




**Validation report form for renewal of crediting period for
CDM project activities
(Version 03.0)**

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

BASIC INFORMATION

Title and UNFCCC reference number of the project activity	Olkaria II Geothermal Expansion Project UNFCCC no.: 3773
Number and duration of the next crediting period	Crediting Period: 2 nd (04/12/2017 to 03/12/2024)
Version number of the validation report	2.2
Completion date of the validation report	11/08/2020
Version number of PDD to which this report applies	Version 12.0
Project participants	<p>Kenya: Kenya Electricity Generating Company Ltd. (KenGen)</p> <p>Netherlands: Netherlands' Ministry of Infrastructure and the Environment (IenM)</p> <p>Austria: Kommunalkredit Public Consulting GmbH</p> <p>Germany: KfW</p> <p>Denmark: Maersk Olie og Gas A/S, DONG Energy Slag and service; Nordjysk Ethandel A/S, Danish Ministry of Climate, Energy and Building, /Danish Energy Agency; Aalborg Portland A/S</p> <p>Sweden: Goteborg Energi AB</p> <p>Italy: Government of Italy-Ministry for the Environment, Land and Sea</p> <p>Finland: Ruukki Metals Oy</p> <p>Spain: Kingdom of Spain- Ministry of Agriculture, Food and Environment & Ministry of Economy and Competitiveness; EDP Energias de Portugal, S.A.; Endesa Generacion, S.A., Gas Natural SDG S.A.;</p> <p>Japan: Idemitsu Kosan Co., Ltd.; The Okinawa Electric Power Co., Inc. ;</p> <p>Norway: Statoil ASA; Statkraft Carbon Invest AS</p> <p>Switzerland: Schweizerische Ruckversicherungsgesellschafts AG (Swiss RE)</p> <p>Luxembourg: Ministry for Sustainable Development and Infrastructure</p> <p>Bilateral and Multilateral Funds: Managing Company - International Bank for Reconstruction and Development (IBRD) as Trustee of the Community Development Carbon Fund (CDCF)</p>

Host Party	Kenya
Applied methodologies and standardized baselines	ACM0002 ver. 19 - Consolidated methodology for grid-connected electricity generation from renewable sources
Mandatory sectoral scopes	1: Energy industries (renewable - / non-renewable sources)
Conditional sectoral scopes, if applicable	NA
Estimated amount of annual average GHG emission reductions or GHG removals by sinks in the next crediting period	78,640 tCO _{2e}
Name and UNFCCC reference number of the DOE	Earthood Services Private Limited E-0066
Name, position and signature of the approver of the validation report	 Kaviraj Singh Managing Director

SECTION A. Executive summary

The project activity involves expansion of an already existing Olkaria II Geothermal Power Plant. The plant has been set up to use naturally occurring direct steam from the geothermal reservoir to run a steam turbine and generate electricity.

The electricity generated from the project activity is supplied to the national grid, thus replacing the conventional method of generation of electricity, that being burning of coal. This results in overall reduction of carbon emissions from electricity generation.

This project activity is located in Kenya at Olkaria site which is located in Hell's Gate national Park.

Total estimated annual average emissions reduction for this crediting period are 78,640tCO₂e.

The project activity replaced carbon intensive fuel which would otherwise have been used for electricity generation.

Scope of Validation

The scope of the services provided by Earthood Services Private Limited for the project is to perform validation of the renewal of crediting period for the project activity. The scope of validation is to assess the claims and assumptions made in the revised project design document (PDD) against the UNFCCC criteria, including but not limited to, CDM PS, CDM VVS, applied methodology and other relevant rules and requirements established for CDM project activities.

Validation Process

The validation process is undertaken by validation team that involves the following:

- the desk review of documents and evidences submitted by the project participant in context of the reference CDM rules and guidelines issued by CDM EB,
- undertaking site visit, interview or interactions with the representative of the project participant,
- reporting audit findings with respect to clarifications and non-conformities and the closure of the findings, as appropriate and
- preparing a draft validation report for renewable of crediting period complying with the CDM requirements

An independent Technical Review team reviews the validation report prepared by validation team. The final validation report that is accepted by Technical Reviewer is then approved on behalf of Earthood Services Private Limited and processed further as per CDM procedures.

Conclusion

The review of the PDD, supporting documentation and subsequent follow-up actions (onsite visit and interviews) has provided Earthood with sufficient evidence to determine the fulfilment of stated criteria.

Earthood is of the opinion that the project activity "Olkaria II Geothermal Expansion Project" as described in the final revised PDD version 12 dated 11/08/2020 meets all relevant requirements of CDM, meets host country criteria and has correctly applied the methodology ACM0002 ver. 19 - Consolidated methodology for grid- connected electricity generation from renewable sources/10/. Therefore, the project is being recommended to CDM EB for request for its renewable of crediting period.

SECTION B. Validation team, technical reviewer and approver**B.1. Validation team member**

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)	Involvement in			
						Desk/document review	On-site inspection	Interview(s)	Validation findings
1.	Team Leader	IR	Mahala	Deepika	Central Office	Y	Y	Y	Y
2.	Validator	IR	Guleria	Shifali	Central Office	Y	N	N	Y

3.	Local Expert	ER	Njata	Virginia Njeri	Central Office	Y	Y	Y	Y
4.	Technical Expert	IR	Mahala	Deepika	Central Office	Y	Y	Y	Y
5.	Methodology Expert	IR	Mahala	Deepika	Central Office	Y	Y	Y	Y

B.2. Technical reviewer and approver of the validation report for RCP

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
1.	Technical reviewer	IR	Gautam	Ashok	Central Office
2.	Technical Expert to TR	IR	Gautam	Ashok	Central Office
3.	Approver	IR	Singh	Kaviraj	Central Office

SECTION C. Means of validation

C.1. Desk/document review

The validation for the renewal of crediting period is performed primarily as a document review of the project design document version (final) version 12 dated 11/08/2020. The cross checks between information provided in the PDD and information from sources other than those used, if available, the validation team's sectoral or local expertise and, if necessary, independent background investigations.

The complete list of documents/evidences assessed by validation team is included under Appendix 3

C.2. On-site inspection

Duration of on-site inspection: 22/07/2019				
No.	Activity performed on-site	Site location	Date	Team member
1.	Opening Meeting: Introduction, scope and objective of work, roles and responsibilities of audit team, resources required, and timetable of the onsite audit including venue for closing meeting and any concerns from PP.	Olkaria, Kenya	22/07/2019	Deepika Mahala, Virginia Njeri Njata
2.	Travel to site location	Olkaria, Kenya	22/07/2019	Deepika Mahala, Virginia Njeri Njata
3.	Physical inspection of the site	Olkaria, Kenya	22/07/2019	Deepika Mahala, Virginia Njeri Njata
4.	Project Activity (Technology, Location and Implementation)	Olkaria, Kenya	22/07/2019	Deepika Mahala, Virginia Njeri Njata
5.	Choice and applicability of baseline methodology(ies)	Olkaria, Kenya	22/07/2019	Deepika Mahala, Virginia Njeri Njata
6.	Project boundary and emission sources included in the project boundary.	Olkaria, Kenya	22/07/2019	Deepika Mahala, Virginia Njeri Njata
7.	Baseline identification	Olkaria, Kenya	22/07/2019	Deepika Mahala, Virginia Njeri Njata
8.	Parameter fixed Ex-ante and Baseline emissions, Project emissions and Leakage calculation	Olkaria, Kenya	22/07/2019	Deepika Mahala, Virginia Njeri Njata
9.	Monitoring plan (feasibility of monitoring arrangements described in PDD, QA/QC procedures, responsibility of implementation of monitoring plan, data recording & storage procedures)	Olkaria, Kenya	22/07/2019	Deepika Mahala, Virginia Njeri Njata
10.	Operational lifetime of the project activity, Start date of the project activity, Crediting period	Olkaria, Kenya	22/07/2019	Deepika Mahala, Virginia Njeri Njata
11.	Environmental impacts and need of EIA	Olkaria, Kenya	22/07/2019	Deepika Mahala, Virginia Njeri Njata

12.	Compilation of the findings by Auditor/s (CARs/CLs)	Olkaria, Kenya	22/07/2019	Deepika Mahala, Virginia Njeri Njata
13.	Closing Meeting: Submission of the audit findings to the client and agreement on the issues raised and agreement on timelines.	Olkaria, Kenya	22/07/2019	Deepika Mahala, Virginia Njeri Njata

C.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Metto	James	Kenya Electricity Generating Company PLC	22/07/2019	Project Activity (Technology, Location and Implementation)	Deepika Mahala, Virginia Njeri
2.	Belenky	Lucas	World Bank	22/07/2019	Project Activity (Technology, Location and Implementation)	Deepika Mahala, Virginia Njeri
3.	Kirkou	Stanley	Kenya Electricity Generating Company PLC	22/07/2019	Monitoring schedule and procedures	Deepika Mahala, Virginia Njeri
4.	Ndegwa	John	Kenya Electricity Generating Company PLC	22/07/2019	Monitoring schedule and procedures	Deepika Mahala, Virginia Njeri

C.4. Sampling approach

No sampling approach was applied by the DOE since all data was validated.

