




**Validation report form for post-registration changes for  
CDM project activities  
(Version 03.0)**

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

**BASIC INFORMATION**

<b>Title and UNFCCC reference number of the project activity</b>	Olkaria IV Geothermal Project UNFCCC ref. no: 8646
<b>Process track</b>	<input type="checkbox"/> Prior approval <input checked="" type="checkbox"/> Issuance <input type="checkbox"/> Renewal of crediting period
<b>Version number of the validation report</b>	3
<b>Completion date of the validation report</b>	07/06/2021
<b>Type(s) of PRCs</b>	<input checked="" type="checkbox"/> Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents <sup>1</sup> <input checked="" type="checkbox"/> Corrections <input type="checkbox"/> Changes to the start date of the crediting period <input type="checkbox"/> Inclusion of a monitoring plan <input checked="" type="checkbox"/> Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines or other methodological regulatory documents <input checked="" type="checkbox"/> Changes to the project design <input type="checkbox"/> Changes specific to afforestation and reforestation project activities
<b>Version number of PDD to which this report applies</b>	PDD v4
<b>Project participants</b>	Kenya Electricity Generating Company Limited
<b>Host Party</b>	Kenya
<b>Applied methodologies and standardized baselines</b>	ACM0002 ver. 13.0.0 - Consolidated baseline methodology for grid-connected electricity generation from renewable sources
<b>Mandatory sectoral scopes</b>	1: Energy industries (renewable - / non-renewable sources)
<b>Conditional sectoral scopes, if applicable</b>	Not applicable

<sup>1</sup> 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).

<b>Name and UNFCCC reference number of the DOE</b>	AENOR INTERNACIONAL S.A.U Reference number: E-0021
<b>Name, position and signature of the approver of the validation report</b>	  José Luis Fuentes Climate Change Manager

## SECTION A. Executive summary

AENOR INTERNACIONAL S.A.U (AENOR) has performed the validation of the Post Registration Changes of the project "Olkaria IV Geothermal Project" (Registration Ref. N° 8646).

The project activity is a greenfield renewable energy project which utilises steam collected from geothermal wells for electricity generation. The renewable energy generated by the project is sold under a Power Purchase Agreement to the Kenya Power and Lighting Company (KPLC). The project activity reduces CO2 emission through the displacement of electricity generated by fossil fuel fired power plants connected to the national grid. During the site visit, the assessment team verified that the project activity was fully implemented and operating since 01/09/2014.

The purpose of the proposed project activity (Olkaria IV Geothermal Project, also known as Olkaria Domes) is to build and operate, a 140 MW generation capacity project, a greenfield geothermal power plant capable of exporting 1,128,288 MWh of clean electricity per year to the Kenya national grid. The electricity exported to the grid will displace the fossil fuel intensive electricity from the Kenya national grid.

The proposed project site is located in the Hell's Gate National Park, approximately 132km northwest of Nairobi, near Naivasha Town on the floor of the southern segment of Kenya's Rift Valley.

AENOR validated that proposed changes comply with the relevant requirements of the CDM PS version 02.0, i.e, that in accordance with paragraphs 228 and 229 the project participant has identified and documented any actual or proposed changes to the operation, implementation or monitoring of the registered CDM project activity.

The project participant has prepared a revised PDD (in both track-change and clean versions) that reflects the actual or proposed changes, using the valid version of the applicable PDD form.

The post-registration changes submitted with the request for issuance are a temporary deviation, corrections, permanent changes of the registered monitoring plan and changes to the project design, all these changes are in accordance with the CDM PS, paragraph 231, 232, 238, 240 accordingly.

For post-registration changes to the registered CDM project activity, the issuance track is used in accordance with paragraph 247 (b) of the CDM PS. AENOR has performed the verification for the next request for issuance of CERs and also has assessed whether the post-registration changes comply with the relevant requirements.

On 20th May 2021, we received an incompleteness for this project activity, the following issues were detected:

1: The validation report shall determine whether the project participants proposed alternative monitoring arrangements or applied the most conservative values approach referred to in the PS for the non-conforming monitoring period.

Issue: Further information and justification is required regarding the appropriateness and the conservativeness of the proposed approach applied during the temporary deviation period. It is noted that the required "quarterly" sampling of W(steam, co2) and W(steam, CH4) have been established consistently through the averaging of the sampling values collected by analyzers at each of the production wells on various sampling dates whereas it is observed that during the temporary deviation period, the highest values identified during the monitoring period were applied only once to one well (instead of to all the operating wells) in Q1 2015 and the value has not been applied to any wells in Q3 2015 before calculating the average value for 2015 as "most conservative". Please refer to the worksheet "project emissions", spreadsheet "ER Olkaria IV-V03".

Please see section D.2. for the response of AENOR.

2: The validation report shall contain an assessment regarding whether the changes would adversely affect the conclusion of the validation report in respect of:

- (a) the applicability and application of the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents with which the project activity has been registered;
- (b) the project boundary and any associated leakages due to the changes;
- (c) the compliance of the monitoring plan with the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents;
- (d) the level of accuracy and completeness of the monitoring compared with the requirements contained in the registered monitoring plan;
- (e) the additionality of the project activity; and
- (f) the scale of the project activity.

