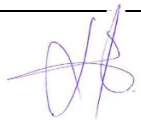
Validation report form for renewal of crediting period for CDM project activities

(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	Chacayes Hydroelectric Project, Chile UNFCCC ref. no: 6848
Number and duration of the next crediting period	2nd crediting period: 7 years (30/07/2019 to 29/07/2026)
Version number of the validation report	02
Completion date of the validation report	18/06/2020
Version number of PDD to which this report applies	5.0
Project participants	Pacific Hydro Chacayes S.A. (PHCSA)
Host Party	Chile
Applied methodologies and standardized baselines	Methodology ACM0002: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources", version 20.0
Mandatory sectoral scopes	1: Energy industries (renewable - / non-renewable sources)
Conditional sectoral scopes, if applicable	Not applicable
Estimated amount of annual average GHG emission reductions or GHG removals by sinks in the next crediting period	234,271 tCO_2e
Name and UNFCCC reference number of the DOE	AENOR INTERNACIONAL S.A.U UNFCCC ref. no: E-0021
Name, position and signature of the approver of the validation report	 José Luis Fuentes Climate Change Manager

SECTION A. Executive summary

AENOR has been contracted by Pacific Hydro Chacayes S.A. (PHCSA) as a project participant, to undertake the validation for the renewal of the crediting period for the CDM project activity "Chacayes Hydroelectric Project, Chile". The validation has been performed through a process of document review based on the PDD, initially submitted for validation and the subsequent revisions, follow-up email interviews with the stakeholders, resolution of outstanding issues and issuance of the validation report for RCP.

The Chacayes Hydroelectric Project, Chile (the Project), developed by Pacific Hydro Chacayes S.A. (PHCSA), is a run-of river hydroelectric power plant with an installed capacity of 113.36 MW (56.68 MW x 2 turbines) and an expected annual net generation of approximately 560,457 MWh of electricity per annum. The purpose of the proposed project activity is to utilize the waters of the Cipreses and Cachapoal Rivers to generate hydro-electricity for export to the SEN grid.

The proposed project activity is located in the Cachapoal Valley, approximately 10 km upstream of the town of Coya on the northern bank of the Cachapoal River. Coya town is approximately 30 km east of the city of Rancagua, which is the major city of Chile's 6th Region. Rancagua is located on the Pan American Highway (Ruta 5) approximately 80 km south of Santiago.

According to CDM Project Standard for project activities version 02.0 /1/, notification of renewal intention from project participants is no longer required, as long as the DOE submit a renewal request to the secretariat no earlier than 270 days prior to, but no later than one year after, the expiry of the crediting period, the project is valid for renewal and no penalty of "unclaimable period" would be required. And the grace period for the submission of renewal request for the existing registered project activities whose crediting period has expired but has not been renewed is set to be 30/09/2020. Therefore, the project is eligible for renewal of crediting period.

The project activity was registered with reference number 6848 on 26/07/2012 as a CDM project with a renewable 7 years crediting period. Then, the first crediting period was from 30 July 2012 to 29 July 2019. Therefore; the second crediting period will be from 30/07/2019 to 29/07/2026.

Scope of the Validation

The scope of the validation is to assess all aspects described in the PS version 02.0 related to the purpose of renewal of the crediting period project relating to the baseline, estimated emissions reductions and the monitoring plan using an approved baseline and monitoring methodology.

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

- The initial version of the updated PDD /2/, including baseline study and Monitoring Plan.
- Approved Methodology: ACM0002: Consolidated baseline methodology for grid-connected electricity generation from renewable sources - Version 20.0 /3/
- Decision 3/CMP.1 and relevant decisions and guidelines from the EB
- CDM Validation and Verification Standard for project activities, version 02.0 /4/
- CDM project cycle procedure for project activities version 02.0 /5/
- CDM project standard for project activities version 02.0
- 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 /6/.
- Tool to calculate the emission factor for an electricity system version 07.0. /7/
- Associated documentation (EF calculation, ER calculation, etc.)

The validation scope is defined as an independent and objective review of the PDD, the project's baseline study and monitoring plan, and other relevant documents. The information in these documents is reviewed against Kyoto Protocol requirements, UNFCCC rules and associated interpretations. AENOR, based on the Specific Instruction for the Validation, verification and

certification of clean development mechanism (CDM) project activities (IE/DTC/0039) /8/, has used a risk-based approach in the validation, focusing on the identification of significant risks for project implementation and the generation of CERs.

The validation is not meant to provide any consultancy services to the Client. However, stated requests for clarifications and/or corrective actions may provide input for improvement of the PDD.

Validation Process

The project validation assessment for renewal of crediting period aims to be a risk-based approach and is based on the methodology developed in the CDM Validation and Verification Standard, an initiative of Designated and Applicant Entities, which aims to harmonise the approach and quality of all such assessments.

The validation for the renewal of the crediting period began in 04/05/2020 when the PP provided the initial version of the PDD, and was concluded in June 2020, with the submission of the final validation report for RCP. The validation was performed in the manner of an audit, where, a desk review of the PDD was undertaken against the latest version of the approved methodology and CDM and other relevant criteria applying to the project.

As a final step of the validation, the validation report for RCP and the protocol have to undergo internal quality control by means of a technical review following the procedures of AENOR. The technical reviewer is a competent person from AENOR, independent of the team that carried out the validation of the project activity.

In order to ensure transparency, a validation protocol was customised for the project, according to Specific Instruction IE-DCT-039. The protocol shows, in a transparent manner, criteria (requirements), means of validation and the results derived from validating the identified criteria.

The validation protocol serves the following purposes:

- It organises, provides details and clarifies the requirements a CDM project is expected to meet.
- It ensures a transparent validation process where the validator will document how a particular requirement has been validated and the result of the validation.