C.5. Clarification requests (CLs), corrective action requests (CARs) and forward action requests (FARs) raised

Area of validation findings	No. of CL	No. of CAR	No. of FAR
Compliance with PDD form	-	CAR#01	-
Application and selection of methodologies and standardized baselines	-	CAR#02, CAR#03	-
Validity of original baseline or its update	-	CAR#04	-
Estimated emission reductions or net anthropogenic removals	-	-	-
Validity of monitoring plan	-	CAR#05, CAR#06	-
Crediting period	-	CAR#01	-
Project participants	-	-	-
Post-registration changes	-	-	-
Others (please specify)	-	-	-
Total	-	06	-

SECTION D. Validation findings

D.1. Compliance with PDD form

Means of validation	The PDD form used is CDM-PDD-FORM version 11/04/, which was the appropriate form, and the latest version available at the time of validation. All the sections of the form were filled as per the guidelines and gave all the relevant details.
Findings	CAR#01 raised and resolved.
Conclusion	The updated PDD has been found to be completed using the valid version of the PDD form. The information that is transferred in the current version of the PDD is materially the same as that in the registered PDD and in line with the para 406 of the VVS for PA version 02/3/

D.2. Application and selection of methodologies and standardized baselines

Means of validation	<p>The PDD employs methodology ACM0002.: Grid-connected electricity generation from renewable sources, version 19/10/. The applied version of the methodology although not the latest, was found to be appropriate by the validation team because this version of methodology was found to be in its grace period until 24/07/2020, as confirmed from the information available on the methodology webpage: https://cdm.unfccc.int/methodologies/DB/VJI9AX539D9MLOPXN2AY9UR1N4IYGD . According to the information provided on this webpage, ACM0002 ver. 19 is valid from 31 Aug 18 to 27 Nov 19; however, requests for registration can be submitted until 24 Jul 2020 23:59:59 GMT.</p> <p>The applicability condition of the methodology ACM0002 (Version 19) is presented as follows:</p>		
	Applicability conditions	Justification by the Project proponent	Means of validation
	<p>This methodology is applicable to grid-connected renewable energy power generation project activities that: (a) Install a Greenfield power plant; (b) Involve a capacity addition to (an) existing plant(s); (c) Involve a retrofit of (an) existing operating plants/units; (d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or (e) Involve a replacement of (an) existing plant(s)/unit(s).</p>	<p>The project activity is the capacity addition of a new generating unit to an existing geothermal power plant that supplies electricity to the grid.</p>	<p>The validation team confirms that the para 3 point (b) of applied methodology/10/ is applicable to the project activity.</p> <p>It was confirmed during the on-site visit through interviews and from the registered PDD/5/ that the project is capacity addition of 35MW (unit 3 in Olkaria II) to an existing geothermal power plant of installed capacity 115MW (45MW from Olkaria I and 70MW from Olkaria II).</p> <p>Olkaria II consists of two units, to which Unit 3 is added as a part of this capacity addition. It is evident from the electricity export invoices/16/ that electricity generated in this power plant is transmitted to national grid.</p>
	<p>The methodology is applicable under the following conditions:</p> <p>a.The project activity may include renewable energy power plant/unit of one of the following types: hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit;</p>	<p>Five years of historical electricity generation data are available, without any capacity addition or retrofit being undertaken between the start of this five-year historical period and the implementation of the project activity.</p>	<p>It was confirmed during the on site visit that the plant is a geothermal power plant.</p> <p>The validation team confirms that the applicability condition in para 4 point (a) of applied methodology/10/ has been met.</p>

	b.In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects) the existing plant/unit started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.		<p>The PP had provided Five years of historical electricity generation data at the time of validation/5/, without any capacity addition or retrofit being undertaken between the start of this five-year historical period and the implementation of the project activity.</p> <p>The validation team confirms that the para 4 point (b) of applied methodology/10/ is applicable to the project activity.</p>
	In case of hydro power plants, one of the following conditions shall apply...	NA	Since the plant is a geothermal power plant, this condition is not applicable.
	In the case of integrated hydro power projects, project proponent shall...	NA	Since the plant is a geothermal power plant, this condition is not applicable.
	The methodology is not applicable to: (a) Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; (b) Biomass fired power plants/units.	The project will not be an activity that involves switching from fossil fuels to renewable energy at the project site.	<p>During the site visit while visiting the geothermal power plant, the validation team could ensure that the power plant did not involve switching from fossil fuels to renewable energy.</p> <p>The validation team confirms that the para 7 points (a) & (b) of applied methodology/10/ are not applicable to the project activity.</p>
	In the case of retrofits, rehabilitations, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of	As the project activity covers a capacity addition, the most plausible baseline scenario is the continuation of the current situation, e.g. use of the power generation equipment already	The continuation of the current situation, e.g. use of the power generation equipment already installed and in use prior to the project activity baseline scenario is the most plausible scenario. This was confirmed from

	baseline scenario, is “the continuation of the current situation, that is to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance”.	installed and in use prior to the project activity.	the on-site visit and interviews and registered PDD/5/. The validity of the original baseline has been assessed in detail under the next section. The validation team confirms that the para 8 point (b) of applied methodology/10/ is applicable to the project activity.
Findings	CAR#02 and CAR#03 raised and resolved.		
Conclusion	The PDD was found to be in accordance with the applied methodology/10/ and the applicable requirements in the CDM project standard for PoA ver 2/1/.		

D.3. Validity of original baseline or its update

Means of validation	<p>Baseline scenario applicable to the project is in accordance with the paragraph 23, option vi of the methodology/10/. The baseline scenario is the continuation of existing Olkaria II facility generating electricity at its historical levels and supplying it to the national grid in the host country. The description of baseline scenario in PDD/6/ was found to be in line with baseline scenario prescribed in the applied methodology/10/.</p> <p>The continuation of existing baseline was validated as per the Methodological Tool/14/ “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period” version 03.0.1.</p> <p>Step 1: Assess the validity of the current baseline for the next crediting period</p> <p><i>Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies</i></p> <p>The baseline scenario identified by the PP was found to be in accordance with applied methodology/10/ and the registered PDD/5/ i.e. generation of electricity from Olkaria II at its previous capacity.</p> <p>The validation team confirms that since the registration of project, no government policies and programmes implemented in the host country mandate the establishment of geothermal power plants or their expansion. Although policies have been brought up in the host country for the energy sector, these policies were found not affecting the baseline as evident from studying National Energy Policy/17/ and Least Cost Power Development Plan/18/.</p> <p>Therefore, the current baseline was found to be in compliance with the most recent relevant mandatory national and/or sectoral policies which have come in to effect after the submission of the PA for validation. This is in accordance with the Methodological Tool “Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period” version 03.0.1/14/.</p> <p>Therefore, decision to not make changes in the current baseline by the PP was found acceptable by the validation team.</p> <p><i>Step 1.2 Assess the impact of circumstances</i></p> <p>The scenario of fuel used in the baseline scenario for electricity generation has remained similar to the fuels used at the time of validation. Therefore, market characteristics were found to have remained similar to that at the time of validation. Therefore, it is considerable to accept that the circumstances have remained same.</p> <p><i>Step 1.3 Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested.</i></p> <p>The establishment and expansion of geothermal power plants is not mandated in</p>
----------------------------	--

Kenya as checked from 'National Energy Plan'/17/ for Kenya and therefore, continuation of the baseline which is electricity generation from fossil fuels is the likely scenario. The Olkaria II plant would not have required any additional investment for operation. The remaining technical life of the turbines has been determined using Tool 10 "Tool to determine the remaining lifetime of equipment"/20/ and has been assessed below.