Issue: It is observed that the the design capacity of each turbo generators has been revised to 74.924 MWh as compared to 70MW in the original PDD, and the overall capacity of project has been revised to 149.848 MW as compared to 140 MW in the original PDD. In addition, the number of production wells have changed from 33 to 21. The DOE should provide information regarding how it has assessed the impact on additionality of the project activity due to any potential difference in capital expenses caused by the change, if any, and potential change to the O&M costs because of significantly smaller number of production wells being put in operation. Kindly please provide the relevant information and validation assessment on these aspects.

Please see section D.7. for the response of AENOR.

The scope of the validation process is to determine that the proposed post-registration changes to the registered CDM project activity comply with the relevant CDM rules and requirements and to submit a request for approval of changes together with the submission of the request for issuance of CERs in accordance with relevant requirements in the "CDM project cycle procedure for project activities".

Furthermore, AENOR, as it is demonstrated below has validated through evidence provided and cross-checks with registered information that the PP has correctly revised the PDD to reflect the proposed changes and they are in compliance with the requirements in the CDM PS, applicable methodology and associated tools and guidelines.

## 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	Interviews	Validation findings
1.	Team Leader (up to May 2020)	IR	Pellitero Martinez	Marcelino	AENOR	Yes	Yes	Yes	Yes
2.	Team Leader	IR	Llorente	Elena	AENOR	Yes	No	No	Yes

	(from May 2020 onwards)								
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## B.2. Technical reviewer and approver of the validation report on PRCs

No.	Role	Type of resource	Last name	First name	Affiliation (e.g. name of central or other office of DOE or outsourced entity)
	Technical reviewer	IR	Arribas Alonso	Luis Javier	AENOR
1.	Approver	IR	Fuentes Perez	Jose Luis	AENOR

## SECTION C. Means of validation

### C.1. Desk/document review

The assessment of post registration changes consisted of the following steps:

- Appointment of team members and technical reviewers
- A desk review of the registered and revised PDD/14/ submitted by the client and additional supporting documents
- Background investigation and follow-up interviews with personnel of the project developer and its contractors,
- Resolution of corrective actions (CARs / CLs)
- Final reporting
- Technical review
- Final approval.

A complete list of all documents reviewed is attached in Appendix 3 of this report.

### C.2. On-site inspection

Duration of on-site inspection: 18/11/2019 to 18/11/2019				
No.	Activity performed on-site	Site location	Date	Team member
1.	Initial meeting: <ul style="list-style-type: none"> <li>• Confirmation of the on-site visit planning.</li> <li>• Clarifications related to monitoring procedures</li> </ul>	Nairobi/KENGEN Headquarters	18/11/2019	Marcelino Pellitero
2.	<ul style="list-style-type: none"> <li>• Verification of project design against registered PDD.</li> <li>• Review of operating and measurement records.</li> <li>• Generation data validation</li> <li>• Estimates and assumptions for determining GHG data</li> </ul>	Olkaria IV Power Plant	18/11/2019	Marcelino Pellitero

	<ul style="list-style-type: none"> <li>• Controls established to detect and correct any error or omission in monitoring parameters</li> <li>• Testing of monitoring equipment and observation of monitoring practices</li> <li>• Calibration of official meters</li> <li>• Running of specific checks and trials on data sources and data management practices where risks are detected</li> <li>• Interviews with data providers and process engineers/technicians</li> </ul>			
3.	Final meeting: <ul style="list-style-type: none"> <li>• Summary of findings detected during the onsite visit</li> </ul>	Olkaria IV Power Plant	18/11/2019	Marcelino Pellitero

### C.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Were	Joshua	KenGen/ Environment and CDM Manager	18/11/2019	Confirmation of the on-site visit planning.  Clarifications related to monitoring procedures	Marcelino Pellitero
2.	Metto	James	KenGen/ Environment & CDM	18/11/2019	Review MR, ER calculation, site inspection, documents and Reporting  PDD/MR//FARs from validation  Information flow, data recording and responsibility	Marcelino Pellitero
3.	Kirakou	Stanley	KenGen/CD M	18/11/2019	Review MR, ER calculation, site inspection, documents and Reporting  PDD/MR//FARs from validation	Marcelino Pellitero

					Information flow, data recording and responsibility	
4.	Mbogo	Jane	KenGen/ Safety and Quality Engineer	18/11/2019	Review MR, ER calculation, site inspection, documents and Reporting  PDD/MR//FARs from validation  Information flow, data recording and responsibility  Da	Marcelino Pellitero
5.	Ndetei	Cornelius J.	KenGen/Env ironmental Scientist	18/11/2019	Plant characteristics (technology, plant capacity, operations)  Metering system and metering equipment  Calibration  Steam field issues	Marcelino Pellitero
6.	Dutta	Bhaskar	CDM Consultant	18/11/2019	Review MR, ER calculation, site inspection, documents and Reporting  PDD/MR//FARs from validation  Information flow, data recording and responsibility	Marcelino Pellitero
7.	Langot	Leonard	Acting Chief Engineer at Olkaria IV	18/11/2019	Plant characteristics (technology, plant capacity, operations)  Metering system and metering equipment  Calibrations  Steam field issues	Marcelino Pellitero

8.	Ouma	Victor	Maintenance Engineer at Olkaria IV	18/11/2019	Plant characteristics (technology, plant capacity, operations)  Metering system and metering equipment  Calibrations  Steam field issues	Marcelino Pellitero
9.	Ndinda	Catherine	KenGen/Lab Analyst	18/11/2019	NCGs sampling and analysis procedures  Sampling frequency  Calculations  Calibrations  Data recording & storage	Marcelino Pellitero

#### C.4. Sampling approach

Not applicable.

