Validation report form for post-registration changes for CDM project activities

(Version 01.0)

Complete this form in accordance with the "Attachment: Instructions for filling out the validation report form for post-registration changes for CDM project activities" at the end of this form.

VALIDATION REPORT ON POST-REGISTRATION CHANGES (PRCs)	
Title and reference number of the project activity	San Jacinto Tizate geothermal project
Process track	☒ Prior approval ☐ Issuance ☐ Renewal of crediting period
Version number of the validation report on PRCs	03
Completion date of the validation report on PRCs	28/04/2017
Type(s) of PRCs	☐ Temporary deviations from the registered monitoring plan, monitoring methodology or standardized baseline ☒ Corrections ☐ Changes to the start date of the crediting period ☐ Inclusion of a monitoring plan to a registered project activity ☒ Permanent changes from registered monitoring plan, monitoring methodology or standardized baseline ☒ Changes to the project design of a registered project activity ☐ Types of changes specific to afforestation and reforestation project activities
Version number of PDD to which this report applies	04.0
Project participant(s)	Polaris Energy Nicaragua S.A EcoSecurities Ltd Blues Traveler Environmental Limited
Host Party	Nicaragua

Sectoral scope(s), selected methodology(ies), and where applicable, selected standardized baseline(s)	1
Name of DOE	Spanish Association for Standardization and Certification – AENOR INTERNACIONAL S.A.U.
Name, position and signature of the approver of the validation report on PRCs	 Jose Magro González Authorized person AENOR INTERNACIONAL S.A.U.

SECTION A. Executive summary

The Spanish Association for Standardisation and Certification, AENOR INTERNACIONAL S.A.U, (henceforth AENOR) was contracted to perform the verification for the seventh monitoring period of the project activity "San Jacinto Tizate geothermal project" (Registration Ref. No. 0198).

The Project Activity involves the construction of a Geothermal Power Plant (GPP) in San Jacinto, Nicaragua. The San Jacinto geothermal project is being carried out by Polaris Geothermal Inc. through its Nicaraguan subsidiary, Polaris Energy Nicaragua S.A. (PENSA).

On 19th April 2017, two requests of clarifications regarding the installed capacity of the project activity have been received so the validation opinion has been changed accordingly.

1. The view page has indicated that the Post Registration Change request is applicable for the first crediting period of the project activity (01/06/05-31/05/12). However, the validation opinion of the DOE indicates that the increase in capacity beyond what is described in the registered PDD has happened in the second crediting period.

2. The description of technology employed in the registered PDD for the project activity mentioned that an additional 10 MW of power capacity will be added in the stage-2 of Phase-I of the project. However, the validation opinion for the PRC mentions installation of only 2X5 MW back pressure turbine in Phase-I and a 38.5MW condensing power unit in Phase-II.

This response is for the two clarifications above:

The validation opinion refers to changes occurred during the first crediting period running from 1 July 2005 to 31 May 2012 but for the sake of transparency we provide information about the installed capacity of the project at the present moment.

Considering the proposed changes, the installed capacity of the project activity changes from 66 MW in the registered PDD to 48.5 MW in the first crediting period. This involves that the electricity generation has been reduced to 146,996 MWh instead of 532,000 MWh from the registered PDD.

Table below summaries these changes comparing the information in the registered PDD and information in the revised PDD for the first crediting period.

PDD registered:

Dates	End 1st quarter 2006		From mid 2007
Project phase	Phase 1		Phase 2
Stage	Stage 1	Stage 2	-
Installed Capacity	2x5 MW	10 MW	1x 46 MW
Technology	Back Pressure	Turbo generator	Condensing Turbine
Total capacity installed	20 MW		66 MW

Revised PDD:

	1st Crediting period		2nd Crediting period			
Dates	From 01/06/2005 to 31/05/2012		From 31/05/2012 until 08/02/2013		From 08/02/2013	
Project Phase/Stage	Phase 1	Phase 2/ Stage1	Phase 1	Phase 2/ Stage1	Phase 2/ Stage1	Phase 2/ Stage 2
Installed Capacity	10 MW	38.5 MW	10 MW	38.5 MW	38.5 MW	38.5 MW
Technology	Back Pressure	Condensing Turbine	Back Pressure	Condensing Turbine	Condensing Turbine	Condensing Turbine
Total capacity installed	48.5 MW		48.5 MW		77 MW	

Therefore, it was scheduled an installed capacity of 66 MW in the registered PDD for the first crediting period but really installed 48.5 MW, at the end of this first period.