Step 1.4 Assessment of the validity of the data and parameters

During the assessment it was confirmed that two parameters fixed at the time of registration need to be updated in line with current requirements, standards and methodology.

Therefore, the following parameters have been updated in line with step 2.2 of tool 11/14/:

Parameter	Value	Justification
Global Warming Potential for methane (GWP _{CH₄})	25	The value has been updated as per EB 69 annex 3/15/
Build Margin CO ₂ emission factor in year y (EF _{grid,BM,y})	0.2906	Re-calculated from the latest available data/16/ and using the Tool to calculate the emission factor for an electricity system which is the latest applicable tool/19/. The tool was found to be appropriately followed and all data used for calculations was also cross checked and found acceptable.

Validity of Turbines:

The turbines were installed in the year 2003 as confirmed from registered PDD/5/. As per methodological tool 10/20/ option (a), manufacturer's specifications can be used to estimate technical lifetime of the equipment if the following conditions are met:

1. Manufacturer information on the equipment lifetime is available;
2. Project participants can demonstrate the equipment has been operated and maintained as per the manufacturer specifications;
3. There is no periodic replacement schedule or scheduled replacement practices; and
4. The equipment has no design flaw or defect and did not have an industrial accident causing equipment to be unable to operate at performance levels.

All the above mentioned conditions were found to be met as confirmed through on-site interviews and contract documents/21/, annual inspection reports/24/,/25/, and maintenance procedures and work instructions document/26/. From the documents it was confirmed that the technical lifetime of existing turbines is till 200,000 hours or 22.8 years (200,000 hours /8760 hours/year) from the date of commissioning. According to the completion report for Olkaria II/14/, The unit turbine was rolled on 23/07/2003 and synchronised 2 days later, the operational acceptance certificate for Unit 1 was issued on 30/09/2003 and for Unit 2 on 20/11/2003. According to the aforesaid report, the generating units were commissioned in September and November 2004, respectively. However, the PP has clarified that year 2004 as commissioning date is a typographical error in the report and actual commissioning has happened in 2003. To support the statement, the PP has provided a report published by Ministry of Energy and Petroleum titled "Development of a Power Generation and Transmission Master Plan, Kenya"/37/. The report/37/ on page 115 mentions the year of commissioning as 2003. Additionally, the revised approved PDD, page 4/5/ also mentioned the commissioning date as September 2003. For determination of date on which the turbines will have to be replaced (DATE_{BaselineRetrofit}), earliest of all these dates have been considered i.e., the date on which the operational acceptance certificate for Unit 1 was issued. Therefore,

	<p>considering 22 years from 30/09/2003, the point in time when equipment shall be replaced would be 29/09/2025.</p> <p>This lifetime calculated in the revised PDD is different from the lifetime of turbine stated in approved PDD/5/, which has been attributed to delay in commissioning than expected. While the contract got signed in 1999/21/, the project got commissioned much later, thus causing change in last year of turbine lifetime validity. The change has been identified and assessed in the PRC validation report/32/ submitted with this RCP validation and the revisions are found appropriate by validation team.</p> <p>Since, technical lifetime of the installed equipment has been confirmed from contract documents/21/ as 22.8 years, which is smaller than the default lifetime of steam turbines as per applied Tool 10 ver.1/20/ (25 years), validity of its lifetime till 2025 has been found appropriate. This period will cover the whole second crediting period and therefore has been accepted by the validation team.</p> <p>Thus, based on the above steps the continuation of the original baseline has been established and therefore the current baseline does not require to be updated.</p>
Findings	CAR 04 raised and resolved.
Conclusion	The DOE has accepted and validates the original baseline for this crediting period in the updated PDD. The baseline scenario is found to be valid in accordance with the methodology/10/ and VVS for PA version 2/3/.

D.4. Estimated emission reductions or net anthropogenic removals

Means of validation	The project activity is expansion of geothermal power plant system and therefore, the project activity has applied ACM0002 Version 19 and was found suitable. In line with sections 5.4.2 and 5.5.1.3 of the methodology/10/ for emission reductions achieved in any year shall be calculated as given below: $ER_y = BE_y - PE_y$		
	Where,		
	ER_y = Emission reductions in year y (t CO ₂ e/yr)		
	BE_y = Baseline emissions in year y (t CO ₂ /yr)		
	PE_y = Project emissions in year y (t CO ₂ e/yr)		
	Baseline Emissions:		
	$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$		
	Where,		
	BE_y	=	Baseline emissions in year y (t CO ₂ /yr)
	$EG_{PJ,y}$	=	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)
$EF_{grid,CM,y}$	=	Combined margin CO ₂ emission factor for grid connected power generation in year y calculated using the latest version of "TOOL07: Tool to calculate the emission factor for an electricity system" (t CO ₂ /MWh)	
For calculating $EG_{PJ,y}$, for capacity addition to geothermal power plant as per applied methodology: $EG_{PJ,y} = EG_{facility,y} - (EG_{historical} + \sigma_{historical}); \text{until } DATE_{BaselineRetrofit}$			
Or $EG_{PJ,y} = 0$ (if in a year y $EG_{facility,y} < (EG_{historical} + \sigma_{historical})$)			
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 plants/units to the grid in year y (MWh/yr)
$EG_{historical}$	=	Annual average historical net electricity generation delivered to the grid by the existing renewable energy power plants/units that was operated at the project site prior to the implementation of the project activity (MWh/yr)
$\sigma_{historical}$	=	Standard deviation of the annual average historical net electricity generation delivered to the grid by the existing renewable energy power plants/units that was operated at the project site prior to the implementation of the project activity (MWh/yr)
$DATE_{BaselineRetrofit}$	=	Point in time when the existing equipment would need to be replaced in the absence of the project activity (date). This only applies to retrofit or replacement projects

Calculation of $DATE_{BaselineRetrofit}$ is done as per Tool 10: Tool to determine the remaining lifetime of equipment/20/. The determination of lifetime of equipment has been assessed by validation team in section D.3 and was found to be accurate.

Calculation of $EF_{grid,CM,y}$

Emission factor for this PA is calculated in line with the latest applied methodology ACM0002/10/ and Tool7: Tool to calculate the emission factor for an electricity system/19/. In line with the tool, options for each step for calculation have been picked by the PP.

For calculation of operating margin, option (c) of para 38 of tool/19/ i.e. "Dispatch data analysis OM" has been picked by the PP. Hourly data from power plant on generation, fuel type and fuel consumption was found to be available. The project only constitutes of grid connected power plant as confirmed from the PPA/22/ and invoices/16/. Therefore, the choice of option (c) has been accepted by the validation team. $EF_{grid,OM-DD,y}$ is a monitored parameter.

$$EF_{grid,OM-DD,y} = \frac{\sum EG_{PJ,h} \times EF_{EL,DD,h}}{EG_{PJ,y}}$$

Where,

$EF_{grid,OM-DD,y}$	=	Dispatch data analysis operating margin CO ₂ emission factor in year y (t CO ₂ /MWh)
$EG_{PJ,h}$	=	Electricity displaced by the project activity in hour h of year y (MWh)
$EF_{EL,DD,h}$	=	CO ₂ emission factor for grid power units in the top of the dispatch order in hour h in year y (t CO ₂ /MWh)
$EG_{PJ,y}$	=	Total electricity displaced by the project activity in year y (MWh)
h	=	Hours in year y in which the project activity is displacing grid electricity
y	=	Year in which the project activity is displacing grid electricity

$$EF_{EL,DD,h} = \frac{\sum FC_{i,n,h} \times NCV_{i,y} \times EF_{CO2,i,y}}{\sum EG_{n,h}}$$

Where,

$EF_{EL,DD,h}$	=	CO ₂ emission factor for grid power units in the top of the dispatch order in hour h in year y (t CO ₂ /MWh)
$FC_{i,n,h}$	=	Amount of fuel type i consumed by grid power unit n in hour h (Mass or volume unit)
$NCV_{i,y}$	=	Net calorific value (energy content) of fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$	=	CO ₂ emission factor of fuel type i in year y (t CO ₂ /GJ)
$EG_{n,h}$	=	Electricity generated and delivered to the grid by grid power unit n

		in hour h (MWh)
n	=	Grid power units in the top of the dispatch (as defined below)
i	=	Fuel types combusted in grid power unit n in year y
h	=	Hours in year y in which the project activity is displacing grid electricity
y	=	Year in which the project activity is displacing grid electricity

For calculation of build margin, option 1 of para 72 from Tool 7/19/ was chosen and documented in the revised PDD/6/, which indicates that build margin emission factor ($EF_{grid,BM,y}$) is a fixed ex-ante parameter.