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

Areas of validation findings	No. of CL	No. of CAR	No. of FAR
Compliance with PDD form	0	0	0
Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents	0	0	0
Corrections	0	0	0
Changes to the start date of the crediting period	0	0	0
Inclusion of a monitoring plan	0	0	0
Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines or other methodological regulatory documents	0	0	0
Changes to the project design	0	0	0
Changes specific to afforestation and reforestation project activities	0	0	0
Others (please specify)	0	0	0
<b>Total</b>	0	0	0

**SECTION D. Validation findings****D.1. Compliance with PDD form**

<b>Means of validation</b>	The compliance of the PDD with the form was verified crosschecking it against the last version of the PDD form (CDM-PDD-FORM version 11.0) /18/, and Instructions for filling out the PDD form.
<b>Findings</b>	No CARs/CLs/FARs raised in this section.
<b>Conclusion</b>	<p>The PDD was completed in the version 11.0 of the PDD form, latest version valid, Report has been completed using the current version of the format without modifying its font, headings or logo, and without any other alteration to the form.</p> <p>Therefore, in AENOR's opinion the monitoring report was completed using the version 11.0 of the applicable PDD form published by the UNFCCC which is the latest version and has followed the Instructions for filling out the PDD form published by the UNFCCC.</p>

**D.2. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents**

<b>Means of validation</b>	<p>The following temporary deviation for the monitoring period 01/09/2014 to 31/12/2018, is requested in this PRC:</p> <p>-The frequency of sampling for the monitoring parameters, <math>W_{\text{steam,CO}_2,y}</math> and <math>W_{\text{steam,CH}_4,y}</math> is done quarterly in accordance with the registered PDD, but for this monitoring period during the year 2015, only two analysis were made. Therefore, from 01/01/2015 to 31/03/2015 and from 01/07/2015 to 30/09/2015 a conservative maximum value for CH<sub>4</sub> and CO<sub>2</sub> has been applied.</p> <p>The maximum values for the entire monitoring period, for the first and third quarter 2015, have been applied, as a conservative value.</p> <p>AENOR has checked that the Single average values applied in the first quarterly and third quarterly during the temporary deviation period are the highest value for the entire period, hence replicating in all the wells and getting an average will give the same value, this is the reason for using the value assigned to one of the well. To make this clear the value have been moved to the last row in each of the two Quarters that has an average for all the wells (See Row 84 for Q1 &amp; Q3 of ER Sheet "ER Olkaria IV-V04"). On the other hand, the ER sheet has now been revised to include the highest values identified for W(steam, CO<sub>2</sub>) and W(steam, CH<sub>4</sub>) for the entire monitoring period in the third quarter of 2015, Q3 2015, since this value was missing, once the value have been added, the project emissions for the project activity have changed. Therefore, the highest values as identified have been used as the average values for Q1 &amp; Q3 (see row 84 for Q1 &amp; Q3 of ER Sheet "ER Olkaria IV-V04") to enhance conservativeness in the final applied annual W(steam, CO<sub>2</sub>) and W(steam, CH<sub>4</sub>) values in cells Q84 and R84 respectively. Attached is the revised ER Sheet "ER Olkaria IV-V04" and MR.</p> <p>AENOR has checked this information against the KenGen Lab reports 2014-2018 /38/ and the ER Olkaria IV-V04 /3/ and confirms that the maximum value for CH<sub>4</sub> and CO<sub>2</sub> of the monitoring period has been taken for the emission reduction calculation and therefore the calculation is deem conservative.</p>
<b>Findings</b>	No CARs/CLs/FARs raised in this section.
<b>Conclusion</b>	In accordance with paragraph 231 a)of the project standard version 02.0 /10/, AENOR determines that the project participants have applied a conservative

	<p>assumptions to the calculations to the extent required to ensure that GHG emission reductions will not be over-estimated as a result of the deviation.</p> <p>AENOR determines that from 01/01/2015 to 31/03/2015 and from 01/07/2015 to 30/09/2015 the most conservative values have been applied for <math>W_{\text{steam,CO}_2,y}</math> and <math>W_{\text{steam,CH}_4,y}</math>.</p> <p>AENOR, in accordance with paragraph 286 of the VVS version 02.0, states that the deviation complies with the relevant requirements in the "CDM project standard for project activities".</p>
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### D.3. Corrections