During the on-site visit, some changes in the project description, and changes to the monitoring plan were identified by the audit team. In accordance with paragraph 267 of the CDM Project Standard version 09.0, the project participant shall identify and document any actual or proposed changes to the operation, implementation and/or monitoring of the registered CDM project activity taking into account the types of changes described in appendix 1, which describes the types of changes that do not require prior approval by the Board. This validation report has been prepared in order to evaluate and assess all the changes detected.

The list of the changes is detailed below:

- Permanent changes
    - Parameter Msy “Quantity of steam that produced during the year y”
    - Parameters WMain,CO_2 “Mass fraction of CO_2 in the produced steam” and WMain,CH_4 “Mass fraction of methane in produced steam”
    - Parameter Mt,y, Wt,CO_2, Wt,CH_4
    - Parameter:EGy
    - Parameters: Fi,y, NCVi,y and EFco_2,I,y
    - Changes to the Operational and quality assurance procedures
    - Change to the installed capacity of the project activity and electricity generation.
- Corrections:
    - Change of the names of the project participants in accordance with the notifications made to the UNFCCC.

Therefore, taking in consideration the different nature of the changes required (with and without prior approval by the Board), and in accordance with paragraph 157 of the PCP version 09, AENOR has combined the changes into just one request for approval. This validation report contains the description of the post registration changes, including their nature, extent of the non-conforming monitoring and the proposed alternative monitoring of the project activity, as well as any other complementary information required by the latest versions of the PCP, PS and VVS.

AENOR confirms that:

- The transfer of information from the old form of the PDD registered (F-CDM-PDD version 02) into the new form under VVS track (F-CDM-PDD Version 08.0) is totally correct and materially the same.

- The proposed revision points have been described, and an assessment has been provided to substantiate the reason for each of the proposed revision points of the revised PDD using objective evidences.

- The changes regarding the monitoring of several parameters are necessary to ensure a conservative monitoring and a realistic approach. They are in accordance with the approved consolidated methodology applicable to the project activity and they ensure the conservativeness of the emission reductions calculation.

For all the reasons stated above, it is AENOR opinion that prior approval by the Board is necessary for these post registration changes and therefore AENOR is submitting the post registration changes for acceptance by the Board including following documents:

- Revised PDD clean – version 04.

- Revised PDD with tracked changes – version 04.

- Validation report of the Post Registration of changes – version 02.

- Investment Analysis San Jacinto-Tizate

- Spreadsheet calculation

SECTION B. Validation team, technical reviewer and approver

The list of involved personnel and the qualification status are summarised in the table below.

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 review	On-site inspection	Interview(s)	Validation findings
1.	Team Leader	IR	LLORENTE PÉREZ	Elena	AENOR	√	√	√	√
2.	Validator	IR	MEDRANO GUTIERREZ	Alfonso	AENOR	√	√	√	√

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)
1.	Technical reviewer	IR	GESTO VILACOBA	Jose Antonio	AENOR
3	Approver	IR	MAGRO GONZÁLEZ	Jose	AENOR

SECTION C. Means of validation

C.1. Desk review

The scope of the desk review process is to assess all changes from the project activity as described in the revised project design document, including their negative impact on the estimates of the emissions reductions, the level of accuracy of the monitoring activity, the additionality or scale of the project and the applicability and application of approved methodologies.

The following documents were reviewed as part of the scope of the activity:

- PDD /1/ and monitoring plan registered
- ACM0002 “Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources”, version 04/2/.
- Spreadsheet calculation /3/.
- CDM Validation and Verification Standard, version 09.0 /4/.
- Clean Development Mechanism Project Cycle Procedure, version 09.0 /5/.
- Clean Development Mechanism Project Standard, version 09.0 /6/.
- Associated documentation (design documentation, manufacturer documentation, internal procedures, etc)
- Relevant decisions, clarifications and guidance from the CMP and the CDM Executive Board.
- The applied monitoring methodology, paying close attention to the frequency of measurements, the quality of metering equipment and the quality assurance and quality control procedures.
- The data and information presented to verify their completeness, including the monitoring report and the measuring records of the different monitored parameters.
- The influence of data management and the quality assurance and quality control system on the generation and reporting of emission reductions.