The Project Design Document submitted by the PP was reviewed against the approved methodology and against CDM and other relevant criteria. Additional background documents related to the project design, rules and regulations issued by the government and baseline were also validated.

The project participant was requested to address all validation findings and finally provided the validation team with sufficient evidence to determine that the applicable CDM requirements have been met. The project participant modified the initial updated PDD to resolve the validation team concerns and resubmitted a final version of the updated PDD /9/. AENOR has prepared this report based on the final updated PDD.

All Corrective Action Requests (CAR) and Clarification Actions (CL) have been checked by the validation team and have been adequately resolved.

All the validation findings are summarized in section C.5 below and documented in more detail in Appendix 4.

The ex-ante emission factor of the national grid of Chile and the ex-ante estimates of emissions reductions have been calculated correctly on the basis of the approved methodology ACM0002: Consolidated baseline methodology for grid-connected electricity generation from renewable sources - Version 20.0 and the “Tool to calculate the emission factor for an electricity system” version 07.0.

In AENOR’s opinion, the GHG emissions reductions of the annual average over the crediting period and the total emissions reductions for the crediting period from 30/07/2019 to 29/07/2026, were calculated correctly and amount 234,271 tonnes of CO_2 equivalent.

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	Llorente Pérez	Elena	AENOR	Yes	No	Yes	Yes

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	Arribas Alonso	Luis Javier	AENOR
2.	Approver	IR	Fuentes Perez	Jose Luis	AENOR

SECTION C. Means of validation

C.1. Desk/document review

The Project Design Document submitted by the PP was reviewed against the approved methodology and against CDM and other relevant criteria. Additional background documents related to the project design, rules and regulations issued by the government and baseline were also validated.

To address the corrective actions and clarification requests that arose from the desk review, the consultants revised the initial project design document submitted and developed the final PDD.

C.2. On-site inspection

Duration of on-site inspection: N/A				
No.	**Activity performed on-site**	**Site location**	**Date**	**Team member**
1.	N/A	N/A	N/A	N/A

Due to COVID-19 pandemic and as per the three months allowance granted (from 23 March to 23 June 2020) by the CDM Board /24/ to deviate from the requirements in paragraph 30 of the VVS version 2.0, no on-site inspection was conducted as part of this validation assessment.

According to the validation contract /25/ the validation shall finish 2 months after the reception of the PDD by AENOR and according to clause 18 of the same contract, this can be terminated due to the interruption of the process for a cause not attributable to AENOR. Since the revised PDD was received on 04/05/2020 and aforementioned contract provisions the site visit cannot be postponed.

In order to verify information and compliance with applicable requirements and to ensure the completeness and credibility of the audit, this rely on skype interviews with project participants, persons responsible for data collection, wire diagram, photographic evidence.

C.3. Interviews

No.	Interviewee			Date	Subject	Team member
	Last name	First name	Affiliation			
1.	Pérez-Cotapos	Jose Miguel	Project participant at Pacific Hydro Chacayes S.A.	27/05/2020	- Basic information, technology of the project, etc.; - Monitor Data: meter readings, control and maintenance, QA&QC systems - Status of the project activity and any modifications with respect to the registered PDD. - Applicability to the latest methodology. - National and local policies and changes - Baseline of the project and its updates - The lifetime of the project activity - Emission Factors and their updates - Monitoring plan and changes	Elena Llorente Pérez
2.	Vaquero	Laura	Carbon consultant at Everis			
3.	Medrano	Alfonso	Carbon consultant at Everis			

C.4. Sampling approach

Not applicable.

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	0	CAR 1	0
Application and selection of methodologies and standardized baselines	0	0	0
Validity of original baseline or its update	0	0	0
Estimated emission reductions or net anthropogenic removals	0	CAR 2	0
Validity of monitoring plan	0	0	0
Crediting period	0	0	0
Project participants	0	0	0

Post-registration changes	CL 1	0	0
Others (please specify)	0	0	0
Total	1	2	0

SECTION D. Validation findings

D.1. Compliance with PDD form

Means of validation	The assessment team has checked all sections of the updated PDD and confirms that the valid version of the applicable PDD form listed in UNFCCC website have been applied. The assessment team also checked the information transferred to the updated PDD against the original registered PDD and two minor corrections have been found and are requested in a PRC along with this issuance request.
Findings	**CL1- In accordance with the registered PDD, Chacayes Hydroelectric Project has an installed capacity of 110.8MW and a surface area of 180,000 m2. The revised PDD has an installed capacity of 113.36 MW and a pond surface area of 180,179 m2. Please provide evidences of the technical characteristic of the project activity.** **CAR 1- The PDD, section B.1 and section B.2 ,should be completed in accordance with the PDD template version 11.0.**
Conclusion	Due to the clarification and the corrective action requested during the validation process, the project participants made a final version of the PDD which includes corrections to all issues raised, so according to paragraph 403 of VVS for project activities version 02.0, AENOR validation team confirms that: • The updated PDD complies with the applicable PDD form with version 11.0 and instructions therein for filling out the PDD /10/. • Information transferred to the updated PDD form is materially the same as that in the registered PDD /11/, unless the two minor corrections that are requested in the PRC along with this issuance request and the changes require in this request for the renewal of the crediting period..