<b>Means of validation</b>	<p>The following corrections in the registered PDD are requested in this PRC:</p> <ul style="list-style-type: none"> <li>- <u>Section A.2, location of the project activity</u>, the coordinates of the project have been changed as per Geographic with decimals units and the new coordinates show the actual site with more accuracy.</li> </ul> <p>AENOR has checked this issue against google earth coordinates. Therefore, AENOR considers it correct.</p> <ul style="list-style-type: none"> <li>- <u>Section B.6.2. of the revised PDD <math>GWP_{CH_4}</math></u>, Global warming potential of methane valid for the relevant commitment period, the default value for the second commitment period has been updated to 25 tCO<sub>2</sub>/tCH<sub>4</sub>.</li> </ul> <p>AENOR considers this correct since the value of global warming potential of methane has been considered for this second commitment period. Therefore, since this crediting period falls under the second commitment of the Kyoto protocol, the value of 25 tCO<sub>2</sub>/tCH<sub>4</sub> has been applied, this value is more conservative, since it is used for the project emissions,</p> <ul style="list-style-type: none"> <li>- <u>EF<sub>grid,BM,y</sub></u> (Build margin CO<sub>2</sub> emission factor in year y). It is now included in the PDD section B.6.2., since the BM EF was calculated ex-ante and fixed in the registered PDD. A value of 0.6250 tCO<sub>2</sub>/MWh for the BM has been stated in the revised PDD.</li> </ul> <p>AENOR deems this correct since the BM EF was already a fixed parameter in the registered PDD. AENOR assesses the parameter against the registered PDD /1/.</p> <ul style="list-style-type: none"> <li>- <u>Section B.6.3., ex ante calculation of emission reduction</u> The project proponent chose to neglect the emission from an installed emergency diesel generator as provided by version 13.0.0 of the methodology which states that the use of fossil fuels for the back up or emergency purposes (e.g. diesel generators) can be neglected. This issue is better explained in the revised PDD, the project emissions still being zero.</li> </ul> <p>AENOR checked this issue against the work instruction for standby diesel generator /37/ and during the on site visit. Therefore, the correction in the revised PDD it is considered correct.</p> <ul style="list-style-type: none"> <li>- <u>B.6.4 and C.3.2, Starting date of the crediting period</u> The date of the starting date of the crediting period has been updated to 01/09/2014 as UNFCCC website, since the PP already made a previous notification to UNFCCC Team.</li> </ul> <p>AENOR has checked this issue against the UNFCCC website and the PP email notification and considers it correct.</p>
<b>Findings</b>	No CARs/CLs/FARs raised in this section.
<b>Conclusion</b>	

	<p>In accordance with paragraph 287 of the VVS version 02, AENOR determines that the corrections made by project participants in the revised PDD comply with the relevant requirements in the “CDM project standard for project activities”.</p> <p>The proposed changes in the revised PDD make it a more accurate reflection of the actual situation. The information reported is consistent and accurate.</p> <p>The corrected parameters are in accordance with the applied methodologies, the registered monitoring plan, the applied standardized baselines and the other applied methodological regulatory documents.</p> <p>Hence, AENOR confirms that information is consistent and complete in the revised PDD and spreadsheet calculations.</p>
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#### D.4. Changes to the start date of the crediting period

Means of validation	N/A
Findings	N/A
Conclusion	N/A

#### D.5. Inclusion of a monitoring plan

Means of validation	N/A
Findings	N/A
Conclusion	N/A

#### D.6. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines or other methodological regulatory documents

Means of validation	<p>The proposed permanent changes in the registered PDD are requested in this PRC:</p> <p><u>Section B.7.1. data and parameters to be monitored and Section B.7.3. other elements of the monitoring plan</u></p> <ol style="list-style-type: none"> <li>1. <b><i>EG<sub>facility,y</sub></i></b>, Quantity of net electricity generation supplied by the project plant, the measurement procedure has been changed to include the difference of electricity export and Import from the grid gives the value of net electricity generation supplied by the project plant/unit to the grid. Also, the double check has been updated with the current document that it is used to cross checked. The location and number of electricity meters have been updated in the revised PDD. The four meters, two main and two check meters, are installed after each generator but before the substation to record electricity export and import. All the four meters are located at same point.</li> </ol> <p>AENOR has checked this issue with the Data Capture Sheets for the monitoring period /19/ and the electricity bills /20/. AENOR considers this issue correct since it reflects the actual situation. AENOR after checking this issue during the on-site visit and also with the plant diagram /17/ has considered this change correct, since the location and number of electricity meters do not reduce the level of accuracy of the emission reduction calculation.</p>
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2. The OM EF is calculated ex post, the addition of the monitored parameters in accordance with the tool have been added in the revised PDD, these are the followings: **FC<sub>i,n,h</sub>**, **NCV<sub>i,y</sub>**, **EF<sub>CO2,i,y</sub>**, **EG<sub>n,h</sub>**, **EG<sub>m,y</sub>** and **EG<sub>PJ,h</sub>**,

AENOR has checked this issue against the tool to calculate the emission factor for an electricity system /21/ and also the EF of the OM has been checked against the spreadsheets /32/ /33/ /34/ /35/ /36/. Therefore, AENOR deems the inclusion of the parameters correct.