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: 2012-01-27- 2012-01-30				
No.	**Activity performed on-site**	**Site location**	**Date**	**Team member**
1	Verification of all facilities and installed capacity of San Jacinto Tizate Geothermal Project. Review of operating and measurement records. Testing of electricity meters and observation of monitoring practices Generation data validation Calibration of official meters. Running of specific checks and trials on data sources and data management practices where risks are detected Estimates and assumptions for determining GHG data Controls established to detect and correct any inconsistency in monitoring parameters Internal audit and non-conformance procedure	San Jacinto Tizate Geothermal Project Power plant	2012-01-27-29	Alfonso MEDRANO GUTIERREZ Elena LLORENTE PÉREZ
2	A review of information flows for generating, aggregating and reporting the monitoring parameters. A cross-check between information provided in the Monitoring Report and data from data base. A check of the monitoring practices against the requirements of the PDD and the selected methodology. A review of calculations and assumptions made in determining the GHG data and emission reductions. An identification of quality control and quality assurance procedures in place to prevent or identify and correct any errors or omissions in the reported monitoring parameters. Interviews with relevant personnel of Polaris to confirm that the operational and data collection procedures are implemented. An assessment of the implementation and operation of the project activity as per the registered PDD. Documentation provided to close CAR/CLs of the verification protocol	San Jacinto Tizate Geothermal Project Power plant	30-01-2012	Alfonso MEDRANO GUTIERREZ Elena LLORENTE PÉREZ

C.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	ARGUELLO	Alejandro	Corporate Development Manager Polaris Energy Nicaragua S.A.	2012-01-27 30-01-2012	Assessment of the implementation and operation of the project activity as per the registered PDD.	Alfonso MEDRANO GUTIERREZ Elena LLORENTE PÉREZ
2	ESCALANTE	Juan	Plant Manager Polaris Energy Nicaragua S.A.	2012-01-27 30-01-2012	Monitoring practise	Alfonso MEDRANO GUTIERREZ Elena LLORENTE PÉREZ
3	RUIZ	Diogenes	Environmental Manager Polaris Energy Nicaragua S.A.	2012-01-27 30-01-2012	Assessment of the implementation and operation of the project activity as per the registered PDD. Monitoring practise	Alfonso MEDRANO GUTIERREZ Elena LLORENTE PÉREZ

C.4. Clarification requests, corrective action requests and forward action requests raised

Areas of validation findings	No. of CL	No. of CAR	No. of FAR
Compliance with PDD form			
Temporary deviations from the registered monitoring plan, monitoring methodology or standardized baseline			
Corrections			
Changes to the start date of the crediting period			
Inclusion of a monitoring plan to a registered project activity			
Permanent changes from registered monitoring plan, monitoring methodology or standardized baseline			
Changes to the project design of a registered project activity		CAR1	
Types of changes specific to afforestation and reforestation project activities			
Others (please specify)			
Total		1	

SECTION D. Validation findings

D.1. Compliance with PDD form

Means of validation	During desk review process, the compliance of the revised PDD (both in tracked-change and clean versions) with the valid version of the applicable PDD form and the *Instructions for filling out the PDD form* was checked. The project participant has used the latest version of the PDD form for the revised PDD. All sections, titles, tables, have been revised and crosschecked against the *Instructions for filling out the validation report form for post-registration changes for CDM project activities* /9/ and they were correct.
Findings	No finding has been detected regarding the use of the new form.
Conclusion	The proposed revised PDD has adopted the Project Design Document Form for CDM Project of Activities (CDM-PDD-FORM) Version 08.0. AENOR has assessed the information included comparing with which was included in the registered PDD (CDM-PDD version 02) due to the fact that it was registered under the previous regulatory framework (VVM track). Once compared both versions, it is AENOR opinion that the information included in the new form is materially the same as the information in the registered PDD. The changes that are the subject of the request for approval have been highlighted.

D.2. Temporary deviations from the registered monitoring plan, monitoring methodology or standardized baseline

Means of validation	Not applicable
Findings	Not applicable
Conclusion	Not applicable

D.3. Corrections

Means of validation	The corrections requested consist of: **1. Change of the project participant in accordance with the notification made to the UNFCCC. Polaris Energy Nicaragua S.A is used in the PDD to replace San Jacinto Power SA.** At the time of registration, Polaris Energy Nicaragua S.A was known as San Jacinto Power SA. The project entity's name is now Polaris Energy Nicaragua S.A. The change does not impact project legal terms and implementation. **2. Change of the project participant in accordance with the notification made to the UNFCCC. Blues Traveler Environmental Limited is used in the PDD to replace Standard Bank Plc.** The list of project participants included in the new revised PDD is consistent with list included in the UNFCCC webpage and supported with written approvals /8/ and authorizations /9/ of all the DNAs involved in the project activity and checked by the audit team. All this information is considered appropriate and consistent by the audit

	team.
Findings	No finding have been detected here
Conclusion	It is confirmed by the audit team that the information regarding the project participants included in the revised PDD is consistent with letters of Approval and information hosted in the UNFCCC website.