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

Means of validation	The assessment team has checked whether the selected baseline and monitoring methodology applied is applicable to the project activity. This assessment was based on a review of the updated PDD for the 2nd crediting period, associated documentation, previous validation and telephone calls. At the time of registration, the PP has used the approved consolidated baseline and monitoring methodology ACM0002 version 13 “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”. The revised PDD for the 2nd crediting period applies a valid version of the same methodology, that is ACM0002 version 20.0 “Grid-connected electricity generation from renewable sources”. The main changes for the updated version include expanding the applicability of the methodology, more definitions, clarifications, references, etc. The assessment of the relevant information contained in the revised PDD against each applicability condition is described below:

Applicability conditions Project case	DOE Assessment
1. This methodology is applicable to grid-connected renewable energy	The proposed project activity involves the installation of a grid-connected

		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); (e) Involve a replacement of (an) existing plant(s)/unit(s).	renewable power generation project: run of river hydro power plant. Hence, project complies with this condition and methodology is applicable. AENOR could check this against the Environmental Impact Declaration (DIA) approved by the Libertador General Bernardo O'Higgins region environmental commission (COREMA), published on SEA Chile.
		2. The methodology is applicable under the following conditions: (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; (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	(a) The project activity includes a hydro power plant/unit. Hence, project complies with this condition and methodology is applicable. AENOR could check this against the Environmental Impact Declaration (DIA) approved by the Libertador General Bernardo O'Higgins region environmental commission (COREMA), published on SEA Chile. (b) Not applicable. It is not a capacity addition, retrofit or replacement of an existing power plant.
		In case of hydro power plants, one of the following conditions shall apply: (a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or (b) The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density, calculated using equation (7), is greater than 4 W/m2; or (c) The project activity results in new single or multiple reservoirs and the power density, calculated using	Condition c) applies to this project: The project activity results in new single or multiple reservoirs and the power density is greater than 4 W/m2. Hence, project complies with this condition and methodology is applicable. AENOR could check this against the Environmental Impact Declaration (DIA) approved by the Libertador General Bernardo O'Higgins region environmental commission (COREMA), published on SEA Chile.

		equation (7), is greater than 4 W/m2; or (d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (7), is lower than or equal to 4 W/m2, all of the following conditions shall apply: (i) The power density calculated using the total installed capacity of the integrated project, as per equation (8), is greater than 4 W/m2; (ii) Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; (iii) Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m2 shall be: a. Lower than or equal to 15 MW; and b. Less than 10 per cent of the total installed capacity of integrated hydro power project.	
		4. In the case of integrated hydro power projects, project proponent shall: (a) Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or (b) Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore, this water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum of five years prior to the implementation of the CDM project activity.	Not applicable. This project doesn´t integrate different hydro power project. Hence, project complies with this condition and methodology is applicable.
		5. The methodology is not applicable	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 activity doesn´t involve the use of fossil fuels or Biomass fired.
	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".	Not Applicable.
	In addition, the applicability conditions included in the tools referred in the methodology.	The project activity meets the applicability conditions included in the tools referred in the methodology. Hence, project complies with this condition and methodology is applicable.
Findings	No CARs/CLs/FARs raised in this section.	
Conclusion	According to paragraph 404(b) of the VVS for project activities version 02.0, AENOR validation team confirms that the application of the baseline methodology is transparent and conservative, and that the chosen baseline and monitoring methodology i.e. ACM0002 version 20.0 is applicable to the project activity.	

D.3. Validity of original baseline or its update

Means of validation	AENOR checked the updated PDD to assess the validity of the original/current baseline for the proposed CDM project activity against the applicable requirements of 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. The validity of the baseline has been assessed as per 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 3.0.1 /6/. The assessment was performed as follows: **Step 1.-Assess the validity of the current baseline for the next crediting period** As demonstrated in the validation report /12/ for the registered PDD, the baseline scenario for the project activity is "Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system" As per the methodology ACM0002 Version 20.0, the baseline for the project activity remains the same as that in the validation report for the registered PDD, which is "electricity delivered to the grid by the project activity would have otherwise been

	generated by the operation of grid-connected power plant and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system" Version 07.0". **Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies** There are no new national and/or sectoral policies that could affect the baseline scenario since the date of PDD registered till now. Hence, it was concluded that the current baseline was complied with all relevant national and sectorial policies. **Step 1.2: Assess the impact of circumstances** The audit team could assess that there are no important changes in the market characteristics and the conditions used to determine the baseline emissions in the previous crediting period are still valid. **Step 1.3: Assess whether the continuation of the use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested**. The current baseline scenario is the continuation of the current practice. In the absence of the project, the electricity would have been supplied by the grid, and it will not request an investment by the project proponent or third party. So, this step is not applicable. **Step 1.4: Assessment of the validity of the data and parameters** The emission factors have been updated by the project participants for the second crediting period of the project activity accordingly. **Step 2.-Update the current baseline and the data and parameters** **Step 2.1: Update the current baseline** As per the requirement of the sub-step, the update for the power grid emission factor of the second crediting period is based on ACM0002 Version 20.0, which is the methodology applied to the project activity at the time of request for renewal of the crediting period. **Step 2.2: Update the data and parameters** The emission factors for the project activity have been updated as per the "Tool to calculate the emission factor for an electricity system", Version 07.0. With reference to the "Tool to calculate the emission factor for an electricity system", the Simple OM emission factor ($EF_{grid,OM,y)}$ of the SEN (Chilean grid) is calculated as 0.798 tCO2e/MWh. Similarly, the build margin emission factor ($EF_{grid,BM,y}$) of the SEN is calculated ex-ante as 0.292 tCO_{2e}/MWh. Therefore, the combined baseline emission factor is determined ex-ante and will remain fixed during the second crediting period. $EF_{grid,CM,y}$ = 0.798*0.25 + 0.292*0.75 = 0.418 tCO_{2e}/MWh Validity of original baseline and its update was therefore confirmed
Findings	No CARs/CLs/FARs raised in this section.
Conclusion	According to paragraph 404 of the VVS for project activities version 02.0, AENOR validation team confirms that: • There has been no change in the relevant national and/or sectoral regulations on building a hydropower plant project for supplying electricity to the grid since the previous crediting period. • The baseline scenario for building a Hydropower plant project for supplying electricity to the grid is still valid according to methodology ACM0002