3. The parameters **W<sub>steam,CO2,y</sub>**, average mass fraction of carbon dioxide in the produced steam in year y and **W<sub>steam,CH4,y</sub>**, average mass fraction of methane in the produced steam in year y, the measuring methods have been updated. The non-condensable gases sampling is carried out at the steam field-power plant interface or at production wells using ASTM Standard Practice E1675 for Sampling 2-Phase Geothermal Fluid/ASTM E947 Standard Specifications for Sampling Single Phase Geothermal Liquid or Steam for Purposes of Chemical Analysis. There are 21 points for sampling, not all of them are available every quarter, therefore in order to be an accurate reflection of actual project operation the sampling will be made at the steam field-power plant interface or at production wells. Also the **W<sub>steam,CO2,y,it</sub>** is determined with the titroprocessor instead of the cromatograph equipment. And the quality assurance has been updated to be accordance with the actual Quality management procedures

AENOR has checked this issue against the ASTM Standard Practice E1675 / ASTM E947 Standard Specifications for Sampling Single Phase Geothermal Liquid or Steam for Purposes of Chemical Analysis (as applicable to sampling single phase steam only) /26//39/ and the methodology ACM0002 /6/ and considers that the change of location of the sampling points do not reduce the level of accuracy of the emission reductions since the sampling points at production wells/at interface plant will be used as double checked the location chose for the monitoring parameters.

Also, the results of the Kengen lab analysis were checked during the onsite visit and the work instructions - Treatment and Preservation of Geothermal samples /22/ and the work Instruction - Water and Steam sampling for Geothermal wells /23/ are consistent in accordance with the requirements stated in the monitoring plan of the revised PDD.

4. **M<sub>Steam,y</sub>**, Quantity of steam produced in year y. The location and number of the venturi flow meters has been updated in the revised PDD. There will be two main steam pipelines with their corresponding venturi meters (measuring main steam consumption) for each unit as well as two auxiliary steam pipelines with their corresponding venture meters(measuring auxiliary steam consumption). Quantity of steam measured by the main venturi meters and the auxiliary meters will be used to determine the quantity of steam produced in year y.

AENOR considers this issue correct since it reflects the actual situation. AENOR after checking this issue during the on-site visit and also with the plant diagram /17/ has considered this change correct, since the location and number of venturi meters do not reduce the level of accuracy of the emission reduction calculation.

AENOR has also reviewed and cross-checked the following documents to validate the proposed changes:

Olkaria IV Steam Consumption data 2014 with auxiliary cons /27/, Olkaria IV Steam Consumption data 2015 with auxiliary cons /28/, Olkaria IV Steam Consumption data 2016 with auxiliary cons/ 29/, Olkaria IV Steam Consumption data 2017 with auxiliary cons /30/, Olkaria IV Steam Consumption data 2018 with auxiliary cons /31/, as well as the monthly generation reports of the plant.

	<p>5. The description of the monitoring system and the organizational chart, responsibility of calculation of the emission reduction have been updated. Also, a new schematic diagram of the metering points has been included to update the metering location of the main monitoring parameters.</p> <p>AENOR has checked the CDM Management Procedure /25/ and KenGen Integrated Management System Manual /24/ in order to check the monitoring procedures and the new organizational chart and also it was checked during the on site visit to the geothermal plant, therefore AENOR deems it correct.</p> <p>6. Appendix 7 of the revised PDD has been updated with the above changes for the monitoring plan.</p> <p>AENOR has checked that the changes of Appendix 7 are in accordance with the changes for section B.7 for the monitoring plan.</p>
<b>Findings</b>	No CARs/CLs/FARs raised in this section.
<b>Conclusion</b>	<p>AENOR deems, in accordance with paragraph 299 of the VVS, that the permanent changes to the registered monitoring plan comply with the relevant requirements in the "CDM project standard for project activities".</p> <p>AENOR determines, in accordance with paragraph 297 of the VVS, that the permanent changes to the registered monitoring plan described in the revised PDD are in compliance with the applied methodologies and the other applied methodological regulatory documents, and do not reduce the level of accuracy of the monitoring compared with the requirements contained in the registered monitoring plan.</p>