D.4. Changes to the start date of the crediting period

Means of validation	Not applicable
Findings	Not applicable
Conclusion	Not applicable

D.5. Inclusion of a monitoring plan to a registered project activity

Means of validation	Not applicable
Findings	Not applicable
Conclusion	Not applicable

D.6. Permanent changes from registered monitoring plan, monitoring methodology or standardized baseline

Means of validation	There are required six permanent changes: 1. ***Permanent change parameter Msy "Quantity of steam that produced during the year y"*** The parameter Msy "Quantity of steam that produced during the year y" has changed the description of the measurement method in order to be more precise. The quantity of steam is measured at the steam field-power plant interface. More information has been added in the table of the parameter in order to be more precise with the real situation. Since the form of the PDD has been updated the following columns have been added with respect to version 02 of the PDD form: description, value applied, measurement method, QA/QC procedures and additional comment. 2. ***Permanent changes for the parameters WMain,CO2 "Mass fraction of CO2 in the produced steam" and WMain,CH4 "Mass fraction of methane in produced steam"*** For the parameters $WMain,CO_2$ "Mass fraction of CO_2 in the produced steam" and $WMain,CH_4$ "Mass fraction of methane in produced steam" the following changes are requested: The sampling of the average mass fraction of carbon dioxide and methane in the produced steam will be conducted only at the steam field-power power plant and cannot be conducted in the productions wells, as it has been doing the project since 1 June 2005 and verified for six monitoring periods. Therefore, the non-condensable gases sampling is carried out at the point just inside the project boundary. The steam flow measurement is an indirect measurement achieved by

	the pressure difference (DP) created by an orifice plate. This pressure difference is measured by the differential pressure transmitter which in turn calculates the steam flow. They are located at the discharge outlet of each Unit's stream scrubbers. Therefore, for this project activity the sampling of the Wmain,$C0_2$ and Wmain,CH_4 parameters are carried out twice. This change in the parameters it is requested in order to be more accurate with the present situation. On the other hand, the descriptions, the source of data, values applied of the parameters have been updated to be in accordance with the new PDD form version 08.0. ***3. <u>Permanent changes to the parameter Mt,y, Wt,CO2, Wt,CH4</u>*** The parameters "Quantity of steam generated during well testing", Mt,y, "fraction of CO_2 in steam during well testing", "Wt,CO_2, fraction of CH_4 in steam during well testing", "Wt,CH_4" will be deleted since it is not used in the emission reduction calculations. ***4. <u>Permanent change to the parameter:EGy</u>*** For the parameter EGy "Net electricity supplied to the grid by the project activity in year y" the following changes are requested: More information has been added in the table of the parameter in order to be more precise with the real situation. Since the form of the PDD has been updated the following columns have been added with respect to version 02 of the PDD form: description, value applied, measurement method, QA/QC procedures and additional comment. ***5. <u>Permanent Changes to the parameters: Fi,y, NCVi,y and EFco$_2$,i,y</u>*** The parameters $F_{i,y}$ "Amount of fossil fuel type i used for the operation of the geothermal plant in year y", $NCV_{i,y}$, Net calorific value (energy content) of fuel type i in year y , and $EF_{CO2,i,y}$"CO2e emission factor of fuel type i in year y" have been added in the monitoring plan, since aback up diesel generator was bought in March 2011, therefore the carbon dioxide emissions from fossil fuel combustion ($PEFF_y$) have been added in the emission reduction calculation of the project activity. These parameters are used to calculate the CO2 emissions from combustion of diesel fuel related to the operation of the geothermal power plant and it shall be monitored in accordance with the "Tool to calculate project or leakage CO2 emissions from fossil fuel combustion". ***6. <u>Permanent Changes to the Operational and quality assurance procedures</u>*** Appendix 5, further background information on monitoring plan, has been updated to be in accordance with the changes requested above. The operational procedures and quality assurance responsibilities have also been improved in order to be more accurate with the present situation. These are the changes requested: - The laboratory responsible for the analysis of fraction of CH_4 and CO_2 in