	Version 20.0

D.4. Estimated emission reductions or net anthropogenic removals

Means of validation	AENOR checked the estimated GHG emission reductions in the updated PDD, EF grid calculation spreadsheet /14/ and ER calculation spreadsheet /13/ against the applicable requirements in the Project Standard, methodology ACM0002 Version 20.0 and applicable methodological tools. The validation team of AENOR checked that the estimated GHG emission reductions in the updated PDD and ER calculation spreadsheet comply with the applicable requirements in the Project standard, and the valid version of the methodologies and tools that are applicable to the registered CDM project activity as follows: **Emission Reduction (ER_y)** The emission reduction (ER_y) of the project activity are calculated as the difference between the baseline emissions (BE_y), project emissions (PE_y) and emissions due to leakage (LE_y). $ER_y = BE_y - PE_y - LE_y$ **ER_y = 234,271 tCO_{2e}/year** **Determination of the project activity emissions (PE_y)** Project emissions from water reservoirs of hydro power plants The proposed project activity is a run-of-river hydropower plant that utilises an off river regulation pond to regulate the flow of water. This pond is not a water storage pond and is not considered to be a reservoir. However, to confirm that no project emissions need to be accounted for, the power density of the pond is calculated as follows: $$PD = \frac{Cap_{PJ} - Cap_{BL}}{A_{PJ} - A_{BL}}$$ Where: PD = Power density of the project activity, in W/m^2 Cap_{PJ} = Installed capacity of the hydro plant after the implementation of the project activity Cap_{BL} = Installed capacity of the hydro plant before the implementation of the project activity (W). For new hydro plants this is zero. A_{PJ} = Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2). A_{BL} = Area of the single or multiple reservoirs measured in the surface of the water, after the implementation of the project activity, when the reservoir is full (m^2). For new reservoir this value is zero, which is the case for the Project activity. Where the value of PD is greater than 10 W/m^2 then Project emissions (PE) is considered to equal zero. The proposed project activity has an installed capacity of 113.36 MW and a pond surface area of 180,179 m^2 which equates to a power density of 629 W/m^2. On this basis $PE_{HP,y} = 0$. Total Project emissions For the proposed project activity: PEy = 0. **Determine the emission factor for the grid** The baseline emission factor for the grid ($EF_{grid,y}$) has been calculated as a combined margin emission factor, using the “Tool to calculate the emission factor

for an electricity system" version 07.0.

The determination of the relevant electricity system was made following the Option 2, considering the dispatch area covered by the responsible dispatch centre for each year of the ex-ante emission factor calculation requirements. In this case, since in November 2017, the SIC grid was connected to the SING grid, creating a new electricity system called SEN, which considers a single dispatch area coordinated by the National Electricity Coordinator (CEN); thus, the relevant electricity system is the SEN /15/.

As the "Tool to calculate the emission factor for an electricity system" requires an annual based emission factor calculation, and the interconnection occurred during 2017, therefore the relevant electricity system is SEN for 2017, 2018 and 2019. The Project participant has chosen to calculate the operating margin and build margin emission factor the option I and only grid power plants are included in the calculation.

In terms of vintage of data, the period considered for the calculation is 2017-2019.

As data for Option A is actually available, this option will be used for the calculation; under this option, the simple OM emission factor is calculated based on the net electricity generation and an emission factor for each power unit, as follows:

The operating margin emission factor is calculated as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

$EF_{grid,OMsimple,y}$ =Simple operating margin CO2 emission factor in year y (tCO2/MWh).

$EG_{m,y}$ =Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh)

$EF_{EL,m,y}$=CO2 emission factor of power unit m in year y (tCO2/MWh).

m=All power units serving the grid in year y except low-cost/must-run power units.

y=The relevant year as per the data vintage chosen in Step 3 (2017 to 2019).

Determination of $EF_{EL,m,y}$

The emission factor of each power unit m is determined, options A1 and A2 of the tool are applied as follow:

• **Option A1** - If for a power unit *m* data on fuel consumption and electricity generation is available, the emission factor ($EF_{EL,m,y}$) is determined as follows:

Equation 1. Emission factor per power unit calculation

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \times NCV_{i,y} \times EF_{CO_2,i,y}}{EG_{m,y}}$$

Where:

$EF_{EL,m,y}$	=	CO_2 emission factor of power unit m in year y (tCO_2/MWh).
$FC_{i,m,y}$	=	Amount of fuel type *i* consumed by power unit m in year y (mass or volume unit). /16/17/18/
$NCV_{i,y}$	=	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* (tCO_2/GJ).

$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in year y (MWh) /21/22/23/

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 chosen in Step 3 (2017 to 2019).

Option A2 - In for a power unit m only data on electricity generation and the fuel types used is available, the emission factor is determined based on the CO_2 emission factor of the fuel type used and the efficiency of the power unit, as follows:

Equation 2. CO_2 emission factor based on efficiency

$$EF_{EL,m,y} = \frac{EF_{CO2,m,i,y} \times 3.6}{\eta_{m,y}}$$

Where:

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2/MWh).

$EF_{CO2,m,i,y}$ = Average CO_2 emission factor of fuel type i used in power unit m in year y (tCO_2/GJ).

$\eta_{m,y}$ = Average net energy conversion efficiency of power unit m in year y (ratio).

m = All power units serving the grid in year y except low-cost/must-run power units.

y = The relevant year as per the data vintage chosen in Step 3.

Where several fuel types are used in the power unit, the fuel type with the lowest CO_2 emission factor for $EF_{CO2,m,i,y}$ is used.

Calculate the build margin (BM) emission factor

The BM emission factor is determined in accordance to Option 1 of the "Tool to calculate the emission factor of an electricity system" version 07.0, where for the second crediting period the build margin emission factor is calculated ex-ante based on the most recent information available (2019) on units already built for sample group *m* at the time of PDD submission to the DOE for validation.