## D.7. Changes to the project design

<b>Means of validation</b>	<p>The proposed changes in the registered PDD are requested in this PRC:</p> <p><u>1. Section A.1 and A.3, purpose and general description of the project activity and technologies</u>, The installed capacity the geothermal project consists of two identical turbines and generators of 74.924MW units. Therefore, the total installed capacity of the turbines and generators has been updated in the revised PDD to 149.848 MW, but the geothermal project still has a total generation capacity of 140 MW, as the registered PDD. Also ,the generator transformer capacity has changed from 87,500Kva to 88,500 kVA.</p> <p>AENOR has assessed that the extra capacity of the turbines and generators, does not contribute to any extra revenue since the capacity that is billed is only 140MW as evidenced by the Data Capture Sheets which is an attachment of the electricity sales invoice /19/ which are in accordance to the signed PPA.</p> <p>AENOR has verified that this PPA of the power plant between KenGen and KPLC signed on 28<sup>th</sup> January 2014 /15/ and the Generation License from the industry Regulator (ERC) dated 6<sup>th</sup> December 2012 /16/ is for a capacity generation of 140 MW and therefore AENOR considers this change correct and that it would not affect the additionality of the registered CDM project activity nor the scale of the registered CDM project activity. The accuracy of the emission reduction would not be reduced, nor the methodology applicability conditions.</p> <p>As explained above, the contract for Construction of the power plant required the contractor to deliver a plant with a net dispatch capacity of 140MW, this had been documented in both the PPA between KenGen and KPLC signed on 28th January 2014 before the plant was commissioned the Regulators license as well dated 6th</p>
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	<p>December 2012. The PPA and License to the plant is for a capacity of 140 MW as evidenced by the provided PPA and License from the industry Regulator (ERC). The extra ratings of each turbo generators from 70MWh to 74.924 MWh therefore does not contribute to any extra revenue since the capacity that is billed is only 140MW as evidenced by the sample invoices, there is no financial incentive to generate more that the Contracted Capacity of 140MW . (The PPA Extract &amp; Generating License are submitted along this PRC for references, as confidential versions).</p> <p><u>2. Section A.3, technologies/measures</u>, as explained in section D.6 of this PRC report, the location and number of the electricity meters and the venturi meters have changed. There are four steam pipelines, 2 main pipelines and 2 auxiliary pipelines with steam meters each pipeline. For the electricity meters, these are installed after the generator but before the substation to record electricity export and import. All the four meters are located at same point. Also, the number of production wells has been changed from 33 wells to 21, due to a mistake in the original registered PDD. These modifications have been added to the revised PDD.</p> <p>The registered PDD has inside the numbers of 33 and 26 wells, but these numbers in the PDD were a typo error since the ER estimation calculation were already made at the time for registration for 21 wells, please see the NCG analysis considered 21 wells refer to Appendix 3 – NB - The Wells numbers skips some numbers (Olkaria IV_ ER &amp; Kenyan EF attached), available at CDM website at the time of registration, these are the same number of wells from the beginning of the operations. Secondly, the investment analysis used at Registration has been reviewed and noted that the number of wells were not included, so no changes are needed in the investment analysis, since the PDD has typo errors regarding the number of wells.</p> <p>AENOR has assessed that there is not impact on additionality of the project activity since there is no potential difference in capital expenses caused by the change of the capacity generation nor the smaller number of production wells being put in operation, since it was a typo error in the registered PDD.</p> <p>Therefore, AENOR deems correct that the project has not changed both in capacity and number of wells from the design of the project activity.</p> <p>AENOR after checking this issue during the on site visit and the plant diagram has considered these changes correct. These changes are also explained in section D.6 of this validation PRC report.</p>
<b>Findings</b>	No CARs/CLs/FARs raised in this section.
<b>Conclusion</b>	<p>AENOR deems, in accordance with paragraph 300 of the VVS, that the proposed changes to the project design of the registered CDM project activity comply with the relevant requirements in the “CDM project standard for project activities”.</p> <p>AENOR determines, by means of the on-site inspection and review of the submitted revised PDD by the project participants that the description of the changes accurately reflects the implementation, operation and monitoring of the modified CDM project activity.</p> <p>AENOR, in accordance with paragraph 303 of the VVS and by means of reviewing the revised PDD against applicable additionality and methodological requirements, determines that the proposed changes would not adversely affect the conclusions of the validation report of the registered PDD with regard to:</p> <p>(a) The additionality of the registered CDM project activity;</p> <p>(b) The scale of the registered CDM project activity;</p>

	<p>(c) The applicability and application of the applied methodologies and the applied methodological regulatory documents with which the CDM project activity has been registered;</p> <p>(d) The compliance of the monitoring plan with the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents.</p> <p>AENOR has assessed the impacts of the actual changes on the monitoring plan, the level of accuracy of the monitoring activity, the applied methodologies, the applied standardized baselines and the other applied methodological regulatory documents. Therefore, AENOR confirms that the changes would not impact on the overall operation/ability of the CDM project activity to deliver emission reductions as stated in the PDD.</p> <p>Besides, AENOR considers, in accordance with paragraph 310 (a) of the VVS, that the proposed revisions ensure that the level of accuracy and completeness in the monitoring and verification process is not reduced as a result of the revision.</p>
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#### D.8. Changes specific to afforestation and reforestation project activities

<b>Means of validation</b>	N/A
<b>Findings</b>	N/A
<b>Conclusion</b>	N/A

#### SECTION E. Internal quality control

Following the completion of the assessment process by the validation team, all documentation undergoes an internal quality control through a technical review before submission to the CDM-EB. The technical reviewer is a qualified member of AENOR, independent from the team that carried out the validation of the post registration changes. The technical review team has collectively all the competence required including the technical area(s).

#### SECTION F. Validation opinion

AENOR has performed the validation of the post registration changes of the for the CDM project activity: "Olkaria IV Geothermal Project" (Registration Ref. No. 8646). The validation of the PRC was performed on the basis of UNFCCC criteria and host country criteria, as well as criteria given to provide for consistent project operations, monitoring and reporting.

The validation of the PRC consisted on the on-site visit and desk review of the project design and the baseline and monitoring plan.

This post-registration change is submitted along with the request of issuance of CERs under issuance track in accordance with paragraph 247 (b) of the PS.

AENOR planned and performed its work to obtain the information and explanations considered necessary to provide sufficient evidence to give reasonable assurance that the level of accuracy of GHG emission reductions is not adversely affect. This assessment included:

- Collection of evidence supporting the reported data.
- Checking whether the provisions in the provided documents were consistently and appropriately applied.