	steam will be a “certified laboratory” instead of “LaGeo, S.A. de C.V” The proposed change of the monitoring plan has been carried out to improve the description of the monitoring plan with clearer information and now a detailed and real description of the project staff responsibilities for implementing the operation and maintenance procedures have been included.
Findings	No finding have been detected here
Conclusion	***1. Permanent change parameter Msy “Quantity of steam that produced during the year y”*** The revision included in the parameter Msy has been made in order to be more accurate with the actual situation. Therefore, AENOR certifies that the changes requested are in accordance with the methodology ACM0002 version 04 page 17 and 20 and paragraph 312 and 313 of the VVS. ***2. Permanent changes for the parameters WMain,CO2 “Mass fraction of CO2 in the produced steam” and WMain,CH4 “Mass fraction of methane in produced steam”*** AENOR has assessed that San Jacinto Tizate geothermal project has been verified for six monitoring periods and it is operating the same way than it was for the previous monitoring periods. Besides, AENOR has assessed other registered geothermal projects and has found that “Darajat Unit III Geothermal Project” (Ref 0673) verified for eight monitoring periods, “Lahendong II-20 MW Geothermal Project” (Ref. 2876) verified for three monitoring periods and Amatitlan Geothermal Project verified for three monitoring periods (Ref. 2022) are operating the same way than San Jacinto Tizate geothermal project has been doing since June 2005, therefore the sampling of NCG it is made at the steam-field-power plant interface following note 2, page 20 of the methodology. AENOR has assessed that this change is made in accordance with the methodology ACM0002 version 4 page 10, 18 and 20 and with the geothermal registered projects in Nicaragua, Guatemala and Indonesia at UNFCCC website. The non-condensable gases sampling is carried out at the steam field-power plant interface (before and after Steam Scrubber) and the frequency of sampling it is made in accordance with the methodology ACM0002 version 04, page 18 and paragraph 312 of VVS, and in the same way of other registered geothermal projects published at UNFCCC website. AENOR certifies that these changes comply with the methodology ACM0002 version 04, page 10, 18 and 20 and paragraph 312 and 313 of VVS. ***3. Permanent changes to the parameter Mt,y, Wt,CO2, Wt,CH4*** These parameters, Quantity of steam generated during well testing”, Mt,y, “fraction of CO2 in steam during well testing”, Wt,CO2, fraction of CO2 in steam during well testing, Wt,CH4 are not required as fugitive carbon dioxide and methane emissions due to well testing and well bleeding are not considered, as they are negligible, following footnote 7, page 10 of the methodology. AENOR certifies that this change is in accordance with the applied methodology

	ACM0002 version 04, page 10, and practices in other registered geothermal projects in Nicaragua, and paragraph 312, 313 of the VVS. ***4. Permanent changes to the parameter:EGy*** AENOR certifies that these changes are in accordance with the methodology ACM0002 version 04 and paragraph 312,313 of the VVS. ***5. Permanent Changes to the parameter: Fi,y, $NCV_{i,Y}$ and $EFco2_{i,y}$*** AENOR certifies that this change is in accordance with the applied methodology ACM0002 version 04, the "Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion" and paragraph 312, 313 of the VVS. ***6. Permanent Changes to the Operational and quality assurance procedures*** AENOR has assessed that the quality assurance and quality control procedures are sufficient to ensure that the emissions reductions achieved from the proposed project activity can be reported ex post and verified. Therefore, AENOR certifies that the change requested is in accordance with the methodology ACM0002 version 04 and paragraph 312, 313 of the VVS. In conclusion, the proposed above six permanent changes comply with the applied methodology and do not reduce the level of accuracy of the monitoring compared with the requirements contained in the registered monitoring plan.

D.7. Changes to the project design of a registered project activity

Means of validation

Permanent Changes to the project design

It was scheduled an installed capacity of 66 MW in the registered PDD for the first crediting period but really installed 48.5 MW, at the end of this first period.

Table below summaries these changes comparing the information in the registered PDD and information in the revised PDD for the first crediting period.