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

Where,

$EF_{grid,BM,y}$	=	Build margin CO ₂ emission factor in year y (t CO ₂ /MWh)
$EG_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
$EF_{EL,m,y}$	=	CO ₂ emission factor of power unit m in year y (t CO ₂ /MWh)
m	=	Power units included in the build margin
y	=	Most recent historical year for which electricity generation data is available

$EF_{EL,m,y}$ is calculated using Option A1 which was found acceptable by the validation team since the application of the methodological choice is in line with the applied Tool 7.

$$EF_{EL,m,y} = \frac{\sum FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_{m,y}}$$

Where,

$EF_{EL,m,y}$	=	CO ₂ emission factor of power unit m in year y (t CO ₂ /MWh)
$FC_{i,m,y}$	=	Amount of fuel type i consumed by power unit m in year y (Mass or volume unit)
$NCV_{i,y}$	=	Net calorific value (energy content) of fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$	=	CO ₂ emission factor of fuel type i in year y (t CO ₂ /GJ)
$EG_{m,y}$	=	Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)
m	=	All power units serving the grid in year y except low-cost/must-run power units
i	=	All fuel types combusted in power unit m in year y
y	=	The relevant year as per the data vintage (January 2018-December 2018)

Thus, combined margin emissions factor is calculated as follow:

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times WOM + EF_{grid,BM,y} \times WBM$$

Where,

- WOM = Weighting of operating margin emissions factor (per cent)
 WBM = Weighting of build margin emissions factor (per cent)

Values used for these parameters i.e. 0.25 and 0.75 respectively were found to be in line with Tool 07 guidelines for second crediting period, and therefore accepted by the DOE.

Project Emissions:

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

Where,

PE_y	=	Project emissions in year y (t CO ₂ e/yr)
$PE_{FF,y}$	=	Project emissions from fossil fuel consumption in year y (t CO ₂ /yr)
$PE_{GP,y}$	=	Project emissions from the operation of dry, flash steam or binary geothermal power plants in year y (t CO ₂ e/yr)

	$PE_{HP,y}$	=	Project emissions from water reservoirs of hydro power plants in year y (t CO ₂ e/yr)																					
	<p>Since this is not a hydro project, considering $PE_{HP,y}$ as 0 was found to be an acceptable choice in line with the applied methodology/10/.</p> <p>Therefore,</p> $PE_y = PE_{FF,y} + PE_{GP,y}$ <p>Here, $PE_{GP,y} = PE_{dry or flash steam,y} + PE_{binary,y}$</p> <p>Where,</p> <table border="1"> <tr> <td>$PE_{GP,y}$</td> <td>=</td> <td>Project emissions from the operation of dry steam, flash steam and/or binary geothermal power plants in year y (t CO₂e/yr)</td> </tr> <tr> <td>$PE_{dry or flash steam,y}$</td> <td>=</td> <td>Project emissions from the operation of dry steam or flash steam geothermal power plants due to release of non-condensable gases in year y (t CO₂e/yr)</td> </tr> <tr> <td>$PE_{binary,y}$</td> <td>=</td> <td>Project emissions from the operation of binary geothermal power plants due to physical leakage of non-condensable gases and working fluid in year y (t CO₂e/yr)</td> </tr> </table> <p>Since the project includes a dry steam geothermal power plant, the use of following equation was found in line with applied methodology:</p> $PE_{dry or flash steam,y} = (W_{steam,CO_2,y} + W_{steam,CH_4,y} \times GWP_{CH_4}) \times M_{steam,y}$ <p>Where,</p> <table border="1"> <tr> <td>$W_{steam,CO_2,y}$</td> <td>=</td> <td>Average mass fraction of CO₂ in the produced steam in year y (t CO₂/t steam)</td> </tr> <tr> <td>$W_{steam,CH_4,y}$</td> <td>=</td> <td>Average mass fraction of CH₄ in the produced steam in year y (t CH₄/t steam)</td> </tr> <tr> <td>GWP_{CH_4}</td> <td>=</td> <td>Global warming potential of CH₄ valid for the relevant commitment period (t CO₂e/t CH₄)</td> </tr> <tr> <td>$M_{steam,y}$</td> <td>=</td> <td>Quantity of steam produced in year y (t steam/yr)</td> </tr> </table> <p>All formulae and equations above used for calculation of emission reductions were checked against the applied methodology and were found to be appropriate.</p>			$PE_{GP,y}$	=	Project emissions from the operation of dry steam, flash steam and/or binary geothermal power plants in year y (t CO ₂ e/yr)	$PE_{dry or flash steam,y}$	=	Project emissions from the operation of dry steam or flash steam geothermal power plants due to release of non-condensable gases in year y (t CO ₂ e/yr)	$PE_{binary,y}$	=	Project emissions from the operation of binary geothermal power plants due to physical leakage of non-condensable gases and working fluid in year y (t CO ₂ e/yr)	$W_{steam,CO_2,y}$	=	Average mass fraction of CO ₂ in the produced steam in year y (t CO ₂ /t steam)	$W_{steam,CH_4,y}$	=	Average mass fraction of CH ₄ in the produced steam in year y (t CH ₄ /t steam)	GWP_{CH_4}	=	Global warming potential of CH ₄ valid for the relevant commitment period (t CO ₂ e/t CH ₄)	$M_{steam,y}$	=	Quantity of steam produced in year y (t steam/yr)
	$PE_{GP,y}$	=	Project emissions from the operation of dry steam, flash steam and/or binary geothermal power plants in year y (t CO ₂ e/yr)																					
	$PE_{dry or flash steam,y}$	=	Project emissions from the operation of dry steam or flash steam geothermal power plants due to release of non-condensable gases in year y (t CO ₂ e/yr)																					
	$PE_{binary,y}$	=	Project emissions from the operation of binary geothermal power plants due to physical leakage of non-condensable gases and working fluid in year y (t CO ₂ e/yr)																					
	$W_{steam,CO_2,y}$	=	Average mass fraction of CO ₂ in the produced steam in year y (t CO ₂ /t steam)																					
	$W_{steam,CH_4,y}$	=	Average mass fraction of CH ₄ in the produced steam in year y (t CH ₄ /t steam)																					
	GWP_{CH_4}	=	Global warming potential of CH ₄ valid for the relevant commitment period (t CO ₂ e/t CH ₄)																					
	$M_{steam,y}$	=	Quantity of steam produced in year y (t steam/yr)																					
	Findings	None																						
Conclusion	The emission reductions or net anthropogenic GHG removals in the updated PDD/6/ comply with the applicable requirements in the CDM project standard for project activities version 02/1/. The final GHG estimated annual average emission reductions in the PDD version 12 dated 11/08/2020 are 78,640tCO ₂ e.																							