Equation 3. BM emission factor calculation

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

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_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 (tCO_2/MWh). m = Power units included in the build margin. y = Most recent historical year for which electricity generation data is available. The CO_2 emission factor of each power unit m ($EF_{EL,m,y}$) is determined as per guidance in Step 4, using options A1 or A2 (represented by Equations 4 and 5 in Step 4), using for y the most recent historical year (2019) for which power generation data is available, and using as m the power units included in the build margin. The combined margin emissions factor is calculated as follows: $EF_{OM,y}=EF_{grid,OM,y}*W_{OM} + EF_{grid,BM,y}*W_{BM}$ Where: $EF_{BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh) $EF_{OM,y}$ = Operating margin CO_2 emission factor in year y (tCO_2/MWh) W_{OM} = Weighting of operating margin emissions factor (%) W_{BM} = Weighting of build margin emissions factor (%) **EF_{OM}: 0.798 tCO_{2e}/MWh** **EF_{BM} = 0.292 tCO_{2e}/MWh** **EF_{CM} =** (0.798 x 0.25) + (0.292 x 0.75) = **0.418 tCO_{2e}/MWh** **BE_y = 234,271 tCO_{2e}/year** **Leakage** According to ACM0002 version 20.0, no leakage needs to be considered for the proposed project.
Findings	**CAR 2- The following inconsistences have been detected in the Chile Electricity System Emission Factor 2019 CDM Chacayes v1.0 spreadsheet, please clarify:** - **The data for the sheet "LCMR" should be adjusted to the CNE yearbooks. For instance the percentage of coal (SIC) and solar (SING) 2017 (page 31), and the total gross electricity generation of SIC 2015. Also please provide the 2019 CNE yearbook.** - **For the sheet "NCVi,y&EFCO2,i,y" the Gross Calorific Value (GCV) from the "Balance Energia Chile 2018" has to be converted to NCV in accordance with the data of IPCC, 2006. Guidelines for national greenhouse gas inventories. V2_2_Ch1_Introduction, Page 1.16 (90 or 95%) in order to be used in the EF calculation.** - **Update the information according to "Thermal generation: coal, key in the energetic matrix" (Revista EI; 06/05/2014; http://www.revistaei.cl/reportajes/generacion-termoelectrica-carbon-clave-en-la-matriz-energetica/) to use the data for other bituminous coal (sheet "NCVi,y&EFCO2,i,y").** - **For the sheet, "EF_BM,2019" review the data of electricity generation of the power plants, from Solar Luce to Solar La Lajuela, for instance: Solar Luce, Solar Bellavista 2, Solar San Isidro, Solar Tricahue, Solar La Ligua, Solar Villa Seca, the data of electricity generation is**

	available. - **In the sheet OM2019, correct the year of the FC2018.** - **For the sheet "NCVi,y&EFCO2,i,y" the value of the propane GCV is 12.100 kcal/kg for Chile National Energy Balance 2018.** - **Include in the excel spreadsheet the reference source for the electricity generation of the plants: https://www.cne.cl/estadisticas/electricidad/ and review the electricity generation of 2019, for instance the power plant "Teno".**
Conclusion	In accordance with paragraph 113 of the VVS for project activities version 02.0, , AENOR validation team confirms that: • All assumptions and data used by the project participants are listed in the PDD and/or supporting documents, including their references and sources; • All documentation used by the project participants as the basis for assumptions and source of data is correctly quoted and interpreted in the PDD; • All values used in the PDD are considered reasonable in the context of the proposed CDM project activity; • The baseline methodology has been applied correctly to calculate project emissions, baseline emissions, and leakage emissions; • All estimates of the baseline, project and leakage emissions can be replicated using the data and parameter values provided in the PDD.

D.5. Validity of monitoring plan

Means of validation

The project applies methodology ACM0002 - Version 20.0. The original monitoring plan was updated based on ACM0002 - Version 20.0 requirements. There are no basic changes from the current crediting period.

Based on the document review and follow-up actions, the validation team confirms that the parameter required to be monitored for the project will be:

Data/Parameter	$EG_{facility,y}$
Data unit	MWh/year
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in the year y
Value applied	560,457
Measurement methods and procedures	Electricity will be measured continuously by the installed electricity metering system consisting of calibrated electricity meter(s). Meters will be calibrated as stated in B.7.2. Collected data will be recorded continuously by the installed SCADA system and data will be archived electronically and retained for 2 years following the end of the crediting period. The net energy generated and supplied to the grid by the project activity, excluding internal power consumption, will be directly measured at metering point M5 and M6, and metering point M1 and M2 remain as a backup meters.
Monitoring frequency	Continuous (hourly) measurements and monthly recording.
QA/QC	Meter quality is governed by the Chilean Technical Standards and the meters are required to have a maximum

procedures	error of 0.2% under Chilean law. This data is utilised by CEN for determining the energy balance between generators. Generation data of the Project will be cross checked versus CNE and CEN records to ensure data reliability.
Purpose of data	Calculation of baseline emissions
Additional comment	N/A

Data/Parameter	$Cap_{,PJ}$
Data unit	W
Description	Installed capacity of the project activity after the implementation of the project activity
Value applied	113,348,000 W
Measurement methods and procedures	Determined based on manufacturer's specifications and/or nameplates and/or recognized standards

Item	Description	Capacity	Source
Turbine	Rated capacity of each unit	56.68 MW	Nameplate
Generator	Rated capacity of each unit	65,600 kVA	Nameplate
Net Capacity	Minimum Continuous Rating Electrical Output at metering point (rated plant electrical output)	110.8 MW, at 0.9 power factor	Manufacturer's specification

Monitoring frequency	Once at the beginning of each crediting period.
QA/QC procedures	NA
Purpose of data	Calculation of baseline emissions
Additional comment	110.8MW is the "rated plant electrical output measured at revenue metering points, with both turbines operating at a net head of 168.6m and each discharging 36.35 m3/s, and both units generating at rated voltage, frequency and indicated power factor", defined in Schedule F "Performance Guarantee" of the EPC Contract.