PDD registered:

Dates	End 1st quarter 2006		From mid 2007
Project phase	Phase 1		Phase 2
Stage	Stage 1	Stage 2	-
Installed Capacity	2x5 MW	10 MW	1x 46 MW
Technology	Back Pressure	Turbo	Condensing Turbine

		generator	
Total capacity installed	20 MW		66 MW

Revised PDD:

	1st Crediting period		2nd Crediting period			
Dates	From 01/06/2005 to 31/05/2012		From 31/05/2012 until 08/02/2013		From 08/02/2013	
Project Phase/Stage	Phase 1	Phase 2/ Stage1	Phase 1	Phase 2/ Stage1	Phase 2/ Stage1	Phase 2/ Stage 2
Installed Capacity	10 MW	38.51 MW	10 MW	38.5 MW	38.5 MW	38.5 MW
Technology	Back Pressure	Condensing Turbine	Back Pressure	Condensing Turbine	Condensing Turbine	Condensing Turbine
Total capacity installed	48.5 MW		48.5 MW		77 MW	

Therefore, it was scheduled an installed capacity of 66 MW in the registered PDD for the first crediting period but really installed 48.5 MW, at the end of this first period.

The change in the installed capacity does not affect to the scale of the project activity, since it continues of large scale, nor the applicability of the methodology applied in the registered PDD.

- Section B.5 Demonstration of additionality

Since investment analysis was originally used to demonstrate additionality, project participants have modified the key parameters in the original spreadsheet calculations affected by the proposed or actual changes to the project activity.

Capital Expenditures	**Value**	**Unit**	**Comments**
Phase 1 - Investment costs of the back pressure units	59,200	$ 000	AENOR has verified the information against Original approved investment analysis
Phase 2.I - Investment cost for the Fuji	184,675	$ 000	AENOR has verified the information against Amendment No. 2 to the Common Terms Agreement with the lenders, page 10.
Phase 2.II - Investment cost for the Fuji	223,564	$ 000	AENOR has verified the information against Amendment No. 2 to the Common Terms Agreement with the

[1] For the first crediting period and during the phase II of the project development a 1x 38,5 MW turbine was installed instead of the 46 MW with two turbines planned in the registered PDD.

			lenders, page 10.
Phase 2.I - Make-up wells in 2015, 2019 and 2023	8,840	$ 000	AENOR has verified the information against Base Case Model submitted to the banks (Phase 2.I & Phase 2.II assumptions sheet).
Phase 2.II - Make-up wells in 2026 and 2029	8,840	$ 000	As for Phase 2.I above.

AENOR has verified and confirmed that the values used in the financial analysis are consistent with the value of the source and that this information has been included in line with the requirements form UNFCCC. References are included in the PDD and in the IRR calculation spreadsheet. The financial spreadsheets have been verified to be correct. The assumptions used, the base documents and the financial calculations have also been verified

It has been demonstrated that the IRR without CDM revenues is estimated to be 4.97 per cent. Under the new conditions the project IRR is still lower than the IRR benchmark of 7.67 per cent adopted by the project participant in the original registered PDD.

A detailed sensitivity analysis was undertaken by the PP to test the project's feasibility with varying parameters. The variables plant factor (that reflects electricity production), investment costs relative to make-up wells and O&M costs are subjected to a ± 10% variation.

The sensitivity analysis of the project IRR confirms concluding that under those scenarios, the financial attractiveness of the project activity without CERs continues to be below the initial identified financial benchmark.

	-10%	Base case	10%
Benchmark	7.67%	7.67%	7.67%
Plant factor	4.07%	4.97%	6.26%
Investment costs	5.06%	4.97%	5.31%
O&M costs	4.80%	4.97%	5.57%
Tariff	6.26%	4.97%	4.07%

As per the information assessed the changes does no impact on the additionality of the registered CDM project activity.

- Section B.6.3. Ex ante calculation of emission reductions and Section B.6.4. Summary of ex ante estimates of emission reductions

The installed capacity of the project activity has changed from 66 MW, in the registered PDD, to 48.5 MW in the revised PDD, due to this change the electricity generation has been reduced to 146,996 MWh instead of 532,000 MWh.

The calculation of the emission factor was fixed ex-ante, therefore, the main change in the emission reduction calculation is the electricity generation of the project activity.

Apart from the change in the installed capacity and the electricity generation of the project activity, aback up diesel generator was bought in March 2011, therefore the carbon dioxide emissions from fossil fuel combustion ($PEFF_y$) have been added in the emission reduction calculation of the project activity.