D.5. Validity of monitoring plan

Means of validation	The monitoring plan given in the updated PDD/6/ complies with the registered monitoring plan. The values of ex-ante parameter and monitored parameters can be found in the table given below.		
	S. No.	Parameter (Unit)	Value in updated PDD
	1.	Global Warming Potential of Methane; GWP_{CH_4} , (tCO ₂ e/tCH ₄)	25
	2.	Annual average net electricity generation delivered to the grid by the existing renewable energy plant that was	549,800
			Assessment
			As per EB 69 Annex 3, the value of the GWP of methane is 25 for the second commitment period/15/.
			The value is validated from the Kengen Annual Report 2008/27/, which lists net electricity generation for 5 years before the project activity was implemented. The value is consistent with the registered PDD/5/ and in line with

		operated at the project site prior to the implementation of the project activity; $EG_{\text{historical}}$, MWh/yr		applied methodology/10/ and has therefore been accepted by validation team.
	3.	Standard deviation of the annual average historical net electricity generation delivered to the grid by the existing renewable energy plant that was operated at the project site prior to the implementation of the project activity; $\sigma_{\text{historical}}$, MWH/yr	12,637.25	The parameter is calculated using the net electricity generation data from Kengen Annual Report 2008/27/. The value calculated is consistent with the registered PDD/5/ and in line with applied methodology/10/ and has therefore been accepted by validation team.
	4.	Point in time when the existing equipment would need to be replaced in the absence of the project activity, $DATE_{\text{BaselineRetrofit}}$, year	Year 2025 ¹	The date has been determined from the contract documents with Kingston Morrison which state the operational lifetime of the turbines/21/. This lifetime calculated in the revised PDD is more than the lifetime of turbine stated in approved PDD/5/. The project got commissioned in 2003/26/ whereas the purchase contract got signed in 1999/21/ thus, resulting in change in last year of turbine lifetime validity from 2022 to 2025. The revision is also discussed in section D.3 of this report and a PRC for the same was carried out and is submitted along with this RCP request/32/. Since, technical lifetime of the installed equipment has been confirmed from contract documents/21/ as 22.8 years, which is smaller than the default lifetime of steam turbines as per applied Tool 10 ver.1/20/ (25 years), validity of its lifetime till 2025 has been found appropriate. The method of determination of this parameter was found to be in line with Tool 10/20/ and therefore, it has been accepted by the assessment team.
	5.	Build Margin CO ₂ emission factor in year y, $EF_{\text{grid,BM,y}}$, tCO ₂ /MWh	0.2906	The value for this parameter was validated from the calculation sheet provided by the PP. The sheet used the latest data available for calculation at the time of submission of CDM-PDD

¹ The exact date of replacement of equipment should be 22/07/2025, as discussed in section D.3 of this report. However, since the unit of parameter $DATE_{\text{baselinereetrofit}}$ is "Year", 2025 is the value used and found more suitable for this parameter.

to DOE for validation i.e. 10/07/2019 /35/. The latest data available at that time was till December 2018 which is provided in Kenya Power data/30/ and confirmed from email correspondence of KenGen representatives with KPLC representatives/34/. The data was also cross checked from the World Bank data catalogue/31/ where too, the latest data available is for 2018. The calculations in Emission Factor calculation sheet were checked and were found to be in line with Tool 7: Tool to calculate the emission factor for an electricity system/19/ and has therefore been found acceptable by the validation team.

Monitored parameters:

Sno	Parameter and Unit	Monitoring Frequency	Equipment
1	Quantity of net electricity generation supplied by the project plants/units in year y , $EG_{\text{facility},y}$, MWh/yr	Measured hourly, recorded monthly	Facility meters
2	Dispatch data analysis Operating Margin CO_2 Emission Factor, $EF_{\text{grid,OM-DD},y}$, tCO_2e/MWh	Annual	Values for calculations done using Tool 7: Tool to calculate the emission factor for an electricity system/19/
3	Amount of fossil fuel type i consumed by power unit n in hour h or by power unit m in year y , $FC_{i,n,h}$ and $FC_{i,m,y}$, Mass or Volume	Annual (for OM); Fixed (for BM)	Calculated
4	Net calorific value (energy content) of fossil fuel type i in year y , $NCV_{i,y}$, TJ/mass or volume	Annual (for OM); Fixed (for BM)	IPCC Guidelines for National Greenhouse Gas Inventories/28/
5	CO_2 emission factor of fossil fuel type i in year y , $EF_{CO_2,i,y}$ and $EF_{CO_2,m,i,y}$, tCO_2/TJ	Annual (for OM); Fixed (for BM)	IPCC Guidelines for National Greenhouse Gas Inventories/28/
6	Net electricity generated and delivered to the Kenyan grid by power plant/unit m in year y or n in hour h , $EG_{n,h}$ and $EG_{m,y}$, MWH	Annual (for OM); Fixed (for BM)	Facility Meter
7	Electricity displaced by the project activity in	Hourly	Calculated

		hour h in year y , $EG_{PJ,h}$, MWh		
	8	Average mass fraction of carbon dioxide in the produced steam in year y , $W_{\text{steam},CO_2,y}$, tCO ₂ /t steam	At least every three months	Chromatography tests and analysis conducted at site
	9	Average mass fraction of methane in the produced steam in year y , $W_{\text{steam},CH_4,y}$, tCO ₂ /t steam	At least every three months	Chromatography tests and analysis conducted at site
	10	Quantity of steam produced during the year y , $M_{\text{steam},y}$, t steam/year	Daily	Flow meter
	11	Quantity of fuel type i combusted in the project plant in process j during the year y , $FC_{i,j,y}$, Mass or volume unit per year	Monthly	Fuel meters in flow meters
Findings	CAR 05 and CAR 06 raised and resolved			
Conclusion	The parameter fixed ex-ante and monitored, which are a part of the monitoring plan are in line with the registered PDD/5/ and was found to be acceptable as per the VVS for PA version 02/3/.			

D.6. Crediting period

Means of validation	<p>Crediting period renewal has been requested, the previous crediting period was 04/12/2010 – 03/12/2017 (Renewable)/5/,/29/.</p> <p>As per meeting report from CDM EB105 meeting/33/ para 28, grace period for submission requests of renewal of project activities with expired crediting period is till 30 September 2020. The meeting report from CDM EB100/11/ also states that Notification for renewal intention from PP is no longer a requirement.</p> <p>Since the submission for this renewal is being made within the grace period, PA was found to be in line with the standard and CDM EB requirements.</p> <p>Therefore, the next start date for the second crediting period for the current request for renewal of the crediting period as 04/12/2017 is found to be acceptable by the validation team.</p>
Findings	CAR#01 raised and resolved
Conclusion	<p>The next crediting period of the project activity commences on the day immediately after the expiration of the of the first crediting period i.e. 04/12/2010 – 03/12/17/5/.</p> <p>This found to be in compliance with VVS for PA version 02 /3/. Furthermore, the intent to renew the crediting period was no more found to be a requirement.</p>

D.7. Project participants

Means of validation	<p>The names of the PP in the new updated PDD are:</p> <p>Kenya Electricity Generating Company Ltd.;</p> <p>Netherlands' Ministry of Infrastructure and the Environment (IenM);</p> <p>Kommunalkredit Public Consulting GmbH;</p> <p>KfW</p> <p>Maersk Olie og Gas A/S</p> <p>DONG Naturgas A/S</p> <p>Nordjysk Ethandel A/S</p> <p>Danish Ministry of Climate, Energy and Building, /Danish Energy Agency</p> <p>Aalborg Portland A/S</p> <p>Goteborg Energi AB</p> <p>Government of Italy-Ministry for the Environment, Land and Sea</p>
----------------------------	--

	Ruukki Metals Oy Kingdom of Spain- Ministry of Agriculture, Food and Environment & Ministry of Economy and Competitiveness EDP Energias de Portugal, S.A.; Endesa Generacion, S.A., Gas Natural SDG S.A.; Idemitsu Kosan Co.,Ltd.; The Okinawa Electric Power Co., Inc. ; Statoil ASA; Statkraft Carbon Invest AS Schweizerische Ruckversicherungsgesellschafts AG (Swiss RE) Ministry for Sustainable Development and Infrastructure International Bank for Reconstruction and Development (IBRD)
	All were found to be in line with the latest MoC/7/.
Findings	No findings.
Conclusion	The names of the project participants in the updated PDD/6/ are consistent with the names of the project participant in the latest version of MoC/7/.

D.8. Post-registration changes

Type of post-registration changes (PRCs)	Confirmation (Y/N)	Validation report for PRCs	
		Version	Completion date
Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents ²	N	NA	NA
Corrections	Y	2.0	11/08/2020
Change to the start date of the crediting period	N	NA	NA
Inclusion of a monitoring plan	N	NA	NA
Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents	N	NA	NA
Changes to the project design	N	NA	NA
Changes specific to afforestation and reforestation project activities	N	NA	NA

SECTION E. Internal quality control

The draft validation report for renewal of crediting period prepared by the validation team was reviewed by an independent technical review team to confirm if the internal procedures established and implemented by ESPL were duly complied with and such opinion/conclusion is reached in an objective manner that complies with the applicable CDM rules/requirements. The technical review team is collectively required to possess the technical expertise of all the technical area/sectoral scope the project activity relates to. All team members of technical review team were independent of the validation team.