Data/Parameter	$A_{,PJ}$

	Data unit	m^2
	Description	Area of the single reservoir measured in the surface of the water, after the implementation of the project activity, when the reservoir is full.
	Value applied	180,179
	Measurement methods and procedures	Measured using topographical surveys, maps, satellite pictures or other suitable means. Assessed annually.
	Monitoring frequency	Once at the beginning of each crediting period.
	QA/QC procedures	NA
	Purpose of data	Calculation of project emissions.
	Additional comment	As power density is approximately 629 W/m2 (>>10W/m2), PEHP,y = 0.
Findings	No CARs/CLs/FARs raised in this section.	
Conclusion	The Monitoring plan contained in the updated PDD is in accordance with the requirements of the monitoring methodology and tools applied. All necessary changes have been appropriately reflected in the updated PDD, the monitoring plan in the updated PDD is in compliance with the applied monitoring methodology, and the monitoring arrangements described in the updated PDD can be implemented and are feasible within the project design	

D.6. Crediting period

Means of validation	The assessment team checked whether the starting date and length of the 2nd crediting period, as stated in the updated PDD meets all applicable requirements for renewal of crediting period. The first 7-year renewable crediting period was from 30/07/2012 to 29/07/2019, the PPs are applying for a second period started from 30/07/2019 to 29/07/2026.
Findings	No CARs/CLs/FARs raised in this section.
Conclusion	According to paragraph 412 of VVS for project activities version 02.0, AENOR validation team confirms that the correct crediting period has been applied in the updated PDD.

D.7. Project participants

Means of validation	AENOR checked the names of the project participants included in the updated PDD against the names included in the latest version of the completed Modalities of Communication (MoC) form for the project activity as available in the UNFCCC website.
Findings	No CARs/CLs/FARs raised in this section.
Conclusion	According to paragraph 412 of VVS for project activities version 02.0, AENOR validation team confirms that the information of the PPs has been correctly indicated in the updated PDD.

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[1]	N	N/A	N/A
Corrections	Y	02	18/06/2020
Change to the start date of the crediting period	N	N/A	N/A
Inclusion of a monitoring plan	N	N/A	N/A
Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents	N	N/A	N/A
Changes to the project design	N	N/A	N/A
Changes specific to afforestation and reforestation project activities	N	N/A	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 project activity. The technical reviewer or the team appointed for the technical review are qualified in the technical area(s) and sectoral scope(s) of the project activity.

SECTION F. Validation opinion

AENOR has performed the validation of the renewal of the crediting period of the project "Chacayes Hydroelectric Project, Chile". The validation 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 consisted of the following phases: i) a desk review of the project design and the baseline and monitoring plan; ii) the resolution of outstanding issues and the issuance of the final validation report and opinion. In the course of the validation process one clarification and two corrective actions were raised, all have been successfully closed.

The review of the project design documentation has provided to AENOR enough evidence to determine the validity of the original baseline scenario and the update of the baseline. The project correctly applies the baseline and monitoring methodology ACM0002: Consolidated baseline methodology for grid-connected electricity generation from renewable sources - Version 20.0.

The calculation of the project emission reductions is carried out in a transparent and conservative manner, so the project activity is likely to achieve the average estimated amount of emission reductions of 234,271 tCO_{2e} per year over the 2nd renewable crediting period.

In AENOR´s opinion, the project meets all relevant UNFCCC requirements and the relevant host country criteria for the renewal of the crediting period. Hence, AENOR requests the renewal of the crediting period of the project.

The validation has been performed using a risk based approach, as described above. The only purpose of this report is its use during the registration process as part of the CDM project cycle.

[1] 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).

Hence, AENOR cannot be held liable by any party for decisions made or not made based on the validation opinion, which goes beyond the purpose.

Madrid, 18/06/2020

Elena Llorente Pérez
Team leader

José Luis Fuentes
Authorized person

Appendix 1. Abbreviations

Abbreviations	Full texts
ACM0002	Consolidated baseline methodology for grid-connected electricity generation from renewable sources - Version 20.0
BM	Build margin
CAR	Corrective Action Request
CDM	Clean Development Mechanism
CDM-EB	CDM Executive Board
CEN	National Electricity Coordinator
CER	Certified Emission Reductions
CNE	National Energy Comission
CL	Clarification Action
CM	Combined margin
CO2	Carbon dioxide
CO2e	Carbon dioxide equivalent
DOE	Designated operational entity
DR	Desk review
ER	Emission reduction
EF	Emission factor
FAR	Forward action request
GHG	Greenhouse Gasses
GSC	Global stakeholder consultation
GWh	Electrical Giga Watt hour
IPPC	Intergovernmental Panel on Climate Change
kW	Kilowatt
LC/MR	Low cost/Must run
MP	Monitoring plan
MW	Megawatt
OM	Operating margin

Abbreviations	Full texts
PDD	Project Design Document
PP	Project participant
PS	CDM project standard for programmes of activities version 02.0
RCP	Renewal of crediting period
SEN	National Electricity System (Chilean grid after interconnection of SIC and SING by the end of year 2017)
tCO_{2e}	Carbon dioxide equivalent tonnes
UNFCCC	United Nations Framework Convention on Climate Change
VVS	CDM validation and verification standard for programmes of activities version 02.0

Appendix 2. Competence of team members and technical reviewers

CERTIFICATE OF QUALIFICATION

Subject: Validation and technical review team for "Chacayes Hydroelectric Project, Chile "

Madrid, 18/06/2020

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: Elena Llorente Pérez

CDM team leader: YES

CDM validator: YES

CDM verifier: N.A.

