emission reductions

Fewer emission reductions were obtained from Kathu Solar Park for this monitoring period than originally antipated when compared to the estimate per the project design document.

F.7. Remarks on scale of small-scale CPAs

Not applicable because this is a large scale project.

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Document information

Version	*Date*	*Description*
04.0	6 April 2021	Revision to: • Reflect the “Clarification: Regulatory requirements under temporary measures for post-2020 cases” (CDM-EB109-A01-CLAR).
03.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the “CDM project standard for programmes of activities” (CDM-EB93-A07-STAN); • Add a section on remarks on the observance of the scale limit of small-scale CPAs during the crediting periods; • Add "changes specific to afforestation or reforestation activities/CPA" as a possible post-registration changes; • Clarify the reporting of net anthropogenic GHG removals for A/R PoAs between two commitment periods; • Make structural and editorial improvements.
02.0	7 June 2017	Revision to: • Ensure consistency with version 01.0 of the “CDM project standard for programmes of activities (CDM-EB93-A07-STAN); • Make editorial improvements.
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