The technical review process may accept or reject the validation opinion or raise additional findings in which case these must be resolved before requesting for registration. The technical review process is recorded in the internal documents of ESPL and the additional findings gets included in the report.

The final report approved by the technical reviewer is authorized by Managing Director and issued to PP and/or submitted for request for registration/renewal, as appropriate on behalf of ESPL.

SECTION F. Validation opinion

The validation of "Olkaria II Geothermal Expansion Project" for renewal of its crediting period was performed on the basis of rules and requirements defined by UNFCCC for the CDM project activities.

It is demonstrated that the project is not a likely baseline scenario and the emission reductions attributable to the project are, hence, additional to any that would occur in the absence of the proposed CDM project

² Other standards, methodologies, methodological tools and guidelines (to be) applied in accordance with the applied(selected) methodologies are collectively referred to as the other (applied) methodological regulatory documents).

activity. The project correctly applies the approved baseline and monitoring methodology ACM0002 Ver 19: Grid-connected electricity generation from renewable sources and is assessed against latest valid CDM PS, VVS and PS and/or other applicable CDM Decisions/Tools/Guidance/Forms.

The proposed CDM project activity is likely to achieve the anticipated emission reductions stated in the PDD provided the underlying assumptions do not change. The expected emission reductions (annual average) from the project activity are estimated to be 78,640tCO₂e per year over the selected 7 years crediting period starting from 04/12/2017. The proposed CDM project activity is likely to achieve the anticipated emission reductions stated in the PDD provided the underlying assumptions do not change.

ESPL has informed the project participants of the validation outcome through the draft validation report and final validation report. In case of negative validation outcome, the final validation report is only submitted to PP. The final validation report contains the information with regard to fulfilment of the requirements for validation, as appropriate.

ESPL applied the following validation process and methodology using a competent validation team;

- the desk review of documents and evidences submitted by the project participant in context of the reference CDM rules and guidelines issued by CDM EB,
- undertaking/conducting site visit, interview or interactions with the representative of the project participant,
- reporting audit findings with respect to clarifications and non-conformities and the closure of the findings, as appropriate and
- preparing a draft validation opinion based on the auditing findings and conclusions
- technical review of the draft validation opinion along with other documents as appropriate by an independent competent technical review team
- finalization of the validation opinion (this report)

The review of the PDD, supporting documentation and subsequent follow-up actions (onsite visit and interviews) have provided ESPL with sufficient evidence to determine the fulfilment of stated criteria.

ESPL is of the opinion that the project activity “Olkaria II Geothermal Expansion Project” as described in the final PDD/6/ does meet the stated criteria of CDM, meets host country criteria and has correctly applied the methodology ACM0002 Ver. 19: Grid-connected electricity generation from renewable sources. Therefore, the project is being recommended to CDM EB for request for renewal of crediting period.

Appendix 1. Abbreviations

	Full texts
ACM	Approved Consolidated Methodology
AM	Approved Methodology
ACM	Approved Consolidated Methodology
BE	Baseline Emission
BM	Build Margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CH ₄	Methane
CL	Clarification Request
CM	Combined Margin
CO ₂	Carbon di oxide
CP	Crediting Period
DNA	Designated National Authority
DR	Desk Review
DOE	Designated Operational Entity
EB	Executive Board
ESPL	Earthood Services Private Limited
FAR	Forward Action Request
GHG	Green House Gas
GSC/GSP	Global Stakeholder Consultation Process
GW	Giga Watt
GWh	Giga Watt hour
IPCC	Intergovernmental Panel on Climate Change
KP	Kyoto Protocol
kW	kilo Watt
kWh	kilo Watt hour
LoA	Letter of Approval/Authorization
LSC	Local Stakeholder Consultation Process
MoC	Modalities of Communication
MoV	Means of Validation
MP	Monitoring Plan
MW	Mega Watt
MWh	Mega Watt hour
N ₂ O	Nitrous Oxide
ODA	Official Development Assistance
OM	Operating Margin
PA	Project Activity
PCP	Project Cycle Procedure
PDD	Project Design Document
PE	Project Emission
PLF	Plant Load Factor
PoA DD	Programme of Activities Design Document
PP	Project Participant
PS	Project Standard
RFR	Request for Registration
tCO ₂ e	tonnes of Carbon di Oxide equivalent
TPH	Tonnes Per Hour
UNFCCC	United Nations Framework Convention on Climate Change
V	Version
VVS	Validation and Verification Standard

Appendix 2. Competence of team members and technical reviewers

Competence Statement			
Name	Deepika Mahala		
Country	India		
Education	M. Sc. (Environmental Management), GGSIP University B.Sc. Hons. (Chemistry), Sri Venkateshwar College, DU		
Experience	3 Years +		
Field	Climate Change		
Approved Roles			
Team Leader	YES		
Validator	YES		
Verifier	YES		
Methodology Expert	ACM0002, AMS.I.D., AMS.I.A, AMS.III.AV, AMS.II.G		
Local expert	YES (India)		
Financial Expert	NO		
Technical Reviewer	YES		
TA Expert	YES (TA 1.2 & TA 3.1)		
Reviewed by	Shreya Garg	Date	14/09/2018
Approved by	Anshika Gupta	Date	14/09/2018

Competence Statement			
Name	Virginia Njeri		
Country	Kenya		
Education	Diploma (Business Management)		
Experience	7 Years		
Field	Administration		
Approved Roles			
Team Leader	No		
Validator	No		
Verifier	No		
Methodology Expert	No		
Local expert	Kenya		
Financial Expert	No		
Technical Reviewer	No		
TA Expert	No		
Reviewed by	Abhishek Mahawar	Date	01/03/2018
Approved by	Ashok Kumar Gautam	Date	01/03/2018

Competence Statement	
Name	Ashok Gautam
Country	India
Education	M. Sc. (Environmental Sciences) M. Tech. (Energy & Environmental Management)

Experience	16 Years +		
Field	Energy, Climate Change & Environment		
Approved Roles			
Team Leader	YES		
Validator	YES		
Verifier	YES		
Methodology Expert	AMS-I.D., AMS-I.A., AMS-I.C., AMS-I.E, AMS-II.D., AMS-II.G., AMS-III.E., AMS-III.H., AMS-III.Q, AMS-III.Z., AMS-III.AV., AM0029, AM0025, AM0056, ACM0001, ACM0002, ACM0004, ACM0012, ACM0006, AM0018, ACM0009, AM0034, AMS.I.B		
Local expert	YES (India)		
Financial Expert	YES		
Technical Reviewer	YES		
TA Expert	YES (TA 1.1, TA 1.2, TA 3.1, TA 13.1)		
Reviewed by	Shreya Garg	Date	25/01/2019
Approved by	Anshika Gupta	Date	25/01/2019

Competence Statement			
Name	Shifali Guleria		
Education	M.Sc. (Environmental Studies and Resource Management), TERI University		
Experience	1+ year		
Field	Climate Change		
Approved Roles			
Team Leader	YES		
Validator	YES		
Verifier	YES		
Methodology Expert	NO		
Local expert	YES		
Financial Expert	NO		
Technical Reviewer	NO		
TA Expert	YES (1.2, 3.1)		
Reviewed by	Shreya Garg (Quality Manager)	Date	24/09/2019
Approved by	Anshika Gupta (Technical Manager)	Date	25/09/2019

Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
1.	UNFCCC	Standard: CDM PS for PA	Ver. 2	Others
2.	UNFCCC	Standard: CDM PCP for PA	Ver. 2	Others
3.	UNFCCC	Standard: CDM VVS for PA	Ver. 2	Others
4.	UNFCCC	Form: CDM-PDD-FORM	Ver. 11.0	Others
5.	KenGen	Revised Approved PDD (for 1 st Crediting Period)	Ver. 08 dated 14/10/2014	PP
6.	KenGen	For 2 nd Crediting Period		PP