External technical expert: N.A.

Technical areas related with the project activity:

Technical areas related with the project activity: 1.2. Renewables

Jose Luis Fuentes
Climate Change Manager

CERTIFICATE OF QUALIFICATION

Subject: Validation and technical review team for “Chacayes Hydroelectric Project, Chile”

Madrid, 18/06/2020

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: Luis Javier Arribas

CDM team leader: NO

CDM Tehnical reviewer: YES

CDM verifier: N.A.

External technical expert: N.A.

Technical areas related with the project activity:

Technical areas related with the project activity: 1.2. Renewables

José Luis Fuentes
Climate Change Manager

Appendix 3. Documents reviewed or referenced

No.	Author	Title	References to the document	Provider
1	UNFCCC	CDM project standard for project activities version 2.0	https://cdm.unfccc.int/Reference/Standards/index.html	UNFCCC
2	PPs	Previous PDD version.		PPs
3	UNFCCC	ACM0002: Grid-connected electricity generation from renewable source version 20.0	https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG	UNFCCC
4	UNFCCC	CDM Validation and Verification Standard for project activities version 2.0	https://cdm.unfccc.int/Reference/Standards/index.html	UNFCCC
5	UNFCCC	CDM Project Cycle Procedure for project activities version 2.0	https://cdm.unfccc.int/Reference/Procedures/index.html	UNFCCC
6	UNFCCC	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	https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-11-v3.0.1.pdf	UNFCCC
7	UNFCCC	Methodological Tool: Tool to calculate the emission factor for an electricity system version 07.0	https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf .	UNFCCC
8	AENOR	Specific Instruction for the Validation, verification and certification of clean development mechanism (CDM) project activities(IE/DTC/0039)		AENOR
9	PPs	Final PDD version 5.0		PPs
10	UNFCCC	CDM-PDD form version 11.0	https://cdm.unfccc.int/Reference/PDDs_Forms/index.html	UNFCCC
11	PPs	Registered PDD version 4.4	https://cdm.unfccc.int/Projects/DB/DNV-CUK1343210523.53/view	UNFCCC
12	UNFCCC	Validation Report version 2	https://cdm.unfccc.int/Projects/DB/DNV-CUK1343210523.53/view	UNFCCC

13	PPs	Ex-ante emission reduction calculation v4		PPs
14	PPs	Chile Electricity System Emission Factor 2019 CDM Chacayes v4.0		PPs
15	CEN	Resolution 668	https://www.leychile.cl/Navegar?idNorma=1111361	CEN
16	CNE	Gross electricity generation per type of fuel 2015-2019. Energy yearbooks.	https://www.cne.cl/nuestros-servicios/reportes/informacion-y-estadisticas/	CNE
17	CNE	Annual Electricity generation of the project electricity system 2019	http://www.cne.cl/estadisticas/electricidad/	CNE
18	CNE	Chile National Energy Balance 2018	http://energiaabierta.cl/visualizaciones/balance-de-energia/	CNE
19	IPPC	Guidelines on National GHG Inventories, Vol. 2 (Energy), Chapter 1, Table 1.4, Pages 1.23 and 1.24	http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf	IPPC
20	CEN	SIC electricity generation and fuels consumption per power unit, 2017	https://sic.coordinador.cl/informes-y-documentos/fichas/operacion-real/	CEN
21	CEN	SING electricity generation and fuels consumption per power unit, 2017	http://cdec2.cdec-sing.cl/pls/portal/cdec.pck_web_coord_elec.sp_pagina?p_id=5169	CEN
22	CNE	SEN electricity generation and fuels consumption per power unit, 2018	http://datos.energiaabierta.cl/dataviews/252286/consumo-de-combustibles-en-el-sen/	CNE
23	CNE	SEN electricity generation and fuels consumption per power unit, 2019	http://datos.energiaabierta.cl/dataviews/252286/consumo-de-combustibles-en-el-sen/	CNE
24	UNFCCC	Allowance for relax mandatory site visits by DOEs for a period of three months (23 March to 23 June 2020) due to COVID-19 pandemic		UNFCCC
25	AENOR and PP	Validation contract		AENOR
26	UNFCCC	Verification report: Nº 10343-14/011	https://cdm.unfccc.int/Projects/DB/DNV-CUK1343210523.53/iProcess/RWTUV1390469416.13/view	UNFCCC

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

Table 1. CL from this validation

CL ID	1	**Section no.**	D.1	**Date:** 08/05/2020
Description of CAR				
In accordance with the registered PDD, Chacayes Hydroelectric Project has an installed capacity of 110.8MW and a surface area of 180,000 m2. The revised PDD has an installed capacity of 113.36 MW and a pond surface area of 180,179 m2. Please provide evidences of the technical characteristic of the project activity.				
Project participant response				**Date:** 11/05/2020
As it was explained in the registered PDD (page 36; parameter Cap_{PJ}) *"110.8 MW, is the rated plant electrical output measured at revenue metering points, with both turbines operating at a net head of 168.6m and each discharging 36.35 m3/s, and both units generating at rated voltage, frequency and indicated power factor", defined in Schedule F "Performance Guarantee" of the EPC Contract*. However the maximum rated power of each turbine installed in the project is 56.68 MW, and therefore the installed capacity is 56.68 MW x 2 turbines = 113.36 MW. Please see evidence attached. Regarding the pond surface area value, it has been updated to the most recent data measured by the PP. Please see "INFORME TOPOBATIMETRICO TRANQUE CHUPALLAL 25-02-2020 3-4" attached.				
Documentation provided by project participant				
Placa Turbina U1.png *Placa Turbina U2.png* *INFORME TOPOBATIMETRICO TRANQUE CHUPALLAL 25-02-2020 3-4*				
DOE assessment				**Date:** 19/05/2020
A correction to the registered PDD should be made in accordance with the installed capacity of both turbines and the pond surface area. CL 1 is closed.				