AENOR confirms that the proposed changes, do not adversely affect to the additionality of the project, the scale of the project, applicability and application of the methodology and other regulatory documents with which the project was registered.

The proposed PRC to the project activities neither impact the applicability conditions of the methodology and baseline, nor impact the additionality and the scale of the project and the accuracy is not reduced.

Madrid 07 June 2021



Elena Llorente Pérez  
Team leader



José Luis Fuentes  
Authorized person

## Appendix 1. Abbreviations

Abbreviations	Full texts
AENOR	AENOR INTERNACIONAL S.A.U.
ACM0002	"Consolidated baseline methodology for grid-connected electricity generation from renewable sources" version 13.0.0
CAR	Corrective action request
CDM	Clean Development Mechanism
CER	Certified Emission Reduction(s)
CH <sub>4</sub>	Methane
CO <sub>2</sub>	Carbon Dioxide
CO <sub>2</sub> e	Carbon dioxide equivalent
DOE	Designated Operational Entity
ERC	Energy Regulatory Commission
FAR	Forward action request
GHG	Greenhouse Gases
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
KENGEN	Kenya Electricity Generating Company Limited
KPLC	Kenya Power and Lighting Company PLC
MP	Monitoring Plan
MR	Monitoring Report
NCGs	Non-Condensable Gases
PDD	Project Design Document
PP	Project Participant
PPA	Power Purchase Agreement
PRC	Post Registration Changes
tC	Carbon tonnes
tCO <sub>2</sub> e	Carbon dioxide equivalent tonnes
TJ	Tera Joules
UNFCCC	United Nations Framework Convention on Climate Change
VVS	CDM validation and verification standard for project activities version 02.0
PCP	CDM project cycle procedure for project activities version 02.0
PS	CDM project standard for project activities version 02.0

## Appendix 2. Competence of team members and technical reviewers

### CERTIFICATE OF QUALIFICATION

**Subject:** Validation and technical review team for “Olkaria IV Geothermal Project”

Madrid, 07/06/2021

Hereby I confirm the following records of qualification, according with AENOR internal instruction “Validation, Verification and Certification of Clean Development Mechanism (CDM) project activities” IE-DTC-039, and with regard to the validation process of the above mentioned project activity:

Name: Elena Llorente Pérez

CDM team leader: YES


CDM validator: N.A.

CDM verifier: N.A.

CDM Technical reviewer: N.A

External technical expert: N.A.

Technical areas related with the project activity: TA1.2: Renewables



Jose Luis Fuentes  
Climate Change Manager

**CERTIFICATE OF QUALIFICATION**

**Subject:** Validation and technical review team for “Olkaria IV Geothermal Project”

Madrid, 29 May 2020

Hereby I confirm the following records of qualification, according with AENOR internal instruction “Validation, Verification and Certification of Clean Development Mechanism (CDM) project activities” IE-DTC-039, and with regard to the validation process of the above mentioned project activity:

Name: Marcelino Pellitero

CDM team leader: YES

CDM validator: N.A.

CDM verifier: N.A.

CDM Technical reviewer: N.A

External technical expert: N.A.

Technical areas related with the project activity: TA1.2: Renewables

A handwritten signature in blue ink, consisting of a series of loops and a long horizontal stroke.

Jose Luis Fuentes  
Climate Change Manager

## CERTIFICATE OF QUALIFICATION

**Subject:** Validation and technical review team for “Olkaria IV Geothermal Project”

Madrid, 07/06/2021

Hereby I confirm the following records of qualification, according with AENOR internal instruction “Validation, Verification and Certification of Clean Development Mechanism (CDM) project activities” IE-DTC-039, and with regard to the validation process of the above mentioned project activity:

Name: Luis Javier Arribas

CDM team leader: N.A.

CDM validator: N.A.

CDM verifier: N.A

CDM Technical reviewer: Yes

External technical expert: N.A.

Technical areas related with the project activity: TA1.2: Renewables

A handwritten signature in blue ink, consisting of a stylized 'J' and 'F' intertwined.

Jose Luis Fuentes  
Climate Change Manager

## Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
1	KENGEN	Registered PDD version 3, 7/11/2012 Olkaria IV Geothermal Project	<a href="https://cdm.unfccc.int/Projects/DB/JCI1355128868.24/view">https://cdm.unfccc.int/Projects/DB/JCI1355128868.24/view</a>	UNFCCC website
2	KENGEN	MR V04	07/06/2021	KENGEN
3	KENGEN	<i>ER Olkaria IV-V04</i>		KENGEN
4	AENOR	IE-DTC-039 - Validation, verification and certification of clean development mechanism (CDM) project activities.		AENOR
5	UNFCCC	CDM Validation and Verification Standard for project activities version 2.0	<a href="http://cdm.unfccc.int/Reference/Standards/index.html">http://cdm.unfccc.int/Reference/Standards/index.html</a>	UNFCCC website
6	UNFCCC	ACM0002: Consolidated baseline methodology for grid-connected electricity generation from renewable sources – Version 13.0.0	<a href="https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG">https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG</a>	UNFCCC website
7	UNFCCC	Guideline: Application of materiality in verifications	<a href="https://cdm.unfccc.int/Reference/Guidclarif/index.html">https://cdm.unfccc.int/Reference/Guidclarif/index.html</a>	UNFCCC website
8	JCI	Validation report of Olkaria IV Geothermal Project	<a href="https://cdm.unfccc.int/Projects/DB/JCI1355128868.24/view">https://cdm.unfccc.int/Projects/DB/JCI1355128868.24/view</a>	UNFCCC website
9	KENGEN	MR version 01 dated 22/08/2019		KENGEN
10	UNFCCC	CDM project standard for project activities version 2.0	<a href="http://cdm.unfccc.int/Reference/Standards/index.html">http://cdm.unfccc.int/Reference/Standards/index.html</a>	UNFCCC website
11	UNFCCC	CDM project cycle procedure for project activities version 2.0	<a href="https://cdm.unfccc.int/Reference/Procedures/index.html">https://cdm.unfccc.int/Reference/Procedures/index.html</a>	UNFCCC website
12	UNFCCC	Monitoring report form for CDM project activity	<a href="https://cdm.unfccc.int/Reference/PDDs_Forms/index.html">https://cdm.unfccc.int/Reference/PDDs_Forms/index.html</a>	UNFCCC website