The generator is operated only in emergency situations. Emissions from this generator will there be 0 for PEFF 2005 – 2010, and calculated for PEFF 2011-2012.

For the proposed project activity, the following baseline have been calculated:

Baseline Emissions (BEy) = EGy * EFy

Project activity emissions for the geothermal projects are:

PEy = PESy + PEFFy

Where:

PEFFy (Carbon dioxide emissions from fossil fuel combustion)

PESy (Fugitive CO2 emissions due to release of non-condensable gases from the produced steam)

The emission reductions of the San Jacinto geothermal project are:

ERy = BEy - PEy

Baseline emissions (BEy), year	**EGy** (MWh/year)	**EFy** (tCO2/MWh)	**Baseline emissions reductions** (tCO2e/Year)	**Project emissions (tCO2)**	**Emissions reduction (tCO2)**
2005[2]	32,870	0,754	24,783	2,478	22,305
2006	78,888	0,754	59,481	5.948	53,533
2011	78,888	0,754	59,481	5,949	53,532
2012[3]	146,996	0,754	110,835	11,084	99,751

Therefore, the emission reductions have been reduced from 280,703 to 63,322 from the registered PDD.

For further details see the Excel file submitted along with this PRC report.

Findings

CAR 1- The project activity has not been implemented in accordance with the registered

[2] 1 June 2005- 31 Dec 2005
[3] 7 Jan 2012-31 May 2012

	PDD.
Conclusion	AENOR has assessed the revised PDD against applicable additionality and methodological requirements and determine that the proposed changes would not adversely affect the additionality of the registered CDM project activity, the scale of the registered CDM project activity, the applicability of the approved baseline methodology and the compliance of the monitoring plan. Therefore, AENOR certifies that the change requested is in accordance with the methodology ACM0002 version 04 and paragraph 318,319 and 320 of the VVS.

D.8. Types of changes specific to afforestation and reforestation project activities

Means of validation	Not applicable
Findings	Not applicable
Conclusion	Not applicable

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 was contracted to perform the verification of the CDM project activity: “San Jacinto Tizate geothermal project” (Registration Ref. No. 0198) for the monitoring period from 30/06/2009-31/12/2010, and during the on-site visit, the post-registration changes were identified by the audit team.

AENOR has performed the validation of the proposed changes according to the approved consolidated methodology ACM0002 version 04, CDM Validation and verification Standard (Version 09), CDM Project Standard (version 09) and Project cycle procedure (Version 09).

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, prepared on the basis of the monitoring plan included in the revised PDD compared with registered monitoring plan of the project is not adversely affect. This assessment included:

- Collection of evidence supporting the reported data.
- Checking whether the provisions of the revised monitoring plan, were consistently and appropriately applied.

This revision improves the accuracy of information provided and consistency in the revised PDD and the monitoring plan.

Furthermore, AENOR confirms that:

- The transfer of information from the old form of the PDD registered (CDM PDD version 02) into the new form under VVS track (F-CDM-PDD Version 08.0) is totally correct and materially the same.
- The proposed revision points have been described, and an assessment has been provided to substantiate the reason for each of the proposed revision points of the revised PDD and management system, using objective evidences.
- The changes regarding the monitoring of several parameters are necessary to ensure a conservative monitoring and a realistic approach. They are in accordance with the approved consolidated methodology applicable to the project activity and they ensure the conservativeness of the emission reductions calculation.

AENOR has combined the changes into just one request for approval taken into consideration the different nature of the changes required (with and without prior approval by the Board).

For all the reasons stated above, it is AENOR opinion that prior approval by the Board is necessary for these post registration changes and therefore AENOR is submitting the post registration changes for acceptance by the Board.

Madrid, 28 April 2017

Jose Magro González	Elena Llorente Pérez
Authorized person	Validation Team Leader

Appendix 1. Abbreviations

Abbreviations	Full texts
AENOR	Spanish Association for Standardisation and Certification
ACM0002	Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources
CAR	Corrective action request
CDM	Clean development mechanism
CDM-EB	CDM Executive Board
CER	Certified emission reduction
CL	Clarification request
CMP	Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DNA	Designated national authority
DOE	Designated operational entity
ER	Emission reduction
FAR	Forward action request
GHG	Greenhouse gas(es)
MoV	Means of verification
MP	Monitoring Plan
MR	Monitoring report
MW	Megawatt
PCP	Clean Development Mechanism Project Cycle Procedure (Version 09.0)
PDD	Project Design Document
PP	Project participants
PS	Clean Development Mechanism Project Standard (Version 09.0)
tC	Carbon tonnes
tCO_2eq	Carbon dioxide equivalent tonnes
UNFCCC	United Nations Framework Convention on Climate Change
VVS	CDM Validation and Verification Standard version 09.0