Table 2. CAR from this validation

CAR ID	1	**Section no.**	D.1	**Date:** 08/05/2020
Description of CAR				
The PDD, section B.1 and section B.2 ,should be completed in accordance with the PDD template version 11.0.				
Project participant response				**Date:** 11/05/2020
Sections B.1 and B" have been completed according to the Instructions to PDD template version 11.0.				
Documentation provided by project participant				
PDD Chacayes Hydroelectric Project, Chile				
DOE assessment				**Date:** 19/05/2020
The PDD has been modified and it is considered correct. CAR 1 is closed.				

CAR ID	2	**Section no.**	D.4	**Date:** 08/05/2020
Description of CAR				

The following inconsistences have been detected in the Chile Electricity System Emission Factor 2019 CDM Chacayes v1.0 spreadsheet, please clarify:

- The data for the sheet “LCMR” should be adjusted to the CNE yearbooks. For instance the percentage of coal (SIC) and solar (SING) 2017 (page 31), and the total gross electricity generation of SIC 2015. Also please provide the 2019 CNE yearbook.
- For the sheet “NCVi,y&EFCO2,i,y” the Gross Calorific Value (GCV) from the “Balance Energia Chile 2018” has to be converted to NCV in accordance with the data of IPCC, 2006. Guidelines for national greenhouse gas inventories. V2_2_Ch1_Introduction, Page 1.16 (90 or 95%) in order to be used in the EF calculation.
- Update the information according to "Thermal generation: coal, key in the energetic matrix" (Revista EI; 06/05/2014; http://www.revistaei.cl/reportajes/generacion-termoelectrica-carbon-clave-en-la-matriz-energetica/) to use the data for other bituminous coal (sheet “NCVi,y&EFCO2,i,y”).
- For the sheet, “EF_BM,2019” review the data of electricity generation of the power plants, from Solar Luce to Solar La Lajuela, for instance: Solar Luce, Solar Bellavista 2, Solar San Isidro, Solar Tricahue, Solar La Ligua, Solar Villa Seca, the data of electricity generation is available.
- In the sheet OM2019, correct the year of the FC2018.
- For the sheet “NCVi,y&EFCO2,i,y” the value of the propane GCV is 12.100 kcal/kg for Chile National Energy Balance 2018.
- Include in the excel spreadsheet the reference source for the electricity generation of the plants: https://www.cne.cl/estadisticas/electricidad/ and review the electricity generation of 2019, for instance the power plant “Teno”.

Project participant response	**Date:** 11/05/2020

- Sheetspread “LCMR”: Data from yearbooks and monthly reports has been checked. There was only detected and error on the generation percent of coal for the year 2017. The LCMR percent for last 5 years has decreased to 48% after correction.

  The 2019 CNE yearbook doesn´t exist yet at CNE website. The data used for calculate 2019 electricity generation have been obtained from the 2019 monthly reports obtained from the CNE Website.
- Sheetspread “NCVi,y&EFCO2,i,y”: Coal Emission Factor has been update according to IPCC 2006 report. It has also modified the value of Propane GCV to 12.100 kcal/kg for Chile National Energy Balance 2018.

  The source of the emission factor has been update to *IPCC 2006 Guidelines for national greenhouse gas inventories. V2_2_Ch1_Introduction, Table 1.4.*
- Sheetspread “EF_BM,2019”: The electricity generation data has been reviewed and updates have been made for the power plants mentioned, including data from sheet “AEGtotal_2019” where the information comes from.
- The required reference was already added in sheetspread “AEGtotal_2019” cell B3.

  Data of “Teno” power plant have been checked and no error have been detected.
- Sheetspread “OM2019”: The year of FC2019 have been correct.

Documentation provided by project participant
Chile Electricity System Emission Factor 2019 CDM Chacayes v3

DOE assessment	**Date:** 19/05/2020

- Sheetspread “EF_BM,2019” and “AEGtotal-2019”: Ok, please review the Excel spreadsheet attached in the email, Chile electricity system emission factor, with the power plants mark as registered CDM project. Update the AEGtotal, the Set of 5 units, AEGset 20%, accordingly.
- Sheetspread “NCVi,y&EFCO2,i,y”: ok, the Gross Calorific Value (GCV) from the “Balance Energia Chile 2018” has to be converted to NCV in accordance with the data of IPCC, 2006. Guidelines for national greenhouse gas inventories. V2_2_Ch1_Introduction, Page 1.16 (90 or 95%) in order to be used in the EF calculation.
- Data of EG “Teno” power plant is 719 in the OM 2019, but 1.597 in the Excel Generación Bruta.

Project participant response	**Date:** 25/05/2020

- Sheetspread “EF_BM,2019” and “AEGtotal-2019” have been reviewed the plants that correspond with CDM Projects, and Set of 5 Units has been actualized.
- The GCV of “NCVi,y&EFCO2,i,y” have been converted to NCV (to 95%) according to the data IPPC, 2006.
- The data base of “AEGtotal-2019” and “OM2019” comes from different sources, both of them are official sources from Comisión Nacional de Chile (CNE). Therefore it has been decided to use the most conservative option for this power plant (719 MWh/year for both data sheets).

Documentation provided by project participant
Chile Electricity System Emission Factor 2019 CDM Chacayes v4.0

DOE assessment	**Date:**04/06/2020
The Chile Electricity System Emission Factor spreadsheet has been corrected and it is considered correct. CAR 2 is resolved.	

Table 3. FAR 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

Version	*Date*	*Description*
03.0	31 May 2019	Revision to: • 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