		Draft PDD	Version 9 dated 27/05/2019	
		Final PDD	Version 12 dated 11/08/2020	
7.	KenGen	Signed MoC Forms	Several (UN webpage)	Others
8.	KenGen	ER Sheet (draft)	-	PP
9.	KenGen	ER Sheet (final)	corresponding to final PDD	PP
10.	UNFCCC	Methodology: ACM0002- Grid-connected electricity generation from renewable sources	Version 19	Others
11.	CDM EB	Meeting report: CDM Executive Board one hundredth meeting	27 th to 31 st August, 2018, Ver. 01.0	Others
12.	KenGen	Minutes of Meeting and Attendance sheet	-	PP
13.	PP	No ODA declaration	-	PP
14.	UNFCCC	Methodological Tool 11 "Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period"	Ver. 03.0.1	Others
15.	UNFCCC	EB 69 Annex 3: Standard for Application of The Global Warming Potentials to Clean Development Mechanism Project Activities and Programmes of Activities for the Second Commitment Period of the Kyoto Protocol'	13/09/2012	Others
16	PP	Electricity export invoices	-	PP
17	Ministry of Energy, Kenya	National Energy Policy	2018	Others
18	Ministry of Energy, Kenya	Least Cost Power Development Plan	-	
19	UNFCCC	Tol 07: Tool to calculate the emission factor for an electricity system	Ver. 7.0	
20	UNFCCC	Tool 10: Tool to determine the remaining lifetime of equipment	Ver. 1.0	Others
21	Kingston Morrison	Olkaria II contract document "OG 102 Bid document"	Volume 3.0	PP
22	KenGen	Power Purchase Agreement		
23	KenGen	Electricity generation datasheets	Various	PP
24	KenGen	Annual Inspection Reports: Mechanical	2016 2017-18	PP
25	KenGen	Annual Inspection Works Reports	2013 2014-15	PP
26	KenGen	Maintainace procedures and Work instructions	Rev-04	PP
27	KenGen	Annual Reports	2008 2010	PP
28	IPCC	IPCC Guidelines for National Greenhouse Gas Inventories	2006	Others
29	UNFCCC	UN webpage for PA: https://cdm.unfccc.int/Projects/DB/DNV-CUK1276170328.71/view	-	Others
30	KPLC	KPLC dispatch data	2018	PP
31	World Bank	World Bank data catalog https://datacatalog.worldbank.org/dataset/resource/	Last visited 17/03/2020	Others
32	ESPL	PRC Validation Report	Ver. 2.0, Dated 11/08/2020	Others

33	CDM EB	Meeting report: CDM Executive Board 105 th meeting	25 th to 28 th November, 2019, Ver. 01.1	Others
34	KenGen and KPLC	e-mail correspondence between KPLC and KenGen regarding procurement of dispatch data	08/07/2019	PP
35	KenGen	e-mail correspondence between KenGen and ESPL for submission of initial PDD to DOE	10/07/2019	Others
36	Sinclair Knight Merz Ltd.	Commissioning certificate for unit 1 and unit 2	December, 2004	PP
37	Ministry of Energy and Petroleum	Development of a Power Generation and Transmission Master Plan, Kenya	28/11/2016	PP

Appendix 4. Clarification requests, corrective action requests and forward action requests

Table 1. Remaining FAR from validation or previous verifications

FAR ID	00	Section no.	NA	Date : DD/MM/YYYY
Description of FAR				
XX				
Project participant response				Date : DD/MM/YYYY
XX				
Documentation provided by project participant				
XX				
DOE assessment				Date: DD/MM/YYYY
XX				

Table 2. CL from this verification

CL ID	00	Section no.	NA	Date : DD/MM/YYYY
Description of CL				
XX				
Project participant response				Date : DD/MM/YYYY
XX				
Documentation provided by project participant				
XX				
DOE assessment				Date: DD/MM/YYYY
XX				

Table 3. CAR from this verification

CAR ID	01	Section no.	D.1, D.6	Date : 22/07/2019
Description of CAR				
The latest template available on UNFCCC website for CDM-PDD-FORM is Version 11.0 whereas the PDD provided by the PP is in template version 05.0. PP is requested to update the template of PDD.				
Project participant response				Date : 29/07/2019
Revised PDD provided				
Documentation provided by project participant				
Revised PDD provided				
DOE assessment				Date: 05/08/2019

<p>Latest template has now been used as checked from the UN website. The PDD form has not been filled using the template guidelines</p>	
<ol style="list-style-type: none"> Under section A.1, Provide the purpose and a general description of the project activity, including a summary of: <ol style="list-style-type: none"> The technologies/measures to be employed and/or implemented by the project activity; The project boundary; The baseline scenario; The estimates of annual average and total GHG emission reductions for the chosen crediting period. Under section A.3. Describe the technologies/measures to be employed and/or implemented by the project activity, including: <ol style="list-style-type: none"> A list of the facilities, systems and equipment that will be installed and/or modified by the project activity; The types and levels of services (such as the amount of a certain type of cement produced or the amount of electricity fed into the electricity grid) provided by the facilities, systems and equipment and their relation, if any, to other facilities, systems and equipment outside the project boundary; The arrangement of the facilities, systems and equipment; The age and average lifetime of the equipment based on the manufacturer's specifications and industry standards; The installed capacities, load factors and efficiencies; The energy and mass flows and balances of the facilities, systems and equipment, if necessary; The monitoring equipment and their location in the systems Under section C.3.1 For the renewable crediting period type, PP shall indicate whether it is the first, second or third crediting period Under section F PP shall indicate whether each project participant listed in the PDD is authorized by at least one Party involved in the project activity in the respective letter of approval or in a separate authorization letter. 	
Project participant response	Date : 08/09/2019
<ol style="list-style-type: none"> Missing content has been added in section A.1 Text added to section A.3. A statement has been added that it is the second crediting period. Statement added 	
Documentation provided by project participant	
Revised PDD provided	
DOE assessment	Date: 25/09/2019
All revisions made by the PP were found to be in line with the template guidelines and in line with PS for PA. Therefore, the finding is closed.	

CAR ID	02	Section no.	D.2	Date : 05/08/2019
Description of CL				
<p>As para 8 of the applied methodology, "In the case of retrofits, rehabilitations, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, that is to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance"</p> <p>PP shall demonstrate in the PDD under section B.2., if the condition has been fulfilled.</p>				
Project participant response				Date : 08/09/2019
Text revised/added in B.2 and B.4				
Documentation provided by project participant				
Revised PDD provided				
DOE assessment				Date: 25/09/2019
The revision was found to be in line with the applied methodology and the applicability condition is found to be met. Therefore, the finding is closed.				

CAR ID	03	Section no.	D.2	Date : 05/08/2019
Description of CAR				
PP shall clarify if the project power plant is a binary geothermal PP or dry/flash steam geothermal power plant and provide evidence for the same. As per the applied methodology, For dry geothermal power plants, fugitive emissions of CH ₄ and CO ₂ from non-condensable gases contained in geothermal steam shall be considered under PROJECT ACTIVITY and CH ₄ shall not be considered for CO ₂ emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants. However, under section B.3. PP has not followed the requirements of applied methodology.				
Project participant response				Date : 08/09/2019
Statement added on the type of power plant (dry/flash) and emission sources in the baseline and project have been updated.				
Documentation provided by project participant				
Revised PDD provided				
DOE assessment				Date: 25/09/2019
All revisions now clearly demonstrate that the power plant is a dry/flash unit and the PDD was found to be in line with the applied methodology for the given technology. Therefore, the finding is closed.				

CAR ID	04	Section no.	D.3	Date : 05/08/2019
Description of CAR				
<p>1. As per para 59 of ACM0002 v 19.0 Project participants shall refer to "TOOL11: Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period". Therefore, PP shall demonstrate the validity of original baseline under section B.4.</p> <p>2. As per para 284 of PS for PA v 2.0, The project participants shall assess and incorporate the impact of national and/or sectoral policies and circumstances, existing at the time of requesting renewal of crediting period on the current baseline GHG emissions, without reassessing the baseline scenario.</p>				
Project participant response				Date : 08/09/2019
<p>1. Added text as per requirement of TOOL11</p> <p>2. Statement added on current regulations/policies</p>				
Documentation provided by project participant				
Revised PDD provided				
DOE assessment				Date: 25/09/2019
The current baseline has been assessed in line with TOOL 11. However, it was found during the assessment by validation team that a new national energy policy has come in to place since the validation of project activity. Other policies like Least Cost Power Development Plan (2011) were also found. PP is requested to assess compliance of the project with all such related national/sectoral policies which can impact the current baseline. Open				
Project participant response				Date : 02/10/2019
Text has been expanded to include consideration of low cost power development plan and new national energy policy.				
Documentation provided by project participant				
Revised PDD provided				
DOE assessment				Date: 17/10/2019
The PDD was found to be appropriately revised by assessing the baseline against national and sectoral policies that have come up in Kenya since the registration of PA. Therefore, the PA was found to be in compliance with tool 11 and therefore, the finding is closed.				