Appendix 2. Competence of team members and technical reviewers

CERTIFICATE OF QUALIFICATION

Subject: Validation of PRC and Technical Review Team for “San Jacinto Tizate geothermal project”

Madrid, 3rd February 2017

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 in relation with the validation process of the above mentioned project activity:

Name: **Elena Llorente Pérez**

CDM Team leader: Yes

CDM Validator: Yes

CDM Verifier: Yes

External Technical Expert: No

Technical areas related with the project activity:

T.A. 1.2. Renewables

Authorized person
Mª Carmen González Galán

CERTIFICATE OF QUALIFICATION

Subject: Validation of PRC and Technical Review Team for “San Jacinto Tizate geothermal project”

Madrid, 3rd February 2016

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 in relation with the validation process of the above mentioned project activity:

Name: **Alfonso Medrano Gutierrez**

CDM Team leader: Yes

CDM Validator: Yes

CDM Verifier: Yes

External Technical Expert: No

Technical areas related with the project activity:

T.A. 1.2. Renewables

Authorized person
Mª Carmen González Galán

CERTIFICATE OF QUALIFICATION

Subject: Validation of PRC and Technical Review Team for “San Jacinto Tizate geothermal project”

Madrid, 3rd February 2017

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 in relation with the validation process of the above mentioned project activity:

Name: **Jose Antonio Gesto**

CDM Team leader: Yes

CDM Validator: Yes

CDM Verifier: Yes

External Technical Expert: No

Technical areas related with the project activity:

T.A. 1.2. Renewables

Authorized person

Mª Carmen González Galán

Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
1	EcoSecurities Ltd.	Registered PDD San Jacinto Tizate geothermal project Revised PDD San Jacinto Tizate geothermal project	October 2005 Version 04 – 20/01/2017	UNFCCC
2	UNFCCC	ACM0002 "Consolidated monitoring methodology for zero-emissions grid-connected electricity generation from renewable sources.	Version 04	UNFCCC
3	UNFCCC	Spreadsheet calculation		UNFCCC
4	UNFCCC	CDM Validation and Verification Standard	Version 09.0.	UNFCCC
5	UNFCCC	Clean Development Mechanism Project Cycle Procedure.	Version 09.0.	UNFCCC
6	UNFCCC	Clean Development Mechanism Project Standard	Version 09.0.	UNFCCC
7	UNFCCC	Instructions for filling out the validation report form for post-registration changes for CDM project activities	Version 01.0	UNFCCC
8	UNFCCC	Letters of Approval of Nicaragua and UK.		UNFCCC
9	UNFCCC	Written authorizations of Nicaragua and UK.		UNFCCC
10	Polaris Energy Nicaragua S.A	Investment Analysis San Jacinto-Tizate		Polaris Energy Nicaragua S.A
11	CNDC	Letter to the National Dispatch Center		CNDC
12	Polaris Energy Nicaragua S.A	Generation summary 2012		Polaris Energy Nicaragua S.A
13	Polaris Energy Nicaragua S.A	Generation summary 2013		Polaris Energy Nicaragua S.A
14	Fuji Electric Systems	Installed capacity BP and Fuji units nameplates pictures		Polaris Energy Nicaragua S.A

15	Polaris Energy Nicaragua S.A	Commissioning schedule-Phase II		Polaris Energy Nicaragua S.A

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

Table 1. CL from this validation

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

Table 2. CAR from this validation

CAR ID	1	**Section no.**		**Date:** 20/01/2017
Description of CAR				
The project activity has not been implemented in accordance with the registered PDD.				
Project participant response				**Date:** 20//01/2017
The revised PDD have been modified and improved, and they are in accordance with the applied consolidated methodology.				
Documentation provided by project participant				
Revised PDD.				
DOE assessment				**Date:** 20/01/2017
New version of the revised PDD has been edited in order to improve the quality of the information stated in the revised PDD, the consistency with the applied methodology, and to improve the transparency. The reorganization of the parameters is considered appropriate, and therefore, this CAR is closed.				

Table 3. FAR from this validation

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