No.	Author	Title	References to the document	Provider
13	IPCC	2006 IPCC Guidelines for National Greenhouse Gas Inventories		IPCC
14	KENGEN	Revised PDD, V04	29/09/2020	KENGEN
15	PP	PPA Extract Olkaria IV Power plant – Executed	28/01/2014	PP
16	ERC	Generation license	6/12/2012	PP
17	PP	Diagram line of meters	2020	PP
18	UNFCCC	CDM-PDD-FORM version 11.0		UNFCCC
19	Kengen	Data Capture sheet from 01/09/2014 to 31/12/2018, electricity export	01/09/2014	PP
20	Kengen	Electricity bills from 01/09/2014 to 31/12/2018, electricity imports	01/09/2014	PP
21	UNFCCC	Tool to calculate the emission factor for an electricity system	version 2.2.1.	UNFCCC
22	KenGen	Work Instruction - Treatment and Preservation of Geothermal samples	04/08/017	PP
23	KenGen	Work Instruction - Water and Steam sampling from Geothermal Wells	04/08/017	PP
24	PP	KenGen Integrated Management System Manual - 09 Nov 2017	9/11/2017	PP
25	PP	KenGen - CDM Management Procedure	1/12/2017	PP
26	ASTM International	The ASTM Standard Practice E1675-4 for Sampling 2-Phase Geothermal Fluid for purposes of chemical analysis	2012	PP
27	PP	Olkaria IV Steam Consumption data 2014 with auxiliary cons	2014	PP
28	PP	Olkaria IV Steam Consumption data 2015 with auxiliary cons	2015	PP
29	PP	Olkaria IV Steam Consumption data 2016 with auxiliary cons	2016	PP
30	PP	Olkaria IV Steam Consumption data 2017 with auxiliary cons	2017	PP
31	PP	Olkaria IV Steam Consumption data 2018 with auxiliary cons	2018	PP

No.	Author	Title	References to the document	Provider
32	PP	GEF Olkaria IV 2014 Updated	2014	PP
33	PP	GEF Olkaria IV 2015 Updated	2015	PP
34	PP	GEF Olkaria IV 2016 Updated	2016	PP
35	PP	GEF Olkaria IV 2017 Updated	2017	PP
36	PP	GEF Olkaria IV 2018 Updated	2018	PP
37	PP	Work instruction for standby diesel generator	04-08-2017	PP
38	PP	KenGen Lab reports 2014-2018	2018	PP
39	ASTM International	ASTM E947 Standard Specifications for sampling single phase Geothermal liquid or steam for purposes of Chemical Analysis.	2012	PP

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

Table 1. CLs from this validation

CL ID	xx	Section no.	Date: DD/MM/YYYY
Description of CL			
N/A			
Project participant response			Date: DD/MM/YYYY
N/A			
Documentation provided by project participant			
N/A			
DOE assessment			Date: DD/MM/YYYY
N/A			

Table 2. CARs from this validation

CAR ID	xx	Section no.	Date: DD/MM/YYYY
Description of CAR			
N/A			
Project participant response			Date: DD/MM/YYYY
N/A			
Documentation provided by project participant			
N/A			
DOE assessment			Date: DD/MM/YYYY
N/A			

Table 3. FARs from this validation

FAR ID	xx	Section no.	Date: DD/MM/YYYY
Description of FAR			
N/A			
Project participant response			Date: DD/MM/YYYY
N/A			
Documentation provided by project participant			
N/A			
DOE assessment			Date: DD/MM/YYYY
N/A			

## Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
03.0	31 May 2019	Revision to: <ul style="list-style-type: none"><li>• Ensure consistency with version 02.0 of the “CDM validation and verification standard for programmes of activities” (CDM-EB93-A08-STAN);</li><li>• Make editorial improvements.</li></ul>
02.0	29 December 2017	Revision to align with the requirements of the “CDM validation and verification standard for programme of activities” (version 01.0).
01.0	5 June 2015	Initial publication.

Decision Class: Regulatory  
Document Type: Form  
Business Function: Registration  
Keywords: post-registration change, programme of activities, validation report