CAR ID	05	Section no.	D.5	Date : 05/08/2019
Description of CAR				
<p>Ex-ante Parameters:</p> <ol style="list-style-type: none"> 1. PP shall transparently present the calculation of EFgrid,BM,y in the ER sheet. 2. For Parameter GWPC_{H4}, Latest value applicable for the current crediting period must be applied 3. For parameter DATE_{baseline/retrofit}: As per 54 para of ACM0002 v 19. project participants may take into account the typical average technical lifetime of the type equipment, which shall be determined and documented as per "TOOL10: Tool to determine the remaining lifetime of equipment". It is not clear how PP has determined the value of the parameter Year 2025. 				
Project participant response				Date : 08/09/2019
<ol style="list-style-type: none"> 1. Grid emission and ER worksheet provided. 2. Value for the global warming emission potential of methane has been updated. 3. TOOL10 has been followed and evidence for lifetime provided. 				
Documentation provided by project participant				
Revised PDD ER sheet provided				
DOE assessment				Date: 25/09/2019
<ol style="list-style-type: none"> 1. Grid emission sheet was assessed by the validation team. However, source of some values could not be traced (please see the comments in sheet). Open 2. Latest applicable value has been used. This finding is closed. 3. PP is requested to demonstrate the usage of TOOL 10 in the PDD as well. Open 				
Project participant response				Date : 02/10/2019
<ol style="list-style-type: none"> 1. Comments have been addressed and source of values provided. 2. OK. 3. TOOL 10 has been applied showing that the criteria to use option a) of the tool are met. 				
Documentation provided by project participant				
Revised PDD provided				
DOE assessment				Date: 17/10/2019
<ol style="list-style-type: none"> 1. All values were traced back to the sources with the new sources provided. The finding is closed. 3. It's now clear that PA equipment lifetime calculation is in line with methodological tool10: Tool to determine the remaining lifetime of equipment. The finding is closed. <p>Reopened after TR comments (03/12/2019) Expected year of replacement of equipment as per the approved PDD is 2022. PP is requested to clarify the cause of shift of year of replacement from 2022 to 2025. Open</p>				
Project participant response				Date : 26/02/2020
The lifetime is estimated at 200,000 hours. This is the equivalent of 25.98 years (25years when rounded down). An explanation has been added in the PDD to explain the extension of lifetime. This has been added under a post-registration change to the CPA.				
Documentation provided by project participant				
NA				
DOE assessment				Date: 17/03/2020
The change has been added as a part of the pos-registration changes proposed by PP and accepted by the validation team following PS for PA and VVS for PA ver 2.0 in PRC validation report submitted with this RCP request.				

CAR ID	06	Section No.	D.5	Date : 05/08/2019
Description of CAR				

Ex-post Parameters	
<ol style="list-style-type: none"> For the parameter EGfacility,y: EFgrid,OM-DD,y FCi,n,h and FCi,m,y EGn,h and EGm,y EGPJ,h Wsteam,CO2,y Wsteam,CH4,y Msteam,y FCi,j,y <p>The value used for ex-ante estimation shall be justified. The source document of the parameter is also not clearly mentioned in the PDD.</p> <ol style="list-style-type: none"> For parameter Wsteam,CO2,y and Wsteam,CH4,y Under section B.7.1. it is mentioned that Sampling will be performed to correct specifications and re-sampled, should a sample be abnormal. However, no sampling plan has been outlined in the PDD. The calibration frequency is also not mentioned PP shall provide the emission factor calculation sheet. PP shall present the Ex-ante ER calculation in the ER sheet. 	
Project participant response	Date : 08/09/2019
<ol style="list-style-type: none"> Sources for values have been provided. Text has been removed as these values are not sampled. GEF worksheet has been provided ER worksheet has been provided. 	
Documentation provided by project participant	
Revised PDD provided	
DOE assessment	Date: 25/09/2019
<ol style="list-style-type: none"> The source documents have now been mentioned. However, in some cases (listed below) the source document mentioned, or source of the values used for calculation of the parameter is not clear (please see the comments): <ol style="list-style-type: none"> EGfacility,y Wsteam,CO2,y Wsteam,CH4,y Msteam,y PP is requested to provide information about these sources and provide supporting documents for the values being used. Open Since no sampling is to be conducted and the equipment is self-calibrating, the finding is closed. The worksheet has been provided. However, sources of some data in the sheet is not clear (please see the comments in worksheet). Open ER calculations have been provided in ER sheet. However, sources and calculation of some data was not found to be clearly demonstrated (please see the comments in ER sheet). PP is requested to address those comments and link the cells according to the formulae used in order to avoid human error which might occur due to manual entries. Open 	
Project participant response	Date : 02/10/2019
<ol style="list-style-type: none"> Folder with raw data where these values were pulled from have been shared. OK. Comments have been addressed and source of values provided. Comments have been addressed and source of values provided. 	
Documentation provided by project participant	
Revised PDD provided	
DOE assessment	Date: 17/10/2019

1. All raw data was made available to validation and values were traced back to their sources. All values were found to be consistent with the reported values. Therefore, the finding is closed.
3. All source documents was made available to validation and values were traced back to their sources. All values were found to be consistent with the reported values. Therefore, the finding is closed.
4. All source documents was made available to validation and values were traced back to their sources. All values were found to be consistent with the reported values. Therefore, the finding is closed.

Reopened after comments from TR (03/12/2019)

1. The monitored parameters were found to be calculated using plant data from 2017. PP shall explain why the assumptions for these parameters have been updated:

- a) $EG_{facility,y}$:
 - b) $W_{steam,CO2,y}$
 - c) $W_{steam,CH4,y}$
 - d) $M_{steam,y}$
 - e) $FC_{i,j,y}$
- Open

3. As per Tool 7: 'Tool to calculate the emission factor for an electricity system' para 72 (a), "For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE".

PP is requested to clarify which data was used for calculation of parameter $EF_{grid,BM,y}$ and also clarify if the applied values were the latest available at the time of submission of renewal request to the DOE. Open

Project participant response

Date : 03/12/2019

1. Some monitored parameter values have been reverted to original values and power generation is based on plant capacity.

3. Electricity generation data from 2018 was used. This is the most recent available data at the time of submission. A statement to this effect has been added in the PDD.

Documentation provided by project participant

DOE assessment

Date: 16/12/2019

1. Values for the above listed monitored parameters were found to be reverted to their original values in line with PS for PA requirements for PRC. The values were found to be consistent with the revised approved PDD (for first crediting period) ver 8.0 and therefore, the finding is closed.

3. The usage of electricity generation data from 2018 for calculation of emission factor was found to be in line with TOOL07 because this was the latest data available at the time of submission for request for RCP. Closed

Table 4. FAR from this verification

FAR ID	XX	Section No.	Date : DD/MM/YYYY
Description of FAR			
XX			
Project participant response			Date : DD/MM/YYYY
XX			
Documentation provided by project participant			
XX			
DOE assessment			Date: DD/MM/YYYY
XX			

- - - - -

Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
03.0	31 May 2019	Revision to: <ul style="list-style-type: none">• Ensure consistency with version 02.0 of the “CDM validation and verification standard for project activities” (CDM-EB93-A05-STAN) and version 02.0 of the “CDM project cycle procedure for project activities” (CDM-EB93-A06-PROC);• Make editorial improvements.
02.0	31 October 2017	Revision to align with the requirements of the “CDM validation and verification standard for project activities” (version 01.0).
01.0	23 March 2015	Initial publication.
Decision Class: Regulatory Document Type: Form Business Function: Renewal of crediting period Keywords: crediting period, project activities, validation report		